The Drive & Control Company

Rexroth
Bosch Group

Product catalog
Industrial hydraulics

Part 3: Cylinders












Product catalog Industrial hydraulics

Part 3: Cylinders

Product catalogs Industrial hydraulics of Bosch Rexroth at a glance:

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Should you have queries with regard to the products in this catalog, please contact the Rexroth sales partner in your vicinity.

www.boschrexroth.com/contact

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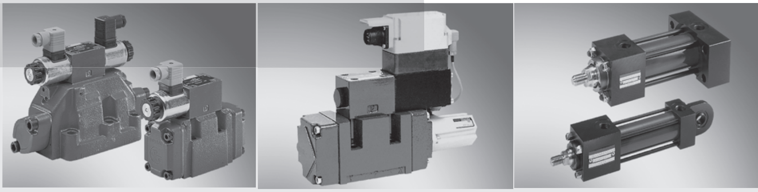
RE 07008/02.05



DE	**Ihre Sprache? – Siehe Rückseite!**
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1 Important basic information

1.1 Conventions used in this product information

Cross-references are printed in *italics*.

⚠ DANGER

This symbol indicates a threat of danger which will result directly in death or very serious injury if not avoided.

⚠ WARNING

This symbol indicates a threat of danger which may result in death or very serious injury if not avoided.

⚠ CAUTION

This symbol indicates possible danger which may lead to minor or serious injury and/or to material damage.

IMPORTANT

This symbol indicates additional information.

1.2 What you need to know about this product information

This product information applies to the following types of hydraulic products:

- Hydraulic components
- Hydraulic power units
- Hydraulic systems.

This product information applies exclusively to hydraulic products that are operated with mineral-oil-based pressure fluids, if the *Operating Instructions* do not expressly permit the use of other pressure fluids.

IMPORTANT

As this product information for Rexroth hydraulic products applies in a general sense, some of the content may not necessarily apply to the hydraulic product you have purchased.

However, only by strictly observing this product information and the Operating Instructions can accidents be prevented and problem-free operation of your Rexroth hydraulic product be guaranteed.

Observing the product information and Operating Instructions

- reduces downtimes and maintenance costs
- increases the service life of your hydraulic products.

The Operating Instructions must be directly accessible to one of the personnel at the hydraulic product and kept readily available at all times in a place known to the personnel.

The Operating Instructions must be read and understood and all its provisions observed by those responsible and by the operative personnel. We recommend that a record is made in writing of the employees' familiarisation with all the relevant parts.

The cross-references to directives, standards and regulations contained in this product information refer to the versions current at the time of writing of this product information, which can be obtained from the title page of this product information.

1.3 The contents of this product information

In addition to this document, product information for Rexroth hydraulic products normally includes Operating Instructions consisting of three parts:

- **Part I**, the general Operating Instructions for the relevant class of products
- **Part II**, the Technical Datasheet
- **Part III**, the Product- and Application-specific Operating Instructions.

If you do not have all three parts, please request the missing part from Bosch Rexroth. Only if all the information contained in all parts of the three-part Operating Instructions is observed can safe operation of Rexroth hydraulic products be ensured.

Specific cross-references are used to draw your attention to information that you can find in the Operating Instructions.

The Operating Instructions contain detailed information about the product, including

- Information about the scope of delivery
- Safety instructions
- Technical data and operating limits
- Information about bringing into (first) use and maintenance
- Information about the mode of operation
- Layouts, drawings
- Parts lists if appropriate
- Information about replacement parts and accessories.

2 Scope of delivery and responsibilities

2.1 Scope of delivery and responsibilities of Bosch Rexroth

Rexroth hydraulic products fulfil all safety requirements applicable to fluid power systems and their components.

IMPORTANT

For the scope of delivery and the responsibilities of Bosch Rexroth with respect to the product, please refer to the *Product-specific Operating Instructions*.

2.2 Responsibilities of the plant operator

⚠ CAUTION

If Rexroth hydraulic products are positioned in the vicinity of sources of ignition or strong radiators of heat, protection must be put in place that would prevent any escaping pressure fluid from igniting and the hose lines from aging prematurely.

Mineral-oil-based pressure fluid is hazardous to water and flammable. It may only be used if the relevant safety datasheet from the manufacturer is available and all the measures stipulated therein have been implemented.

If there is a risk of fluid leaking from the hydraulic product and contaminating water or the ground, the hydraulic product in question must be placed in a suitable collecting trough. In connection with this, the applicable statutory regulations must be observed.

You must also observe the EU directives for the use of work equipment (Directive 89/391/EC) and the associated individual directives, especially Directive 1999/92/EC for the protection from the danger arising from potentially explosive atmospheres and their implementations in national legislation. The legislation contains minimum requirements with respect to the making available by the employer of work equipment and for the use of work equipment by employees at work, including the regulations for operating equipment requiring supervision and the obligation to produce explosion protection documentation. This involves, for example, dividing areas endangered by potentially explosive atmospheres into zones and specifying suitable work equipment and procedures for these areas.

2.2.1 Noise protection

The A-weighted equivalent continuous sound power level of Rexroth hydraulic products can be obtained from the relevant *Operating Instructions*. If no values are documented then it can be taken that the value is less than 70 dB(A).

Installation of Rexroth hydraulic products in a machine or system may increase this value, and if so, the manufacturer of the machine/system must document this.

At or above 85 dB(A), the plant operator must make suitable hearing protection available to the personnel.

2.2.2 Special points concerning the installation of certain products

A Rexroth hydraulic product is intended above all for installation in machines, systems and power units as a part machine or a component for installation into another machine or system and is not a complete machine in the sense of the EU directive. In addition to the Machinery Directive, still further directives may apply, such as the Pressure Equipment Directive or the Explosion Protection Directive.

A wide range of dangers can arise from the combined actions of the hydraulic product and the machine or system in which the hydraulic product is installed. Therefore you must always make sure that the hydraulic product is also suitable without restriction for the proposed application at the installation location. The interfaces with the overall machine and the operating conditions are also of the greatest importance. We recommend that the results of the hazard analysis (risk assessment) of the overall machine are taken into account in the design of the hydraulic product.

The functioning of the hydraulic product is also influenced by the machine or system in which it is installed.

For this reason, you must also always observe the Operating Instructions of the overall system in which your hydraulic product is installed. It is most important for you to also consider the possible use of the hydraulic product in a potentially explosive atmosphere (see 94/9/EC).

IMPORTANT

Bosch Rexroth points out that, at the time of their first introduction on to the market, hydraulic products comply with the requirements of all relevant EU directives and/or their implementation into national legislation in Germany. If the scope of delivery is intended to be installed in a machine or system, then the Machinery Directive applies as appropriate – including the then currently applicable amendments – in that the scope of delivery does not necessarily comply with the requirements of the Machinery Directive because the scope of delivery is intended for installation in a machine or because the scope of delivery is intended for combination with other machines into a machine or a hydraulic system.

The bringing into use of the scope of delivery shall therefore not be permitted until the machine or system in which the scope of delivery is to be installed or of which it represents a component complies with the requirements of all relevant EU directives.

Details of further responsibilities can be found in *3 Important basic safety instructions* and in the *Operating Instructions*.

2.3 Liability, guarantee, warranty

Bosch Rexroth shall not be liable for damages that result from non-compliance with or disregard of these and other parts of the Operating Instructions.

Unauthorised tampering shall render the warranty null and void.

Bosch Rexroth shall only be liable if the scope of delivery was shown to be defective. Bosch Rexroth shall not be liable if a deficiency occurs that involves parts having been replaced by the customer with equivalent but not identical parts as specified by the manufacturer.

Please refer to our general terms of supply or your contract for details of the guarantee and manufacturer's warranty.

2.4 Copyright

This product information may only be reproduced – electronically or mechanically, in whole or in part – with the express written permission of Bosch Rexroth. It may likewise not be distributed, amended, transmitted, translated into another language or employed or copied for other purposes or by other parties without such consent.

3 Important basic safety instructions

3.1 What to do in an emergency

In the event of an emergency, fault or other abnormal occurrences:

1. Switch off the hydraulic system.
2. Secure the main switch against being unintentionally switched on again.
3. Secure the danger area so that no one can enter the danger area unknowingly or uncontrolled.
4. Notify the relevant specialist personnel immediately.
5. In the event of fire, observe the provisions of the safety datasheets issued by the manufacturer of the pressure fluid and the fire precautions specifically applicable to your place of work, which must be documented in the plant operator's operating manual.

⚠ WARNING

Fighting fires with materials other than those permitted can lead to explosions and/or more rapid spread of the fire!
Danger to life from smoke inhalation!

3.2 Safety labelling on the hydraulic product

IMPORTANT

- The meanings of the safety labelling on the Rexroth product are explained in the *Operating Instructions*.
- For a diagram of the nameplate and an explanation of the information on it please refer to the *Operating Instructions*.

3.3 Proper use

Rexroth hydraulic products are designed and constructed for the provision, transmission, control or regulation of energy and signals using the flow of oil.

Unless otherwise agreed, the Rexroth hydraulic product satisfies at least safety category B in accordance with EN 954-1.

If the hazard analysis/risk assessment of the overall machine in which the Rexroth hydraulic product is to be installed indicates that a safety category higher than category B in accordance with EN 954-1 is required for the Rexroth hydraulic product, then a correspondingly higher rated hydraulic product can be supplied and installed only after special agreement with Bosch Rexroth.

IMPORTANT

The hydraulic product shall be operated exclusively with pressure fluids complying with DIN 51524. Where other pressure fluids are permitted, for example brake fluids for brake valves, this is specially mentioned in the *Operating Instructions*.

For details on proper use see *4 Technical data and ambient conditions*.

The following information can be found in the *Operating Instructions*:

- the proper use, specific to the hydraulic product
- where applicable, the safety category in accordance with EN 954-1
- non-permitted and improper use.

3.3.1 Proper use, requirements before operation

- Rexroth hydraulic products may only be operated if they are in perfect technical condition.
  - In the event of disturbances in the power supply and/or damage to the electrical equipment, switch off immediately and secure the main switch against being switched on again without authorisation.
  - Report and rectify all faults and damage indicated by the system or discovered by other means.
- The connections, operating conditions and performance data specified in the *Operating Instructions* must be observed and never changed.
- Rexroth hydraulic products shall not be converted or otherwise modified without prior consultation with Bosch Rexroth.
- The plant operator shall not modify the program code of programmable control systems.
- Dependencies and time factors shall not be modified without prior consultation.
- The safety devices fitted by Rexroth must be present, properly installed and in full working order – except when this is impractical during setting up or maintenance work. They shall not be relocated, bypassed or rendered ineffective.
- Safety components such as limit switches, valves and other control components shall not be rendered inoperative.
- Tamperproof lead seals installed by the manufacturer shall not be removed or damaged except when this is necessary in the course of maintenance tasks defined in the *Operating Instructions.*
- The specified maintenance tasks in the *Operating Instructions* shall be carried out at the intervals stated in the *Operating Instructions*.

- Uncontrolled access by persons unfamiliar with the system to the immediate operating zone of Rexroth hydraulic products is prohibited (even if the product in question has been shut down).
- Rexroth hydraulic products must never be assembled, operated or maintained by persons under the influence of alcohol, drugs or other medication which affect one's ability to react.

3.4 Requirements for personnel, duty of care

3.4.1 Qualifications of specialist personnel

A specialist person is someone who, using his specialist training, knowledge and experience as well as familiarity with the relevant conditions, can

- safely carry out the tasks allocated to him and correctly assess the scope and implications of his work
- recognise possible dangers
- undertake the necessary measures to eliminate possible accidents.

3.4.2 Requirements for hydraulics maintenance personnel

In accordance with DIN 31051, maintenance comprises the individual activities of **inspection**, **servicing** and **repair**. All personnel involved in maintenance shall be familiar with and observe all parts of the Operating Instructions and this product information.

Inspection personnel shall fulfil the following requirements:

- They have been instructed in the relevant activity.
- Specialist knowledge of hydraulics is not required for purely inspection activities but the personnel must be aware of the particular dangers associated with hydraulic products.

Servicing personnel (who carry out filter and oil changes, for example) shall fulfil the following requirements:

- They have been instructed in the relevant activity.
- Specialist knowledge of hydraulics is not required to carry out servicing work.

Repair personnel shall fulfil the following requirements:

- The personnel must be hydraulics experts, who have been instructed and meet the definition given above,
- Repair personnel must be familiar with the function of the hydraulic system as a whole, from subsystems to their interaction with the function of the entire machine.
- Repair personnel must be able to read hydraulic circuit diagrams, interpret individual functions from their symbols and understand function diagrams.
- Repair personnel must possess knowledge of the function and construction of hydraulic elements.

3.4.3 Requirements for electrical maintenance personnel

All work on electrical equipment shall only be carried out by an authorised, qualified electrician, or by instructed persons under the guidance and supervision of a qualified electrician, in accordance with the rules applicable to electrotechnical products.

3.4.4 Minimum age

Persons under the age of 18 who are currently receiving instruction or training or are working under supervision may not work on Rexroth hydraulic products.

This does not apply to young persons of 16 or over if

- working on Rexroth hydraulic products is necessary in order for them to accomplish a training objective
- their protection is guaranteed by the supervision of an experienced, competent person
- they are allowed to use only tools, work implements and protective gear that preclude the risk of injury.

3.4.5 Training

The plant operator using Bosch Rexroth hydraulic products shall train his personnel regularly in the following subjects:

- Observation and use of the Operating Instructions and legal requirements
- Proper operation of the Rexroth hydraulic product
- Observation of the instructions of safety officers and the plant operator's operating manual
- What to do in an emergency.

IMPORTANT

Bosch Rexroth can provide you with training support in specialist areas.

An overview of the training can be found on the Internet at **http://www.boschrexroth.de/didactic**.

3.5 General ancillary dangers and protective measures when operating hydraulic products

⚠ DANGER

In the interests of your safety, all safety instructions shall be carefully observed, especially those in the Operating Instructions.

In spite of the high intrinsic safety of Rexroth hydraulic products, the risk of personal injury or damage to the environment cannot be excluded, even when the equipment is properly used.

New, additional dangers may arise if the hydraulic product is installed in another machine or installed with other machines in a system. This shall apply in particular to mechanical movements generated by the hydraulic product.

Information on these additional dangers can be found in the overall operating manual of the supplier of the overall system in which the hydraulic product is installed.

3.5.1 Dangers from pressure fluid

⚠ CAUTION

Handling pressure fluid without protection is **hazardous to health**.

Please observe the manufacturer's safety instructions and the safety datasheets for the pressure fluid that you are using.

⚠ DANGER

Serious damage to health or death may result if pressure fluid enters the blood stream or is swallowed. If this occurs, contact a doctor immediately!

3.5.2 Malfunctions due to contamination of pressure fluid

Contamination of the pressure fluid can be caused by:

- Wear during operation of the machine/system (metallic and non-metallic abrasion)
- Leaks of the hydraulic product
- Contaminants introduced during servicing/repair
- The use of dirty (unfiltered) pressure fluid when the pressure fluid is changed.

Contaminants lead to malfunctions, increased wear and shorter service life of the hydraulic product. This can have negative effects on the safety and reliability of the hydraulic product.

Therefore the maintenance tasks specified in the *Operating Instructions* shall be carried out at regular intervals and the utmost cleanliness is required during work on the hydraulic product.

⚠ CAUTION

When changing the pressure fluid, always use factory-fresh pressure fluid and filter it before filling to remove any contaminants in the pressure fluid that it often contains from the packaging container (drum). Flush out lines and hoses before installation.

The cleanliness class of a pressure fluid is specified in accordance with ISO 4406. Detailed information can be obtained from the relevant datasheet or the *Operating Instructions*.

1

In older datasheets, the cleanliness class is sometimes specified in accordance with NAS 1638. The following table can be used to convert this to an equivalent ISO 4406 cleanliness class:

Comparison table for cleanliness classes

Earlier class to NAS 1638	Current class to ISO 4406 (c)
Class 7	Class 18/16/13
Class 9	Class 20/18/15

3.5.3 Electrical dangers

When working on electrical systems:

- De-energise the hydraulic system before beginning any maintenance work.
- Cordon off the working area with red-white safety chain and warning signs.
- Lock the main switch, remove the key and keep it in a safe place until the work is completed.
- Attach a warning sign to the main switch.
- Check that there is no voltage using a **two-pole** voltage detector.
- Earth and short-circuit the point where you are working.
- Cover neighbouring live parts.
- Clear your workplace to prevent contact with live parts as a result of tripping or slipping. Wear safety footwear.
- Always use electrically insulated tools.
- Disconnect plugs at sensors and valves – even those with low voltages – after the system has been de-energised.

⚠ DANGER

Even after disconnection of the electrical supply (main switch OFF) the following supply systems/danger areas can still give rise to life-threatening voltages:

- ➢ Electrics, electronics, hydraulics (e.g. accumulators, rechargeable batteries)
- ➢ Main switch
- ➢ Power supply cables
- ➢ Points identified with an electric shock warning sign.

3.5.4 Product-specific ancillary dangers

All product-specific ancillary dangers and precautions can be found in the relevant *Operating Instructions*.

3.5.5 Disposal

- ➢ Take metal, cable and plastic ducts to a recycling materials collection centre.
- ➢ Dispose of electronic components as electronic waste.
- ➢ Dispose of back-up batteries as special waste.
- ➢ Cleaning agents, operating fluids and other materials:

⚠ CAUTION

Please observe the disposal regulations specified in the appropriate *Safety Datasheets*.

4 Technical data and ambient conditions

IMPORTANT

The product-specific technical data, operating limits and ambient conditions for the operation of your Rexroth hydraulic product can be found in the *Operating Instructions*.

This includes the following information:

- Minimum flow rate for adequate cooling
- Permissible maximum temperature of the coolant
- Performance data
- Type of control and regulation functions
- Permissible pressures, flow rates
- Connections.

4.1 Information about pressure fluids

Unless otherwise indicated in the Operating Instructions, the following specification applies to the pressure fluid to be used:

- Mineral-oil-based pressure fluid complying with the requirements of DIN 51524.
- Operating temperature range 0 °C…+80 °C (in tank < 72 °C).

Any deviations from this can be found in the *Operating Instructions*.

IMPORTANT

Bosch Rexroth recommends a maximum operating temperature of 55 °C, because the rate of ageing of the pressure fluid increases and the service life of the seals and hoses is reduced at higher temperatures.

- Viscosity ranges:
  see RE 07075 and RE 90220
- Max. permissible contamination class of the pressure fluid in accordance with ISO 4406: see *3.5.2 Malfunctions due to contamination of pressure fluid*.

The maximum permissible cleanliness class can be found in the *Operating Instructions*. The following types of pressure fluids shall be used.

IMPORTANT

Rexroth hydraulic components are tested with test oil MZ45 manufactured by ESSO (class ISO VG 46 at 40 °C), (Viscosity η = approx. 46 mm^2/s).

4.2 Ambient conditions

4.2.1 Use in potentially explosive atmospheres

⚠ DANGER

Rexroth hydraulic products shall be used in potentially explosive atmospheres only if they are designed for this purpose and this is expressly stated in the *Operating Instructions*.

IMPORTANT

Directive 1999/92/EC of the European Parliament and Council dated 16 December 1999 concerning the minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres governs protection from danger from potentially explosive atmospheres. Observe the requirements contained in the regulations for operating equipment requiring supervision and the obligation to produce explosion protection documentation.
This involves, for example, dividing areas endangered by potentially explosive atmospheres into zones and specifying suitable work equipment and procedures for these areas.

Observe the requirements of *Directive 94/9/EC of the European Parliament and Council dated 23 March 1994 on the approximation of laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres* (ATEX Product Directive) and/or the corresponding national legislation by means of which the Directive was implemented in law in the EU member states. The directive contains requirements for the use of equipment and protective systems in potentially explosive atmospheres.

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4.2.2 Climatic operating conditions

Unless otherwise indicated in the Operating Instructions, the permissible ambient temperature

- for control units: 0 °C…+50 °C
- for drive units with electric motors without heat exchangers, surface-cooled by free air circulation: 0 °C…+30 °C
- for drive units with heat exchangers: < +40 °C.

Unless otherwise specified, Rexroth hydraulic products are designed for use in temperate climate zones and in covered areas (not in the open air) at relative air humidities of < 70 % and at room temperatures of 22 °C.

IMPORTANT

For systems with oil-air heat exchangers:
Observe the information given in the circuit diagram in the *Operating Instructions*.

In relation to the electronic equipment, the permissible ambient conditions apply to installed and protected electrical connections of class IP 55.

- Ambient temperature +5 °C…+40 °C
  assuming that the average air temperature over a 24 hour period does not exceed +35 °C.
- Relative air humidity: 23…95 %, non-condensing.
- Altitude: up to 1000 m above national datum.

⚠ DANGER

Rexroth hydraulic products shall not be used in aeronautical equipment, except where they have been specially approved and appropriately labelled to this effect.

5 What you need to know about pressure fluids

5.1 How to handle pressure fluids safely

DANGER

Mineral-oil-based pressure fluid is hazardous to water and flammable.
It may only be used if the relevant safety datasheet from the manufacturer is present and all the measures stipulated therein have been implemented.

5.2 Functions and effectiveness

Due to the many tasks of pressure fluid, its selection, inspection and maintenance are of vital importance for:

- proper functioning
- operating safety
- service life
- and the cost effectiveness of the hydraulic product.

The tasks of pressure fluid:

- to transmit hydraulic energy from the pump to the hydraulic cylinder/motor
- to lubricate parts moving against one another
- corrosion protection
- to remove contaminants
- to remove locally accumulated heat.

5.2.1 Reduced function due to ageing

The effectiveness of pressure fluid diminishes as it ages (undergoes chemical changes). Acids and resinous residues form, which may cause valve spools to stick.

The following factors accelerate the ageing process:

- high temperatures
- oxygen in the pressure fluid
- air humidity
- water
- metallic catalysers
- operating pressure
- contaminants.

IMPORTANT

Observe the following rules of thumb:
At pressure fluid temperatures >70 °C, the rate of ageing doubles for each 10 °C.

5.3 Viscosity

5.3.1 Viscosity grades

The most important characteristic of a pressure fluid is its viscosity, i.e. stickiness. Viscosity range always plays a priority role in the selection of a pressure fluid.

Viscosity is measured in the SI unit [mm^2/s]. Many manufacturers still provide their information in centiStoke [cSt], the equivalent of [mm^2/s].

The viscosity grades (VG = viscosity grade) in accordance with ISO 3448 relate to the viscosity at 40 °C. The viscosity grade is appended to the type designation or the commercial name of the pressure fluid.
Example: A pressure fluid with a viscosity grade of ISO VG 46 has a viscosity of 46 mm^2/s at 40 °C.

The relationship between medium temperature and viscosity for hydraulic oil (example)

Medium temperature	Viscosity
3 °C	800 mm^2/s
8 °C	500 mm^2/s
25 °C	100 mm^2/s
60 °C	20 mm^2/s
77 °C	12 mm^2/s

Too high a viscosity leads to the formation of air and vapour bubbles as a result of low pressure (cavitation). Too low a viscosity leads to increased leakage losses. Increased leakage losses cause the pressure fluid to heat up more, leading in turn to a further reduction in viscosity. The pressure fluid then loses its ability to lubricate.

Valves, pumps and hydraulic motors, in particular, require exact compliance with the defined viscosity ranges.

For certain ambient and operating temperatures, not all the requirements can always be covered with the available ranges of the viscosity grades.

In order to comply with all the requirements, high viscosity pressure fluids with viscosity index improvers or a pressure fluid cooler/heater may be used.

5.4 Leakage fluid

Clearances and play mean that some leakage fluid escapes from all hydraulic products. Leakage fluid can be lead away internally or externally, depending on the component. It can be fed back into the tank or must be disposed of.

⚠ CAUTION

Make sure that the leakage fluid is fed back into the tank in a proper manner.
Dispose of leakage fluid that is not fed back into the tank properly, in compliance with the applicable environmental protection regulations.

5.5 Topping up/refilling

⚠ CAUTION

When topping up/refilling your hydraulic system, make sure that you use pressure fluid of the same sort and type and from the same manufacturer.

If the fluid is heavily contaminated or prematurely aged, then the system, including the tank must be cleaned and flushed before refilling. New pressure fluid must always be filtered in accordance with the required cleanliness class, as it does not normally meet the required cleanliness class in the as-supplied state.

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6 Construction and mode of operation of a hydraulic system

6.1 Definitions of terms

Hydraulics (fluid technology)

Transmission, control and distribution of energy and signals using a pressurised fluid medium.

Hydraulic system

Arrangement of interconnected components for transferring and controlling hydraulic energy.

Component

A single unit (e.g. a valve, filter, cylinder, motor) that consists of one or more parts and which is a functional constituent of a hydraulic system.

Drive

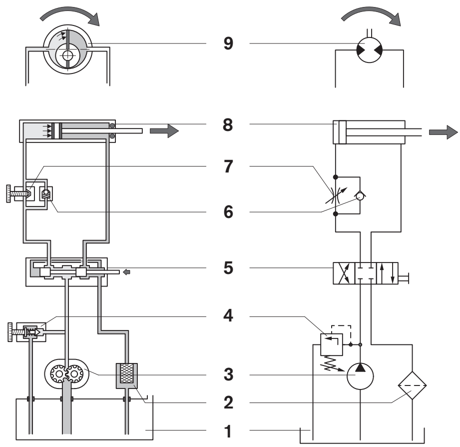
A component that converts the energy of the hydraulic fluid into mechanical energy (e.g. motor, cylinder).

6.2 Schematic

In a system operated with hydraulic oil, first of all mechanical energy is converted into hydraulic energy, transported and controlled in this form, to finally be converted once more into mechanical work.

The hydraulic elements are arranged in accordance with these functions. The following diagram shows a schematic representation of the elements of a complete hydraulic system.

To demonstrate their operating principle, standardised symbols (ISO 1219) are used instead of sectional diagrams of the various devices. Line connections are represented by simple lines, as can be seen in the example.



1	Tank	Oil preparation
2	Filter	
3	Pump	Energy conversion
4	Pressure limiting valve	Energy control
5	Directional valve	
6	Check valve	
7	Throttle valve	
8	Hydraulic cylinder	Energy conversion
9	Hydraulic motor	

6.3 Safety concept

Hydraulic products contain sensors and actuators, the interaction of which is particularly important with regard to the fulfilment of technical safety functions.

Individual hydraulic products form part of an overall safety concept.

Applications required to perform safety functions are designed using special hydraulic components that satisfy the requirements of the relevant directives, such as the Pressure Equipment Directive and other standards.

The manufacturer of the overall machine or system defines and bears responsibility for the safety category to EN 954-1 to be fulfilled.

IMPORTANT

A more detailed description of the safety concept and the specific safety components installed can be found in the *Operating Instructions* and the *Operating Instructions of the supplier of the overall system* in which the hydraulic product is installed.

7 Moving hydraulic units/components

Hydraulic units or components may be moved by a fork-lift truck or a hoist, depending on their size and the local conditions.

IMPORTANT

For details see the *Operating Instructions*.

⚠ CAUTION

Always ensure hydraulic products are empty of pressure fluid for transportation.

Rexroth hydraulic products are delivered empty of pressure fluid. However, products may contain oil residues left over from the final inspection at our factory.

8 Storage and longer standstills

8.1 Hydraulic systems - subsequent bringing into use after storage

Corrosion, especially oxidation, can cause metal surfaces to lose the standard of surface finish required for the hydraulic system to function properly.

Rust and other metallic and non-metallic particles lead to abrasive wear (erosion), which detrimentally affects the functioning of the hydraulic system.

⚠ CAUTION

If a hydraulic system is to be brought into use again following a long standstill, it must first be flushed clean.

8.1.1 Factory-applied corrosion protection

Rexroth hydraulic products are tested in accordance with Class III using a hydraulic oil that has additional anti-corrosive properties. The film of oil that remains in the product after the test provides sufficient internal corrosion protection.

This factory lubrication ensures that valves do not stick during subsequent use of the hydraulic product, and guarantees compatibility with seals and the pressure fluid to be used.

IMPORTANT

The factory-applied corrosion protection is adequate provided that

- ➢ no condensation or leakage water can enter the system
- ➢ long standstills are avoided.

Contact Bosch Rexroth if you are not clear about the consequences of long standstills on the state of the hydraulic product.

8.1.2 Storage times in relation to the ambient conditions

Delays in bringing into use, long shipping and storage times or long periods of non-use can lead to rust formation in Rexroth hydraulic products. Additional corrosion protection measures must be implemented to prevent this.

IMPORTANT

If all the openings on the hydraulic products are not sealed so as to be air-tight, this will reduce the storage life of the hydraulic product by nine months.
After the specified storage time has expired, in any event not longer than 24 months, the corrosion protection must be checked and further conservation measures applied if necessary.

8.2 Seals, hoses and hose lines

CAUTION

Seals:
Observe the requirements of ISO 2230 and/or DIN 7716 and the specific manufacturer's data on seals.

Hoses and hose lines:
In the Federal Republic of Germany, please observe the requirements of *DIN 20066, ZH 1/74 Safety rules for hydraulic hose lines* and the specific manufacturer's data on hoses and hose lines.

In addition, the following conditions shall be observed:

- Seals, hoses and hose lines are stored in cool, dry and dust-free conditions.

The hoses and hose lines can be enclosed in plastic foil to ensure low-dust storage conditions. Ideal storage conditions for hoses and hose lines are temperatures from +15 °C to +25 °C and a relative humidity of below 65 %.

- Do not store elastomers below –10 °C. The ideal storage conditions for seals are temperatures from +10 °C to +20 °C and a relative humidity of between 65 % and 75 %.
- Store hoses and hose lines in the original packaging if possible. Prevent the entry of air.
- Avoid direct sunlight and UV radiation and shield from nearby sources of heat.
- Darkened storage locations are preferred.
- Do not use ozone-forming light sources or equipment (e.g. fluorescent lamps, mercury-vapour lamps, copiers, laser printers) or electrical spark-forming devices in the vicinity of hoses and hose lines.
- Seals, hoses and hose lines must not come into contact in particular with materials or vapours that could damage them (e.g. acids, alkalis, solvents).
- Store seals, hoses and hose lines lying down and free from tension. If the hoses and hose lines are coiled, take care not to bend them to less than the smallest bending radius specified by the manufacturer.

Maximum storage times

- NBR seals: 4 years
- FKM seals: 10 years
- Hoses: 4 years
- Hose lines: 2 years

For reasons of safety, seals, hoses/hose lines shall not be used once these permissible storage times are reached or exceeded. Permissible storage times could be considerably reduced if the permissible storage conditions are not maintained. If you are not clear about the storage times and/or storage conditions then you should not use the product.

9 Assembly and bringing into first use

IMPORTANT

Only the permissible pressure fluids given in the Operating Instructions are to be used. Information on other pressure fluids can be found in the *Operating Instructions* or are available on request.

Filling the pressure fluid tank must always take place through a suitable filter unit. Experience has shown that even new pressure fluid can often have more than the maximum permissible level of contamination.

All information specific to assembly and bringing into first use can be found in the *Operating Instructions*.

Pay attention to cleanliness:

➢ Do not use cleaning wool or cloths containing fibres for cleaning.

  Depending on the condition of the system or machine, cleaning with fibre-free cloths may be sufficient. Use suitable liquid cleaning agents to remove lubricants and other stronger contaminants. Make sure that cleaning agent does not get into the hydraulic system.

➢ Never use hemp and putty as sealants.

The functional or failure behaviour of identical hydraulic products may vary due to conditions specific to the machine or system in which the hydraulic product is installed (mass, speed, electrical triggering at setpoint values, etc.), see also Section *11 Trouble-shooting*.

9.1 Safety advice for assembly and bringing into first use

⚠ DANGER

Hydraulic products are generally intended for installation in machines/systems or devices.

The function of the hydraulic product must therefore always be seen in relation to the function of this machine – i.e. seemingly identical hydraulic products may demonstrate different functional behaviours as a result of the function of the machine in which they are installed.

For this reason, a hydraulic drive must not be brought into use until it has been determined that the machine in which it is installed conforms to EU standards.

Do not bring hydraulic drives into use until you have familiarised yourself completely, firstly with the function of the hydraulic product and hydraulic equipment and secondly with the hydraulically powered machine functions, and have clarified and dealt with any possible dangers.

Bringing into (first) use shall only be done by an instructed, authorised hydraulics expert who has the required specialist knowledge.

Specialist hydraulics knowledge means, among other things, that the person can read and fully understand hydraulics drawings. In particular, he must fully comprehend the range of functions of the integrated safety components as part of the overall safety concept.

9.2 Before bringing into first use

1. Check the scope of delivery for transport damage.
2. Check that the Operating Instructions for the Rexroth hydraulic product are present and complete.
   Contact us if the Operating Instructions are not there or are incomplete.
3. Assemble the hydraulic product.
   - Observe the *Operating Instructions* and this product information.
   - Assemble the hydraulic components, so that they are mounted strain-free on even surfaces.
   - Tighten the fastening bolts evenly using the specified tightening torque.
4. Ensure that the interfaces of the system/machine and the installation conditions provide for safe operation of the hydraulic product. If in doubt, consult the people responsible for the overall system/functional machine.
5. Check the construction of the hydraulic product against the circuit diagrams, lists of equipment and assembly drawings. If there are any differences, draw this to the attention of the people responsible. If important documents are missing, they can be requested from Bosch Rexroth. Only documents issued by the bodies authorised to do so shall be used.
6. Based on the *Operating Instructions* for the system or machine in which the hydraulic product is installed, check whether bringing the hydraulic system into use could lead to uncontrolled, dangerous movements. Where appropriate, take into account the hazard analysis/risk assessment for the system or machine.
7. Take the precautions appropriate to the anticipated dangers, e.g.
   - Ensure that the cylinder piston rod can move out without danger.
   - Use a hoist or other lifting device to additionally secure lifted loads.

8. As part of bringing into (first) use, check whether the electric motors and valve solenoids can be switched manually using the electrical controls of the system/machine. If they cannot be switched manually – or can but with difficulty – you must provide a remote control (e.g. test boxes for Rexroth proportional valves) for the internal function test of the hydraulic system.

IMPORTANT

Starting up the hydraulics solely by means of emergency manual operation is not recommended, as several valves at once cannot be switched as required in the correct sequence.

9. Draw up a sequential program for bringing into (first) use and store it with the technical documentation as an appendix to the Operating Instructions.
   For this you should consider the following:
   Hydraulic drives basically consist of the following functional groups
   - ➢ Pump circuit (generation of pressurised oil flow); pump, electric motor, oil tank, filters, monitoring devices, etc.
   - ➢ Control system for at least one hydraulic consumer (cylinder, motor); directional control valves, pressure and flow control valves, check valves
   - ➢ Hydraulic consumers (cylinders, motors) with specially assigned valves, e.g. braking valve.
10. Divide the functional circuit diagram into separate mini-circuits that can each be started up in succession.
11. Read the functional circuit diagram and seek clarification of any unclear text or diagrams. More information about the functioning of components, e.g. a pump regulator, is available in the *Technical Datasheet*.
12. Establish into which position valves are to be switched, or how valves are to be set.
13. Put up any necessary directional, prohibitive or informative signs and check whether the meaning of these signs are explained in the *Operating Instructions*.
14. Follow this sequence for bringing into (first) use
   - ➢ Pump circuit
   - ➢ Parts of control system:
     e.g. pressure cut-off and switchover,
     open centre,
     pressure reduction etc.
   - ➢ Cylinder and motor circuits:
     First move,
     fill and bleed,
     then finally optimise all settings.

9.3 Bringing into first use, subsequent bringing into use

⚠ DANGER

Before bringing into (first) use, have all pressure accumulators and safety systems checked by an expert or specialist in accordance with national regulations.

1. Clean the lock on the transport and storage container before opening.
2. Clean the hydraulic unit and all other component groups, so that no dirt can get into the hydraulic system during bringing into (first) use.
3. Check the paint on the tank for integrity.
4. Flush the connection lines to remove dirt, scale, chips etc.
5. Pickle and flush welded pipes.

⚠ CAUTION

Remove all residues of water and cleaning agents before performing further work.

6. Clean the interior of the hydraulic components to get rid of contaminants:
   - Clean the filler plug of the pressure fluid tank.
   - Remove dust and chips using an industrial vacuum cleaner, by rinsing parts or similar cleaning method.
   - Completely remove any oil residues left over from the factory test.
   - Remove any gummed oil which may have formed due to incorrect storage.
7. Connect up all connection lines.

IMPORTANT

Observe the installation instructions from the manufacturer of the connection components.

⚠ DANGER

Make sure that pipes and hoses are connected at all ports or that the ports are sealed with screw plugs.

8. Carry out a special check to make sure that the union nuts and flanges are correctly tightened at the pipe connections and flanges.

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IMPORTANT

Mark all the checked connections, e.g. with paint.

Make sure that all pipes and hoses and every combination of connection pieces, couplings or connection points with hoses or pipes are checked for their operational safety by someone who has the appropriate knowledge and experience.

9. Connect the hydraulic consumers. Dimension the connection lines in accordance with the performance data in the *Circuit Diagram* and the *Operating Instructions*.
10. Install the electrical system for the drive and control system:
    - Check the connected loads.
    - Connect coolant water if necessary.
    - Check the direction of rotation of the pumps (e.g. as indicated by attached arrow markings).
11. Check the pressure fluid to ensure that no water has entered it.
12. Before filling the pressure fluid tank, please observe the following requirements:
    - ➢ The pressure fluid must conform to the specification in the *Operating Instructions*.

    ⚠ CAUTION

    Never fill new hydraulic products with used pressure fluid.

    - ➢ The drums of pressure fluid must be sealed and clean on the outside.

IMPORTANT

If the pressure fluid has a high level of initial contamination (see *4 Technical data and ambient conditions*):

Use a filter unit to fill the pressure fluid tank. Ensure that the filter element is clean.

IMPORTANT

The fineness of the filter shall correspond to the cleanliness class required by the overall system and if possible be even finer.
The filter unit used shall fulfil the requirements for functional safety and service life.

- If possible, fill the pressure fluid tank via a filling coupling, using a return filter if possible.

⚠ CAUTION

Use oil filler units (filter units) suitable for pressure fluids.

- Do not remove the filter strainers from filler necks or the filter element from filters before filling the pressure fluid tank.

13. Fill the pressure fluid tank up to the upper mark on the inspection window. Observe the maximum fluid level, taking into consideration the volume in the connection lines and hydraulic consumers.
14. Set the pressure and flow control valves, pump regulator, signalling elements such as pressure switches, limit switches and temperature regulators to the settings and values defined in the sequential program (see *9.2 Before bringing into first use*).

⚠ DANGER

Do not change the settings of valves with a safety function, valves with a position switch or valves with preset electronics.

- Set operating-pressure valves and flow control valves to the lowest possible values.
- Set directional control valves to their basic setting.
- Reduce the setpoint values of proportional valves to minimum values.
- Do not remove the tamperproof lead seals. Damaged or removed tamperproof lead seals indicate improper use of the hydraulic product.

15. If applicable:
    Fill the pressure accumulator to the specified gas precharge pressure and then check the pressure, see *Operating Instructions*.
16. Fill the pump body:
    Use the leakage oil port to fill pump bodies that have this feature, see *Operating Instructions*.
17. If applicable:
    Open the cocks in the suction line.
18. Start the drive motors:
    - With electric motor in jogging mode, allow to start briefly
    - Combustion engines in idle
    - Pay attention to the direction of rotation.

19. Bleed the hydraulics (valve, pump, motor, line, cylinder).

IMPORTANT

Details on bleeding can be found in the *Operating Instructions*.

- Operate the hydraulic product at low pressure until it is fully bled.
- Bleed the hydraulics lines to consumers or measuring points at the highest point, if possible.
- Operate the directional valves in jogging mode.
- Next, advance and retract all hydraulic consumers several times.
- Increase the load slowly. Check the pressure fluid level in the pressure fluid tank. If necessary, top it up with pressure fluid.

Bleeding has been accomplished fully and correctly if the pressure fluid in the tank does not foam, if the hydraulic consumers do not make any jerky movements and if no abnormal noises can be heard.

20. Set the valves and sensors and start up the machine:

- Set the switching operations of valves with a switching time adjustment/ramp in accordance with the dynamic conditions, see *Operating Instructions*.
- Finely adjust and optimise the setting of proportional valves without on-board electronics (OBE).

Manufacturing tolerances mean that valves and amplifiers have to be adjusted in line with one another. Valves with in-built electronics (OBE, On Board Electronics) have the valve and amplifiers adjusted in line with one another at the factory.

Amplifiers for valves without OBE are supplied from the factory with a basic setting. Depending on the type of valve and amplifier, you may have to fine-tune the null point and sensitivity before bringing the valve into use.

IMPORTANT

Details on fine-tuning can be found in the *Operating Instructions*.

21. Check the operating temperature after the machine has been running continuously for several hours. Too high an operating temperature indicates that there are faults that need to be analysed and rectified.

22. Rectify any leakages, e.g. by relieving couplings from pressure and then retightening.

IMPORTANT

Apart from moisture, which should not be sufficient to form one drop, no measurable, unintentional leakage shall be found.

23. After bringing the machine into first use, have a sample of the pressure fluid analysed to ensure that it achieves the required cleanliness class. Change the pressure fluid if the required cleanliness class is not achieved.
If the pressure fluid is not tested in the laboratory after bringing the machine into first use:
Change the pressure fluid.

24. Replace the pressure fluid filter.

25. Document and file all set values.

⚠ DANGER

26. To ensure the safety of persons and the system, after bringing the machine into first use, perform the following tests using the defined maximum values:

- Function test
- Pressure test.

Prepare a record of the bringing into (first) use or acceptance and have it signed by the plant operator. This record is an important document and requires to be filed.

IMPORTANT

Information on how to perform the function test and pressure test can be found in the *Operating Instructions*.

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10 Operation

IMPORTANT

Please refer to the *Operating Instructions* for all information on how to operate the Rexroth hydraulic product.

11 Trouble-shooting

11.1 What to do in the event of a fault

⚠ DANGER

In the event of abnormal occurrences or malfunctions, stop all work on the Rexroth hydraulic product immediately and inform the responsible personnel.

IMPORTANT

A table for product-specific trouble-shooting can be found in the *Operating Instructions*.

If the responsible personnel are unable to rectify the problem immediately:

- Switch off the main switch. If applicable, turn off any combustion engines used as drive motors.
- Secure the main switch against being unintentionally switched on again.
- Inform the machine manufacturer.

11.2 The basic approach to trouble-shooting

The information in this section is intended to help you create the ideal conditions for carrying out trouble-shooting as efficiently as possible.

11.2.1 General conditions

- ➢ Is all the necessary technical documentation to hand?
- ➢ If no hydraulic circuit diagram is available:
  Can a hydraulic circuit diagram be drawn using the structure, signs and labelling of the equipment?
- ➢ Are there enough measuring points?
- ➢ Has the customer provided useful information about how the malfunction manifests itself and about the functional behaviour of the system/component prior to the malfunction?
- ➢ Is there a machine record book that may document similar malfunctions in the past?

11.2.2 Recommended way of working when trouble-shooting

Successful trouble-shooting for a hydraulic product requires precise knowledge about the structure and method of operation of the individual components.
Where hydraulics are combined with electrics/electronics, in particular, trouble-shooting is rendered more difficult and co-operation between electricians and hydraulic specialists is required.

- Even if you are under time pressure, proceed systematically and methodically.
  Indiscriminate, hasty dismantling and readjustments may, in the worst case, result in the original cause of failure being impossible to determine.
- Make sure that you gain an overview of the function of the hydraulics in respect of the overall system in which the hydraulics are installed.
- Try to find out whether the hydraulics performed the required function in the overall system prior to the occurrence of the fault.
- Try to determine any modifications to the overall system in which the hydraulics are installed:
  - ➢ Have the operating conditions or operating range of the hydraulics been changed?
  - ➢ Have modifications (e.g. retrofitted equipment) or repairs been carried out on the overall system (machine/system, electrics, control system) or on the hydraulics? If yes: What were they?
  - ➢ Have the set values of the hydraulics been changed?
  - ➢ Have the hydraulics recently undergone maintenance?
  - ➢ Has the hydraulic product/machine been operated improperly?
  - ➢ How does the malfunction manifest itself?
- Form a clear picture of the cause of the fault. Ask the machine operators directly, if necessary.
- Document any work undertaken, changed set values, etc.
- Document any amendments/additional information that should be included in the *Operating Instructions*.

11.2.3 Systematic trouble-shooting procedure

- ➢ Is there an inspection and maintenance book which might provide information about the trend of test parameters (e.g. temperature of hydraulic fluid, replacement intervals of filter elements, noises)?
- ➢ Have there been any identical or similar failures in the past?
  - Make a note of causes of failures with a low probability. Only investigate the failure causes you have noted down if all failure causes with a high probability have been proven to be inapplicable.
  - Draw up a list of priorities of the most probable failure causes.
  - Verify these listed failure causes one after the other (by means of theoretical conclusions, disassembly, measurements or tests).
  - Document the causes of failure you have discovered, and note down how you discovered them.

11.3 Trouble-shooting tables

IMPORTANT

The causes of failure in hydraulic systems can be extremely complex. Therefore, general rules for trouble-shooting can only be laid down to a limited degree.

Please refer to the relevant *Operating Instructions* for product specific information about trouble-shooting the Rexroth hydraulic product.

12 Maintenance

12.1 Definitions of terms

The term **Maintenance** as defined in DIN 31051 encompasses all measures to maintain and restore the desired conditions and to determine and assess the actual condition of the technical devices of a system .

These measures are divided into the following categories:

- ➢ Inspection (determining the actual condition)
- ➢ Servicing (maintaining the desired condition)
- ➢ Repair (restoring the desired condition).

The above measures include:

- ➢ Adapting maintenance objectives to suit company objectives
- ➢ Determining appropriate maintenance strategies.

12.2 Safety during maintenance tasks

⚠ DANGER

In the interests of safety, please observe all the following safety instructions carefully and at all times.

- Check safety devices regularly to see that they are working properly.
- Perform all maintenance work properly, completely and within the stipulated periods and make a record of the work.
- Inform all personnel before commencing maintenance work.
- Generously cordon off the maintenance zone before commencing work.
- Inform all persons of ongoing maintenance work by means of the appropriate signs.
  In particular, attach warning signs to the control cabinet, main switch, actuators and points of access.

If you have to switch off the hydraulic product, secure it against being unintentionally switched on again as follows:

- Switch off all drives, disconnect the hydraulics from the mains at the main switch.
- Depressurise the hydraulic product (relieve any pressure accumulators of pressure).
- Secure the main switch against being unintentionally switched on again.

Before undertaking any manual intervention in the Rexroth hydraulic product:

⚠ DANGER

Please refer to the *Operating Instructions* for all the necessary information on depressurisation and on those parts of the Rexroth hydraulic product that are not depressurised automatically.

- **Advance all cylinders to their safe end position.**
- **Lower all loads.**
- **Switch off all pumps.**
- **Mechanically support vertical cylinders so that they cannot drop. Never perform any maintenance work on raised units without external support.**
- **Relieve any accumulators of pressure in the proper manner.**
- **Switch off the pressure supply and secure the hydraulic product against being inadvertently switched on again.**
- **Ensure that only authorised personnel remain in the work zone.**
- **Wear safety glasses, gloves and boots.**
- **Allow pressure lines and sections of the system which have to be opened to cool down before commencing maintenance work.**
- **Open with care any segments that have to remain under pressure.**

Since check valves are located in the pressure lines above the pumps, the hydraulic system may still be under pressure even after it has been disconnected from the actual pressure supply.

Certain segments, such as servo cylinders, also continue to remain under pressure because the proportional valves remain in the closed position (all valves are illustrated in their basic position in the hydraulics diagram).

Observe the following:

- ➢ Only new, interchangeable and tested components, replacement parts and lubricants in original-equipment quality are approved for use/replacement.
- ➢ For reasons of safety, the installation of used and/or untested components is strictly prohibited and leads to loss of EU Conformity.

Exercise extreme vigilance when operating the hydraulic product in maintenance mode, which may in certain circumstances necessitate the temporary removal of certain safety devices.

Make sure that all safety devices are properly installed and have undergone a function test before bringing the system (back) into use.

- Perform welding, burning or grinding work on the hydraulic unit or its attachments only with the approval of local safety authorities/fire brigade and with suitable protective covering to prevent ingress of contaminants.
- When performing assembly work above your height, use the steps and platforms provided by the plant operator. Do not climb on any parts of the system.
- Remove all tools and materials needed for maintenance from the hydraulic product.
- Always rectify any leakage from the hydraulic product immediately.
- Always inform personnel before (re)starting the hydraulic product.

12.3 Inspection and servicing

The objective of inspection and servicing is

- ➢ To maintain all system functions along with the initial parameters of the system
- ➢ To ensure continual availability of the system
- ➢ To detect weak points
- ➢ To ensure that the system attains the required service life.

IMPORTANT

The following general specifications are based on use of the hydraulic product in central Europe and under the usual operating conditions of commercial and industrial plants.

We strongly recommend the use of an inspection and servicing book, in which all work specific to that site, and all inspection and servicing intervals should be defined and documented.

An inspection and servicing book is also helpful in that

- ➢ It provides comparison values to aid with early detection of malfunctions
- ➢ It allows warranty claims to be dealt with more easily.

⚠ CAUTION

Ensure cleanliness during all work.

- Please observe the requirements for pressure fluids mentioned in Section *9 Assembly and bringing into first use*.
- Clean the external environment of couplings/joints and devices before disassembly. Do not use cleaning wool or cloths containing fibres for cleaning.
- Seal all openings using protective caps.
- Bleed the hydraulic product after each item of servicing work.
- Document and file details of any work undertaken, changed set values, etc.
- Document and file details of any amendments/additional information that should be included in the Operating Instructions.
- Modifications and additions could affect the validity of the EU Conformity Declaration/Manufacturer's Declaration. Always consult Bosch Rexroth about any proposed modifications or additions.

12.3.1 Inspection procedures and test equipment, general

The following are some of the typical inspection and testing procedures that are regularly used in connection with hydraulic systems and components.

IMPORTANT

Keep the indicated typical test equipment ready for this type of work.

Type of test	Typical test equipment	Typical testing activities
Pressure measurement	Pressure gauge or sensor with suitable measuring range and connection pipe and connection coupling	Checking of • specified pressure • opening pressure • pressure difference before and after the object under test
Visual inspection	–	Checks for • all components securely seated • damage • wear • leakage (formation of oil droplets) • presence of all warning and informative signs
Touch inspection	–	Checks for • unusual local vibrations
Temperature inspection	Temperature measuring instrument	Checks for • unusual local temperature zones
Acoustic inspection	–	Checks for • changes in running noise of the unit • changes in flow noise • changes in operating noise in the unit and valve control.

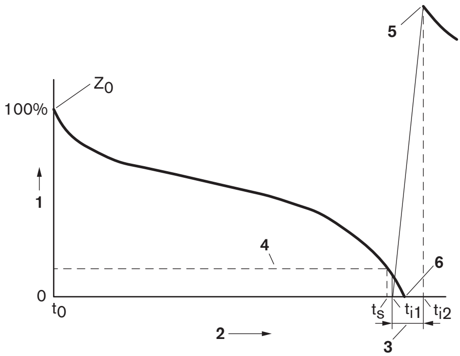
12.3.2 Location of testing and measuring points

IMPORTANT

Please refer to the *Operating Instructions* for the installation location of filling level indicators, filling points, drainage points, filters, testing points, strainers, solenoids, etc. that require regular inspection and servicing.

12.3.3 Inspection and servicing plan, hydraulic products, general

The graph illustrates the concept of wear/wear margin.
The wear margin is a characteristic feature used to describe the condition of the system for the purpose of maintenance.



1 Wear margin Z_0
2 Time t
3 Repair (corrective maintenance) time ($t_{i2} - t_{i1}$)
4 Damage threshold (damage time t_S)
5 Desired condition after corrective maintenance
6 Failure

The reduction in the wear margin reflects wear. The curve represents one possible form of the wear profile during the period of use. It is determined during inspection and varies depending, firstly, on the system itself (e.g. material selection, surface treatment, quality) and secondly on external influences or boundary conditions such as servicing levels, corrosive circulating air and dust. Thirdly, it depends on how the system is operated; whether with partial load or partially with excess load, whether it is subject to surge loads or steady load, etc. Where hydraulic systems are concerned, the curve is also influenced by the cleanliness class and degree of fouling of the pressure fluid, the number of cycles and the ambient conditions.

All the factors mentioned above can exert an influence on the curve but this need not necessarily adversely affect the quality of its information, as wear always signifies the reduction in the wear margin, which is understood to be the primary initial variable before wear commences.

Consequently, this means that a sudden change in the wear margin must also count as wear, and that the element of time on its own is not of decisive importance for wear, but is of considerable interest in the assessment and evaluation of such wear.

An increase in the wear margin to over 100 % above its baseline may be achieved through corrective maintenance, if such measures entail an improvement and this increase is established as the new desired condition for future corrective maintenance.

Certain system parts may be subject to a wear margin which diminishes in such a way that the time available for use is insufficient for the requirements of the plant or operation. In this case, investigations must be carried out to ascertain whether the introduction of suitable technical measures might counter this reduction in the wear margin to a satisfactory extent. The time and expenditure required for such measures must naturally be kept in reasonable proportion to the expected degree of success.

If such conditions arise, we refer to these parts as weak points. Since their elimination may provide economic and safety advantages, weak points require to be rectified immediately.

IMPORTANT

The inspection and servicing plan for your particular product can be found in the *Operating Instructions*.

12.3.4 Inspection and servicing plan, electrohydraulic systems

Electrohydraulic systems with proportional valves must be serviced in accordance with hydraulic requirements and strategies. However, technical control components must also be incorporated in these servicing cycles.

On this basis, an overall strategy for system servicing must be developed and documented.

IMPORTANT

The appropriate component characteristics relevant to servicing can be found in the *Operating Instructions*.

12.3.5 Inspection and servicing plan: electrics and control system

IMPORTANT

The product-specific inspection and servicing plan for electrics and control systems can be found in the *Operating Instructions*.

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12.3.6 Lubrication points, lubricants, intervals

IMPORTANT

The details of the specified lubricants, lubrication points and associated lubrication cycles can be found in the *Operating Instructions*.

12.3.7 Set values of valves, regulators and signalling elements

Pressure and flow control valves, pump regulators and signalling elements such as pressure sensors, pressure switches, limit switches and temperature regulators are given their optimum setting when the system is brought into first use.

Check regularly whether all values are correctly set with the aid of the hydraulics diagram and the documented values.

⚠ DANGER

The set values of valves with position switches shall only be calibrated or readjusted at the factory.
The set values of safety valves shall not be altered by the user. Any readjustment shall be performed by authorised testing bodies only.

Too low a pressure difference between the operating pressure and the opening pressure can lead to frequent opening of safety valves. This leads to increased power losses and an unacceptable increase in temperature of the pressure fluid. In this event, select a lower operating pressure.

12.3.8 Replacement of pressure fluid filters and ventilation filters

⚠ CAUTION

Unfiltered pressure fluid filters lead to increased wear of all the system's hydraulic products and can cause functional failures with dangerous effects. Therefore, always replace contaminated oil filters immediately.

Clogged ventilation filters result in inadequate cooling and can therefore cause excessive heating up and malfunctions of the hydraulic system. Therefore, always replace contaminated ventilation filters immediately.

- Clogged filters must always be replaced immediately.
  Do not clean clogged filters.
- Allow the contents of the replaced oil filter to drip and fully drain.
- Dispose of the filter in accordance with the applicable regulations.

Exact instructions on how to replace a filter can be found in the *Filter manufacturer's instructions for use*.

12.3.9 Checking filters with a contamination indicator

Filters with contamination indicators continuously measure the degree of fouling. The dirt-retention capacity of the filter is utilized to the full.

IMPORTANT

Check the contamination indicator when the pressure fluid is warm (during or immediately after operation).

If the ambient temperature is low or the pressure fluid is cold, its high viscosity may cause clogging to be indicated, although the pressure fluid is in fact clean.

Procedure:

1. Wait until the hydraulic product has reached operating temperature.
2. Press the indicator button (check function):
   If the indicator button pops out again immediately, the filter must be replaced by the end of the shift at the latest.

Due to the progressive loss in pressure as the filter becomes increasingly contaminated, the indicator point has a certain reserve capacity, i.e. generally sufficient for a work shift of 8 h.

If the filter is not replaced after 8 h, dirt may penetrate the system, resulting in contamination of the hydraulic product.

⚠ CAUTION

In certain circumstances the contamination indicator does not show a required filter replacement.

If the check function never indicates filter replacement and the contamination indicator is functioning correctly, this may have the following causes:

- ➢ Faulty filter
- ➢ A bypass valve may have been installed and is not closing correctly, e.g. due to the entry of dirt particles.

12.4 Service and storage lives of hose lines

IMPORTANT

In terms of the service life of hydraulic hose lines in these Operating Instructions, replacement and storage lives are measured from the date of manufacture of the hose line.

Even when properly stored and subjected to permissible loads, seals, hoses and hose lines undergo a natural ageing process.

The replacement and storage lives of seals, hoses and hose lines are therefore limited (see *8.2 Seals, hoses and hose lines*).

⚠ DANGER

Hose lines must be replaced in accordance with the provisions of the servicing plan, even if there are no detectable technical defects in the hose line.

Hoses that have already been used as part of a hose line shall not be reused in a hose line.

The first use may have changed the properties of the hose material to such an extent that reuse of the hose represents a very high risk.

12.5 Topping up the pressure fluid

IMPORTANT

Only pressure fluids specified in the *Operating Instructions* are to be used.

When changing or topping up the pressure fluid, fill the pressure fluid tank on the hydraulic product as follows:

1. Fill the pressure fluid tank using a special filling unit with an integral filter (min. 10 µm).
2. Drop the system pressure right down by resetting the pump. Set the pressure setting value on the pump pressure control to minimum or zero pressure.
3. Fill and bleed the line system of the hydraulic product from the unit to the cylinder. To do this actuate the cylinder in both directions, see *Operating Instructions*.
4. Top up the pressure fluid volume to the specified quantity.
5. Raise the pump pressure to the system pressure.

The hydraulic product is ready for operation.

6. Carry out a test run.
7. Check the level of the fluid after the hydraulic product has warmed up to the operating temperature and adjust if necessary.

IMPORTANT

Check the contamination indicator when the pressure fluid is warm (during or immediately after operation).

If the ambient temperature is low or the pressure fluid is cold, its high viscosity may cause clogging to be apparently indicated.

12.6 Servicing pressure accumulators

⚠ DANGER

Pressure accumulators are subject to the national legislation on safety requirements for pressure vessels applicable in the place of installation.

Observe the Pressure Equipment Directive 97/23/EC.

IMPORTANT

The gas precharge pressure is measured with a testing and filling device.

Details of the procedure can be found in the *Operating Instructions*.

Inspection and servicing

- Carry out the tests required by law.
- Test and monitor the gas precharge pressure regularly.

12.7 Repair

IMPORTANT

Repair (corrective maintenance) is the restoring of the desired condition.

In addition, observe the special safety instructions in *12 Maintenance* and the safety instructions in the *Operating Instructions*.

⚠ DANGER

Ensure cleanliness during all work.

- Clean the external environment of couplings/joints and devices before disassembly. Do not use cleaning wool or cloths containing fibres for cleaning.
- Seal all openings using protective caps.
- Bleed the hydraulic product after each item of repair work.
- If appropriate, follow the procedure for bringing into first use, see *9.3 Bringing into first use, subsequent bringing into use*.
- Document any amendments/additional information that should be included in the Operating Instructions.

12.7.1 General safety instructions for repair work

⚠ DANGER

Repair work shall only be done by an authorised hydraulics expert who has the required specialist hydraulics knowledge.

Specialist hydraulics knowledge means, among other things, that the person can read and fully understand hydraulics drawings. In particular, he must fully comprehend the range of functions of the integrated safety components.

Components may only be dismantled for the purpose of repair to the extent described in the *Operating Instructions*.

Never repair a defective safety valve. It must be completely replaced.

Faulty parts may only be replaced by new, interchangeable, tested components in original-equipment quality. Any deviations from this can be found in the *Operating Instructions*.

Before each subsequent bringing into use after repair work, the hydraulic product shall be accepted by a hydraulics expert.

The operator of the hydraulic product is required to check by means of a servicing record that the inspection and servicing plan as been complied with.

Pressure vessels have to be pressure tested every 10 years and the information recorded in accordance with the Pressure Equipment Directive 97/23/EC or its implementation in national legislation.

13 General information about hydraulic pressure accumulators

13.1 General

The regulations applicable at the place of installation concerning hydraulic pressure accumulators (hydrostatic accumulators) must be observed before bringing into use and during operation.

The plant operator bears sole responsibility for compliance with the existing regulations.

Hydrostatic accumulators are subject to the national implementation of the EU Pressure Equipment Directive 97/23/EC.

Documents supplied with accumulators must be preserved with care; they will be required during recurring inspections by specialists.

The bringing into use of hydrostatic accumulators shall be carried out by trained expert personnel only.

⚠ WARNING

Do not perform any welding, soldering or mechanical work on accumulator vessels.

Welding and soldering carry a risk of explosion!

Mechanical tampering may cause the vessel to burst and the operating permit will be withdrawn.

Do not charge hydrostatic accumulators with oxygen or air. Risk of explosion!

Depressurise the system before working on hydraulic installations.

Improper installation can lead to serious damage to persons and property.

13.2 Safety devices relating to hydraulic pressure accumulators

The equipping, installation and operation of hydrostatic accumulators is regulated by the national implementation of the EU Pressure Equipment Directive 97/23/EC and additionally in the Federal Republic of Germany by the *Technical Regulations for Pressure Vessels (TRB)*. This legislation requires the following safety equipment:

- Device to protect against excessive pressure (prototype-tested)
- Pressure relief device
- Pressure measuring device
- Test gauge connection
- Shut-off device
- Optional: electromagnetically operated pressure relief device
- Safety device to protect against overheating.

IMPORTANT

See the *Operating Instructions*.

14 Hydraulic systems

Hydraulic systems are generally intended for installation in machines or systems. In addition to the basic information about the installed components, the information contained in the Operating Instructions made available for each hydraulic system by Bosch Rexroth also applies to hydraulic systems.

By installing the hydraulic system in a machine or system, the interaction of the hydraulic system with the overall machine may give rise to changes in the potential dangers. In particular the effect of hydraulic and electrical control of hydraulic drives that create mechanical movement are to be considered.

This information shall be included in the hazard analysis/risk assessment of the overall machine carried out by its supplier and in the *Operating Instructions of the overall machine*. This also applies to the specification of the interfaces between the hydraulic system and the overall machine.

Hydraulic systems are subject to legislation including the Pressure Equipment Directive and other relevant EU directives that have been implemented in national legislation. Exact information can be found in the EU Conformity Declaration or Manufacturer's Declaration that is supplied with the hydraulic system or the hydraulic product.

⚠ WARNING

Before installing a hydraulic system in a machine or modifying an existing hydraulic system in a machine, satisfy yourself that

- the hydraulic system is suitable for its application in the machine
- the ambient conditions in the machine are suitable and/or permissible for the use of the hydraulic system
- other installed items on or in the machine cannot disturb or endanger the functioning or the safe operation of the hydraulic system.

If the overall machine is to be used in a potentially explosive atmosphere, then it must be ensured that the hydraulic system has been designed and is suitable for this use.

14.1 Effects of leaks in the hydraulic system on the machine

If pressure fluid escapes from the hydraulic system and comes into contact with hot surfaces on the machine, this can lead to the generation of life-threatening smoke, fire and/or other dangerous operating conditions.

These risks shall be determined by the machine manufacturer by means of a hazard analysis and if necessary provision made for the appropriate safety devices.

DE	Bestellinformation für deutsche Produktinformation:	RD 07008
EN	Ordering Information for Product Information in English:	RE 07008
FR	Information de commande pour la notice française Informations générales sur les produits :	RF 07008
IT	Informazioni d'ordine per le informazioni tedesche sul prodotto:	RI 07008
ES	Información para el pedido de la información del producto en español:	RS 07008
FI	Tilaustiedot - suomenkieliset tuotetiedot:	RSF 07008
NL	Bestelinformatie voor Nederlandse productinformatie:	RNL 07008
SV	Beställningsnummer för svensk produktinformation:	RSK 07008
PT	Informação dos dados de encomenda para informação de produto alemã:	RP 07008
DA	Bestillingsinformationer vedr. dansk produktinformation:	RDK 07008
EL	Πληροφορίερ παραγγελίαρ για τιρ γερμανικέρ πληροφορίερ προϊϋντορ:	RGR 07008

http://www.boschrexroth.com/bri-products
→ Datenblatt-Suche/Datasheet search
→ Suche nach Datenblatt/Search by datasheet

07008

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Cylinder

Hydraulic cylinders
Rexroth cylinders are characterized by high quality and innovative concepts such as precisely guided piston rods in conjunction with advanced sealing technology, self-adjusting or variable end position cushioning and safety bleeding.
Proximity switches and integrated position measuring systems in conjunction with built-on control blocks and high-response valves allow the realization of complete hydraulic axes.

Mill type cylinder

Designation	Type	Piston Ø in mm	Series	Norminal pressure in bar	Data sheet	Page
Differential cylinder						
Hydraulic cylinder, Mill type design	CDL2	25 ... 200	1X	160, 250	17326	43
Differential cylinder / Double rod cylinder						
Hydraulic cylinder, Mill type design	CDH1 CGH1 CSH1	40 ... 320	3X	250	17332	71
Hydraulic cylinder, Mill type design	CDH2 CGH2 CSH2	40 ... 320	3X	250	17335	145
Hydraulic cylinder, Mill type design	CDH3 CGH3 CSH3	40 ... 320	3X	350	17338	223
Hydraulic cylinder, Mill type design	CDM1 CGM1 CSM1	25 ... 200	2X	160	17329	297

2

The Drive & Control Company

Rexroth
Bosch Group

Hydraulic cylinder
Mill type

CDL2 type

RE 17326
Version: 2013-06
Replaces: 12.12

- Series L2
- Component series 1X

2 pressure ranges:
- Nominal pressure 160 bar *[16 MPa]*
- Nominal pressure 250 bar *[25 MPa]*

Features

- 4 types of mounting
- Piston Ø (**ØAL**) 25 ... 200 mm
- Piston rod Ø (**ØMM**) 14 ... 125 mm
- Stroke length up to 3 m
- Short length

Contents

Project planning software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Ordering code

01	02	03		04		05		06	07	08		09	10	11	12	13	14	15	16	17	18
CD	**L2**		**/**		**/**		**/**			**1X**	**/**	**B**	**1**	**1**	**C**		**U**		**W**		*****

01	Differential cylinder	**CD**
02	Series L2	**L2**

Types of mounting

03	Self-aligning clevis at base	**MP5**
	Round flange at head	**MF3** [1]
	Trunnion	**MT4** [1; 2]
	No mounting	**M00** [3]
04	Piston Ø (**ØAL**) from 25 ... 200 mm; possible version see page 14	**...**
05	Piston rod Ø (**ØMM**) at a nominal pressure of 160 bar: 14, 18, 22, 28, 36, 45, 56 and 70 mm possible; see page 6 Piston rod Ø (**ØMM**) at a nominal pressure of 250 bar: 25, 32, 40, 50, 63, 80, 100 and 125 mm possible; see page 6	**...**
06	Stroke length in mm; admissbile stroke lengths must be observed, see page 24 and 25	**...**

Design principle

07	Head and base screwed in	**C** [3]
	Head screwed in, base welded	**D** [4]
08	Component series 10 ... 19 (10 ... 19: Unchanged installation and connection dimensions)	**1X**

Line connection/version

09	Pipe thread according to ISO 228-1	**B**

Line connection/position at head

10	View to piston rod 	**1**

Line connection/position at base

11	View to piston rod 	**1**

Piston rod design

12	Hard chromium-plated	**C**

Piston rod end

13	Thread	**H** [4]
	Piston rod end H with mounted swivel head CGKD	**K** [4]
	With swivel head, not removable	**F** [4; 5]
	Internal thread	**E** [3]
	Piston rod end E with mounted swivel head CGKL	**L** [3]

End position cushioning

14	**Without** end position cushioning	**U**

Seal design

15	Standard seal system (suitable for mineral oils HL, HLP)	**M**
	Standard seal system FKM (for phosphate ester HFDR)	**V**

Ordering code

01	02	03		04		05		06	07	08		09	10	11	12	13	14	15	16	17	18
CD	**L2**		**/**		**/**		**/**			**1X**	**/**	**B**	**1**	**1**	**C**		**U**		**W**		*****

Option 1

16	**Without** option	**W**

Option 2

17	**Without** option	**W**
	With piston rod extension "LY" in mm	**Y** 6)

18	Further details in the plain text	*****

1) Only piston Ø (**ØAL**) 25 ... 125 mm
2) Trunnion position freely selectable. Always specify the dimension "XV/XU" in mm in the plain text when ordering (see order example)
3) Only piston Ø (**ØAL**) 25 ... 32 mm
4) Only piston Ø (**ØAL**) 40 ... 200 mm
5) Only MP5; MT4
6) Always specify the piston rod extension dimension "LY" in mm in the plain text when ordering (see order example)

Order example:
CDL2MT4/100/56/200D1X/B11CHUMWY LY = 20 XV = 245
CDL2MF3/80/45/100D1X/B11CHUMWW

2

Project planning software ICS (Interactive Catalog System)

The ICS (Interactive Catalog System) is a selection and project planning aid for hydraulic cylinders. The ICS allows designers for machines and systems to quickly and reliably find the perfect hydraulic cylinder solution through logic-guided type code enquiries. This software helps to solve design and project planning tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical data of the selected component as well as 2D and 3D CAD data in the correct file format for all common CAD systems.

Technical data

(For applications outside these parameters, please consult us!)

general			
Weight		kg	See page 28
Installation position			Any
Ambient temperature range		°C	–20 ... +80
Primer coat [1)]		µm	Min. 40

hydraulic			
Nominal pressure [2)]		bar *[MPa]*	160 *[16]* (with **ØMM**: 14, 18, 22, 28, 36, 45, 56 and 70 mm)
		bar *[MPa]*	250 *[25]* (with **ØMM**: 25, 32, 40, 50, 63, 80, 100 and 125 mm)
Minimum operating pressure [3)]	(without load)	bar *[MPa]*	10 *[1]*
Static test pressure		bar *[MPa]*	240/375 *[24/37.5]*
Hydraulic fluid			See table below
Hydraulic fluid temperature range		°C	–20 ... +80
Viscosity range		mm^2/s	12 ... 380 (preferably 20 ... 100)
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [4)]
Stroke speed (depending on line connection)		m/s	0.5

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Flame-resistant	– water-free	HFDR	FKM	ISO 12922

1) By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010). Other colors upon request. With cylinders and attachment parts, the following surfaces are not primed or painted:
- All fit diameters to the customer side
- Sealing surfaces for line connection

The surfaces that are not painted are protected by means of a corrosion protection agent (MULTICOR LF 80).

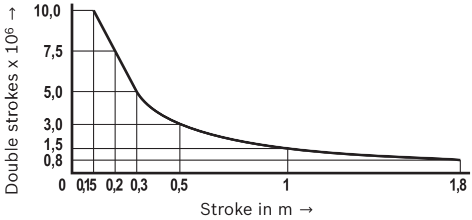
2) The cylinders of this series have been designed for 2 million load cycles at a nominal pressure of 160/250 bar. Higher operating pressures upon request. If there are extreme loads, such as high sequence cycles, the suitability of mounting elements and threaded piston rod connections for the application must be checked due to standardized geometries.

3) A minimum operating pressure is required in order to guarantee good functioning of the cylinder. Without load, a minimum pressure is recommend, for lower pressures, please contact us.

4) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter

Technical data
(For applications outside these parameters, please consult us!)

Life cycle:
Rexroth cylinders correspond to the reliability recommendations for industrial applications.
≥ 10000000 double strokes in idle continuous operation or 3000 km piston travel at 70 % of the nominal pressure, without load on the piston rod, with a maximum velocity of 0.5 m/s, with a failure rate of less than 5 %.



☞ **Notice!**
Boundary and application conditions:
- The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder (MP5 or MT4) or the piston rod.
- The buckling length/buckling load of the piston rod and/or the hydraulic cylinder must be observed (see page 24 and 25).
- The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from the area ratio of annulus to piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Standards:
Rexroth standard; main dimensions like piston Ø (**ØAL**) and piston rod Ø (**ØMM**) correspond to ISO 3320.

Acceptance:
Each cylinder is tested according to Rexroth standard and in compliance with ISO 10100: 2001.

Safety instructions:
For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions 07100-B have to be observed!
Service and repair work has to be performed by Bosch Rexroth AG or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair work not performed by Bosch Rexroth AG.

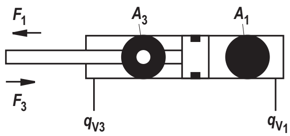
Check lists for hydraulic cylinders:
Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic cylinders (07200).

This list does not claim to be complete. In case of questions regarding the compatibility with media or exceedance of the boundary or application conditions, please contact us.

2

Diameters, areas, forces, flow

Piston ØAL	Piston rod ØMM mm at a nominal pressure of		Area ratio φ	Areas		Force generated by pressure[1] F_1 kN at a nominal pressure of		Traction force[1] F_3 kN at a nominal pressure of		Flow at **0.1** m/s[2]		Max. available stroke length
			A_1/A_3	Piston A_1	Ring A_3					Off q_{V1}	On q_{V3}	
mm	160 bar	250 bar		cm²	cm²	160 bar	250 bar	160 bar	250 bar	l/min	l/min	mm
25	**14**	**–**	1,46	4,91	3,37	7,85	–	5,39	–	2,94	2,02	600
32	**18**	**–**	1,46	8,04	5,50	12,86	–	8,79	–	4,82	3,30	800
40	**22**	**–**	1,43	12,56	8,76	20,10	–	14,02	–	7,54	5,26	1000
	–	**25**	1,64		7,65	–	31,40	–	19,13		4,59	
50	**28**	**–**	1,46	19,63	13,47	31,40	–	21,55	–	11,78	8,08	1200
	–	**32**	1,69		11,59	–	49,06	–	28,97		6,95	
63	**36**	**–**	1,49	31,16	20,98	49,85	–	33,57	–	18,69	12,59	1400
	–	**40**	1,68		18,60	–	77,89	–	46,49		11,16	
80	**45**	**–**	1,46	50,24	34,34	80,38	–	54,95	–	30,14	20,61	1700
	–	**50**	1,64		30,62	–	125,60	–	76,54		18,37	
100	**56**	**–**	1,46	78,50	53,88	125,60	–	86,21	–	47,10	32,33	2000
	–	**63**	1,66		47,34	–	196,25	–	118,36		28,41	
125	**70**	**–**	1,46	122,66	84,19	196,25	–	134,71	–	73,59	50,51	2300
	–	**80**	1,69		72,42	–	306,64	–	181,04		43,45	
160	**–**	**100**	1,64	200,96	122,46	–	502,40	–	306,15	120,58	73,48	2600
200	**–**	**125**	1,64	314,00	191,34	–	785,00	–	478,36	188,40	114,81	3000



[1] Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. swivel heads, plates or valves, etc.)

[2] Stroke speed

Tolerances
(dimensions in mm)

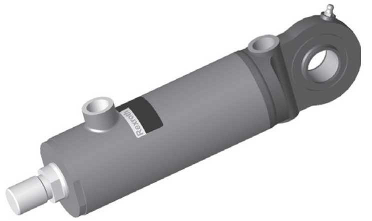
Installation dimensions	WC	XO/XF[1]	XV/XU	
Type of mounting	MF3	MP5	MT4	
Stroke length	**Tolerances**			**Stroke tolerances**
≤ 1250	±3	±2	±2	+2,5
> 1250 ... ≤ 3000	±4	±3	±4	+4

[1] Including stroke length

Overview: Types of mounting

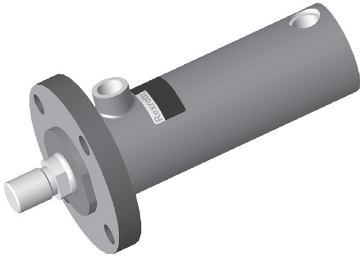
MP5

see page 8 and 9



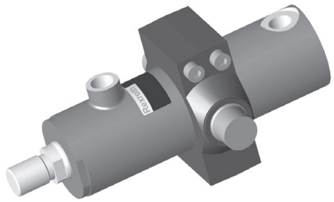
MF3

see page 10 and 11



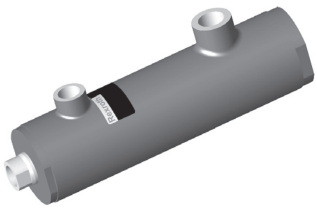
MT4

see page 12 and 13



M00

see page 14

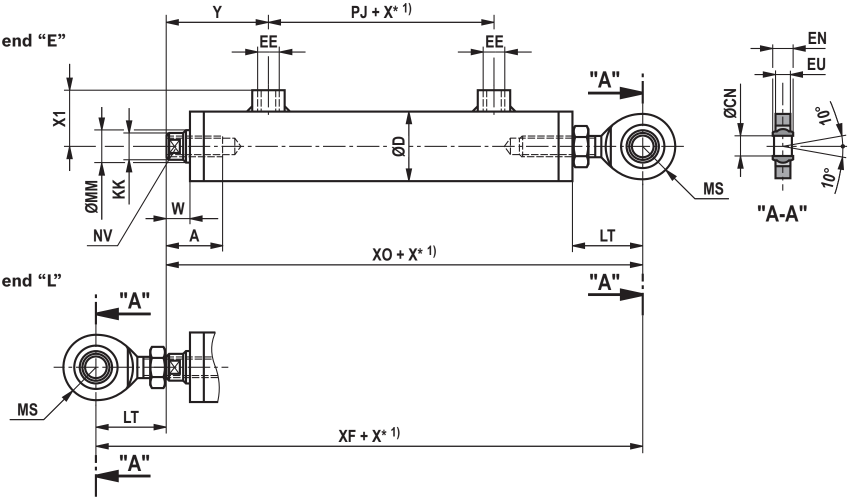


Dimensions: Type of mounting MP5
(dimensions in mm)

ØAL 25 ... 32 mm

Piston rod end “E”

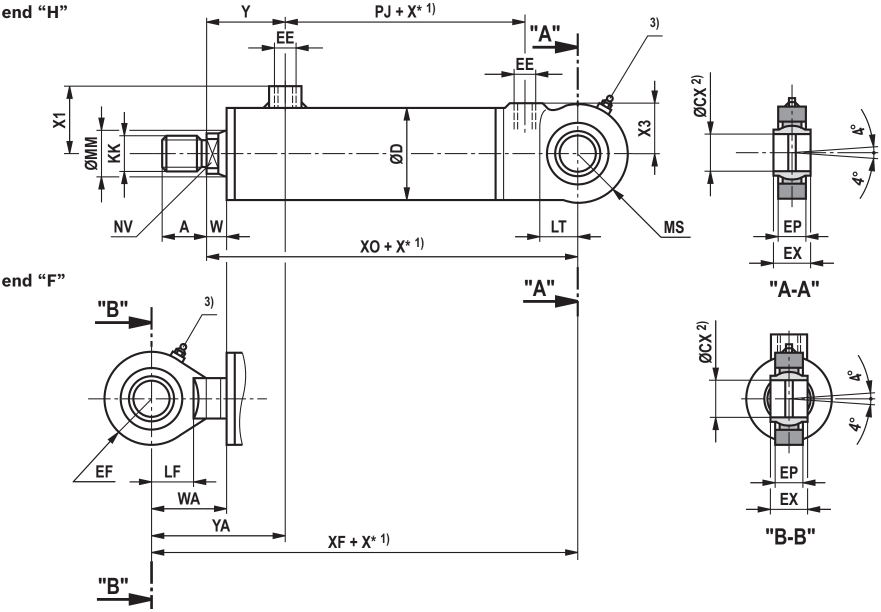
Piston rod end “L”



ØAL 40 ... 200 mm

Piston rod end “H”

Piston rod end “F”



Dimensions: Type of mounting MP5
(dimensions in mm)

ØAL	ØMM at a nominal pressure of 160 bar	ØMM at a nominal pressure of 250 bar	KK	A	NV	W	WA	ØD	Y	YA	PJ	XO	XF
25	**14**	**–**	M10	26	12	10	–	32	44	–	26	131	158
32	**18**	**–**	M12	28	15	11	–	40	48	–	31	148	180
40	**22**	**–**	M16x1,5	22	17	13	44	50	60	91	50	140	171
	–	**25**	M20x1,5	28	19	15	41	52	62	88	54	147	173
50	**28**	**–**	M20x1,5	28	22	13	50	60	62	99	57	157	194
	–	**32**	M27x2	36	27	15	52	62	64	101	65	167	204
63	**36**	**–**	M27x2	36	28	14	63	75	68	117	69	182	231
	–	**40**	M33x2	45	32	17	64	78	71	118	72	192	239
80	**45**	**–**	M33x2	45	36	16	76	95	84	144	76	208	268
	–	**50**	M42x2	56	41	19	74	100	84	139	81	222	277
100	**56**	**–**	M42x2	56	46	18	88	120	90	160	85	227	297
	–	**63**	M48x2	63	50	19	90	125	91	162	93	256	327
125	**70**	**–**	M48x2	63	60	20	106	150	99	185	93	259	345
	–	**80**	M64x3	85	65	22	112	160	105	195	113	307	397
160	**–**	**100**	M80x3	95	85	30	118	200	124	212	120	390	478
200	**–**	**125**	M100x3	112	110	35	143	245	139	247	124	434	542

ØAL	ØMM at a nominal pressure of 160 bar	ØMM at a nominal pressure of 250 bar	EE	X1 ±1	X3 ±1	LT	LF	MS ±2	ØCX H7	EX h12	EP max.	EF ±2	ØCN -0,008	EN h12	EU max.
25	**14**	**–**	G1/8	24,5	–	27	–	14,5	–	–	–	–	10	9	7,5
32	**18**	**–**	G1/4	33	–	32	–	17	–	–	–	–	12	10	8,5
40	**22**	**–**	G1/4	39	29	24	23	28	20	20	16	28	–	–	–
	–	**25**	G1/4	46	30	29	29	31	25	25	20	33	–	–	–
50	**28**	**–**	G3/8	45	33	31	29	33	25	25	20	33	–	–	–
	–	**32**	G3/8	52	37	37	34	39	32	32	22	42	–	–	–
63	**36**	**–**	G1/2	55	40	38	34	42	32	32	22	42	–	–	–
	–	**40**	G1/2	65	44	48	44	48	40	40	26	51	–	–	–
80	**45**	**–**	G1/2	65	53	46	44	51	40	40	26	51	–	–	–
	–	**50**	G1/2	76	57	57	50	60	50	50	34	61	–	–	–
100	**56**	**–**	G3/4	80	63	54	50	61	50	50	34	61	–	–	–
	–	**63**	G3/4	91	70	73	63	73	63	63	42	76	–	–	–
125	**70**	**–**	G3/4	95	78	65	63	76	63	63	42	76	–	–	–
	–	**80**	G3/4	109	88	90	80	92	80	80	52	92	–	–	–
160	**–**	**100**	G1	136	97	120	–	110	100	100	72	110	–	–	–
200	**–**	**125**	G1	158	120	145	–	130	125	125	92	130	–	–	–

1) **X*** = stroke length

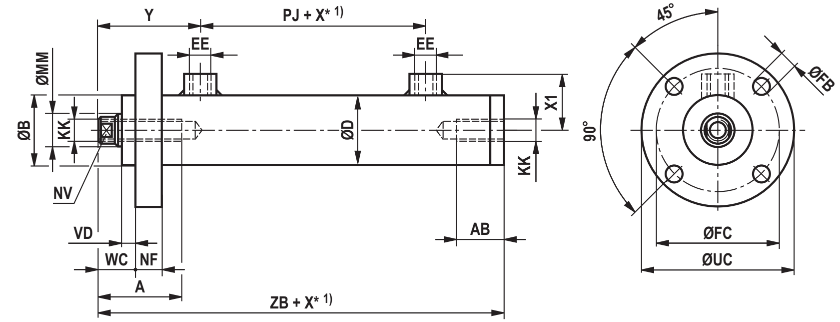
2) Related bolts Ø j6

3) Lubricating nipple, cone head form A according to DIN 71412

Dimensions: Type of mounting MF3
(dimensions in mm)

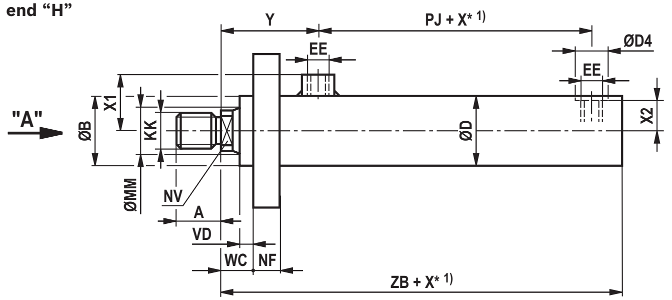
ØAL 25 ... 32 mm

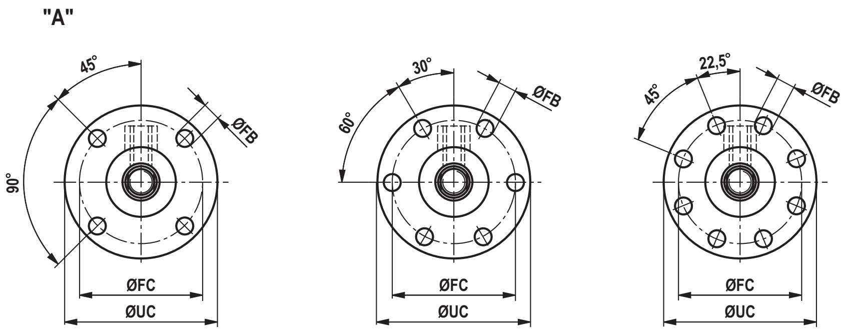
Piston rod end "E"



ØAL 40 ... 125 mm

Piston rod end "H"





Dimensions: Type of mounting MF3
(dimensions in mm)

ØAL	ØMM at a nominal pressure of		KK	A	AB	NV	ØB ±0,3	VD	WC	NF	ØD	Y	PJ
	160 bar	250 bar											
25	**14**	**–**	M10	26	21	12	32	6	16	12	32	44	26
32	**18**	**–**	M12	28	25	15	40	6	17	12	40	48	31
40	**22**	**–**	M16x1,5	22	–	17	50	7	20	14	50	60	50
	–	**25**	M20x1,5	28	–	19	52	7	22	17	52	72	53
50	**28**	**–**	M20x1,5	28	–	22	60	7	20	16	60	62	57
	–	**32**	M27x2	36	–	27	62	7	22	19	62	77	59
63	**36**	**–**	M27x2	36	–	28	75	7	21	20	75	68	71
	–	**40**	M33x2	45	–	32	78	7	24	22	78	86	71
80	**45**	**–**	M33x2	45	–	36	93	7	23	25	95	84	80
	–	**50**	M42x2	56	–	41	100	10	29	28	100	97	75
100	**56**	**–**	M42x2	56	–	46	120	8	26	25	120	90	89
	–	**63**	M48x2	63	–	50	125 [2)]	11	30	32	125	106	89
125	**70**	**–**	M48x2	63	–	60	150 [2)]	9	29	32	150	99	97
	–	**80**	M64x3	85	–	65	160 [2)]	17	39	35	160	119	102

ØAL	ØMM at a nominal pressure of		EE	ØD4	X1 ±1	X2 ±1	ZB	ØFB H13	ØFC	ØUC max.	Number of mounting bores
	160 bar	250 bar									
25	**14**	**–**	G1/8	–	24,5	–	104	6,6	55	68	4
32	**18**	**–**	G1/4	–	33	–	116	9	65	78	4
40	**22**	**–**	G1/4	23	39	22	124	11	85	108	4
	–	**25**	G1/4	23	46	23	139	11	92	114	6
50	**28**	**–**	G3/8	27	45	27	135	13,5	100	128	4
	–	**32**	G3/8	27	52	28	151	13,5	106	132	6
63	**36**	**–**	G1/2	36	55	33,5	159	17,5	120	148	4
	–	**40**	G1/2	36	65	35	177	17,5	132	164	6
80	**45**	**–**	G1/2	36	65	44,5	185	22	150	188	4
	–	**50**	G1/2	36	76	47	192	17,5	160	193	8
100	**56**	**–**	G3/4	43	80	57	202	22	180	218	4
	–	**63**	G3/4	43	91	60	218	22	190	230	6
125	**70**	**–**	G3/4	43	95	72	221	17,5	200	238	8
	–	**80**	G3/4	43	109	77	244	22	230	270	8

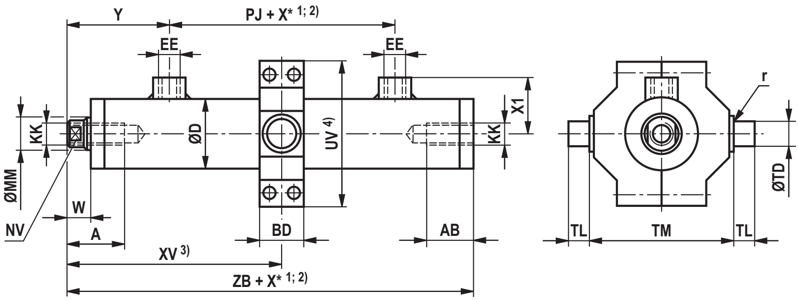
1) **X*** = stroke length
2) Tolerance: ±0.5

2

Dimensions: Type of mounting MT4 (dimensions in mm)

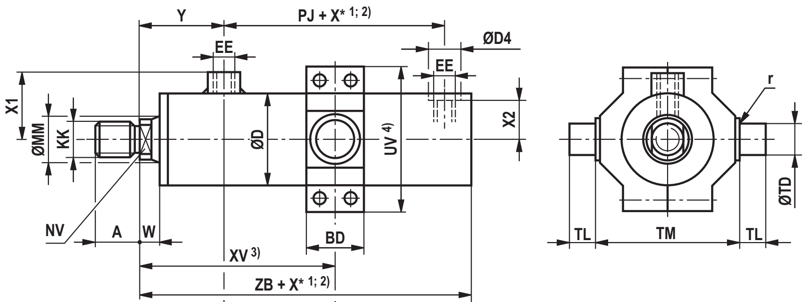
ØAL 25 ... 32 mm

Piston rod end "E"

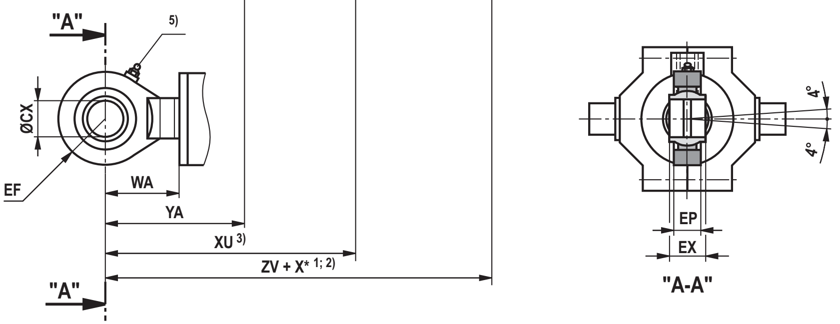


ØAL 40 ... 125 mm

Piston rod end "H"



Piston rod end "F"



Dimensions: Type of mounting MT4 (dimensions in mm)

ØAL	ØMM at a nominal pressure of		KK	A	AB	NV	W	WA	ØD	Y	YA	PJ	X* 2)	XV		XU	
	160 bar	250 bar											min.	min.	max.	min.	max.
25	**14**	**–**	M10	26	21	12	10	–	32	44	–	26	21	68	47+X*	–	–
32	**18**	**–**	M12	28	25	15	11	–	40	48	–	31	28	78	50+X*	–	–
40	**22**	**–**	M16x1,5	22	–	17	13	44	50	60	91	50	23	94	71+X*	125	102+X*
	–	**25**	M20x1,5	28	–	19	15	41	52	62	88	53	60	112	52+X*	138	78+X*
50	**28**	**–**	M20x1,5	28	–	22	13	50	60	62	99	57	32	104	72+X*	141	109+X*
	–	**32**	M27x2	36	–	27	15	52	62	64	101	62	66	121	55+X*	158	92+X*
63	**36**	**–**	M27x2	36	–	28	14	63	75	68	117	71	37	119	82+X*	168	131+X*
	–	**40**	M33x2	45	–	32	17	64	78	71	118	71	78	135	57+X*	182	104+X*
80	**45**	**–**	M33x2	45	–	36	16	76	95	84	144	80	51	144	93+X*	204	153+X*
	–	**50**	M42x2	56	–	41	19	74	100	84	139	78	91	157	66+X*	212	121+X*
100	**56**	**–**	M42x2	56	–	46	18	88	120	90	160	89	69	162	93+X*	232	163+X*
	–	**63**	M48x2	63	–	50	19	90	125	91	162	90	115	180	65+X*	251	136+X*
125	**70**	**–**	M48x2	63	–	60	20	106	150	99	185	97	85	183	98+X*	269	184+X*
	–	**80**	M64x3	85	–	65	22	112	160	105	195	102	135	208	73+X*	298	163+X*

2

ØAL	ØMM at a nominal pressure of		EE	ØD4	X1 ±1	X2 ±1	ZB	ZV	BD	UV max.	TD f8	TL	TM h12	r	ØCX H7	EX h12	EP max.	EF ±2
	160 bar	250 bar																
25	**14**	**–**	G1/8	–	24,5	–	104	–	20	66	12	10	63	1	–	–	–	–
32	**18**	**–**	G1/4	–	33	–	116	–	25	77	16	12	75	1	–	–	–	–
40	**22**	**–**	G1/4	23	39	22	124	155	35	88	20	16	90	1,5	20	20	16	28
	–	**25**	G1/4	23	46	23	129	155	40	98	25	20	95	1,5	25	25	20	33
50	**28**	**–**	G3/8	27	45	27	135	172	40	102	25	20	105	1,5	25	25	20	33
	–	**32**	G3/8	27	52	28	141	178	50	114	32	25	112	1,5	32	32	22	42
63	**36**	**–**	G1/2	36	55	33,5	159	208	50	129	32	25	120	2	32	32	22	42
	–	**40**	G1/2	36	65	35	162	209	60	137	40	32	125	1,5	40	40	26	51
80	**45**	**–**	G1/2	36	65	44,5	185	245	65	148	40	32	135	2,5	40	40	26	51
	–	**50**	G1/2	36	76	47	182	237	75	167	50	40	150	2	50	50	34	61
100	**56**	**–**	G3/4	43	80	57	202	272	80	178	50	40	160	2,5	50	50	34	61
	–	**63**	G3/4	43	91	60	204	275	100	201	63	50	180	2,5	63	63	42	76
125	**70**	**–**	G3/4	43	95	72	221	307	100	218	63	50	195	3	63	63	42	76
	–	**80**	G3/4	43	109	77	230	320	120	257	80	63	224	2,5	80	80	52	92

1) **X*** = stroke length

2) Please observe min. stroke length "**X*** min".

3) Trunnion position freely selectable. Always specify the dimensions "XV/XU" in mm in the plain text when ordering.

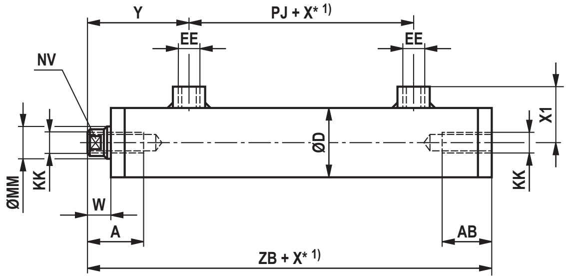
4) The specified dimensions are maximum values.

5) Lubricating nipple, cone head form A according to DIN 71412

Dimensions: Type of mounting M00 (dimensions in mm)

ØAL 25 ... 32 mm

Piston rod end “E”

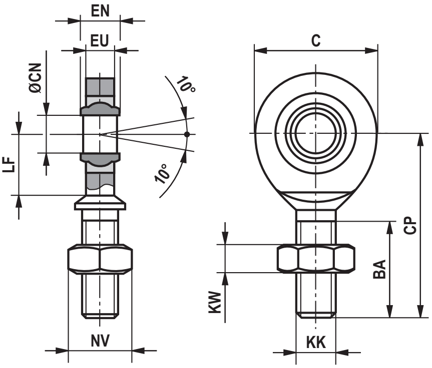


ØAL	ØMM at a nominal pressure of		KK	A	AB	NV	W	ØD	Y	PJ	EE	X1 ±1	ZB
	160 bar	250 bar											
25	**14**	**–**	M10	26	21	12	10	32	44	26	G1/8	24,5	104
32	**18**	**–**	M12	28	25	15	11	40	48	31	G1/4	33	116

[1] **X*** = stroke length

Dimensions: Swivel head CGKL (dimensions in mm)

ISO 12240-4



2

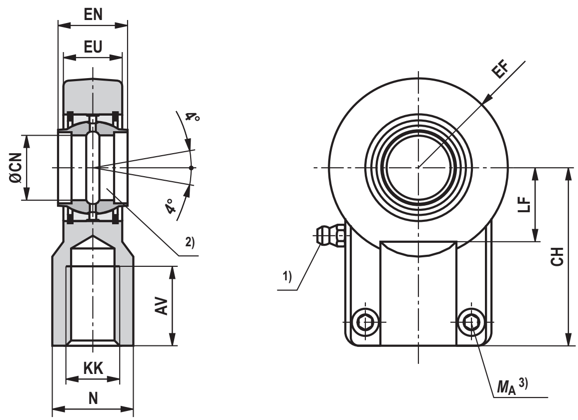
ØAL	ØMM	Type	Material no.	KK	BA min.	C	ØCN -0,008	CP max.	EN h12	EU max.	KW	LF min.	NV	m [1] kg	C_0 [2] kN	F_{adm} [3] kN
25	**14**	**CGKL 10**	3712500031	M10	26	29	10	48	9	7,5	5	15	16	0,1	22	8,1
32	**18**	**CGKL 12**	3713200031	M12	28	34	12	54	10	8,5	6	18	18	0,1	30,4	11,2

ØAL = piston Ø
ØMM = piston rod Ø
[1] ***m*** = weight of swivel head in kg
[2] C_0 = static load rating of the swivel head in kN
[3] F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Swivel head CGKD (clampable) (dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no.	Nominal force kN	AV min.	N max.	CH js13	EF max.	ØCN H7 2)	EN h12	EU max.
40	**22**	**CGKD 20**	R900308576	20	23	28	52	25	20	20	17,5
40	**25**	**CGKD 25**	R900323332	32	29	31	65	32	25	25	22
50	**28**										
50	**32**	**CGKD 32**	R900322049	50	37	38	80	40	32	32	28
63	**36**										
63	**40**	**CGKD 40**	R900322029	80	46	47	97	50	40	40	34
80	**45**										
80	**50**	**CGKD 50**	R900322719	125	57	58	120	63	50	50	42
100	**56**										
100	**63**	**CGKD 63**	R900322028	200	64	70	140	72,5	63	63	53,5
125	**70**										
125	**80**	**CGKD 80**	R900322700	320	86	91	180	92	80	80	68
160	**100**	**CGKD 100**	R900322030	500	96	110	210	114	100	100	85,5
200	**125**	**CGKD 125**	R900322026	800	113	135	260	160	125	125	105

Dimensions: Swivel head CGKD (clampable) (dimensions in mm)

ØAL	ØMM	Type	KK	LF min.	Clamping screws ISO 4762-10.9	M_A [3] Nm	m [4] kg	C_0 [5] kN	F_{adm} [6] kN
40	**22**	**CGKD 20**	M16x1,5	20,5	M8x20	25	0,35	48	17,7
40	**25**	**CGKD 25**	M20x1,5	25,5	M8x20	30	0,65	78	28,8
50	**28**								
50	**32**	**CGKD 32**	M27x2	30	M10x25	59	1,15	114	42,1
63	**36**								
63	**40**	**CGKD 40**	M33x2	39	M10x30	59	2,1	204	75,3
80	**45**								
80	**50**	**CGKD 50**	M42x2	47	M12x35	100	4	310	114,4
100	**56**								
100	**63**	**CGKD 63**	M48x2	58	M16x40	250	7,2	430	158,7
125	**70**								
125	**80**	**CGKD 80**	M64x3	74	M20x50	490	15	695	265,5
160	**100**	**CGKD 100**	M80x3	94	M24x60	840	25,5	1060	391,1
200	**125**	**CGKD 125**	M100x3	116	M24x70	840	52,5	1430	527,7

ØAL = piston Ø

ØMM = piston rod Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Bolt Ø m6 required

3) M_A = tightening torque in Nm
The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque

4) m = weight of swivel head in kg

5) C_0 = static load rating of the swivel head in kN

6) F_{adm} = maximum admissible load on the swivel head in kN during oscillatory or alternating loads

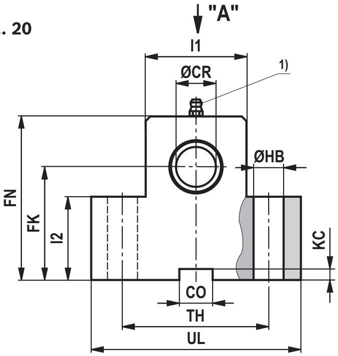
☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

2

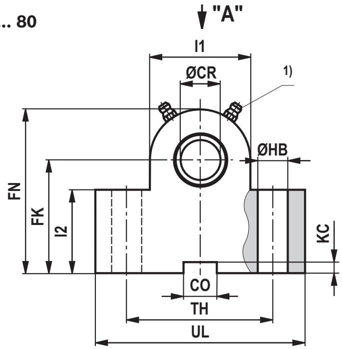
Dimensions: Trunnion bracket CLTB (dimensions in mm)

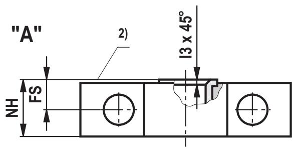
ISO 8132

CLTB 12 ... 20



CLTB 25 ... 80





ØAL	ØMM	Type 3)	Material no.	Nominal force kN 4)	ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13
25	**14**	**CLTB 12**	R900772607	8	12	10	34	50	8	9
32	**18**	**CLTB 16**	R900772608	12,5	16	16	40	60	10	11
40	**22**	**CLTB 20**	R900772609	20	20	16	45	70	10	11
40	**25**	**CLTB 25**	R900772610	32	25	25	55	80	12	13,5
50	**28**									
50	**32**	**CLTB 32**	R900772611	50	32	25	65	100	15	17,5
63	**36**									
63	**40**	**CLTB 40**	R900772612	80	40	36	76	120	16	22
80	**45**									
80	**50**	**CLTB 50**	R900772613	125	50	36	95	140	20	26
100	**56**									
100	**63**	**CLTB 63**	R900772614	200	63	50	112	180	25	33
125	**70**									
125	**80**	**CLTB 80**	R900772615	320	80	50	140	220	31	39

Dimensions: Trunnion bracket CLTB (dimensions in mm)

ØAL	ØMM	Type [3]	KC +0,3	l1	l2	l3	NH max.	TH js14	UL max.	*m* [5] kg
25	**14**	**CLTB 12**	3,3	25	25	1	17	40	63	0,4
32	**18**	**CLTB 16**	4,3	30	30	1	21	50	80	0,85
40	**22**	**CLTB 20**	4,3	40	38	1,5	21	60	90	1,2
40	**25**	**CLTB 25**	5,4	56	45	1,5	26	80	110	2,1
50	**28**									
50	**32**	**CLTB 32**	5,4	70	52	2	33	110	150	4,55
63	**36**									
63	**40**	**CLTB 40**	8,4	88	60	2,5	41	125	170	7,3
80	**45**									
80	**50**	**CLTB 50**	8,4	100	75	2,5	51	160	210	14,5
100	**56**									
100	**63**	**CLTB 63**	11,4	130	85	3	61	200	265	23,1
125	**70**									
125	**80**	**CLTB 80**	11,4	160	112	3,5	81	250	325	52,3

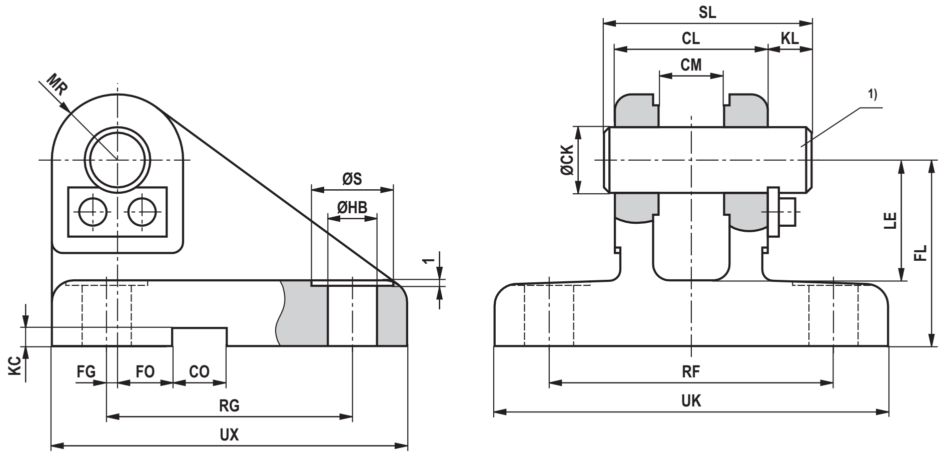
ØAL = piston Ø
ØMM = piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Contact surface trunnion (inside)
3) Bearing blocks are always supplied in pairs
4) Nominal force applies to applications in pairs
5) *m* = weight of trunnion bracket in kg (specified per pair)

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The trunnion brackets are suitable for mounting type MT4.

2

Dimensions: Clevis bracket CLCA (clampable) (dimensions in mm)

ISO 8132, form B



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK 1) H9	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14	ØHB H13
25	**14**	**CLCA 10** 2)	3)	5	10	24	10	8	2	32	10	6,6
32	**18**	**CLCA 12** 2)	R900542861	8	12	28	12	10	2	34	10	9
40	**22**	**CLCA 20**	R900542863	20	20	45	20	16	7,5	45	10	11
40	**25**	**CLCA 25**	R900542864	32	25	56	25	25	10	55	10	13,5
50	**28**											
50	**32**	**CLCA 32**	R900542865	50	32	70	32	25	14,5	65	6	17,5
63	**36**											
63	**40**	**CLCA 40**	R900542866	80	40	90	40	36	17,5	76	6	22
80	**45**											
80	**50**	**CLCA 50**	R900542867	125	50	110	50	36	25	95	0	26
100	**56**											
100	**63**	**CLCA 63**	R900542868	200	63	140	63	50	33	112	0	33
125	**70**											
125	**80**	**CLCA 80**	R900542869	320	80	170	80	50	45	140	0	39
160	**100**	**CLCA 100**	3)	500	100	210	100	63	52,5	180	0	52
200	**125**	**CLCA 125**	3)	800	125	270	125	80	75	230	0	52

Dimensions: Clevis bracket CLCA (clampable) (dimensions in mm)

ØAL	ØMM	Type	KC +0,3	KL	LE min.	MR max.	RF js14	RG js14	ØS	SL	UK max.	UX max.	*m* 4) kg
25	**14**	**CLCA 10** 2)	3,3	8	22	10	39	44	11	34	56	60	0,33
32	**18**	**CLCA 12** 2)	3,3	8	22	12	52	45	15	38	72	65	0,45
40	**22**	**CLCA 20**	4,3	10	30	20	75	70	18	58	100	95	1,5
40	**25**	**CLCA 25**	5,4	10	37	25	90	85	20	69	120	115	3
50	**28**												
50	**32**	**CLCA 32**	5,4	13	43	32	110	110	26	87	145	145	4,5
63	**36**												
63	**40**	**CLCA 40**	8,4	16	52	40	140	125	33	110	185	170	8,5
80	**45**												
80	**50**	**CLCA 50**	8,4	19	65	50	165	150	40	133	215	200	13,5
100	**56**												
100	**63**	**CLCA 63**	11,4	20	75	63	210	170	48	164	270	230	23,4
125	**70**												
125	**80**	**CLCA 80**	11,4	26	95	80	250	210	57	202	320	280	38,5
160	**100**	**CLCA 100**	12,4	30	120	100	315	250	76	246	405	345	99,2
200	**125**	**CLCA 125**	15,4	32	170	125	365	350	76	310	455	450	174,1

ØAL = piston Ø
ØMM = piston rod Ø

1) Bolt Ø m6 required
(bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)

2) 2 washers for mounting required
- for CLCA 10: Washer DIN 988 10x16x0.5
  Material no. R900061310
- for CLCA 12: Washer DIN 988 12x18x1
  Material no. R900006948

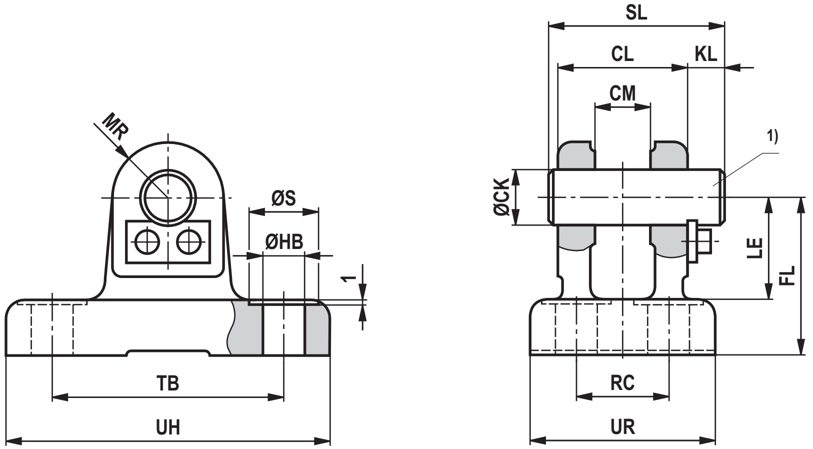
3) Upon request

4) ***m*** = weight of clevis bracket in kg

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The clevis brackets are suitable for mounting type MP5 and for mounting on the swivel head.

Dimensions: Clevis bracket CLCD (clampable) (dimensions in mm)

ISO 8132, form A



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 1)	CL h16	CM A12	FL js12	ØHB H13	KL	LE min.
25	**14**	**CLCD 10** 2)	3)	5	10	24	10	32	6,6	8	22
32	**18**	**CLCD 12** 2)	R900542879	8	12	28	12	34	9	8	22
40	**22**	**CLCD 20**	R900542881	20	20	45	20	45	11	10	30
40	**25**	**CLCD 25**	R900542882	32	25	56	25	55	13,5	10	37
50	**28**										
50	**32**	**CLCD 32**	R900542883	50	32	70	32	65	17,5	13	43
63	**36**										
63	**40**	**CLCD 40**	R900542884	80	40	90	40	76	22	16	52
80	**45**										
80	**50**	**CLCD 50**	R900542885	125	50	110	50	95	26	19	65
100	**56**										
100	**63**	**CLCD 63**	R900542886	200	63	140	63	112	33	20	75
125	**70**										
125	**80**	**CLCD 80**	R900542887	320	80	170	80	140	39	26	95
160	**100**	**CLCD 100**	3)	500	100	210	100	180	45	30	120
200	**125**	**CLCD 125**	3)	800	125	270	125	230	52	32	170

Dimensions: Clevis bracket CLCD (clampable) (dimensions in mm)

ØAL	ØMM	Type	MR max.	RC js14	ØS	SL	TB js14	UR max.	UH max.	*m* [3] kg
25	**14**	**CLCD 10** [2]	10	17	11	34	42	33	60	0,27
32	**18**	**CLCD 12** [2]	12	20	15	38	50	40	70	0,35
40	**22**	**CLCD 20**	20	32	18	58	75	58	98	0,95
40	**25**	**CLCD 25**	25	40	20	69	85	70	113	1,9
50	**28**									
50	**32**	**CLCD 32**	32	50	26	87	110	85	143	3
63	**36**									
63	**40**	**CLCD 40**	40	65	33	110	130	108	170	5,5
80	**45**									
80	**50**	**CLCD 50**	50	80	40	133	170	130	220	10,6
100	**56**									
100	**63**	**CLCD 63**	63	100	48	164	210	160	270	17
125	**70**									
125	**80**	**CLCD 80**	80	125	57	202	250	210	320	32
160	**100**	**CLCD 100**	100	160	66	246	315	260	400	74
200	**125**	**CLCD 125**	125	200	76	310	385	320	470	129

2

ØAL = piston Ø

ØMM = piston rod Ø

1) Bolt Ø m6 required
(bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)

2) 2 Washers for mounting required
- for CLCD 10: Washer DIN 988 10x16x0.5
  Material no. R900061310
- for CLCD 12: Washer DIN 988 12x18x1
  Material no. R900006948

3) Upon request

4) *m* = weight of clevis bracket in kg

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The clevis brackets are suitable for mounting type MP5 and for mounting on the swivel head.

Buckling

For the admissible stroke length with flexibly guided load and a factor of 3.5 for safety against buckling, please refer to the relevant table. For other installation positions of the cylinder, the admissible stroke length must be interpolated. Admissible stroke length for non-guided load on request.
Buckling calculations are carried out according to the following formulas:

1. Calculation according to Euler

$$\boldsymbol{F} = \frac{\boldsymbol{\pi}^2 \cdot \boldsymbol{E} \cdot \boldsymbol{I}}{\boldsymbol{v} \cdot \boldsymbol{L}_K^2} \quad \text{if } \boldsymbol{\lambda} > \boldsymbol{\lambda}_g$$

2. Calculation according to Tetmajer

$$\boldsymbol{F} = \frac{\boldsymbol{d}^2 \cdot \boldsymbol{\pi}\,(335-0{,}62 \cdot \boldsymbol{\lambda})}{4 \cdot \boldsymbol{v}} \quad \text{if } \boldsymbol{\lambda} \leq \boldsymbol{\lambda}_g$$

Explanation:

$\boldsymbol{E}$ = module of elasticity in N/mm^2
= $2{,}1 \times 10^5$ for steel

$\boldsymbol{I}$ = geometrical moment of inertia in mm^4 for circular cross-section
$= \frac{\boldsymbol{d}^4 \cdot \boldsymbol{\pi}}{64} = 0{,}0491 \cdot \boldsymbol{d}^4$

$\boldsymbol{v}$ = 3,5 (safety factor)

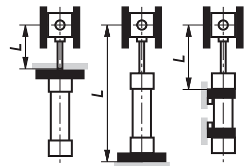
$\boldsymbol{L}_K$ = free buckling length in mm (depending on the type of mounting see sketches A, B, C)

$\boldsymbol{d}$ = piston rod Ø in mm

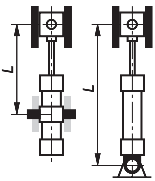
$\boldsymbol{\lambda}$ = slenderness ratio
$= \frac{4 \cdot \boldsymbol{L}_K}{\boldsymbol{d}} \qquad \boldsymbol{\lambda}_g = \boldsymbol{\pi} \cdot \sqrt{\frac{\boldsymbol{E}}{0{,}8 \cdot \boldsymbol{R}_e}}$

$\boldsymbol{R}_e$ = yield strength of the piston rod material

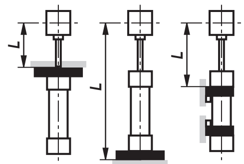
Influence of the mounting type on the buckling length:



$\boldsymbol{L}_K = 0{,}7\,\boldsymbol{L}$

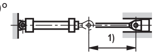
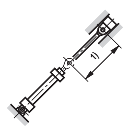
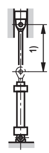


$\boldsymbol{L}_K = \boldsymbol{L}$



$\boldsymbol{L}_K = 2\,\boldsymbol{L}$

Admissible stroke length: Type of mounting MP5 (dimensions in mm)

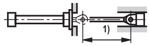
ØAL	ØMM	Admissible stroke at									Installation position
		80 bar			160 bar			250 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
25	14	170	175	185	105	105	110	–	–	–	0° 
32	18	230	230	250	145	145	150	–	–	–	
40	22	285	290	315	185	190	195	–	–	–	
	25	370	380	425	255	260	270	190	190	195	
50	28	380	390	420	255	260	265	–	–	–	45° 
	32	490	505	570	345	350	365	260	265	270	
63	36	500	515	565	345	350	360	–	–	–	
	40	600	625	715	435	440	465	330	335	340	
80	45	610	630	705	430	440	455	–	–	–	
	50	725	755	890	535	545	580	410	415	430	
100	56	755	780	890	545	555	580	–	–	–	90° 
	63	910	950	1145	685	700	755	540	545	565	
125	70	935	975	1125	690	705	740	–	–	–	
	80	1125	1180	1485	870	895	985	695	705	740	
160	100	1350	1420	1810	1050	1085	1200	840	855	900	
200	125	1645	1735	2250	1300	1340	1500	1045	1065	1130	1) Admissible stroke

Admissible stroke length: Type of mounting MF3 (dimensions in mm)

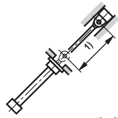
ØAL	ØMM	Admissible stroke at 80 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
25	14	600	600	600	485	485	495	–	–	–
32	18	800	800	800	630	635	645	–	–	–
40	22	1000	1000	1000	735	740	755	–	–	–
	25	1000	1000	1000	935	950	985	755	760	770
50	28	1200	1200	1200	955	965	990	–	–	–
	32	1200	1200	1200	1200	1200	1200	990	1000	1025
63	36	1400	1400	1400	1250	1260	1310	–	–	–
	40	1400	1400	1400	1400	1400	1400	1230	1240	1275
80	45	1700	1700	1700	1530	1550	1620	–	–	–
	50	1700	1700	1700	1700	1700	1700	1505	1520	1570
100	56	2000	2000	2000	1875	1910	2000	–	–	–
	63	2000	2000	2000	2000	2000	2000	1910	1935	2000
125	70	2300	2300	2300	2300	2300	2300	–	–	–
	80	2300	2300	2300	2300	2300	2300	2300	2300	2300

Installation position

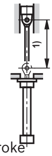
0°



45°



90°



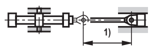
1) Admissible stroke

Admissible stroke length: Type of mounting MT4 2) (dimensions in mm)

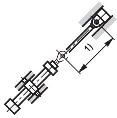
ØAL	ØMM	Admissible stroke at 80 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
25	14	270	275	290	180	180	185	–	–	–
32	18	355	360	385	245	245	250	–	–	–
40	22	410	420	450	280	285	290	–	–	–
	25	515	530	590	365	370	380	275	275	280
50	28	540	555	595	375	380	390	–	–	–
	32	680	705	790	495	500	520	380	380	390
63	36	710	730	800	505	510	525	–	–	–
	40	840	870	995	620	630	660	480	485	495
80	45	860	885	985	620	625	650	–	–	–
	50	1010	1055	1225	755	770	815	595	600	615
100	56	1050	1090	1230	770	780	815	–	–	–
	63	1265	1320	1580	965	990	1055	770	780	800
125	70	1300	1350	1555	970	990	1040	–	–	–
	80	1565	1645	2050	1230	1260	1380	995	1010	1050

Installation position

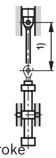
0°



45°



90°

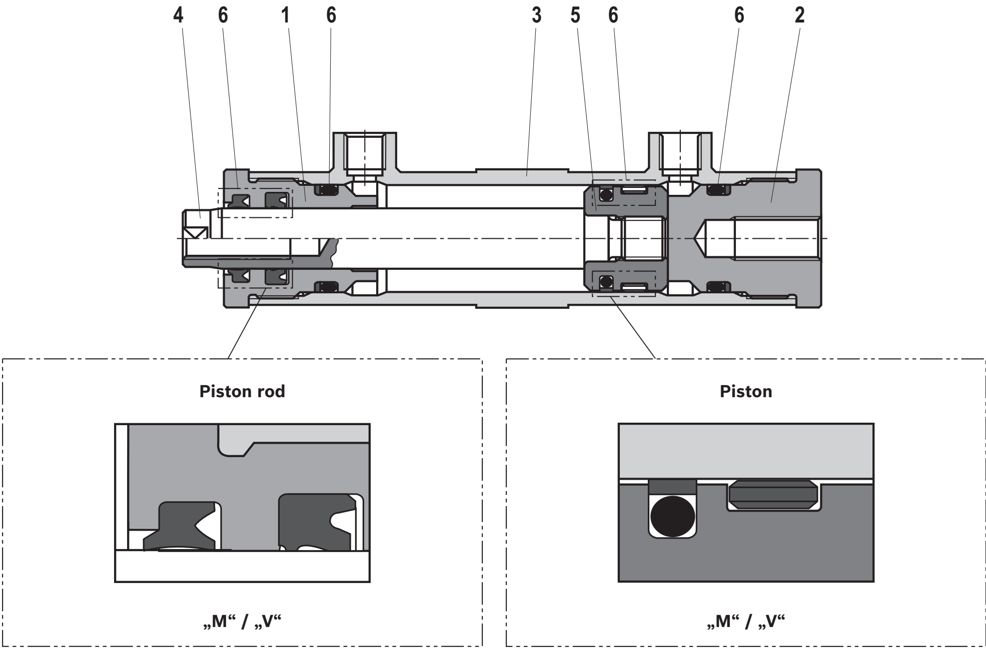


1) Admissible stroke

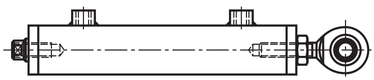
2) Trunnion in cylinder center

Overview: Individual components

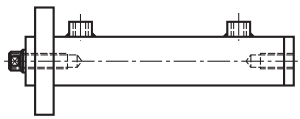
ØAL 25 ... 32 mm



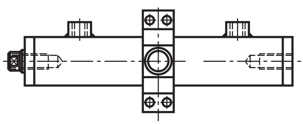
Type of mounting MP5



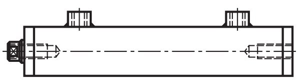
Type of mounting MF3



Type of mounting MT4



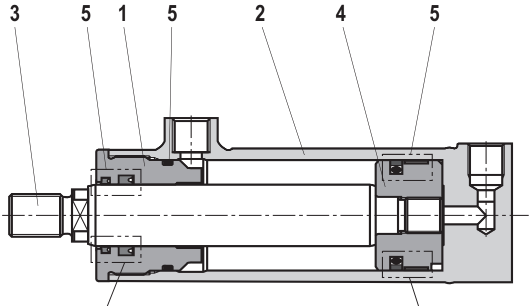
Type of mounting M00



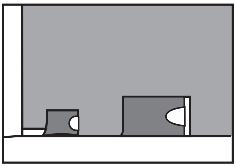
- **1** Head
- **2** Base
- **3** Pipe
- **4** Piston rod
- **5** Piston
- **6** Seal kit: Scraper, rod seal, piston seal, O ring, guide ring

Overview: Individual components

ØAL 40 ... 200 mm

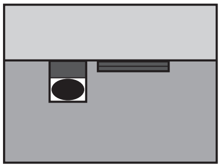


Piston rod



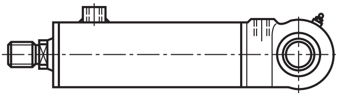
„M“ / „V“

Piston

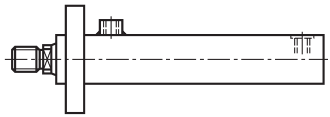


„M“ / „V“

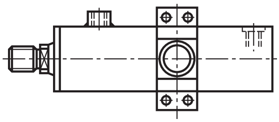
Type of mounting MP5



Type of mounting MF3



Type of mounting MT4



1 Head
2 Pipe
3 Piston rod
4 Piston
5 Seal kit: Scraper, rod seal, piston seal, O ring, guide ring

Seal kit

ØAL mm	ØMM mm	Material no. for seal kit for version M	V
25	**14**	R961008600	R961008616
32	**18**	R961008601	R961008617
40	**22**	R961008602	R961008618
	25	R961008603	R961008619
50	**28**	R961008604	R961008620
	32	R961008605	R961008621
63	**36**	R961008606	R961008622
	40	R961008607	R961008623
80	**45**	R961008608	R961008624
	50	R961008609	R961008625
100	**56**	R961008610	R961008626
	63	R961008611	R961008627
125	**70**	R961008612	R961008628
	80	R961008613	R961008629
160	**100**	R961008614	R961008630
200	**125**	R961008615	R961008631

Cylinder weight

Piston	Piston rod	Weight of cylinder with stroke length 0 mm				Weight of cylinder per 100 mm stroke length
ØAL mm	ØMM mm	MP5 kg	MF3 kg	MT4 kg	M00 kg	kg
25	**14**	1	1	1	1	0,4
32	**18**	2	2	2	2	0,6
40	**22**	2	3	3	–	0,9
	25	2	4	4	–	1,1
50	**28**	3	4	5	–	1,2
	32	4	5	7	–	1,5
63	**36**	5	7	9	–	1,8
	40	6	9	12	–	2,3
80	**45**	9	13	15	–	2,9
	50	11	15	20	–	3,8
100	**56**	15	20	26	–	4,6
	63	19	26	36	–	6
125	**70**	29	35	46	–	7,2
	80	38	43	67	–	10,1
160	**100**	67	–	–	–	15,1
200	**125**	110	–	–	–	22

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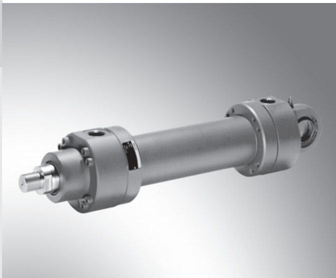
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Hydraulic cylinder mill type

RE 17332/07.13
Replaces: 07.12

Series CDH1 / CGH1 / CSH1

Component series 3X
Nominal pressure 250 bar (25 MPa)



HA/4646/95

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Features

– 6 types of mounting
– Piston Ø (**ØAL**): 40 to 320 mm
– Piston rod Ø (**ØMM**): 22 to 220 mm
– Stroke lengths to 6 m

Project planning software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Technical data (For applications outside these parameters, please consult us!)

Standards:
Bosch Rexroth standard; main dimensions like piston Ø and piston rod Ø correspond to ISO 3320

Nominal pressure: 250 bar
Static test pressure: 375 bar
Reduced test pressure: 315 bar
Higher operating pressures upon request
The specified operating pressures apply to applications with shock-free operation with regard to excess pressure and/ or external loads. With extreme loads like e.g. high cycle sequence, mounting elements and threaded piston rod connections must be designed for durability.

Minimum pressure:
Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the cylinder. Without load, a minimum pressure of 10 bar is recommended for differential cylinders; for lower pressures as well as double-acting cylinders, please contact us.

Installation position: Any

Hydraulic fluid:
Mineral oils DIN 51524 HL, HLP
Oil-in-water emulsion HFA
Water glycol HFC
Phosphate ester HFD-R
Polyol ester HFD-U

Hydraulic fluid temperature range: See page 62
Ambient temperature range: See page 62
Optimum viscosity range: 20 to 100 mm^2/s
Minimum admissible viscosity: 12 mm^2/s
Maximum admissible viscosity: 380 mm^2/s

Cleanliness class according to ISO
Maximum admissible degree of contamination of the hydraulic fluid according to ISO 4406 (c) class 20/18/15.
The cleanliness classes specified for the components need to be met in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter

Bleeding by default: Secured against screwing out

Primer coat: By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010) of min. 40 µm. Other colors upon request.
With cylinders and attachment parts, the following surfaces are not primed or painted:
- All fit diameters to the customer side
- Sealing surfaces for line connection
- Sealing surfaces for flange connection
- Connection surfaces for valve mounting
- Inductive proximity switches
- Position measurement system

The surfaces that are not painted are protected by means of a corrosion protection agent (MULTICOR LF 80).
In the online order system, more painting systems can be selected. These systems are not displayed via the type key and not automatically considered when ordering replacement cylinders. Accessories that are ordered as separate order item are not primed or painted by default. Corresponding priming and/or painting on request.

Stroke velocity: Please observe the guideline on max. stroke velocities (with recommended flow velocity of 5 m/s in the line connection) in the table. Higher stroke velocities on request.
If the extension velocity is considerably higher than the retraction velocity of the piston rod, drag-out losses of the medium may result. If necessary, please consult us.

Piston Ø (mm)	Line connection	Max. stroke velocity in m/s
40	G1/2	0,31
50	G1/2	0,20
63	G3/4	0,28
80	G3/4	0,18
100	G1	0,20
125	G1 1/4	0,20
140	G1 1/4	0,16
160	G1 1/2	0,18
180	G1 1/2	0,14
200	G1 1/2	0,11
220	G1 1/2	0,09
250	G1 1/2	0,07
280	G1 1/2	0,06
320	G1 1/2	0,04

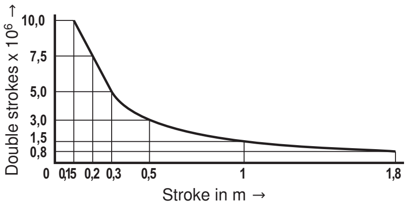
Technical data (For applications outside these parameters, please consult us!)

Boundary and application conditions:

- The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder (MP3/MP5 or MT4) or the piston rod.
- The buckling length/buckling load of the piston rod and/or the hydraulic cylinder must be observed (see page topic Buckling).
- The maximum admissible stroke velocities with regard to the suitability/load of seals must be observed as must their compatibility with the properties of the fluid type (see page topic Seals).
- The maximum admissible velocities/kinetic energies when moving into the end positions, also considering external loads, must be observed.
  Danger: Excess pressure
- The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from the area ratio of annulus to piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Notice: This list does not claim to be complete. In case of questions regarding the compatibility with media or exceedance of the boundary or application conditions, please contact us.

Life cycle:
Rexroth cylinders correspond to the reliability recommendations for industrial applications.
≥ 10000000 double strokes in idle continuos operation or 3000 km piston travel at 70 % of the maximum operating pressure, without load on the piston rod, with a maximum velocity of 0.5 m/s, with a failure rate of less than 5 %.



Acceptance:
Each cylinder is tested according to Bosch Rexroth standard and in compliance with ISO 10100: 2001.

Safety instructions:
For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions 07100-B have to be observed!
Service and repair works have to be performed by Bosch Rexroth AG or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair works not performed by Bosch Rexroth AG.

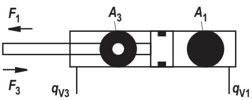
Check lists for hydraulic cylinders:
Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic cylinders (07200).

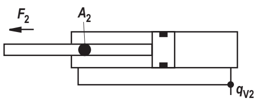
Project planning software ICS (Interactive Catalog System)

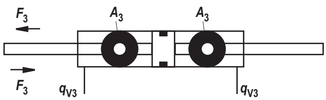
The ICS (Interactive Catalog System) is a selection and project planning aid for hydraulic cylinders. The ICS allows designers for machines and systems to quickly and reliably find the perfect hydraulic cylinder solution through logic-guided type key enquiries. This software helps to solve design and project planning tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical data of the selected components as well as 2D and 3D CAD data in the correct file format for all common CAD systems.
This allows users to reduce costs while increasing their competitiveness.

Diameters, areas, forces, flow

Piston	Piston rod	Area ratio	Areas			Force at 250 bar 1)			Flow at 0.1 m/s 2)			Max. available stroke length
			Piston	Rod	Ring	Pressure	Diff.	Pulling	Off	Diff.	On	
ØAL mm	**ØMM** mm	φ A_1/A_3	A_1 cm²	A_2 cm²	A_3 cm²	F_1 kN	F_2 kN	F_3 kN	q_{V1} l/min	q_{V2} l/min	q_{V3} l/min	mm
40	**22**	1,43	12,56	3,80	8,76	31,40	9,50	21,90	7,5	2,3	5,3	2000
	28	1,96		6,16	6,40		15,40	16,00		3,7	3,8	
50	**28**	1,46	19,63	6,16	13,47	49,10	15,40	33,70	11,8	3,7	8,1	2000
	36	2,08		10,18	9,45		25,45	23,65		6,1	5,7	
63	**36**	1,48	31,17	10,18	20,99	77,90	25,45	52,45	18,7	6,1	12,6	2000
	45	2,04		15,90	15,27		39,75	38,15		9,5	9,2	
80	**45**	1,46	50,26	15,90	34,36	125,65	39,75	85,90	30,2	9,5	20,7	2000
	56	1,96		24,63	25,63		61,55	64,10		14,8	15,4	
100	**56**	1,46	78,54	24,63	53,91	196,35	61,55	134,80	47,1	14,8	32,3	3000
	70	1,96		38,48	40,06		96,20	100,15		23,1	24,0	
125	**70**	1,46	122,72	38,48	84,24	306,75	96,20	210,55	73,6	23,1	50,5	3000
	90	2,08		63,62	59,10		159,05	147,70		38,2	35,4	
140	**90**	1,70	153,94	63,62	90,32	384,75	159,05	225,70	92,4	38,2	54,2	3000
	100	2,04		78,54	75,40		196,35	188,40		47,1	45,3	
160	**100**	1,64	201,06	78,54	122,50	502,50	196,35	306,15	120,6	47,1	73,5	3000
	110	1,90		95,06	106,00		237,65	264,85		57,0	63,6	
180	**110**	1,60	254,47	95,06	159,43	636,17	237,65	398,52	152,7	57,0	95,7	3000
	125	1,93		122,72	131,75		306,80	329,37		73,6	79,1	
200	**125**	1,64	314,16	122,72	191,44	785,25	306,80	478,45	188,5	73,6	114,9	3000
	140	1,96		153,96	160,20		384,90	400,35		92,4	96,1	
220	**140**	1,68	380,1	153,9	226,2	950,3	384,8	565,5	228,1	92,4	135,7	6000
	160	2,12		201,0	179,1		502,6	447,7		120,7	107,4	
250	**160**	1,69	490,8	201,0	289,8	1227,2	502,7	724,5	294,5	120,7	173,8	6000
	180	2,08		254,4	236,4		636,2	591,0		152,7	141,8	
280	**180**	1,70	615,7	254,4	361,3	1539,4	636,2	903,2	369,4	152,7	216,7	6000
	200	2,04		314,1	301,6		785,4	753,9		188,5	180,9	
320	**200**	1,64	804,2	314,1	490,1	2010,6	785,4	1225,2	482,5	188,5	294,0	6000
	220	1,90		380,1	424,2		950,3	1060,3		228,1	254,4	







1) Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. self-aligning clevises, plates or valves, etc.)

2) Stroke velocity

Tolerances according to ISO 6020-1

Installation dimensions	WC	XC 2)	XO 2)	XS 1), 2)	XV 2)	ZP 2)	
Type of mounting	MF3	MP3	MP5	MS2	MT4	MF4	
Stroke length	Tolerances						Stroke tolerances
≤ 1250	±2	±1,5	±1,5	±2	±2	±1,5	+2
> 1250 – ≤ 3150	±4	±3	±3	±4	±4	±3	+5
> 3150 – ≤ 6000	±8	±5	±5	±8	±8	±5	+8

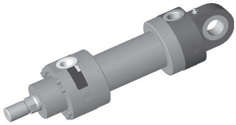
1) Not standardized

2) Including stroke length

Overview of types of mounting: Series CDH1 and CGH1

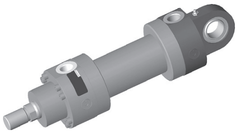
CDH1 MP3

see page 10, 11



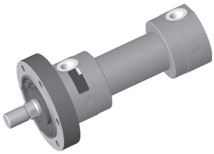
CDH1 MP5

see page 12, 13



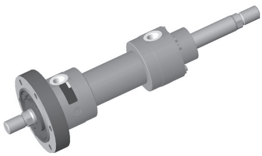
CDH1 MF3

see page 14, 15



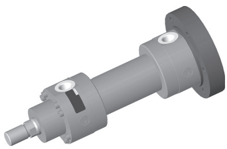
CGH1 MF3

see page 14, 15



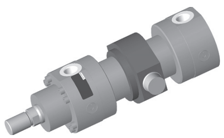
CDH1 MF4

see page 16, 17



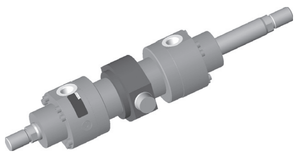
CDH1 MT4

see page 18, 19



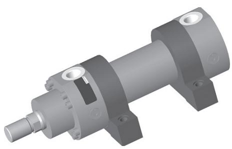
CGH1 MT4

see page 18, 19



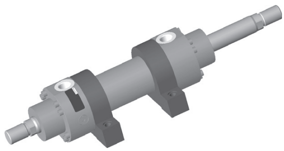
CDH1 MS2

see page 20, 21



CGH1 MS2

see page 20, 21



Ordering code series CDH1

CD	H1	/	/	/	A	3X/						

Differential cylinder = CD

Series = H1

Types of mounting
- Swivel eye at base 1) = **MP3**
- Self-aligning clevis at base = **MP5**
- Round flange at head = **MF3**
- Round flange at base = **MF4**
- Trunnion 2) = **MT4**
- Foot mounting = **MS2**

Piston Ø (ØAL) 40 to 320 mm

Piston rod Ø (ØMM) 22 to 220 mm

Stroke length in mm 3)

Design principle
Head and base flanged = **A**

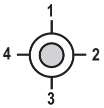
Component series
30 to 39 Unchanged installation and connection dimensions = **3X**

Line connection / version
- According to ISO 1179-1 (pipe thread ISO 228-1) = **B**
- According to ISO 9974-1 (metric thread ISO 261) = **M**
- Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) 4) 9) = **D**
- Flange porting pattern according to ISO 6164 tab. 2 4) = **H**
- According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange 31) = **C**

For directional and high-response valves
- Subplate size 6 4) 5) = **P**
- Subplate size 10 4) 6) = **T**
- Subplate size 16 4) 7) = **U**
- Subplate size 25 4) 8) = **V**

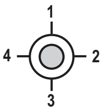
For SL and SV valves
- Subplate size 6 4) 5) 15) = **A**
- Subplate size 10 4) 6) 15) = **E**
- Subplate size 20 4) 7) 15) = **L**
- Subplate size 30 4) 8) 15) = **N**

Line connection/position at head
View to piston rod



- 30) = **1**
- 30) = **2**
- 30) = **3**
- 30) = **4**

Line connection/position at base
View to piston rod



- 30) = **1**
- 30) 34) = **2**
- 30) = **3**
- 30) 34) = **4**

Piston rod design
- Hard chromium-plated = **C**
- Hardened and hard chromium-plated 12) = **H**
- Nickel-plated and hard chromium-plated 12) = **N**

Option
- **Z =** Additional options, fill fields for additional options
- **W =** Without additional options, do **not** fill fields for additional options

Seal design

For mineral oil HL, HLP and HFA
- **M =** Standard seal system
- **L =** Standard seal system with guide rings
- **R =** Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC
- **G =** Standard seal system HFC
- **T =** Servo quality/ reduced friction
- **A =** Chevron seal kits

For phosphate ester HFD-R and polyol ester HFD-U
- **S =** Servo quality/ reduced friction
- **V =** Standard seal system FKM
- **B =** Chevron seal kits

End position cushioning
- **U =** Without
- **D =** 1) On both sides, self-adjusting
- **E =** On both sides, adjustable

Piston rod end
- **A =** Thread for self-aligning clevis CGAS
- **G =** 13) Thread for self-aligning clevis CGA, CGAK, plain clevis CSA
- **S =** With mounted self-aligning clevis CGAS
- **L =** 13) With mounted self-aligning clevis CGA
- **M =** 13) With mounted self-aligning clevis CGAK
- **N =** 1) With mounted plain clevis CSA

Ordering code series CDH1

Additional options

Fields for additional options

	Z					

Inductive proximity switches **without** mating connector [37] = **E**
Mating connector - separate order see page 44
without inductive proximity switches = **W**

Additional guide rings [10), 28)] = **F**
Without additional guide rings = **W**

Threaded coupling, on both sides = **A**
Without threaded coupling = **W**

A = [14), 35)] Spherical bearing, maintenance-free
B = Flanged grease nipple
W = Standard conical grease nipple

Y = Specify the piston rod extension LY in the clear text in mm
W = Without piston rod extension

Order examples:

Without additional options: **CDH1MP5/100/56/300A3X/B11CADMW**

With additional options: **CDH1MP5/100/56/300A3X/B11CADMZ EWABW**

1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the "XV" dimension in the clear text in mm
3) Observe the max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) pages 56 to 58
4) Not possible with MF4
5) Piston Ø 40 to 80 mm, only position 11, subplates only possible in combination with line connection "B" at the head
6) Piston Ø 63 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
7) Piston Ø 125 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
8) Piston Ø 160 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
9) Only piston Ø 80 to 320 mm
10) Seal design A, B not possible; piston Ø 220 to 320 mm standard
12) Only piston rod Ø 22 to 140 mm
13) Not with piston Ø 320 mm
14) Not possible with piston rod end "N"
15) Subplates for SL and SV valves (isolator valves)
Note: Seal designs T, G, L, R, S and V are not designed for the static holding function!
28) With seal design "L" standard
30) All graphical presentations in the data sheet show position 1
31) With MS2, only position 11 is possible
34) With MF4 and line connection B, M or C not possible
35) Not possible with MP3
37) Min. stroke length = 20 mm

Ordering code series CGH1

CG	H1	/	/	/	A	3X	/							

Double-acting cylinder [18] **= CG**

Series **= H1**

Types of mounting
Round flange at head **= MF3**
Trunnion [2] **= MT4**
Foot mounting **= MS2**

Piston Ø (ØAL) 40 to 320 mm

Piston rod Ø (ØMM) 22 to 220 mm

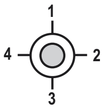
Stroke length in mm [3]

Design principle
Head and base flanged **= A**

Component series
30 to 39 Unchanged installation and connection dimensions **= 3X**

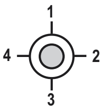
Line connection / version
According to ISO 1179-1 (pipe thread ISO 228-1) **= B**
According to ISO 9974-1 (metric thread ISO 261) **= M**
Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) [9] **= D**
Flange porting pattern according to ISO 6164 tab. 2 **= H**
According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31] **= C**

Line connection/position at head
View to piston rod



[30] **= 1**
[30] **= 2**
[30] **= 3**
[30] **= 4**

Line connection/position at base
View to piston rod



[30] **= 1**
[30] **= 2**
[30] **= 3**
[30] **= 4**

Piston rod design
Hard chromium-plated [36] **= C**
Hardened and hard chromium-plated [12] **= H**
Nickel-plated and hard chromium-plated [11] **= N**

Option
Z = Additional options, fill fields for additional options
W = Without additional options, do **not** fill fields for additional options

Seal design
For mineral oil HL, HLP and HFA
M = Standard seal system
L = Standard seal system with guide rings
R = Reduced friction heavy industry
For mineral oil HL, HLP, HFA and water glycol HFC
G = Standard seal system HFC
T = Servo quality/ reduced friction
A = Chevron seal kits
For phosphate ester HFD-R and polyol ester HFD-U
S = Servo quality/ reduced friction
V = Standard seal system FKM
B = Chevron seal kits

End position cushioning
U = Without
D = [1] On both sides, self-adjusting
E = On both sides, adjustable

Piston rod end
A = Thread for plain clevis CGAS
G = [13] Thread for plain clevis CGA, CGAK, plain clevis CSA
S = [17] With mounted self-aligning clevis CGAS
L = [13] [17] With mounted self-aligning clevis CGA
M = [13] [17] With mounted self-aligning clevis CGAK
N = [1] [17] With mounted plain clevis CSA

Ordering code series CGH1

Additional options

Fields for additional options

| | Z | | | | | |

Inductive proximity switches **without** mating connector Mating connector - separate order see page 44	[37] **= E**
without inductive proximity switches	**= W**
Additional guide rings	[10), 28] **= F**
Without additional guide rings	**= W**
Threaded coupling, on both sides	**= A**
Without threaded coupling	**= W**

A = [14), 35]	Spherical bearing, maintenance-free
B =	Flanged grease nipple
W =	Standard conical grease nipple

Y = [16]	Specify the piston rod extension LY in the clear text in mm
W =	Without piston rod extension

Order examples:

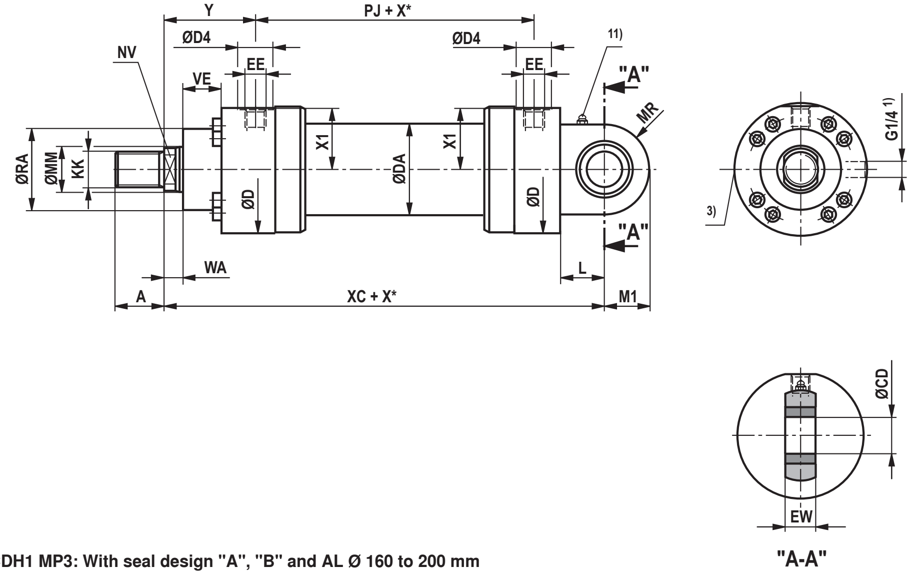
Without additional options: **CGH1MF3/100/56/300A3X/B11CADMW**

With additional options: **CGH1MF3/100/56/300A3X/B11CADMZ EWABW**

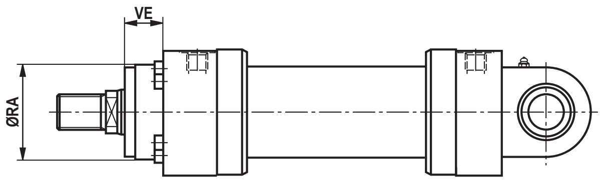
1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the "XV" dimension in the clear text in mm
3) Observe the max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) pages 56 to 58
9) Only piston Ø 80 to 320 mm
10) Seal design A, B not possible; piston Ø 220 to 320 mm standard
11) Only piston rod Ø 22 to 36 mm
12) Only piston rod Ø 22 to 140 mm
13) Not with piston Ø 320 mm
14) Not possible with piston rod end "N"
16) Only at left piston rod side (orientation: Catalog figures)
17) Only one plain clevis / self-aligning clevis mounted, left piston rod side (orientation: Catalog figures)
18) Not standardized
28) With seal design "L" standard
30) All graphical presentations in the data sheet show position 1
35) Not possible with MP3
36) Not possible with piston rod Ø 45 to 140 mm
37) Min. stroke length = 20 mm

Swivel eye at base CDH1: MP3

CDH1 MP3; ØAL 40 to 200 mm



CDH1 MP3: With seal design "A", "B" and AL Ø 160 to 200 mm



Dimensions CDH1: MP3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ
40	**22/28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278

2

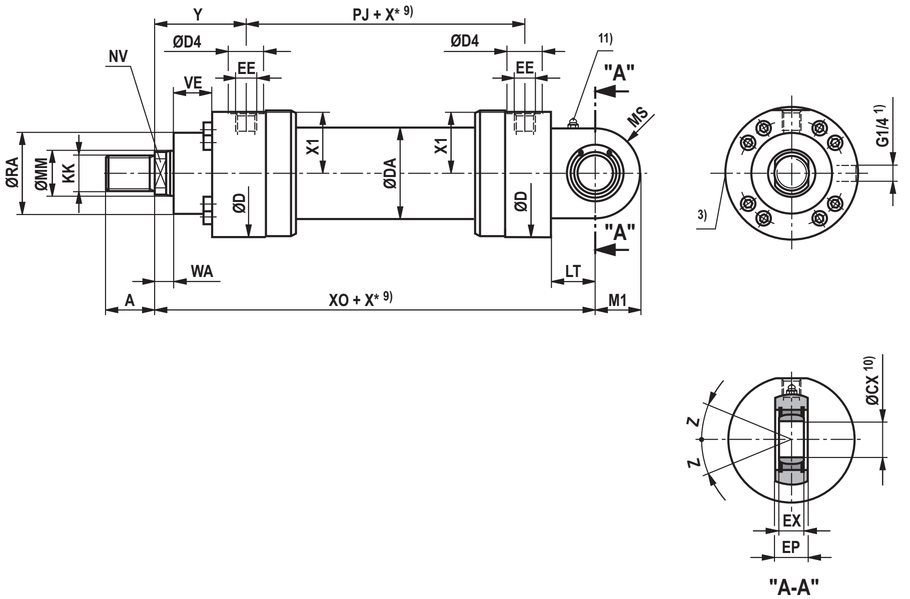
ØAL	ØMM	X1	WA	XC	L	MR	M1	ØCD H11	EW -0,4	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**22/28**	41	14	252	32,5	31	28	25	23	52	40	52	20
50	**28/36**	48,5	18	265	37,5	36	32,5	30	28	65	40	65	16
63	**36/45**	56,5	22	302	45	42	40	35	30	75	45	75	17
80	**45/56**	67	20	330	50	52	50	40	35	95	45	95	13
100	**56/70**	82	30	385	60	65	62,5	50	40	115	55	115	20
125	**70/90**	99	32	447	70	70	70	60	50	135	60	135	17
140	**90/100**	109,5	35	490	75	82	82	70	55	155	70	155	22
160	**100/110**	129	40	550	85	95	95	80	60	200	80	200	80
180	**110/125**	142,5	40	610	90	113	113	90	65	220	90	220	90
200	**125/140**	152	40	645	115	125	125	100	70	235	95	235	95

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

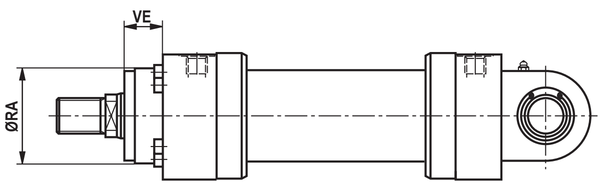
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
11) Standard design „W“
Grease nipple cone head form A according to DIN 71412

Self-aligning clevis at base CDH1: MP5

CDH1 MP5



CDH1 MP5: With seal design "A", "B" and AL Ø 160 to 320 mm



Dimensions CDH1: MP5 (dimensions in mm)

ØAL	ØMM	KK [5]	A [5]	KK [6]	A [6]	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1
40	**22/28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	242

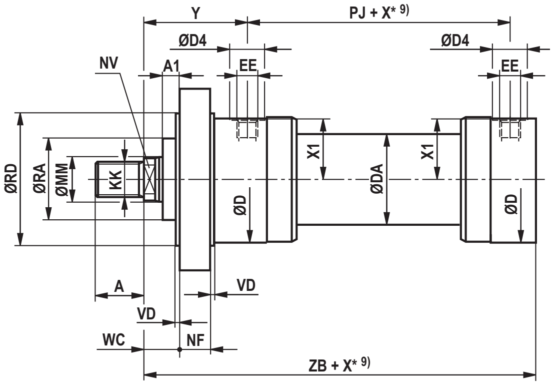
ØAL	ØMM	WA	XO	X* min	LT	M1	MS	ØCX	EP -0,4	EX	Z	ØRA [7]	VE [7]	ØRA [8]	VE [8]
40	**22/28**	14	252	–	32,5	28	31	$25_{-0,010}$	23	$20_{-0,12}$	7°	52	40	52	20
50	**28/36**	18	265	–	37,5	32,5	36	$30_{-0,010}$	28	$22_{-0,12}$	6°	65	40	65	16
63	**36/45**	22	302	–	45	40	42	$35_{-0,012}$	30	$25_{-0,12}$	6°	75	45	75	17
80	**45/56**	20	330	–	50	50	52	$40_{-0,012}$	35	$28_{-0,12}$	7°	95	45	95	13
100	**56/70**	30	385	–	60	62,5	65	$50_{-0,012}$	40	$35_{-0,12}$	6°	115	55	115	20
125	**70/90**	32	447	–	70	70	70	$60_{-0,015}$	50	$44_{-0,15}$	6°	135	60	135	17
140	**90/100**	35	490	–	75	82	82	$70_{-0,015}$	55	$49_{-0,15}$	6°	155	70	155	22
160	**100/110**	40	550	–	85	95	95	$80_{-0,015}$	60	$55_{-0,15}$	6°	200	80	200	80
180	**110/125**	40	610	–	90	113	113	$90_{-0,020}$	65	$60_{-0,20}$	5°	220	90	220	90
200	**125/140**	40	645	–	115	125	125	$100_{-0,020}$	70	$70_{-0,20}$	7°	235	95	235	95
220	**140/160**	40	750	–	125	150 [12]	140 [12]	$110_{-0,020}$	80	$70_{-0,20}$	6°	270	115	270	115
250	**160/180**	40	789	–	140	168 [12]	158 [12]	$110_{-0,020}$	80	$70_{-0,20}$	6°	300	125	300	125
280	**180/200**	40	884	31	150	188 [12]	178 [12]	$120_{-0,020}$	90	$85_{-0,20}$	6°	325	130	325	130
320	**200/220**	40	980	–	175	210 [12]	200 [12]	$140_{-0,020}$	110	$90_{-0,20}$	7°	365	155	365	155

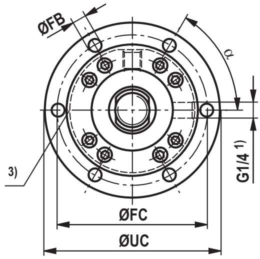
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length "X*min"
10) Related bolt Ø m6;
related bolt Ø j6 with maintenance-free spherical bearing
11) Standard design „W"
Grease nipple cone head form A according to DIN 71412
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

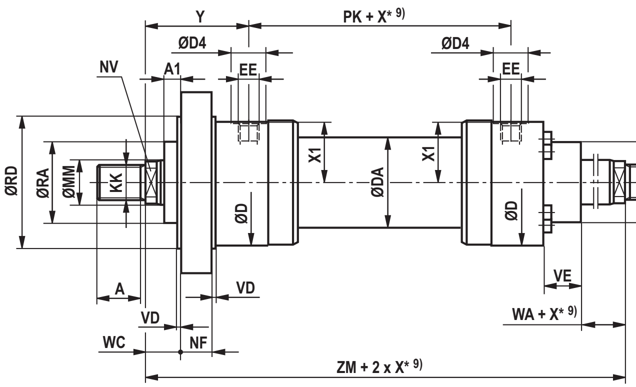
Round flange at head CDH1/CGH1: MF3

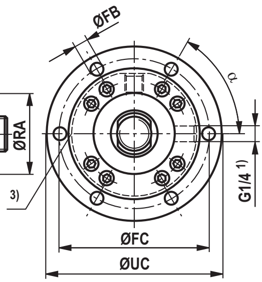
CDH1 MF3



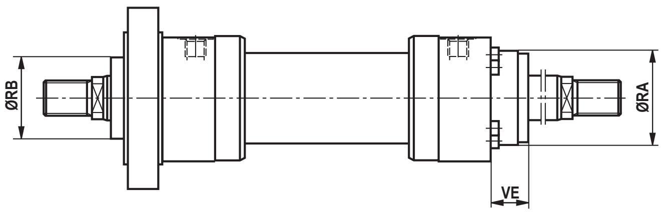


CGH1 MF3





CGH1 MF3: With seal design "A", "B" and AL Ø 160 to 320 mm



Dimensions CDH1/CGH1: MF3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1
40	**22/28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243

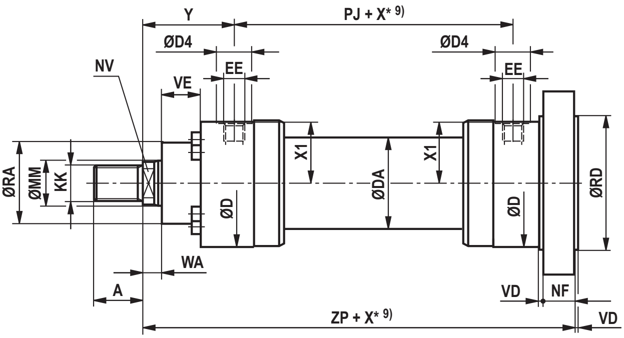
ØAL	ØMM	ØRD e8	WC	VD	NF	PK	A1	ZB	ZM	X* min	ØFB H13	ØFC js13	ØUC -1	α	WA	ØRA 7)	VE 7)	ØRA 8)	VE 8)	ØRB 8) max
40	**22/28**	90	19	5	30	120	0	226	278	–	9	108	130	60°	14	52	40	52	20	–
50	**28/36**	110	23	5	30	120	0	233	294	–	11	130	160	60°	18	65	40	65	16	–
63	**36/45**	130	27	5	35	133	0	262	333	–	13,5	155	185	60°	22	75	45	75	17	–
80	**45/56**	145	25	5	35	146	0	280	354	–	13,5	170	200	60°	20	95	45	95	13	–
100	**56/70**	175	35	5	45	171	0	330	419	–	17,5	205	245	60°	30	115	55	115	20	–
125	**70/90**	210	37	5	50	205	0	382	475	–	22	245	295	60°	32	135	60	135	17	–
140	**90/100**	230	45	10	50	219	0	420	531	–	22	265	315	60°	35	155	70	155	22	–
160	**100/110**	275	50	10	60	240	0	475	610	–	30	325	385	60°	40	200	80	200	80	–
180	**110/125**	300	50	10	70	264	0	515	662	–	30	360	420	60°	40	220	90	220	90	–
200	**125/140**	320	50	10	75	278	0	535	688	–	33	375	445	60°	40	235	95	235	95	–
220	**140/160**	370	60	10	85	326	20	635	810	–	33	430	490	60°	40	270	115	270	115	270
250	**160/180**	415	70	10	85	326	30	659	858	–	39	485	555	60°	40	300	125	300	125	300
280	**180/200**	450	65	10	95	375	25	744	939	31	39	520	590	60°	40	325	130	325	130	325
320	**200/220**	510	65	10	120	431	25	815	1005	–	45	600	680	60°	40	365	155	365	155	365

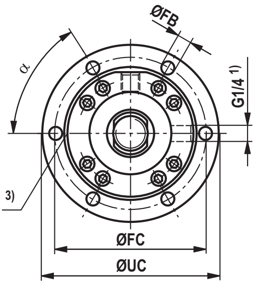
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length "X*min"

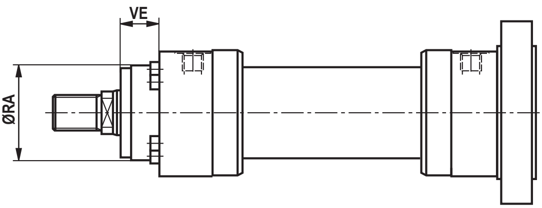
Round flange at base CDH1: MF4

CDH1 MF4





CDH1 MF4: With seal design "A", "B" and AL Ø 160 to 320 mm



Dimensions CDH1: MF4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1
40	**22/28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243

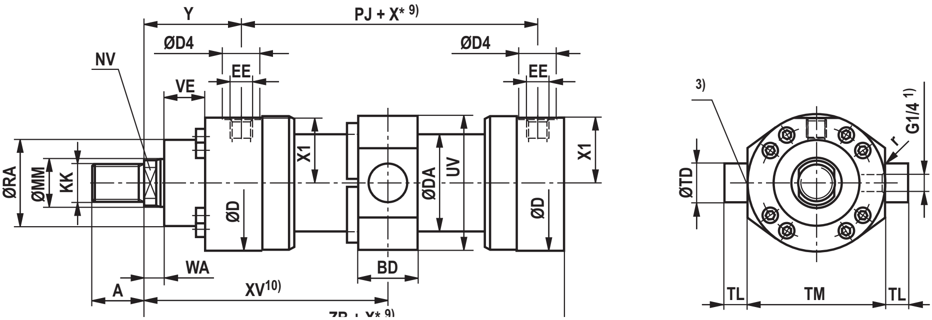
ØAL	ØMM	WA	ZP	X* min	NF	VD	ØRD e8	ØFB H13	ØFC js13	ØUC -1	α	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**22/28**	14	256	–	30	5	90	9	108	130	60°	52	40	52	20
50	**28/36**	18	264	–	30	5	110	11	130	160	60°	65	40	65	16
63	**36/45**	22	297	–	35	5	130	13,5	155	185	60°	75	45	75	17
80	**45/56**	20	315	–	35	5	145	13,5	170	200	60°	95	45	95	13
100	**56/70**	30	375	–	45	5	175	17,5	205	245	60°	115	55	115	20
125	**70/90**	32	432	–	50	5	210	22	245	295	60°	135	60	135	17
140	**90/100**	35	475	–	50	10	230	22	265	315	60°	155	70	155	22
160	**100/110**	40	535	–	60	10	275	30	325	385	60°	200	80	200	80
180	**110/125**	40	585	–	70	10	300	30	360	420	60°	220	90	220	90
200	**125/140**	40	615	–	75	10	320	33	375	445	60°	235	95	235	95
220	**140/160**	40	720	–	85	10	370	33	430	490	60°	270	115	270	115
250	**160/180**	40	744	–	85	10	415	39	485	555	60°	300	125	300	125
280	**180/200**	40	839	31	95	10	450	39	520	590	60°	325	130	325	130
320	**200/220**	40	935	–	120	10	510	45	600	680	60°	365	155	365	155

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

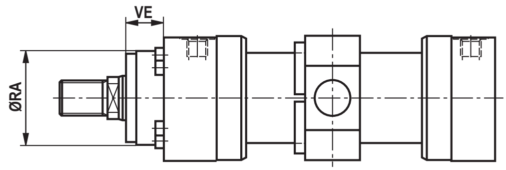
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length "X*min"

Trunnion CDH1/CGH1: MT4

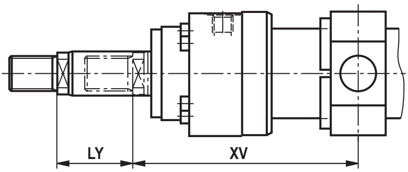
CDH1 MT4



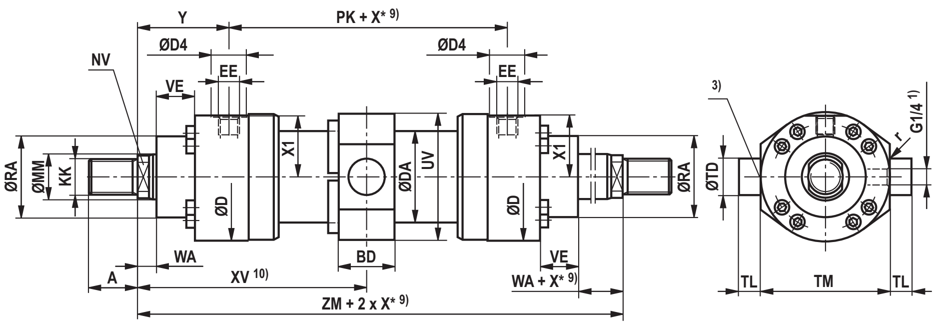
CDH1 MT4: With seal design "A", "B" and AL Ø 160 to 320 mm



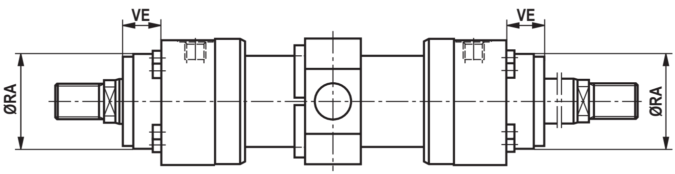
Dimensions for cylinder with piston rod extension "LY" in retracted condition



CGH1 MT4



CGH1 MT4: With seal design "A", "B" and AL Ø 160 to 320 mm



Dimensions CDH1/CGH1: MT4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40	**22/28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	14
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	18
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	22
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	20
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	30
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	32
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	35
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	40
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	40
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	40
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	40
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	40
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	40
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243	40

ØAL	ØMM	PK	ZB	ZM	X* min	XV 11) cent	XV 10) min	XV 10) max	BD	UV 12)	ØTD e8	TL js16	TM h13	r	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**22/28**	120	226	278	22	139+X*/2	150	136+X*	38	97	30	20	95	1,6	52	40	52	20
50	**28/36**	120	233	294	32	147+X*/2	163	140+X*	38	111	30	20	115	1,6	65	40	65	16
63	**36/45**	133	262	333	47	166,5+X*/2	190	155+X*	48	129	35	20	130	2	75	45	75	17
80	**45/56**	146	280	354	58	177+X*/2	206	160+X*	58	153	40	25	145	2	95	45	95	13
100	**56/70**	171	330	419	79	209,5+X*/2	249	185+X*	78	183	50	30	175	2	115	55	115	20
125	**70/90**	205	382	475	91	237,5+X*/2	283	207+X*	98	220	60	40	210	2,5	135	60	135	17
140	**90/100**	219	420	531	121	265,5+X*/2	326	220+X*	118	243	65	42,5	230	2,5	155	70	155	22
160	**100/110**	240	475	610	142	305+X*/2	376	254+X*	128	282	75	52,5	275	2,5	200	80	200	80
180	**110/125**	264	515	661	158	331+X*/2	410	272+X*	138	310	85	55	300	2,5	220	90	220	90
200	**125/140**	278	535	688	194	344+X*/2	441	267+X*	168	331	90	55	320	2,5	235	95	235	95
220	**140/160**	326	635	810	155	405+X*/2	482,5	327,5+X*	135	377	100	60	370	2,5	270	115	270	115
250	**160/180**	326	659	858	175	429+X*/2	516,5	341,5+X*	145	417	110	65	410	2,5	300	125	300	125
280	**180/200**	375	744	939	336	469,5+X*/2	637,5	301,5+X*	165	448	130	70	450	2,5	325	130	325	130
320	**200/220**	431	815	1005	180	502,5+X*/2	592,5	412,5+X*	195	513	160	90	510	2,5	365	155	365	155

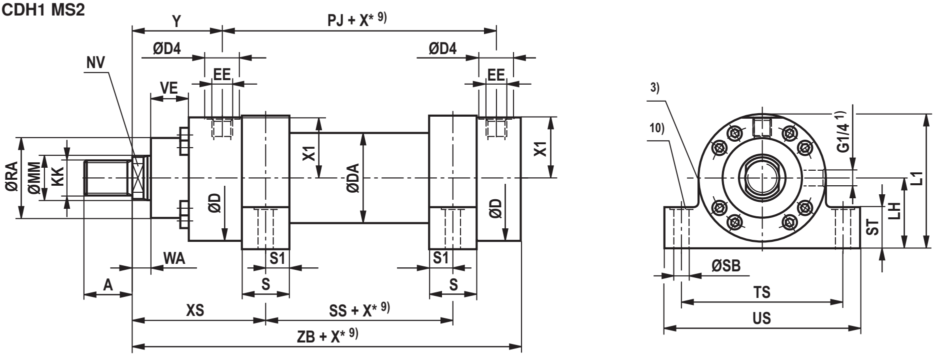
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length "X*min"
10) When ordering, always specify the "XV" dimension in the clear text. Preferred XV dimension:
Observe the trunnion position in the cylinder center XVmin and XVmax
11) XVcent recommendation:
Trunnion position in cylinder center
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

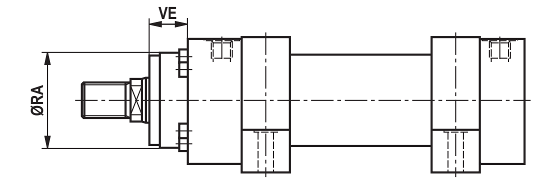
Important installation information: During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

Foot mounting CDH1/CGH1: MS2

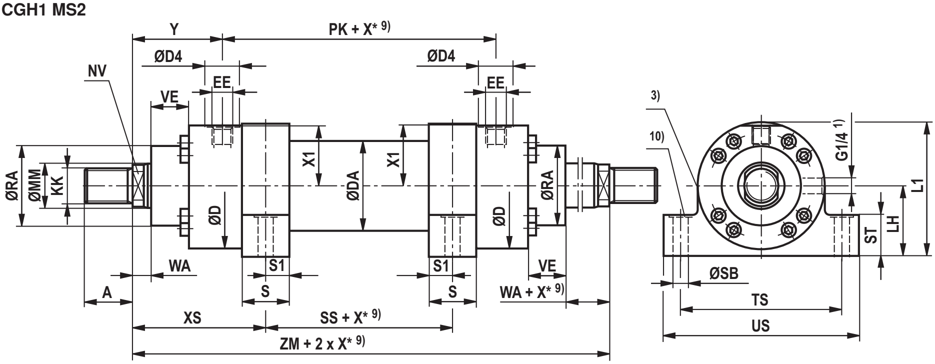
CDH1 MS2



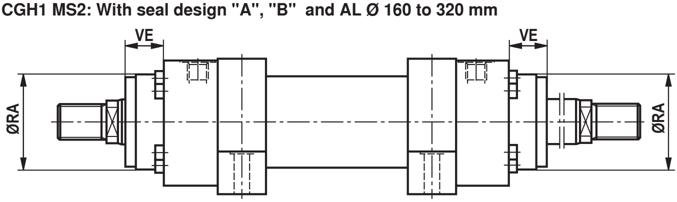
CDH1 MS2: With seal design "A", "B" and AL Ø 160 to 320 mm



CGH1 MS2



CGH1 MS2: With seal design "A", "B" and AL Ø 160 to 320 mm



Dimensions CDH1/CGH1: MS2 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40	**22/28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	14
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	18
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	22
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	20
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	30
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	32
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	35
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	40
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	40
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	40
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	40
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	40
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	40
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243	40

ØAL	ØMM	PK	XS	ZB	ZM	SS	X* min	S	S1	ØSB H13	ST	TS js13	US 12) -1	LH	L1 12)	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**22/28**	120	114	226	278	50	–	30	15	11	32	110	140	45	93	52	40	52	20
50	**28/36**	120	124,5	233	294	45	–	35	17,5	11	37	130	161	55	110	65	40	65	16
63	**36/45**	133	142	262	333	49	–	40	20	13,5	42	150	183	65	129	75	45	75	17
80	**45/56**	146	151	280	354	52	2	50	25	17,5	47	180	220	75	149	95	45	95	13
100	**56/70**	171	179	330	419	61	3	60	30	22	57	210	260	90	181	115	55	115	20
125	**70/90**	205	200	382	475	75	–	70	35	26	67	255	313	105	215	135	60	135	17
140	**90/100**	219	230,5	420	531	70	19	85	42,5	30	72	290	359	115	235	155	70	155	22
160	**100/110**	240	272,5	475	610	65	44	105	52,5	33	77	330	402	135	277	200	80	200	80
180	**110/125**	264	296,5	515	662	69	50	115	57,5	40	92	360	445	150	305	220	90	220	90
200	**125/140**	278	307,5	535	688	73	56	125	62,5	40	97	385	471	160	322	235	95	235	95
220	**140/160**	326	367,5	635	810	75	100	155	77,5	45	102	445	541	185	373	270	115	270	115
250	**160/180**	326	391,5	659	858	75	100	155	77,5	52	112	500	610	205	414	300	125	300	125
280	**180/200**	375	407,5	744	939	124	171	155	77,5	52	127	530	641	225	449	325	130	325	130
320	**200/220**	431	440	815	1005	125	85	190	95	62	142	610	732	255	512	365	155	365	155

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length "X*min"
10) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 – The screws must not be subjected to shear force. Force distribution via additional external fitting strips.
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

2

Ordering code series CSH1

CS	H1	/	/	/	A	3X /							Z

Differential cylinder with position measurement system [18] **= CS**

Series = H1

Types of mounting
- Swivel eye at base [1] **= MP3**
- Self-aligning clevis at base **= MP5**
- Round flange at head **= MF3**
- Round flange at base **= MF4**
- Trunnion [2] **= MT4**
- Foot mounting **= MS2**

Piston Ø (ØAL) 40 to 320 mm

Piston rod Ø (ØMM) 28 to 220 mm

Stroke length in mm [3]

Design principle
- Head and base flanged **= A**

Component series
- 30 to 39 Unchanged installation and connection dimensions **= 3X**

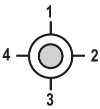
Line connection / version
- According to ISO 1179-1 (pipe thread ISO 228-1) **= B**
- According to ISO 9974-1 (metric thread ISO 261) **= M**
- Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) [4], [9] **= D**
- Flange porting pattern according to ISO 6164 tab. 2 [4] **= H**
- According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31] **= C**

For directional and control valves
- Subplate size 6 [4] [5] **= P**
- Subplate size 10 [4] [6] **= T**
- Subplate size 16 [4] [7] **= U**
- Subplate size 25 [4] [8] **= V**

For SL and SV valves
- Subplate size 6 [4] [5] [15] **= A**
- Subplate size 10 [4] [6] [15] **= E**
- Subplate size 20 [4] [7] [15] **= L**
- Subplate size 30 [4] [8] [15] **= N**

Line connection/position at head

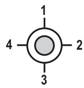
View to piston rod



- [30] **= 1**
- [30] **= 2**
- [30] **= 3**
- [30] **= 4**

Line connection / position at base [30]
- **1 =**
- **2 =** [34]
- **3 =**
- **4 =** [34]

View to piston rod



Piston rod design
- **C =** Hard chromium-plated
- **N =** [19] Nickel-plated and hard chromium-plated

Piston rod end
- **A =** Thread for plain clevis CGAS
- **G =** [13] Thread for plain clevis CGA, CGAK, plain clevis CSA
- **S =** With mounted self-aligning clevis CGAS
- **L =** [13] With mounted self-aligning clevis CGA
- **M =** [13] With mounted self-aligning clevis CGAK
- **N =** [1] With mounted plain clevis CSA

End position cushioning
- **U =** Without
- **E =** [20] On both sides, adjustable

Seal design

For mineral oil HL, HLP and HFA
- **M =** [29] Standard seal system
- **L =** Standard seal system with guide rings
- **R =** [29] Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC
- **G =** [29] Standard seal system HFC
- **T =** [29] Servo quality/ reduced friction

For phosphate ester HFD-R and polyol ester HFD-U
- **S =** [29] Servo quality/ reduced friction
- **V =** [29] Standard seal system FKM

Option
- **Z =** Additional options, fill the fields for additional options

Additional options

	Z

Fields for additional options

T				

- Position measurement system (magnetostrictive) **without** mating connector **= T**
  Mating connector - separate order see page 47, 49
- Analog output 4-20 mA **= C**
- Analog output 0-10 V **= F**
- Digital output SSI **= D**
- Profibus D63 **= N**
- Profibus D53 **= P**
- Threaded coupling, on both sides **= A**
- Without threaded coupling **= W**
- **A =** [14], [35] Spherical bearing, maintenance-free
- **B =** Flanged grease nipple
- **W =** Standard conical grease nipple
- **Y =** Piston rod extension LY specify in the clear text in mm
- **W =** Without piston rod extension

Order example:
CSH1MP5/100/56/300A3X/T11CAEMZ TCAWW

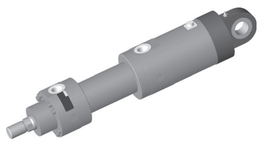
Ordering code Series CSH1

[1] Only piston Ø 40 to 200 mm
[2] Trunnion position freely selectable. When ordering, always specify the "XV" dimension in the clear text in mm.
[3] Observe the max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) pages 56 to 58
[4] Not possible with MF4
[5] Piston Ø 40 to 80 mm, only position 11, subplates only possible in combination with line connection "B" at the head
[6] Piston Ø 63 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
[7] Piston Ø 125 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
[8] Piston Ø 160 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
[9] Only piston Ø 80 to 320 mm
[13] Not with piston Ø 320 mm
[14] Not possible with piston rod end "N"
[15] Subplates for SL and SV valves (isolator valves)
Note: Seal designs T, G, L, R, S and V are not designed for the static holding function!
[18] Not standardized
[19] Only piston rod Ø 28 to 140 mm
[20] Possible from piston rod Ø 45 mm
[29] With CSH, by default with guide belts
[30] All graphical presentations in the data sheet show position 1
[31] With MS2, only position 11 is possible
[34] With MF4 and line connection B, M or C not possible
[35] Not possible with MP3

Overview of types of mounting: Series CSH1

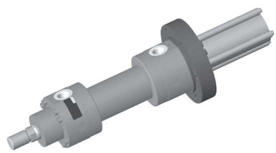
CSH1 MP3

see page 24, 25



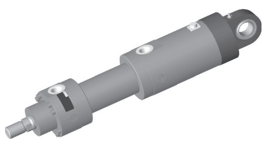
CSH1 MF4

see page 30, 31



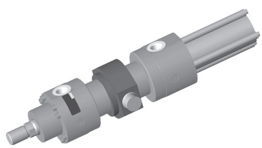
CSH1 MP5

see page 26, 27



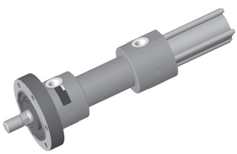
CSH1 MT4

see page 32, 33



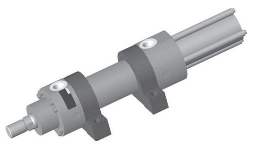
CSH1 MF3

see page 28, 29



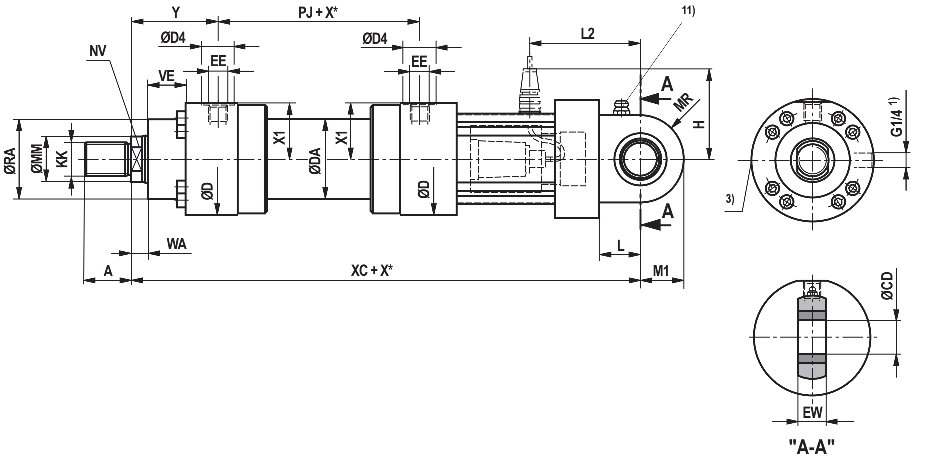
CSH1 MS2

see page 34, 35

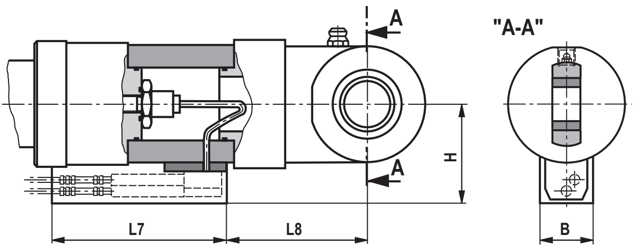


Swivel eye at base CSH1: MP3

CSH1 MP3; AL-Ø 40 to 200 mm
for position measurement system output "C", "F" and "D"



CSH1 MP3; AL-Ø 40 to 200 mm
for position measurement system output "N" and "P"



Dimensions CSH1: MP3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X* max
40	**28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	1000
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	1000
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	2000
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	2000
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	3000
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	3000
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	3000
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	3000
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	3000
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	3000

ØAL	ØMM	X1	WA	XC	L	MR	M1	ØCD H11	EW -0,4	ØRA	VE	L2	H 14)	H 13)	L7	L8	B
40	**28**	41	14	417	32,5	31	28	25	23	52	40	98	115	106	200	75	64
50	**28/36**	48,5	18	430	37,5	36	32,5	30	28	65	40	103	120	113	200	80	64
63	**36/45**	56,5	22	480	45	42	40	35	30	75	45	116	130	122	200	93	64
80	**45/56**	67	20	515	50	52	50	40	35	95	45	132	125	133	200	104	64
100	**56/70**	82	30	560	60	65	62,5	50	40	115	55	145	135	148	200	117	64
125	**70/90**	99	32	620	70	70	70	60	50	135	60	172	145	166	200	148	64
140	**90/100**	109,5	35	665	75	82	82	70	55	155	70	182	155	176	200	156	64
160	**100/110**	129	40	720	85	95	95	80	60	200	80	200	165	196	200	168	64
180	**110/125**	142,5	40	775	90	113	113	90	65	220	90	222	175	210	200	189	64
200	**125/140**	152	40	815	115	125	125	100	70	235	95	237	190	217	200	206	64

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37

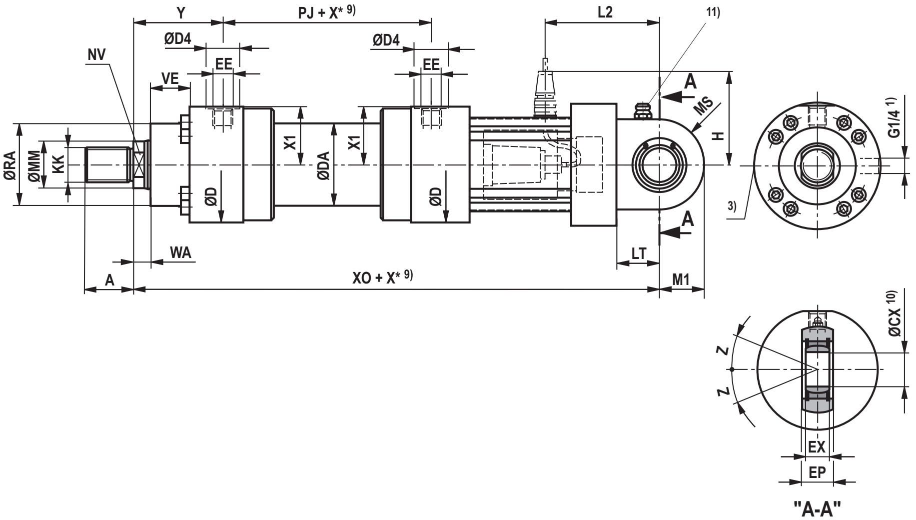
5) Thread design „G"
6) Thread design „A"
11) Standard design „W"
Grease nipple cone head form A according to DIN 71412
13) Dimensions for position transducer output „N" and „P"
14) Dimensions for position transducer output „C", „F" and „D"

2

Self-aligning clevis at base CSH1: MP5

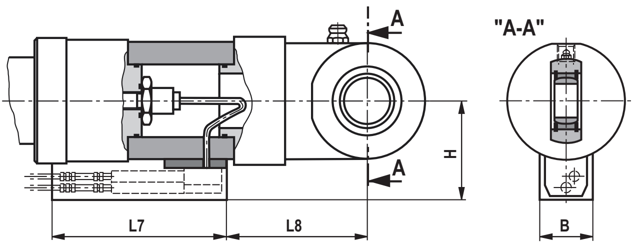
CSH1 MP5

for position measurement system output "C", "F" and "D"



CSH1 MP5

for position measurement system output "N" and "P"



Dimensions CSH1: MP5 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	X* max
40	**28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	1000
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	1000
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	2000
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	2000
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	3000
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	3000
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	3000
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	3000
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	3000
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	3000
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	3000
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	3000
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	3000
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	242	3000

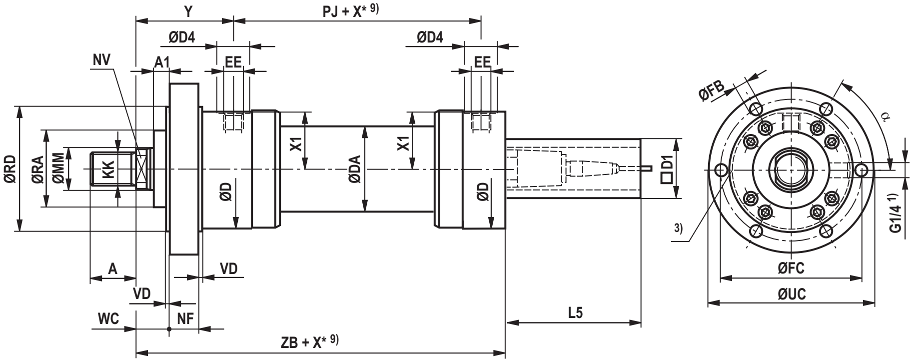
ØAL	ØMM	WA	XO	X* min	LT	M1	MS	ØCX	EP -0,4	EX	Z	ØRA	VE	L2	H 14)	H 13)	L7	L8	B
40	**28**	14	417	–	32,5	28	31	$25_{-0,010}$	23	$20_{-0,12}$	7°	52	40	98	115	106	200	75	64
50	**28/36**	18	430	–	37,5	32,5	36	$30_{-0,010}$	28	$22_{-0,12}$	6°	65	40	103	120	113	200	80	64
63	**36/45**	22	480	–	45	40	42	$35_{-0,012}$	30	$25_{-0,12}$	6°	75	45	116	130	122	200	93	64
80	**45/56**	20	515	–	50	50	52	$40_{-0,012}$	35	$28_{-0,12}$	7°	95	45	132	125	133	200	104	64
100	**56/70**	30	560	–	60	62,5	65	$50_{-0,012}$	40	$35_{-0,12}$	6°	115	55	145	135	148	200	117	64
125	**70/90**	32	620	–	70	70	70	$60_{-0,015}$	50	$44_{-0,15}$	6°	135	60	172	145	166	200	148	64
140	**90/100**	35	665	–	75	82	82	$70_{-0,015}$	55	$49_{-0,15}$	6°	155	70	182	155	176	200	156	64
160	**100/110**	40	720	–	85	95	95	$80_{-0,015}$	60	$55_{-0,15}$	6°	200	80	200	165	196	200	168	64
180	**110/125**	40	775	–	90	113	113	$90_{-0,020}$	65	$60_{-0,20}$	5°	220	90	222	175	210	200	189	64
200	**125/140**	40	815	–	115	125	125	$100_{-0,020}$	70	$70_{-0,20}$	7°	235	95	237	190	217	200	206	64
220	**140/160**	40	960	–	125	150 [12]	140 [12]	$110_{-0,020}$	80	$70_{-0,20}$	6°	270	115	280	205	254	200	248	64
250	**160/180**	40	1000	–	140	168 [12]	158 [12]	$110_{-0,020}$	80	$70_{-0,20}$	6°	300	125	300	220	269	200	263	64
280	**180/200**	40	1105	31	150	188 [12]	178 [12]	$120_{-0,020}$	90	$85_{-0,20}$	6°	325	130	330	270	276	200	295	64
320	**200/220**	40	1210	–	175	210 [12]	200 [12]	$140_{-0,020}$	110	$90_{-0,20}$	7°	365	155	375	300	309	200	340	64

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
9) Observe the min. stroke length "X*min"
10) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing
11) Standard design „W" Grease nipple cone head form A according to DIN 71412
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting
13) Dimensions for position transducer output „N" and „P"
14) Dimensions for position transducer output „C", „F" and „D"

Round flange at head CSH1: MF3

CSH1 MF3



Dimensions CSH1: MF3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	L5	X* max
40	**28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	166	1000
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	166	1000
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	166	2000
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	166	2000
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	166	3000
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	166	3000
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	166	3000
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	166	3000
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	166	3000
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	166	3000
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	166	3000
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	166	3000
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	166	3000
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243	166	3000

ØAL	ØMM	ØRD e8	WC	VD	NF	A1	ZB	X* min	ØFB H13	ØFC js13	ØUC -1	α	ØRA	D1 max
40	**28**	90	19	5	30	0	235	–	9	108	130	60°	52	80
50	**28/36**	110	23	5	30	0	243	–	11	130	160	60°	65	96
63	**36/45**	130	27	5	35	0	287	–	13,5	155	185	60°	75	96
80	**45/56**	145	25	5	35	0	312	–	13,5	170	200	60°	95	96
100	**56/70**	175	35	5	45	0	352	–	17,5	205	245	60°	115	96
125	**70/90**	210	37	5	50	0	392	–	22	245	295	60°	135	96
140	**90/100**	230	45	10	50	0	430	–	22	265	315	60°	155	96
160	**100/110**	275	50	10	60	0	475	–	30	325	385	60°	200	96
180	**110/125**	300	50	10	70	0	515	–	30	360	420	60°	220	96
200	**125/140**	320	50	10	75	0	535	–	33	375	445	60°	235	96
220	**140/160**	370	60	10	85	20	635	–	33	430	490	60°	270	96
250	**160/180**	415	70	10	85	30	659	–	39	485	555	60°	300	96
280	**180/200**	450	65	10	95	25	744	31	39	520	590	60°	325	96
320	**200/220**	510	65	10	120	25	815	–	45	600	680	60°	365	96

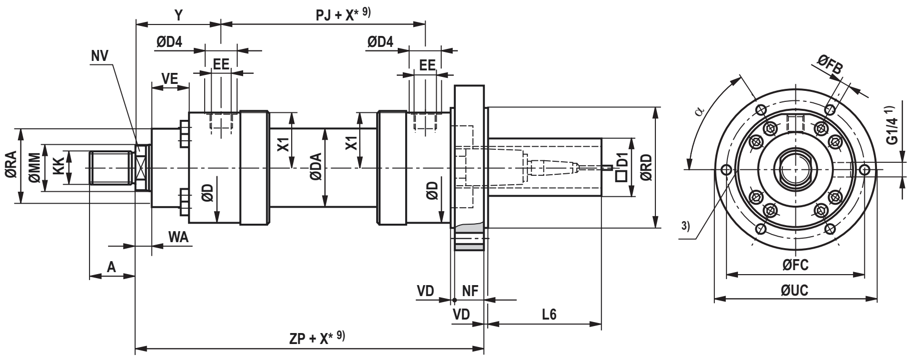
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
9) Observe the min. stroke length "X*min"

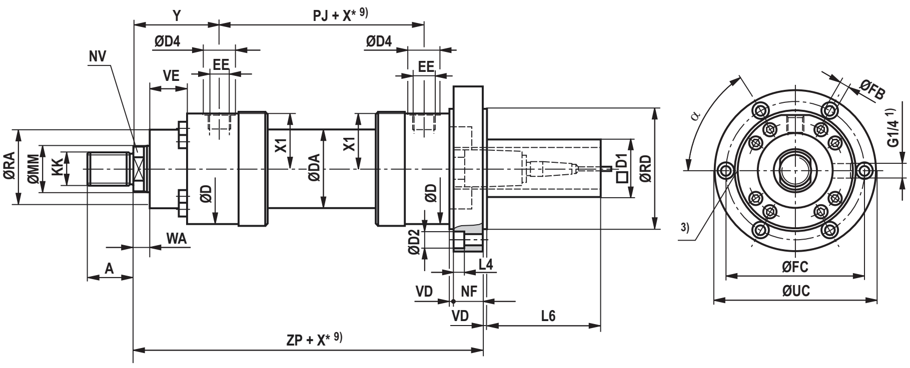
2

Round flange at base CSH1: MF4

CSH1 MF4; ØAL 40 to 100 mm



CSH1 MF4; ØAL 125 to 320 mm



Dimensions CSH1: MF4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	L4	ØD2	X* max
40	**28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	0	0	1000
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	0	0	1000
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	0	0	2000
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	0	0	2000
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	0	0	3000
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	21,5	33	3000
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	21,5	33	3000
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	28,5	43	3000
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	28,5	43	3000
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	32	48	3000
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	32	48	3000
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	38	57	3000
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	38	57	3000
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243	44	66	3000

ØAL	ØMM	WA	ZP	X* min	NF	VD	ØRD e8	ØFB H13	ØFC js13	ØUC -1	α	ØRA	VE	L6	D1 max
40	**28**	14	265	–	30	5	90	9	108	130	60°	52	40	166	80
50	**28/36**	18	274	–	30	5	110	11	130	160	60°	65	40	166	96
63	**36/45**	22	310	–	35	5	130	13,5	155	185	60°	75	45	166	96
80	**45/56**	20	330	–	35	5	145	13,5	170	200	60°	95	45	143	96
100	**56/70**	30	390	–	45	5	175	17,5	205	245	60°	115	55	123	96
125	**70/90**	32	432	–	50	5	210	22	245	295	60°	135	60	121	96
140	**90/100**	35	475	–	50	10	230	22	265	315	60°	155	70	111	96
160	**100/110**	40	535	–	60	10	275	30	325	385	60°	200	80	96	96
180	**110/125**	40	585	–	70	10	300	30	360	420	60°	220	90	86	96
200	**125/140**	40	615	–	75	10	320	33	375	445	60°	235	95	76	96
220	**140/160**	40	720	–	85	10	370	33	430	490	60°	270	115	71	96
250	**160/180**	40	744	–	85	10	415	39	485	555	60°	300	125	71	96
280	**180/200**	40	839	31	95	10	450	39	520	590	60°	325	130	61	96
320	**200/220**	40	935	–	120	10	510	45	600	680	60°	365	155	36	96

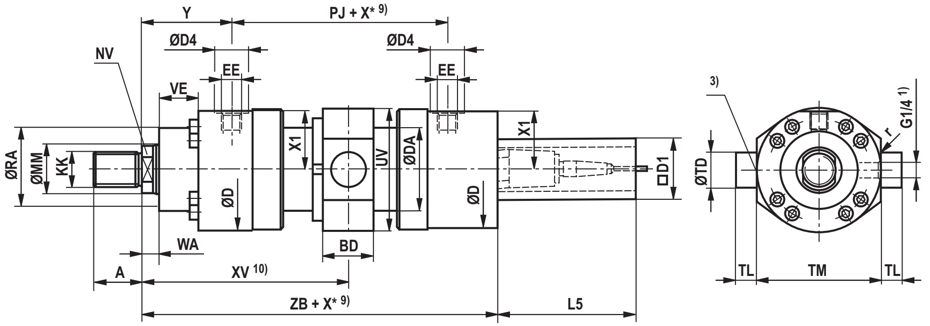
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
9) Observe the min. stroke length "X*min"

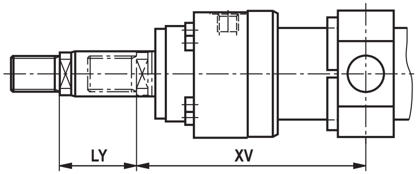
2

Trunnion CSH1: MT4

CSH1 MT4



Dimensions for cylinder with piston rod extension "LY" in retracted condition



Dimensions CSH1: MT4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	L5	X* max
40	**28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	14	166	1000
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	18	166	1000
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	22	166	2000
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	20	166	2000
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	30	166	3000
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	32	166	3000
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	35	166	3000
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	40	166	3000
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	40	166	3000
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	40	166	3000
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	40	166	3000
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	40	166	3000
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	40	166	3000
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243	40	166	3000

ØAL	ØMM	ZB	X* min	XV 11) cent	XV 10) min	XV 10) max	BD	UV 12)	ØTD e8	TL js16	TM h13	r	ØRA	VE	D1 max
40	**28**	235	22	139+X*/2	150	136+X*	38	97	30	20	95	1,6	52	40	80
50	**28/36**	243	32	147+X*/2	163	140+X*	38	111	30	20	115	1,6	65	40	96
63	**36/45**	287	47	166,5+X*/2	190	155+X*	48	129	35	20	130	2	75	45	96
80	**45/56**	312	58	177+X*/2	206	160+X*	58	153	40	25	145	2	95	45	96
100	**56/70**	352	79	209,5+X*/2	249	185+X*	78	183	50	30	175	2	115	55	96
125	**70/90**	392	91	237,5+X*/2	283	207+X*	98	220	60	40	210	2,5	135	60	96
140	**90/100**	430	121	265,5+X*/2	326	220+X*	118	243	65	42,5	230	2,5	155	70	96
160	**100/110**	475	142	305+X*/2	376	254+X*	128	282	75	52,5	275	2,5	200	80	96
180	**110/125**	515	158	331+X*/2	410	272+X*	138	310	85	55	300	2,5	220	90	96
200	**125/140**	535	194	344+X*/2	441	267+X*	168	331	90	55	320	2,5	235	95	96
220	**140/160**	635	155	405+X*/2	482,5	327,5+X*	135	377	100	60	370	2,5	270	115	96
250	**160/180**	659	175	429+X*/2	516,5	341,5+X*	145	417	110	65	410	2,5	300	125	96
280	**180/200**	744	336	469,5+X*/2	637,5	301,5+X*	165	448	130	70	450	2,5	325	130	96
320	**200/220**	815	180	502,5+X*/2	592,5	412,5+X*	195	513	160	90	510	2,5	365	155	96

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

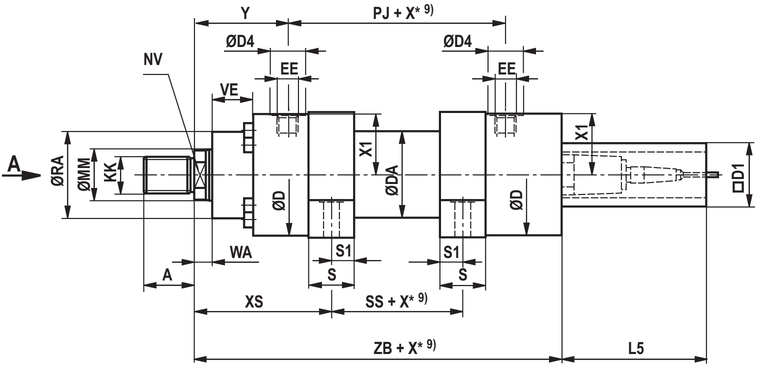
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
9) Observe the min. stroke length "X*min"
10) When ordering, always specify the "XV" dimension in the clear text. Preferred XV dimension: Observe the trunnion position in the cylinder center XVmin and XVmax
11) XVcent recommendation: Trunnion position in cylinder center
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

Important installation information: During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

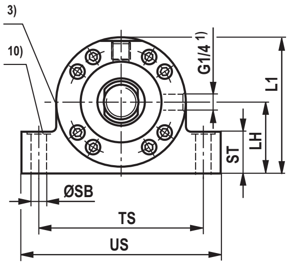
2

Foot mounting CSH1: MS2

CSH1 MS2; ØAL 40 to 320 mm



View A



Dimensions CSH1: MS2 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	L5	X* max
40	**28**	M16x1,5	16	M18x2	30	16/22	88	52	34	G1/2	M22x1,5	79	120	41	14	166	1000
50	**28/36**	M22x1,5	22	M24x2	35	22/30	102	62	34	G1/2	M22x1,5	87	120	48,5	18	166	1000
63	**36/45**	M28x1,5	28	M30x2	45	30/36	120	78	42	G3/4	M27x2	100	133	56,5	22	166	2000
80	**45/56**	M35x1,5	35	M39x3	55	36/46	140	95	42	G3/4	M27x2	104	146	67	20	166	2000
100	**56/70**	M45x1,5	45	M50x3	75	46/60	170	125	47	G1	M33x2	124	171	82	30	166	3000
125	**70/90**	M58x1,5	58	M64x3	95	60/75	206	150	58	G1 1/4	M42x2	135	205	99	32	166	3000
140	**90/100**	M65x1,5	65	M80x3	110	75/85	226	170	58	G1 1/4	M42x2	156	219	109,5	35	166	3000
160	**100/110**	M80x2	80	M90x3	120	85/95	265	190	65	G1 1/2	M48x2	185	240	129	40	166	3000
180	**110/125**	M100x2	100	M100x3	140	95/110	292	210	65	G1 1/2	M48x2	199	264	142,5	40	166	3000
200	**125/140**	M110x2	110	M110x4	150	110/120	310	235	65	G1 1/2	M48x2	205	278	152	40	166	3000
220	**140/160**	M120x3	120	M120x4	160	120/140	355	273	65	G1 1/2	M48x2	242	326	174	40	166	3000
250	**160/180**	M120x3	120	M120x4	160	140/160	395	305	65	G1 1/2	M48x2	266	326	194	40	166	3000
280	**180/200**	M130x3	130	M150x4	190	160/180	425	343	65	G1 1/2	M48x2	282	375	210	40	166	3000
320	**200/220**	–	–	M160x4	200	180/200	490	394	65	G1 1/2	M48x2	287	431	243	40	166	3000

2

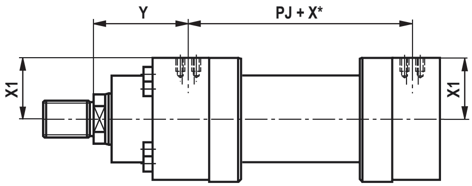
ØAL	ØMM	XS	ZB	SS	X* min	S	S1	ØSB H13	ST	TS js13	US 12) -1	LH	L1 12)	ØRA	VE	D1 max
40	**28**	114	235	50	–	30	15	11	32	110	140	45	93	52	40	80
50	**28/36**	124,5	243	45	–	35	17,5	11	37	130	161	55	110	65	40	96
63	**36/45**	142	287	49	–	40	20	13,5	42	150	183	65	129	75	45	96
80	**45/56**	151	312	52	2	50	25	17,5	47	180	220	75	149	95	45	96
100	**56/70**	179	352	61	3	60	30	22	57	210	260	90	181	115	55	96
125	**70/90**	200	392	75	–	70	35	26	67	255	313	105	215	135	60	96
140	**90/100**	230,5	430	70	19	85	42,5	30	72	290	359	115	235	155	70	96
160	**100/110**	272,5	475	65	44	105	52,5	33	77	330	402	135	277	200	80	96
180	**110/125**	296,5	515	69	50	115	57,5	40	92	360	445	150	305	220	90	96
200	**125/140**	307,5	535	73	56	125	62,5	40	97	385	471	160	322	235	95	96
220	**140/160**	367,5	635	75	100	155	77,5	45	102	445	541	185	373	270	115	96
250	**160/180**	391,5	659	75	100	155	77,5	52	112	500	610	205	414	300	125	96
280	**180/200**	407,5	744	124	171	155	77,5	52	127	530	641	225	449	325	130	96
320	**200/220**	440	815	125	85	190	95	62	142	610	732	255	512	365	155	96

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

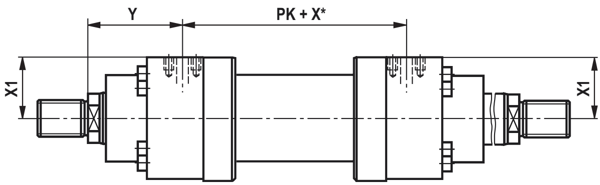
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0.5 mm deep
3) Throttle valve only with end position cushioning "E" (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G"
6) Thread design „A"
9) Observe the min. stroke length "X*min"
10) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 – The screws must not be subjected to shear force. Force distribution via additional external fitting strips.
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

Flange connections

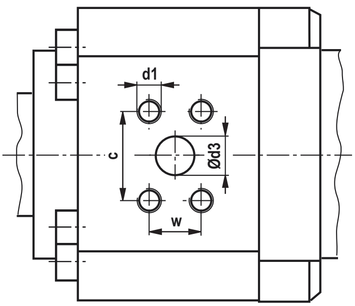
CDH1/CSH1



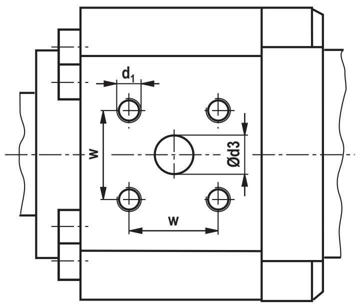
CGH1



Porting pattern for rectangular flange according to ISO 6162-2 table 2 type 1



Porting pattern for square flange according to ISO 6164 table 2



Flange connections

Dimensions (dimensions in mm)

ØAL	Version „D“ ISO 6162-2 tab.2 type1 (400 bar) (≙ SAE 6000 PSI)											Version „H“ ISO 6164 tab.2 (400 bar)								
	Y	PJ PK	X1	$Ød_3$	$Ød_3$ 4)	c ±0,25	w ±0,25	d_1	t_1 1)	t_1 2)	p 3)	Y	PJ PK	X1	$Ød_3$	w ±0,25	d1	t_1 1)	t_1 2)	p 3)
40	–	–	–	–	–	–	–	–	–	–	–	78	122	40,5	10	24,7	M6	12,5	10	400
50	–	–	–	–	–	–	–	–	–	–	–	86	122	48	10	24,7	M6	12,5	10	400
63	–	–	–	–	–	–	–	–	–	–	–	99	135	57	13	29,7	M8	16	13	400
80	102,5	149	65	13	1/2“	40,5	18,2	M8	16	14	400	103	148	67	13	29,7	M8	16	15	400
100	124	171	80,5	13	1/2“	40,5	18,2	M8	16	16	400	123	173	81,5	19	35,4	M8	16	16	400
125	135	205	97,5	19	3/4“	50,8	23,8	M10	20	20	400	131,5	212	99	25	43,8	M10	20	20	400
140	152	227	107	25	1“	57,2	27,8	M12	24	24	400	152	227	109	25	43,8	M10	20	20	400
160	184	242	127	25	1“	57,2	27,8	M12	24	24	400	182,5	245	128	32	51,6	M12	24	24	400
180	199	264	139,5	32	1 1/4“	66,6	31,8	M14	26	26	400	199	264	142	32	51,6	M12	24	24	400
200	205	278	149	32	1 1/4“	66,6	31,8	M14	26	26	400	201,5	285	149,5	38	60,1	M16	30	30	400
220	242	326	168	38	1 1/2“	79,3	36,5	M16	30	30	400	242	326	171	38	60,1	M16	30	30	400
250	266	326	189	38	1 1/2“	79,3	36,5	M16	30	30	400	266	326	192	38	60,1	M16	30	30	400
280	282	375	204	38	1 1/2“	79,3	36,5	M16	30	30	400	282	375	207	38	60,1	M16	30	30	400
320	287	431	236	51	2“	96,8	44,5	M20	36	36	400	287	431	240	51	69,3	M16	30	30	400

Dimensions see page 10 to 21, and/or pages 24 to 35

ØAL = Piston Ø
X* = Stroke length
1) Thread depth for seal design M, T, G, L, R, S and V
2) Thread depth for seal design A and B
3) Max. operating pressure for related flanges in bar
4) Flange porting pattern according to ISO 6162-2 tab. 2 type 1 corresponds to flange porting pattern according to SAE 6000 PSI

Subplates for valve mounting (SL and SV valve)

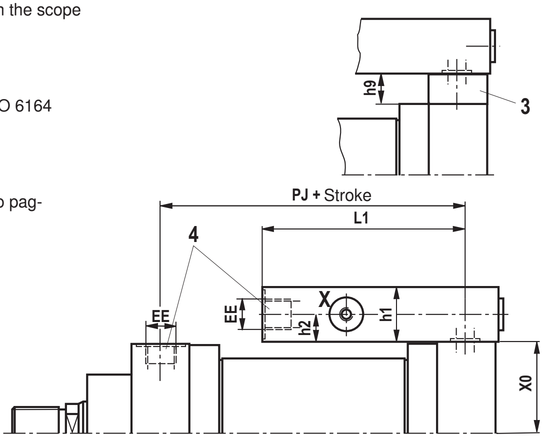
Note:
Valves, fittings and piping are **not** included in the scope of delivery!

1 Port B to the piston side according to ISO 6164
2 Bore for locating pin
3 Adapter plate for MT4 type of mounting (part of the scope of delivery for MT4)
4 Line connection "B" dimensions see also pages 10 to 21 as well as pages 24 to 35

Important notice
Subplates for SL and SV valves (isolator valves)

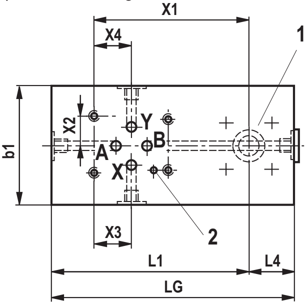
Note:
Seal designs T, G, L, R, S and V are not designed for the static holding function!

Installation situation with MT4



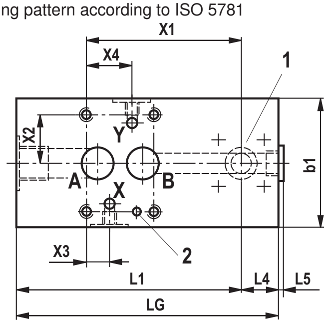
Size 6

Porting pattern according to ISO 24340 form A and ISO 4401



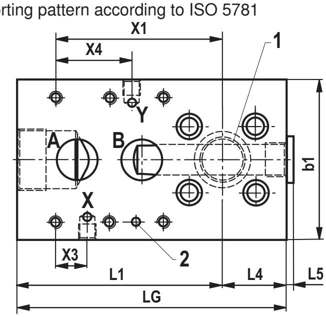
Size 10 and 20

Porting pattern according to ISO 5781

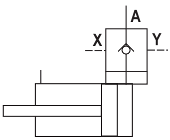


Size 30

Porting pattern according to ISO 5781



Piping symbol

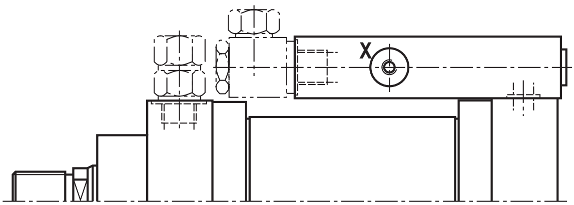


Subplates for valve mounting (SL and SV valve – dimensions in mm)

ØAL	Valve size	PJ	EE	Stroke min [1]		X0	Plate dimensions							Port size, porting pattern						Position point Valve	
				2)	3)		L1	L4	L5	LG	b1	h1	h9	h2	A	X	Y	X3	X4	X1	X2
40	6	121	G1/2	50	50	40,5	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21,5	21,5	65,5	15,5
50	6	121	G1/2	50	50	48,0	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21,5	21,5	65,5	15,5
63	6	134	G3/4	64	64	57,0	100	25	5	125	55	47	20	23,5	G3/4	G1/4	G1/4	21,5	21,5	70,5	15,5
	10	134	G3/4	64	64	57,0	105	25	5	130	85	47	20	23,5	G3/4	G1/4	G1/4	21,4	21,4	73	33,3
80	6	147	G3/4	58	58	67,0	100	25	5	125	55	47	20	23,5	G3/4	G1/4	G1/4	21,5	21,5	70,5	15,5
	10	147	G3/4	58	58	67,0	105	25	5	130	85	47	20	23,5	G3/4	G1/4	G1/4	21,4	21,4	73	33,3
100	10	172	G1	50	79	81,5	102	28	5	130	85	50	20	25	G1	G1/4	G1/4	21,4	21,4	70	33,3
125	10	208,5	G1 1/4	60	91	99,0	115	35	5	150	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	80	33,3
	20	208,5	G1 1/4	60	91	99,0	140	35	5	175	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	95	39,7
140	10	223	G1 1/4	50	121	109,0	115	35	5	150	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	80	33,3
	20	223	G1 1/4	50	121	109,0	140	35	5	175	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	95	39,7
160	10	242,5	G1 1/2	60	142	128,0	120	40	5	160	85	70	30	35	G1 1/2	G1/4	G1/4	21,4	21,4	90	33,3
	20	242,5	G1 1/2	60	142	128,0	135	50	5	185	100	70	30	35	G1 1/2	G1/4	G1/4	20,8	39,7	105	39,7
	30	242,5	G1 1/2	60	142	128,0	160	50	5	210	125	70	30	35	G1 1/2	G1/4	G1/4	24,6	59,6	130	48,4
180	10	264	G1 1/2	50	158	142,0	120	40	5	160	85	70	30	35	G1 1/2	G1/4	G1/4	21,4	21,4	90	33,3
	20	264	G1 1/2	50	158	142,0	135	50	5	185	100	70	30	35	G1 1/2	G1/4	G1/4	20,8	39,7	105	39,7
	30	264	G1 1/2	50	158	142,0	160	50	5	210	125	70	30	35	G1 1/2	G1/4	G1/4	24,6	59,6	130	48,4
200	10	281,5	G1 1/2	30 [4]	194	149,5	130	45	5	175	95	70	20	35	G1 1/2	G1/4	G1/4	21,4	21,4	100	33,3
	20	281,5	G1 1/2	30 [4]	194	149,5	140	45	5	185	100	70	20	35	G1 1/2	G1/4	G1/4	20,8	39,7	115	39,7
	30	281,5	G1 1/2	30 [4]	194	149,5	165	45	5	210	125	70	20	35	G1 1/2	G1/4	G1/4	24,6	59,6	140	48,4

ØAL = Piston Ø

1) The information only applies to the following connection situation!



2) Not for MT4

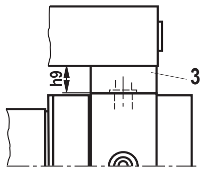
3) Only for MT4

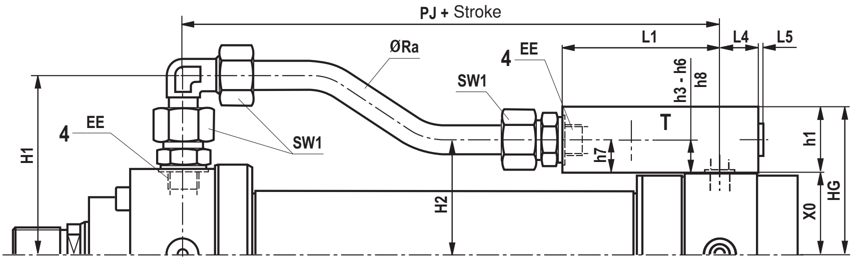
4) With type of mounting "MS2", observe X*min on page 21 and/or 35

Subplates for valve mounting (directional and high-response valves)

1 Port B to the piston side according to ISO 6164
2 Bore for locating pin
3 Adapter plate for MT4 type of mounting (part of the scope of delivery for MT4)
4 Line connection "B" dimensions see also pages 10 to 21 as well as pages 24 to 35

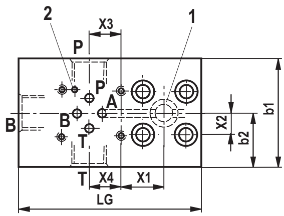
Installation situation with MT4





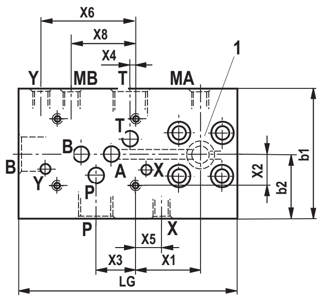
Size 6

Porting pattern according to ISO 24340 form A and ISO 4401



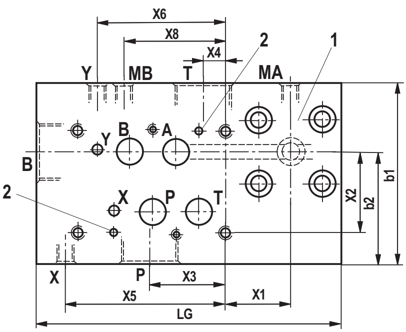
Size 10

Porting pattern according to ISO 24340 form A and ISO 4401



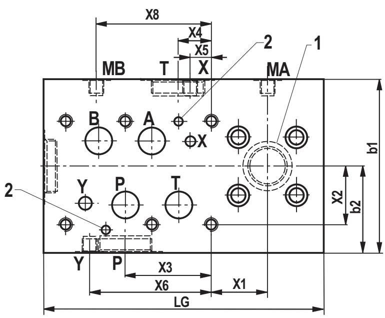
Size 16

Porting pattern according to ISO 24340 form A and ISO 4401



Size 25

Porting pattern according to ISO 24340 form A and ISO 4401



With larger stroke lengths and depending on the piston diameter, the pipeline is mounted at the cylinder pipe using pipe supports. A maximum of two sandwich plates is admissible.

Subplates for valve mounting (directional and high-response valves – dimensions in mm)

ØAL	Valve size	PJ	EE	Stroke min	Plate dimensions																
					L1	L4	L5 max	H1	H2 1)	H2 2)	SW1	ØRa	b1	h1	LG	HG 1)	HG 2)	b2	X0	h7	h9
40	6	121	G1/2	242	90	20	4	96,0	60,5	70,5	30	16,0x2,5	65	40	110	80,5	90,5	32,5	40,5	20	10
50	6	121	G1/2	242	90	20	4	103,5	68,0	78,0	30	16,0x2,5	65	40	110	88,0	98,0	32,5	48,0	20	10
63	6	134	G3/4	276	100	25	5	121,5	80,5	100,5	36	20,0x3,0	75	47	125	104,0	124,0	37,5	57,0	23,5	20
	10	134	G3/4	301	125	25	5	121,5	80,0	100,0	36	20,0x3,0	90	70	150	127,0	147,0	45	57,0	23	20
80	6	147	G3/4	263	100	25	5	132,0	90,5	110,5	36	20,0x3,0	75	47	125	114,0	134,0	37,5	67,0	23,5	20
	10	147	G3/4	288	125	25	5	132,0	90,0	110,0	36	20,0x3,0	90	70	150	137,0	157,0	45	67,0	23	20
100	10	172	G1	317	132	28	5	155,0	111,5	131,5	46	25,0x4,0	90	80	160	161,5	181,5	45	81,5	30	20
125	10	208,5	G1 1/4	330	135	35	5	177,5	134,0	164,0	50	30,0x5,0	105	95	170	194,0	224,0	52,5	99,0	35	30
	16	208,5	G1 1/4	370	175	35	5	177,5	144,0	174,0	50	30,0x5,0	120	100	210	199,0	229,0	60	99,0	45	30
140	10	223	G1 1/4	315	135	35	5	188,0	144,0	174,0	50	30,0x5,0	105	95	170	204,0	234,0	52,5	109,0	35	30
	16	223	G1 1/4	355	175	35	5	188,0	154,0	184,0	50	30,0x5,0	120	100	210	209,0	239,0	60	109,0	45	30
160	10	242,5	G1 1/2	399	150	40	5	218,0	163,0	193,0	60	38,0x6,0	105	95	190	223,0	253,0	52,5	128,0	35	30
	16	242,5	G1 1/2	429	180	40	5	218,0	178,0	208,0	60	38,0x6,0	125	105	220	233,0	263,0	62,5	128,0	50	30
	25	242,5	G1 1/2	449	200	50	0	218,0	183,0	213,0	60	38,0x6,0	155	110	250	238,0	268,0	77,5	128,0	55	30
180	10	264	G1 1/2	377	150	40	5	231,5	177,0	207,0	60	38,0x6,0	105	95	190	237,0	267,0	52,5	142,0	35	30
	16	264	G1 1/2	407	180	40	5	231,5	192,0	222,0	60	38,0x6,0	125	105	220	247,0	277,0	62,5	142,0	50	30
	25	264	G1 1/2	427	200	50	0	231,5	197,0	227,0	60	38,0x6,0	155	110	250	252,0	282,0	77,5	142,0	55	30
200	10	281,5	G1 1/2	365	155	50	5	241,0	184,5	204,5	60	38,0x6,0	110	95	205	244,5	264,5	55	149,5	35	20
	16	281,5	G1 1/2	400	190	50	5	241,0	199,5	219,5	60	38,0x6,0	125	105	240	254,5	274,5	62,5	149,5	50	20
	25	281,5	G1 1/2	420	210	50	0	241,0	204,5	224,5	60	38,0x6,0	155	110	260	259,5	279,5	77,5	149,5	55	20

ØAL	Valve size	Port size, porting pattern																Position point Valve	
		P	X3	h3	T	X4	h4	X	X5	h5	Y	X6	h6	MA	MB	X8	h8	X1	X2
40	6	G1/2	21,5	20	G1/2	21,5	20	-	-	-	-	-	-	-	-	-	-	25	15,5
50	6	G1/2	21,5	20	G1/2	21,5	20	-	-	-	-	-	-	-	-	-	-	25	15,5
63	6	G3/4	21,5	23,5	G3/4	21,5	23,5	-	-	-	-	-	-	-	-	-	-	30	15,5
	10	G3/4	27	33	G3/4	3,5	33	G1/4	18	47	G1/4	65,0	47	G1/4	G1/4	60	17	45	21,4
80	6	G3/4	21,5	23,5	G3/4	21,5	23,5	-	-	-	-	-	-	-	-	-	-	30	15,5
	10	G3/4	27	33	G3/4	3,5	33	G1/4	18	47	G1/4	65,0	47	G1/4	G1/4	60	17	45	21,4
100	10	G1	27	30	G1	3,5	40	G1/4	18	57	G1/4	65,0	57	G1/4	G1/4	58	20	52	21,4
125	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	65,0	72	G1/4	G1/4	55	25	55	21,4
	16	G1 1/4	52	32	G1 1/4	15	32	G1/4	76,5	75	G1/4	88,0	80	G1/4	G1/4	88	40	45	40
140	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	65,0	72	G1/4	G1/4	55	25	55	21,4
	16	G1 1/4	52	32	G1 1/4	15	32	G1/4	76,5	75	G1/4	88,0	80	G1/4	G1/4	88	40	45	40
160	10	G1 1/2	27	35	G1 1/2	3,5	45	G1/4	20	72	G1/4	65,0	72	G1/4	G1/4	55	25	60	21,4
	16	G1 1/2	57	35	G1 1/2	15	34	G1/4	76,5	80	G1/4	86,0	85	G1/4	G1/4	86	45	50	40
	25	G1 1/2	77	42	G1 1/2	30	34	G1/4	19	90	G1/4	109,0	90	G1/4	G1/4	103	50	50	52,1
180	10	G1 1/2	27	35	G1 1/2	3,5	45	G1/4	20	72	G1/4	65,0	72	G1/4	G1/4	55	25	60	21,4
	16	G1 1/2	57	35	G1 1/2	15	34	G1/4	76,5	80	G1/4	86,0	85	G1/4	G1/4	86	45	50	40
	25	G1 1/2	77	42	G1 1/2	30	34	G1/4	19	90	G1/4	109,0	90	G1/4	G1/4	103	50	50	52,1
200	10	G1 1/2	27	35	G1 1/2	3,5	45	G1/4	19	72	G1/4	62,0	72	G1/4	G1/4	50	25	72	21,4
	16	G1 1/2	57	35	G1 1/2	15	34	G1/4	76,5	80	G1/4	86,0	85	G1/4	G1/4	86	45	60	40
	25	G1 1/2	77	42	G1 1/2	30	34	G1/4	19	90	G1/4	109,0	90	G1/4	G1/4	103	50	60	52,1

ØAL = Piston Ø

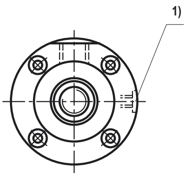
1) Not for MT4

2) Only for MT4

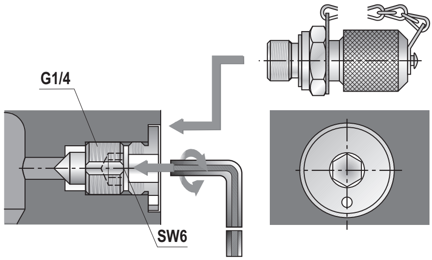
Bleeding / threaded coupling (dimensions in mm)

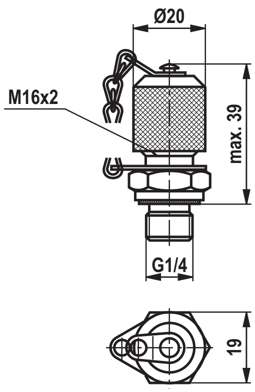
By default, a patented safety bleeding device against unintended screwing out in head and base is delivered for all cylinders.

The port allows for the installation of a threaded coupling with check valve for pressure measurement or contamination-free bleeding. Threaded coupling with check valve function, i.e. it can also be connected when the system is pressurized.



1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)



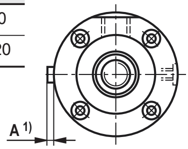


Scope of delivery: Threaded coupling **G1/4**

SCREW JOINT AB 20-11/K1 G1/4 with seal ring of NBR
Material no. **R900009090**
SCREW JOINT AB 20-11/K1V G1/4 with seal ring of FKM
Material no. **R900001264**

Throttle valve (dimensions in mm)

ØAL	**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**	**180**	**200**	**220**	**250**	**280**	**320**
Protrusion A 1)	1	0	0	0	0	0	0	0	0	0	9,5	0	0	0
Nominal width	4	4	4	5	5	8	8	8	8	8	20	20	20	20



ØAL = Piston Ø

1) Throttle valve only with end position cushioning "E" (180° for bleeding) Protrusion A in closed condition

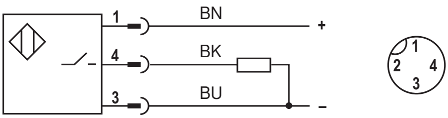
Proximity switch

Inductive proximity switches are used as reliable end position control for hydraulic cylinders. They are an important element for the safe and exact monitoring of safety equipment, lockings and/or other machine functions in their end position by means of the output of signals. The proximity switch which is high-pressure-resistant up to 500 bar works in a contactless manner. Consequently, it is wear-free. The proximity switch is set at the factory. The switching distance must not be adjusted. The lock nut of the proximity switch is marked at the factory using sealing wax. On versions with proximity switch, the cylinders are provided with proximity switches on both sides.

Technical data (For applications outside these parameters, please consult us!)

Function type			PNP normally open contact
Admissible pressure		bar	500
Operating voltage		V DC	10 … 30
	Including residual ripple	%	≤ 15
Voltage drop		V	≤ 1.5
Rated operating voltage		V DC	24
Rated operating current		mA	200
Idle current		mA	≤ 8
Residual current		μA	≤ 10
Repetition accuracy		%	≤ 5
Hysteresis		%	≤ 15
Ambient temperature range		°C	–25 … +80
Temperature drift		%	≤ 10
Switching frequency		Hz	1000
Protection class	Active area		IP 68
	Proximity switch		IP 67
Housing material			Material no. 1.4104

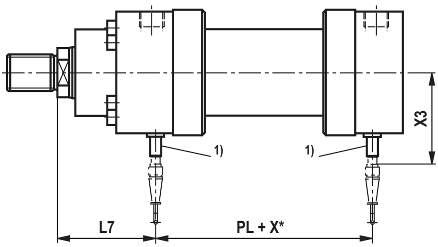
Pin assignment



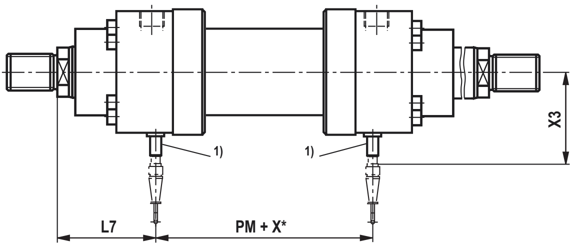
BN brown
BK black
BU blue

Proximity switch

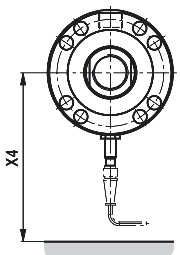
CDH1

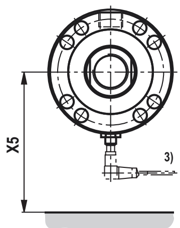


CGH1



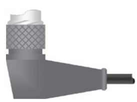
Installation space for mating connector





Mating connector with 5 m cable
Material no. **R900026512**
(mating connector is **not** included in the scope of delivery, must be ordered separately)

Mating connector, angled with 5 m cable
(position of the cable outlet cannot be defined)
Material no. **R988064311**
(mating connector is **not** included in the scope of delivery, must be ordered separately)



Proximity switch

Dimensions (dimensions in mm)

ØAL	ØMM	PL	PM	L7	X3	X4	X5
40	**22** **28**	112	112	83	94	170	125
50	**28** **36**	110	110	92	98	175	130
63	**36** **45**	125	125	104	103	180	135
80	**45** **56**	138	138	108	108	185	140
100	**56** **70**	161	161	129	116	195	150
125	**70** **90**	189	189	143	126	205	160
140	**90** **100**	209	209	161	146	225	180
160	**100** **110**	228	228	191	151	230	185
180	**110** **125**	254	254	204	159	235	190
200	**125** **140**	264	264	212	166	245	200
220	**140** **160**	310	310	250	177 [2)]	255	– [3)]
250	**160** **180**	310	310	274	187 [2)]	265	– [3)]
280	**180** **200**	369	369	285	189 [2)]	275	– [3)]
320	**200** **220**	415	415	295	209 [2)]	285	– [3)]

Dimensions see pages 10 to 21

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

1) The proximity switch is always located opposite of the line connection

2) Piston Ø 220 - 320 mm
Proximity switch not protruding

3) Piston Ø 220 - 320 mm
Angled mating connector not possible

2

Position measurement system

The position measurement system that is pressure-resistant up to 500 bar works in a contactless and absolute manner. The basis of this position measurement system is the magnetostrictive effect. Here, the coincidence of two magnetic fields triggers a torsion pulse. This pulse runs on the waveguide inside the gauge from the measuring point to the sensor head. The running time is constant and almost temperature-independent. It is proportional to the position of the solenoid and thus a measure for the actual position value and is converted in the sensor into a direct analog or digital output.

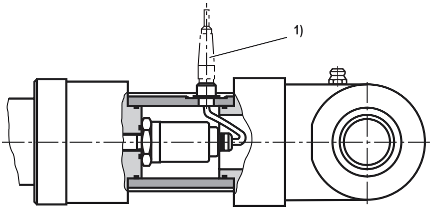
Technical data (For applications outside these parameters, please consult us!)

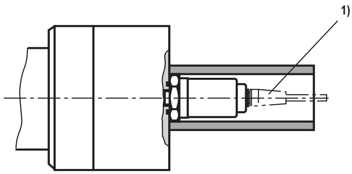
Operating pressure		bar	250
Analog output		V	0 to 10
	Load resistance	kΩ	≥ 5
	Resolution		unlimited
Analog output		mA	4 to 20
	Load resistance	Ω	0 to 500
	Resolution		unlimited
Digital output			SSI 24 bit gray-coded
	Resolution	μm	5
	Direction of measurement		asynchronously forward
Linearity (absolute accuracy)	Analog	% mm	≤ ±0.02 % (referred to measurement length) min. ±0.05
	Digital	% mm	≤ ±0.01 % (referred to measurement length) min. ±0.04
Reproducibility		% mm	±0.001 (referred to measurement length) min. ±0.0025
Hysteresis		mm	≤ 0.004
Supply voltage		V DC	24 (±10 % with analog output)
	Current consumption	mA	100
	Residual ripple	% s-s	≤ 1
	 Current consumption	V DC mA	24 (+20 %/–15 % with digital output) 70
	Residual ripple	% s-s	≤ 1
Protection class	Pipe and flange		IP 67
	Sensor electronics		IP 65
Operating temperature	Sensor electronics	°C	–40 to +75
Temperature coefficient	Voltage	ppm/°C	70
	Current	ppm/°C	90

Position measurement system

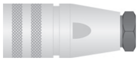
Types of mounting

MP3, MP5 **MF3, MF4, MT4, MS2**

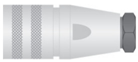




[1] For analog output:
6-pole Amphenol mating connector
Material no. **R900072231**
(mating connector is **not** included in the scope of delivery, must be ordered separately)

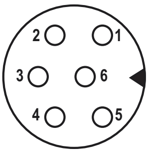


[1] For digital output:
7-pole Amphenol mating connector
Material no. **R900079551**
(mating connector is **not** included in the scope of delivery, must be ordered separately)



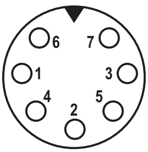
Pin assignment

Position measurement system (analog output)
Connector (view to pin side)



Pin	Cable	Signal / current	Signal / voltage
1	Gray	4 … 20 mA	0 … 10 V
2	Pink	DC ground	DC ground
3	Yellow	Not used	Not used
4	Green	DC ground	DC ground
5	Brown	+24 V DC (+20 % / –15 %)	+24 V DC (+20 % / –15 %)
6	White	DC ground (0 V)	DC ground (0 V)

Position measurement system (digital output)
Connector (view to pin side)



Pin	Cable	Signal / SSi
1	Gray	Data (–)
2	Pink	Data (+)
3	Yellow	Clock (+)
4	Green	Clock (–)
5	Brown	+24 V DC (+20 % / –15 %)
6	White	DC ground (0 V)
7	–	Not used

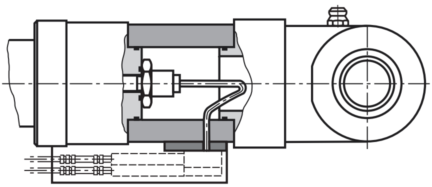
Technical data for the Profibus (For applications outside these parameters, please consult us!)

Output	Interface	Profibus-DP system
	Data record	Profibus-DP (EN 61158)
	Transmission rate	Max. 12 MB/s
Measurement accuracy	Travel resolution	1 µm to 1000 µm selectable as parameter
	Velocity	With 5 µm travel resolution: 0.64 mm/s to 500 mm; 0.43 mm/s to 2000 mm; 0.21 mm/s to 4500 mm: 0.14 mm/s to 7600 mm Measurement length With 2 µm travel resolution: 2.5 times smaller values
	Linearity	< +/–0.01 % F.S. (Minimum +/–50 µm)
	Repeatability	< +/–0.001 % F.S. (Minimum +/–2.5 µm)
	Temperature coefficient	< 15 ppm/°C
	Hysteresis	< 4 µm
Application conditions	Operating temperature	–40 °C to 75 °C
	Protection class	Profile: IP65 Rod: IP 67 with proper coupling plug assembly
	Standards, EMC test	Interference emissions according to EN 61000-6-3 Interference resistance according to EN 61000-6-2 EN 61000-4-2/3/4/6, level 3/4, criterion A, CE-tested
Electrical connection	Operating voltage	24 VDC (–15 / +20 %)

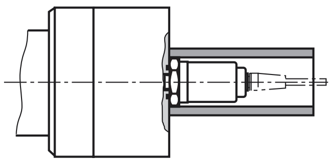
Please ask for the complete technical data!

Types of mounting

MP3, MP5



MF3, MF4, MT4, MS2

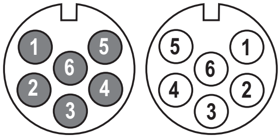


The output of the position measurement system is by default always rotated by 180° to the selected position of the hydraulic connection in the cylinder base.

Mating connector is **not** included in the scope of delivery, must be ordered separately.

Pin assignment for Profibus

Pin assignment for Profibus D63

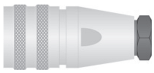


Pins Sockets

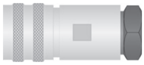
Pin	Cable	Function
1	Green	RxD/TxD-N (bus)
2	Red	RxD/TxD-P (bus)
3	—	DGND (terminating resistor) *
4	—	VP (terminating resistor) *
5	Black	+24 VDC (–15 / +20 %)
6	Blue	DC ground (0 V)
—	Yellow/ green	Shield compensating line, is usually not to be connected

* Only with sockets

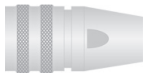
Mating connectors for D63



Signal input
6-pin mating connector M16
Material no. R900705950 (socket)



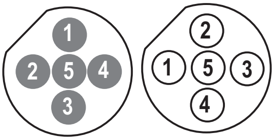
Signal output
6-pin mating connector M16
Material no. R900705951 (pins)



Signal output
6-pin end plug M16
Material no. R900722518 (pins)

Pin assignment for Profibus D53

Bus

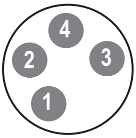


Pins Sockets

Pin	Cable	Function
1	—	VP+5 (terminating resistor) *
2	Green	RxD/TxD-N (bus)
3	—	DGND (terminating resistor) *
4	Red	RxD/TxD-P (bus)
5	Shield	Shield

* Only with sockets

Supply

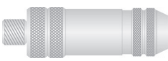


View connector side

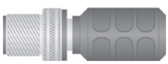
Pin	Cable	Function
1	Brown	+24 VDC (–15 / +20 %)
2	White	Not used
3	Blue	DC ground (0 V)
4	Black	Not used

Mating connectors for D53

Signal input
5-pin mating connector M12-B
Material no. R900773386 (socket)



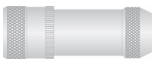
Signal output
5-pin mating connector M12-B
Material no. R901091655 (pins)



Signal output
5-pin end plug M12-B
Material no. R901070126 (pins)

Mating connector is **not** included in the scope of delivery, must be ordered separately.

Supply for D53



4-pin mating connector M8
Material no. R901132799

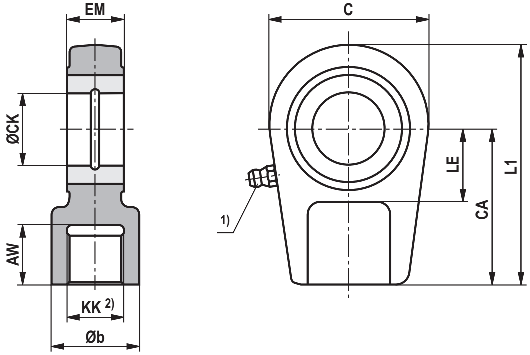
Connection cable 5 m
with 4-pin mating connector M8
Material no. 901213191

Connection cable 10 m
with 4-pin mating connector M8
Material no. 913008737

Connection cable 15 m
with 4-pin mating connector M8
Material no. 913008738

Plain clevis CSA (dimensions in mm)

ØAL 40 to 200 mm



ØAL	Type	Material no.	AW	Øb	C	CA	ØCK H11	EM -0,4	KK	LE	L1	m [3] kg	C_0 [4] kN	F_{adm} [5] kN
40	**CSA 16**	R900303150	17	28	56	50	25	23	M16x1,5	25	80	0,43	72	25,9
50	**CSA 22**	R900303151	23	34	64	60	30	28	M22x1,5	30	94	0,7	106	38,2
63	**CSA 28**	R900303152	29	44	78	70	35	30	M28x1,5	40	112	1,1	153	55,1
80	**CSA 35**	R900303153	36	55	94	85	40	35	M35x1,5	45	135	2,0	250	90,0
100	**CSA 45**	R900303154	46	70	116	105	50	40	M45x1,5	55	168	3,3	365	131,4
125	**CSA 58**	R900303155	59	87	130	130	60	50	M58x1,5	65	200	5,5	400	144,0
140	**CSA 65**	R900303156	66	93	154	150	70	55	M65x1,5	75	232	8,6	540	194,4
160	**CSA 80**	R900303157	81	125	176	170	80	60	M80x2	80	265	12,2	670	241,2
180	**CSA100**	R900303158	101	143	206	210	90	65	M100x2	90	323	21,5	980	352,8
200	**CSA110**	R900303159	111	153	230	235	100	70	M110x2	105	360	27,5	1120	403,2

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CA, CK, EM, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) The plain clevis must always be screwed against the piston rod shoulder

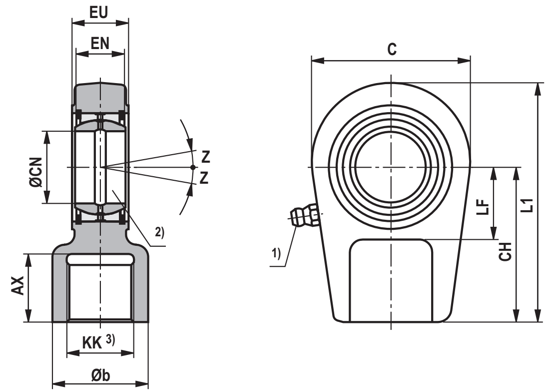
3) ***m*** = Weight plain clevis in kg

4) C_0 = Static load rating of the plain clevis

5) F_{adm} = Max. admissible load of the plain clevis with oscillatory or alternating loads

Self-aligning clevis CGA (dimensions in mm)

ØAL 40 to 280 mm



2

ØAL	Type	Material no.	AX min	Øb max	C	CH	ØCN [2]	EN	EU -0,4	KK	L1	LF min	Z	*m* [4] kg	C_0 [5] kN	F_{adm} [6] kN
40	**CGA 16**	R900303125	17	26	56	50	$25_{-0,010}$	$20_{-0,12}$	23	M16x1,5	80	28	7°	0,43	72	25,9
50	**CGA 22**	R900303126	23	33	64	60	$30_{-0,010}$	$22_{-0,12}$	28	M22x1,5	94	30	6°	0,7	106	38,2
63	**CGA 28**	R900303127	29	41	78	70	$35_{-0,012}$	$25_{-0,12}$	30	M28x1,5	112	38	6°	1,1	153	55,1
80	**CGA 35**	R900303128	36	50	94	85	$40_{-0,012}$	$28_{-0,12}$	35	M35x1,5	135	45	7°	2,0	250	90,0
100	**CGA 45**	R900303129	46	62	116	105	$50_{-0,012}$	$35_{-0,12}$	40	M45x1,5	168	55	6°	3,3	365	131,4
125	**CGA 58**	R900303130	59	76	130	130	$60_{-0,015}$	$44_{-0,15}$	50	M58x1,5	200	65	6°	5,5	400	144,0
140	**CGA 65**	R900303131	66	87	154	150	$70_{-0,015}$	$49_{-0,15}$	55	M65x1,5	232	75	6°	8,6	540	194,4
160	**CGA 80**	R900303132	81	106	176	170	$80_{-0,015}$	$55_{-0,15}$	60	M80x2	265	80	6°	12,2	670	241,2
180	**CGA100**	R900303133	101	125	206	210	$90_{-0,020}$	$60_{-0,20}$	65	M100x2	323	90	5°	21,5	980	352,8
200	**CGA110**	R900303134	111	139	230	235	$100_{-0,020}$	$70_{-0,20}$	70	M110x2	360	105	7°	27,5	1120	403,2
220	**CGA120**	R900303135	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3	407,5	115	6°	40,7	1700	612,0
250	**CGA120**	R900303135	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3	407,5	115	6°	40,7	1700	612,0
280	**CGA130**	R900303136	135	173	340	310	$120_{-0,020}$	$85_{-0,20}$	90	M130x3	490	140	6°	76,4	2900	1044,0

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing

3) The self-aligning clevis must always be screwed against the shoulder of the piston rod

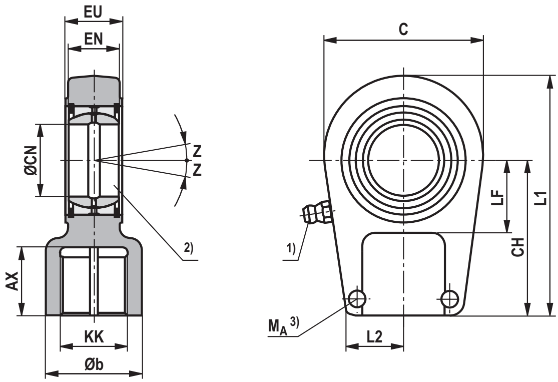
4) ***m*** = Weight self-aligning clevis in kg

5) C_0 = Static load rating of the self-aligning clevis

6) F_{adm} = Max. admissible load of the self-aligning clevis with oscillatory or alternating loads

Self-aligning clevis CGAK (clampable) (dimensions in mm)

ØAL 40 to 280 mm



ØAL	Type	Material no.	AX min	Øb max	C	CH	ØCN 2)	EN	EU -0,4	KK
40	**CGAK 16**	R900303162	17	26	56	50	$25_{-0,010}$	$20_{-0,12}$	23	M16x1,5
50	**CGAK 22**	R900303163	23	33	64	60	$30_{-0,010}$	$22_{-0,12}$	28	M22x1,5
63	**CGAK 28**	R900303164	29	41	78	70	$35_{-0,012}$	$25_{-0,12}$	30	M28x1,5
80	**CGAK 35**	R900303165	36	50	94	85	$40_{-0,012}$	$28_{-0,12}$	35	M35x1,5
100	**CGAK 45**	R900303166	46	62	116	105	$50_{-0,012}$	$35_{-0,12}$	40	M45x1,5
125	**CGAK 58**	R900303167	59	76	130	130	$60_{-0,015}$	$44_{-0,15}$	50	M58x1,5
140	**CGAK 65**	R900303168	66	87	154	150	$70_{-0,015}$	$49_{-0,15}$	55	M65x1,5
160	**CGAK 80**	R900303169	81	106	176	170	$80_{-0,015}$	$55_{-0,15}$	60	M80x2
180	**CGAK100**	R900321655	101	125	206	210	$90_{-0,020}$	$60_{-0,20}$	65	M100x2
200	**CGAK110**	R900321691	111	139	231	235	$100_{-0,020}$	$70_{-0,20}$	70	M110x2
220	**CGAK120**	R900321621	125	155	266	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3
250	**CGAK120**	R900321621	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3
280	**CGAK130**	R900322015	135	173	340	310	$120_{-0,020}$	$85_{-0,20}$	90	M130x3

Self-aligning clevis CGAK (clampable) (dimensions in mm)

ØAL	Type	L1	L2 max	LF	Z	Clamping screws ISO 4762-10.9	M_A 3) Nm	m 4) kg	C_0 5) kN	F_{adm} 6) kN
40	**CGAK 16**	80	24	28	7°	M8	30	0,43	72	25,9
50	**CGAK 22**	94	26	30	6°	M8	30	0,7	106	38,2
63	**CGAK 28**	112	34	38	6°	M10	54	1,1	153	55,1
80	**CGAK 35**	135	39	45	7°	M10	59	2,0	250	90,0
100	**CGAK 45**	168	46	55	6°	M12	100	3,3	365	131,4
125	**CGAK 58**	200	61	65	6°	M16	250	5,5	400	144,0
140	**CGAK 65**	232	66	75	6°	M16	250	8,6	540	194,4
160	**CGAK 80**	265	81	80	6°	M20	490	12,2	670	241,2
180	**CGAK100**	323	91	90	5°	M20	490	21,5	980	352,8
200	**CGAK110**	360	101	105	7°	M24	840	27,5	1120	403,2
220	**CGAK120**	407,5	111	115	6°	M24	840	40,7	1700	612,0
250	**CGAK120**	407,5	111	115	6°	M24	840	40,7	1700	612,0
280	**CGAK130**	490	129	140	6°	M24	840	76,4	2900	1044,0

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing

3) M_A = Tightening torque
The self-aligning clevis must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

4) m = Weight self-aligning clevis in kg

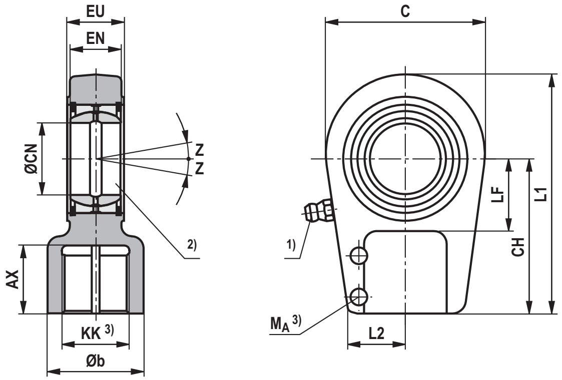
5) C_0 = Static load rating of the self-aligning clevis

6) F_{adm} = Max. admissible load of the self-aligning clevis with oscillatory or alternating loads

2

Self-aligning clevis CGAS (clampable) (dimensions in mm)

ØAL 40 to 320 mm



ØAL	Type	Material no.	AX min	Øb max	C max	CH	ØCN [2)]	EN	EU -0,4	KK
40	**CGAS 25**	R900303137	30	28	56	65	$25_{-0,010}$	$20_{-0,12}$	23	M18x2
50	**CGAS 30**	R900303138	35	34	64	75	$30_{-0,010}$	$22_{-0,12}$	28	M24x2
63	**CGAS 35**	R900303139	46	46	78	90	$35_{-0,012}$	$25_{-0,12}$	30	M30x2
80	**CGAS 40**	R900303140	56	57	94	105	$40_{-0,012}$	$28_{-0,12}$	35	M39x3
100	**CGAS 50**	R900303141	76	70	116	135	$50_{-0,012}$	$35_{-0,12}$	40	M50x3
125	**CGAS 60**	R900303142	96	87	130	170	$60_{-0,015}$	$44_{-0,15}$	50	M64x3
140	**CGAS 70**	R900303143	112	111	154	195	$70_{-0,015}$	$49_{-0,15}$	55	M80x3
160	**CGAS 80**	R900303144	122	129	176	210	$80_{-0,015}$	$55_{-0,15}$	60	M90x3
180	**CGAS 90**	R900303145	142	153	211	250	$90_{-0,020}$	$60_{-0,20}$	65	M100x3
200	**CGAS100**	R900303146	152	170	230	275	$100_{-0,020}$	$70_{-0,20}$	70	M110x4
220	**CGAS110**	R900303147	162	180	264	300	$110_{-0,020}$	$70_{-0,20}$	80	M120x4
250	**CGAS110**	R900303147	162	180	264	300	$110_{-0,020}$	$70_{-0,20}$	80	M120x4
280	**CGAS120**	R900303148	192	210	340	360	$120_{-0,020}$	$85_{-0,20}$	90	M150x4
320	**CGAS140**	R900317314	210	230	380	420	$140_{-0,025}$	$90_{-0,25}$	110	M160x4

Self-aligning clevis CGAS (clampable) (dimensions in mm)

ØAL	Type	L1 max	L2 max	LF min	Z [3]	Clamping screws ISO 4762-10.9	M_A [4] Nm	m [5] kg	C_0 [6] kN	F_{adm} [7] kN
40	**CGAS 25**	95	24	25	7-8°	M8	30	0,65	82	27,1
50	**CGAS 30**	109	28	30	6-7°	M8	30	1,0	122	40,3
63	**CGAS 35**	132	36	40	6-7°	M10	59	1,5	177	58,4
80	**CGAS 40**	155	39	44	7°	M12	100	2,4	287	94,7
100	**CGAS 50**	198	45	55	6-7°	M12	100	4,8	422	139,3
125	**CGAS 60**	240	59	65	6-7°	M16	250	8,6	522	172,3
140	**CGAS 70**	279	70	75	6°	M16	250	12,2	707	233,3
160	**CGAS 80**	305	85	80	6°	M20	490	18,4	870	287,1
180	**CGAS 90**	366	91	90	5°	M20	490	31,6	1284	423,7
200	**CGAS100**	400	95	105	7°	M20	490	34	1460	481,8
220	**CGAS110**	443	106	115	6°	M24	840	44	2024	667,9
250	**CGAS110**	443	106	115	6°	M24	840	44	2024	667,9
280	**CGAS120**	540	122	140	6°	M24	840	75	2970	980,1
320	**CGAS140**	620	129	185	7°	M30	1700	160	3350	1105,5

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing

3) Dimensions may differ depending on the manufacturer

4) M_A = Tightening torque
The self-aligning clevis must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

5) m = Weight self-aligning clevis in kg

6) C_0 = Static load rating of the self-aligning clevis

7) F_{adm} = Max. admissible load of the self-aligning clevis with oscillatory or alternating loads

2

Buckling

The admissible stroke length with flexibly guided load and a factor of 3.5 for safety against buckling can be seen from the relevant table. For other installation positions of the cylinder, the admissible stroke length must be interpolated. Admissible stroke length for non-guided load on request.

Buckling calculations are carried out according to the following formulas:

1. Calculation according to Euler

$$F = \frac{\pi^2 \cdot E \cdot I}{v \cdot L_K^2} \qquad \text{if } \lambda > \lambda_g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi \,(335\text{-}0{,}62 \cdot \lambda)}{4 \cdot v} \qquad \text{if } \lambda \leq \lambda_g$$

Influence of the type of mounting on the buckling length:

Explanation:

E = Module of elasticity in N/mm²
= 2.1 x 10^5 for steel

I = Geometrical moment of inertia in mm⁴
for circular cross-section = $\frac{d^4 \cdot \pi}{64} = 0{,}0491 \cdot d^4$

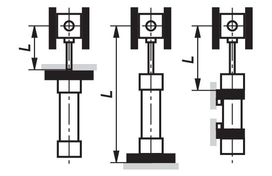
v = 3.5 (safety factor)

L_K = Free buckling length in mm (depending on the type of mounting see sketches A, B, C)

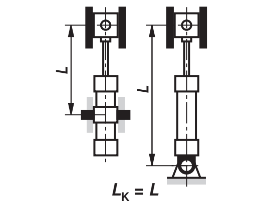
d = Piston rod Ø in mm

λ = Slenderness ratio
= $\frac{4 \cdot L_K}{d}$ $\qquad \lambda_g = \pi \sqrt{\frac{E}{0.8 \cdot R_e}}$

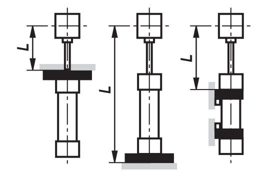
R_e = Yield strength of the piston rod material



$L_K = 0{,}7\, L$



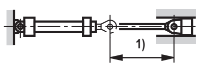
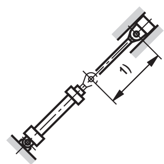
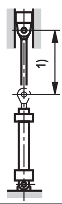
$L_K = L$



$L_K = 2\, L$

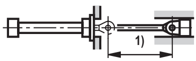
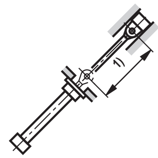
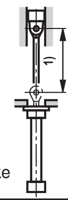
Admissible stroke length (dimensions in mm)

Type of mounting CDH1/CSH1 2): MP3, MP5

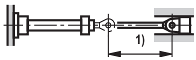
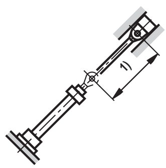
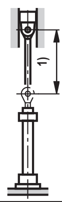
ØAL	ØMM	Admissible stroke length with 100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	250 bar 0°	250 bar 45°	250 bar 90°	Installation position
40	22	195	200	215	130	135	140	40	45	55	0°
	28	385	400	445	295	300	320	215	220	225	
50	28	285	295	310	205	210	215	120	130	135	
	36	535	555	625	425	430	460	320	325	335	
63	36	390	400	440	290	295	305	200	205	210	
	45	655	685	790	530	545	585	410	415	430	
80	45	500	515	560	375	385	400	240	260	280	
	56	815	850	980	665	680	735	520	525	545	
100	56	610	630	705	470	480	505	280	295	355	
	70	985	1030	1240	820	845	930	650	660	695	
125	70	770	800	900	600	615	650	360	380	465	45°
	90	1295	1360	1670	1095	1130	1265	885	900	955	
140	90	1145	1200	1430	945	970	1070	740	755	790	
	100	1400	1475	1840	1190	1230	1390	965	985	1050	
160	100	1230	1285	1530	1010	1040	1140	790	800	840	
	110	1480	1555	1930	1250	1290	1455	1005	1030	1090	
180	110	1305	1365	1630	1065	1095	1200	825	840	880	
	125	1675	1765	2210	1420	1470	1670	1150	1175	1260	
200	125	1500	1580	1930	1240	1290	1430	985	1005	1060	
	140	1865	1965	2520	1590	1660	1910	1305	1340	1440	
220	140	1620	1710	2180	1360	1415	1630	1090	1120	1200	90°
	160	2075	2200	3000	1810	1890	2280	1510	1560	1730	
250	160	1885	1990	2570	1600	1670	1930	1300	1330	1440	
	180	2330	2475	3370	2040	2135	2570	1710	1770	1960	
280	180	2075	2200	2900	1775	1880	2170	1450	1490	1620	
	200	2510	2670	3700	2200	2310	2820	1850	1920	2140	
320	200	2170	2300	3070	1850	1940	2290	1500	1550	1700	1) Adm. Stroke length
	220	2590	2760	3850	2260	2380	2920	1890	1960	2200	

Admissible stroke length (dimensions in mm)

Type of mounting CDH1/CGH1/CSH1 [2]: MF3

ØAL	ØMM	Admissible stroke length with									Installation position
		100 bar			160 bar			250 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	22	895	915	980	730	735	760	440	450	510	0° 
	28	1400	1415	1630	1180	1205	1275	970	980	1010	
50	28	1180	1200	1280	955	965	995	700	730	780	
	36	1785	1855	2160	1530	1570	1695	1275	1290	1340	
63	36	1520	1560	1690	1250	1270	1315	1010	1015	1035	
	45	2000	2000	2000	1875	1925	2000	1570	1595	1670	
80	45	1855	1905	2000	1540	1560	1630	1140	1180	1280	
	56	2000	2000	2000	2000	2000	2000	1910	1940	2000	
100	56	2250	2320	2500	1880	1910	2010	1300	1360	1580	
	70	3000	3000	3000	2770	2860	3000	2360	2400	2550	
125	70	2760	2860	3000	2330	2375	2520	1580	1680	1990	45° 
	90	3000	3000	3000	3000	3000	3000	3000	3000	3000	
140	90	3000	3000	3000	3000	3000	3000	2770	2820	2980	
	100	3000	3000	3000	3000	3000	3000	3000	3000	3000	
160	100	3000	3000	3000	3000	3000	3000	2980	3000	3000	
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000	
180	110	3000	3000	3000	3000	3000	3000	3000	3000	3000	
	125	3000	3000	3000	3000	3000	3000	3000	3000	3000	
200	125	3000	3000	3000	3000	3000	3000	3000	3000	3000	
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000	
220	140	5400	5680	6000	4800	4980	5780	4120	4220	4560	90° 
	160	6000	6000	6000	5820	6000	6000	5150	5330	6000	
250	160	6000	6000	6000	5450	5660	6000	4720	4840	5290	
	180	6000	6000	6000	6000	6000	6000	5730	5920	6000	
280	180	6000	6000	6000	6000	6000	6000	5270	5420	5970	
	200	6000	6000	6000	6000	6000	6000	6000	6000	6000	
320	200	6000	6000	6000	6000	6000	6000	6000	6000	6000	[1] Adm. Stroke length
	220	6000	6000	6000	6000	6000	6000	6000	6000	6000	

Type of mounting CDH1/CSH1 [2]: MF4

ØAL	ØMM	Admissible stroke length with									Installation position
		100 bar			160 bar			250 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	22	325	340	370	245	250	260	105	110	140	0° 
	28	565	590	695	465	475	520	365	370	385	
50	28	455	470	515	350	360	375	220	230	265	
	36	770	805	960	640	660	725	515	525	550	
63	36	600	620	710	475	490	520	350	370	380	
	45	930	975	1210	790	820	920	645	660	700	
80	45	760	785	895	610	625	670	395	420	495	
	56	1150	1210	1495	985	1020	1145	810	825	875	
100	56	905	945	1120	745	765	835	420	460	620	
	70	1370	1445	1880	1190	1235	1440	995	1020	1100	
125	70	1175	1225	1460	980	1010	1105	580	620	835	45° 
	90	1815	1920	2560	1600	1670	1980	1365	1400	1540	
140	90	1600	1695	2190	1390	1440	1670	1150	1180	1275	
	100	1915	2030	2770	1695	1770	2130	1440	1490	1650	
160	100	1730	1825	2350	1490	1550	1790	1235	1265	1365	
	110	2030	2155	2910	1790	1870	2240	1520	1565	1720	
180	110	1850	1950	2510	1590	1655	1900	1310	1340	1450	
	125	2295	2440	3000	2030	2130	2570	1730	1785	1980	
200	125	2110	2230	2270	1835	1910	2250	1530	1575	1720	
	140	2540	2700	3000	2265	2380	2930	1945	2010	2260	
220	140	2250	2400	3350	1990	2090	2550	1685	1740	1950	90° 
	160	2800	2990	4500	2530	2680	3480	2220	2310	2700	
250	160	2615	2780	3900	2320	2435	3000	1980	2050	2300	
	180	3140	3360	5050	2850	3010	3910	2500	2610	3050	
280	180	2850	3050	4400	2550	2680	3370	2190	2270	2600	
	200	3370	3610	5550	3070	3250	4300	2700	2820	3330	
320	200	3000	3210	4700	2680	2830	3590	2100	2390	2750	[1] Adm. Stroke length
	220	3500	3750	5800	3180	3370	4480	2790	2920	3460	

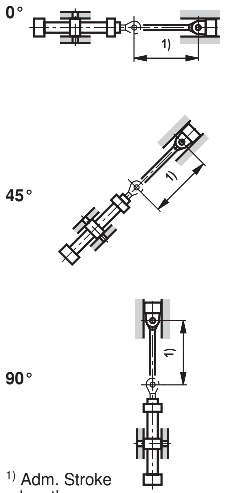
2

Admissible stroke length (dimensions in mm)

Type of mounting CDH1/CGH1/CSH1 2): MT4 trunnion in cylinder center

ØAL	ØMM	Admissible stroke length with								
		100 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	22	340	345	365	250	255	260	130	135	145
	28	590	605	665	470	480	500	365	370	375
50	28	460	470	495	350	355	365	245	250	260
	36	790	815	910	645	655	690	510	515	525
63	36	610	625	675	475	485	500	360	365	370
	45	965	1000	1140	800	815	870	635	645	665
80	45	770	790	850	605	615	635	440	455	475
	56	1190	1235	1410	990	1010	1080	795	805	830
100	56	930	955	1060	745	755	795	490	510	595
	70	1430	1490	1770	1210	1240	1360	985	1000	1045
125	70	1185	1225	1360	960	980	1030	640	670	780
	90	1885	1970	2390	1620	1665	1850	1340	1360	1430
140	90	1675	1710	2060	1410	1415	1575	1140	1155	1205
	100	2020	2115	2610	1735	1790	2010	1440	1465	1555
160	100	1805	1880	2210	1510	1550	1680	1215	1230	1285
	110	2140	2240	2740	1830	1885	2100	1505	1535	1620
180	110	1925	2005	2360	1605	1650	1790	1290	1310	1360
	125	2420	2540	3000	2080	2150	2420	1720	1755	1865
200	125	2130	2230	2690	1790	1840	2040	1440	1465	1540
	140	2610	2750	3000	2250	2330	2670	1865	1910	2050
220	140	2490	2510	3150	2050	2120	2400	1685	1720	1835
	160	3000	3170	4230	2640	2750	3260	2240	2310	2530
250	160	2750	2900	3660	2380	2460	2810	1970	2020	2160
	180	3350	3540	4750	2960	3090	3670	2520	2600	2850
280	180	3040	3210	4140	2640	2750	3170	2210	2260	2440
	200	3620	3840	5210	3210	3360	4040	2750	2830	3140
320	200	3210	3390	4410	2790	2900	3380	2320	2380	2580
	220	3770	4000	5450	3340	3490	4200	2850	2930	3250

Installation position

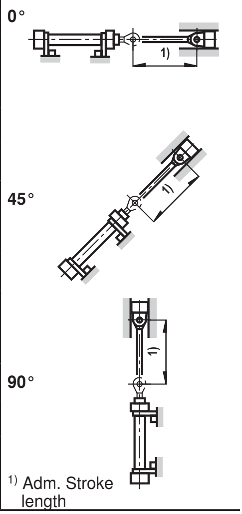


1) Adm. Stroke length

Type of mounting CDH1/CGH1/CSH1 2): MS2

ØAL	ØMM	Admissible stroke length with								
		100 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	22	825	840	885	645	650	665	370	375	410
	28	1305	1350	1535	1085	1110	1180	875	885	910
50	28	1075	1100	1175	855	865	890	610	625	675
	36	1680	1750	2000	1430	1465	1590	1175	1190	1240
63	36	1405	1440	1570	1135	1155	1200	895	900	920
	45	2000	2000	2000	1760	1810	1990	1460	1480	1555
80	45	1730	1780	1960	1410	1435	1500	1000	1050	1155
	56	2000	2000	2000	2000	2000	2000	1785	1820	1920
100	56	2110	2180	2440	1740	1770	1870	1140	1220	1440
	70	3000	3000	3000	2620	2710	3000	2210	2260	2400
125	70	2600	2695	3000	2170	2210	2360	1400	1480	1820
	90	3000	3000	3000	3000	3000	3000	2890	2970	3000
140	90	3000	3000	3000	3000	3000	3000	2585	2635	2800
	100	3000	3000	3000	3000	3000	3000	3000	3000	3000
160	100	3000	3000	3000	3000	3000	3000	2760	2810	2990
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000
180	110	3000	3000	3000	3000	3000	3000	2940	3000	3000
	125	3000	3000	3000	3000	3000	3000	3000	3000	3000
200	125	3000	3000	3000	3000	3000	3000	3000	3000	3000
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000
220	140	5090	5370	6000	4490	4670	5470	3820	3910	4260
	160	6000	6000	6000	5510	5800	6000	4850	5020	5750
250	160	5790	6000	6000	5150	5370	6000	4420	4540	4990
	180	6000	6000	6000	6000	6000	6000	5420	5630	6000
280	180	6000	6000	6000	5700	5960	6000	4930	5070	5630
	200	6000	6000	6000	6000	6000	6000	6000	6000	6000
320	200	6000	6000	6000	6000	6000	6000	5200	5400	6000
	220	6000	6000	6000	6000	6000	6000	6000	6000	6000

Installation position



1) Adm. Stroke length

With longer strokes, an extended guide and/or the use of guide rings may be reasonable for increasing the service life, depending on the respective application and installation position. Recommendation on request.

2) With CSH1, observe the maximum stroke length "X*max", pages 24 to 35

End position cushioning

End position cushioning:
The objective is to reduce the velocity of a moved mass, whose center of gravity lies on the cylinder axis to a level, at which neither the cylinder nor the machine into which the cylinder is installed is damaged. For velocities above 20 mm/s, we recommend the use of an end position cushioning feature, which absorbs energy without requiring the use of additional equipment. It must, however, always be verified whether end position cushioning is also required for lower velocities with large masses.

Damping capacity:
When decelerating masses via end position cushioning, the structural-inherent cushioning capacity must not be exceeded. Cylinders with end position cushioning can achieve their full cushioning capacity only over the entire stroke length.

With the adjustable end position cushioning version "E", a throttle valve is additionally provided when compared with version "D". End position cushioning version "E" allows cycle times to be optimized. The maximum cushioning capacity can only be achieved when the throttle valve is closed.

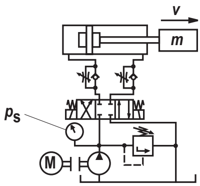
The calculation depends on the factors weight, velocity, system pressure and installation position. For this reason, mass and velocity are used to determine the characteristic D_m and system pressure and installation position to determine the characteristic $\boldsymbol{D}_p$.

These two characteristics are used for verifying the admissible damping capacity in the "damping capacity" diagram. The intersection point of the characteristics $\boldsymbol{D}_m$ and $\boldsymbol{D}_p$ must always be below the damping capacity curve of the selected cylinder. The values in the diagrams refer to an average oil temperature of +45 to +65 °C with the throttle valve being closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position cushioning versions can be offered on request.

When fixed or adjustable stops are used, special measures must be taken!

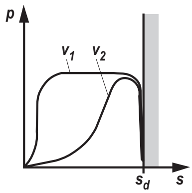
2



Formulas:

$$D_m = \frac{m}{10^K} \; ; \; K = kv\,(0{,}5 - v)$$

m = Moved weight in kg
v = Stroke velocity in m/s
kv = See table page 60



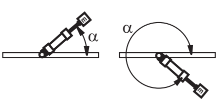
Extension for CDH1 and CSH1

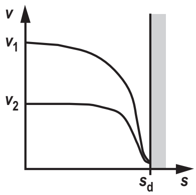
$$D_p = p_S - \frac{m \cdot 9{,}81 \cdot \sin\alpha}{A_1 \cdot 10}$$

Retraction for CDH1, CGH1 and CSH1; extension for CGH1

$$D_p = p_S + \frac{m \cdot 9{,}81 \cdot \sin\alpha}{A_3 \cdot 10}$$

p_S = System pressure in bar
A_1 = Piston area in cm² (see page 4)
A_3 = Annulus area in cm² (see page 4)
α = Angle to the horizontal in degrees





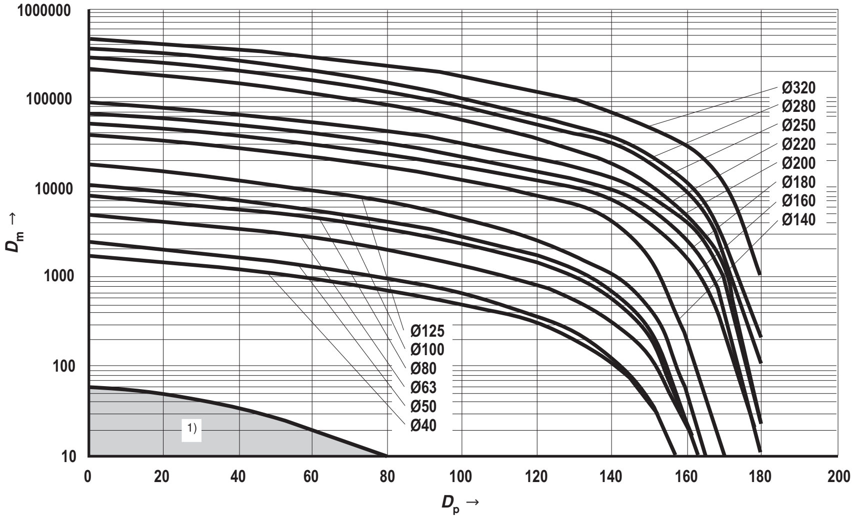
Damping length

ØAL mm	40	50	63	80	100	125	140	160	180	200	220	250	280	320
Head side	21	20	23	25	25	25	33	33	37	37	76	81	86	90
Base side	21	20	23	25	25	25	33	33	37	37	76	81	86	90

End position cushioning

ØAL mm	**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**	**180**	**200**	**220**	**250**	**280**	**320**
kv ①	2,85	2,97	2,56	2,82	3,51	3,02	2,53	2,65	2,91	2,76	2,85	2,95	3,11	3,13
kv ②	3,1	3,25	2,85	2,85	3,52	2,91	2,53	2,93	2,95	2,95	2,93	3,1	3,12	3,07
kv ③	2,95	3,1	2,73	3,1	3,51	2,95	2,51	2,91	2,95	2,91	2,93	2,93	3,15	3,25

Damping capacity: Extension for CDH1 and CSH1, with *kv* ①

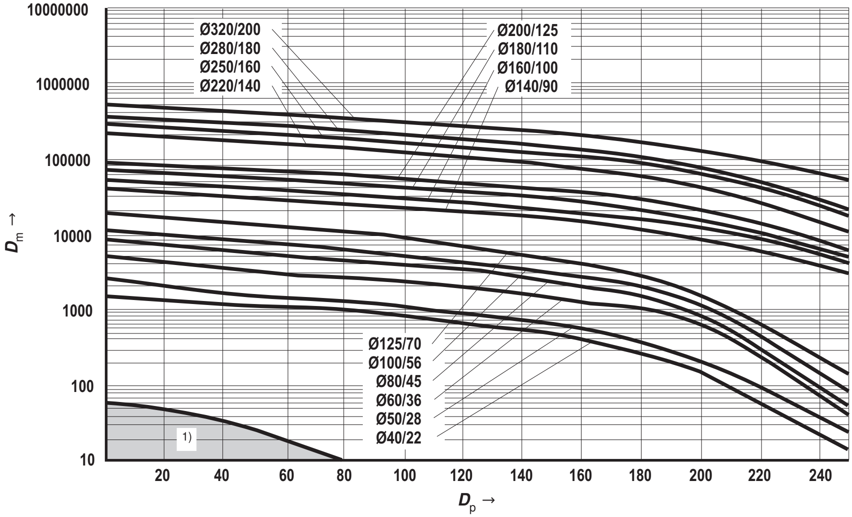


ØAL = Piston Ø

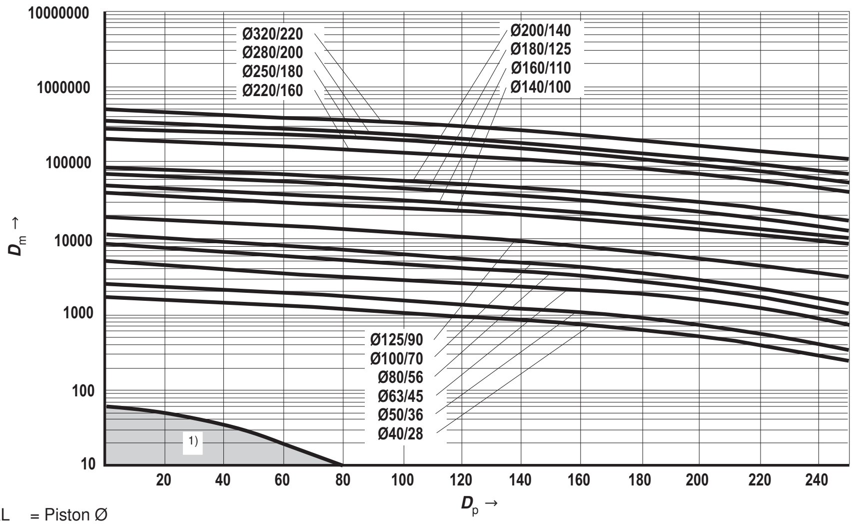
[1] If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

End position cushioning

Damping capacity: Retraction for CDH1, CGH1 and CSH1; extension for CGH1 with *kv* ②



Damping capacity: Retraction for CDH1, CGH1 and CSH1; extension for CGH1 with *kv* ③



ØAL = Piston Ø

1) If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

Selection criteria for seals

	Work and environmental conditions	Seal versions M	G	V	L	A	B	T	R	S
Medium / temperature	**Medium HL, HLP** / operating temperature medium –20 °C to +80 °C	++	++	++	++	++	++	++	++	++
	Medium HFA / operating temperature medium +5 °C to +55 °C	+/–	+/–	+/–	+/–	+	+/–	++	+/–	+/–
	Medium HFC / operating temperature medium –20 °C to +60 °C	–	++	–	–	+/–	–	++	–	–
	Medium HFD-R / operating temperature medium –15 °C to +80 °C	–	–	++	–	–	++	–	–	++
	Medium HFD-U / operating temperature medium –15 °C to +80 °C	–	–	++	–	–	++	–	–	++
	Ambient and rod temperature in the area of the piston rod from –20 °C to +80 °C [1]	++	+	+ [2]	++	++	+ [2]	+	++	++ [2]
	Extended ambient and rod temperature in the area of the piston rod from +80 °C to +120 °C	–	–	++	–	–	+	–	–	++
Function / velocity...	Static holding function more than 10 minutes: Attention! Application- and temperature-dependent	++	+	+	+	++	++	+	+	+
	Static holding function short-term < 1 minute	++	++	++	++	++	++	++	++	++
	Robust application conditions: Steel works, mining, thin ice	++	++	++	++	++	++	–	++	–
	Zero point control, hardly amplitude, frequency max. 5 Hz, not longer than 5 minutes	–	–	–	+/–	–	–	++	+	++
	Cylinder velocity min. 0.001 m/sec stick-slip behavior	++	+	+	++	–	–	++	++	++
	Cylinder velocity from 0.01 m/sec to 0.5 m/sec [3]	++	+	+	++	+	+	++	++	++
	Cylinder velocity > 0.5 m/sec to max. 0.8 m/sec [3]	–	+/–	+/–	++	–	–	++	+	++
	Stroke > 1.0 m	+/–	++	++	++	++	++	++	++	++
	Standstill period (wear)	++	+/–	+/–	++	+/–	–	++	++	++
	Undissolved air in the oil [4]	–	+	+	+	–	–	+	+	+

++ = very good + = good +/– = conditional, depending on the application parameters – = unsuitable

General technical data in corresponding data sheets will remain valid!

[1] Moreover, observe the corresponding medium temperature range
[2] Lower temperature limit –15 °C
[3] Standard line connections not designed for that velocityt
[4] – Seal is destroyed / + Seal is not directly destroyed, leaks may occur

Generally, a medium temperature of approx. 40 °C is recommended. The specified values are to be regarded as guidelines; depending on the application, it may be necessary to check the suitability of the seal system.

Seal kits [1)]

CDH1 – Standard

ØAL	ØMM	Material no. for seal design								
		M	G	V	L	A	B	T	R	S
40	22	R900850072	R961006000	R961006035	R961006070	R900860270	R900859816	R900849536	R961006105	R900861000
	28	R900851087	R961006002	R961006037	R961006072	R900859445	R900859770	R900858841	R961006107	R900861001
50	28	R900850181	R961006003	R961006038	R961006073	R900860928	R900860938	R900857535	R961006108	R900861002
	36	R900849392	R961006005	R961006040	R961006075	R900851515	R900860940	R900860277	R961006110	R900861004
63	36	R900850191	R961006006	R961006041	R961006076	R900860930	R900851206	R900860278	R961006111	R900861005
	45	R900847956	R961006008	R961006043	R961006078	R900851638	R900859678	R900847855	R961006113	R900861007
80	45	R900851086	R961006009	R961006044	R961006079	R900854708	R900860942	R900860280	R961006114	R900861008
	56	R900850905	R961006011	R961006046	R961006081	R900854718	R900851205	R900856180	R961006116	R900861010
100	56	R900853936	R961006012	R961006047	R961006082	R900860470	R900860944	R900860282	R961006117	R900861011
	70	R900853382	R961006014	R961006049	R961006084	R900856094	R900860946	R900860285	R961006119	R900861013
125	70	R900853966	R961006015	R961006050	R961006085	R900854709	R900860948	R900860286	R961006120	R900861014
	90	R900857949	R961006017	R961006052	R961006087	R900856095	R900855464	R900856102	R961006122	R900861016
140	90	R900858281	R961006018	R961006053	R961006088	R900860932	R900860951	R900860289	R961006123	R900861017
	100	R900853965	R961006019	R961006054	R961006089	R900856096	R900860952	R900860290	R961006124	R900849080
160	100	R900855683	R961006020	R961006055	R961006090	R900860468	R900860953	R900860291	R961006125	R900861018
	110	R900851146	R961006021	R961006056	R961006091	R900860933	R900860954	R900857536	R961006126	R900861019
180	110	R900856497	R961006023	R961006058	R961006093	R900860934	R900860955	R900852561	R961006128	R900861020
	125	R900848603	R961006024	R961006059	R961006094	R900860935	R900860956	R900860292	R961006129	R900861021
200	125	R900860294	R961006025	R961006060	R961006095	R900860936	R900860957	R900860295	R961006130	R900861022
	140	R900856431	R961006026	R961006061	R961006096	R900860937	R900860958	R900860293	R961006131	R900861023
220	140	R900888100	R961006027	R961006062	R961006097	R900888116	R900888140	R900888108	R961006132	R900888132
	160	R900888101	R961006028	R961006063	R961006098	R900888117	R900888141	R900888109	R961006133	R900888133
250	160	R900888102	R961006029	R961006064	R961006099	R900888118	R900888142	R900888110	R961006134	R900888134
	180	R900888103	R961006030	R961006065	R961006100	R900888119	R900888143	R900888111	R961006135	R900888135
280	180	R900888104	R961006031	R961006066	R961006101	R900888120	R900888144	R900888112	R961006136	R900888136
	200	R900888105	R961006032	R961006067	R961006102	R900888121	R900888145	R900888113	R961006137	R900888137
320	200	R900888106	R961006033	R961006068	R961006103	R900888122	R900888146	R900888114	R961006138	R900888138
	220	R900888107	R961006034	R961006069	R961006104	R900888123	R900888147	R900888115	R961006139	R900888139

ØAL = Piston Ø
ØMM = Piston rod Ø
1) Seal kits for proximity switches and subplate mounting separate material no.

Seal kits [1]

CGH1 – Standard

ØAL	ØMM	Material no. for seal design								
		M	G	V	L	A	B	T	R	S
40	22	R900867251	R961006221	R961006256	R961006291	R900866746	R900867132	R900868888	R961006326	R900868942
	28	R900867252	R961006223	R961006258	R961006293	R900866747	R900867133	R900868889	R961006328	R900868943
50	28	R900867253	R961006224	R961006259	R961006294	R900866748	R900867134	R900868890	R961006329	R900868944
	36	R900864930	R961006226	R961006261	R961006296	R900866750	R900867136	R900868892	R961006331	R900868946
63	36	R900867260	R961006227	R961006262	R961006297	R900866751	R900867137	R900868893	R961006332	R900868947
	45	R900867262	R961006229	R961006264	R961006299	R900866753	R900867139	R900868895	R961006334	R900868949
80	45	R900867263	R961006230	R961006265	R961006300	R900866754	R900867140	R900868896	R961006335	R900868950
	56	R900867265	R961006232	R961006267	R961006302	R900866756	R900867142	R900868898	R961006337	R900868952
100	56	R900867266	R961006233	R961006268	R961006303	R900866757	R900867143	R900868899	R961006338	R900868953
	70	R900867268	R961006235	R961006270	R961006305	R900866759	R900867146	R900868901	R961006340	R900868955
125	70	R900867269	R961006236	R961006271	R961006306	R900866760	R900867147	R900868902	R961006341	R900867906
	90	R900867270	R961006238	R961006273	R961006308	R900866762	R900867149	R900868904	R961006343	R900868957
140	90	R900867271	R961006239	R961006274	R961006309	R900866763	R900867150	R900868905	R961006344	R900868958
	100	R900867272	R961006240	R961006275	R961006310	R900866764	R900867151	R900868906	R961006345	R900868959
160	100	R900867273	R961006241	R961006276	R961006311	R900866765	R900867152	R900868907	R961006346	R900868960
	110	R900867274	R961006242	R961006277	R961006312	R900866766	R900867153	R900868908	R961006347	R900868961
180	110	R900867275	R961006244	R961006279	R961006314	R900866767	R900867154	R900868909	R961006349	R900868962
	125	R900867276	R961006245	R961006280	R961006315	R900866768	R900867155	R900868910	R961006350	R900868963
200	125	R900867277	R961006246	R961006281	R961006316	R900866769	R900867156	R900868911	R961006351	R900868964
	140	R900867278	R961006247	R961006282	R961006317	R900866770	R900867157	R900868912	R961006352	R900868965
220	140	R900888020	R961006248	R961006283	R961006318	R900888036	R900888060	R900888028	R961006353	R900888052
	160	R900888021	R961006249	R961006284	R961006319	R900888037	R900888061	R900888029	R961006354	R900888053
250	160	R900888022	R961006250	R961006285	R961006320	R900888038	R900888062	R900888030	R961006355	R900888054
	180	R900888023	R961006251	R961006286	R961006321	R900888039	R900888063	R900888031	R961006356	R900888055
280	180	R900888024	R961006252	R961006287	R961006322	R900888040	R900888064	R900888032	R961006357	R900888056
	200	R900888025	R961006253	R961006288	R961006323	R900888041	R900888065	R900888033	R961006358	R900888057
320	200	R900888026	R961006254	R961006289	R961006324	R900888042	R900888066	R900888034	R961006359	R900888058
	220	R900888027	R961006255	R961006290	R961006325	R900888043	R900888067	R900888035	R961006360	R900888059

ØAL = Piston Ø
ØMM = Piston rod Ø

[1] Seal kits for proximity switches and subplate mounting separate material no.

Seal kits [1)]

CDH1 – Standard + additional option F

ØAL	ØMM	Material no. for seal design					
		M+F	G+F	V+F	T+F	R+F	S+F
40	22	R900861024	R961006140	R961006167	R900861049	R961006194	R900861099
	28	R900861025	R961006142	R961006169	R900861050	R961006196	R900861100
50	28	R900861026	R961006143	R961006170	R900861051	R961006197	R900861101
	36	R900861028	R961006145	R961006172	R900861053	R961006199	R900861103
63	36	R900861029	R961006146	R961006173	R900861054	R961006200	R900861104
	45	R900861031	R961006148	R961006175	R900861056	R961006202	R900861106
80	45	R900861032	R961006149	R961006176	R900861057	R961006203	R900861107
	56	R900861034	R961006151	R961006178	R900861059	R961006205	R900861109
100	56	R900861035	R961006152	R961006179	R900861060	R961006206	R900861112
	70	R900861037	R961006154	R961006181	R900861062	R961006208	R900861115
125	70	R900861038	R961006155	R961006182	R900861063	R961006209	R900861117
	90	R900861040	R961006157	R961006184	R900861065	R961006211	R900861122
140	90	R900861041	R961006158	R961006185	R900861066	R961006212	R900861124
	100	R900861042	R961006159	R961006186	R900861067	R961006213	R900861126
160	100	R900861043	R961006160	R961006187	R900861068	R961006214	R900861128
	110	R900861044	R961006161	R961006188	R900861069	R961006215	R900861130
180	110	R900861045	R961006163	R961006190	R900861070	R961006217	R900861133
	125	R900861046	R961006164	R961006191	R900861071	R961006218	R900861135
200	125	R900861047	R961006165	R961006192	R900861072	R961006219	R900861142
	140	R900861048	R961006166	R961006193	R900861073	R961006220	R900861143

CGH1 – Standard + additional option F

ØAL	ØMM	Material no. for seal design					
		M+F	G+F	V+F	T+F	R+F	S+F
40	22	R900868998	R961006361	R961006388	R900869025	R961006415	R900869092
	28	R900868999	R961006363	R961006390	R900869026	R961006417	R900869093
50	28	R900869000	R961006364	R961006391	R900869027	R961006418	R900869094
	36	R900869002	R961006366	R961006393	R900869029	R961006420	R900869096
63	36	R900869003	R961006367	R961006394	R900869030	R961006421	R900869097
	45	R900869005	R961006369	R961006396	R900869032	R961006423	R900869099
80	45	R900869006	R961006370	R961006397	R900869033	R961006424	R900869100
	56	R900869008	R961006372	R961006399	R900869035	R961006426	R900869102
100	56	R900869009	R961006373	R961006400	R900869036	R961006427	R900869103
	70	R900869013	R961006375	R961006402	R900869038	R961006429	R900869105
125	70	R900869014	R961006376	R961006403	R900869039	R961006430	R900869106
	90	R900869016	R961006378	R961006405	R900869041	R961006432	R900869108
140	90	R900869017	R961006379	R961006406	R900869042	R961006433	R900869109
	100	R900869018	R961006380	R961006407	R900869043	R961006434	R900869110
160	100	R900869019	R961006381	R961006408	R900869044	R961006435	R900869111
	110	R900869020	R961006382	R961006409	R900869045	R961006436	R900869112
180	110	R900869021	R961006384	R961006411	R900869046	R961006438	R900869113
	125	R900869022	R961006385	R961006412	R900869047	R961006439	R900869114
200	125	R900869023	R961006386	R961006413	R900869048	R961006440	R900869115
	140	R900869024	R961006387	R961006414	R900869049	R961006441	R900869116

ØAL = Piston Ø
ØMM = Piston rod Ø

1) Seal kits for proximity switches and subplate mounting separate material no.

2

Seal kits 2)

CSH1

ØAL	ØMM	Material no. for seal design						
		M	G	V	L	T	R	S
40	28	R900861025	R961006142	R961006169	R961006072	R900861050	R961006196	R900861100
50	28	R900861026	R961006143	R961006170	R961006073	R900861051	R961006197	R900861101
	36	R900861028	R961006145	R961006172	R961006075	R900861053	R961006199	R900861103
63	36	R900861029	R961006146	R961006173	R961006076	R900861054	R961006200	R900861104
	45	R900861031	R961006148	R961006175	R961006078	R900861056	R961006202	R900861106
80	45	R900861032	R961006149	R961006176	R961006079	R900861057	R961006203	R900861107
	56	R900861034	R961006151	R961006178	R961006081	R900861059	R961006205	R900861109
100	56	R900861035	R961006152	R961006179	R961006082	R900861060	R961006206	R900861112
	70	R900861037	R961006154	R961006181	R961006084	R900861062	R961006208	R900861115
125	70	R900861038	R961006155	R961006182	R961006085	R900861063	R961006209	R900861117
	90	R900861040	R961006157	R961006184	R961006087	R900861065	R961006211	R900861122
140	90	R900861041	R961006158	R961006185	R961006088	R900861066	R961006212	R900861124
	100	R900861042	R961006159	R961006186	R961006089	R900861067	R961006213	R900861126
160	100	R900861043	R961006160	R961006187	R961006090	R900861068	R961006214	R900861128
	110	R900861044	R961006161	R961006188	R961006091	R900861069	R961006215	R900861130
180	110	R900861045	R961006163	R961006190	R961006093	R900861070	R961006217	R900861133
	125	R900861046	R961006164	R961006191	R961006094	R900861071	R961006218	R900861135
200	125	R900861047	R961006165	R961006192	R961006095	R900861072	R961006219	R900861142
	140	R900861048	R961006166	R961006193	R961006096	R900861073	R961006220	R900861143
220	140	R900888100	R961006027	R961006062	R961006097	R900888108	R961006132	R900888132
	160	R900888101	R961006028	R961006063	R961006098	R900888109	R961006133	R900888133
250	160	R900888102	R961006029	R961006064	R961006099	R900888110	R961006134	R900888134
	180	R900888103	R961006030	R961006065	R961006100	R900888111	R961006135	R900888135
280	180	R900888104	R961006031	R961006066	R961006101	R900888112	R961006136	R900888136
	200	R900888105	R961006032	R961006067	R961006102	R900888113	R961006137	R900888137
320	200	R900888106	R961006033	R961006068	R961006103	R900888114	R961006138	R900888138
	220	R900888107	R961006034	R961006069	R961006104	R900888115	R961006139	R900888139

ØAL = Piston Ø
ØMM = Piston rod Ø

2) Seal kits for position measurement system and subplate mounting separate material no.

Seal kits

Only for proximity switches

ØAL	Material no. for seal design								
	M / M+F	T / T+F	G / G+F	L	R / R+F	A	S / S+F	V / V+F	B
40 to 200	R900885938						R900885939		
220 to 320	R900894997						R900894998		

Only for subplate mounting

ØAL	Material no. for seal design	
	M, T, G, L, R, A	S, B, V
40	R961006022	R961006243
50	R961006022	R961006243
63	R961006057	R961006278
80	R961006057	R961006278
100	R961006092	R961006313
125	R961006127	R961006348
140	R961006127	R961006348
160	R961006162	R961006383
180	R961006162	R961006383
200	R961006189	R961006410

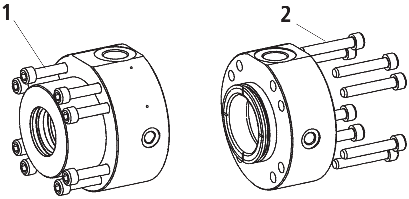
Only for position measurement system

ØAL	Material no. for seal design	
	M, T, G, L, R	S, V
40	R900885935	R900885937
50	R900894958	R900894979
63	R900894959	R900894980
80	R900894960	R900894981
100	R900894961	R900894982
125	R900894962	R900894983
140	R900894963	R900894985
160	R900894964	R900894986
180	R900894973	R900894987
200	R900894974	R900894988
220	R900894975	R900894989
250	R900894976	R900894991
280	R900894977	R900894993
320	R900894978	R900894994

ØAL = Piston Ø

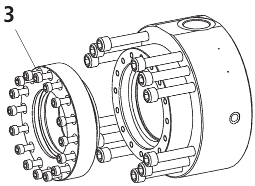
Tightening torques

Screws: Head and base (item 1 and 2)



Series	Piston Ø	Screw	Quantity	Quality class	Tightening torque
CDH1 / CGH1 / CSH1	**40**	M8	4	10.9	23 Nm
CDH1 / CGH1 / CSH1	**50**	M8	8	10.9	20 Nm
CDH1 / CGH1 / CSH1	**63**	M8	8	10.9	30 Nm
CDH1 / CGH1 / CSH1	**80**	M10	8	10.9	55 Nm
CDH1 / CGH1 / CSH1	**100**	M12	8	10.9	100 Nm
CDH1 / CGH1 / CSH1	**125**	M16	8	10.9	200 Nm
CDH1 / CGH1 / CSH1	**140**	M16	12	10.9	170 Nm
CDH1 / CGH1 / CSH1	**160**	M16	12	10.9	220 Nm
CDH1 / CGH1 / CSH1	**180**	M20	12	10.9	350 Nm
CDH1 / CGH1 / CSH1	**200**	M20	12	10.9	410 Nm
CDH1 / CGH1 / CSH1	**220**	M20	16	10.9	460 Nm
CDH1 / CGH1 / CSH1	**250**	M24	16	10.9	700 Nm
CDH1 / CGH1 / CSH1	**280**	M24	16	10.9	800 Nm
CDH1 / CGH1 / CSH1	**320**	M30	16	10.9	1500 Nm

Screws: Seal cover (item 3))

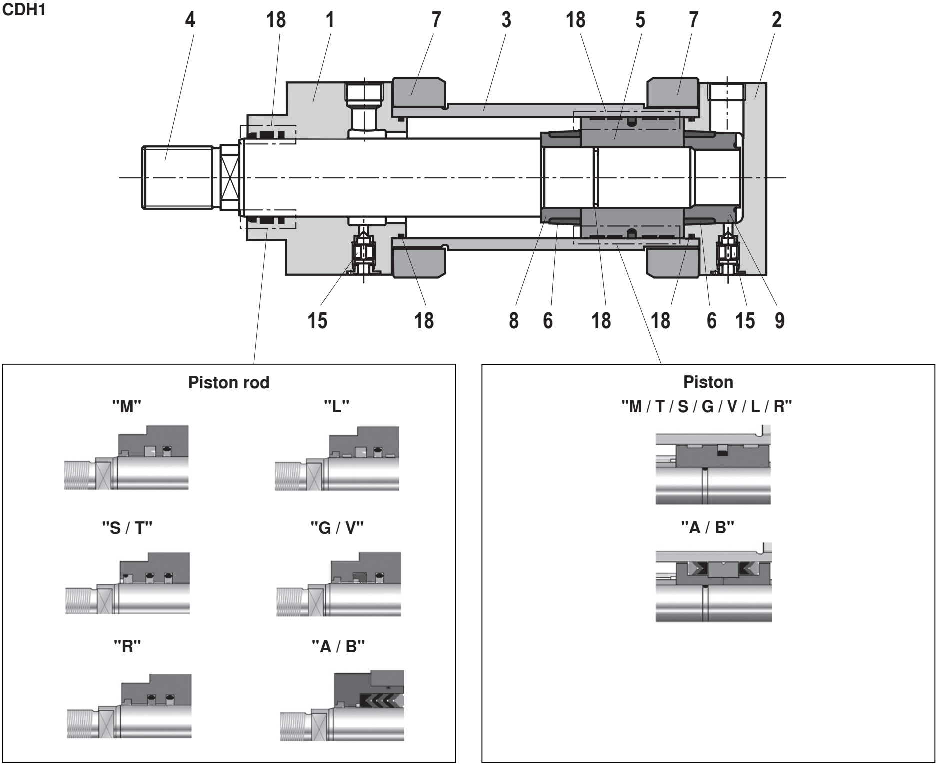


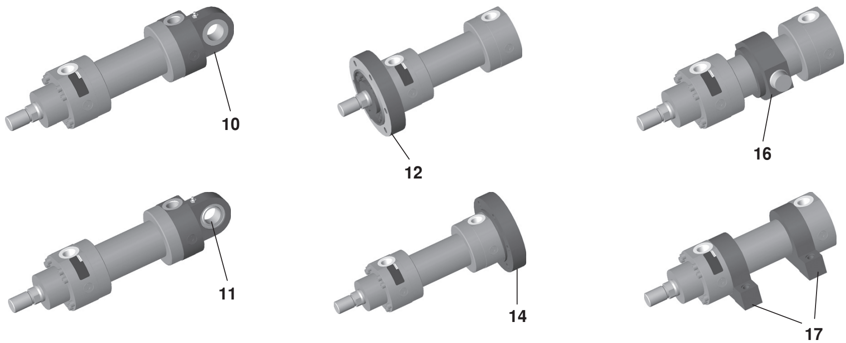
Only with seal design "A" and "B"

<table>
<tr><th>Series</th><th>Piston Ø</th><th>Piston rod Ø</th><th>Screw</th><th>Quantity</th><th>Quality class</th><th>Tightening torque</th></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">160</td><td>100</td><td rowspan="2">M10</td><td rowspan="2">16</td><td rowspan="2">10.9</td><td rowspan="2">60 Nm</td></tr>
<tr><td>110</td></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">180</td><td>110</td><td rowspan="2">M12</td><td rowspan="2">16</td><td rowspan="2">10.9</td><td rowspan="2">80 Nm</td></tr>
<tr><td>125</td></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">200</td><td>125</td><td rowspan="2">M12</td><td rowspan="2">16</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>140</td></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">220</td><td>140</td><td rowspan="2">M12</td><td>16</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>160</td><td>24</td></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">250</td><td>160</td><td rowspan="2">M12</td><td rowspan="2">24</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>180</td></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">280</td><td>180</td><td rowspan="2">M12</td><td rowspan="2">24</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>200</td></tr>
<tr><td rowspan="2">CDH1 / CGH1</td><td rowspan="2">320</td><td>200</td><td>M12</td><td>24</td><td rowspan="2">10.9</td><td>90 Nm</td></tr>
<tr><td>220</td><td>M16</td><td>16</td><td>230 Nm</td></tr>
</table>

Spare parts: Series CDH1

CDH1

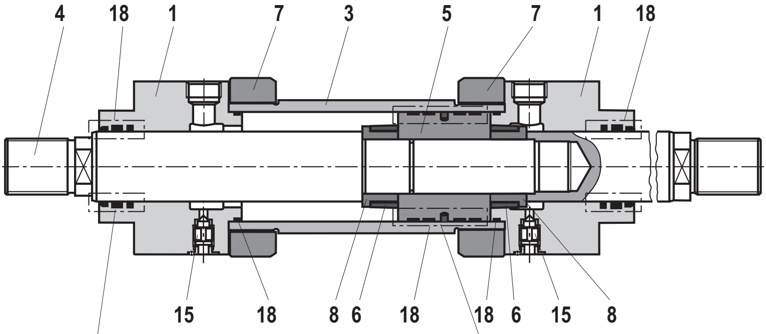


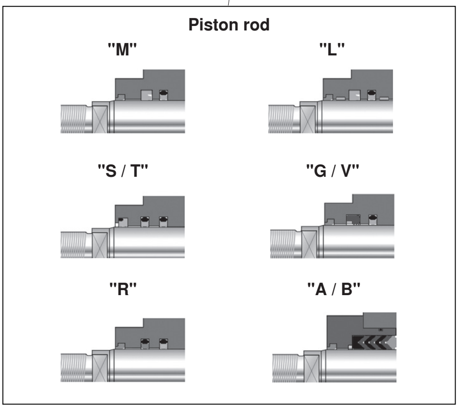


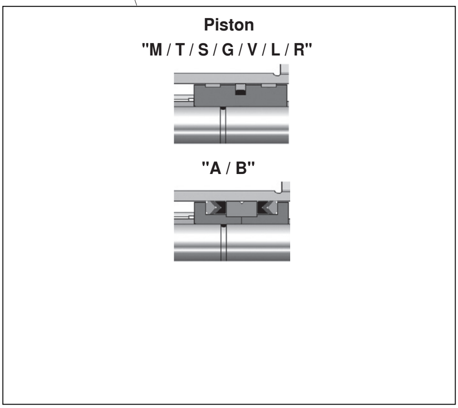
1	Head	**6**	Damping bush	**11**	Base MP5	**17**	Foot MS2
2	Base	**7**	Flange	**12**	Round flange MF3	**18**	Seal kit: Scraper, Rod seal, Piston seal, O-ring, Guide ring
3	Pipe	**8**	Socket	**14**	Round flange MF4		
4	Piston rod	**9**	Socket	**15**	Bleeding		
5	Piston	**10**	Base MP3	**16**	Trunnion MT4		

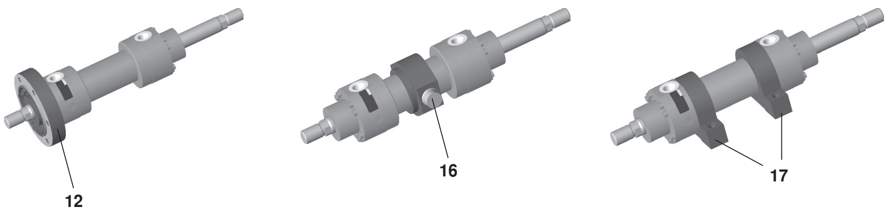
Spare parts: Series CGH1

CGH1



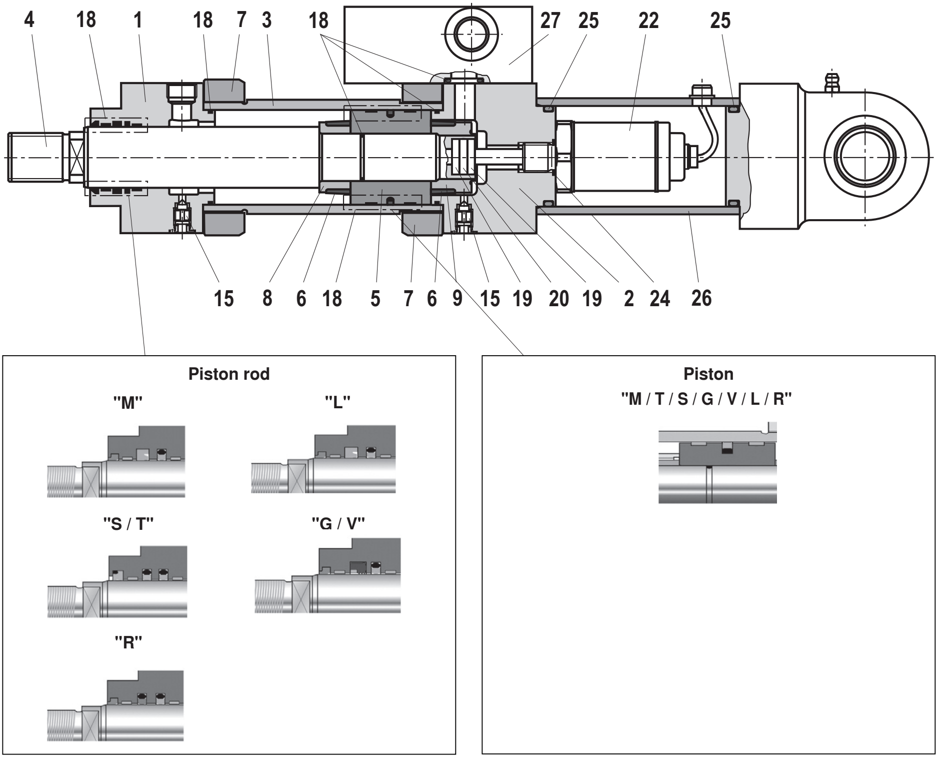


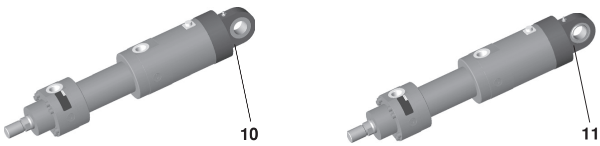




- **1** Head
- **3** Pipe
- **4** Piston rod
- **5** Piston
- **6** Damping bush
- **7** Flange
- **8** Socket
- **12** Round flange MF3
- **15** Bleeding
- **16** Trunnion MT4
- **17** Foot MS2
- **18** Seal kit:
  - Scraper
  - Rod seal
  - Piston seal
  - O-ring
  - Guide ring

Spare parts: Series CSH1 MP3 and MP5





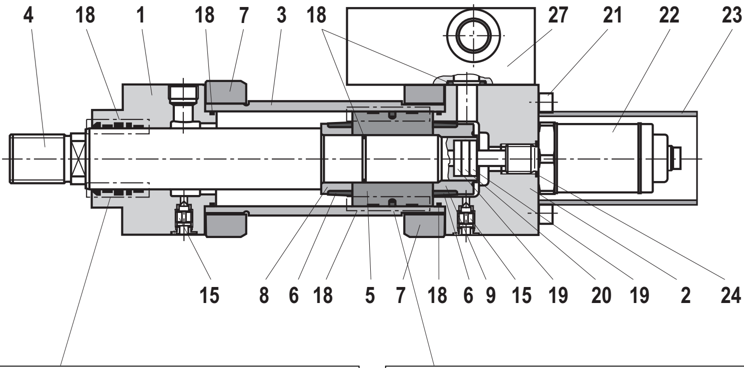
1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston

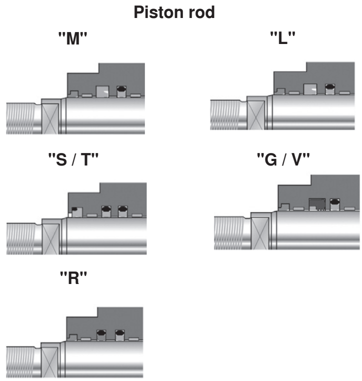
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Base MP3

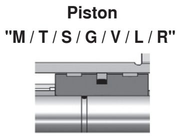
11 Base MP5
15 Bleeding
18 Seal kit:
Scraper
Rod seal
Piston seal
O-ring
Guide ring

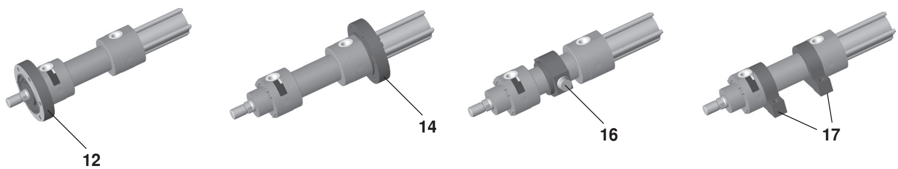
19 Insulating socket
20 Solenoid
22 Position transducer
24 Seal
25 Seal
26 Protective pipe
27 Subplate

Spare parts: Series CSH1 MF3, MF4, MT4 and MS2









1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket
9 Socket
12 Round flange MF3
14 Round flange MF4
15 Bleeding
16 Trunnion MT4
17 Foot MS2
18 Seal kit:
Scraper
Rod seal
Piston seal
O-ring
Guide ring
19 Insulating socket
20 Solenoid
21 Hexagon socket head cap screws
22 Position transducer
23 Protective pipe
24 Seal
27 Subplate

Cylinder weight

Piston	Piston rod	CD/CS cylinder with 0 mm stroke length					Per 100 mm stroke length	CG cylinder with 0 mm stroke length			Per 100 mm stroke length
ØAL	**ØMM**	**MP3** 1) **MP5** 1)	**MP3** 2) **MP5** 2)	**MF3** **MF4**	**MT4**	**MS2**		**MF3**	**MT4**	**MS2**	
mm	mm	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
40	**22** **28**	7 7	12 12	9 9	9 9	9 9	0,9 1,0	10 10	9 9	9 10	1,2 1,5
50	**28** **36**	10 10	16,5 16,5	14 14	12 12	12 13	1,2 1,5	15 15	14 14	14 14	1,6 2,3
63	**36** **45**	16 16	25,5 25,5	22 22	19 19	19 20	2,1 2,6	24 24	21 22	21 22	2,9 3,8
80	**45** **56**	25 26	35 36	30 31	29 30	31 32	2,9 3,6	34 35	33 34	35 36	4,1 5,5
100	**56** **70**	43 44	58,5 59,5	52 53	50 51	52 53	4,6 5,7	59 60	56 58	58 60	6,6 8,8
125	**70** **90**	79 80	99 100	93 95	91 93	90 92	7,3 9,2	103 106	101 105	100 104	10,3 14,2
140	**90** **100**	111 112	137 138	127 128	130 131	131 132	10,7 11,9	145 146	147 149	148 150	15,7 18,1
160	**100** **110**	168 169	205 206	198 200	200 202	209 210	12,6 13,9	230 234	233 236	241 244	18,8 21,4
180	**110** **125**	236 239	283 286	270 272	269 271	278 281	14,7 16,8	314 319	312 318	322 327	22,1 26,5
200	**125** **140**	306 309	361 364	348 351	346 349	358 361	19,0 21,5	369 376	367 373	380 386	28,6 33,5
220	**140** **160**	452	556	515	479	509	27,1 30,9	598	562	593	39,1 46,7
250	**160** **180**	582	710	664	618	649	32,7 36,9	784	739	770	48,5 56,9
280	**180** **200**	753	950	846	784	822	44,2 48,8	981	919	957	64,2 73,4
320	**200** **220**	1125	1404	1290	1180	1222	55,2 60,4	1452	1343	1385	79,8 90,2

ØAL = Piston Ø
ØMM = Piston rod Ø
1) Weight without position measurement system
2) Weight with position measurement system

2

Notes

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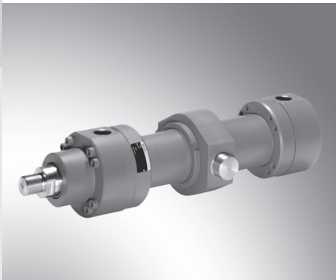
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Hydraulic cylinder mill type

RE 17335/07.13
Replaces: 07.12

Series CDH2 / CGH2 / CSH2

Component series 3X
Nominal pressure 250 bar (25 MPa)



H4652_d

Table of contents

Contents

Features

– Standards: ISO 24333, ISO 6022
– 6 types of mounting
– Piston Ø: (**ØAL**): 40 to 320 mm
– Piston rod Ø (**ØMM**): 25 to 220 mm
– Stroke lengths up to 6 m

Project planning software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Technical data (For applications outside these parameters, please consult us!)

Standards:
The installation dimensions and types of mounting of the cylinders comply with the standards DIN 24333 and ISO 6022.

Nominal pressure: 250 bar

Static test pressure: 375 bar
Reduced test pressure: 315 bar
Higher operating pressures upon request
The specified operating pressures apply to applications with shock-free operation with regard to excess pressure and/or external loads. With extreme loads like e.g. high cycle sequence, mounting elements and threaded piston rod connections must be designed for durability.

Minimum pressure:
Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the cylinder. Without load, a minimum pressure of 10 bar is recommended for differential cylinders; for lower pressures as well as double-acting cylinders, please contact us.

Installation position: Any

Hydraulic fluid:
Mineral oils DIN 51524 HL, HLP
Oil-in-water emulsion HFA
Water glycol HFC
Phosphate ester HFD-R
Polyol ester HFD-U

Hydraulic fluid temperature range: See page 66

Ambient temperature range: See page 66

Optimum viscosity range: 20 to 100 mm^2/s

Minimum admissible viscosity: 12 mm^2/s

Maximum admissible viscosity: 380 mm^2/s

Cleanliness class according to ISO
Maximum admissible degree of contamination of the hydraulic fluid according to ISO 4406 (c) class 20/18/15.
The cleanliness classes specified for the components need to be met in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter

Bleeding by default: Secured against screwing out

Primer coat: By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010) of min. 40 µm. Other colors upon request.
With cylinders and attachment parts, the following surfaces are not primed or painted:
- All fit diameters to the customer side
- Sealing surfaces for line connection
- Sealing surfaces for flange connection
- Connection surfaces for valve mounting
- Inductive proxiwithy switches
- Position measurement system

The surfaces that are not painted are protected by means of a corrosion protection agent (MULTICOR LF 80).
In the online order system, more painting systems can be selected. These systems are not displayed via the type key and not automatically considered when ordering replacement cylinders. Accessories that are ordered as separate order item are not primed or painted by default. Corresponding priming and/or painting on request.

Stroke velocity: Please observe the guideline on max. stroke velocities (with recommended flow velocity of 5 m/s in the line connection) in the table. Higher stroke velocities on request.
If the extension velocity is considerably higher than the retraction velocity of the piston rod, drag-out losses of the medium may result. If necessary, please consult us.

Piston-Ø (mm)	Line connection	Max. stroke velocity in m/s
40	G1/2	0,31
50	G1/2	0,20
63	G3/4	0,28
80	G3/4	0,18
100	G1	0,20
125	G1	0,13
140	G1 1/4	0,16
160	G1 1/4	0,12
180	G1 1/4	0,10
200	G1 1/4	0,08
220	G1 1/2	0,09
250	G1 1/2	0,07
280	G1 1/2	0,06
320	G1 1/2	0,04

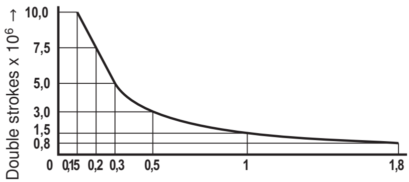
Technical data (For applications outside these parameters, please consult us!)

Boundary and application conditions:

- The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder (MP3/MP5 or MT4) or the piston rod.
- The buckling length/buckling load of the piston rod and/or the hydraulic cylinder must be observed (see page topic Buckling).
- The maximum admissible stroke velocities with regard to the suitability/load of seals must be observed as must their compatibility with the properties of the fluid type (see page topic Seals).
- The maximum admissible velocities/kinetic energies when moving into the end positions, also considering external loads, must be observed.
  Danger: Excess pressure
- The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from the area ratio of annulus to piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Notice: This list does not claim to be complete. In case of questions regarding the compatibility with media or exceedance of the boundary or application conditions, please contact us.

Life cycle:
Rexroth cylinders correspond to the reliability recommendations for industrial applications.
≥ 10000000 double strokes in idle continuos operation or 3000 km piston travel at 70 % of the maximum operating pressure, without load on the piston rod, with a maximum velocity of 0.5 m/s, with a failure rate of less than 5 %.



Acceptance:
Each cylinder is tested according to Bosch Rexroth standard and in compliance with ISO 10100: 2001.

Safety instructions:
For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions 07100-B have to be observed!
Service and repair works have to be performed by Bosch Rexroth AG or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair works not performed by Bosch Rexroth AG.

Check lists for hydraulic cylinders:
Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic cylinders (07200).

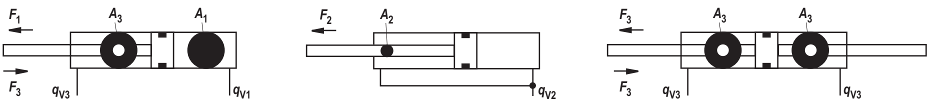
Project planning software ICS (Interactive Catalog System)

The ICS (Interactive Catalog System) is a selection and project planning help for hydraulic cylinders. The ICS allows designers for machines and systems to quickly and reliably find the perfect hydraulic cylinder solution through logic-guided type key enquiries. This software helps to solve design and project planning tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical data of the selected components as well as 2D and 3D CAD data in the correct file format for all common CAD systems.
This allows users to reduce costs while increasing their competitiveness.

2

Diameters, areas, forces, flow

Piston	Piston rod	Area ratio	Areas			Force at 250 bar [1]			Flow at 0.1 m/s [2]			Max. available stroke length
			Piston	Rod	Ring	Pressure	Diff.	Pulling	Off	Diff.	On	
ØAL mm	**ØMM** mm	φ A_1/A_3	A_1 cm^2	A_2 cm^2	A_3 cm^2	F_1 kN	F_2 kN	F_3 kN	q_{V1} l/min	q_{V2} l/min	q_{V3} l/min	mm
40	**25** **28**	1,64 1,96	12,56	4,90 6,16	7,65 6,40	31,40	12,25 15,40	19,12 16,00	7,5	2,9 3,7	4,6 3,8	2000
50	**32** **36**	1,69 2,08	19,63	8,04 10,18	11,59 9,45	49,10	20,12 25,45	28,98 23,65	11,8	4,8 6,1	7,0 5,7	2000
63	**40** **45**	1,67 2,04	31,17	12,56 15,90	18,61 15,27	77,90	31,38 39,75	46,52 38,15	18,7	7,5 9,5	11,2 9,2	2000
80	**50** **56**	1,66 1,96	50,26	19,63 24,63	30,63 25,63	125,65	49,07 61,55	76,58 64,10	30,2	11,8 14,8	18,4 15,4	2000
100	**63** **70**	1,66 1,96	78,54	31,16 38,48	47,38 40,06	196,35	77,93 96,20	118,42 100,15	47,1	18,7 23,1	28,4 24,0	3000
125	**80** **90**	1,69 2,08	122,72	50,24 63,62	72,48 59,10	306,75	125,62 159,05	181,13 147,70	73,6	30,1 38,2	43,5 35,4	3000
140	**90** **100**	1,70 2,04	153,94	63,62 78,54	90,32 75,40	384,75	159,05 196,35	225,70 188,40	92,4	38,2 47,1	54,2 45,3	3000
160	**100** **110**	1,64 1,90	201,06	78,54 95,06	122,50 106,00	502,50	196,35 237,65	306,15 264,85	120,6	47,1 57,0	73,5 63,6	3000
180	**110** **125**	1,60 1,93	254,47	95,06 122,72	159,43 131,75	636,17	237,65 306,80	398,52 329,37	152,7	57,0 73,6	95,7 79,1	3000
200	**125** **140**	1,64 1,96	314,16	122,72 153,96	191,44 160,20	785,25	306,80 384,90	478,45 400,35	188,5	73,6 92,4	114,9 96,1	3000
220	**140** **160**	1,68 2,12	380,1	153,96 201,0	226,2 179,1	950,3	384,9 502,6	565,5 447,7	228,1	92,4 120,7	135,7 107,4	6000
250	**160** **180**	1,69 2,08	490,8	201,0 254,4	289,8 236,4	1227,2	502,6 636,2	724,5 590,0	294,5	120,7 152,7	173,8 141,8	6000
280	**180** **200**	1,70 2,04	615,7	254,4 314,1	361,3 301,6	1539,4	636,2 785,4	903,2 753,9	369,4	152,7 188,5	216,7 180,9	6000
320	**200** **220**	1,64 1,90	804,2	314,1 380,1	490,1 424,2	2010,6	785,4 950,3	1225,2 1060,3	482,5	188,5 228,1	294,0 254,4	6000



[1] Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. self-aligning clevises, plates or valves, etc.)

[2] Stroke velocity

Tolerances according to ISO 6020-1

Installation dimensions	WC	XC [2]	XO [2]	XS [1], [2]	XV [2]	ZP [2]	
Type of mounting	MF3	MP3	MP5	MS2	MT4	MF4	
Stroke length	Tolerances						Stroke tolerances
≤ 1250	±2	±1,5	±1,5	±2	±2	±1,5	+2
> 1250 – ≤ 3150	±4	±3	±3	±4	±4	±3	+5
> 3150 – ≤ 6000	±8	±5	±5	±8	±8	±5	+8

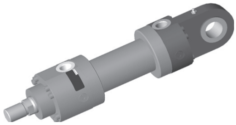
[1] Not standardized

[2] Including stroke length

Overview of types of mounting: Series CDH2 and CGH2

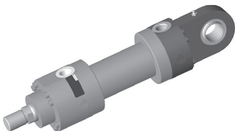
CDH2 MP3

see page 10, 11



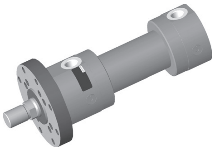
CDH2 MP5

see page 12, 13



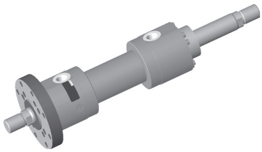
CDH2 MF3

see page 14, 15



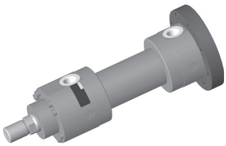
CGH2 MF3

see page 14, 15



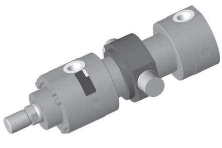
CDH2 MF4

see page 16, 17



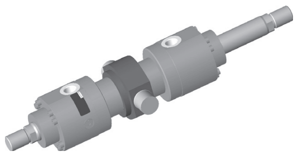
CDH2 MT4

see page 18, 19



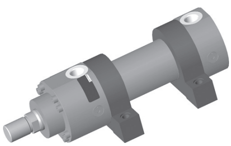
CGH2 MT4

see page 18, 19



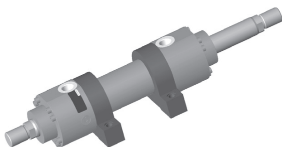
CDH2 MS2

see page 20, 21



CGH2 MS2

see page 20, 21



Ordering code series CDH2

CD	H2	/	/	/	A	3X/							

Differential cylinder = **CD**

Series = **H2**

Types of mounting

Swivel eye at base = **MP3**
Self-aligning clevis at base = **MP5**
Round flange at head = **MF3**
Round flange at base = **MF4**
Trunnion 2) = **MT4**
Foot mounting 18) = **MS2**

Piston Ø (AL) 40 to 320 mm

Piston rod Ø (MM) 25 to 220 mm

Stroke length in mm 3)

Design principle

Head and base flanged = **A**

Component series

30 to 39 Unchanged installation and connection dimensions = **3X**

Line connection / version

According to ISO 1179-1 (pipe thread ISO 228-1) = **B**
According to ISO 9974-1 (metric thread ISO 261) 33) = **M**
Flange porting pattern according to ISO 6162-1 tab. 2 type 1 (≙ SAE 3000 PSI) 4) 21) = **F**
Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) 4) 9) = **D**
Flange porting pattern according to ISO 6164 tab. 1 1) 4) = **K**
Flange porting pattern according to ISO 6164 tab. 2 4) = **H**
According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange 31) = **C**

For directional and high-response valves

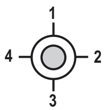
Subplate size 6 4) 5) = **P**
Subplate size 10 4) 6) = **T**
Subplate size 16 4) 7) = **U**
Subplate size 25 4) 32) = **V**

For SL and SV valves

Subplate size 6 4) 5) 15) = **A**
Subplate size 10 4) 6) 15) = **E**
Subplate size 20 4) 7) 15) = **L**
Subplate size 30 4) 32) 15) = **N**

Line connection/position at head

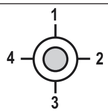
View to piston rod



30) = **1**
30) = **2**
30) = **3**
30) = **4**

Line connection/position at base

View to piston rod



30) = **1**
30) = **2**
30) = **3**
30) = **4**

Piston rod design

Hard chromium-plated = **C**
Hardened and hard chromium-plated 23) = **H**
Nickel-plated and hard chromium-plated 23) = **N**

Piston rod end

H = Thread for self-aligning clevis CGKD
F = With mounted self-aligning clevis CGKD

End position cushioning

U = Without
D = 1) On both sides, self-adjusting
E = On both sides, adjustable

Seal design

For mineral oil HL, HLP and HFA

M = Standard seal system
L = Standard seal system with guide rings
R = Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC

G = Standard seal system HFC
T = Servo quality/ reduced friction
A = Chevron seal kits

For phosphate ester HFD-R and polyol ester HFD-U

S = Servo quality/ reduced friction
V = Standard seal system FKM
B = Chevron seal kits

Option

Z = Additional options, fill fields for additional options
W = Without additional options, do **not** fill fields for additional options

Ordering code series CDH2

Additional options

Fields for additional options

	Z					

Inductive proxiwithy switches **without** mating connector — 37) **= E**
Mating connector - separate order see page 44
without inductive proxiwithy switches — **= W**

Additional guide rings — 10), 28) **= F**
Without additional guide rings — **= W**

Threaded coupling, on both sides — **= A**
Without threaded coupling — **= W**

B = Flanged grease nipple
W = Standard conical grease nipple

Y = Specify the piston rod extension LY in the clear text in mm
W = without piston rod extension

Order examples:

Without additional options: **CDH2MT4/63/45/350A3X/B11CHDMW, XV = 300 mm**

With additional options: **CDH2MF3/80/56/500A3X/B11CHDMZ EWAWW**

1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the "XV" dimension in the clear text in mm
3) Max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) observe pages 60 to 62
4) Not possible with MF4
5) Piston Ø 40 to 80 mm, only position 11, subplates only possible in combination with line connection "B" at the head
6) Piston Ø 63 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
7) Piston Ø 125 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
9) Only piston Ø 80 to 320 mm
10) Seal design A, B not possible; piston Ø 220 to 320 mm standard
15) Subplates for SL and SV valves (isolator valves) Note: Seal designs T, G, L, R, S and V are not designed for the static holding function!
18) Not standardized
21) Only piston Ø 63 to 200 mm
23) Only piston rod Ø 25 to 140 mm
28) With seal design "L" standard
30) All graphical presentations in the data sheet show position 1
31) With MS2, only position 11 is possibleh
32) Piston Ø 180 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
33) Version does not comply with ISO 6022
37) Min. stroke length = 20 mm

Ordering code series CGH2

CG	H2	/	/	/	A	3X/							

Double-acting cylinder [18] = **CG**

Series = **H2**

Types of mounting
Round flange at head = **MF3**
Trunnion [2] = **MT4**
Foot mounting = **MS2**

Piston Ø (AL) 40 to 320 mm

Piston rod Ø (MM) 25 to 220 mm

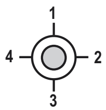
Stroke length in mm [3]

Design principle
Head and base flanged = **A**

Component series
30 to 39 Unchanged installation and connection dimensions = **3X**

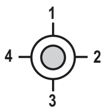
Line connection / version
According to ISO 1179-1 (pipe thread ISO 228-1) = **B**
According to ISO 9974-1 (metric thread ISO 261) [33] = **M**
Flange porting pattern according to ISO 6162-1 tab. 2 type 1 (≙ SAE 3000 PSI) [21] = **F**
Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) [9] = **D**
Flange porting pattern according to ISO 6164 tab. 1 [1] = **K**
Flange porting pattern according to ISO 6164 tab. 2 = **H**
According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31] = **C**

Line connection/position at head
View to piston rod



[30] = **1**
[30] = **2**
[30] = **3**
[30] = **4**

Line connection/position at base
View to piston rod



[30] = **1**
[30] = **2**
[30] = **3**
[30] = **4**

Piston rod design
Hard chromium-plated [36] = **C**
Hardened and hard chromium-plated [23] = **H**
Nickel-plated and hard chromium-plated [22] = **N**

Piston rod end
H = Thread for plain clevis CGKD
F = [17] With mounted plain clevis CGKD

End position cushioning
U = Without
D = [1] On both sides, self-adjusting
E = On both sides, adjustable

Seal design
For mineral oil HL, HLP and HFA
M = Standard seal system
L = Standard seal system with guide rings
R = Reduced friction heavy industry
For mineral oil HL, HLP, HFA and water glycol HFC
G = Standard seal system HFC
T = Servo quality/ reduced friction
A = Chevron seal kits
For phosphate ester HFD-R and polyol ester HFD-U
S = Servo quality/ reduced friction
V = Standard seal system FKM
B = Chevron seal kits

Option
Z = Additional options, fill fields for additional options
W = Without additional options, do **not** fill fields for additional options

Ordering code series CGH2

Additional options

Fields for additional options

	Z					

Inductive proxiwithy switches **without** mating connector [37)] **= E**
Mating connector - separate order see page 44
without inductive proxiwithy switches **= W**

Additional guide rings [10), 28)] **= F**
Without additional guide rings **= W**

Threaded coupling, on both sides **= A**
Without threaded coupling **= W**

B = Flanged grease nipple
W = Standard conical grease nipple

Y = [16)] Specify the piston rod extension LY in the clear text in mm
W = Without piston rod extension

Order examples:

Without additional options: **CGH2MF3/100/70/500A3X/B11CHUMW**

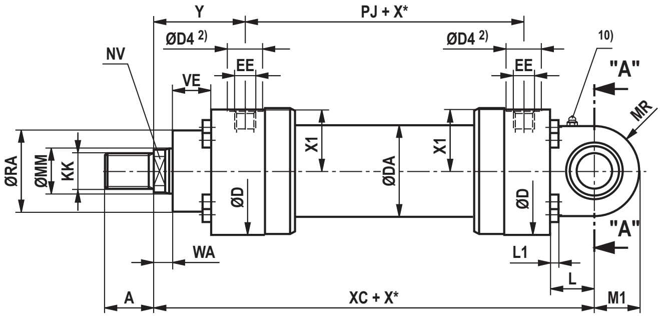
With additional options: **CGH2MF3/100/70/500A3X/B11CHUMZ EWAWW**

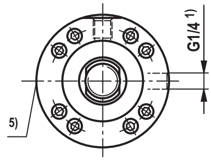
2

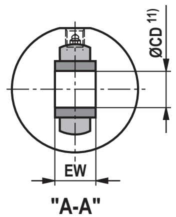
1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the "XV" dimensions in the clear text in mm
3) Max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) observe pages 60 to 62
9) Only piston Ø 80 to 320 mm
10) Seal designs A, B not possible; Piston Ø 220 to 320 mm standard
16) Only at left piston rod side (orientation: Catalog figures)
17) Only one plain clevis / self-aligning clevis mounted, left piston rod side (orientation: Catalog figures)
18) Not standardized
21) Only piston Ø 63 to 200 mm
22) Only piston rod Ø 25 to 40 mm
23) Only piston rod Ø 25 to 140 mm
28) With seal design "L" standard
30) All graphical presentations in the data sheet show position 1
31) With MS2, only position 11 is possible
33) Version does not comply with ISO 6022
36) Not possible with piston rod Ø 45 to 140 mm
37) Min. stroke length = 20 mm

Swivel eye at base CDH2: MP3

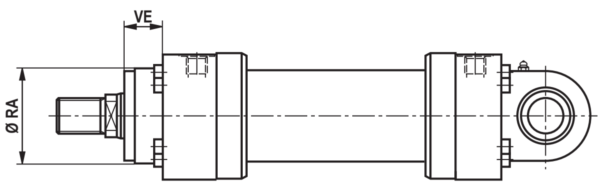
CDH2 MP3







CDH2 MP3: With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH2: MP3 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	XC
40 [6]	25/28	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	282
50	32/36	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	305
63	40/45	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	348
80	50/56	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	395
100	63/70	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	442
125	80/90	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	520
140	90/100	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	580
160	100/110	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	617
180	110/125	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	690
200	125/140	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	756
220 [6]	140/160	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 [3]	244	326	174	42	890
250	160/180	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42	903
280 [6]	180/200	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48	1072
320	200/220	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48	1080

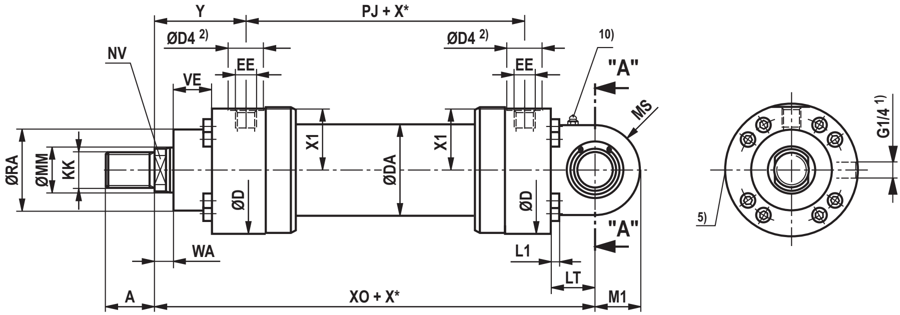
ØAL	ØMM	L	L1	MR	M1	ØCD H9	EW h12	ØRA [7]	VE [7]	ØRA [8]	VE [8]
40 [6]	25/28	53	8	32	32	25	25	52	29	88	–
50	32/36	61	8	40	40	32	32	63	29	102	–
63	40/45	74	8	50	50	40	40	75	32	120	–
80	50/56	90	10	63	63	50	50	90	36	145	–
100	63/70	102	12	71	71	63	63	110	41	170	–
125	80/90	124	16	90	90	80	80	132	45	206	–
140	90/100	149	16	100	100	90	90	145	45	226	–
160	100/110	150	16	112	112	100	100	160	50	200	50
180	110/125	180	20	129	129	110	110	185	55	220	55
200	125/140	206	20	145	145	125	125	200	61	235	61
220 [6]	140/160	253	20	179 [12]	187 [12]	160	160	235	71	270	71
250	160/180	253	24	179 [12]	187 [12]	160	160	250	71	300	71
280 [6]	180/200	320	30	230 [12]	240 [12]	200	200	295	88	325	88
320	200/220	320	30	231 [12]	241 [12]	200	200	320	88	365	88

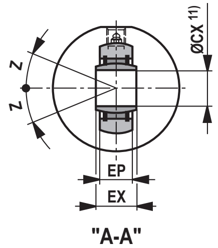
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
10) Standard design "W"
grease nipple cone head form A according to DIN 71412
11) Related bolt Ø f8
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

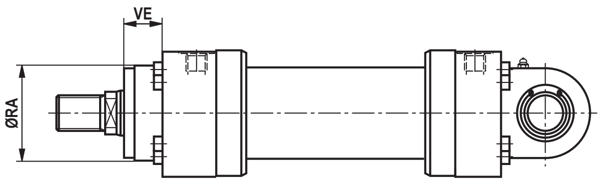
Self-aligning clevis at base CDH2: MP5

CDH2 MP5





CDH2 MP5: With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH2: MP5 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	XO
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	282
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	305
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	348
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	395
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	442
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	520
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	580
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	617
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	690
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	756
220 [6]	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 [3]	244	326	174	42	890
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42	903
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48	1072
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48	1080

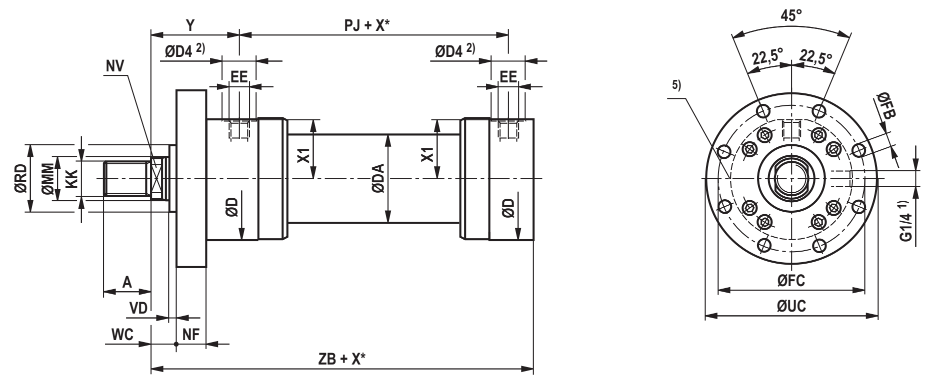
ØAL	ØMM	LT	L1	MS	M1	ØCX [11] H7	EP	EX h12	ØRA [7]	VE [7]	ØRA [8]	VE [8]	Z
40 [6]	**25/28**	53	8	32	32	25	22	25	52	29	88	–	2°
50	**32/36**	61	8	40	40	32	27	32	63	29	102	–	4°
63	**40/45**	74	8	50	50	40	32	40	75	32	120	–	4°
80	**50/56**	90	10	63	63	50	40	50	90	36	145	–	4°
100	**63/70**	102	12	71	71	63	52	63	110	41	170	–	4°
125	**80/90**	124	16	90	90	80	66	80	132	45	206	–	4°
140	**90/100**	149	16	100	100	90	72	90	145	45	226	–	4°
160	**100/110**	150	16	112	112	100	84	100	160	50	200	50	4°
180	**110/125**	180	20	129	129	110	88	110	185	55	220	55	4°
200	**125/140**	206	20	145	145	125	102	125	200	61	235	61	4°
220 [6]	**140/160**	253	20	179 [12]	187 [12]	160	130	160	235	71	270	71	4°
250	**160/180**	253	24	179 [12]	187 [12]	160	130	160	250	71	300	71	4°
280 [6]	**180/200**	320	30	230 [12]	240 [12]	200	138	200	295	88	325	88	4°
320	**200/220**	320	30	231 [12]	241 [12]	200	162	200	320	88	365	88	4°

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

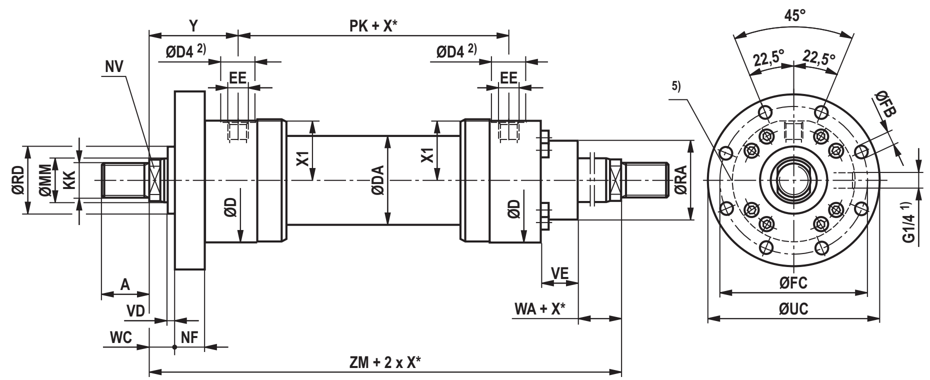
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
10) Standard design "W"
grease nipple cone head form A according to DIN 71412
11) Related bolt-Ø f8
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

Round flange at head CDH2/CGH2: MF3

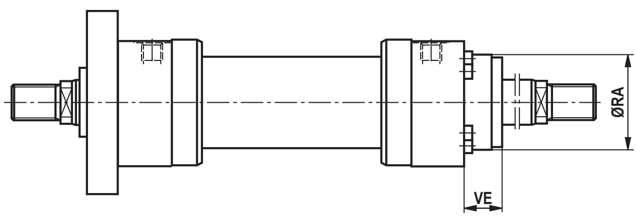
CDH2 MF3



CGH2 MF3 10)



CGH2 MF3 10): With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH2/CGH2: MF3 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40 6)	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40
220 6)	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 3)	244	326	174	42
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 3)	257	326	194	42
280 6)	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 3)	290	375	220,5	48
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 3)	282	391	243	48

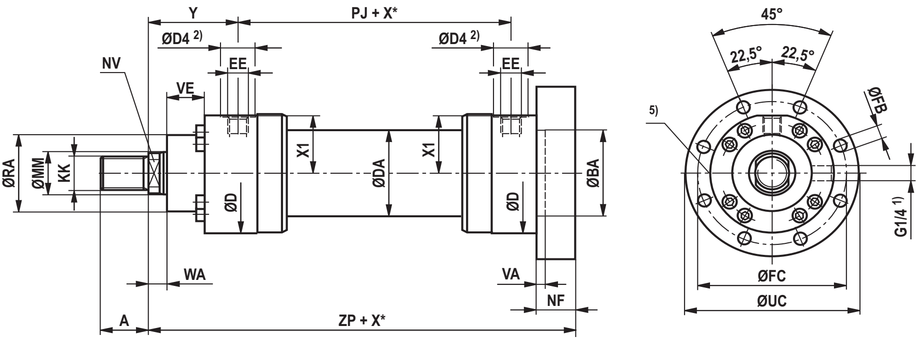
ØAL	ØMM	ØRD f8	WC	VD	NF js13	PK	ZB max	ZM	ØFB H13	ØFC js13	ØUC -1	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40 6)	**25/28**	52	22	4	25	120	230	286	11	115	138	52	29	88	–
50	**32/36**	63	22	4	25	120	244	316	13,5	132	155	63	29	102	–
63	**40/45**	75	25	4	28	133	274	357	13,5	150	175	75	32	120	–
80	**50/56**	90	28	4	32	155	305	395	17,5	180	210	90	36	145	–
100	**63/70**	110	32	5	36	171	340	439	22	212	250	110	41	170	–
125	**80/90**	132	36	5	40	205	396	511	22	250	290	132	45	206	–
140	**90/100**	145	36	5	40	219	430	551	26	285	330	145	45	226	–
160	**100/110**	160	40	5	45	235	467	605	26	315	360	160	50	200	50
180	**110/125**	185	45	5	50	264	510	652	33	355	410	185	55	220	55
200	**125/140**	200	45	5	56	278	550	718	33	385	440	200	61	235	61
220 6)	**140/160**	235	50	8	63	326	637	814	39	435	500	235	71	270	71
250	**160/180**	250	50	8	63	326	650	840	39	475	540	250	71	300	71
280 6)	**180/200**	295	56	8	80	375	752	955	45	555	630	295	88	325	88
320	**200/220**	320	56	8	80	391	760	955	45	600	675	320	88	365	88

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

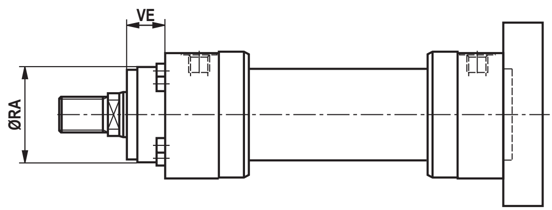
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
10) Double-acting cylinder not standardized

Round flange at base CDH2: MF4

CDH2 MF4



CDH2 MF4: With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH2: MF4 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40
220 [6]	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 [3]	244	326	174	42
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48

ØAL	ØMM	ZP	NF js13	VA	ØBA H8	ØFB H13	ØFC js13	ØUC -1	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40 [6]	**25/28**	250	25	5	52	11	115	138	52	29	88	–
50	**32/36**	265	25	4	63	13,5	132	155	63	29	102	–
63	**40/45**	298	28	4	75	13,5	150	175	75	32	120	–
80	**50/56**	332	32	5	90	17,5	180	210	90	36	145	–
100	**63/70**	371	36	5	110	22	212	250	110	41	170	–
125	**80/90**	430	40	6	132	22	250	290	132	45	206	–
140	**90/100**	465	40	5	145	26	285	330	145	45	226	–
160	**100/110**	505	45	7	160	26	315	360	160	50	200	50
180	**110/125**	550	50	10	185	33	355	410	185	55	220	55
200	**125/140**	596	56	10	200	33	385	440	200	61	235	61
220 [6]	**140/160**	690	63	10	235	39	435	500	235	71	270	71
250	**160/180**	703	63	10	250	39	475	540	250	71	300	71
280 [6]	**180/200**	822	80	10	295	45	555	630	295	88	325	88
320	**200/220**	830	80	10	320	45	600	675	320	88	365	88

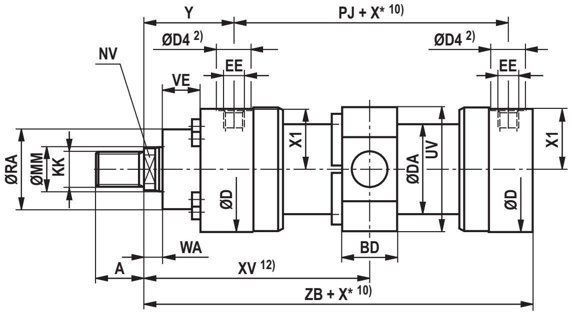
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

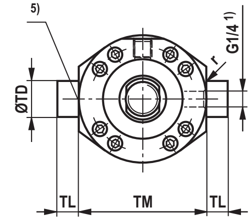
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B

2

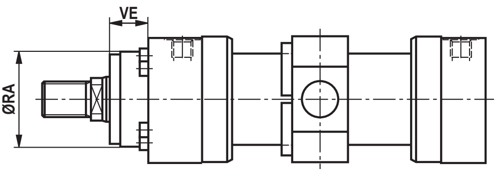
Trunnion CDH2/CGH2: MT4

CDH2 MT4

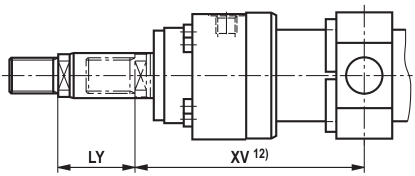




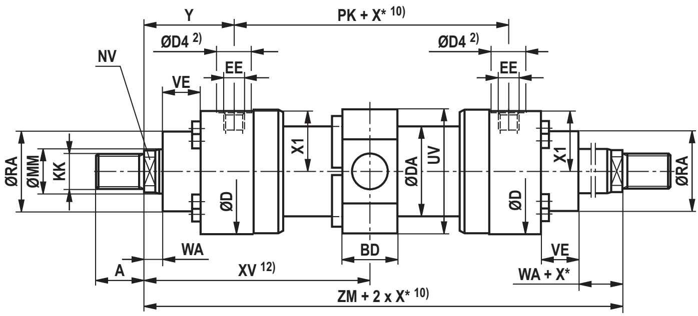
CDH2 MT4: With seal design "A", "B" and ØAL 160 to 320 mm

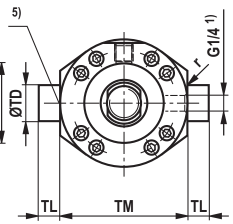


Dimensions for cylinder with piston rod extension "LY" in retracted condition

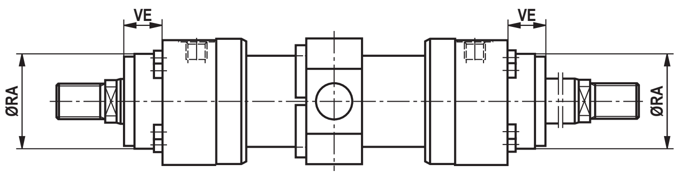


CGH2 MT4 11)





CGH2 MT4 11): With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH2/CGH2: MT4 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40
220 [6]	**140/160**	M125x4	125	120/140	355	273	65	G1 1/2	M48x2 [3]	244	326	174	42
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48

ØAL	ØMM	PK	ZB max	ZM	X* min	XV [14] cent	XV [12] min	XV [12] max	BD	UV [15]	ØTD f8	TL js16	TM h12	r	ØRA [7]	VE [7]	ØRA [8]	VE [8]
40 [6]	**25/28**	120	230	286	22	143+X*/2	154	140+X*	38	97	25	20	95	0,8	52	29	88	–
50	**32/36**	120	244	316	32	158+X*/2	174	151+X*	38	111	32	25	112	0,8	63	29	102	–
63	**40/45**	133	274	357	47	178,5+X*/2	202	167+X*	48	129	40	32	125	1	75	32	120	–
80	**50/56**	155	305	395	58	197,5+X*/2	226,5	180,5+X*	58	163	50	40	150	1	90	36	145	–
100	**63/70**	171	340	439	79	219,5+X*/2	259	195+X*	78	188	63	50	180	1,2	110	41	170	–
125	**80/90**	205	396	511	91	255,5+X*/2	301	225+X*	98	234	80	63	224	1,2	132	45	206	–
140	**90/100**	219	430	551	121	275,5+X*/2	336	230+X*	118	257	90	70	265	1,5	145	45	226	–
160	**100/110**	235	467	605	142	302,5+X*/2	373,5	251,5+X*	128	287	100	80	280	1,5	160	50	200	50
180	**110/125**	264	510	652	158	326+X*/2	405	267+X*	138	328	110	90	320	1,5	185	55	220	55
200	**125/140**	278	550	718	204	359+X*/2	461	277+X*	178	343	125	100	335	1,5	200	61	235	61
220 [6]	**140/160**	326	637	814	200	407+X*/2	507	307+X*	180	393	160	125	385	1,5	235	71	270	71
250	**160/180**	326	650	840	210	420+X*/2	525	315+X*	180	433	160	125	425	1,5	250	71	300	71
280 [6]	**180/200**	375	752	955	241	477,5+X*/2	598	357+X*	220	486	200	160	480	2	295	88	325	88
320	**200/220**	391	760	955	245	477,5+X*/2	600	355+X*	220	536	200	160	530	2	320	88	365	88

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

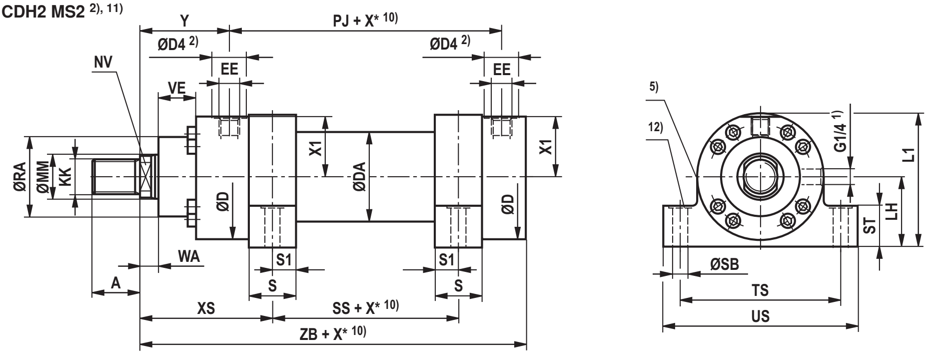
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
10) Observe the min. stroke length "X*min"
11) Double-acting cylinder not standardized
12) When ordering, always specify the "XV" dimension in the clear text. Preferred XV dimension:
Observe the trunnion position in the cylinder center XVmin and XVmax
14) XVcent recommendation:
Trunnion position in cylinder center
15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

Important installation information: During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

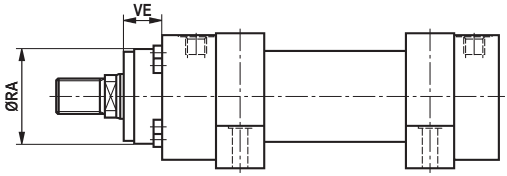
2

Foot mounting CDH2/CGH2: MS2

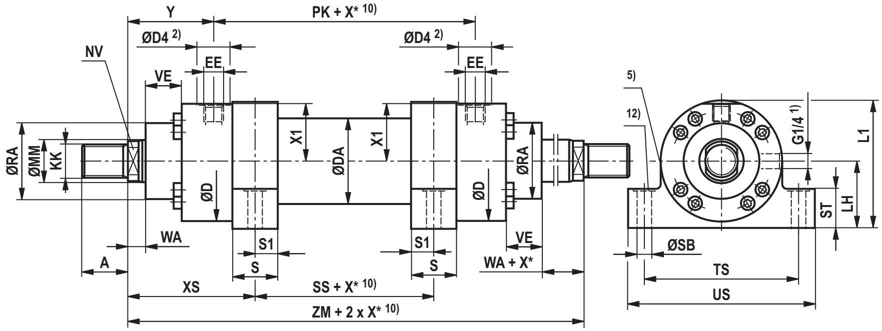
CDH2 MS2 [2), 11)]



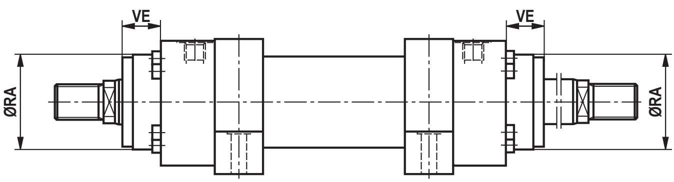
CDH2 MS2 [11)]: With seal design "A", "B" and ØAL 160 to 320 mm



CGH2 MS2 [11)]



CGH2 MS2 [11)]: With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH2/CGH2: MS2 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40 6)	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40
220 6)	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 3)	244	326	174	42
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 3)	257	326	194	42
280 6)	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 3)	290	375	220,5	48
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 3)	282	391	243	48

ØAL	ØMM	PK	XS	ZB max	ZM	SS	X* 10) min	S	S1	ØSB H13	ST	TS js13	US 15)	LH	L1	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40 6)	**25/28**	120	118	230	286	50	1	30	15	11	32	110	140	45	93	52	29	88	–
50	**32/36**	120	135,5	244	316	45	1	35	17,5	11	37	130	161	55	110	63	29	102	–
63	**40/45**	133	154	274	357	49	1	40	20	13,5	42	150	183	65	129	75	32	120	–
80	**50/56**	155	171,5	305	395	52	2	50	25	17,5	47	180	220	75	149	90	36	145	–
100	**63/70**	171	189	340	439	61	3	60	30	22	57	210	260	90	181	110	41	170	–
125	**80/90**	205	218	396	511	75	1	70	35	26	67	255	313	105	215	132	45	206	–
140	**90/100**	219	240,5	430	551	70	19	85	42,5	30	72	290	359	115	235	145	45	226	–
160	**100/110**	235	270	467	605	65	44	105	52,5	33	77	330	402	135	277	160	50	200	50
180	**110/125**	264	291,5	510	652	69	50	115	57,5	40	92	360	445	150	305	185	55	220	55
200	**125/140**	278	322,5	550	718	73	56	125	62,5	40	97	385	471	160	322	200	61	235	61
220 6)	**140/160**	326	369,5	637	814	75	100	155	77,5	45	102	445	541	185	373	235	71	270	71
250	**160/180**	326	382,5	650	840	75	100	155	77,5	52	112	500	610	205	414	250	71	300	71
280 6)	**180/200**	375	415,5	752	955	124	51	155	77,5	52	142	550	661	235	469	295	88	325	88
320	**200/220**	391	435	760	955	85	125	190	95	62	142	610	732	255	512	320	88	365	88

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
10) Observe the min. stroke length "X*min"
11) Not standardized
12) Recess 2 mm deep, for hexagon socket head cap screws ISO 4762. The screws must not be subjected to shear force. Force distribution via additional external fitting strips.
15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

2

Ordering code series CSH2

CS	H2		/	/	/	A	3X	/							Z

Differential cylinder with position measurement system [18] **= CS**

Series = **H2**

Types of mounting

Swivel eye at base [1]	= **MP3**
Self-aligning clevis at base	= **MP5**
Round flange at head	= **MF3**
Round flange at base	= **MF4**
Trunnion [2]	= **MT4**
Foot mounting	= **MS2**

Piston Ø (AL) 40 to 320 mm

Piston rod Ø (MM) 28 to 220 mm

Stroke length in mm [3]

Design principle

Head and base flanged = **A**

Component series

30 to 39 Unchanged installation and connection dimensions = **3X**

Line connection / version

According to ISO 1179-1 (pipe thread ISO 228-1)	= **B**
According to ISO 9974-1 (metric thread ISO 261) [33]	= **M**
Flange porting pattern according to ISO 6162-1 tab. 2 type 1 (≙ SAE 3000 PSI) [4), 21)]	= **F**
Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) [4), 9)]	= **D**
Flange porting pattern according to ISO 6164 tab. 1 [1), 4)]	= **K**
Flange porting pattern according to ISO 6164 tab. 2 [4]	= **H**
According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31]	= **C**

For directional and control valves

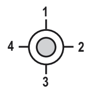
Subplate size 6 [4) 5)]	= **P**
Subplate size 10 [4) 6)]	= **T**
Subplate size 16 [4) 7)]	= **U**
Subplate size 25 [4) 32)]	= **V**

For SL and SV valves

Subplate size 6 [4) 5) 15)]	= **A**
Subplate size 10 [4) 6) 15)]	= **E**
Subplate size 20 [4) 7) 15)]	= **L**
Subplate size 30 [4) 15) 32)]	= **N**

Line connection/position at head

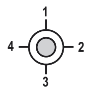
1 = [30]
2 = [30]
3 = [30]
4 = [30]



View to piston rod

Line connection/position at base

1 = [30]
2 = [30]
3 = [30]
4 = [30]



View to piston rod

Piston rod design

C = Hard chromium-plated
N = [19] Nickel-plated and hard chromium-plated

Piston rod end

H = Thread for plain clevis CGKD
F = With mounted plain clevis CGKD

End position cushioning

U = Without
E = [20] On both sides, adjustable

Seal design

For mineral oil HL, HLP and HFA

M = [29] Standard seal system
L = Standard seal system with guide rings
R = [29] Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC

G = [29] Standard seal system HFC
T = [29] Servo quality/reduced friction

For phosphate ester HFD-R and polyol ester HFD-U

S = [29] Servo quality/reduced friction
V = [29] Standard seal system FKM

Option

Z = Additional options, fill fields for additional options

Additional options

Fields for additional options

	Z		T				

Position measurement system (magnetostrictive) **without** mating connector = **T**
Mating connector - separate order, see pages 47, 49

Analog output 4-20 mA	= **C**
Analog output 0-10 V	= **F**
Digital output SSI	= **D**
Profibus D63	= **N**
Profibus D53	= **P**

Threaded coupling, on both sides	= **A**
Without threaded coupling	= **W**

B = Flanged grease nipple
W = Standard conical grease nipple

Y = Piston rod extension LY specify in the clear text in mm
W = Without piston rod extension

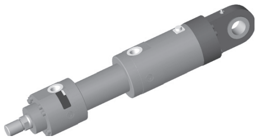
Order example:
CSH2MP5/100/70/500A3X/B11CHUTZ TFABW

Ordering code series CSH2

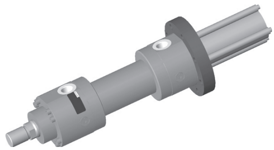
1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the "XV" dimension in the clear text in mm.
3) Max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) observe pages 60 to 62
4) Not possible with MF4
5) Piston Ø 40 to 80 mm, only position 11, subplates only possible in combination with line connection "B" at the head
6) Piston Ø 63 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
7) Piston Ø 125 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
9) Only piston Ø 80 to 320 mm
15) Subplates for SL and SV valves (isolator valves)
Note: Seal designs T, G, L, R, S and V are not designed for the static holding function!
18) Not standardized
19) Only piston rod Ø 28 to 140 mm
20) Possible from piston rod Ø 45 mm
21) Only piston Ø 63 to 200 mm
29) With CSH, by default with guide belts
30) All graphical presentations in the data sheet show position 1
31) With MS2, only position 11 is possible
32) Piston Ø 180 to 200 mm, only position 11, subplates only possible in combination with line connection "B" at the head
33) Version does not comply with ISO 6022

Overview of types of mounting: Series CSH2

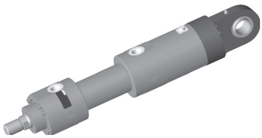
CSH2 MP3
see page 24, 25



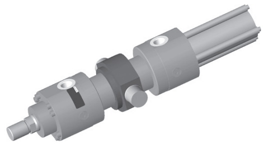
CSH2 MF4
see page 30, 31



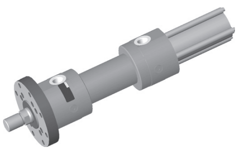
CSH2 MP5
see page 26, 27



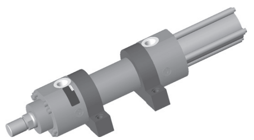
CSH2 MT4
see page 32, 33



CSH2 MF3
see page 28, 29



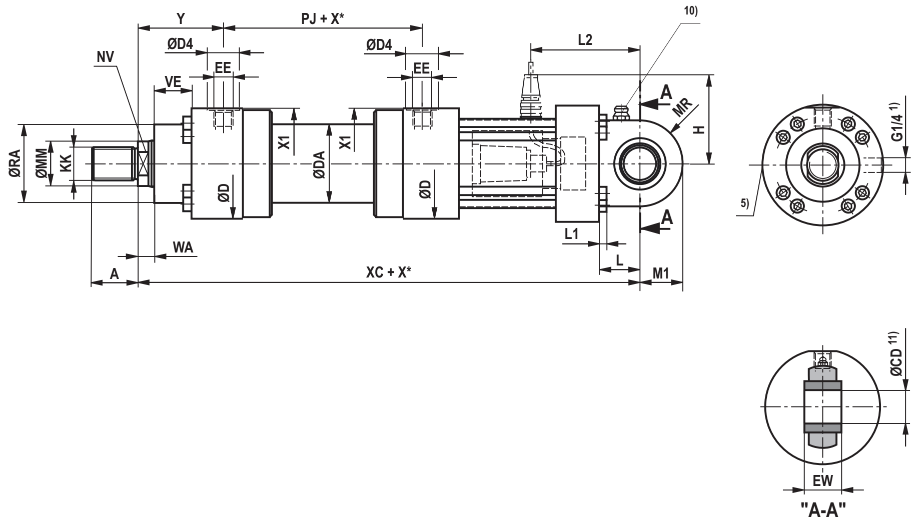
CSH2 MS2
see page 34, 35



Swivel eye at base CSH2: MP3

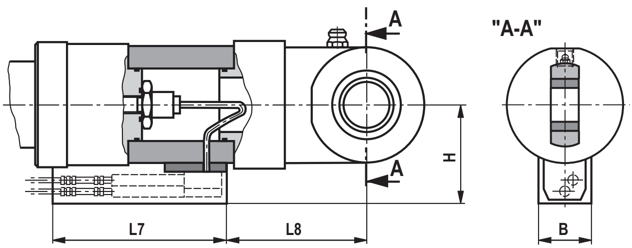
CSH2 MP3

for position measurement system output "C", "F" and "D"



CSH2 MP3

for position measurement system output "N" and "P"



Dimensions CSH2: MP3 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	XC	X* max
40 6)	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	447	1000
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	470	1000
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	526	2000
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	580	2000
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	617	3000
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	693	3000
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	755	3000
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	787	3000
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	855	3000
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	926	3000
220 6)	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 3)	244	326	174	42	1100	3000
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 3)	257	326	194	42	1115	3000
280 6)	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 3)	290	375	220,5	48	1295	3000
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 3)	282	391	243	48	1300	3000

ØAL	ØMM	L	L1	MR	M1	ØCD H9	EW h12	ØRA	VE	L2	H 13)	H 14)	L7	L8	B
40 6)	**25/28**	53	8	32	32	25	25	52	29	124	106	115	200	101	64
50	**32/36**	61	8	40	40	32	32	63	29	132	113	120	200	109	64
63	**40/45**	74	8	50	50	40	40	75	32	150	122	130	200	127	64
80	**50/56**	90	10	63	63	50	50	90	36	176,5	133	125	200	149	64
100	**63/70**	102	12	71	71	63	63	110	41	192	148	135	200	164	64
125	**80/90**	124	16	90	90	80	80	132	45	227	166	145	200	203	64
140	**90/100**	149	16	100	100	90	90	145	45	262	176	155	200	236	64
160	**100/110**	150	16	112	112	100	100	160	50	269,5	196	165	200	237	64
180	**110/125**	180	20	129	129	110	110	185	55	307	210	175	200	274	64
200	**125/140**	206	20	145	145	125	125	200	61	333	217	190	200	302	64
220 6)	**140/160**	253	20	179 12)	187 12)	160	160	235	71	418	254	205	200	386	64
250	**160/180**	253	24	179 12)	187 12)	160	160	250	71	420	269	220	200	387	64
280 6)	**180/200**	320	30	230 12)	240 12)	200	200	295	88	510	286	280	200	475	64
320	**200/220**	320	30	231 12)	241 12)	200	200	320	88	520	309	300	200	485	64

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length

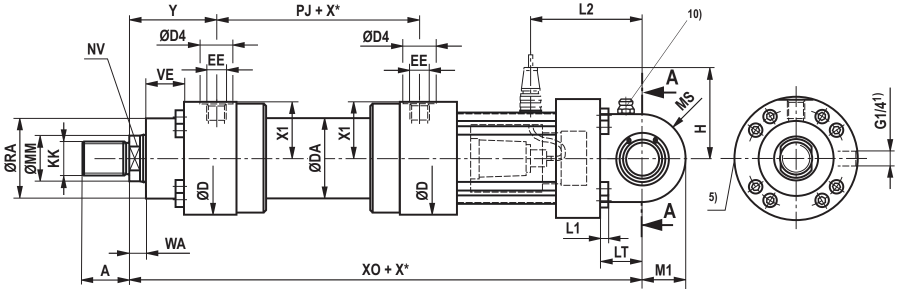
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
10) Standard design "W" grease nipple cone head form A according to DIN 71412
11) Related bolt Ø f8
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting
13) Dimensions for position transducer output „N" and „P"
14) Dimensions for position transducer output „C", „F" and „D"

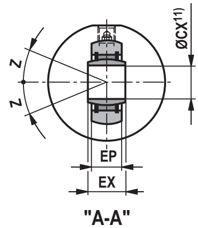
2

Gelenkauge am Boden CSH2: MP5

CSH2 MP5

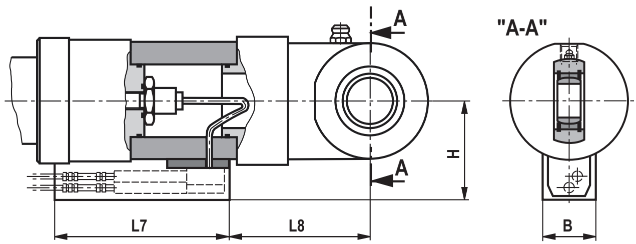
for position measurement system output "C", "F" and "D"





CSH2 MP5

for position measurement system output "N" and "P"



Dimensions CSH2: MP5 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	XO	X* max
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	447	1000
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	470	1000
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	526	2000
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	580	2000
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	617	3000
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	693	3000
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	755	3000
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	787	3000
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	855	3000
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	926	3000
220 [6]	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 [3]	244	326	174	42	1100	3000
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42	1115	3000
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48	1295	3000
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48	1300	3000

ØAL	ØMM	LT	L1	MS	M1	ØCX [11] H7	EP	EX h12	ØRA	VE	Z	L2	H [13]	H [14]	L7	L8	B
40 [6]	**25/28**	53	8	32	32	25	22	25	52	29	2°	124	106	115	200	101	64
50	**32/36**	61	8	40	40	32	27	32	63	29	4°	132	113	120	200	109	64
63	**40/45**	74	8	50	50	40	32	40	75	32	4°	150	122	130	200	127	64
80	**50/56**	90	10	63	63	50	40	50	90	36	4°	176,5	133	125	200	149	64
100	**63/70**	102	12	71	71	63	52	63	110	41	4°	192	148	135	200	164	64
125	**80/90**	124	16	90	90	80	66	80	132	45	4°	227	166	145	200	203	64
140	**90/100**	149	16	100	100	90	72	90	145	45	4°	262	176	155	200	236	64
160	**100/110**	150	16	112	112	100	84	100	160	50	4°	269,5	196	165	200	237	64
180	**110/125**	180	20	129	129	110	88	110	185	55	4°	307	210	175	200	274	64
200	**125/140**	206	20	145	145	125	102	125	200	61	4°	333	217	190	200	302	64
220 [6]	**140/160**	253	20	179 [12]	187 [12]	160	130	160	235	71	4°	418	254	205	200	386	64
250	**160/180**	253	24	179 [12]	187 [12]	160	130	160	250	71	4°	420	269	220	200	387	64
280 [6]	**180/200**	320	30	230 [12]	240 [12]	200	138	200	295	88	4°	510	286	280	200	475	64
320	**200/220**	320	30	231 [12]	241 [12]	200	162	200	320	88	4°	520	309	300	200	485	64

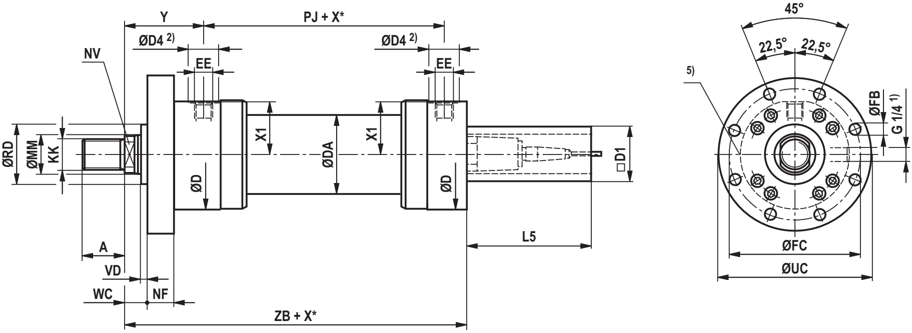
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
10) Standard design "W" grease nipple cone head form A according to DIN 71412
11) Related bolt Ø m6
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting
13) Dimensions for position transducer output „N“ and „P“
14) Dimensions for position transducer output „C“, „F“ and „D“

2

Round flange at head CSH2: MF3

CSH2 MF3



Dimensions CSH2: MF3 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	X* max	L5	D1 max
40 6)	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	1000	166	80
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	1000	166	96
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	2000	166	96
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	2000	166	96
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	3000	166	96
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	3000	166	96
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	3000	166	96
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	3000	166	96
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	3000	166	96
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	3000	166	96
220 6)	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 3)	244	326	174	3000	166	96
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 3)	257	326	194	3000	166	96
280 6)	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 3)	290	375	220,5	3000	166	96
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 3)	282	391	243	3000	166	96

ØAL	ØMM	ØRD f8	WC	VD	NF js13	ZB max	ØFB H13	ØFC js13	ØUC -1
40 6)	**25/28**	52	22	4	25	239	11	115	138
50	**32/36**	63	22	4	25	254	13,5	132	155
63	**40/45**	75	25	4	28	299	13,5	150	175
80	**50/56**	90	28	4	32	332,5	17,5	180	210
100	**63/70**	110	32	5	36	362	22	212	250
125	**80/90**	132	36	5	40	410	22	250	290
140	**90/100**	145	36	5	40	440	26	285	330
160	**100/110**	160	40	5	45	472,5	26	315	360
180	**110/125**	185	45	5	50	510	33	355	410
200	**125/140**	200	45	5	56	550	33	385	440
220 6)	**140/160**	235	50	8	63	637	39	435	500
250	**160/180**	250	50	8	63	650	39	475	540
280 6)	**180/200**	295	56	8	80	752	45	555	630
320	**200/220**	320	56	8	80	760	45	600	675

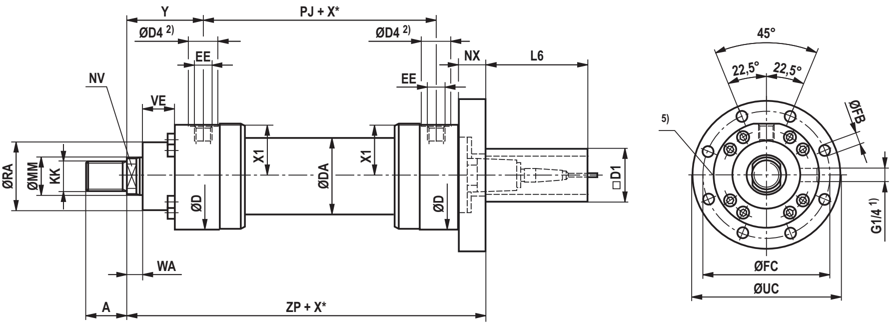
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized

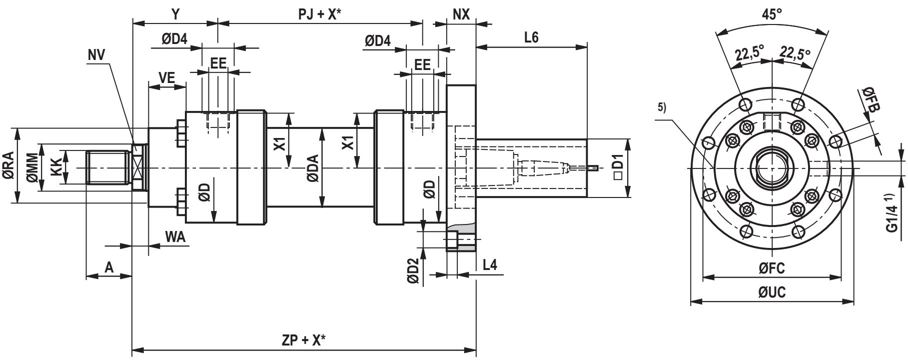
2

Round flange at base CSH2: MF4

CSH2 MF4; ØAL 40 to 100 mm



CSH2 MF4; ØAL 125 to 320 mm



Dimensions CSH2: MF4 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	X* max	L4
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	1000	3
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	1000	3
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	2000	0
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	2000	0
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	3000	0
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	3000	21,5
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	3000	25,5
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	3000	25,5
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	3000	32
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	3000	32
220 [6]	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 [3]	244	326	174	42	3000	38
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42	3000	38
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48	3000	44
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48	3000	44

ØAL	ØMM	L6	ØD2	D1 max	ZP	NX js13	ØFB H13	ØFC js13	ØUC -1	ØRA	VE
40 [6]	**25/28**	166	18	80	262	28	11	115	138	52	29
50	**32/36**	166	20	96	278	28	13,5	132	155	63	29
63	**40/45**	166	0	96	313	28	13,5	150	175	75	32
80	**50/56**	166	0	96	350	32	17,5	180	210	90	36
100	**63/70**	138	0	96	390	36	22	212	250	110	41
125	**80/90**	131	33	96	445	55	22	250	290	132	45
140	**90/100**	121	40	96	485	60	26	285	330	145	45
160	**100/110**	113,5	40	96	525	65	26	315	360	160	50
180	**110/125**	106	48	96	570	70	33	355	410	185	55
200	**125/140**	100	48	96	616	76	33	385	440	200	61
220 [6]	**140/160**	88	57	96	715	88	39	435	500	235	71
250	**160/180**	86	57	96	730	90	39	475	540	250	71
280 [6]	**180/200**	61	66	96	857	115	45	555	630	295	88
320	**200/220**	61	66	96	865	115	45	600	675	320	88

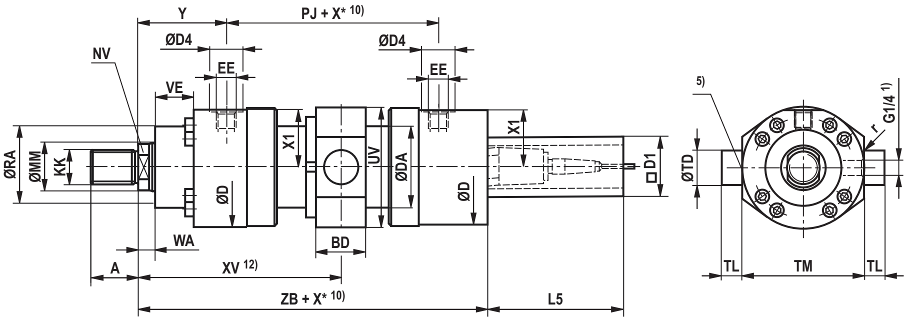
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized

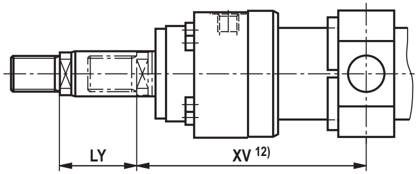
2

Trunnion CSH2: MT4

CSH2 MT4



Dimensions for cylinder with piston rod extension "LY" in retracted condition



Dimensions CSH2: MT4 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	X* max	L5	D1 max
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	1000	166	80
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	1000	166	96
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	2000	166	96
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	2000	166	96
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	3000	166	96
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	3000	166	96
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	3000	166	96
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	3000	166	96
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	3000	166	96
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	3000	166	96
220 [6]	**140/160**	M125x4	125	120/140	355	273	65	G1 1/2	M48x2 [3]	244	326	174	42	3000	166	96
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42	3000	166	96
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48	3000	166	96
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48	3000	166	96

ØAL	ØMM	ZB max	X* min	XV [14] cent	XV [12] min	XV [12] max	BD	UV [15]	ØTD f8	TL js16	TM h12	r	ØRA	VE
40 [6]	**25/28**	239	22	143+X*/2	154	140+X*	38	97	25	20	95	0,8	52	29
50	**32/36**	254	32	158+X*/2	174	151+X*	38	111	32	25	112	0,8	63	29
63	**40/45**	299	47	178,5+X*/2	202	167+X*	48	129	40	32	125	1	75	32
80	**50/56**	332,5	58	197,5+X*/2	226,5	180,5+X*	58	163	50	40	150	1	90	36
100	**63/70**	362	79	219,5+X*/2	259	195+X*	78	188	63	50	180	1,2	110	41
125	**80/90**	410	91	255,5+X*/2	301	225+X*	98	234	80	63	224	1,2	132	45
140	**90/100**	440	121	275,5+X*/2	336	230+X*	118	257	90	70	265	1,5	145	45
160	**100/110**	472,5	142	302,5+X*/2	373,5	251,5+X*	128	287	100	80	280	1,5	160	50
180	**110/125**	510	158	326+X*/2	405	267+X*	138	328	110	90	320	1,5	185	55
200	**125/140**	550	204	359+X*/2	461	277+X*	178	343	125	100	335	1,5	200	61
220 [6]	**140/160**	637	200	407+X*/2	507	307+X*	180	393	160	125	385	1,5	235	71
250	**160/180**	650	210	420+X*/2	525	315+X*	180	433	160	125	425	1,5	250	71
280 [6]	**180/200**	752	241	477,5+X*/2	598	357+X*	220	486	200	160	480	2	295	88
320	**200/220**	760	245	477,5+X*/2	600	355+X*	220	536	200	160	530	2	320	88

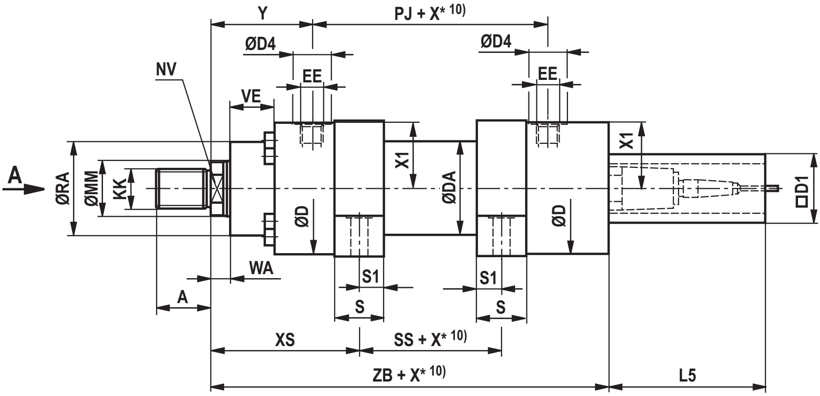
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
10) Observe the min. stroke length "X*min"
11) Double-acting cylinder not standardized
12) When ordering, always specify the "XV" dimension in the clear text. Preferred XV dimension: Observe the trunnion position in the cylinder center XVmin and XVmax
14) XVcent recommendation: Trunnion position in cylinder center
15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

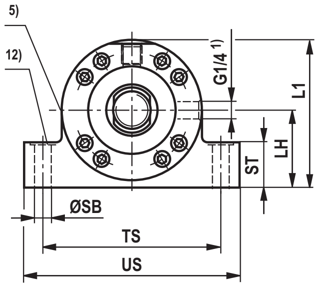
Important installation information: During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product's service life.

Foot mounting CSH2: MS2

CSH1 MS2



View A



Dimensions CSH2: MS2 (dimensions in mm)

ØAL	ØMM	KK	A	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	X* max
40 [6]	**25/28**	M20x1,5	28	19/22	88	52	34	G1/2	M22x1,5	83	120	41	18	1000
50	**32/36**	M27x2	36	27/30	102	62	34	G1/2	M22x1,5	98	120	48,5	18	1000
63	**40/45**	M33x2	45	32/36	120	78	42	G3/4	M27x2	112	133	56,5	21	2000
80	**50/56**	M42x2	56	41/46	145	95	42	G3/4	M27x2	120	155	69,5	24	2000
100	**63/70**	M48x2	63	50/60	170	125	47	G1	M33x2	134	171	82	27	3000
125	**80/90**	M64x3	85	65/75	206	150	47	G1	M33x2	153	205	100,5	31	3000
140	**90/100**	M72x3	90	75/85	226	170	58	G1 1/4	M42x2	166	219	109,5	31	3000
160	**100/110**	M80x3	95	85/95	265	190	58	G1 1/4	M42x2	185	235	129,5	35	3000
180	**110/125**	M90x3	105	95/110	292	210	58	G1 1/4	M42x2	194	264	143,5	40	3000
200	**125/140**	M100x3	112	110/120	306	235	58	G1 1/4	M42x2	220	278	150,5	40	3000
220 [6]	**140/160**	M125x4	125	120/140	355	270	65	G1 1/2	M48x2 [3]	244	326	174	42	3000
250	**160/180**	M125x4	125	140/160	395	305	65	G1 1/2	M48x2 [3]	257	326	194	42	3000
280 [6]	**180/200**	M160x4	160	160/180	445	343	65	G1 1/2	M48x2 [3]	290	375	220,5	48	3000
320	**200/220**	M160x4	160	180/200	490	394	65	G1 1/2	M48x2 [3]	282	391	243	48	3000

ØAL	ØMM	L5	D1 max	XS	ZB max	SS	X* [10] min	S	S1	ØSB H13	ST	TS js13	US [15]	LH	L1 [15]	ØRA	VE
40 [6]	**25/28**	166	80	118	239	50	1	30	15	11	32	110	140	45	93	52	29
50	**32/36**	166	96	135,5	254	45	1	35	17,5	11	37	130	161	55	110	63	29
63	**40/45**	166	96	154	299	49	1	40	20	13,5	42	150	183	65	129	75	32
80	**50/56**	166	96	171,5	332,5	52	2	50	25	17,5	47	180	220	75	149	90	36
100	**63/70**	166	96	189	362	61	3	60	30	22	57	210	260	90	181	110	41
125	**80/90**	166	96	218	410	75	1	70	35	26	67	255	313	105	215	132	45
140	**90/100**	166	96	240,5	440	70	19	85	42,5	30	72	290	359	115	235	145	45
160	**100/110**	166	96	270	472,5	65	44	105	52,5	33	77	330	402	135	277	160	50
180	**110/125**	166	96	291,5	510	69	50	115	57,5	40	92	360	445	150	305	185	55
200	**125/140**	166	96	322,5	550	73	56	125	62,5	40	97	385	471	160	322	200	61
220 [6]	**140/160**	166	96	369,5	637	75	100	155	77,5	45	102	445	541	185	373	235	71
250	**160/180**	166	96	382,5	650	75	100	155	77,5	52	112	500	610	205	414	250	71
280 [6]	**180/200**	166	96	415,5	752	124	51	155	77,5	52	142	550	661	235	469	295	88
320	**200/220**	166	96	435	760	85	125	190	95	62	142	610	732	255	512	320	88

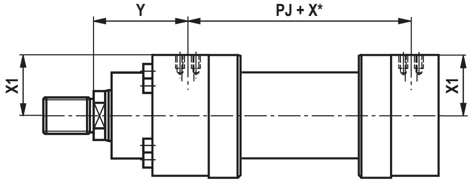
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Thread size does not correspond to ISO 6022; M50 x 2 available upon request
4) Flange connections see separate table pages 36 and 37
5) Throttle valve only with end position cushioning "E" (180° for bleeding)
6) Piston Ø not standardized
10) Observe the min. stroke length "X*min"
12) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 – The screws must not be subjected to shear force. Force distribution via additional external fitting strips.
15) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

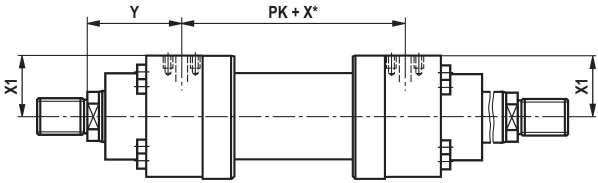
2

Flange connections

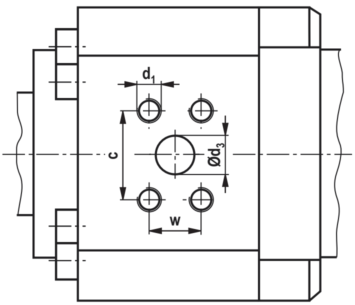
CDH2/CSH2



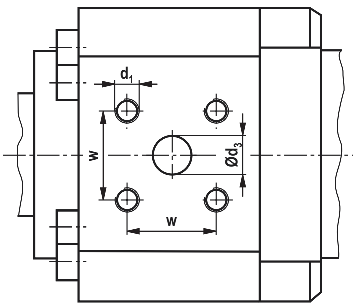
CGH2



Porting pattern for rectangular flange according to ISO 6162-1 tab. 2 type 1 and ISO 6162-2 tab. 2 type 1



Porting pattern for square flange according to ISO 6164 table 1 and ISO 6164 table 2



Flange connections

ØAL	Version "F" [6] ISO 6162-1 tab.2 type1 (200 - 350 bar) (≙ SAE 3000 PSI)											Version "K" [7] ISO 6164 tab.1 (250 bar)								
	Y	PJ PK	X1	Ød_3	Ød_3 [4]	c ±0,25	w ±0,25	d_1	t_1 [1]	t_1 [2]	p [3]	Y	PJ PK	X1	Ød_3	w ±0,25	d_1	t_1 [1]	t_1 [2]	p [3]
40	–	–	–	–	–	–	–	–	–	–	–	82	122	40,5	10	24,7	M6	12,5	10	250
50	–	–	–	–	–	–	–	–	–	–	–	97	122	48	10	24,7	M6	12,5	12,5	250
63	111	135	55	13	1/2“	38,1	17,5	M8	16	16	350	111	135	57	13	29,7	M8	16	16	250
80	123,5	148	68	13	1/2“	38,1	17,5	M8	16	16	350	123,5	148	69,5	13	29,7	M8	16	16	250
100	133	173	79	19	3/4“	47,6	22,3	M10	20	20	350	133	173	81,5	19	35,4	M8	16	16	250
125	153	205	98	25	1“	52,4	26,2	M10	20	20	350	157	197	100	19	35,4	M8	16	16	250
140	162	227	107	32	1 1/4“	58,7	30,2	M10	20	20	250	162	227	109	25	43,8	M10	20	20	250
160	181,5	242	127	32	1 1/4“	58,7	30,2	M10	20	20	250	181,5	242	128,5	25	43,8	M10	20	20	250
180	193	266	139	38	1 1/2“	69,9	35,7	M12	24	24	200	194	264	142	32	51,6	M12	24	24	250
200	219	280	146,5	38	1 1/2“	69,9	35,7	M12	24	24	200	220	278	148,5	32	51,6	M12	24	24	250

2

ØAL	Version "D" [8] ISO 6162-2 tab.2 type1 (400 bar) (≙ SAE 6000 PSI)											Version "H" [8] ISO 6164 tab.2 (400 bar)								
	Y	PJ PK	X1	Ød_3	Ød_3 [5]	c ±0,25	w ±0,25	d_1	t_1 [1]	t_1 [2]	p [3]	Y	PJ PK	X1	Ød_3	w ±0,25	d_1	t_1 [1]	t_1 [2]	p [3]
40	–	–	–	–	–	–	–	–	–	–	–	82	122	40,5	10	24,7	M6	12,5	10	400
50	–	–	–	–	–	–	–	–	–	–	–	97	122	48	10	24,7	M6	12,5	12,5	400
63	–	–	–	–	–	–	–	–	–	–	–	111	135	57	13	29,7	M8	16	16	400
80	120	155	67	13	1/2“	40,5	18,2	M8	16	14	400	123,5	148	69,5	13	29,7	M8	16	16	400
100	134	171	80,5	13	1/2“	40,5	18,2	M8	16	16	400	133	173	81,5	19	35,4	M8	16	16	400
125	153	205	97	19	3/4“	50,8	23,8	M10	20	20	400	157	197	100	19	35,4	M8	16	16	400
140	162	227	107	25	1“	57,2	27,8	M12	24	24	400	162	227	109	25	43,8	M10	20	20	400
160	181,5	242	127	25	1“	57,2	27,8	M12	24	24	400	181,5	242	128,5	25	43,8	M10	20	20	400
180	194	264	139,5	32	1 1/4“	66,6	31,8	M14	26	26	400	194	264	142	32	51,6	M12	24	24	400
200	220	278	147	32	1 1/4“	66,6	31,8	M14	26	26	400	220	278	148,5	32	51,6	M12	24	24	400
220	244	326	168	38	1 1/2“	79,3	36,5	M16	30	30	400	244	326	171	38	60,1	M16	30	30	400
250	257	326	189	38	1 1/2“	79,3	36,5	M16	30	30	400	257	326	192	38	60,1	M16	30	30	400
280	290	375	215	38	1 1/2“	79,3	36,5	M16	30	30	400	290	375	218	38	60,1	M16	30	30	400
320	282	391	236	51	2“	96,8	44,5	M20	36	36	400	282	391	240	51	69,3	M16	30	30	400

Main dimensions see pages 6 to 17

ØAL = Piston Ø
X* = Stroke length

1) Thread depth for seal design M, T, G, L, R, S and V
2) Thread depth for seal design A and B
3) Max. operating pressure for related flanges in bar
4) Flange porting pattern according to ISO 6162-1 tab.2 type 1 corresponds to flange porting pattern according to SAE 3000 PSI
5) Flange porting pattern according to ISO 6162-2 tab.2 type 1 corresponds to flange porting pattern according to SAE 6000 PSI
6) Version "F" with piston Ø 125 to 200 mm not standardized
7) Version "K" with piston Ø 40 to 50 mm and piston Ø 180 to 200 mm not standardized
8) Versions "D" and "H" not standardized

Subplates for valve mounting (SL and SV valve)

Note:

Valves, fittings and piping are **not** included in the scope of delivery!

1 Port B to the piston side according to ISO 6164

2 Bore for locating pin

3 Adapter plate for MT4 type of mounting (part of the scope of delivery for MT4)

4 Line connection "B" dimensions see also pages 10 to 21 and pages 24 to 35

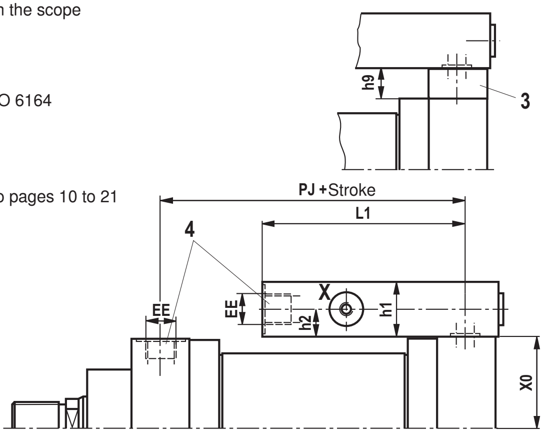
Important notice

Subplates for SL and SV valves (isolator valves)

Note:

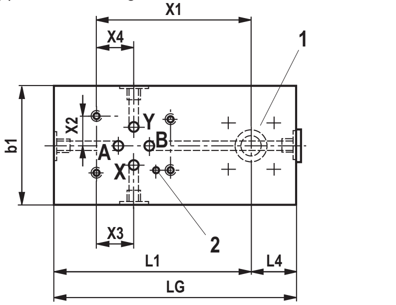
Seal designs T, G, L, R, S and V are not designed for the static holding function!

Installation situation with MT4



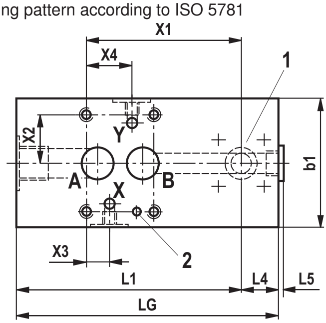
Size 6

Porting pattern according to DIN 24340 form A and ISO 4401



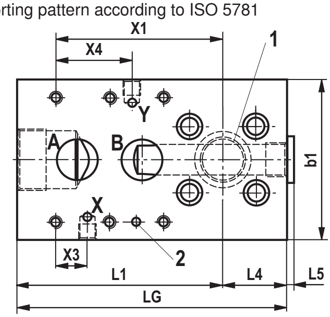
Size 10 and 20

Porting pattern according to ISO 5781

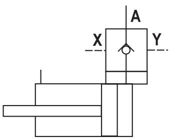


Size 30

Porting pattern according to ISO 5781



Piping symbol

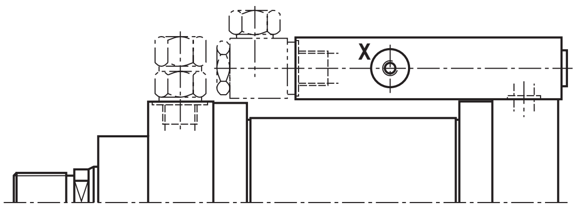


Subplates for valve mounting (SL and SV valve – dimensions in mm)

ØAL	Valve size	PJ	EE	Stroke min		X0	Plate dimensions							Port size, porting pattern						Position points Valve	
				2)	3)		L1	L4	L5	LG	b1	h1	h9	h2	A	X	Y	X3	X4	X1	X2
40	6	121	G1/2	50	50	40,5	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21,5	21,5	65,5	15,5
50	6	121	G1/2	50	50	48,0	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21,5	21,5	65,5	15,5
63	6	134	G3/4	64	64	57,0	100	25	5	125	55	47	20	23,5	G3/4	G1/4	G1/4	21,5	21,5	70,5	15,5
	10	134	G3/4	64	64	57,0	105	25	5	130	85	47	20	23,5	G3/4	G1/4	G1/4	21,4	21,4	73	33,3
80	6	151,5	G3/4	58	58	69,5	100	25	5	125	55	47	20	23,5	G3/4	G1/4	G1/4	21,5	21,5	70,5	15,5
	10	151,5	G3/4	58	58	69,5	105	25	5	130	85	47	20	23,5	G3/4	G1/4	G1/4	21,4	21,4	73	33,3
100	10	172	G1	50	79	81,5	102	28	5	130	85	50	20	25	G1	G1/4	G1/4	21,4	21,4	70	33,3
125	10	201	G1	50	91	100,0	102	28	5	130	85	50	20	25	G1	G1/4	G1/4	21,4	21,4	70	33,3
	20	201	G1	50	91	100,0	137	28	5	165	100	50	20	25	G1	G1/4	G1/4	20,8	39,7	92	39,7
140	10	223	G1 1/4	50	121	109,0	115	35	5	150	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	80	33,3
	20	223	G1 1/4	50	121	109,0	140	35	5	175	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	95	39,7
160	10	238,5	G1 1/4	30 4)	142	128,5	115	35	5	150	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	80	33,3
	20	238,5	G1 1/4	30 4)	142	128,5	140	35	5	175	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	95	39,7
180	10	264	G1 1/4	30 4)	158	142,0	120	40	5	160	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	90	33,3
	20	264	G1 1/4	30 4)	158	142,0	135	50	5	185	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	105	39,7
	30	264	G1 1/4	30 4)	158	142,0	160	50	5	210	125	60	30	30	G1 1/4	G1/4	G1/4	24,6	59,6	130	48,4
200	10	278	G1 1/4	20 4)	204	148,5	120	40	5	160	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	90	33,3
	20	278	G1 1/4	20 4)	204	148,5	135	50	5	185	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	105	39,7
	30	278	G1 1/4	20 4)	204	148,5	160	50	5	210	125	60	30	30	G1 1/4	G1/4	G1/4	24,6	59,6	130	48,4

ØAL = Piston Ø

1) The information only applies to the following connection situation!



2) Not for MT4

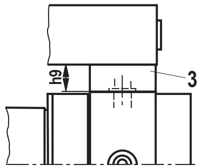
3) Only for MT4

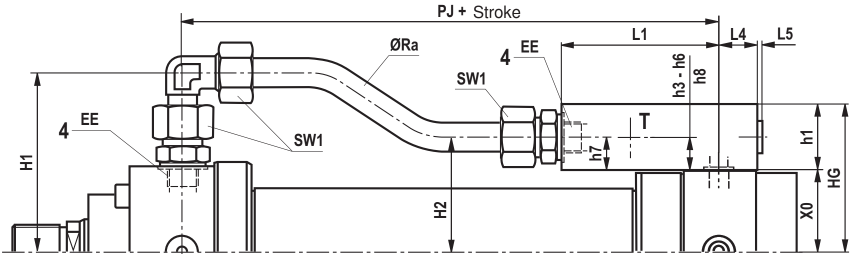
4) With type of mounting "MS2", observe X*min on page 21 and/or 35

Subplates for valve mounting (directional and high-response valves)

1 Port B to the piston side according to ISO 6164
2 Bore for locating pin
3 Adapter plate for MT4 type of mounting (part of the scope of delivery for MT4)
4 Line connection "B" dimensions see also pages 10 to 21 and pages 24 to 35

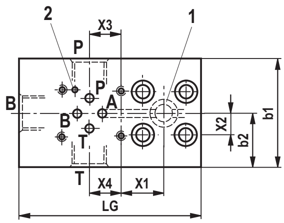
Installation situation with MT4





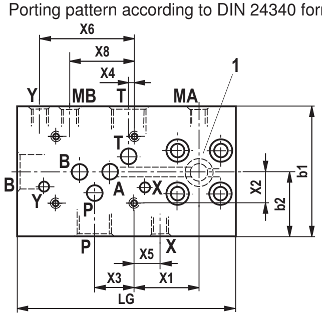
Size 6

Porting pattern according to DIN 24340 form A and ISO 4401



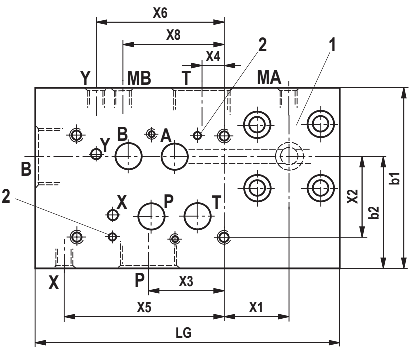
Size 10

Porting pattern according to DIN 24340 form A and ISO 4401



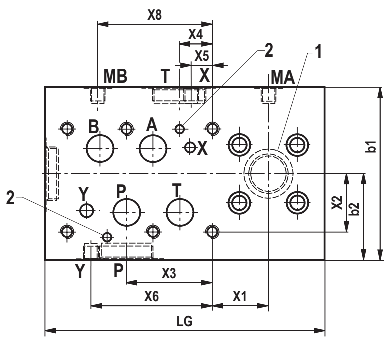
Size 16

Porting pattern according to DIN 24340 form A and ISO 4401



Size 25

Porting pattern according to DIN 24340 form A and ISO 4401



With larger stroke lengths and depending on the piston diameter, the pipeline is mounted at the cylinder pipe using pipe supports. A maximum of two sandwich plates is admissible.

Subplates for valve mounting (directional and high-response valves – dimensions in mm)

ØAL	Valve size	PJ	EE	Stroke min	Plate dimensions																
					L1	L4	L5	H1	H2 1)	H2 2)	SW1	ØRa	b1	h1	LG	HG 1)	HG 2)	b2	X0	h7	h9
40	6	121	G1/2	242	90	20	4	96,0	60,5	70,5	30	16,0x2,5	65	40	110	80,5	90,5	32,5	40,5	20	10
50	6	121	G1/2	242	90	20	4	103,5	68,0	78,0	30	16,0x2,5	65	40	110	88,0	98,0	32,5	48,0	20	10
63	6	134	G3/4	276	100	25	5	121,5	80,5	100,5	36	20,0x3,0	75	47	125	104,0	124,0	37,5	57,0	23,5	20
	10	134	G3/4	301	125	25	5	121,5	80,0	100,0	36	20,0x3,0	90	70	150	127,0	147,0	45	57,0	23	20
80	6	151,5	G3/4	259	100	25	5	134,5	93,0	113,0	36	20,0x3,0	75	47	125	116,5	136,5	37,5	69,5	23,5	20
	10	151,5	G3/4	284	125	25	5	134,5	92,5	112,5	36	20,0x3,0	90	70	150	139,5	159,5	45	69,5	23	20
100	10	172	G1	317	132	28	5	155,0	111,5	131,5	46	25,0x4,0	90	80	160	161,5	181,5	45	81,5	30	20
125	10	201	G1	288	132	28	5	173,5	130,0	150,0	46	25,0x4,0	90	80	160	180,0	200,0	45	100,0	30	20
	16	201	G1	318	162	28	5	173,5	140,0	160,0	46	25,0x4,0	115	90	190	190,0	210,0	57,5	100,0	40	20
140	10	223	G1 1/4	315	135	35	5	188	144,0	174,0	50	30,0x5,0	105	95	170	204,0	234,0	52,5	109,0	35	30
	16	223	G1 1/4	355	175	35	5	188	154,0	184,0	50	30,0x5,0	120	100	210	209,0	239,0	60	109,0	45	30
160	10	238,5	G1 1/4	300	135	35	5	208	163,5	193,5	50	30,0x5,0	105	95	170	223,5	253,5	52,5	128,5	35	30
	16	238,5	G1 1/4	340	175	35	5	208	173,5	203,5	50	30,0x5,0	120	100	210	228,5	258,5	60	128,5	45	30
180	10	264	G1 1/4	289	150	40	5	222	177,0	207,0	50	30,0x5,0	105	95	190	237,0	267,0	52,5	142,0	35	30
	16	264	G1 1/4	319	180	40	5	222	192,0	222,0	50	30,0x5,0	125	105	220	247,0	277,0	62,5	142,0	50	30
	25	264	G1 1/4	339	200	50	0	222	197,0	227,0	50	30,0x5,0	155	110	250	252,0	282,0	77,5	142,0	55	30
200	10	278	G1 1/4	275	150	40	5	229	183,5	213,5	50	30,0x5,0	105	95	190	243,5	273,5	52,5	148,5	35	30
	16	278	G1 1/4	305	180	40	5	229	198,5	228,5	50	30,0x5,0	125	105	220	253,5	283,5	62,5	148,5	50	30
	25	278	G1 1/4	325	200	50	0	229	203,5	233,5	50	30,0x5,0	155	110	250	258,5	288,5	77,5	148,5	55	30

ØAL	Valve size	Port size, porting pattern"																Position points-Valve	
		P	X3	h3	T	X4	h4	X	X5	h5	Y	X6	h6	MA	MB	X8	h8	X1	X2
40	6	G1/2	21,5	20	G1/2	21,5	20	-	-	-	-	-	-	-	-	-	-	25	15,5
50	6	G1/2	21,5	20	G1/2	21,5	20	-	-	-	-	-	-	-	-	-	-	25	15,5
63	6	G3/4	21,5	23,5	G3/4	21,5	23,5	-	-	-	-	-	-	-	-	-	-	30	15,5
	10	G3/4	27	33	G3/4	3,5	33	G1/4	18	47	G1/4	65,0	47	G1/4	G1/4	60	17	45	21,4
80	6	G3/4	21,5	23,5	G3/4	21,5	23,5	-	-	-	-	-	-	-	-	-	-	30	15,5
	10	G3/4	27	33	G3/4	3,5	33	G1/4	18	47	G1/4	65,0	47	G1/4	G1/4	60	17	45	21,4
100	10	G1	27	30	G1	3,5	40	G1/4	18	57	G1/4	65,0	57	G1/4	G1/4	58	20	52	21,4
125	10	G1	27	30	G1	3,5	40	G1/4	18	57	G1/4	65,0	57	G1/4	G1/4	58	20	52	21,4
	16	G1	50	26	G1	17	25	G1/4	76,5	60	G1/4	88,0	70	G1/4	G1/4	88	35	37	37,5
140	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	65,0	72	G1/4	G1/4	55	25	55	21,4
	16	G1 1/4	52	32	G1 1/4	15	32	G1/4	76,5	75	G1/4	88,0	80	G1/4	G1/4	88	40	45	40
160	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	65,0	72	G1/4	G1/4	55	25	55	21,4
	16	G1 1/4	52	32	G1 1/4	15	32	G1/4	76,5	75	G1/4	88,0	80	G1/4	G1/4	88	40	45	40
180	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	62	72	G1/4	G1/4	55	25	60	21,4
	16	G1 1/4	57	35	G1 1/4	15	34	G1/4	76,5	80	G1/4	86	85	G1/4	G1/4	86	45	50	40
	25	G1 1/4	77	42	G1 1/4	29,4	32	G1/4	17,5	90	G1/4	112,7	90	G1/4	G1/4	110	50	50	52,1
200	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	62	72	G1/4	G1/4	55	25	60	21,4
	16	G1 1/4	57	35	G1 1/4	15	34	G1/4	76,5	80	G1/4	86	85	G1/4	G1/4	86	45	50	40
	25	G1 1/4	77	42	G1 1/4	29,4	32	G1/4	17,5	90	G1/4	112,7	90	G1/4	G1/4	110	50	50	52,1

ØAL = Piston Ø

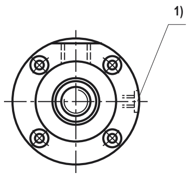
1) Not for MT4

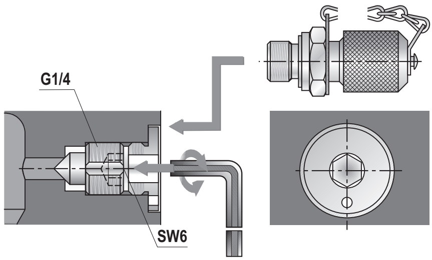
2) Only for MT4

Bleeding / threaded coupling (dimensions in mm)

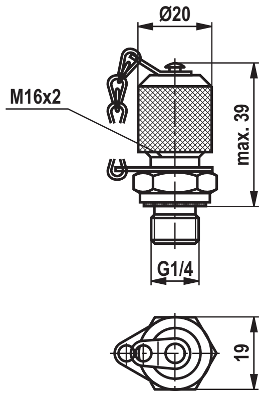
By default, a patented safety bleeding device against unintended screwing out in head and base is delivered for all cylinders.

The port allows for the installation of a threaded coupling with check valve for pressure measurement or contamination-free bleeding. Threaded coupling with check valve function, i.e. it can also be connected when the system is pressurized.





1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)

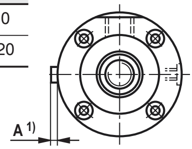


Scope of delivery: Threaded coupling **G1/4**

SCREW JOINT AB 20-11/K1 G1/4 with seal ring of NBR
Material no. **R900009090**
SCREW JOINT AB 20-11/K1V G1/4 with seal ring of FKM
Material no. **R900001264**

Throttle valve (dimensions in mm)

ØAL	**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**	**180**	**200**	**220**	**250**	**280**	**320**
Protrusion A 1)	1	0	0	0	0	0	0	0	0	0	9,5	0	0	0
Nominal width	4	4	4	5	5	8	8	8	8	8	20	20	20	20



ØAL = Piston Ø

1) Throttle valve only with end position cushioning "E" (180° for bleeding)
Protrusion A in closed condition

Proxiwithy switch

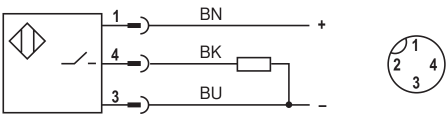
Inductive proxiwithy switches are used as reliable end position control for hydraulic cylinders. They are an important element for the safe and exact monitoring of safety equipment, lockings and/or other machine functions in their end position by means of the output of signals. The proxiwithy switch which is high-pressure-resistant up to 500 bar works in a contactless manner. Consequently, it is wear-free. The proxiwithy switch is set at the factory. The switching distance must not be adjusted. The lock nut of the proxiwithy switch is marked at the factory using sealing wax. On versions with proxiwithy switch, the cylinders are provided with proxiwithy switches on both sides.

2

Technical data (For applications outside these parameters, please consult us!)

Function type			PNP normally open contact
Admissible pressure		bar	500
Operating voltage		V DC	10 … 30
	Including residual ripple	%	≤ 15
Voltage drop		V	≤ 1.5
Rated operating voltage		V DC	24
Rated operating current		mA	200
Idle current		mA	≤ 8
Residual current		μA	≤ 10
Repetition accuracy		%	≤ 5
Hysteresis		%	≤ 15
Ambient temperature range		°C	–25 … +80
Temperature drift		%	≤ 10
Switching frequency		Hz	1000
Protection class	Active area		IP 68 according to DIN 40050
	Proxiwithy switch		IP 67 according to DIN 40050
Housing material			Material no. 1.4104

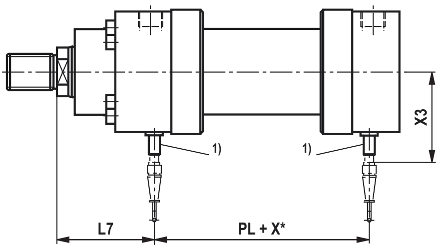
Pin assignment



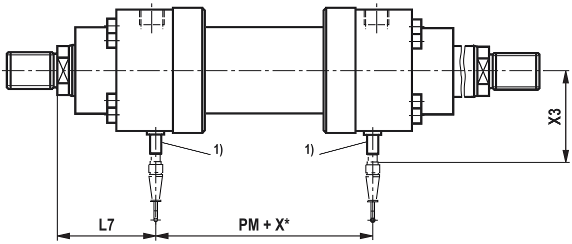
BN brown
BK black
BU blue

Proxiwithy switch

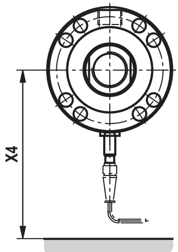
CDH2

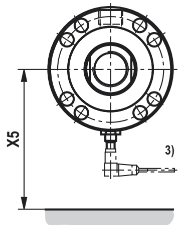


CGH2



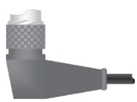
Installation space for mating connector





Mating connector with 5 m cable
Material no. **R900026512**
(mating connector is **not** included in the scope of delivery, must be ordered separately)

Mating connector, angled with 5 m cable (position of the cable outlet cannot be defined)
Material no. **R988064311**
(mating connector is **not** included in the scope of delivery**,** must be ordered separately)



Proxiwithy switch

Dimensions (dimensions in mm))

ØAL	ØMM	PL	PM	L7	X3	X4	X5
40	**25** **28**	112	112	87	94	170	125
50	**32** **36**	110	110	103	98	175	130
63	**40** **45**	125	125	116	103	180	135
80	**50** **56**	138	138	128,5	108	185	140
100	**63** **70**	161	161	139	116	195	150
125	**80** **90**	189	189	161	126	205	160
140	**90** **100**	209	209	171	146	225	180
160	**100** **110**	228	228	188,5	151	230	185
180	**110** **125**	254	254	199	159	235	190
200	**125** **140**	264	264	227	166	245	200
220	**140** **160**	310	310	252	177 2)	255	– 3)
250	**160** **180**	310	310	265	187 2)	265	– 3)
280	**180** **200**	369	369	293	199 2)	275	– 3)
320	**200** **220**	375	375	290	209 2)	285	– 3)

Main dimensions see pages 10 to 21

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

1) The proxiwithy switch is always located opposite of the line connection

2) Piston Ø 220 to 320 mm
Proxiwithy switch not protruding

3) Piston Ø 220 to 320 mm
Angled mating connector not possible

2

Position measurement system

The position measurement system that is pressure-resistant up to 500 bar works in a contactless and absolute manner. The basis of this position measurement system is the magnetostrictive effect. Here, the coincidence of two magnetic fields triggers a torsion pulse. This pulse runs on the waveguide inside the gauge from the measuring point to the sensor head. The running time is constant and almost temperature-independent. It is proportional to the position of the solenoid and thus a measure for the actual position value and is converted in the sensor into a direct analog or digital output.

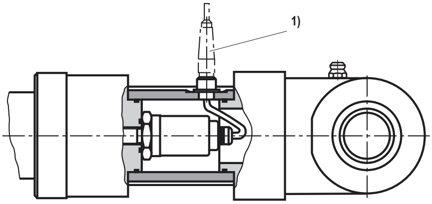
Technical data (For applications outside these parameters, please consult us!)

Operating pressure		bar	250
Analog output		V	0 to 10
	Load resistance	kΩ	≥ 5
	Resolution		unliwithed
Analog output		mA	4 to 20
	Load resistance	Ω	0 to 500
	Resolution		unliwithed
Digital output			SSI 24 bit gray-coded
	Resolution	μm	5
	Direction of measurement		asynchronously forward
Linearity (absolute accuracy)	Analog	% mm	≤ ±0.02 % (referred to measurement length) min. ±0.05
	Digital	% mm	≤ ±0.01 % (referred to measurement length) min. ±0.04
Reproducibility		% mm	±0.001 (referred to measurement length) min. ±0.0025
Hysteresis		mm	≤ 0.004
Supply voltage		V DC	24 (±10 % with analog output)
	Current consumption	mA	100
	Residual ripple	% s-s	≤ 1
	 Current consumption	V DC mA	24 (+20 %/–15 % with digital output) 70
	Residual ripple	% s-s	≤ 1
Protection class	Pipe and flange		IP 67
	Sensor electronics		IP 65
Operating temperature	Sensor electronics	°C	–40 to +75
Temperature coefficient	Voltage	ppm/°C	70
	Current	ppm/°C	90

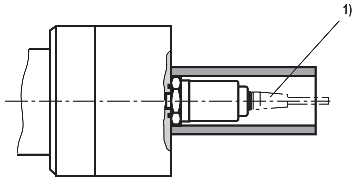
Position measurement system

Types of mounting

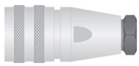
MP3, MP5



MF3, MF4, MT4, MS2



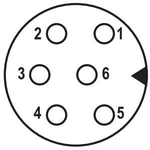
1) For analog output:
6-pole Amphenol mating connector
Material no. **R900072231**
(mating connector is **not** included in the scope of delivery, must be ordered separately)



1) For digital output:
7-pole Amphenol mating connector
Material no. **R900079551**
(mating connector is **not** included in the scope of delivery, must be ordered separately)

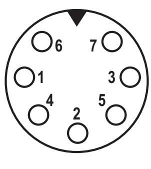
Pin assignment

Position measurement system (analog output)
Connector (view to pin side)



Pin	Cable	Signal / current	Signal / voltage
1	Gray	4 … 20 mA	0 … 10 V
2	Pink	DC ground	DC ground
3	Yellow	Not used	Not used
4	Green	DC ground	DC ground
5	Brown	+24 V DC (+20 % / –15 %)	+24 V DC (+20 % / –15 %)
6	White	DC ground (0 V)	DC ground (0 V)

Position measurement system (digital output)
Connector (view to pin side)



Pin	Cable	Signal / SSi
1	Gray	Data (–)
2	Pink	Data (+)
3	Yellow	Clock (+)
4	Green	Clock (–)
5	Brown	+24 V DC (+2 0% / –15 %)
6	White	DC ground (0 V)
7	–	Not used

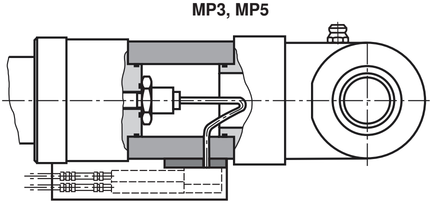
Technical data for the Profibus (For applications outside these parameters, please consult us!)

Output	Interface	Profibus-DP system
	Data record	Profibus-DP (EN 61158)
	Transmission rate	Max. 12 MB/s
Measurement accuracy	Travel resolution	1 µm to 1000 µm selectable as parameter
	Velocity	With 5 µm travel resolution: 0.64 mm/s to 500 mm; 0.43 mm/s to 2000 mm; 0.21 mm/s to 4500 mm: 0.14 mm/s to 7600 mm Measurement length With 2 µm travel resolution: 2.5 times smaller values
	Linearity	< +/–0.01 % F.S. (Minimum +/–50 µm)
	Repeatability	< +/–0.001 % F.S. (Minimum +/–2.5 µm)
	Temperature coefficient	< 15 ppm/°C
	Hysteresis	< 4 µm
Application conditions	Operating temperature	–40 °C to 75 °C
	Protection class	Profile: IP65 Rod: IP 67 with proper coupling plug assembly
	Standards, EMC test	Interference emissions according to EN 61000-6-3 Interference resistance according to 61000-6-2 EN 61000-4-2/3/4/6, level 3/4, criterion A, CE-tested
Electrical connection	Operating voltage	24 VDC (–15 / +20 %)

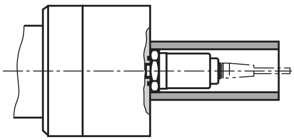
Please ask for the complete technical data!

Types of mounting

MP3, MP5



MF3, MF4, MT4, MS2

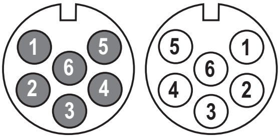


The output of the position measurement system is by default always rotated by 180° to the selected position of the hydraulic connection in the cylinder base.

Mating connector is **not** included in the scope of delivery, must be ordered separately.

Pin assignment for Profibus

Pin assignment for Profibus D63

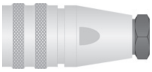


Pins Sockets

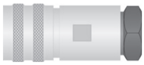
Pin	Cable	Function
1	Green	RxD/TxD-N (bus)
2	Red	RxD/TxD-P (bus)
3	—	DGND (terminating resistor) *
4	—	VP (terminating resistor) *
5	Black	+24 VDC (–15 / +20 %)
6	Blue	DC ground (0 V)
—	Yellow/ green	Shield compensating line, is usually not to be connected

* Only with sockets

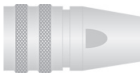
Mating connectors for D63



Signal input
6-pin mating connector M16
Material no. R900705950 (socket)



Signal output
6-pin mating connector M16
Material no. R900705951 (pins)

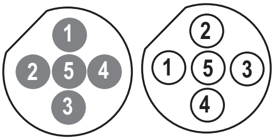


Signal output
6-pin end plug M16
Material no. R900722518 (pins)

2

Pin assignment for Profibus D53

Bus

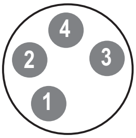


Pins Sockets

Pin	Cable	Function
1	—	VP+5 (terminating resistor) *
2	Green	RxD/TxD-N (bus)
3	—	DGND (terminating resistor) *
4	Red	RxD/TxD-P (bus)
5	Shield	Shield

* Only with sockets

Supply

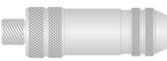


View connector side

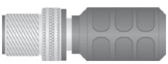
Pin	Cable	Function
1	Brown	+24 VDC (–15 / +20 %)
2	White	Not used
3	Blue	DC ground (0 V)
4	Black	Not used

Mating connectors for D53

Signal input
5-pin mating connector M12-B
Material no. R900773386 (socket)



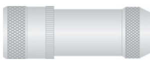
Signal output
5-pin mating connector M12-B
Material no. R901091655 (pins)



Signal output
5-pin end plug M12-B
Material no. R901070126 (pins)

Mating connector is **not** included in the scope of delivery, must be ordered separately.

Supply for D53



4-pin mating connector M8
Material no. R901132799

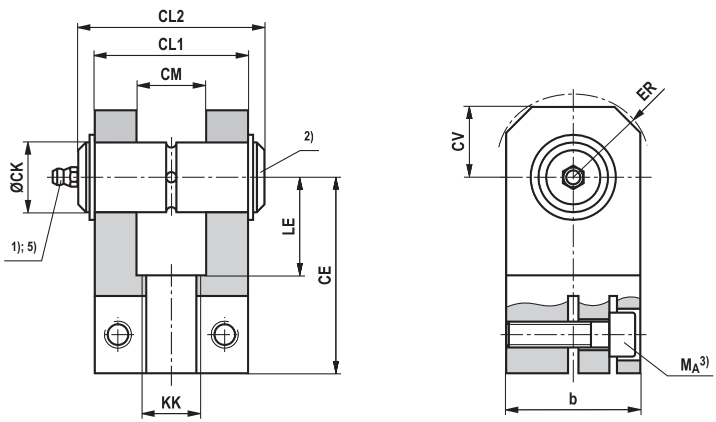
Connection cable 5 m
with 4-pin mating connector M8
Material no. 901213191

Connection cable 10 m
with 4-pin mating connector M8
Material no. 913008737

Connection cable 15 m
with 4-pin mating connector M8
Material no. 913008738

Fork clevis CCKB (clampable) (dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no.	Nominal force kN	b max	CE js13	ØCK H9 2)	CL1 h16	CL2 max	CM A13	ER max
40	**25 / 28**	**CCKB 25**	R900542845	32	50	65	25	56	84	25	32
50	**32 / 36**	**CCKB 32**	R900542846	50	65	80	32	70	105	32	40
63	**40 / 45**	**CCKB 40**	R900542847	80	80	97	40	90	133	40	50
80	**50 / 56**	**CCKB 50**	R900542848	125	100	120	50	110	165	50	63
100	**63 / 70**	**CCKB 63**	R900542849	200	140	140	63	140	185	63	71
125	**80 / 90**	**CCKB 80**	R900542850	320	180	180	80	170	225	80	90
140	**90 / 100**	**CCKB 90**	6)	400	200	195	90	190	6)	90	100
160	**100 / 110**	**CCKB 100**	6)	500	220	210	100	210	6)	100	110

Fork clevis CCKB (clampable) (dimensions in mm)

ØAL	ØMM	Type	KK	LE min	CV max	Clamping screw ISO 4762-10.9	M_A 3) Nm	m 4) kg
40	**25 / 28**	**CCKB 25**	M20x1,5	34	32	M10x35	49	1,4
50	**32 / 36**	**CCKB 32**	M27x2	41	40	M12x40	85	2,8
63	**40 / 45**	**CCKB 40**	M33x2	51	50	M16x50	210	5,2
80	**50 / 56**	**CCKB 50**	M42x2	63	63	M20x60	425	9,5
100	**63 / 70**	**CCKB 63**	M48x2	75	71	M24x80	730	21,5
125	**80 / 90**	**CCKB 80**	M64x3	94	90	M30x100	1450	38,2
140	**90 / 100**	**CCKB 90**	M72x3	108	100	M36x120	2480	6)
160	**100 / 110**	**CCKB 100**	M80x3	114	110	M36x130	2480	6)

2

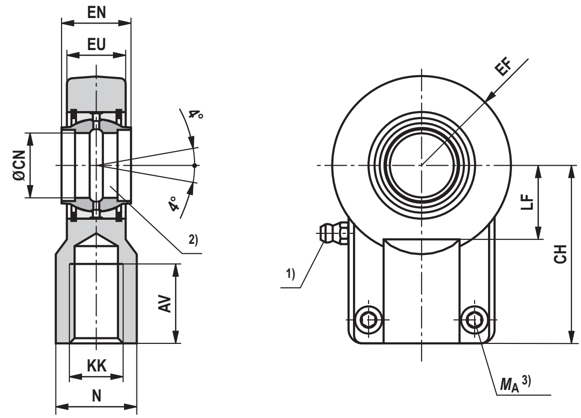
Note:
Geometry and dimensions may differ depending on the manufacturer.
In case of combination with other mounting elements, the usability must be checked.

ØAL = Piston Ø
ØMM = Piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Related bolt Ø m6
(bolt and bolt lock are included in the scope of delivery and not mounted upon delivery)

3) M_A = Tightening torque
The fork clevis must always be screwed against the piston rod shoulder. Afterwards, the clamping screws must be tightened with the specified tightening torque.
4) m = Weight fork clevis in kg
5) Without lubrication bore
6) Upon request

Self-aligning clevis CGKD (clampable) (dimensions in mm)

ISO 8132



ØAL	ØMM	Type	Material no.	Nominal force kN	AV min	N max	CH js13	EF max	ØCN H7 2)	EN h12	EU max
40	**25 / 28**	**CGKD 25**	R900323332	32	29	31	65	32	25	25	22
50	**32 / 36**	**CGKD 32**	R900322049	50	37	38	80	40	32	32	28
63	**40 / 45**	**CGKD 40**	R900322029	80	46	47	97	50	40	40	34
80	**50 / 56**	**CGKD 50**	R900322719	125	57	58	120	63	50	50	42
100	**63 / 70**	**CGKD 63**	R900322028	200	64	70	140	72,5	63	63	53,5
125	**80 / 90**	**CGKD 80**	R900322700	320	86	91	180	92	80	80	68
140	**90 / 100**	**CGKD 90** 7)	R900325702	400	91	100	195	101	90	90	72
160	**100 / 110**	**CGKD 100**	R900322030	500	96	110	210	114	100	100	85,5
180	**110 / 125**	**CGKD 110** 7)	R900308153	635	106	125	235	129	110	110	88
200	**125 / 140**	**CGKD 125**	R900322026	800	113	135	260	160	125	125	105
220	**140 / 160**	**CGKD 160**	R900300718	1.520	126	165	310	200	160	160	133
250	**160 / 180**	**CGKD 160**	R900300718	1.520	126	165	310	200	160	160	133
280	**180 / 200**	**CGKD 200**	R900324814	2.000	161	215	390	250	200	200	165
320	**200 / 220**	**CGKD 200**	R900324814	2.000	161	215	390	250	200	200	165

Self-aligning clevis CGKD (clampable) (dimensions in mm)

ØAL	ØMM	Type	KK	LF min	Clamping screw ISO 4762-10.9	M_A [3] Nm	m [4] kg	C_0 [5] kN	F_{adm} [6] kN
40	**25 / 28**	**CGKD 25**	M20x1,5	25,5	M8x20	30	0,65	78	28,8
50	**32 / 36**	**CGKD 32**	M27x2	30	M10x25	59	1,15	114	42,1
63	**40 / 45**	**CGKD 40**	M33x2	39	M10x30	59	2,1	204	75,3
80	**50 / 56**	**CGKD 50**	M42x2	47	M12x35	100	4	310	114,4
100	**63 / 70**	**CGKD 63**	M48x2	58	M16x40	250	7,2	430	158,7
125	**80 / 90**	**CGKD 80**	M64x3	74	M20x50	490	15	695	256,5
140	**90 / 100**	**CGKD 90** [7]	M72x3	85	M20x60	490	19	750	276,8
160	**100 / 110**	**CGKD 100**	M80x3	94	M24x60	840	25,5	1060	391,1
180	**110 / 125**	**CGKD 110** [7]	M90x3	105	M24x60	840	36,5	1200	442,8
200	**125 / 140**	**CGKD 125**	M100x3	116	M24x70	840	52,5	1430	527,7
220	**140 / 160**	**CGKD 160**	M125x4	145	M24x80	840	82,5	2200	811,8
250	**160 / 180**	**CGKD 160**	M125x4	145	M24x80	840	82,5	2200	811,8
280	**180 / 200**	**CGKD 200**	M160x4	190	M30x100	1700	168	3650	1346,9
320	**200 / 220**	**CGKD 200**	M160x4	190	M30x100	1700	168	3650	1346,9

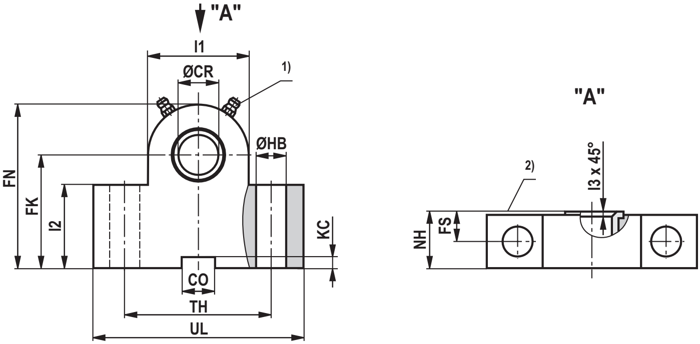
Note:
Geometry and dimensions may differ depending on the manufacturer.
In case of combination with other mounting elements, the usability must be checked.

ØAL = Piston Ø
ØMM = Piston rod Ø
[1] Lubricating nipple, cone head form A according to DIN 71412
[2] Related bolt Ø m6
[3] M_A = Tightening torque
The self-aligning clevis must always be screwed against the piston rod shoulder. Afterwards, the clamping screws must be tightened with the specified tightening torque.
[4] m = Weight self-aligning clevis in kg
[5] C_0 = Static load rating of the self-aligning clevis
[6] F_{adm} = Maximum admissible load of the self-aligning clevis with oscillatory or alternating loads
[7] Not contained in the standard

2

Trunnion bracket CLTB (dimensions in mm)

ISO 8132



ØAL	Type [3]	Material no.	Nominal force kN [4]	ØCR H7	CO N9	FK js12	FN max	FS js14	ØHB H13	KC +0,3
40	**CLTB 25**	R900772610	32	25	25	55	80	12	13,5	5,4
50	**CLTB 32**	R900772611	50	32	25	65	100	15	17,5	5,4
63	**CLTB 40**	R900772612	80	40	36	76	120	16	22	8,4
80	**CLTB 50**	R900772613	125	50	36	95	140	20	26	8,4
100	**CLTB 63**	R900772614	200	63	50	112	180	25	33	11,4
125	**CLTB 80**	R900772615	320	80	50	140	220	31	39	11,4
140	**CLTB 90**	R901364220	385	90	63	160	250	40	45	12,4
160	**CLTB 100**	R901205929	500	100	63	180	280	45	52	12,4
180	**CLTB 110**	R901364223	630	110	80	200	310	50	52	15,4

Trunnion bracket CLTB (dimensions in mm)

ØAL	Type [3]	l1	l2	l3	NH max	TH js14	UL max	*m* [5] kg
40	**CLTB 25**	56	45	1,5	26	80	110	2,1
50	**CLTB 32**	70	52	2	33	110	150	4,55
63	**CLTB 40**	88	60	2,5	41	125	170	7,3
80	**CLTB 50**	100	75	2,5	51	160	210	14,5
100	**CLTB 63**	130	85	3	61	200	265	23,1
125	**CLTB 80**	160	112	3,5	81	250	325	52,3
140	**CLTB 90**	180	130	4	91	265	345	[6]
160	**CLTB 100**	200	145	4,5	102	295	385	100
180	**CLTB 110**	220	160	5	112	320	410	[6]

2

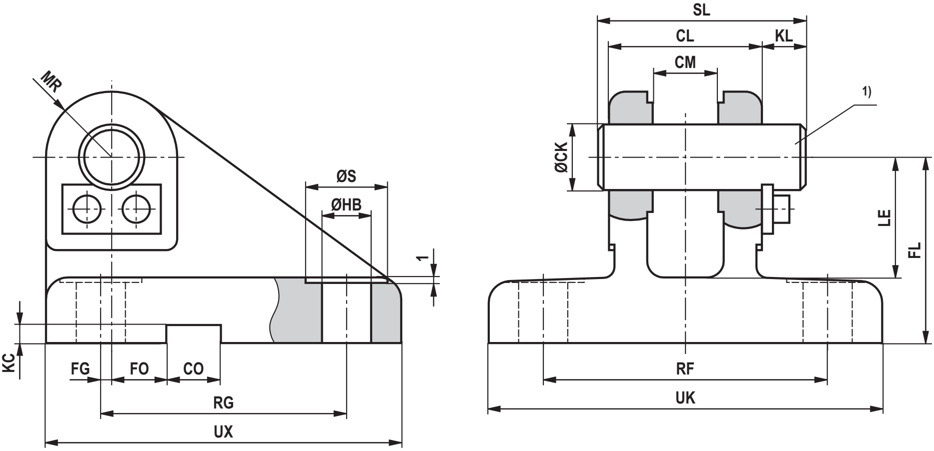
Note:
Geometry and dimensions may differ depending on the manufacturer.
In case of combination with other mounting elements, the usability must be checked.
The trunnion brackets are suitable for mounting type MT4.

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412
2) Contact surface trunnion (inside)
3) Bearing blocks are always supplied in pairs
4) Nominal force applies to applications in pairs
5) ***m*** = Weight trunnion bracket in kg (indication per pair)
6) Upon request

Clevis bracket CLCA (clampable) (dimensions in mm)

ISO 8132, form B



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 1)	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14
40	**25 / 28**	**CLCA 25**	R900542864	32	25	56	25	25	10	55	10
50	**32 / 36**	**CLCA 32**	R900542865	50	32	70	32	25	14,5	65	6
63	**40 / 45**	**CLCA 40**	R900542866	80	40	90	40	36	17,5	76	6
80	**50 / 56**	**CLCA 50**	R900542867	125	50	110	50	36	25	95	0
100	**63 / 70**	**CLCA 63**	R900542868	200	63	140	63	50	33	112	0
125	**80 / 90**	**CLCA 80**	R900542869	320	80	170	80	50	45	140	0
140	**90 / 100**	**CLCA 90**	3)	400	90	190	90	63	47,5	160	0
160	**100 / 110**	**CLCA 100**	3)	500	100	210	100	63	52,5	180	0
180	**110 / 125**	**CLCA 110**	3)	635	110	240	110	80	62,5	200	0
200	**125 / 140**	**CLCA 125**	3)	800	125	270	125	80	75	230	0

Clevis bracket CLCA (clampable) (dimensions in mm)

ØAL	ØMM	Type	ØHB H13	KC +0,3	KL	LE min	MR max	RF js14	RG js14	ØS	SL	UK max	UX max	*m* [2] kg
40	**25 / 28**	**CLCA 25**	13,5	5,4	10	37	25	90	85	20	69	120	115	3
50	**32 / 36**	**CLCA 32**	17,5	5,4	13	43	32	110	110	26	87	145	145	5
63	**40 / 45**	**CLCA 40**	22	8,4	16	52	40	140	125	33	110	185	170	9,6
80	**50 / 56**	**CLCA 50**	26	8,4	19	65	50	165	150	40	133	215	200	15,5
100	**63 / 70**	**CLCA 63**	33	11,4	20	75	63	210	170	48	164	270	230	27,5
125	**80 / 90**	**CLCA 80**	39	11,4	26	95	80	250	210	57	202	320	280	47
140	**90 / 100**	**CLCA 90**	45	12,4	28	108	90	280	235	66	224	360	320	[3]
160	**100 / 110**	**CLCA 100**	52	12,4	30	120	100	315	250	76	246	405	345	[3]
180	**110 / 125**	**CLCA 110**	52	15,4	31	138	110	335	305	76	277	425	400	[3]
200	**125 / 140**	**CLCA 125**	52	15,4	32	170	125	365	350	76	310	455	450	[3]

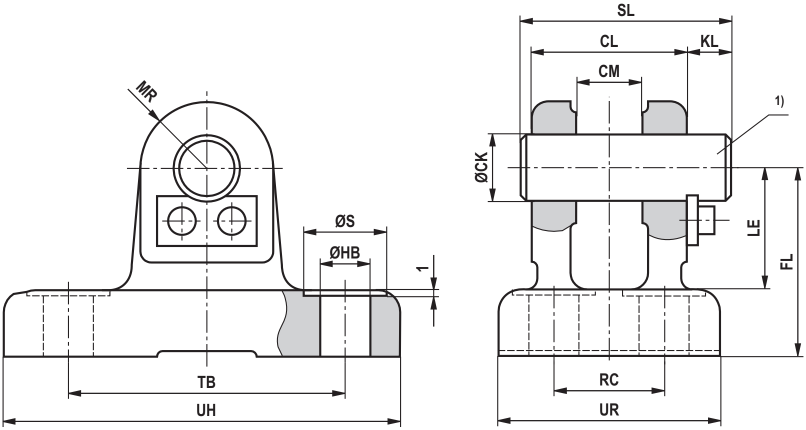
2

Note:
Geometry and dimensions may differ depending on the manufacturer.
In case of combination with other mounting elements, the usability must be checked.

ØAL = Piston Ø
ØMM = Piston rod Ø
[1] Related bolt Ø m6
(bolt and bolt lock are included in the scope of delivery and not mounted upon delivery)
[2] ***m*** = Weight clevis bracket in kg
[3] Upon request

Clevis bracket CLCD (clampable) (dimensions in mm)

ISO 8132, form A



ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 1)	CL h16	CM A13	FL js12	ØHB H13	KL
40	**25** / **28**	**CLCD 25**	R900542882	32	25	56	25	55	13,5	10
50	**32** / **36**	**CLCD 32**	R900542883	50	32	70	32	65	17,5	13
63	**40** / **45**	**CLCD 40**	R900542884	80	40	90	40	76	22	16
80	**50** / **56**	**CLCD 50**	R900542885	125	50	110	50	95	26	19
100	**63** / **70**	**CLCD 63**	R900542886	200	63	140	63	112	33	20
125	**80** / **90**	**CLCD 80**	R900542887	320	80	170	80	140	39	26
140	**90** / **100**	**CLCD 90**	3)	400	90	190	90	160	45	28
160	**100** / **110**	**CLCD 100**	3)	500	100	210	100	180	45	30
180	**110** / **125**	**CLCD 110**	3)	635	110	240	110	200	52	31
200	**125** / **140**	**CLCD 125**	3)	800	125	270	125	230	52	32

Clevis bracket CLCD (clampable) (dimensions in mm)

ØAL	ØMM	Type	LE min	MR max	RC js14	ØS	SL	TB js14	UR max	UH max	*m* 2) kg
40	**25 / 28**	**CLCD 25**	37	25	40	20	69	85	70	113	1,9
50	**32 / 36**	**CLCD 32**	43	32	50	26	87	110	85	143	3
63	**40 / 45**	**CLCD 40**	52	40	65	33	110	130	108	170	5,5
80	**50 / 56**	**CLCD 50**	65	50	80	40	133	170	130	220	10,6
100	**63 / 70**	**CLCD 63**	75	63	100	48	164	210	160	270	17
125	**80 / 90**	**CLCD 80**	95	80	125	57	202	250	210	320	32
140	**90 / 100**	**CLCD 90**	108	90	140	66	224	290	230	370	3)
160	**100 / 110**	**CLCD 100**	120	100	160	66	246	315	260	400	3)
180	**110 / 125**	**CLCD 110**	138	110	180	76	277	350	290	445	3)
200	**125 / 140**	**CLCD 125**	170	125	200	76	310	385	320	470	3)

2

Note:
Geometry and dimensions may differ depending on the manufacturer.
In case of combination with other mounting elements, the usability must be checked.

ØAL = Piston Ø
ØMM = Piston rod Ø
1) Related bolt Ø m6
(bolt and bolt lock are included in the scope of delivery and not mounted upon delivery)
2) ***m*** = Weight clevis bracket in kg
3) Upon request

Buckling

The admissible stroke length with flexibly guided load and a factor of 3.5 for safety against buckling can be seen from the relevant table. For other installation positions of the cylinder, the admissible stroke length must be interpolated. Admissible stroke length for non-guided load on request.

Buckling calculations are carried out according to the following formulas:

1. Calculation according to Euler

$$F = \frac{\pi^2 \cdot E \cdot I}{v \cdot L_K^2} \qquad \text{if } \lambda > \lambda_g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi\,(335\text{-}0{,}62 \cdot \lambda)}{4 \cdot v} \qquad \text{if } \lambda \leq \lambda_g$$

Explanation:

E = Module of elasticity in N/mm^2
  = 2.1 x 10^5 for steel

I = Geometrical moment of inertia in mm^4
  for circular cross-section = $\frac{d^4 \cdot \pi}{64} = 0{,}0491 \cdot d^4$

v = 3.5 (safety factor)

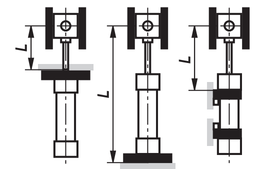
L_K = Free buckling length in mm (depending on the type of mounting see sketches A, B, C)

d = Piston rod Ø in mm

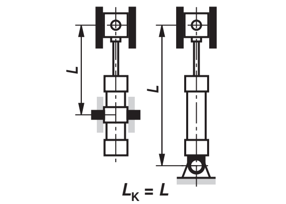
λ = Slenderness ratio
  $= \frac{4 \cdot L_K}{d} \qquad \lambda_g = \pi \sqrt{\frac{E}{0.8 \cdot R_e}}$

R_e = Yield strength of the piston rod material

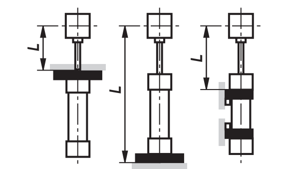
Influence of the type of mounting on the buckling length:



$L_K = 0{,}7\,L$



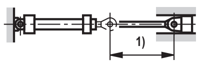
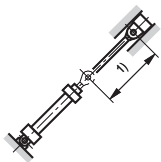
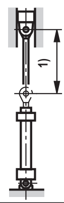
$L_K = L$



$L_K = 2\,L$

Admissible stroke length (dimensions in mm)

Type of mounting CDH2/CSH2 [2]: MP3, MP5

ØAL	ØMM	Admissible stroke length with 100 bar			160 bar			250 bar			Installation position
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	**25**	195	200	215	130	135	140	40	45	55	0°
	28	385	400	445	295	300	320	215	220	225	
50	**32**	380	390	430	280	285	300	195	200	205	
	36	505	525	595	395	405	430	290	295	305	
63	**40**	480	500	550	365	370	385	255	260	265	
	45	640	660	750	505	515	550	380	385	395	
80	**50**	590	615	690	455	465	495	330	335	345	
	56	765	800	930	615	630	685	470	475	495	
100	**63**	750	780	910	595	610	660	445	455	470	
	70	940	985	1195	775	800	885	605	615	650	
125	**80**	970	1015	1200	780	805	880	595	605	635	45°
	90	1235	1300	1610	1030	1070	1200	825	840	895	
140	**90**	1075	1130	1360	875	905	1000	675	685	725	
	100	1335	1405	1770	1120	1165	1325	900	920	985	
160	**100**	1175	1230	1480	955	985	1085	735	750	785	
	110	1430	1500	1875	1195	1240	1400	955	975	1040	
180	**110**	1250	1310	1570	1010	1045	1150	775	790	830	
	125	1620	1710	2160	1365	1420	1620	1100	1125	1205	
200	**125**	1435	1510	1860	1180	1220	1365	915	935	990	
	140	1795	1900	2450	1525	1590	1840	1240	1270	1370	
220	**140**	1620	1710	2180	1360	1415	1630	1090	1120	1200	90°
	160	2075	2200	3000	1810	1890	2280	1510	1560	1730	
250	**160**	1805	1910	2490	1520	1590	1850	1220	1250	1360	
	180	2250	2395	3300	1960	2060	2500	1630	1690	1880	
280	**180**	2075	2200	2900	1775	1880	2170	1450	1490	1620	
	200	2510	2670	3700	2200	2310	2820	1850	1920	2140	
320	**200**	2135	2270	3030	1820	1900	2260	1470	1510	1660	[1] Adm. Stroke length
	220	2550	2720	3820	2230	2340	2880	1860	1930	2170	

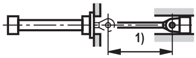
Admissible stroke length (dimensions in mm)

Type of mounting CDH2/CGH2/CSH2 [2)]: MF3

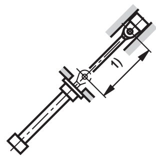
ØAL	ØMM	Admissible stroke length with 100 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	25	895	915	980	730	735	760	440	450	510
	28	1400	1415	1630	1180	1205	1275	970	980	1010
50	32	1440	1490	1670	1210	1230	1300	985	995	1025
	36	1760	1830	2000	1510	1545	1675	1255	1270	1320
63	40	1735	1800	2000	1475	1510	1620	1215	1230	1270
	45	2000	2000	2000	1830	1880	2080	1540	1560	1640
80	50	2000	2000	2000	1810	1850	1995	1495	1515	1570
	56	2000	2000	2000	2000	2000	2000	1870	1900	2000
100	63	2580	2690	3000	2235	2300	2550	1875	1910	2010
	70	3000	3000	3000	2690	2780	3000	2300	2350	2520
125	80	3000	3000	3000	2840	2930	3000	2400	2450	2590
	90	3000	3000	3000	3000	3000	3000	3000	3000	3000
140	90	3000	3000	3000	3000	3000	3000	2700	2760	2950
	100	3000	3000	3000	3000	3000	3000	3000	3000	3000
160	100	3000	3000	3000	3000	3000	3000	2920	2980	3000
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000
180	110	3000	3000	3000	3000	3000	3000	3000	3000	3000
	125	3000	3000	3000	3000	3000	3000	3000	3000	3000
200	125	3000	3000	3000	3000	3000	3000	3000	3000	3000
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000
220	140	5400	5680	6000	4800	4980	5780	4120	4220	4560
	160	6000	6000	6000	5820	6000	6000	5150	5330	6000
250	160	5850	6000	6000	5270	5500	6000	4600	4740	5250
	180	6000	6000	6000	6000	6000	6000	5650	5850	6000
280	180	6000	6000	6000	6000	6000	6000	5270	5420	5970
	200	6000	6000	6000	6000	6000	6000	6000	6000	6000
320	200	6000	6000	6000	6000	6000	6000	5950	6000	6000
	220	6000	6000	6000	6000	6000	6000	6000	6000	6000

Installation position

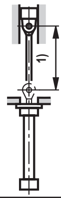
0°



45°



90°



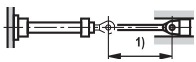
1) Adm. Stroke length

Type of mounting CDH2/CSH2 [2)]: MF4

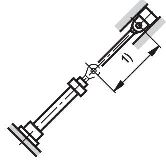
ØAL	ØMM	Admissible stroke length with 100 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	25	325	340	370	245	250	260	105	110	140
	28	565	590	695	465	475	520	365	370	385
50	32	600	625	715	485	495	530	370	375	390
	36	755	790	950	630	650	715	505	515	540
63	40	730	765	905	600	615	675	470	480	500
	45	920	965	1190	780	805	905	630	645	685
80	50	910	950	1130	750	775	845	595	605	630
	56	1125	1185	1470	960	990	1120	785	800	850
100	63	1120	1175	1460	945	980	1105	770	785	835
	70	1350	1430	1860	1175	1220	1420	980	1000	1090
125	80	1430	1510	1910	1225	1270	1450	1000	1025	1100
	90	1750	1855	2490	1540	1610	1910	1300	1340	1470
140	90	1585	1675	2170	1370	1425	1650	1135	1165	1260
	100	1895	2010	2750	1675	1755	2110	1425	1470	1630
160	100	1725	1820	2340	1490	1545	1780	1230	1260	1360
	110	2030	2150	2900	1785	1870	2230	1510	1560	1720
180	110	1855	1960	2510	1595	1660	1910	1315	1350	1450
	125	2300	2440	3350	2040	2130	2580	1735	1790	1990
200	125	2105	2230	2950	1830	1910	2250	1530	1570	1715
	140	2535	2700	3000	2260	2370	2920	1940	2010	2255
220	140	2250	2400	3350	1990	2090	2550	1685	1740	1950
	160	2800	2990	4500	2530	2680	3480	2220	2310	2700
250	160	2600	2770	3900	2310	2430	3000	1975	2040	2300
	180	3130	3350	5050	2840	3000	3910	2500	2600	3040
280	180	2850	3050	4400	2550	2680	3370	2190	2270	2600
	200	3370	3610	5550	3070	3250	4300	2700	2820	3330
320	200	3070	3270	4750	2750	2890	3650	2150	2460	2810
	220	3560	3820	5850	3250	3430	4550	2860	2980	3530

Installation position

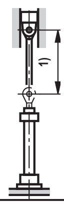
0°



45°



90°



1) Adm. Stroke length

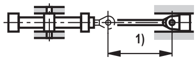
Admissible stroke length (dimensions in mm)

Type of mounting CDH2/CGH2/CSH2 2): MT4 trunnion in cylinder center

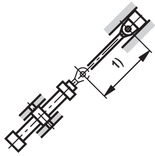
ØAL	ØMM	Admissible stroke length with								
		100 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	25	340	345	365	250	255	260	130	135	145
	28	590	605	665	470	480	500	365	370	375
50	32	600	615	670	470	480	495	355	360	365
	36	770	795	890	625	635	670	485	490	505
63	40	740	765	845	590	600	630	450	455	465
	45	940	975	1115	770	790	845	610	620	640
80	50	920	950	1055	735	750	790	570	575	590
	56	1155	1195	1375	950	975	1045	755	765	790
100	63	1145	1190	1365	940	960	1030	740	750	775
	70	1400	1460	1740	1180	1210	1330	955	970	1015
125	80	1470	1530	1780	1220	1250	1350	970	985	1020
	90	1820	1910	2320	1550	1600	1780	1275	1300	1370
140	90	1640	1710	2020	1370	1410	1540	1100	1120	1170
	100	1980	2080	2570	1700	1755	1970	1400	1430	1515
160	100	1780	1850	2180	1485	1520	1660	1190	1210	1260
	110	2110	2210	2710	1800	1860	2080	1480	1510	1595
180	110	1910	1990	2340	1590	1635	1780	1275	1295	1350
	125	2405	2530	3000	2065	2130	2400	1710	1740	1850
200	125	2180	2280	2740	1840	1890	2090	1490	1510	1590
	140	2660	2800	3000	2300	2380	2720	1915	1960	2100
220	140	2490	2510	3150	2050	2120	2400	1685	1720	1835
	160	3000	3170	4230	2640	2750	3260	2240	2310	2530
250	160	2730	2870	3640	2350	2440	2790	1950	1990	2140
	180	3320	3520	4720	2940	3060	3650	2500	2570	2830
280	180	3040	3210	4140	2640	2750	3170	2210	2260	2440
	200	3620	3840	5210	3210	3360	4040	2750	2830	3140
320	200	3250	3430	4455	2820	2930	3410	2360	2420	2620
	220	3800	4030	5500	3370	3530	4250	2880	2970	3290

Installation position

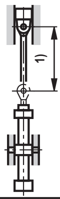
0°



45°



90°



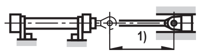
1) Adm. Stroke length

Type of mounting CDH2/CGH2/CSH2 2): MS2

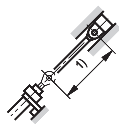
ØAL	ØMM	Admissible stroke length with								
		100 bar			160 bar			250 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°
40	25	825	840	885	645	650	665	370	375	410
	28	1305	1350	1535	1085	1110	1180	875	885	910
50	32	1330	1375	1560	1095	1120	1190	875	885	910
	36	1645	1715	2030	1395	1430	1560	1140	1160	1210
63	40	1610	1670	1950	1345	1380	1490	1085	1100	1145
	45	1980	2000	2000	1700	1750	1950	1410	1435	1510
80	50	1980	2000	2000	1665	1710	1850	1350	1370	1425
	56	2000	2000	2000	2000	2000	2000	1730	1760	1860
100	63	2420	2535	3000	2080	2140	2390	1720	1750	1850
	70	2880	3000	3000	2530	2630	3000	2140	2190	2360
125	80	3000	3000	3000	2660	2750	3000	2220	2270	2410
	90	3000	3000	3000	3000	3000	3000	2810	2890	3000
140	90	3000	3000	3000	2970	3000	3000	2490	2550	2740
	100	3000	3000	3000	3000	3000	3000	3000	3000	3000
160	100	3000	3000	3000	3000	3000	3000	2690	2750	2950
	110	3000	3000	3000	3000	3000	3000	3000	3000	3000
180	110	3000	3000	3000	3000	3000	3000	2890	2960	3000
	125	3000	3000	3000	3000	3000	3000	3000	3000	3000
200	125	3000	3000	3000	3000	3000	3000	3000	3000	3000
	140	3000	3000	3000	3000	3000	3000	3000	3000	3000
220	140	5090	5370	6000	4490	4670	5470	3820	3910	4260
	160	6000	6000	6000	5510	5800	6000	4850	5020	5750
250	160	5520	5860	6000	4940	5170	6000	4270	4410	4920
	180	6000	6000	6000	6000	6000	6000	5320	5520	6000
280	180	6000	6000	6000	5700	5960	6000	4930	5070	5630
	200	6000	6000	6000	6000	6000	6000	6000	6000	6000
320	200	6000	6000	6000	5890	6000	6000	4750	5310	6000
	220	6000	6000	6000	6000	6000	6000	6000	6000	6000

Installation position

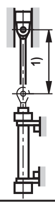
0°



45°



90°



1) Adm. Stroke length

With longer strokes, an extended guide and/or the use of guide rings may be reasonable for increasing the service life, depending on the respective application and installation position. Recommendation on request.

2) With CSH2, observe the maximum stroke length "X*max", pages 24 to 35

End position cushioning

End position cushioning:
The objective is to reduce the velocity of a moved mass, whose center of gravity lies on the cylinder axis to a level, at which neither the cylinder nor the machine into which the cylinder is installed is damaged. For velocities above 20 mm/s, we recommend the use of an end position cushioning feature, which absorbs energy without requiring the use of additional equipment. It must, however, always be verified whether end position cushioning is also required for lower velocities with large masses.

Damping capacity:
When decelerating masses via end position cushioning, the structural-inherent cushioning capacity must not be exceeded. Cylinders with end position cushioning can achieve their full cushioning capacity only over the entire stroke length.

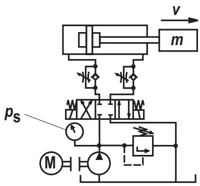
With the adjustable end position cushioning version "E", a throttle valve is additionally provided when compared with version "D". End position cushioning version "E" allows cycle times to be optimized. The maximum cushioning capacity can only be achieved when the throttle valve is closed.

The calculation depends on the factors weight, velocity, system pressure and installation position. For this reason, mass and velocity are used to determine the characteristic $\boldsymbol{D}_m$ and system pressure and installation position to determine the characteristic $\boldsymbol{D}_p$.

These two characteristics are used for verifying the admissible damping capacity in the "damping capacity" diagram. The intersection point of the characteristics $\boldsymbol{D}_m$ and $\boldsymbol{D}_p$ must always be below the damping capacity curve of the selected cylinder. The values in the diagrams refer to an average oil temperature of +45 to +65 °C with the throttle valve being closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position cushioning versions can be offered on request.

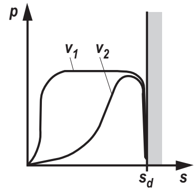
When fixed or adjustable stops are used, special measures must be taken!



Formulas:

$$\boldsymbol{D}_m = \frac{\boldsymbol{m}}{10^K}\ ;\ \boldsymbol{K} = \boldsymbol{kv}\,(0{,}5 - \boldsymbol{v})$$

$\boldsymbol{m}$ = Moved weight in kg
$\boldsymbol{v}$ = Stroke velocity in m/s
$\boldsymbol{kv}$ = See table page 64



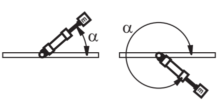
Extension for CDH2 and CSH2

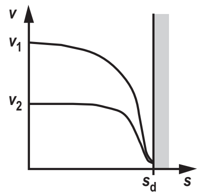
$$\boldsymbol{D}_p = \boldsymbol{p}_S - \frac{\boldsymbol{m} \cdot 9{,}81 \cdot \sin\boldsymbol{\alpha}}{\boldsymbol{A}_1 \cdot 10}$$

Retraction for CDH2, CGH2 and CSH2; extension for CGH2

$$\boldsymbol{D}_p = \boldsymbol{p}_S + \frac{\boldsymbol{m} \cdot 9{,}81 \cdot \sin\boldsymbol{\alpha}}{\boldsymbol{A}_3 \cdot 10}$$

$\boldsymbol{p}_S$ = System pressure in bar
$\boldsymbol{A}_1$ = Piston area in cm² (see page 4)
$\boldsymbol{A}_3$ = Annulus area in cm² (see page 4)
$\boldsymbol{\alpha}$ = Angle to the horizontal in degrees





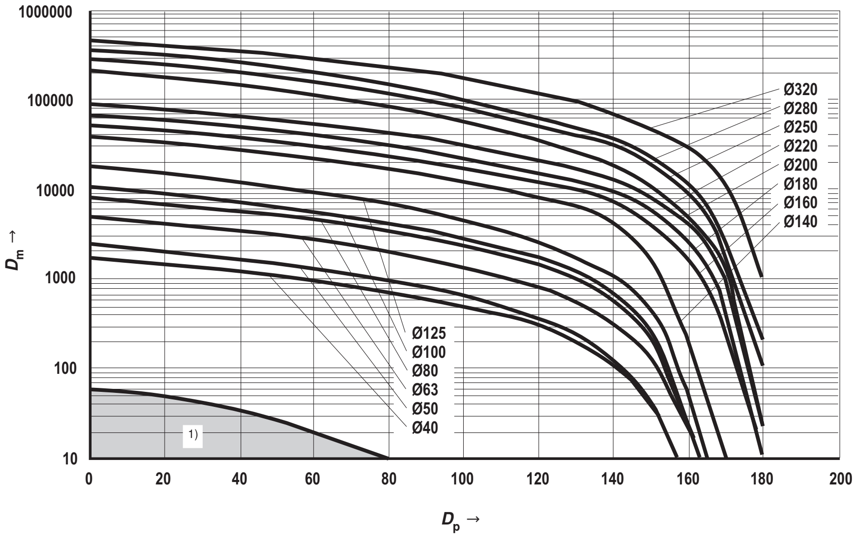
Damping length

ØAL mm	40	50	63	80	100	125	140	160	180	200	220	250	280	320
Head side	21	20	23	25	25	25	33	33	37	37	76	81	86	90
Base side	21	20	23	25	25	25	33	33	37	37	76	81	86	90

End position cushioning

ØAL mm	**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**	**180**	**200**	**220**	**250**	**280**	**320**
kv ①	2,85	2,97	2,56	2,82	3,51	3,02	2,53	2,65	2,91	2,76	2,85	2,95	3,11	3,13
kv ②	3,1	3,25	2,85	2,85	3,52	2,91	2,53	2,93	2,95	2,95	2,93	3,1	3,12	3,07
kv ③	2,95	3,1	2,73	3,1	3,51	2,95	2,51	2,91	2,95	2,91	2,93	2,93	3,15	3,25

Damping capacity: Extension for CDH2 and CSH2, with *kv* ①

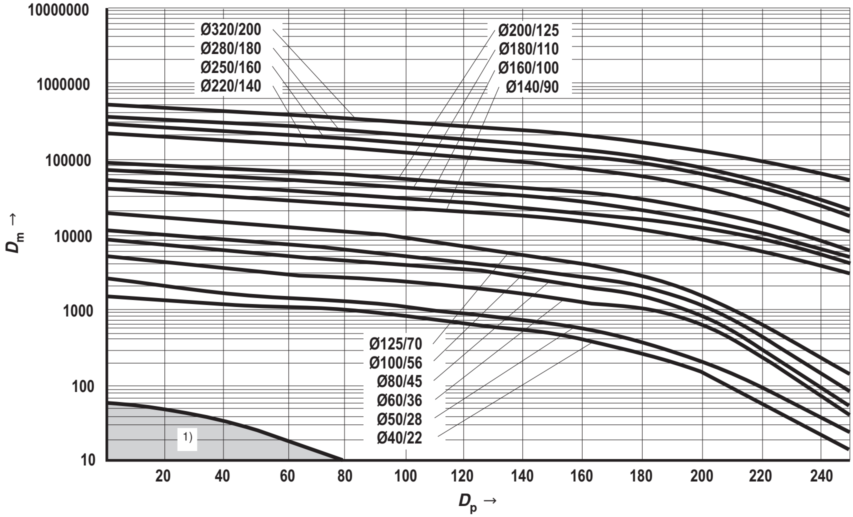


ØAL = Piston Ø

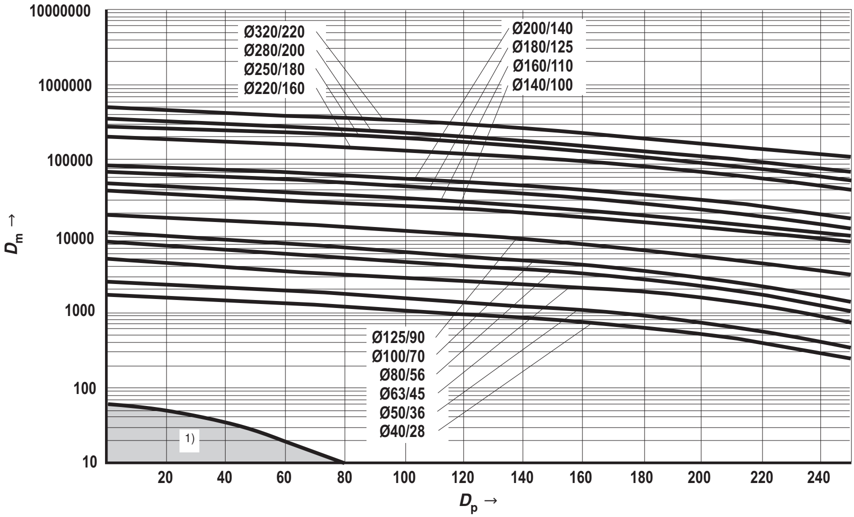
1) If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

End position cushioning

Damping capacity: Retraction for CDH2, CGH2 and CSH2; extension for CGH2 with *kv* ②



Damping capacity: Retraction for CDH2, CGH2 and CSH2; extension for CGH2 with *kv* ③



ØAL = Piston Ø

1) If with standard applications the calculated intersection point of $\boldsymbol{D}_m$ and $\boldsymbol{D}_p$ is within the marked area, we recommend designing the cylinder without end position cushioning.

Selection criteria for seals

	Work and environmental conditions	Seal versions								
		M	G	V	L	A	B	T	R	S
Medium / temperature	**Medium HL, HLP** / operating temperature medium –20 °C to +80 °C	++	++	++	++	++	++	++	++	++
	Medium HFA / operating temperature medium +5 °C to +55 °C	+/–	+/–	+/–	+/–	+	+/–	++	+/–	+/–
	Medium HFC / operating temperature medium –20 °C to +60 °C	–	++	–	–	+/–	–	++	–	–
	Medium HFD-R / operating temperature medium –15 °C to +80 °C	–	–	++	–	–	++	–	–	++
	Medium HFD-U / operating temperature medium –15 °C to +80 °C	–	–	++	–	–	++	–	–	++
	Ambient and rod temperature in the area of the piston rod from –20 °C to +80 °C [1]	++	+	+ [2]	++	++	+ [2]	+	++	++ [2]
	Extended ambient and rod temperature in the area of the piston rod from +80 °C to +120 °C	–	–	++	–	–	+	–	–	++
Function / velocity...	Static holding function more than 10 minutes: Attention! Application- and temperature-dependent	++	+	+	+	++	++	+	+	+
	Static holding function short-term < 1 minute	++	++	++	++	++	++	++	++	++
	Robust application conditions: Steel works, mining, thin ice	++	++	++	++	++	++	–	++	–
	Zero point control, hardly amplitude, frequency max. 5 Hz, not longer than 5 minutes	–	–	–	+/–	–	–	++	+	++
	Cylinder velocity min. 0.001 m/sec stick-slip behavior	++	+	+	++	–	–	++	++	++
	Cylinder velocity from 0.01 m/sec to 0.5 m/sec [3]	++	+	+	++	+	+	++	++	++
	Cylinder velocity > 0.5 m/sec to max. 0.8 m/sec [3]	–	+/–	+/–	++	–	–	++	+	++
	Stroke > 1.0 m	+/-	++	++	++	++	++	++	++	++
	Standstill period (wear)	++	+/–	+/–	++	+/–	–	++	++	++
	Undissolved air in the oil [4]	–	+	+	+	–	–	+	+	+

++ = very good + = good +/– = conditional, depending on the application parameters – = unsuitable

General technical data in corresponding data sheets will remain valid!

1) Moreover, observe the corresponding medium temperature range
2) Lower temperature limit –15 °C
3) Standard line connections not designed for that velocity
4) – Seal is destroyed / + Seal is not directly destroyed, leaks may occur

Generally, a medium temperature of approx. 40 °C is recommended. The specified values are to be regarded as guidelines; depending on the application, it may be necessary to check the suitability of the seal system.

Seal kits [1)]

CDH2 – Standard

ØAL	ØMM	Material no. for seal design								
		M	G	V	L	A	B	T	R	S
40	25	R901010141	R961006001	R961006036	R961006071	R901010145	R901010147	R901010143	R961006106	R901010146
	28	R900851087	R961006002	R961006037	R961006072	R900859445	R900859770	R900858841	R961006107	R900861001
50	32	R900860274	R961006004	R961006039	R961006074	R900860929	R900860939	R900860275	R961006109	R900861003
	36	R900849392	R961006005	R961006040	R961006075	R900851515	R900860940	R900860277	R961006110	R900861004
63	40	R900859509	R961006007	R961006042	R961006077	R900851637	R900860941	R900860279	R961006112	R900861006
	45	R900847956	R961006008	R961006043	R961006078	R900851638	R900859678	R900847855	R961006113	R900861007
80	50	R900857129	R961006010	R961006045	R961006080	R900856092	R900860943	R900860281	R961006115	R900861009
	56	R900850905	R961006011	R961006046	R961006081	R900854718	R900851205	R900856180	R961006116	R900861010
100	63	R900860283	R961006013	R961006048	R961006083	R900856093	R900860945	R900860284	R961006118	R900861012
	70	R900853382	R961006014	R961006049	R961006084	R900856094	R900860946	R900860285	R961006119	R900861013
125	80	R900860287	R961006016	R961006051	R961006086	R900860931	R900860950	R900860288	R961006121	R900861015
	90	R900857949	R961006017	R961006052	R961006087	R900856095	R900855464	R900856102	R961006122	R900861016
140	90	R900858281	R961006018	R961006053	R961006088	R900860932	R900860951	R900860289	R961006123	R900861017
	100	R900853965	R961006019	R961006054	R961006089	R900856096	R900860952	R900860290	R961006124	R900849080
160	100	R900855683	R961006020	R961006055	R961006090	R900860468	R900860953	R900860291	R961006125	R900861018
	110	R900851146	R961006021	R961006056	R961006091	R900860933	R900860954	R900857536	R961006126	R900861019
180	110	R900856497	R961006023	R961006058	R961006093	R900860934	R900860955	R900852561	R961006128	R900861020
	125	R900848603	R961006024	R961006059	R961006094	R900860935	R900860956	R900860292	R961006129	R900861021
200	125	R900860294	R961006025	R961006060	R961006095	R900860936	R900860957	R900860295	R961006130	R900861022
	140	R900856431	R961006026	R961006061	R961006096	R900860937	R900860958	R900860293	R961006131	R900861023
220	140	R900888100	R961006027	R961006062	R961006097	R900888116	R900888140	R900888108	R961006132	R900888132
	160	R900888101	R961006028	R961006063	R961006098	R900888117	R900888141	R900888109	R961006133	R900888133
250	160	R900888102	R961006029	R961006064	R961006099	R900888118	R900888142	R900888110	R961006134	R900888134
	180	R900888103	R961006030	R961006065	R961006100	R900888119	R900888143	R900888111	R961006135	R900888135
280	180	R900888104	R961006031	R961006066	R961006101	R900888120	R900888144	R900888112	R961006136	R900888136
	200	R900888105	R961006032	R961006067	R961006102	R900888121	R900888145	R900888113	R961006137	R900888137
320	200	R900888106	R961006033	R961006068	R961006103	R900888122	R900888146	R900888114	R961006138	R900888138
	220	R900888107	R961006034	R961006069	R961006104	R900888123	R900888147	R900888115	R961006139	R900888139

ØAL = Piston Ø
ØMM = Piston rod Ø
[1)] Seal kits for proximity switches and subplate mounting separate material no.

2

Seal kits [1)]

CGH2 – Standard

ØAL	ØMM	Material no. for seal design								
		M	**G**	**V**	**L**	**A**	**B**	**T**	**R**	**S**
40	**25**	R901010159	R961006222	R961006257	R961006292	R901010162	R901010170	R901010161	R961006327	R901010169
	28	R900867252	R961006223	R961006258	R961006293	R900866747	R900867133	R900868889	R961006328	R900868943
50	**32**	R900867254	R961006225	R961006260	R961006295	R900866749	R900857135	R900868891	R961006330	R900868945
	36	R900864930	R961006226	R961006261	R961006296	R900866750	R900867136	R900868892	R961006331	R900868946
63	**40**	R900867261	R961006228	R961006263	R961006298	R900866752	R900867138	R900868894	R961006333	R900868948
	45	R900867262	R961006229	R961006264	R961006299	R900866753	R900867139	R900868895	R961006334	R900868949
80	**50**	R900867264	R961006231	R961006266	R961006301	R900866755	R900867141	R900868897	R961006336	R900868951
	56	R900867265	R961006232	R961006267	R961006302	R900866756	R900867142	R900868898	R961006337	R900868952
100	**63**	R900867267	R961006234	R961006269	R961006304	R900866758	R900867144	R900868900	R961006339	R900868954
	70	R900867268	R961006235	R961006270	R961006305	R900866759	R900867146	R900868901	R961006340	R900868955
125	**80**	R900860730	R961006237	R961006272	R961006307	R900866761	R900867148	R900868903	R961006342	R900868956
	90	R900867270	R961006238	R961006273	R961006308	R900866762	R900867149	R900868904	R961006343	R900868957
140	**90**	R900867271	R961006239	R961006274	R961006309	R900866763	R900867150	R900868905	R961006344	R900868958
	100	R900867272	R961006240	R961006275	R961006310	R900866764	R900867151	R900868906	R961006345	R900868959
160	**100**	R900867273	R961006241	R961006276	R961006311	R900866765	R900867152	R900868907	R961006346	R900868960
	110	R900867274	R961006242	R961006277	R961006312	R900866766	R900867153	R900868908	R961006347	R900868961
180	**110**	R900867275	R961006244	R961006279	R961006314	R900866767	R900867154	R900868909	R961006349	R900868962
	125	R900867276	R961006245	R961006280	R961006315	R900866768	R900867155	R900868910	R961006350	R900868963
200	**125**	R900867277	R961006246	R961006281	R961006316	R900866769	R900867156	R900868911	R961006351	R900868964
	140	R900867278	R961006247	R961006282	R961006317	R900866770	R900867157	R900868912	R961006352	R900868965
220	**140**	R900888020	R961006248	R961006283	R961006318	R900888036	R900888060	R900888028	R961006353	R900888052
	160	R900888021	R961006249	R961006284	R961006319	R900888037	R900888061	R900888029	R961006354	R900888053
250	**160**	R900888022	R961006250	R961006285	R961006320	R900888038	R900888062	R900888030	R961006355	R900888054
	180	R900888023	R961006251	R961006286	R961006321	R900888039	R900888063	R900888031	R961006356	R900888055
280	**180**	R900888024	R961006252	R961006287	R961006322	R900888040	R900888064	R900888032	R961006357	R900888056
	200	R900888025	R961006253	R961006288	R961006323	R900888041	R900888065	R900888033	R961006358	R900888057
320	**200**	R900888026	R961006254	R961006289	R961006324	R900888042	R900888066	R900888034	R961006359	R900888058
	220	R900888027	R961006255	R961006290	R961006325	R900888043	R900888067	R900888035	R961006360	R900888059

ØAL = Piston Ø
ØMM = Piston rod Ø

1) Seal kits for proximity switches and subplate mounting separate material no.

Seal kits [1)]

CDH2 – Standard + additional option F

ØAL	ØMM	Material no. for seal designg					
		M+F	G+F	V+F	T+F	R+F	S+F
40	25	R901010148	R961006141	R961006168	R901010149	R961006195	R901010150
	28	R900861025	R961006142	R961006169	R900861050	R961006196	R900861100
50	32	R900861027	R961006144	R961006171	R900861052	R961006198	R900861102
	36	R900861028	R961006145	R961006172	R900861053	R961006199	R900861103
63	40	R900861030	R961006147	R961006174	R900861055	R961006201	R900861105
	45	R900861031	R961006148	R961006175	R900861056	R961006202	R900861106
80	50	R900861033	R961006150	R961006177	R900861058	R961006204	R900861108
	56	R900861034	R961006151	R961006178	R900861059	R961006205	R900861109
100	63	R900861036	R961006153	R961006180	R900861061	R961006207	R900861114
	70	R900861037	R961006154	R961006181	R900861062	R961006208	R900861115
125	80	R900861039	R961006156	R961006183	R900861064	R961006210	R900861120
	90	R900861040	R961006157	R961006184	R900861065	R961006211	R900861122
140	90	R900861041	R961006158	R961006185	R900861066	R961006212	R900861124
	100	R900861042	R961006159	R961006186	R900861067	R961006213	R900861126
160	100	R900861043	R961006160	R961006187	R900861068	R961006214	R900861128
	110	R900861044	R961006161	R961006188	R900861069	R961006215	R900861130
180	110	R900861045	R961006163	R961006190	R900861070	R961006217	R900861133
	125	R900861046	R961006164	R961006191	R900861071	R961006218	R900861135
200	125	R900861047	R961006165	R961006192	R900861072	R961006219	R900861142
	140	R900861048	R961006166	R961006193	R900861073	R961006220	R900861143

2

CGH2 – Standard + additional option F

ØAL	ØMM	Material no. for seal design					
		M+F	G+F	V+F	T+F	R+F	S+F
40	25	R901010151	R961006362	R961006389	R901010154	R961006416	R901010156
	28	R900868999	R961006363	R961006390	R900869026	R961006417	R900869093
50	32	R900869001	R961006365	R961006392	R900869028	R961006419	R900869095
	36	R900869002	R961006366	R961006393	R900869029	R961006420	R900869096
63	40	R900869004	R961006368	R961006395	R900869031	R961006422	R900869098
	45	R900869005	R961006369	R961006396	R900869032	R961006423	R900869099
80	50	R900869007	R961006371	R961006398	R900869034	R961006425	R900869101
	56	R900869008	R961006372	R961006399	R900869035	R961006426	R900869102
100	63	R900869012	R961006374	R961006401	R900869037	R961006428	R900869104
	70	R900869013	R961006375	R961006402	R900869038	R961006429	R900869105
125	80	R900869015	R961006377	R961006404	R900869040	R961006431	R900869107
	90	R900869016	R961006378	R961006405	R900869041	R961006432	R900869108
140	90	R900869017	R961006379	R961006406	R900869042	R961006433	R900869109
	100	R900869018	R961006380	R961006407	R900869043	R961006434	R900869110
160	100	R900869019	R961006381	R961006408	R900869044	R961006435	R900869111
	110	R900869020	R961006382	R961006409	R900869045	R961006436	R900869112
180	110	R900869021	R961006384	R961006411	R900869046	R961006438	R900869113
	125	R900869022	R961006385	R961006412	R900869047	R961006439	R900869114
200	125	R900869023	R961006386	R961006413	R900869048	R961006440	R900869115
	140	R900869024	R961006387	R961006414	R900869049	R961006441	R900869116

ØAL = Piston Ø
ØMM = Piston rod Ø

[1)] Seal kits for proximity switches and subplate mounting separate material no.

Seal kits 2)

CSH2

ØAL	ØMM	Material no. for seal design						
		M	T	G	L	R	S	V
40	28	R900861025	R900861050	R961006142	R961006072	R961006196	R900861100	R961006169
50	32	R900861027	R900861052	R961006144	R961006074	R961006198	R900861102	R961006171
	36	R900861028	R900861053	R961006145	R961006075	R961006199	R900861103	R961006172
63	40	R900861030	R900861055	R961006147	R961006077	R961006201	R900861105	R961006174
	45	R900861031	R900861056	R961006148	R961006078	R961006202	R900861106	R961006175
80	50	R900861033	R900861058	R961006150	R961006080	R961006204	R900861108	R961006177
	56	R900861034	R900861059	R961006151	R961006081	R961006205	R900861109	R961006178
100	63	R900861036	R900861061	R961006153	R961006083	R961006207	R900861114	R961006180
	70	R900861037	R900861062	R961006154	R961006084	R961006208	R900861115	R961006181
125	80	R900861039	R900861064	R961006156	R961006086	R961006210	R900861120	R961006183
	90	R900861040	R900861065	R961006157	R961006087	R961006211	R900861122	R961006184
140	90	R900861041	R900861066	R961006158	R961006088	R961006212	R900861124	R961006185
	100	R900861042	R900861067	R961006159	R961006089	R961006213	R900861126	R961006186
160	100	R900861043	R900861068	R961006160	R961006090	R961006214	R900861128	R961006187
	110	R900861044	R900861069	R961006161	R961006091	R961006215	R900861130	R961006188
180	110	R900861045	R900861070	R961006163	R961006093	R961006217	R900861133	R961006190
	125	R900861046	R900861071	R961006164	R961006094	R961006218	R900861135	R961006191
200	125	R900861047	R900861072	R961006165	R961006095	R961006219	R900861142	R961006192
	140	R900861048	R900861073	R961006166	R961006096	R961006220	R900861143	R961006193
220	140	R900888100	R900888108	R961006027	R961006097	R961006132	R900888116	R961006062
	160	R900888101	R900888109	R961006028	R961006098	R961006133	R900888117	R961006063
250	160	R900888102	R900888110	R961006029	R961006099	R961006134	R900888118	R961006064
	180	R900888103	R900888111	R961006030	R961006100	R961006135	R900888119	R961006065
280	180	R900888104	R900888112	R961006031	R961006101	R961006136	R900888120	R961006066
	200	R900888105	R900888113	R961006032	R961006102	R961006137	R900888121	R961006067
320	200	R900888106	R900888114	R961006033	R961006103	R961006138	R900888122	R961006068
	220	R900888107	R900888115	R961006034	R961006104	R961006139	R900888123	R961006069

ØAL = Piston Ø
ØMM = Piston rod Ø

2) Seal kits for position measurement system and subplate mounting separate material no.

Seal kits

Only for proximity switches

ØAL	Material no. for seal design								
	M / M+F	T / T+F	G / G+F	L	R / R+F	A	S / S+F	V / V+F	B
40 to 200	R900885938						R900885939		
220 to 320	R900894997						R900894998		

Only for subplate mounting

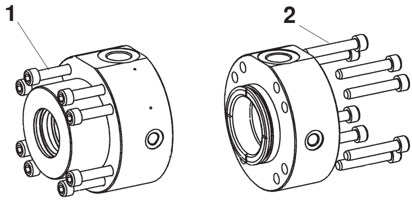
ØAL	Material no. for seal design	
	M, T, G, L, R, A	S, B, V
40	R961006022	R961006243
50	R961006022	R961006243
63	R961006057	R961006278
80	R961006057	R961006278
100	R961006092	R961006313
125	R961006092	R961006313
140	R961006127	R961006348
160	R961006127	R961006348
180	R961006162	R961006383
200	R961006162	R961006383

Only for position measurement system

ØAL	Material no. for seal design	
	M, T, G, L, R	S, V
40	R900885935	R900885937
50	R900894958	R900894979
63	R900894959	R900894980
80	R900894960	R900894981
100	R900894961	R900894982
125	R900894962	R900894983
140	R900894963	R900894985
160	R900894964	R900894986
180	R900894973	R900894987
200	R900894974	R900894988
220	R900894975	R900894989
250	R900894976	R900894991
280	R900894977	R900894993
320	R900894978	R900894994

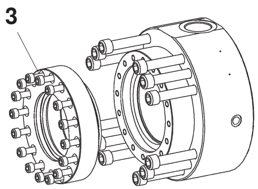
Tightening torques

Screws: Head and base (item 1 and 2)



Series	Piston Ø	Screw	Quantity	Quality class	Tightening torque
CDH2 / CGH2 / CSH2	**40**	M8	4	10.9	23 Nm
CDH2 / CGH2 / CSH2	**50**	M8	8	10.9	20 Nm
CDH2 / CGH2 / CSH2	**63**	M8	8	10.9	30 Nm
CDH2 / CGH2 / CSH2	**80**	M10	8	10.9	55 Nm
CDH2 / CGH2 / CSH2	**100**	M12	8	10.9	100 Nm
CDH2 / CGH2 / CSH2	**125**	M16	8	10.9	200 Nm
CDH2 / CGH2 / CSH2	**140**	M16	12	10.9	170 Nm
CDH2 / CGH2 / CSH2	**160**	M16	12	10.9	220 Nm
CDH2 / CGH2 / CSH2	**180**	M20	12	10.9	350 Nm
CDH2 / CGH2 / CSH2	**200**	M20	12	10.9	410 Nm
CDH2 / CGH2 / CSH2	**220**	M20	16	10.9	460 Nm
CDH2 / CGH2 / CSH2	**250**	M24	16	10.9	700 Nm
CDH2 / CGH2 / CSH2	**280**	M30	12	10.9	1700 Nm
CDH2 / CGH2 / CSH2	**320**	M30	16	10.9	1500 Nm

Screws: Seal cover (item 3)



Only with seal design "A" and "B"

<table>
<tr><th>Series</th><th>Piston Ø</th><th>Piston rod Ø</th><th>Screw</th><th>Quantity</th><th>Quality class</th><th>Tightening torque</th></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">160</td><td>100</td><td rowspan="2">M10</td><td rowspan="2">16</td><td rowspan="2">10.9</td><td rowspan="2">60 Nm</td></tr>
<tr><td>110</td></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">180</td><td>110</td><td rowspan="2">M12</td><td rowspan="2">16</td><td rowspan="2">10.9</td><td rowspan="2">80 Nm</td></tr>
<tr><td>125</td></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">200</td><td>125</td><td rowspan="2">M12</td><td rowspan="2">16</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>140</td></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">220</td><td>140</td><td rowspan="2">M12</td><td>16</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>160</td><td>24</td></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">250</td><td>160</td><td rowspan="2">M12</td><td rowspan="2">24</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>180</td></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">280</td><td>180</td><td rowspan="2">M12</td><td rowspan="2">24</td><td rowspan="2">10.9</td><td rowspan="2">90 Nm</td></tr>
<tr><td>200</td></tr>
<tr><td rowspan="2">CDH2 / CGH2</td><td rowspan="2">320</td><td>200</td><td>M12</td><td>24</td><td rowspan="2">10.9</td><td>90 Nm</td></tr>
<tr><td>220</td><td>M16</td><td>16</td><td>230 Nm</td></tr>
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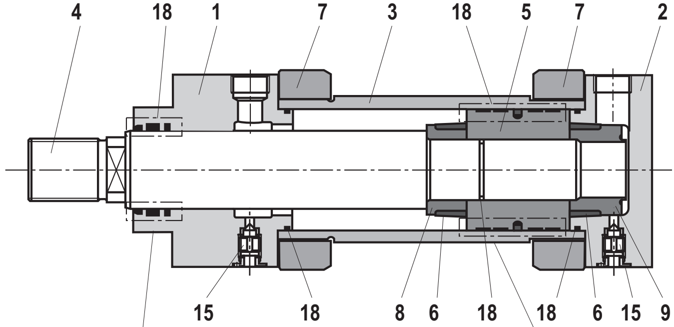
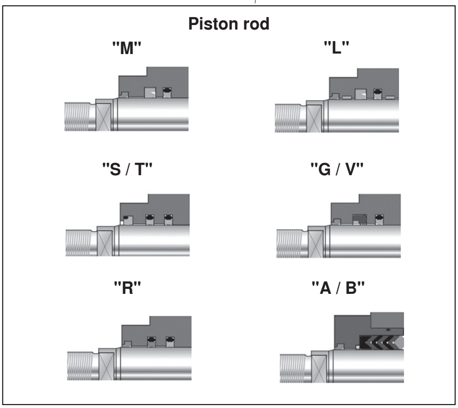
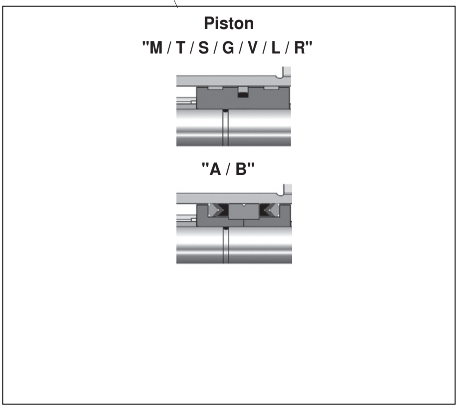
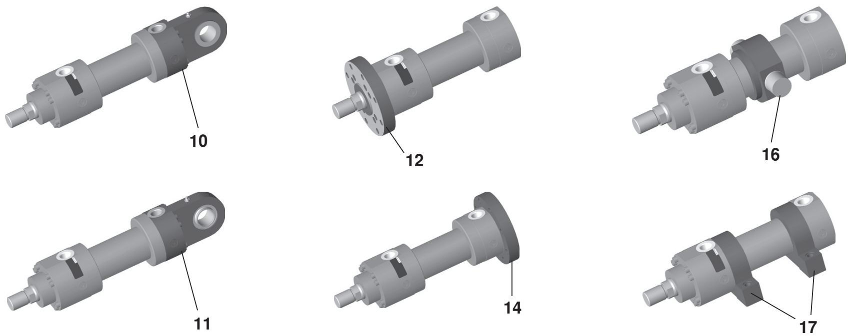
Spare parts: Series CDH2

CDH2





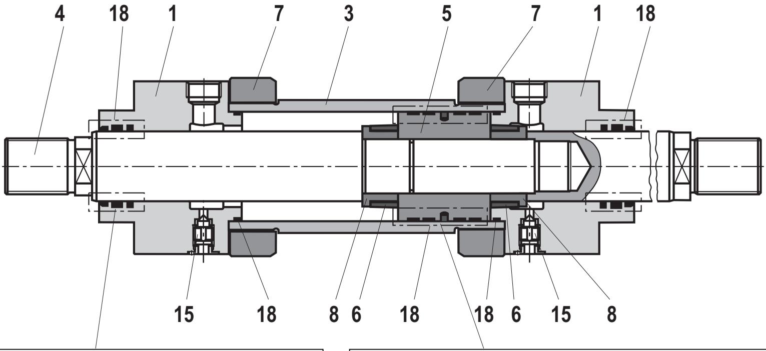


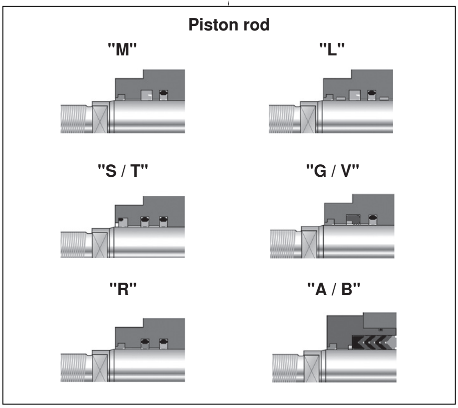


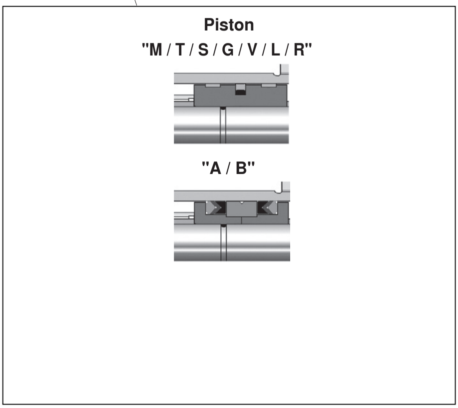
1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Base MP3
11 Base MP5
12 Round flange MF3
14 Round flange MF4
15 Bleeding
16 Trunnion MT4
17 Foot MS2
18 Seal kit:
Scraper
Rod seal
Piston seal
O-ring
Guide ring

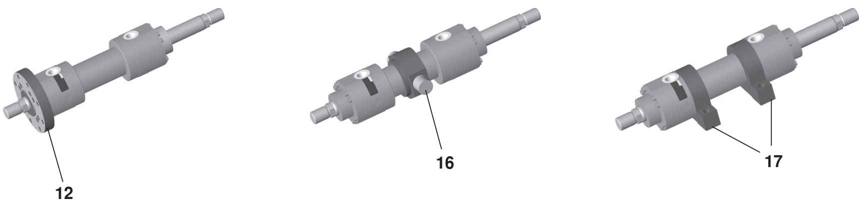
Spare parts: Series CGH2

CGH2





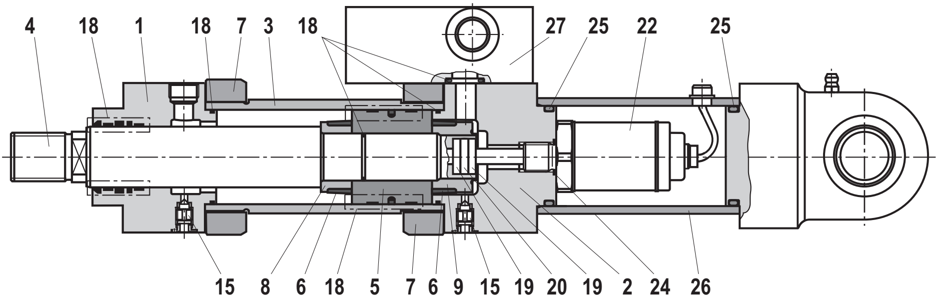


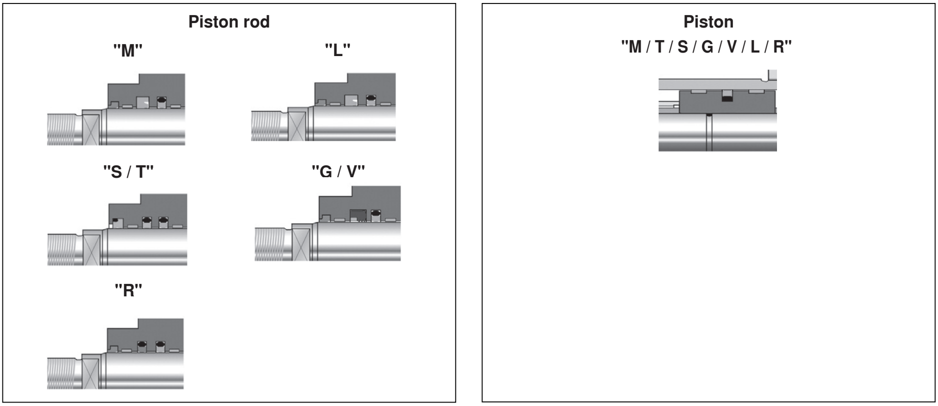


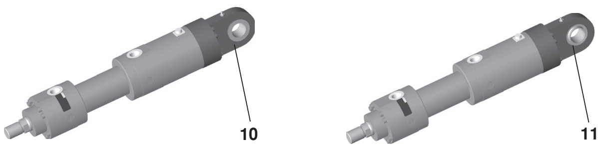
1 Head
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket

12 Round flange MF3
15 Bleeding
16 Trunnion MT4
17 Foot MS2
18 Seal kit:
- Scraper
- Rod seal
- Piston seal
- O-ring
- Guide ring

Spare parts: Series CSH2 MP3 and MP5

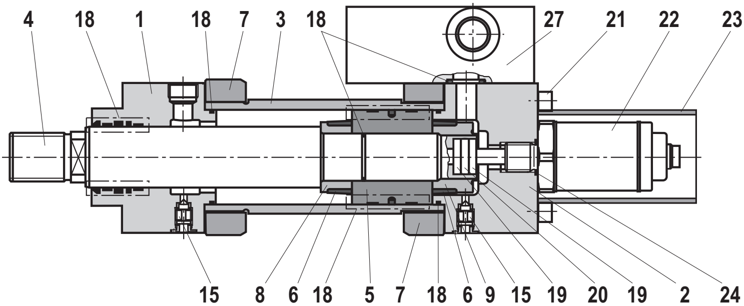


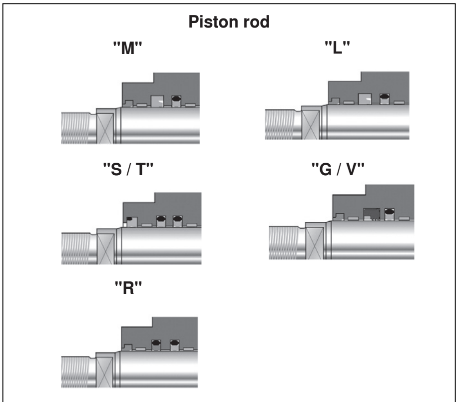


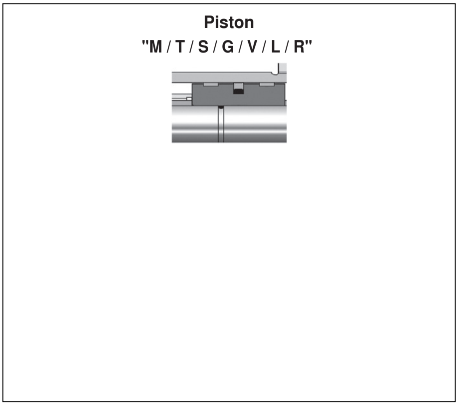


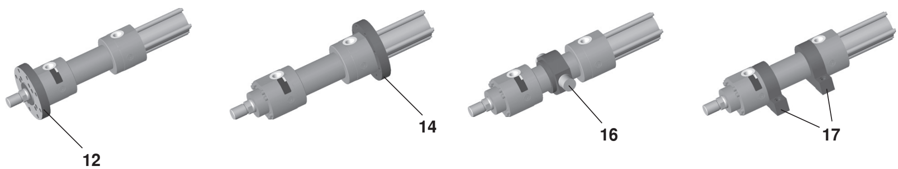
1	Head
2	Base
3	Pipe
4	Piston rod
5	Piston
6	Damping bush
7	Flange
8	Socket
9	Socket
10	Base MP3
11	Base MP 5
15	Bleeding
18	Seal kit: Scraper, Rod seal, Piston seal, O-ring, Guide ring
19	Insulating socket
20	Solenoid
22	Position transducer
24	Seal
25	Seal
26	Protective pipe
27	Subplate

Spare parts: Series CSH2 MF3, MF4, MT4 and MS2









- **1** Head
- **2** Base
- **3** Pipe
- **4** Piston rod
- **5** Piston
- **6** Damping bush
- **7** Flange
- **8** Socket
- **9** Socket
- **12** Round flange MF3
- **14** Round flange MF4
- **15** Bleeding
- **16** Trunnion MT4
- **17** Foot MS2
- **18** Seal kit:
  - Scraper
  - Rod seal
  - Piston seal
  - O-ring
  - Guide ring
- **19** Insulating socket
- **20** Solenoid
- **21** Hexagon socket head cap screws
- **22** Position transducer
- **23** Protective pipe
- **24** Seal
- **27** Subplate

Cylinder weight

Piston	Piston rod	CD/CS cylinder with 0 mm stroke length					Per 100 mm stroke length	CG cylinder with 0 mm stroke length			Per 100 mm stroke length
ØAL	**ØMM**	**MP3** [1] **MP5** [1]	**MP3** [2] **MP5** [2]	**MF3** **MF4**	**MT4**	**MS2**		**MF3**	**MT4**	**MS2**	
mm	mm	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
40	**25**	7	12	9	9	9	0,9	10	10	10	1,3
	28	7	12	9	9	9	1,0	10	10	10	1,5
50	**32**	12	19,5	14	13	13	1,3	16	16	16	1,9
	36	12	19,5	14	13	14	1,5	16	16	16	2,3
63	**40**	20	29,5	21	21	21	2,3	25	25	25	3,3
	45	20	29,5	21	21	21	2,6	25	25	25	3,8
80	**50**	32	42,5	35	34	35	3,2	41	40	41	4,7
	56	32	42,5	35	34	36	3,6	41	40	42	5,5
100	**63**	51	64,5	54	54	55	5,2	63	63	64	7,6
	70	51	64,5	55	54	56	5,7	64	64	65	8,8
125	**80**	95	114	96	99	98	8,2	113	115	114	12,1
	90	96	115	97	100	99	9,2	115	117	116	14,2
140	**90**	131	157	132	136	137	10,7	155	158	159	15,7
	100	132	158	133	137	138	11,9	156	160	161	18,1
160	**100**	185	220	184	197	206	12,6	217	231	239	18,8
	110	186	221	186	199	207	13,9	220	233	242	21,4
180	**110**	255	303	253	264	274	14,7	294	305	314	22,1
	125	258	304	256	267	277	16,8	300	311	320	26,5
200	**125**	349	405	332	350	363	19,0	359	377	389	28,6
	140	352	406	335	353	366	21,5	365	383	396	33,5
220	**140**	527	625	512	546	518	27,1	604	638	610	39,1
	160						30,9				46,7
250	**160**	673	795	640	677	650	32,7	761	798	772	48,5
	180						36,9				56,9
280	**180**	976	1192	966	1020	918	44,2	1130	1183	1081	64,2
	200						48,8				73,4
320	**200**	1251	1512	1172	1223	1174	55,2	1354	1405	1356	79,8
	220						60,4				90,2

ØAL = Piston Ø
ØMM = Piston rod Ø
1) Weight without position measurement system
2) Weight with position measurement system

Notes

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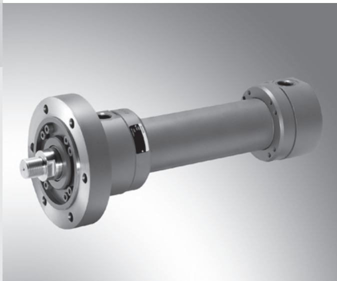
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Hydraulic cylinder, mill type

RE 17338/07.13
Replaces: 07.12

Series CDH3 / CGH3 / CSH3

Component series 3X
Nominal pressure 350 bar (35 MPa)



H4645_d

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Contents

Features

- 6 types of mounting
- Piston Ø (**ØAL**): 40 to 320 mm
- Piston rod Ø (**ØMM**): 28 to 220 mm
- Stroke lengths to 6 m

Project planning software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Technical data (For applications outside these parameters, please consult us!)

Standards:
Bosch Rexroth standard; main dimensions like piston Ø and piston rod Ø correspond to ISO 3320.

Nominal pressure: 350 bar

Static test pressure: 525 bar
Reduced test pressure: 315 bar
Higher operating pressures upon request
The specified operating pressures apply to applications with shock-free operation with regard to excess pressure and/or external loads. With extreme loads like e.g. high cycle sequence, mounting elements and threaded piston rod connections must be designed for durability.

Minimum pressure:
Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the cylinder. Without load, a minimum pressure of 10 bar is recommended for differential cylinders; for lower pressures as well as double-acting cylinders, please contact us.

Installation position: Any

Hydraulic fluid:
Mineral oils DIN 51524 HL, HLP
Oil-in-water emulsion HFA
Water glycol HFC
Phosphate ester HFD-R
Polyol ester HFD-U

Hydraulic fluid temperature range: See page 62

Ambient temperature range: See page 62

Optimum viscosity range: 20 to 100 mm^2/s

Minimum admissible viscosity: 12 mm^2/s

Maximum admissible viscosity: 380 mm^2/s

Cleanliness class according to ISO
Maximum admissible degree of contamination of the hydraulic fluid according to ISO 4406 (c) class 20/18/15.
The cleanliness classes specified for the components need to be met in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter

Bleeding by default: Secured against screwing out

Primer coat: By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010) of min. 40 µm. Other colors upon request.
With cylinders and attachment parts, the following surfaces are not primed or painted:
- All fit diameters to the customer side
- Sealing surfaces for line connection
- Sealing surfaces for flange connection
- Connection surfaces for valve mounting
- Inductive proximity switches
- Position measurement system

The surfaces that are not painted are protected by means of a corrosion protection agent (MULTICOR LF 80).
In the online order system, more painting systems can be selected. These systems are not displayed via the type key and not automatically considered when ordering replacement cylinders. Accessories that are ordered as separate order item are not primed or painted by default. Corresponding priming and/or painting on request.

Stroke velocity: Please observe the guideline on max. stroke velocities (with recommended flow velocity of 5 m/s in the line connection) in the table. Higher stroke velocities on request.
If the extension velocity is considerably higher than the retraction velocity of the piston rod, drag-out losses of the medium may result. If necessary, please consult us.

Piston Ø (mm)	Line connection	Max. stroke velocity in m/s
40	G1/2	0,31
50	G1/2	0,20
63	G3/4	0,28
80	G3/4	0,18
100	G1	0,20
125	G1 1/4	0,20
140	G1 1/4	0,16
160	G1 1/2	0,18
180	G1 1/2	0,14
200	G1 1/2	0,11
220	G1 1/2	0,09
250	G1 1/2	0,07
280	G1 1/2	0,06
320	G1 1/2	0,04

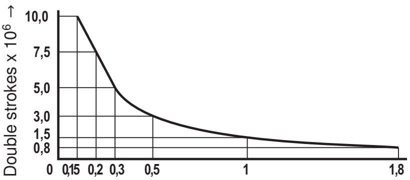
Technical data (For applications outside these parameters, please consult us!)

Boundary and application conditions:

- The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder (MP3/MP5 or MT4) or the piston rod.
- The buckling length/buckling load of the piston rod and/or the hydraulic cylinder must be observed (see page topic Buckling).
- The maximum admissible stroke velocities with regard to the suitability/load of seals must be observed as must their compatibility with the properties of the fluid type (see page topic Seals).
- The maximum admissible velocities/kinetic energies when moving into the end positions, also considering external loads, must be observed.
  Danger: Excess pressure
- The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from the area ratio of annulus to piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Notice: This list does not claim to be complete. In case of questions regarding the compatibility with media or exceedance of the boundary or application conditions, please contact us.

Life cycle:
Rexroth cylinders correspond to the reliability recommendations for industrial applications.
≥ 10000000 double strokes in idle continuos operation or 3000 km piston travel at 70 % of the maximum operating pressure, without load on the piston rod, with a maximum velocity of 0.5 m/s, with a failure rate of less than 5 %.



Acceptance:
Each cylinder is tested according to Bosch Rexroth standard and in compliance with ISO 10100: 2001.

Safety instructions:
For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions 07100-B have to be observed!
Service and repair works have to be performed by Bosch Rexroth AG or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair works not performed by Bosch Rexroth AG.

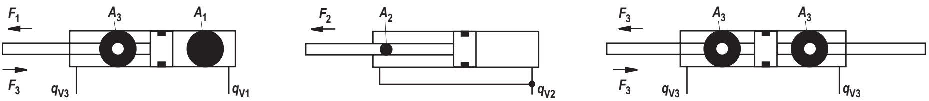
Check lists for hydraulic cylinders:
Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic cylinders (07200).

Project planning software ICS (Interactive Catalog System)

The ICS (Interactive Catalog System) is a selection and project planning help for hydraulic cylinders. The ICS allows designers for machines and systems to quickly and reliably find the perfect hydraulic cylinder solution through logic-guided type key enquiries. This software helps to solve design and project planning tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical data of the selected components as well as 2D and 3D CAD data in the correct file format for all common CAD systems.
This allows users to reduce costs while increasing their competitiveness.

Diameters, areas, forces, flow

Piston	Piston rod	Area ratio	Areas			Force at 350 bar [1]			Flow at 0.1 m/s [2]			Max. available stroke length
			Piston	Rod	Ring	Pressure	Diff.	Pulling	Off	Diff.	On	
ØAL mm	**ØMM** mm	φ A_1/A_3	A_1 cm²	A_2 cm²	A_3 cm²	F_1 kN	F_2 kN	F_3 kN	q_{V1} l/min	q_{V2} l/min	q_{V3} l/min	mm
40	**28**	1,96	12,56	6,16	6,40	43,96	21,56	22,40	7,5	3,7	3,8	2000
50	**36**	2,08	19,63	10,18	9,45	68,71	35,63	33,08	11,8	6,1	5,7	2000
63	**45**	2,04	31,17	15,90	15,27	109,10	55,65	53,45	18,7	9,5	9,2	2000
80	**56**	1,96	50,26	24,63	25,63	175,91	86,21	89,71	30,2	14,8	15,4	2000
100	**70**	1,96	78,54	38,48	40,06	274,89	134,68	140,21	47,1	23,1	24,0	3000
125	**90**	2,08	122,72	63,62	59,10	429,52	222,67	206,85	73,6	38,2	35,4	3000
140	**100**	2,04	153,94	78,54	75,40	538,79	274,89	263,90	92,4	47,1	45,3	3000
160	**110**	1,90	201,06	95,06	106,00	703,71	332,71	371,00	120,6	57,0	63,6	3000
180	**125**	1,93	254,47	122,72	131,75	890,65	429,52	461,13	152,7	73,6	79,1	3000
200	**140**	1,96	314,16	153,96	160,20	1099,56	538,86	560,70	188,5	92,4	96,1	3000
220	**160**	2,12	380,1	201,0	179,1	1330,5	703,7	626,8	228,1	120,7	107,4	6000
250	**180**	2,08	490,8	254,4	236,4	1718,1	890,6	827,4	294,5	152,7	141,8	6000
280	**200**	2,04	615,7	314,1	301,6	2155,1	1099,6	1055,6	369,4	188,5	180,9	6000
320	**220**	1,90	804,2	380,1	424,2	2814,9	1330,5	1484,4	482,5	228,1	254,4	6000



[1] Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. self-aligning clevises, plates or valves, etc.)

[2] Stroke velocity

Tolerances according to ISO 6020-1

Installation dimensions	WC	XC[2]	XO[2]	XS[1), 2)]	XV[2]	ZP[2]	
Type of mounting	MF3	MP3	MP5	MS2	MT4	MF4	
Stroke length	Tolerances						Stroke tolerances
≤ 1250	±2	±1,5	±1,5	±2	±2	±1,5	+2
> 1250 – ≤ 3150	±4	±3	±3	±4	±4	±3	+5
> 3150 – ≤ 6000	±8	±5	±5	±8	±8	±5	+8

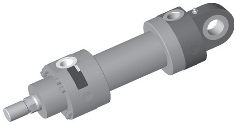
[1] Not standardized

[2] Including stroke length

Overview of types of mounting: Series CDH3 and CGH3

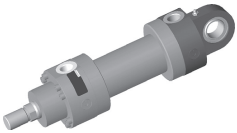
CDH3 MP3

see page 10, 11



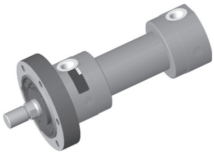
CDH3 MP5

see page 12, 13



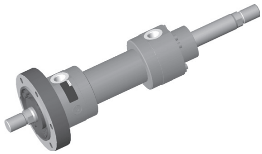
CDH3 MF3

see page 14, 15



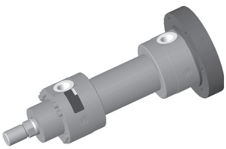
CGH3 MF3

see page 14, 15



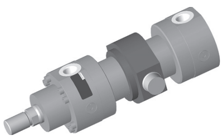
CDH3 MF4

see page 16, 17



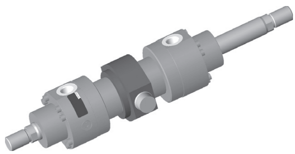
CDH3 MT4

see page 18, 19



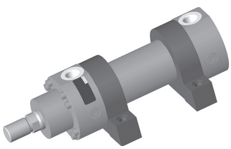
CGH3 MT4

see page 18, 19



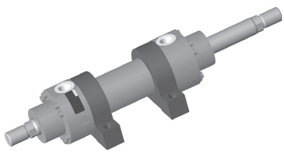
CDH3 MS2

see page 20, 21



CGH3 MS2

see page 20, 21



Ordering code series CDH3

CD	H3	/	/	/	A	3X/							

Differential cylinder = CD

Series = H3

Types of mounting
- Swivel eye at base [1)] = **MP3**
- Self-aligning clevis at base = **MP5**
- Round flange at head = **MF3**
- Round flange at base = **MF4**
- Trunnion [2)] = **MT4**
- Foot mounting = **MS2**

Piston Ø (ØAL) 40 to 320 mm

Piston rod Ø (ØMM) 28 to 220 mm

Stroke length in mm [3)]

Design principle
Head and base flanged = **A**

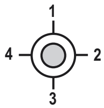
Component series
30 to 39 Unchanged installation and connection dimensions = **3X**

Line connection / version
- According to ISO 1179-1 (pipe thread ISO 228-1) = **B**
- According to ISO 9974-1 (metric thread ISO 261) = **M**
- Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (≙ SAE 6000 PSI) [4) 25)] = **D**
- Flange porting pattern according to ISO 6164 tab. 2 [4)] = **H**
- According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31)] = **C**

For directional and high-response valves
- Subplate size 6 [4) 5) 27)] = **P**
- Subplate size 10 [4) 6) 27)] = **T**
- Subplate size 16 [4) 7) 27)] = **U**
- Subplate size 25 [4) 8) 27)] = **V**

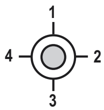
For SL and SV valves
- Subplate size 6 [4) 5) 15) 27)] = **A**
- Subplate size 10 [4) 6) 15) 27)] = **E**
- Subplate size 20 [4) 7) 15) 27)] = **L**
- Subplate size 30 [4) 8) 15) 27)] = **N**

Line connection/position at head
View to piston rod



- [30)] = **1**
- [30)] = **2**
- [30)] = **3**
- [30)] = **4**

Line connection/position at base
View to piston rod



- [30)] = **1**
- [30) 34)] = **2**
- [30)] = **3**
- [30) 34)] = **4**

Piston rod design
- Hard chromium-plated = **C**
- Hardened and hard chromium-plated [24)] = **H**
- Nickel-plated and hard chromium-plated [24)] = **N**

Piston rod end
- **A =** Thread for self-aligning clevis CGAS
- **G =** [26)] Thread for self-aligning clevis CGA, CGAK, plain clevis CSA
- **S =** With mounted self-aligning clevis CGAS
- **L =** [26)] With mounted self-aligning clevis CGA
- **M =** [26)] With mounted self-aligning clevis CGAK
- **N =** [1)] With mounted plain clevis CSA

End position cushioning
- **U =** Without
- **D =** [1)] On both sides, self-adjusting
- **E =** On both sides, adjustable

Seal design

For mineral oil HL, HLP and HFA
- **M =** Standard seal system
- **L =** Standard seal system with guide rings
- **R =** Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC
- **G =** [27)] Standard seal system HFC
- **T =** Servo quality/ reduced friction
- **A =** Chevron seal kits

For phosphate ester HFD-R and polyol ester HFD-U
- **S =** Servo quality/ reduced friction
- **V =** [27)] Standard seal system FKM
- **B =** Chevron seal kits

Option
- **Z =** Additional options, fill fields for additional options
- **W =** Without additional options, do **not** fill fields for additional options

Ordering code series CDH3

Additional options

Fields for additional options

	Z					

Inductive proximity switches **without** mating connector[37)] = **E**
Mating connector - separate order see page 44
without inductive proximity switches = **W**

Additional guide rings[10), 28)] = **F**
Without additional guide rings = **W**

Threaded coupling, on both sides = **A**
Without threaded coupling = **W**

A =[14), 35)] Spherical bearing, maintenance-free
B = Flanged grease nipple
W = Standard conical grease nipple

Y = Specify the piston rod extension LY in the clear text in mm
W = Without piston rod extension

2

Order examples:

Without additional options: **CDH3MP5/100/56/300A3X/B11CADMW**

With additional options: **CDH3MP5/100/56/300A3X/B11CADMZ EWABW**

1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the „XV" dimension in the clear text in mm
3) Max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) observe pages 56 to 58
4) Not possible with MF4
5) Piston Ø 40 to 80 mm, only position 11, subplates only possible in combination with line connection „B" at the head
6) Piston Ø 63 to 200 mm, only position 11, subplates only possible in combination with line connection „B" at the head
7) Piston Ø 125 to 200 mm, only position 11, subplates only possible in combination with line connection „B" at the head
10) Seal design A, B not possible; piston Ø 220 to 320 mm standard
13) Not with piston Ø 320 mm
14) Not possible with piston rod end „N"
15) Subplates for SL and SV valves (isolator valves)
Note: Seal designs T, G, L, R, S and V are not designed for the static holding function!
24) Only piston rod Ø 28 to 140 mm
25) Only piston Ø 63 to 320 mm
26) Only piston Ø 40 to 250 mm
27) Maximum operating pressure 315 bar
28) With seal design „L" standard
30) All graphical presentations in the data sheet show position 1
31) With MS2, only position 11 is possible
34) With MF4 and line connection B, M or C not possible
35) Not possible with MP3
37) Min. stroke length = 20 mm

Ordering code series CGH3

CG	H3		/	/	/	A	3X	/							

Double-acting cylinder [18] **= CG**

Series **= H3**

Types of mounting
- Round flange at head **= MF3**
- Trunnion [2] **= MT4**
- Foot mounting **= MS2**

Piston Ø (ØAL) 40 to 320 mm

Piston rod Ø (ØMM) 28 to 220 mm

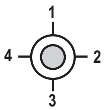
Stroke length in mm [3]

Design principle
- Head and base flanged **= A**

Component series
- 30 to 39 Unchanged installation and connection dimensions **= 3X**

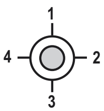
Line connection / version
- According to ISO 1179-1 (pipe thread ISO 228-1) **= B**
- According to ISO 9974-1 (metric thread ISO 261) **= M**
- Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (SAE 6000 PSI) [25] **= D**
- Flange porting pattern according to ISO 6164 tab. 2 **= H**
- According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31] **= C**

Line connection/position at head
View to piston rod



- [30] **= 1**
- [30] **= 2**
- [30] **= 3**
- [30] **= 4**

Line connection/position at base
View to piston rod



- [30] **= 1**
- [30] **= 2**
- [30] **= 3**
- [30] **= 4**

Piston rod design
- Hard chromium-plated [36] **= C**
- Hardened and hard chromium-plated [24] **= H**
- Nickel-plated and hard chromium-plated [19] **= N**

Piston rod end
- **A =** Thread for plain clevis CGAS
- **G =** [26] Thread for self-aligning clevis CGA, CGAK, plain clevis CSA
- **S =** [26] [17] With mounted self-aligning clevis CGAS
- **L =** [26] [17] With mounted self-aligning clevis CGA
- **M =** [26] [17] With mounted self-aligning clevis CGAK
- **N =** [1] [17] With mounted plain clevis CSA

End position cushioning
- **U =** Without
- **D =** [1] On both sides, self-adjusting
- **E =** On both sides, adjustable

Seal design

For mineral oil HL, HLP and HFA
- **M =** Standard seal system
- **L =** Standard seal system with guide rings
- **R =** Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC
- **G =** [27] Standard seal system HFC
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For phosphate ester HFD-R and polyol ester HFD-U
- **S =** Servo quality/ reduced friction
- **V =** [27] Standard seal system FKM
- **B =** Chevron seal kits

Option
- **Z =** Additional options, fill fields for additional options
- **W =** Without additional options, do **not** fill fields for additional options

Ordering code series CGH3

Additional options

Fields for additional options

Z

Inductive proximity switches **without** mating connector Mating connector - separate order see page 44 [37] = **E**
without inductive proximity switches = **W**

Additional guide rings [10), 28)] = **F**
Without additional guide rings = **W**

Threaded coupling, on both sides = **A**
Without threaded coupling = **W**

A = [14), 35)] Spherical bearing, maintenance-free
B = Flanged grease nipple
W = Standard conical grease nipple

Y = [16)] Specify the piston rod extension LY in the clear text in mm
W = Without piston rod extension

Order examples:

Without additional options: **CGH3MF3/100/56/300A3X/B11CADMW**

With additional options: **CGH3MF3/100/56/300A3X/B11CADMZ EWABW**

1) Only piston Ø 40 to 200 mm

2) Trunnion position freely selectable. When ordering, always specify the „XV“ dimension in the clear text in mm

3) Max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) observe pages 56 to 58

10) Seal design A, B not possible; piston Ø 220 to 320 mm standard

14) Not possible with piston rod end „N“

16) Only at left piston rod side (orientation: Catalog figures)

17) Only one plain clevis / self-aligning clevis mounted, left piston rod side (orientation: Catalog figures))

18) Not standardized

19) Only piston rod Ø 28 and 36 mm

24) Only piston rod Ø 28 to 140 mm

25) Only piston Ø 63 to 320 mm

26) Only piston Ø 40 to 250 mm

27) Maximum operating pressure 315 bar

28) With seal design „L“ standard

30) All graphical presentations in the data sheet show position 1

31) With MS2, only position 11 is possible

35) Not possible with MP3

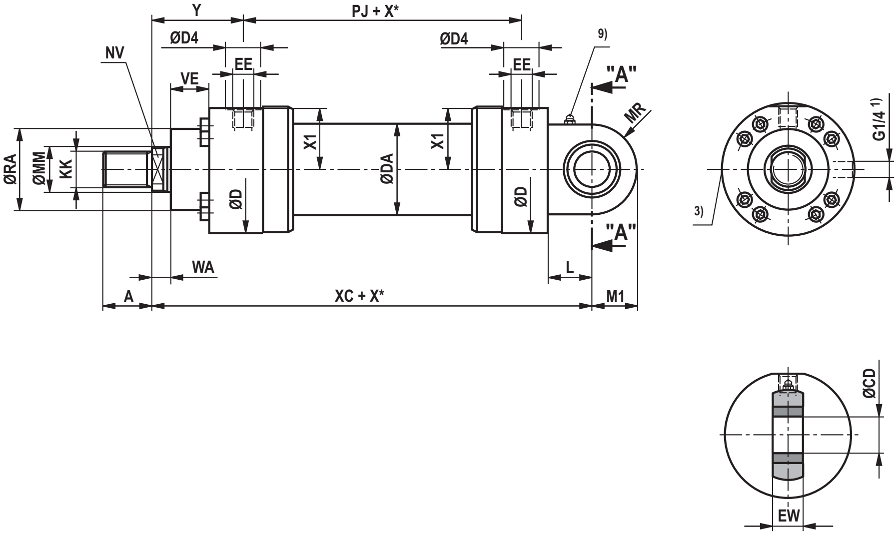
36) Not possible with piston rod Ø 45 to 140 mm

37) Min. stroke length = 20 mm

2

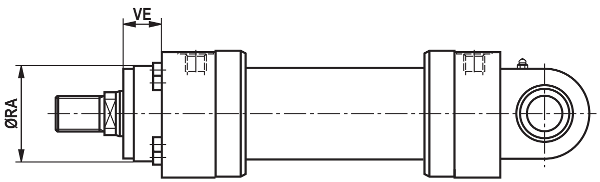
Swivel eye at base CDH3: MP3

CDH3 MP3;   40 to 200 mm



"A-A"

CDH3 MP3: With seal design “A”, “B” and ØAL 160 to 200 mm



Dimensions CDH3: MP3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45

2

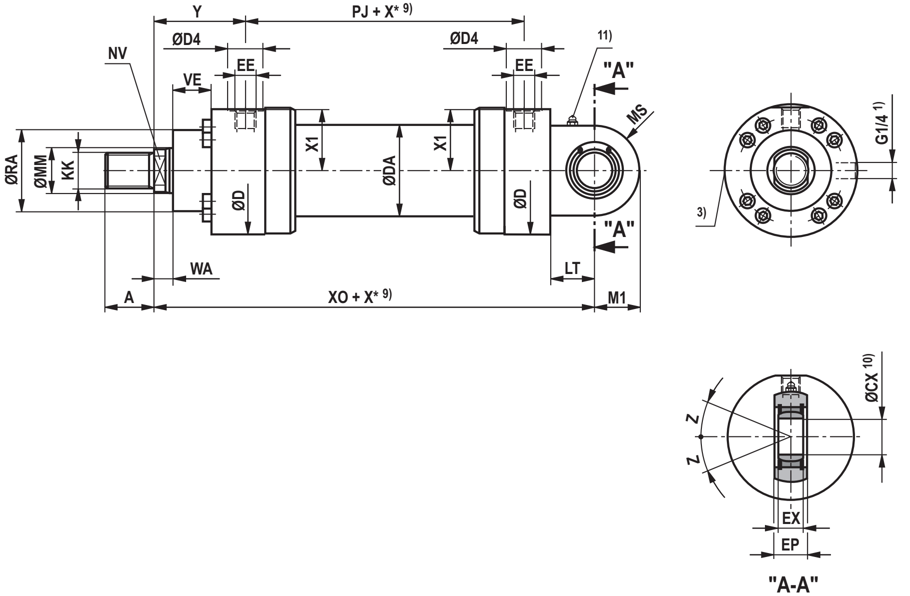
ØAL	ØMM	XC	L	MR	M1	ØCD H11	EW h12	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**28**	268	35	36	34	30	28	52	45	52	20
50	**36**	280	45	42	40	35	30	70	47	70	19
63	**45**	330	50	52	50	40	35	88	43	88	13
80	**56**	355	55	65	62,5	50	40	98	53	98	15
100	**70**	390	65	70	70	60	50	120	55	120	17
125	**90**	495	75	82	82	70	55	150	68	150	20
140	**100**	530	80	95	95	80	60	170	75	170	23
160	**110**	600	90	113	113	90	65	200	90	200	90
180	**125**	665	105	125	125	100	70	230	100	230	100
200	**140**	710	115	142,5	142,5	110	80	250	110	250	110

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

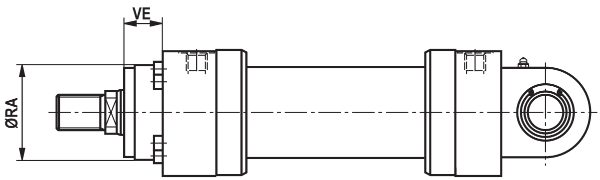
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Standard design „W“ grease nipple cone head form A according to DIN 71412

Self-aligning clevis at base CDH3: MP5

CDH3 MP5



CDH3 MP5: With seal design “A”, “B” and ØAL 160 to 320 mm



Dimensions CDH3: MP5 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	X0	X* min
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	268	–
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	280	–
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	330	–
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	355	–
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	390	–
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	495	–
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	530	–
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	600	–
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	665	–
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	710	–
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40	760	–
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40	825	20
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40	895	–
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40	965	340

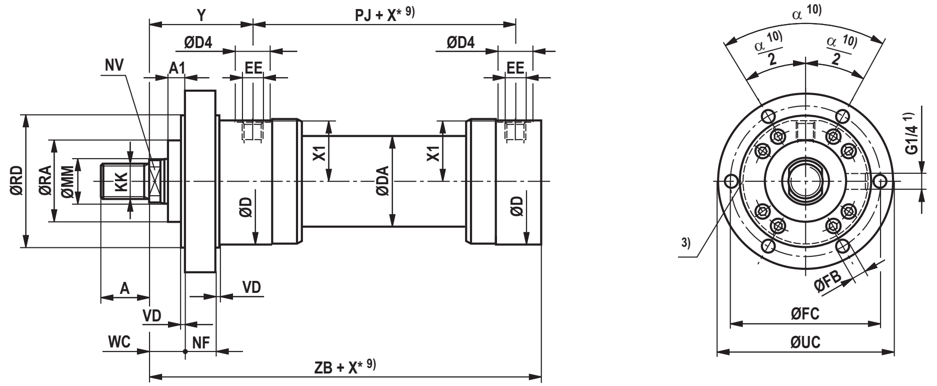
ØAL	ØMM	LT	M1	MS	ØCX	EP -0,4	EX	Z	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**28**	35	34	36	$30_{-0,010}$	28	$22_{-0,12}$	6°	52	45	52	20
50	**36**	45	40	42	$35_{-0,012}$	30	$25_{-0,12}$	6°	70	47	70	19
63	**45**	50	50	52	$40_{-0,012}$	35	$28_{-0,12}$	7°	88	43	88	13
80	**56**	55	62,5	65	$50_{-0,012}$	40	$35_{-0,12}$	6°	98	53	98	15
100	**70**	65	70	70	$60_{-0,015}$	50	$44_{-0,15}$	6°	120	55	120	17
125	**90**	75	82	82	$70_{-0,015}$	55	$49_{-0,15}$	6°	150	68	150	20
140	**100**	80	95	95	$80_{-0,015}$	60	$55_{-0,15}$	6°	170	75	170	23
160	**110**	90	113	113	$90_{-0,020}$	65	$60_{-0,20}$	5°	200	90	200	90
180	**125**	105	125	125	$100_{-0,020}$	70	$70_{-0,20}$	7°	230	100	230	100
200	**140**	115	142,5	142,5	$110_{-0,020}$	80	$70_{-0,20}$	6°	250	110	250	110
220	**160**	115	150 12)	140 12)	$110_{-0,020}$	80	$70_{-0,20}$	6°	275	125	275	125
250	**180**	140	188 12)	178 12)	$120_{-0,020}$	90	$85_{-0,20}$	6°	320	135	320	135
280	**200**	170	210 12)	200 12)	$140_{-0,025}$	100	$90_{-0,25}$	7°	335	150	335	150
320	**220**	200	260 12)	250 12)	$160_{-0,025}$	110	$105_{-0,25}$	8°	350	165	350	165

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

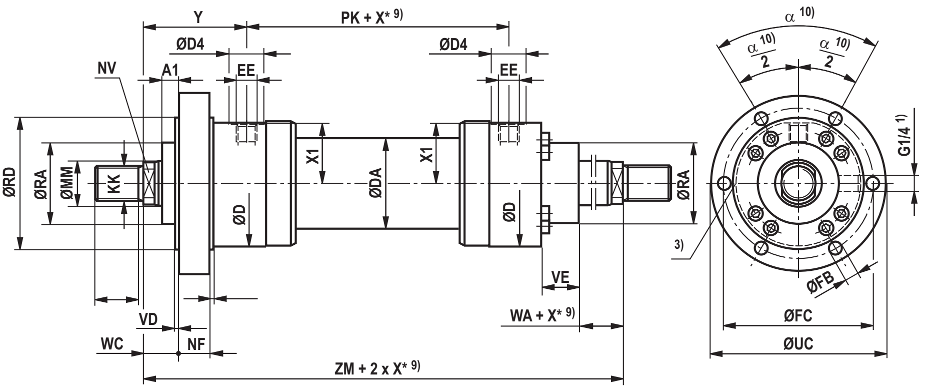
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length „X*min“
10) Related bolt Ø m6;
related bolt Ø j6 with maintenance-free spherical bearing
11) Standard design „W“
grease nipple cone head form A according to DIN 71412
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

Round flange at head CDH3/CGH3: MF3

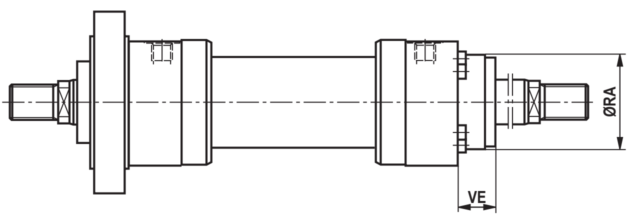
CDH3 MF3



CGH3 MF3



CGH3 MF3: With seal design “A”, “B” and ØAL 160 to 320 mm



Dimensions CDH3/CGH3: MF3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	ØRD e8	WC	VD
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	95	23	5
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	115	20	5
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	150	20	5
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	160	20	5
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	200	20	5
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	245	25	5
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	280	30	10
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	300	40	10
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	335	40	10
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	360	40	10
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	400	40	10
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	450	40	10
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	470	50	10
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	510	55	10

ØAL	ØMM	NF	PK	A1	ZB	ZM	X* min	ØFB H13	ØFC js13	ØUC -1	α	WA	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**28**	35	120	0	238	302	–	13,5	120	145	60°	18	52	45	52	20
50	**36**	40	120	0	237	300	–	13,5	140	165	60°	18	70	47	70	19
63	**45**	40	133	0	285	367	–	17,5	180	210	60°	22	88	43	88	13
80	**56**	50	146	0	305	394	–	17,5	195	230	60°	22	98	53	98	15
100	**70**	55	171	0	330	409	–	22	230	270	60°	25	120	55	120	17
125	**90**	70	205	0	425	545	–	26	290	335	60°	32	150	68	150	20
140	**100**	70	219	0	457	591	–	30	330	380	60°	35	170	75	170	23
160	**110**	80	240	0	515	660	–	30	360	420	45°	40	200	90	200	90
180	**125**	95	264	0	565	746	–	36	400	470	45°	45	230	100	230	100
200	**140**	105	278	0	600	802	–	36	430	500	45°	45	250	110	250	110
220	**160**	115	326	20	655	850	–	39	475	550	45°	40	275	125	275	125
250	**180**	125	336	30	695	880	20	45	530	610	45°	40	320	135	320	135
280	**200**	130	366	25	735	930	–	45	550	630	45°	40	335	150	335	150
320	**220**	140	391	25	775	965	340	45	590	670	30°	40	350	165	350	165

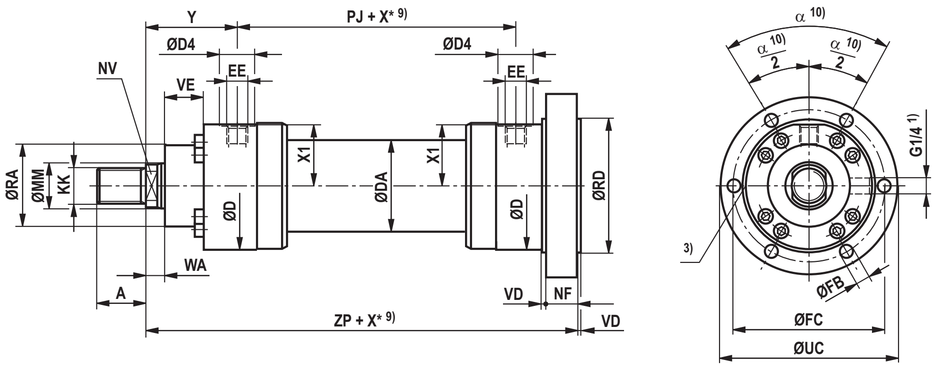
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length „X*min“
10) With piston Ø 160 to 280 mm 8 mounting bores
With piston Ø 320 mm 12 mounting bores

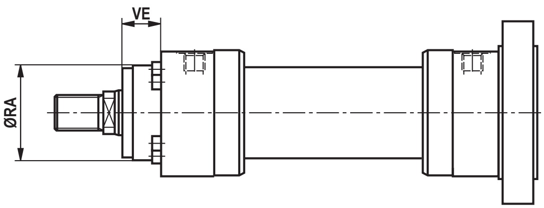
2

Round flange at base CDH3: MF4

CDH3 MF4



CDH3 MF4: With seal design "A", "B" and ØAL 160 to 320 mm



Dimensions CDH3: MF4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40

ØAL	ØMM	ZP	X* min	NF	VD	ØRD e8	ØFB H13	ØFC js13	ØUC -1	α	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**28**	273	–	35	5	95	13,5	120	145	60°	52	45	52	20
50	**36**	277	–	40	5	115	13,5	140	165	60°	70	47	70	19
63	**45**	325	–	40	5	150	17,5	180	210	60°	88	43	88	13
80	**56**	355	–	50	5	160	17,5	195	230	60°	98	53	98	15
100	**70**	385	–	55	5	200	22	230	270	60°	120	55	120	17
125	**90**	495	–	70	5	245	26	290	335	60°	150	68	150	20
140	**100**	532	–	70	10	280	30	330	380	60°	170	75	170	23
160	**110**	600	–	80	10	300	30	360	420	45°	200	90	200	90
180	**125**	665	–	95	10	335	36	400	470	45°	230	100	230	100
200	**140**	710	–	105	10	360	36	430	500	45°	250	110	250	110
220	**160**	770	–	115	10	400	39	475	550	45°	275	125	275	125
250	**180**	820	20	125	10	450	45	530	610	45°	320	135	320	135
280	**200**	865	–	130	10	470	45	550	630	45°	335	150	335	150
320	**220**	915	340	140	10	510	45	590	670	30°	350	165	350	165

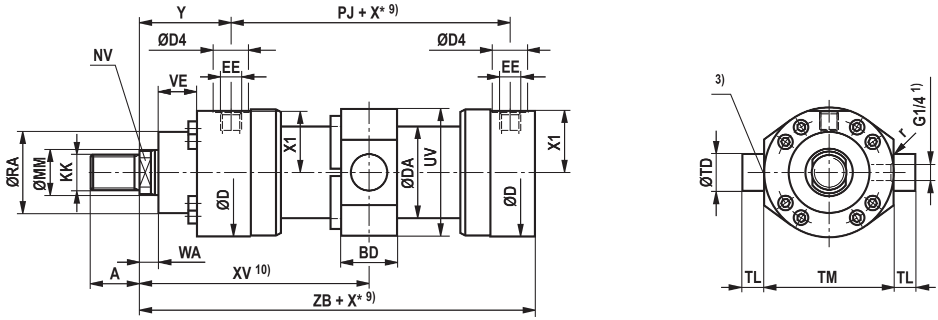
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length „X*min“
10) With piston Ø 160 to 280 mm 8 mounting bores
With piston Ø 320 mm 12 mounting bores

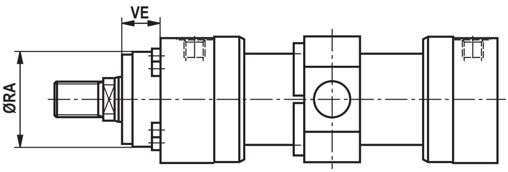
2

Trunnion CDH3/CGH3: MT4

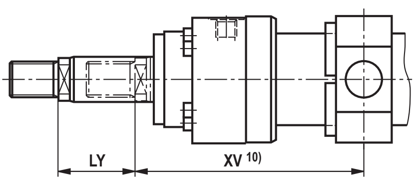
CDH3 MT4



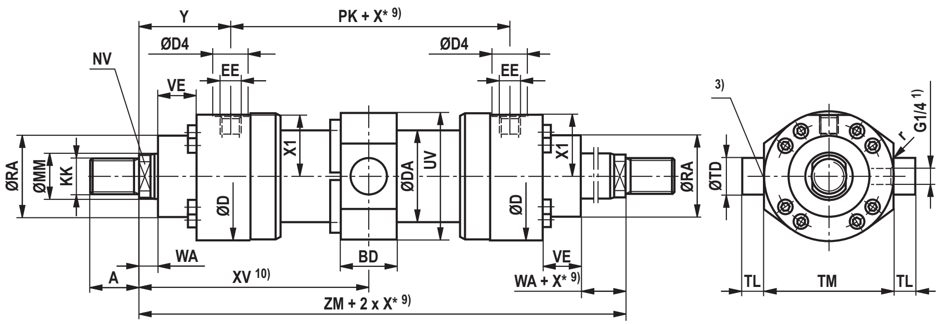
CDH3 MT4: With seal design "A", "B" and ØAL 160 to 320 mm



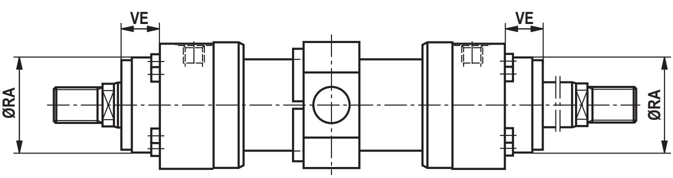
Dimensions for cylinder with piston rod extension "LY" in retracted condition



CGH3 MT4



CGH3 MT4: With seal design "A", "B"and ØAL 160 to 320 mm



Dimensions CDH3/CGH3: MT4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	PK	ZB
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	120	238
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	120	237
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	133	285
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	146	305
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	171	330
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	205	425
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	219	457
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	240	515
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	264	565
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	278	600
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40	326	655
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40	336	695
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40	366	735
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40	391	775

ØAL	ØMM	ZM	X* min	XV 11) cent	XV min	XV max	BD	UV 12)	ØTD e8	TL js16	TM h13	r	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	28	302	42	151+X*/2	172	138+X*	48	101	40	30	95	2	52	45	52	20
50	36	300	50	150+X*/2	175	134+X*	48	117	40	30	120	2	70	47	70	19
63	45	367	64	183,5+X*/2	215,5	163,5+X*	53	153	45	35	150	2	88	43	88	13
80	56	384	82	197+X*/2	238	168+X*	68	169	55	50	160	2	98	53	98	15
100	70	409	109	204,5+X*/2	259	165+X*	88	203	60	55	200	2	120	55	120	17
125	90	545	131	272,5+X*/2	338	222+X*	118	252	75	60	245	2,5	150	68	150	20
140	100	591	147	295,5+X*/2	369	237+X*	128	282	85	70	280	2,5	170	75	170	23
160	110	660	186	330+X*/2	423	257+X*	148	310	95	80	300	2,5	200	90	200	90
180	125	746	212	373+X*/2	479	287+X*	168	348	110	90	335	2,5	230	100	230	100
200	140	802	228	401+X*/2	515	307+X*	188	373	120	100	360	2,5	250	110	250	110
220	160	850	205	425+X*/2	527,5	322,5+X*	165	398	130	100	400	2,5	275	125	275	125
250	180	880	245	440+X*/2	562,5	317,5+X*	175	463	140	100	450	5	320	135	320	135
280	200	930	245	465+X*/2	587,5	342,5+X*	205	486	170	125	480	5	335	150	335	150
320	220	965	600	482,5+X*/2	782,5	182,5+X*	245	537	200	150	500	5	350	165	350	165

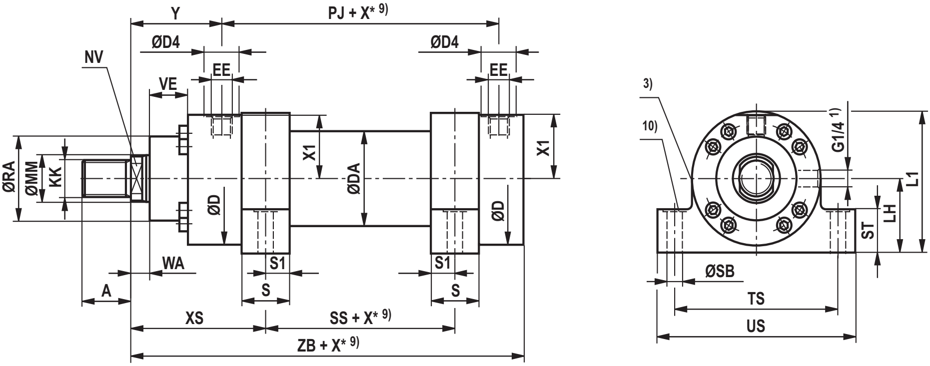
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length „X*min“
10) When ordering, always specify the „XV“ dimension in the clear text. Preferred XV dimension:
Observe the trunnion position in the cylinder center XVmin and XVmax
11) XVcent recommendation:
Trunnion position in cylinder center
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

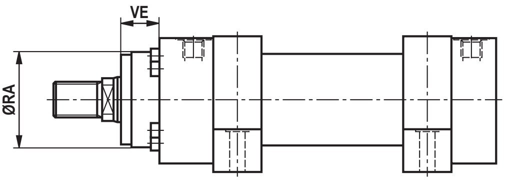
Important installation information: During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product’s service life.

Foot mounting CDH3/CGH3: MS2

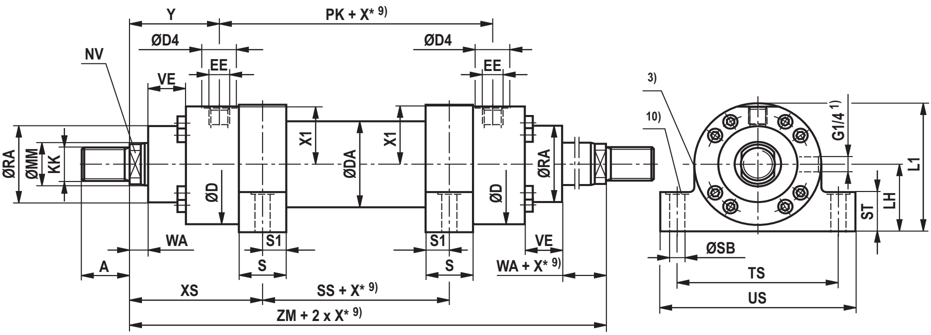
CDH3 MS2



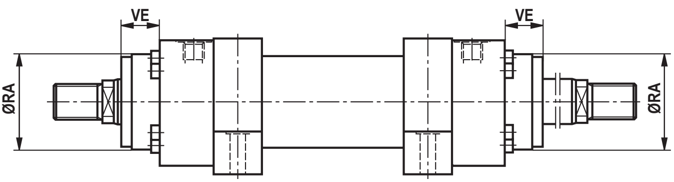
CDH3 MS2. With seal design “A”, “B” and ØAL 160 to 320 mm



CGH3 MS2



CGH3 MS2: With seal design “A”, “B” and ØAL 160 to 320 mm



Dimensions CDH3/CGH3: MS2 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	PK	XS
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	120	126
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	120	130
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	133	164
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	146	176
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	171	179
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	205	245
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	219	265,5
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	240	302,5
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	264	353,5
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	278	379,5
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40	326	387,5
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40	336	397,5
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40	366	410
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40	391	440

ØAL	ØMM	ZB	ZM	SS	X* min	S	S1	ØSB H13	ST	TS js13	US 12)	LH	L1 12)	ØRA 7)	VE 7)	ØRA 8)	VE 8)
40	**28**	238	302	50	–	30	15	17,5	32	125	164	50	100	52	45	52	20
50	**36**	237	300	40	4	40	20	22	37	150	197	60	118	70	47	70	19
63	**45**	285	367	39	15	50	25	24	47	185	235	75	149	88	43	88	13
80	**56**	305	394	42	22	60	30	26	52	210	270	80	160	98	53	98	15
100	**70**	330	409	51	23	70	35	33	62	250	320	100	200	120	55	120	17
125	**90**	425	545	55	39	90	45	40	72	310	392	120	245	150	68	150	20
140	**100**	457	591	60	39	95	47,5	40	77	340	422	135	271	170	75	170	23
160	**110**	515	660	55	64	115	57,5	45	87	370	462	150	305	200	90	200	90
180	**125**	565	746	39	110	145	72,5	45	79	415	515	165	337	230	100	230	100
200	**140**	600	802	43	116	155	77,5	52	112	460	570	180	366	250	110	250	110
220	**160**	655	850	75	100	155	77,5	52	112	500	610	200	398	275	125	275	125
250	**180**	695	880	85	90	155	77,5	52	122	550	660	225	456	320	135	320	135
280	**200**	735	930	110	70	160	80	62	142	600	722	235	476	335	150	335	150
320	**220**	775	965	85	400	190	95	74	162	650	785	255	512	350	165	350	165

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
7) Dimensions for cylinders with seal design M, T, G, L, R, S and V
8) Dimensions for cylinders with seal design A and B
9) Observe the min. stroke length „X*min“
10) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 (for spool Ø 320 mm DIN 931) – The screws must not be subjected to shear force.Force distribution via additional external fitting strips
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

Ordering code series CSH3

CS	H3	/	/	/	A	3X	/							Z

Differential cylinder with position measurement system [18] **= CS**

Series = H3

Types of mounting

- Swivel eye at base [1] **= MP3**
- Self-aligning clevis at base **= MP5**
- Round flange at head **= MF3**
- Round flange at base **= MF4**
- Trunnion [2] **= MT4**
- Foot mounting **= MS2**

Piston Ø (ØAL) 40 to 320 mm

Piston rod Ø (ØMM) 28 to 220 mm

Stroke length in mm [3]

Design principle

Head and base flanged **= A**

Component series

30 to 39 Unchanged installation and connection dimensions **= 3X**

Line connection / version

- According to ISO 1179-1 (pipe thread ISO 228-1) **= B**
- According to ISO 9974-1 (metric thread ISO 261) **= M**
- Flange porting pattern according to ISO 6162-2 tab. 2 type 1 (SAE 6000 PSI) [4], [25] **= D**
- Flange porting pattern according to ISO 6164 tab. 2 [4] **= H**
- According to ISO 1179-1 (pipe thread ISO 228-1) with flat pipe flange [31] **= C**

For directional and control valves

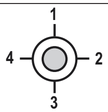
- Subplate size 6 [4] [5] [27] **= P**
- Subplate size 10 [4] [6] [27] **= T**
- Subplate size 16 [4] [7] [27] **= U**
- Subplate size 25 [4] [7] [27] **= V**

For SL and SV valves

- Subplate size 6 [4] [5] [15] [27] **= A**
- Subplate size 10 [4] [6] [15] [27] **= E**
- Subplate size 20 [4] [7] [15] [27] **= L**
- Subplate size 30 [4] [7] [15] [27] **= N**

Line connection/position at head

View to piston rod

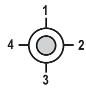


[30] **= 1**
[30] **= 2**
[30] **= 3**
[30] **= 4**

Line connection / position at base [30]

1 =
2 = [34]
3 =
4 = [34]

View to piston rod



Piston rod design

- **C =** Hard chromium-plated
- **N =** [19] Nickel-plated and hard chromium-plated

Piston rod end

- **A =** Thread for plain clevis CGAS
- **G =** [26] Thread for self-aligning clevis CGA, CGAK, plain clevis CSA
- **S =** With mounted self-aligning clevis CGAS
- **L =** [26] With mounted self-aligning clevis CGA
- **M =** [26] With mounted self-aligning clevis CGAK
- **N =** [1] With mounted plain clevis CSA

End position cushioning

- **U =** Without
- **E =** [20] On both sides, adjustable

Seal design

For mineral oil HL, HLP and HFA

- **M =** [29] Standard seal system
- **L =** Standard seal system with guide rings
- **R =** [29] Reduced friction heavy industry

For mineral oil HL, HLP, HFA and water glycol HFC

- **G =** [27] [29] Standard seal system HFC
- **T =** [29] Servo quality/reduced friction

For phosphate ester HFD-R and polyol ester HFD-U

- **S =** [29] Servo quality/reduced friction
- **V =** [27] [29] Standard seal system FKM

Option

Z = Additional options, fill fields for additional options

Additional options

	Z

Fields for additional options

T				

Position measurement system (magnetostrictive) **without** mating connector
Mating connector - separate order, see pages 47, 49 **= T**

- Analog output 4-20 mA **= C**
- Analog output 0-10 V **= F**
- Digital output SSI **= D**
- Profibus D63 **= N**
- Profibus D53 **= P**

- Threaded coupling, on both sides **= A**
- Without threaded coupling **= W**

- **A =** [14], [35] Spherical bearing, maintenance-free
- **B =** Flanged grease nipple
- **W =** Standard conical grease nipple

- **Y =** Piston rod extension LY specify in the clear text in mm
- **W =** Without piston rod extension

Order example:
CSH3MP5/100/70/300A3X/B11CAUMZ TFAWW

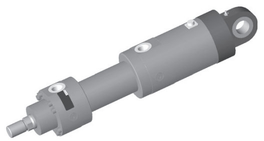
Ordering code series CSH3

1) Only piston Ø 40 to 200 mm
2) Trunnion position freely selectable. When ordering, always specify the „XV“ dimension in the clear text in mm.
3) Max. available stroke length page 4 and admissible stroke length (acc. to buckling calculation) observe pages 56 to 58
4) Not possible with MF4
5) Piston Ø 40 to 80 mm, only position 11, subplates only possible in combination with line connection “B” at the head
6) Piston Ø 63 to 200 mm, only position 11, subplates only possible in combination with line connection “B” at the head
7) Piston Ø 125 to 200 mm, only position 11, subplates only possible in combination with line connection “B” at the head
14) Not possible with piston rod end „N“
15) Subplates for SL and SV valves (isolator valves) Note: Seal designs T, G, L, R, S and V are not designed for the static holding function!
18) Not standardized
19) Only piston rod Ø 28 to 140 mm
20) Possible from piston rod Ø 45 mm
25) Only piston Ø 63 to 320 mm
26) Only piston Ø 40 to 250 mm
27) Maximum operating pressure 315 ba
29) With CSH, by default with guide belts
30) All graphical presentations in the data sheet show position 1
31) With MS2, only position 11 is possible
34) With MF4 and line connection B, M or C not possible
35) Not possible with MP3

Overview of types of mounting: Series CSH3

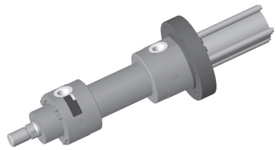
CSH3 MP3

see page 24, 25



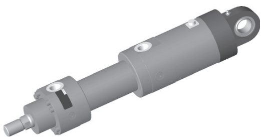
CSH3 MF4

see page 30, 31



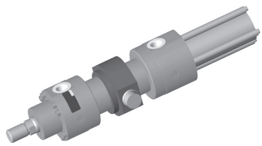
CSH3 MP5

see page 26, 27



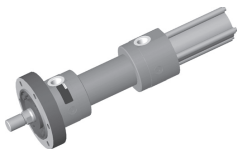
CSH3 MT4

see page 32, 33



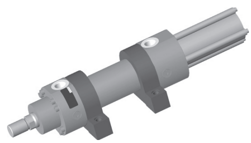
CSH3 MF3

see page 28, 29



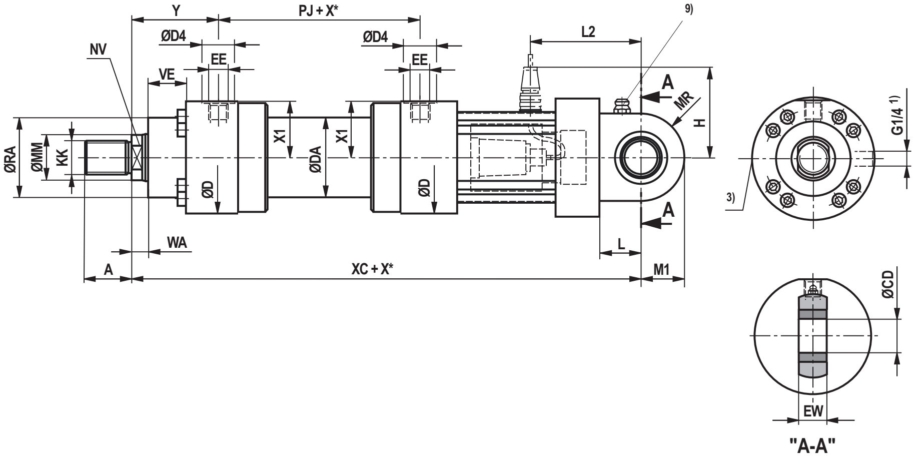
CSH3 MS2

see page 34, 35

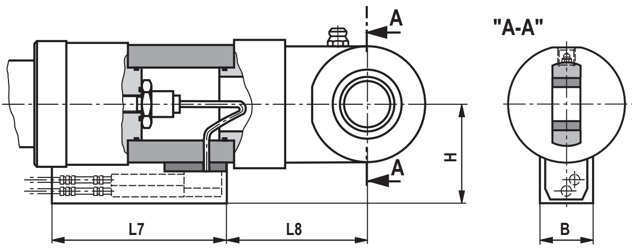


Swivel eye at base CSH3: MP3

CSH3 MP3; ØAL 40 to 200 mm
for position measurement system output “C”, “F” and “D”



CSH3 MP3; ØAL 40 to 200 mm
for position measurement system output “N” and “P”



Dimensions CSH3: MP3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	X* max
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	1000
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	1000
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	2000
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	2000
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	3000
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	3000
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	3000
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	3000
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	3000
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	3000

ØAL	ØMM	XC	L	MR	M1	ØCD H11	EW h12	ØRA	VE	L2	L7	L8	H 13)	H 14)	B
40	**28**	433	35	36	34	30	28	52	45	102	200	83	108	115	64
50	**36**	445	45	42	40	35	30	70	47	115	200	102	116	125	64
63	**45**	508	50	52	50	40	35	88	43	127	200	104	133	140	64
80	**56**	540	55	65	62,5	50	40	98	53	137	200	109	137	125	64
100	**70**	565	65	70	70	60	50	120	55	155	200	127	156	135	64
125	**90**	668	75	82	82	70	55	150	68	185	200	161	181	150	64
140	**100**	705	80	95	95	80	60	170	75	192	200	166	192	160	64
160	**110**	785	90	113	113	90	65	200	90	225	200	193	210	170	64
180	**125**	838	105	125	125	100	70	230	100	235	200	202	226	180	64
200	**140**	888	115	142,5	142,5	110	80	250	110	245	200	214	239	195	64

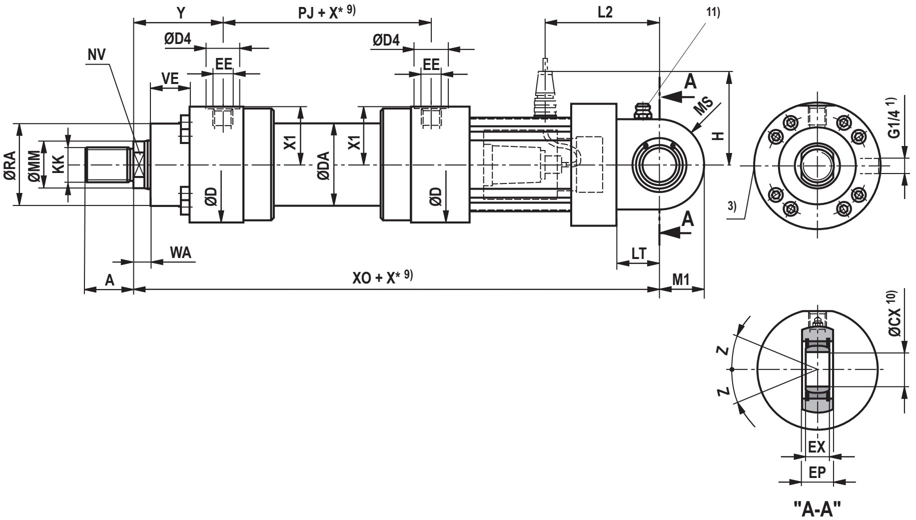
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
9) Standard design „W“ grease nipple cone head form A according to DIN 71412
13) Dimensions for position transducer output „N“ and „P“
14) Dimensions for position transducer output „C“, „F“ and „D“

Self-aligning clevis at base CSH3: MP5

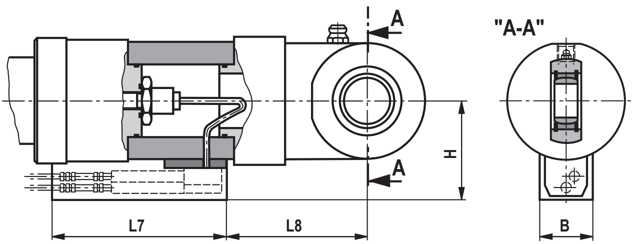
CSH3 MP5

for position measurement system output “C”, “F” and “D”



CSH3 MP5

for position measurement system output “N” and “P”



Dimensions CSH3: MP5 (dimensions in mm)

ØAL	ØMM	KK [5]	A [5]	KK [6]	A [6]	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	XO	X* min
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	433	–
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	445	–
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	508	–
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	540	–
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	565	–
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	668	–
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	705	–
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	785	–
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	838	–
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	888	–
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40	970	–
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40	1055	20
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40	1115	–
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40	1195	340

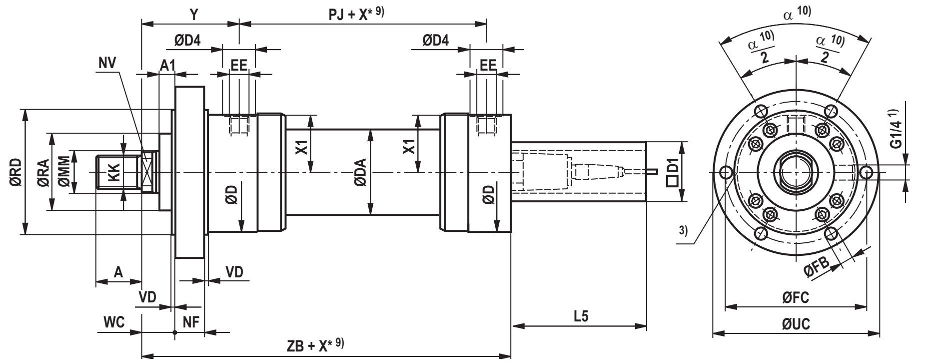
ØAL	ØMM	X* max	LT	M1	MS	ØCX	EP -0,4	EX	Z	ØRA	VE	L2	L7	L8	H [13]	H [14]	B
40	**28**	1000	35	34	36	$30_{-0,010}$	28	$22_{-0,12}$	6°	52	45	102	200	83	108	115	64
50	**36**	1000	45	40	42	$35_{-0,012}$	30	$25_{-0,12}$	6°	70	47	115	200	102	116	125	64
63	**45**	2000	50	50	52	$40_{-0,012}$	35	$28_{-0,12}$	7°	88	43	127	200	104	133	140	64
80	**56**	2000	55	62,5	65	$50_{-0,012}$	40	$35_{-0,12}$	6°	98	53	137	200	109	137	125	64
100	**70**	3000	65	70	70	$60_{-0,015}$	50	$44_{-0,15}$	6°	120	55	155	200	127	156	135	64
125	**90**	3000	75	82	82	$70_{-0,015}$	55	$49_{-0,15}$	6°	150	68	185	200	161	181	150	64
140	**100**	3000	80	95	95	$80_{-0,015}$	60	$55_{-0,15}$	6°	170	75	192	200	166	192	160	64
160	**110**	3000	90	113	113	$90_{-0,020}$	65	$60_{-0,20}$	5°	200	90	225	200	193	210	170	64
180	**125**	3000	105	125	125	$100_{-0,020}$	70	$70_{-0,20}$	7°	230	100	235	200	202	226	180	64
200	**140**	3000	115	142,5	142,5	$110_{-0,020}$	80	$70_{-0,20}$	6°	250	110	245	200	214	239	195	64
220	**160**	3000	115	150 [12]	140 [12]	$110_{-0,020}$	80	$70_{-0,20}$	6°	275	125	270	200	238	254	215	64
250	**180**	3000	140	188 [12]	178 [12]	$120_{-0,020}$	90	$85_{-0,20}$	6°	320	135	320	200	283	284	235	64
280	**200**	3000	170	210 [12]	200 [12]	$140_{-0,025}$	100	$90_{-0,25}$	7°	335	150	350	200	315	294	285	64
320	**220**	3000	200	260 [12]	250 [12]	$160_{-0,025}$	110	$105_{-0,25}$	8°	350	165	400	200	400	309	300	64

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
9) Observe the min. stroke length „X*min“
10) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing
11) Standard design „W“ grease nipple cone head form A according to DIN 71412
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting
13) Dimensions for position transducer output „N“ and „P“
14) Dimensions for position transducer output „C“, „F“ and „D“

Round flange at head CSH3: MF3

CSH3 MF3



Dimensions CSH3: MF3 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	ØRD e8
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	95
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	115
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	150
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	160
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	200
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	245
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	280
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	300
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	335
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	360
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	400
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	450
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	470
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	510

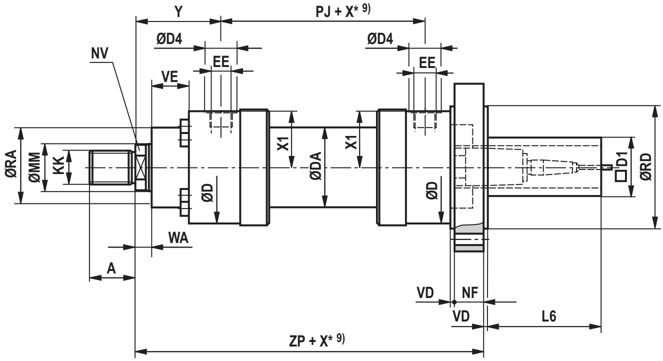
ØAL	ØMM	WC	VD	X* max	L5	D1 max	NF	A1	ZB	X* min	ØFB H13	ØFC js13	ØUC -1	α	ØRA
40	**28**	23	5	1000	166	80	35	0	247	–	13,5	120	145	60°	52
50	**36**	20	5	1000	166	96	40	0	246	–	13,5	140	165	60°	70
63	**45**	20	5	2000	166	96	40	0	304	–	17,5	180	210	60°	88
80	**56**	20	5	2000	166	96	50	0	332	–	17,5	195	230	60°	98
100	**70**	20	5	3000	166	96	55	0	347	–	22	230	270	60°	120
125	**90**	25	5	3000	166	96	70	0	427	–	26	290	335	60°	150
140	**100**	30	10	3000	166	96	70	0	460	–	30	330	380	60°	170
160	**110**	40	10	3000	166	96	80	0	515	–	30	360	420	45°	200
180	**125**	40	10	3000	166	96	95	0	565	–	36	400	470	45°	230
200	**140**	40	10	3000	166	96	105	0	600	–	36	430	500	45°	250
220	**160**	40	10	3000	166	96	115	20	655	–	39	475	550	45°	275
250	**180**	40	10	3000	166	96	125	30	695	20	45	530	610	45°	320
280	**200**	50	10	3000	166	96	130	25	735	–	45	550	630	45°	335
320	**220**	55	10	3000	166	96	140	25	775	340	45	590	670	30°	350

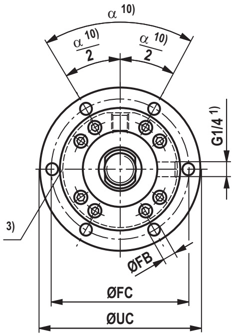
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length
1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
9) Observe the min. stroke length „X*min“
10) With piston Ø 160 to 280 mm 8 mounting bores
With piston Ø 320 mm 12 mounting bores

2

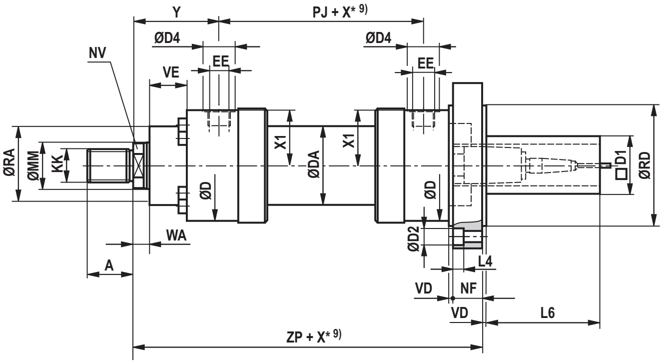
Round flange at base CSH3: MF4

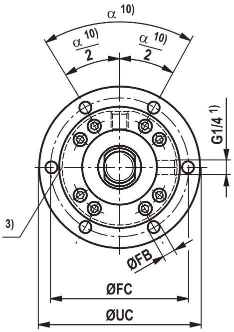
CSH3 MF4; ØAL 40 to 100 mm





CSH3 MF4; ØAL 125 to 320 mm





Dimensions CSH3: MF4 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	D1 max	ØD2	WA
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	80	0	18
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	96	0	18
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	96	0	22
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	96	0	22
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	96	0	25
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	96	40	32
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	96	43	35
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	96	43	40
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	96	53	45
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	96	53	45
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	96	57	40
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	96	66	40
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	96	66	40
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	96	66	40

ØAL	ØMM	X* max	L4	L6	ZP	X* min	NF	VD	ØRD e8	ØFB H13	ØFC js13	ØUC -1	α	ØRA	VE
40	**28**	1000	0	166	282	–	35	5	95	13,5	120	145	60°	52	45
50	**36**	1000	0	166	285	–	40	5	115	13,5	140	165	60°	70	47
63	**45**	2000	0	153	340	–	40	5	150	17,5	180	210	60°	88	43
80	**56**	2000	0	123	370	–	50	5	160	17,5	195	230	60°	98	53
100	**70**	3000	0	106	402	–	55	5	200	22	230	270	60°	120	55
125	**90**	3000	25,5	93	495	–	70	5	245	26	290	335	60°	150	68
140	**100**	3000	28,5	84	532	–	70	10	280	30	330	380	60°	170	75
160	**110**	3000	28,5	71	600	–	80	10	300	30	360	420	45°	200	90
180	**125**	3000	35	56	665	–	95	10	335	36	400	470	45°	230	100
200	**140**	3000	35	46	710	–	105	10	360	36	430	500	45°	250	110
220	**160**	3000	38	41	770	–	115	10	400	39	475	550	45°	275	125
250	**180**	3000	44	31	820	20	125	10	450	45	530	610	45°	320	135
280	**200**	3000	44	26	865	–	130	10	470	45	550	630	45°	335	150
320	**220**	3000	44	16	915	340	140	10	510	45	590	670	30°	350	165

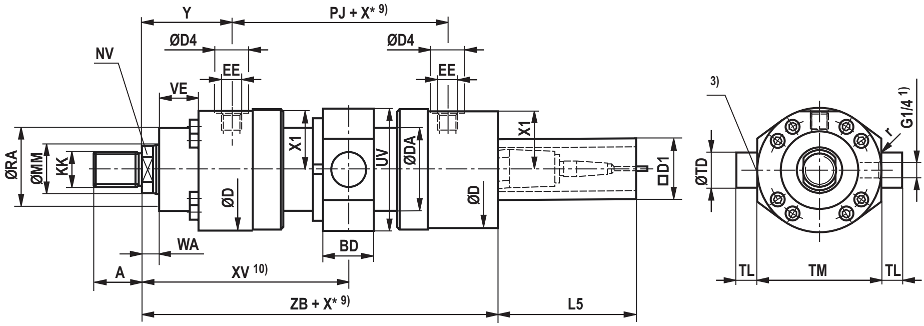
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
9) Observe the min. stroke length „X*min“
10) With piston Ø 160 to 280 mm 8 mounting bores
With piston Ø 320 mm 12 mounting bores

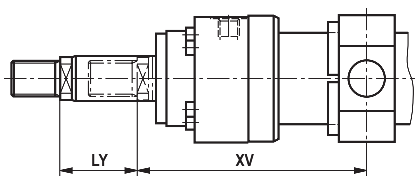
2

Trunnion CSH3: MT4

CSH3 MT4



Dimensions for cylinder with piston rod extension “LY” in retracted condition



Dimensions CSH3: MT4 (dimensions in mm)

ØAL	ØMM	KK [5]	A [5]	KK [6]	A [6]	NV	ØD	ØDA	ØD4 [2]	EE [4]	EE [4]	Y	PJ	X1	WA	ZB
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	247
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	246
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	304
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	332
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	347
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	427
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	460
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	515
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	565
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	600
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40	655
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40	695
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40	735
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40	775

ØAL	ØMM	X* max	L5	D1 max	X* min	XV [11] cent	XV min	XV max	BD	UV [12]	ØTD e8	TL js16	TM h13	r	ØRA	VE
40	28	1000	166	80	42	151+X*/2	172	138+X*	48	101	40	30	95	2	52	45
50	36	1000	166	96	50	150+X*/2	175	134+X*	48	117	40	30	120	2	70	47
63	45	2000	166	96	64	183,5+X*/2	215,5	163,5+X*	53	153	45	35	150	2	88	43
80	56	2000	166	96	82	197+X*/2	238	168+X*	68	169	55	50	160	2	98	53
100	70	3000	166	96	109	204,5+X*/2	259	165+X*	88	203	60	55	200	2	120	55
125	90	3000	166	96	131	272,5+X*/2	338	222+X*	118	252	75	60	245	2,5	150	68
140	100	3000	166	96	147	295,5+X*/2	369	237+X*	128	282	85	70	280	2,5	170	75
160	110	3000	166	96	186	330+X*/2	423	257+X*	148	310	95	80	300	2,5	200	90
180	125	3000	166	96	212	373+X*/2	479	287+X*	168	348	110	90	335	2,5	230	100
200	140	3000	166	96	228	401+X*/2	515	307+X*	188	373	120	100	360	2,5	250	110
220	160	3000	166	96	205	425+X*/2	527,5	322,5+X*	165	398	130	100	400	2,5	275	125
250	180	3000	166	96	245	440+X*/2	562,5	317,5+X*	175	463	140	100	450	5	320	135
280	200	3000	166	96	245	465+X*/2	587,5	342,5+X*	205	486	170	125	480	5	335	150
320	220	3000	166	96	600	482,5+X*/2	782,5	182,5+X*	245	537	200	150	500	5	350	165

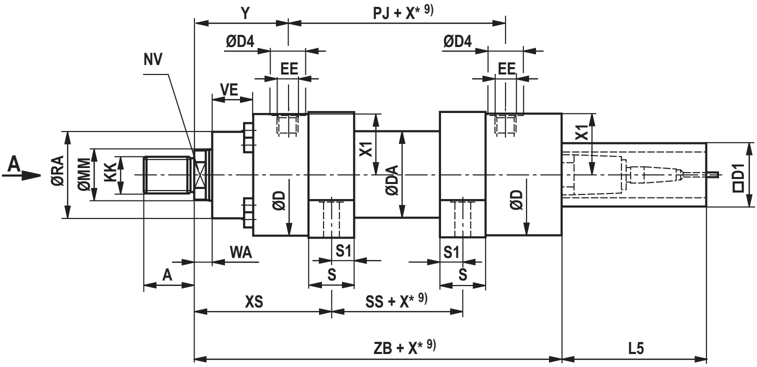
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
9) Observe the min. stroke length „X*min“
10) When ordering, always specify the „XV“ dimension in the clear text. Preferred XV dimension: Observe the trunnion position in the cylinder center XVmin and XVmax
11) XVcent recommendation: Trunnion position in cylinder center
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

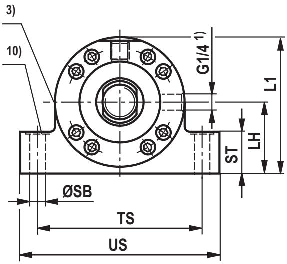
Important installation information: During installation, it must be ensured that the trunnion bearings are installed up to the trunnion shoulders. Any non-compliance may reduce the product’s service life.

Foot mounting CSH3: MS2

CSH3 MS2; ØAL 40 to 320 mm



View A



Dimensions CSH3: MS2 (dimensions in mm)

ØAL	ØMM	KK 5)	A 5)	KK 6)	A 6)	NV	ØD	ØDA	ØD4 2)	EE 4)	EE 4)	Y	PJ	X1	WA	XS
40	**28**	M22x1,5	22	M24x2	35	22	92	52	34	G1/2	M22x1,5	91	120	43	18	126
50	**36**	M28x1,5	28	M30x2	45	30	108	62	34	G1/2	M22x1,5	90	120	51,5	18	130
63	**45**	M35x1,5	35	M39x3	55	36	140	78	42	G3/4	M27x2	117	133	67	22	164
80	**56**	M45x1,5	45	M50x3	75	46	148	100	42	G3/4	M27x2	124	146	71,5	22	176
100	**70**	M58x1,5	58	M64x3	95	60	186	125	47	G1	M33x2	119	171	90,5	25	179
125	**90**	M65x1,5	65	M80x3	110	75	235	160	58	G1 1/4	M42x2	170	205	114	32	245
140	**100**	M80x2	80	M90x3	120	85	258	175	58	G1 1/4	M42x2	186	219	126	35	265,5
160	**110**	M100x2	100	M100x3	140	95	292	200	65	G1 1/2	M48x2	210	240	142,5	40	302,5
180	**125**	M110x2	110	M110x4	150	110	325	220	65	G1 1/2	M48x2	241	264	159,5	45	353,5
200	**140**	M120x3	120	M120x4	160	120	350	245	65	G1 1/2	M48x2	262	278	172,5	45	379,5
220	**160**	M120x3	120	M120x4	160	140	375	292	65	G1 1/2	M48x2	262	326	185	40	387,5
250	**180**	M130x3	130	M150x4	190	160	440	324	65	G1 1/2	M48x2	272	336	218	40	397,5
280	**200**	–	–	M160x4	200	180	460	368	65	G1 1/2	M48x2	282	366	228	40	410
320	**220**	–	–	M180x4	220	200	490	406	65	G1 1/2	M48x2	287	391	243	40	440

ØAL	ØMM	X* max	L5	D1 max	ZB	SS	X* min	S	S1	ØSB H13	ST	TS js13	US 12)	LH	L1 12)	ØRA	VE
40	**28**	1000	166	80	247	50	–	30	15	17,5	32	125	164	50	100	52	45
50	**36**	1000	166	96	246	40	4	40	20	22	37	150	197	60	118	70	47
63	**45**	2000	166	96	304	39	15	50	25	24	47	185	235	75	149	88	43
80	**56**	2000	166	96	332	42	22	60	30	26	52	210	270	80	160	98	53
100	**70**	3000	166	96	347	51	23	70	35	33	62	250	320	100	200	120	55
125	**90**	3000	166	96	427	55	39	90	45	40	72	310	392	120	245	150	68
140	**100**	3000	166	96	460	60	39	95	47,5	40	77	340	422	135	271	170	75
160	**110**	3000	166	96	515	55	64	115	57,5	45	87	370	462	150	305	200	90
180	**125**	3000	166	96	565	39	110	145	72,5	45	79	415	515	165	337	230	100
200	**140**	3000	166	96	600	43	116	155	77,5	52	112	460	570	180	366	250	110
220	**160**	3000	166	96	655	75	100	155	77,5	52	112	500	610	200	398	275	125
250	**180**	3000	166	96	695	85	90	155	77,5	52	122	550	660	225	456	320	135
280	**200**	3000	166	96	735	110	70	160	80	62	142	600	722	235	476	335	150
320	**220**	3000	166	96	775	85	400	190	95	74	162	650	785	255	512	350	165

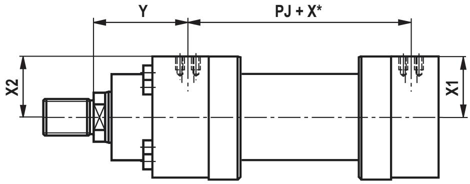
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*max = Max. stroke length
X*min = Min. stroke length

1) Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)
2) Ø D4 max. 0,5 mm deep
3) Throttle valve only with end position cushioning „E“ (180° for bleeding)
4) Flange connections see separate table pages 36 and 37
5) Thread design „G”
6) Thread design „A”
9) Observe the min. stroke length „X*min“
10) Recess 2 mm deep, for hexagon socket head cap screws; ISO 4762 (for spool Ø 320 mm DIN 931) – The screws must not be subjected to shear force.Force distribution via additional external fitting strips
12) The specified dimensions are maximum values, tolerance classes 342 according to ISO 9013 Thermal cutting

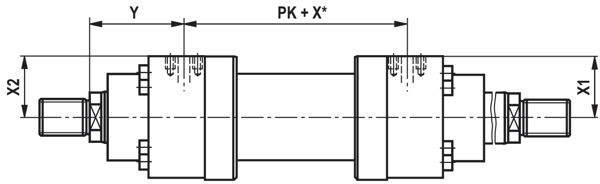
2

Flange connections

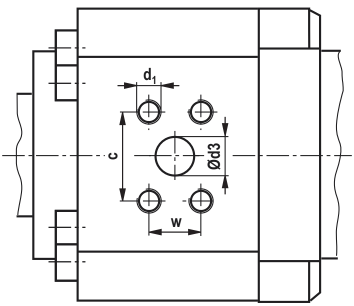
CDH3 / CSH3



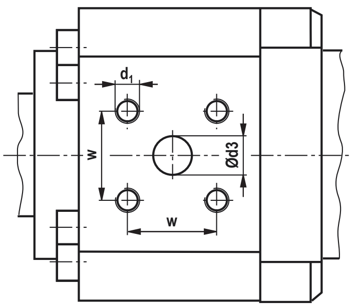
CGH3



Porting pattern for rectangular flange according to ISO 6162-2 tab. 2 type 1



Porting pattern for square flange according to ISO 6164 table 2



Flange connections

Dimensions (dimensions in mm)

ØAL	Version "D" ISO 6162-2 tab.2 type1 (400 bar) (≙ SAE 6000 PSI)											Version "H" ISO 6164 tab.2 (400 bar)							
	Y	PJ PK	X1	X2	$Ød_3$	$Ød_3$ 3)	c ±0,25	w ±0,25	d_1	t_1 1)	p 2)	Y	PJ PK	X1	$Ød_3$	w ±0,25	d_1	t_1 1)	p 2)
40	–	–	–	–	–	–	–	–	–	–	–	90	122	42,5	10	24,7	M6	12,5	400
50	–	–	–	–	–	–	–	–	–	–	–	89	122	51	10	24,7	M6	12,5	400
63	113	141	65	65	13	1/2“	40,5	18,2	M8	16	400	113	141	66	19	35,4	M8	16	400
80	120	154	69	69	13	1/2“	40,5	18,2	M8	16	400	120	154	70	19	35,4	M8	16	400
100	114	181	87	87	19	3/4“	50,8	23,8	M10	20	400	118	173	89,5	19	35,4	M8	16	400
125	162,5	220	111,5	111,5	25	1“	57,2	27,8	M12	24	400	162,5	220	112,5	32	51,6	M12	24	400
140	179,5	232	121,5	121,5	32	1 1/4“	66,6	31,8	M14	26	400	179,5	232	124,5	32	51,6	M12	24	400
160	197,5	265	139,5	139,5	32	1 1/4“	66,6	31,8	M14	26	400	197,5	265	140,5	38	60,1	M16	30	400
180	233,5	279	156,5	156,5	32	1 1/4“	66,6	31,8	M14	26	400	233,5	279	156,5	38	60,1	M16	30	400
200	254,5	293	167,5	167,5	38	1 1/2“	79,3	36,5	M16	30	400	254,5	293	170,5	38	60,1	M16	30	400
220	262	326	178	178	38	1 1/2“	79,3	36,5	M16	30	400	262	326	182	38	60,1	M16	30	400
250	272	336	212	212	38	1 1/2“	79,3	36,5	M16	30	400	272	336	216	38	60,1	M16	30	400
280	282	366	222	222	38	1 1/2“	79,3	36,5	M16	30	400	282	366	226	38	60,1	M16	30	400
320	287	391	236	236	51	2“	96,8	44,5	M20	36	400	287	391	240	51	69,3	M16	30	400

Main dimensions see pages 10 to 21 and/or pages 24 to 35

ØAL = Piston Ø
X* = Stroke length
1) Thread depth
2) Max. operating pressure for related flanges in bar
3) Flange porting pattern according to ISO 6162-2 tab. 2 type 1 corresponds to flange porting pattern according to SAE 6000 PSI

Subplates for valve mounting (SL and SV valve)

Note:

Valves, fittings and piping are **not** included in the scope of delivery!

1 Port B to the piston side according to ISO 6164
2 Bore for locating pin
3 Adapter plate for MT4 type of mounting (part of the scope of delivery for MT4)
4 Line connection "B" dimensions see also pages 10 to 21 and pages 24 to 35

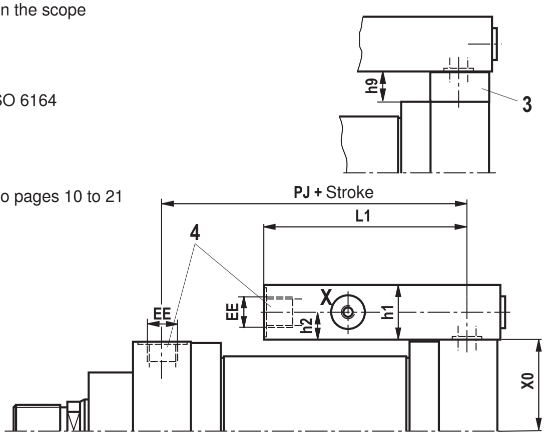
Important notice

Subplates for SL and SV valves (isolator valves)

Note:

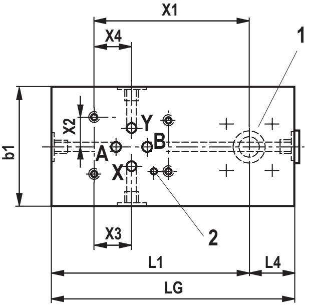
Seal designs T, G, L, R, S and V are not designed for the static holding function!

Installation situation with MT4



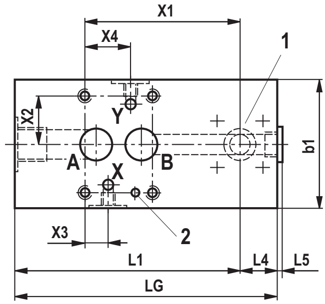
Size 6

Porting pattern according to ISO 24340 form A and ISO 4401



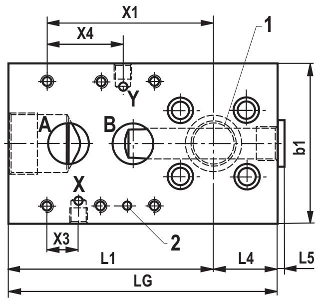
Size 10 and 20

Porting pattern according to ISO 5781

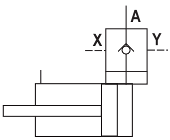


Size 30

Porting pattern according to ISO 5781



Piping symbol

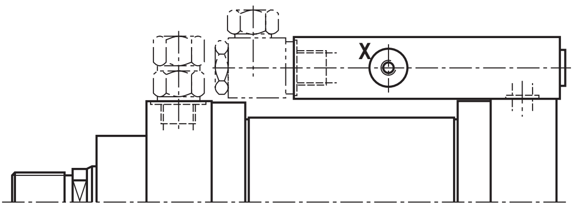


Subplates for valve mounting (SL and SV valve – dimensions in mm)

ØAL	Valve size	PJ	EE	Stroke min [1)		X0	Plate dimensions							Port size, porting pattern						Position point Valve	
				2)	3)		L1	L4	L5	LG	b1	h1	h9	h2	A	X	Y	X3	X4	X1	X2
40	6	121	G1/2	50	50	42,5	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21,5	21,5	65,5	15,5
50	6	121	G1/2	50	50	51,0	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21,5	21,5	65,5	15,5
63	6	137	G3/4	64	64	66,0	105	30	5	135	60	45	20	22,5	G3/4	G1/4	G1/4	21,5	21,5	75,5	15,5
	10	137	G3/4	64	64	66,0	110	30	5	140	85	45	20	22,5	G3/4	G1/4	G1/4	21,4	21,4	78	33,3
80	6	150	G3/4	58	82	70,0	105	30	5	135	60	45	20	22,5	G3/4	G1/4	G1/4	21,5	21,5	75,5	15,5
	10	150	G3/4	58	82	70,0	110	30	5	140	85	45	20	22,5	G3/4	G1/4	G1/4	21,4	21,4	78	33,3
100	10	172	G1	50	109	89,5	102	28	5	130	85	50	20	25	G1	G1/4	G1/4	21,4	21,4	70	33,3
125	10	212,5	G1 1/4	80	131	112,5	120	40	5	160	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	90	33,3
	20	212,5	G1 1/4	80	131	112,5	135	50	5	185	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	105	39,7
	30	212,5	G1 1/4	80	131	112,5	160	50	5	210	125	60	30	30	G1 1/4	G1/4	G1/4	24,6	59,6	130	48,4
140	10	225,5	G1 1/4	60	147	124,5	120	40	5	160	85	60	30	30	G1 1/4	G1/4	G1/4	21,4	21,4	90	33,3
	20	225,5	G1 1/4	60	147	124,5	135	50	5	185	100	60	30	30	G1 1/4	G1/4	G1/4	20,8	39,7	105	39,7
	30	225,5	G1 1/4	60	147	124,5	160	50	5	210	125	60	30	30	G1 1/4	G1/4	G1/4	24,6	59,6	130	48,4
160	10	252,5	G1 1/2	60 [4)]	186	140,5	130	45	5	175	95	70	20	35	G1 1/2	G1/4	G1/4	21,4	21,4	100	33,3
	20	252,5	G1 1/2	60 [4)]	186	140,5	140	45	5	185	100	70	20	35	G1 1/2	G1/4	G1/4	20,8	39,7	115	39,7
	30	252,5	G1 1/2	60 [4)]	186	140,5	165	45	5	210	125	70	20	35	G1 1/2	G1/4	G1/4	24,6	59,6	140	48,4
180	10	271,5	G1 1/2	50 [4)]	212	156,5	130	45	5	175	95	70	20	35	G1 1/2	G1/4	G1/4	21,4	21,4	100	33,3
	20	271,5	G1 1/2	50 [4)]	212	156,5	140	45	5	185	100	70	20	35	G1 1/2	G1/4	G1/4	20,8	39,7	115	39,7
	30	271,5	G1 1/2	50 [4)]	212	156,5	165	45	5	210	125	70	20	35	G1 1/2	G1/4	G1/4	24,6	59,6	140	48,4
200	10	285,5	G1 1/2	30 [4)]	228	170,5	130	45	5	175	95	70	20	35	G1 1/2	G1/4	G1/4	21,4	21,4	100	33,3
	20	285,5	G1 1/2	30 [4)]	228	170,5	140	45	5	185	100	70	20	35	G1 1/2	G1/4	G1/4	20,8	39,7	115	39,7
	30	285,5	G1 1/2	30 [4)]	228	170,5	165	45	5	210	125	70	20	35	G1 1/2	G1/4	G1/4	24,6	59,6	140	48,4

ØAL = Piston Ø

1) The information only applies to the following connection situation!

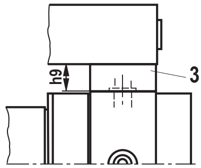


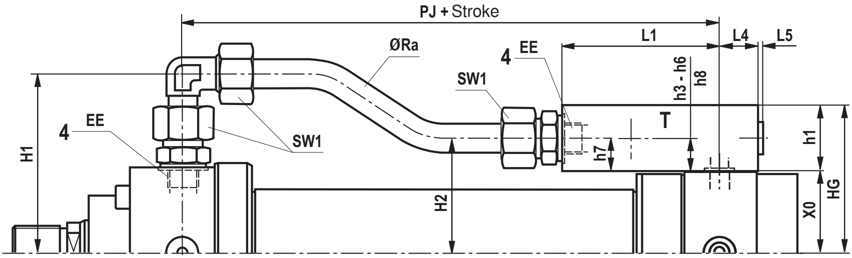
2) Not for MT4
3) Only for MT4
4) With type of mounting „MS2“, observe X*min on page 21 and/or 35

Subplates for valve mounting (directional and high-response valves)

1 Port B to the piston side according to ISO 6164
2 Bore for locating pin
3 Adapter plate for MT4 type of mounting (part of the scope of delivery for MT4)
4 Line connection "B" dimensions see also pages 10 to 21 and pages 24 to 35

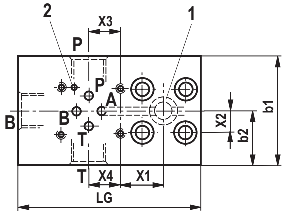
Installation situation with MT4





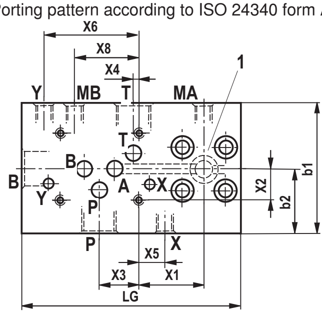
Size 6

Porting pattern according to ISO 24340 form A and ISO 4401



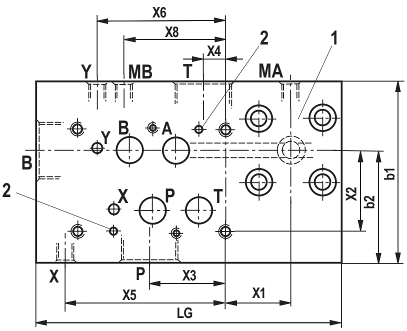
Size 10

Porting pattern according to ISO 24340 form A and ISO 4401



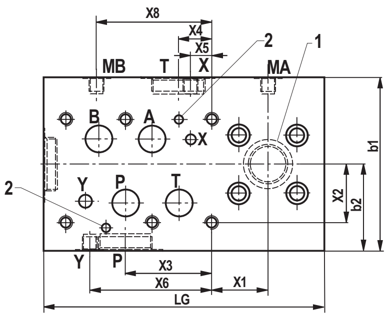
Size 16

Porting pattern according to ISO 24340 form A and ISO 4401



Size 25

Porting pattern according to ISO 24340 form A and ISO 4401



With larger stroke lengths and depending on the piston diameter, the pipeline is mounted at the cylinder pipe using pipe supports. A maximum of two sandwich plates is admissible.

Subplates for valve mounting (directional and high-response valves – dimensions in mm)

ØAL	Valve size	PJ	EE	Stroke min	Plate dimensions																
					L1	L4	L5 max	H1	H2 1)	H2 2)	SW1	ØRa	b1	h1	LG	HG 1)	HG 2)	b2	X0	h7	h9
40	6	121	G1/2	242	90	20	4	98,0	62,5	72,5	30	16,0x2,5	65	40	110	82,5	92,5	32,5	42,5	20	10
50	6	121	G1/2	242	90	20	4	106,5	71,0	81,0	30	16,0x2,5	65	40	110	91,0	101,0	32,5	51,0	20	10
63	6	137	G3/4	278	105	30	5	132,0	88,5	108,5	36	20,0x3,0	75	45	135	111,0	131,0	37,5	66,0	22,5	20
	10	137	G3/4	303	130	30	5	132,0	89,0	109,0	36	20,0x3,0	90	70	160	136,0	156,0	45	66,0	23	20
80	6	150	G3/4	265	105	30	5	136,5	92,5	112,5	36	20,0x3,0	75	45	135	115,0	135,0	37,5	70,0	22,5	20
	10	150	G3/4	290	130	30	5	136,5	93,0	113,0	36	20,0x3,0	90	70	160	140,0	160,0	45	70,0	23	20
100	10	172	G1	317	132	28	5	163,5	119,5	139,5	46	25,0x4,0	90	80	160	169,5	189,5	45	89,5	30	20
125	10	212,5	G1 1/4	341	150	40	5	192,5	147,5	177,5	50	30,0x5,0	105	95	190	207,5	237,5	52,5	112,5	35	30
	16	212,5	G1 1/4	371	180	40	5	192,5	162,5	192,5	50	30,0x5,0	125	105	220	217,5	247,5	62,5	112,5	50	30
	25	212,5	G1 1/4	391	200	50	0	192,5	167,5	197,5	50	30,0x5,0	155	110	250	222,5	252,5	77,5	112,5	55	30
140	10	225,5	G1 1/4	328	150	40	5	204,5	159,5	189,5	50	30,0x5,0	105	95	190	219,5	249,5	52,5	124,5	35	30
	16	225,5	G1 1/4	358	180	40	5	204,5	174,5	204,5	50	30,0x5,0	125	105	220	229,5	259,5	62,5	124,5	50	30
	25	225,5	G1 1/4	378	200	50	0	204,5	179,5	209,5	50	30,0x5,0	155	110	250	234,5	264,5	77,5	124,5	55	30
160	10	252,5	G1 1/2	394	155	50	5	231,5	175,5	195,5	60	38,0x6,0	110	95	205	235,5	255,5	55	140,5	35	20
	16	252,5	G1 1/2	429	190	50	5	231,5	190,5	210,5	60	38,0x6,0	125	105	240	245,5	265,5	62,5	140,5	50	20
	25	252,5	G1 1/2	449	210	50	0	231,5	195,5	215,5	60	38,0x6,0	155	110	260	250,5	270,5	77,5	140,5	55	20
180	10	271,5	G1 1/2	375	155	50	5	248,5	191,5	211,5	60	38,0x6,0	110	95	205	251,5	271,5	55	156,5	35	20
	16	271,5	G1 1/2	248	190	50	5	248,5	206,5	226,5	60	38,0x6,0	125	105	240	261,5	281,5	62,5	156,5	50	20
	25	271,5	G1 1/2	307	210	50	0	248,5	211,5	231,5	60	38,0x6,0	155	110	260	266,5	286,5	77,5	156,5	55	20
200	10	285,5	G1 1/2	253	155	50	5	261,5	205,5	225,5	60	38,0x6,0	110	95	205	265,5	285,5	55	170,5	35	20
	16	285,5	G1 1/2	234	190	50	5	261,5	220,5	240,5	60	38,0x6,0	125	105	240	275,5	295,5	62,5	170,5	50	20
	25	285,5	G1 1/2	293	210	50	0	261,5	225,5	245,5	60	38,0x6,0	155	110	260	280,5	300,5	77,5	170,5	55	20

ØAL	Valve size	Port size, porting pattern																Position point Valve	
		P	X3	h3	T	X4	h4	X	X5	h5	Y	X6	h6	MA	MB	X8	h8	X1	X2
40	6	G1/2	21,5	20	G1/2	21,5	20	-	-	-	-	-	-	-	-	-	-	25	15,5
50	6	G1/2	21,5	20	G1/2	21,5	20	-	-	-	-	-	-	-	-	-	-	25	15,5
63	6	G3/4	21,5	22,5	G3/4	21,5	22,5	-	-	-	-	-	-	-	-	-	-	35	15,5
	10	G3/4	27	33	G3/4	3,5	33	G1/4	18	57	G1/4	64	57	G1/4	G1/4	50	17	50	21,4
80	6	G3/4	21,5	22,5	G3/4	21,5	22,5	-	-	-	-	-	-	-	-	-	-	35	15,5
	10	G3/4	27	33	G3/4	3,5	33	G1/4	18	57	G1/4	64	57	G1/4	G1/4	50	17	50	21,4
100	10	G1	27	30	G1	3,5	40	G1/4	18	57	G1/4	65	57	G1/4	G1/4	58	20	52	21,4
125	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	62	72	G1/4	G1/4	55	25	60	21,4
	16	G1 1/4	57	35	G1 1/4	15	34	G1/4	76,5	80	G1/4	86	85	G1/4	G1/4	86	45	50	40
	25	G1 1/4	77	42	G1 1/4	30	34	G1/4	19	90	G1/4	109	90	G1/4	G1/4	103	50	50	52,1
140	10	G1 1/4	27	35	G1 1/4	3,5	45	G1/4	20	72	G1/4	62	72	G1/4	G1/4	55	25	60	21,4
	16	G1 1/4	57	35	G1 1/4	15	34	G1/4	76,5	80	G1/4	86	85	G1/4	G1/4	86	45	50	40
	25	G1 1/4	77	42	G1 1/4	30	34	G1/4	19	90	G1/4	109	90	G1/4	G1/4	103	50	50	52,1
160	10	G1 1/2	27	35	G1 1/2	3,5	45	G1/4	19	72	G1/4	62,0	72	G1/4	G1/4	50	25	72	21,4
	16	G1 1/2	57	35	G1 1/2	15	34	G1/4	76,5	80	G1/4	86,0	85	G1/4	G1/4	86	45	60	40
	25	G1 1/2	77	42	G1 1/2	30	34	G1/4	19	90	G1/4	109,0	90	G1/4	G1/4	103	50	60	52,1
180	10	G1 1/2	27	35	G1 1/2	3,5	45	G1/4	19	72	G1/4	62,0	72	G1/4	G1/4	50	25	72	21,4
	16	G1 1/2	57	35	G1 1/2	15	34	G1/4	76,5	80	G1/4	86,0	85	G1/4	G1/4	86	45	60	40
	25	G1 1/2	77	42	G1 1/2	30	34	G1/4	19	90	G1/4	109,0	90	G1/4	G1/4	103	50	60	52,1
200	10	G1 1/2	27	35	G1 1/2	3,5	45	G1/4	19	72	G1/4	62,0	72	G1/4	G1/4	50	25	72	21,4
	16	G1 1/2	57	35	G1 1/2	15	34	G1/4	76,5	80	G1/4	86,0	85	G1/4	G1/4	86	45	60	40
	25	G1 1/2	77	42	G1 1/2	30	34	G1/4	19	90	G1/4	109,0	90	G1/4	G1/4	103	50	60	52,1

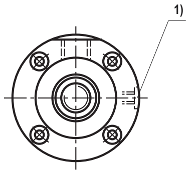
1) Not for MT4

2) Only for MT4

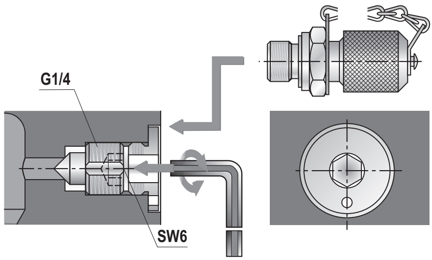
Bleeding / threaded coupling (dimensions in mm)

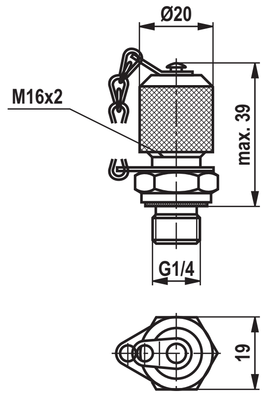
By default, a patented safety bleeding device against unintended screwing out in head and base is delivered for all cylinders.

The port allows for the installation of a threaded coupling with check valve for pressure measurement or contamination-free bleeding. Threaded coupling with check valve function, i.e. it can also be connected when the system is pressurized.



[1)] Bleeding: With view to the piston rod, the position is offset by 90° in relation to the line connection (clockwise)





Scope of delivery: Threaded coupling **G1/4**

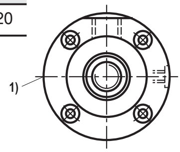
SCREW JOINT AB 20-11/K1 G1/4 with seal ring of NBR
Material no. **R900009090**
SCREW JOINT AB 20-11/K1V G1/4 with seal ring of FKM
Material no. **R900001264**

Throttle valve (dimensions in mm)

ØAL	**40**	**50**	**63**	**80**	**100**	**125**	**140**	**160**	**180**	**200**	**220**	**250**	**280**	**320**
Nominal width	4	4	4	5	5	8	8	8	8	8	20	20	20	20

ØAL = Piston Ø

[1)] Throttle valve only with end position cushioning „E“ (180° for bleeding)



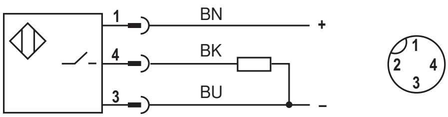
Proximity switch

Inductive proximity switches are used as reliable end position control for hydraulic cylinders. They are an important element for the safe and exact monitoring of safety equipment, lockings and/or other machine functions in their end position by means of the output of signals. The proximity switch which is high-pressure-resistant up to 500 bar works in a contactless manner. Consequently, it is wear-free. The proximity switch is set at the factory. The switching distance must not be adjusted. The lock nut of the proximity switch is marked at the factory using sealing wax. On versions with proximity switch, the cylinders are provided with proximity switches on both sides.

Technical data (For applications outside these parameters, please consult us!)

Function type			PNP normally open contact
Admissible pressure		bar	500
Operating voltage		V DC	10 … 30
	Including residual ripple	%	≤ 15
Voltage drop		V	≤ 1.5
Rated operating voltage		V DC	24
Rated operating current		mA	200
Idle current		mA	≤ 8
Residual current		μA	≤ 10
Repetition accuracy		%	≤ 5
Hysteresis		%	≤ 15
Ambient temperature range		°C	–25 … +80
Temperature drift		%	≤ 10
Switching frequency		Hz	1000
Protection class	Active area		IP 68
	Proximity switch		IP 67
Housing material			Material no. 1.4104

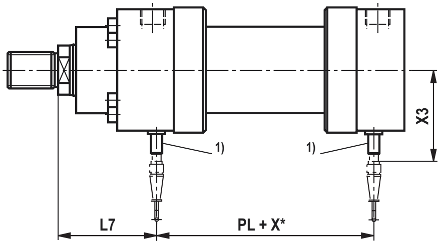
Pin assignment



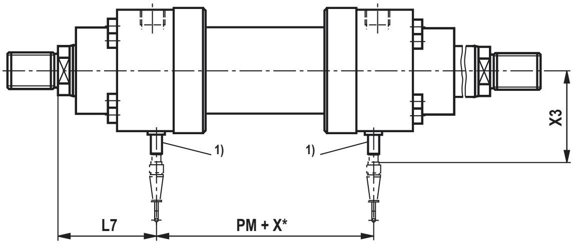
BN brown
BK black
BU blue

Proximity switch

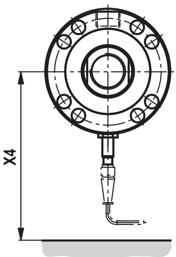
CDH3

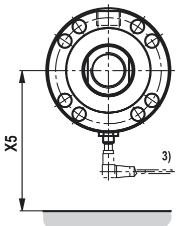


CGH3



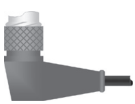
Installation space for mating connector





Mating connector with 5 m cable
Material no. **R900026512**
(mating connector is **not** included in the scope of delivery, must be ordered separately)

Mating connector, angled with 5 m cable
(position of the cable outlet cannot be defined)
Material no. **R988064311**
(mating connector is **not** included in the scope of delivery, must be ordered separately)



Proximity switch

Dimensions (dimensions in mm)

ØAL	ØMM	PL	PM	L7	X3	X4	X5
40	**28**	112	112	95	94	170	125
50	**36**	110	110	95	98	175	130
63	**45**	125	125	121	103	180	135
80	**56**	138	138	128	108	185	140
100	**70**	161	161	124	116	195	150
125	**90**	189	189	178	126	205	160
140	**100**	209	209	191	146	225	180
160	**110**	228	228	216	151	230	185
180	**125**	254	254	246	159 [2]	235	190
200	**140**	264	264	269	166 [2]	245	200
220	**160**	310	310	270	177 [2]	255	– [3]
250	**180**	320	320	280	187 [2]	265	– [3]
280	**200**	360	360	285	199 [2]	275	– [3]
320	**220**	375	375	295	209 [2]	285	– [3]

2

Main dimensions see pages 10 to 21

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

[1] The proximity switch is always located opposite of the line connection

[2] Piston Ø 220 - 320 mm
Proximity switch not protruding

[3] Piston Ø 220 - 320 mm
Angled mating connector not possible

Position measurement system

The position measurement system that is pressure-resistant up to 500 bar works in a contactless and absolute manner. The basis of this position measurement system is the magnetostrictive effect. Here, the coincidence of two magnetic fields triggers a torsion pulse. This pulse runs on the waveguide inside the gauge from the measuring point to the sensor head. The running time is constant and almost temperature-independent. It is proportional to the position of the solenoid and thus a measure for the actual position value and is converted in the sensor into a direct analog or digital output.

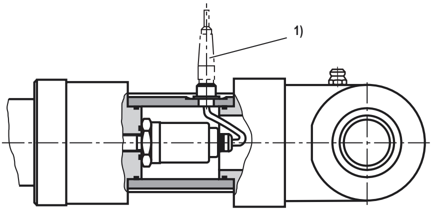
Technical data (For applications outside these parameters, please consult us!)

Operating pressure		bar	250
Analog output		V	0 to 10
	Load resistance	kΩ	≥ 5
	Resolution		unlimited
Analog output		mA	4 to 20
	Load resistance	Ω	0 to 500
	Resolution		unlimited
Digital output			SSI 24 bit gray-coded
	Resolution	µm	5
	Direction of measurement		asynchronously forward
Linearity (absolute accuracy)	Analog	% mm	≤ ±0.02 % (referred to measurement length) min. ±0.05
	Digital	% mm	≤ ±0.01 % (referred to measurement length) min. ±0.04
Reproducibility		% mm	±0.001 (referred to measurement length) min. ±0.0025
Hysteresis		mm	≤ 0.004
Supply voltage		V DC	24 (±10 % with analog output)
	Current consumption	mA	100
	Residual ripple	% s-s	≤ 1
	 Current consumption	V DC mA	24 (+20 %/–15 % with digital output) 70
	Residual ripple	% s-s	≤ 1
Protection class	Pipe and flange		IP 67
	Sensor electronics		IP 65
Operating temperature	Sensor electronics	°C	–40 to +75
Temperature coefficient	Voltage	ppm/°C	70
	Current	ppm/°C	90

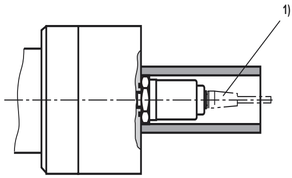
Position measurement system

Types of mounting

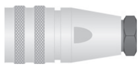
MP3, MP5



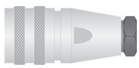
MF3, MF4, MT4, MS2



1) For analog output:
6-pole Amphenol mating connector
Material no. **R900072231**
(mating connector is **not** included in the scope of delivery, must be ordered separately)

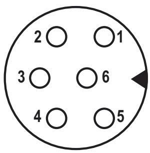


1) For digital output:
7-pole Amphenol mating connector
Material no. **R900079551**
(mating connector is **not** included in the scope of delivery, must be ordered separately)



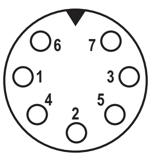
Pin assignment

Position measurement system (analog output)
Connector (view to pin side)



Pin	Cable	Signal / current	Signal / voltage
1	Gray	4 … 20 mA	0 … 10 V
2	Pink	DC ground	DC ground
3	Yellow	Not used	Not used
4	Green	DC ground	DC ground
5	Brown	+24 V DC (+20 % / –15 %)	+24 V DC (+20 % / –15 %)
6	White	DC ground (0 V)	DC ground (0 V)

Position measurement system (digital output)
Connector (view to pin side)



Pin	Cable	Signal / SSi
1	Gray	Data (–)
2	Pink	Data (+)
3	Yellow	Clock (+)
4	Green	Clock (–)
5	Brown	+24 V DC (+20 % / –15 %)
6	White	DC ground (0 V)
7	–	Not used

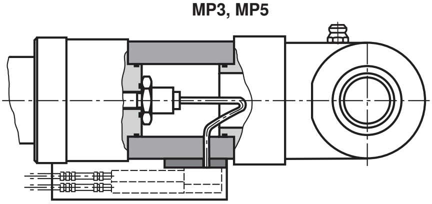
Technical data for the Profibus (For applications outside these parameters, please consult us!)

Output	Interface	Profibus-DP system
	Data record	Profibus-DP (EN 61158)
	Transmission rate	Max. 12 MB/s
Measurement accuracy	Travel resolution	1 μm to 1000 μm selectable as parameter
	Velocity	With 5 μm travel resolution: 0.64 mm/s to 500 mm; 0.43 mm/s to 2000 mm; 0.21 mm/s to 4500 mm: 0.14 mm/s to 7600 mm Measurement length With 2 μm travel resolution: 2.5 times smaller values
	Linearity	< +/–0.01 % F.S. (Minimum +/–50 μm)
	Repeatability	< +/–0.001 % F.S. (Minimum +/–2.5 μm)
	Temperature coefficient	< 15 ppm/°C
	Hysteresis	< 4 μm
Application conditions	Operating temperature	–40 °C to 75 °C
	Protection class	Profile: IP65 Rod: IP 67 with proper coupling plug assembly
	Standards, EMC test	Interference emissions according to EN 61000-6-3 Interference resistance according to EN 61000-6-2 EN 61000-4-2/3/4/6, level 3/4, criterion A, CE-tested
Electrical connection	Operating voltage	24 VDC (–15 / +20 %)

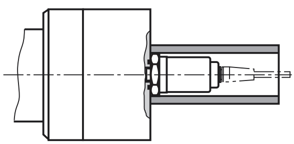
Please ask for the complete technical data!

Types of mounting

MP3, MP5



MF3, MF4, MT4, MS2

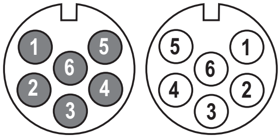


The output of the position measurement system is by default always rotated by 180° to the selected position of the hydraulic connection in the cylinder base.

Mating connector is **not** included in the scope of delivery, must be ordered separately.

Pin assignment for Profibus

Pin assignment for Profibus D63

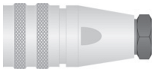


Pins Sockets

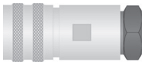
Pin	Cable	Function
1	Green	RxD/TxD-N (bus)
2	Red	RxD/TxD-P (bus)
3	—	DGND (terminating resistor) *
4	—	VP (terminating resistor) *
5	Black	+24 VDC (–15 / +20 %)
6	Blue	DC ground (0 V)
—	Yellow/ green	Shield compensating line, is usually not to be connected

* Only with sockets

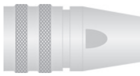
Mating connectors for D63



Signal input
6-pin mating connector M16
Material no. R900705950 (socket)



Signal output
6-pin mating connector M16
Material no. R900705951 (pins)

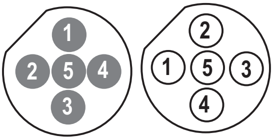


Signal output
6-pin end plug M16
Material no. R900722518 (pins)

2

Pin assignment for Profibus D53

Bus

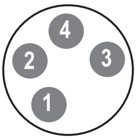


Pins Sockets

Pin	Cable	Function
1	—	VP+5 (terminating resistor) *
2	Green	RxD/TxD-N (bus)
3	—	DGND (terminating resistor) *
4	Red	RxD/TxD-P (bus)
5	Shield	Shield

* Only with sockets

Supply

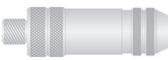


View connector side

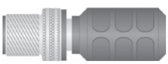
Pin	Cable	Function
1	Brown	+24 VDC (–15 / +20 %)
2	White	Not used
3	Blue	DC ground (0 V)
4	Black	Not used

Mating connectors for D53

Signal input
5-pin mating connector M12-B
Material no. R900773386 (socket)



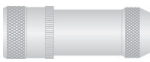
Signal output
5-pin mating connector M12-B
Material no. R901091655 (pins)



Signal output
5-pin end plug M12-B
Material no. R901070126 (pins)

Mating connector is **not** included in the scope of delivery, must be ordered separately.

Supply for D53



4-pin mating connector M8
Material no. R901132799

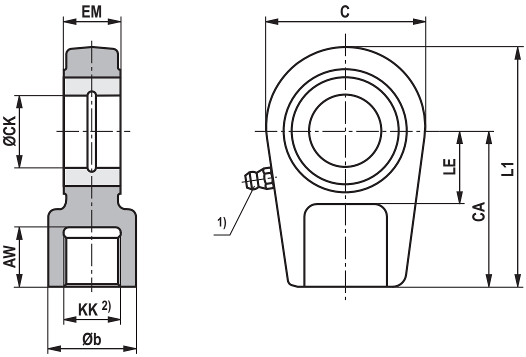
Connection cable 5 m
with 4-pin mating connector M8
Material no. 901213191

Connection cable 10 m
with 4-pin mating connector M8
Material no. 913008737

Connection cable 15 m
with 4-pin mating connector M8
Material no. 913008738

Plain clevis CSA (dimensions in mm)

ØAL 40 to 200 mm



ØAL	Type	Material no.	AW	Øb	C	CA	ØCK H11	EM -0,4	KK	LE	L1	m [3] kg	C_0 [4] kN	F_{adm} [5] kN
40	**CSA 22**	R900303151	23	34	64	60	30	28	M22x1,5	30	94	0,7	106	38,2
50	**CSA 28**	R900303152	29	44	78	70	35	30	M28x1,5	40	112	1,1	153	55,1
63	**CSA 35**	R900303153	36	55	94	85	40	35	M35x1,5	45	135	2,0	250	90,0
80	**CSA 45**	R900303154	46	70	116	105	50	40	M45x1,5	55	168	3,3	365	131,4
100	**CSA 58**	R900303155	59	87	130	130	60	50	M58x1,5	65	200	5,5	400	144,0
125	**CSA 65**	R900303156	66	93	154	150	70	55	M65x1,5	75	232	8,6	540	194,4
140	**CSA 80**	R900303157	81	125	176	170	80	60	M80x2	80	265	12,2	670	241,2
160	**CSA100**	R900303158	101	143	206	210	90	65	M100x2	90	323	21,5	980	352,8
180	**CSA110**	R900303159	111	153	230	235	100	70	M110x2	105	360	27,5	1120	403,2
200	**CSA120**	R900303160	125	176	265	265	110	80	M120x2	115	407,5	40,7	1700	612,0

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CA, CK, EM, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) The plain clevis must always be screwed against the piston rod shoulder

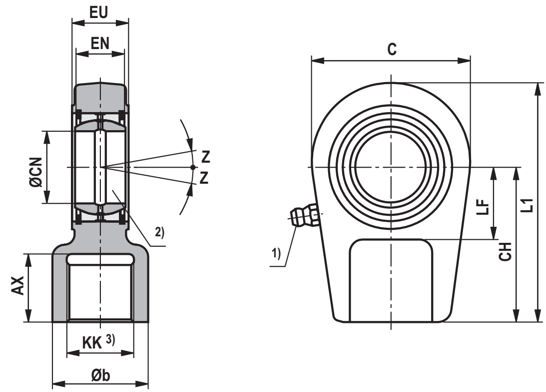
3) ***m*** = Weight plain clevis in kg

4) C_0 = Static load rating of the plain clevis

5) F_{adm} = Max. admissible load of the plain clevis with oscillatory or alternating loads

Self-aligning clevis CGA (dimensions in mm)

ØAL 40 to 250 mm



ØAL	Type	Material no.	AX min	Øb max	C	CH	ØCN [2]	EN	EU -0,4	KK	L1	LF min	Z	*m* [4] kg	C_0 [5] kN	F_{adm} [6] kN
40	**CGA 22**	R900303126	23	33	64	60	$30_{-0,010}$	$22_{-0,12}$	28	M22x1,5	94	30	6°	0,7	106	38,2
50	**CGA 28**	R900303127	29	41	78	70	$35_{-0,012}$	$25_{-0,12}$	30	M28x1,5	112	38	6°	1,1	153	55,1
63	**CGA 35**	R900303128	36	50	94	85	$40_{-0,012}$	$28_{-0,12}$	35	M35x1,5	135	45	7°	2,0	250	90,0
80	**CGA 45**	R900303129	46	62	116	105	$50_{-0,012}$	$35_{-0,12}$	40	M45x1,5	168	55	6°	3,3	365	131,4
100	**CGA 58**	R900303130	59	76	130	130	$60_{-0,015}$	$44_{-0,15}$	50	M58x1,5	200	65	6°	5,5	400	144,0
125	**CGA 65**	R900303131	66	87	154	150	$70_{-0,015}$	$49_{-0,15}$	55	M65x1,5	232	75	6°	8,6	540	194,4
140	**CGA 80**	R900303132	81	106	176	170	$80_{-0,015}$	$55_{-0,15}$	60	M80x2	265	80	6°	12,2	670	241,2
160	**CGA100**	R900303133	101	125	206	210	$90_{-0,020}$	$60_{-0,20}$	65	M100x2	323	90	5°	21,5	980	352,8
180	**CGA110**	R900303134	111	139	230	235	$100_{-0,020}$	$70_{-0,20}$	70	M110x2	360	105	7°	27,5	1120	403,2
200	**CGA120**	R900303135	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3	407,5	115	6°	40,7	1700	612,0
220	**CGA120**	R900303135	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3	407,5	115	6°	40,7	1700	612,0
250	**CGA130**	R900303136	135	173	340	310	$120_{-0,020}$	$85_{-0,20}$	90	M130x3	490	140	6°	76,4	2900	1044,0

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing

3) The self-aligning clevis must always be screwed against the shoulder of the piston rod

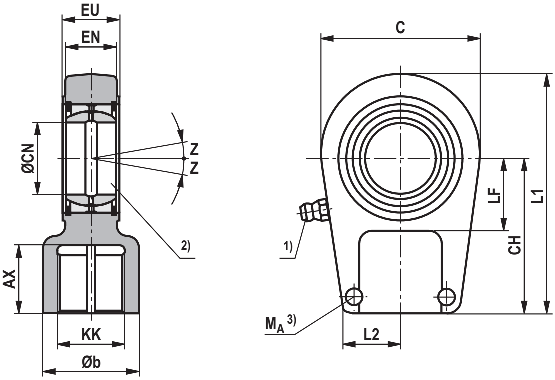
4) ***m*** = Weight self-aligning clevis in kg

5) C_0 = Static load rating of the self-aligning clevis

6) F_{adm} = Max. admissible load of the self-aligning clevis with oscillatory or alternating loads

Self-aligning clevis CGAK (clampable) (dimensions in mm)

ØAL 40 to 250 mm



ØAL	Type	Material no.	AX min	Øb max	C	CH	ØCN [2)]	EN	EU -0,4	KK
40	**CGAK 22**	R900303163	23	33	64	60	$30_{-0,010}$	$22_{-0,12}$	28	M22x1,5
50	**CGAK 28**	R900303164	29	41	78	70	$35_{-0,012}$	$25_{-0,12}$	30	M28x1,5
63	**CGAK 35**	R900303165	36	50	94	85	$40_{-0,012}$	$28_{-0,12}$	35	M35x1,5
80	**CGAK 45**	R900303166	46	62	116	105	$50_{-0,012}$	$35_{-0,12}$	40	M45x1,5
100	**CGAK 58**	R900303167	59	76	130	130	$60_{-0,015}$	$44_{-0,15}$	50	M58x1,5
125	**CGAK 65**	R900303168	66	87	154	150	$70_{-0,015}$	$49_{-0,15}$	55	M65x1,5
140	**CGAK 80**	R900303169	81	106	176	170	$80_{-0,015}$	$55_{-0,15}$	60	M80x2
160	**CGAK100**	R900321655	101	125	206	210	$90_{-0,020}$	$60_{-0,20}$	65	M100x2
180	**CGAK110**	R900321691	111	139	231	235	$100_{-0,020}$	$70_{-0,20}$	70	M110x2
200	**CGAK120**	R900321621	125	155	266	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3
220	**CGAK120**	R900321621	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3
250	**CGAK130**	R900322015	135	173	340	310	$120_{-0,020}$	$85_{-0,20}$	90	M130x3

Self-aligning clevis CGAK (clampable) (dimensions in mm)

ØAL	Type	L1	L2 max	LF	Z	Clamping screws ISO 4762-10.9	M_A [3)] Nm	m [4)] kg	C_0 [5)] kN	F_{adm} [6)] kN
40	**CGAK 22**	94	26	30	6°	M8	30	0,7	106	38,2
50	**CGAK 28**	112	34	38	6°	M10	54	1,1	153	55,1
63	**CGAK 35**	135	39	45	7°	M10	59	2,0	250	90,0
80	**CGAK 45**	168	46	55	6°	M12	100	3,3	365	131,4
100	**CGAK 58**	200	61	65	6°	M16	250	5,5	400	144,0
125	**CGAK 65**	232	66	75	6°	M16	250	8,6	540	194,4
140	**CGAK 80**	265	81	80	6°	M20	490	12,2	670	241,2
160	**CGAK100**	323	91	90	5°	M20	490	21,5	980	352,8
180	**CGAK110**	360	101	105	7°	M24	840	27,5	1120	403,2
200	**CGAK120**	407,5	111	115	6°	M24	840	40,7	1700	612,0
220	**CGAK120**	407,5	111	115	6°	M24	840	40,7	1700	612,0
250	**CGAK130**	490	129	140	6°	M24	840	76,4	2900	1044,0

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

ØAL = Piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing

3) M_A = Tightening torque
The self-aligning clevis must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

4) m = Weight self-aligning clevis in kg

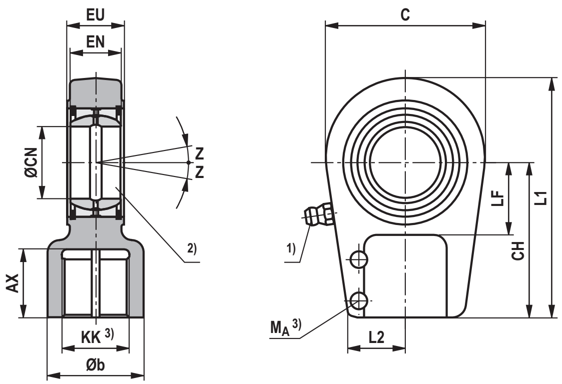
5) C_0 = Static load rating of the self-aligning clevis

6) F_{adm} = Max. admissible load of the self-aligning clevis with oscillatory or alternating loads

2

Self-aligning clevis CGAS (clampable) (dimensions in mm)

ØAL 40 to 320 mm



ØAL	Type	Material no.	AX min	Øb max	C max	CH	ØCN 2)	EN	EU -0,4	KK
40	**CGAS 30**	R900303138	35	34	64	75	$30_{-0,010}$	$22_{-0,12}$	28	M24x2
50	**CGAS 35**	R900303139	46	46	78	90	$35_{-0,012}$	$25_{-0,12}$	30	M30x2
63	**CGAS 40**	R900303140	56	57	94	105	$40_{-0,012}$	$28_{-0,12}$	35	M39x3
80	**CGAS 50**	R900303141	76	70	116	135	$50_{-0,012}$	$35_{-0,12}$	40	M50x3
100	**CGAS 60**	R900303142	96	87	130	170	$60_{-0,015}$	$44_{-0,15}$	50	M64x3
125	**CGAS 70**	R900303143	112	111	154	195	$70_{-0,015}$	$49_{-0,15}$	55	M80x3
140	**CGAS 80**	R900303144	122	129	176	210	$80_{-0,015}$	$55_{-0,15}$	60	M90x3
160	**CGAS 90**	R900303145	142	153	211	250	$90_{-0,020}$	$60_{-0,20}$	65	M100x3
180	**CGAS100**	R900303146	152	170	230	275	$100_{-0,020}$	$70_{-0,20}$	70	M110x4
200	**CGAS110**	R900303147	162	180	264	300	$110_{-0,020}$	$70_{-0,20}$	80	M120x4
220	**CGAS110**	R900303147	162	180	264	300	$110_{-0,020}$	$70_{-0,20}$	80	M120x4
250	**CGAS120**	R900303148	192	210	340	360	$120_{-0,020}$	$85_{-0,20}$	90	M150x4
280	**CGAS140**	R900317314	210	230	380	420	$140_{-0,025}$	$90_{-0,25}$	110	M160x4
320	**CGAS160**	R900303149	221	260	480	460	$160_{-0,025}$	$105_{-0,25}$	110	M180x4

Self-aligning clevis CGAS (clampable) (dimensions in mm)

ØAL	Type	L1 max	L2 max	LF min	Z [3]	Clamping screws ISO 4762-10.9	M_A [4] Nm	m [5] kg	C_0 [6] kN	F_{adm} [7] kN
40	**CGAS 30**	109	28	30	6-7°	M8	30	1,0	122	40,3
50	**CGAS 35**	132	36	40	6-7°	M10	59	1,5	177	58,4
63	**CGAS 40**	155	39	44	7°	M12	100	2,4	287	94,7
80	**CGAS 50**	198	45	55	6-7°	M12	100	4,8	422	139,3
100	**CGAS 60**	240	59	65	6-7°	M16	250	8,6	522	172,3
125	**CGAS 70**	279	70	75	6°	M16	250	12,2	707	233,3
140	**CGAS 80**	305	85	80	6°	M20	490	18,4	870	287,1
160	**CGAS 90**	366	91	90	5°	M20	490	31,6	1284	423,7
180	**CGAS100**	400	95	105	7°	M20	490	34	1460	481,8
200	**CGAS110**	443	106	115	6°	M24	840	44	2024	667,9
220	**CGAS110**	443	106	115	6°	M24	840	44	2024	667,9
250	**CGAS120**	540	122	140	6°	M24	840	75	2970	980,1
280	**CGAS140**	620	129	185	7°	M30	1700	160	3350	1105,5
320	**CGAS160**	710	146	200	8°	M30	1700	235	4302	1419,7

The specified dimensions are maximum values and may vary depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

ØAL = Piston Ø

[1] Lubricating nipple, cone head form A according to DIN 71412

[2] Related bolt Ø m6; related bolt Ø j6 with maintenance-free spherical bearing

[3] Dimensions may differ depending on the manufacturer

[4] M_A = Tightening torque
The self-aligning clevis must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

[5] m = Weight self-aligning clevis in kg

[6] C_0 = Static load rating of the self-aligning clevis

[7] F_{adm} = Max. admissible load of the self-aligning clevis with oscillatory or alternating loads

2

Buckling

The admissible stroke length with flexibly guided load and a factor of 3.5 for safety against buckling can be seen from the relevant table. For other installation positions of the cylinder, the admissible stroke length must be interpolated. Admissible stroke length for non-guided load on request.

Buckling calculations are carried out according to the following formulas:

1. Calculation according to Euler

$$F = \frac{\pi^2 \bullet E \bullet I}{v \bullet L_K^2} \qquad \text{if } \lambda > \lambda_g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \bullet \pi \,(335\text{-}0{,}62 \bullet \lambda)}{4 \bullet v} \qquad \text{if } \lambda \leq \lambda_g$$

Explanation:

E = Module of elasticity in N/mm²
= 2.1 x 10^5 for steel

I = Geometrical moment of inertia in mm⁴
for circular cross-section $= \frac{d^4 \bullet \pi}{64} = 0{,}0491 \bullet d^4$

v = 3.5 (safety factor)

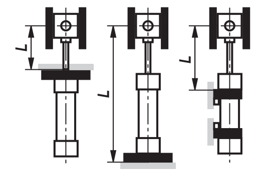
L_K = Free buckling length in mm (depending on the type of mounting see sketches A, B, C)

d = Piston rod Ø in mm

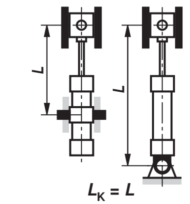
λ = Slenderness ratio
$= \frac{4 \bullet L_K}{d} \qquad \lambda_g = \pi \sqrt{\frac{E}{0.8 \bullet R_e}}$

R_e = Yield strength of the piston rod material

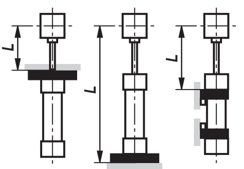
Influence of the type of mounting on the buckling length:



$L_K = 0{,}7\, L$



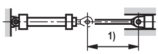
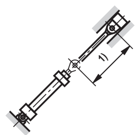
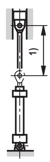
$L_K = L$



$L_K = 2\, L$

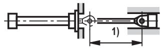
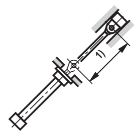
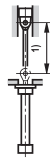
Admissible stroke length (dimensions in mm)

Type of mounting CDH3/CSH3 ²⁾: MP3, MP5

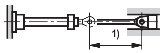
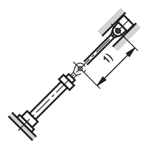
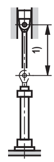
ØAL	ØMM	Admissible stroke length with 100 bar			210 bar			350 bar			Installation position
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	**28**	360	375	420	225	230	240	140	145	150	**0°**
50	**36**	505	525	351	335	340	355	230	235	240	
63	**45**	625	650	755	425	430	455	295	300	305	
80	**56**	765	800	945	530	545	575	375	380	390	
100	**70**	950	995	1200	680	695	745	495	500	515	
125	**90**	1200	1270	1610	895	925	1010	665	680	705	**45°** 
140	**100**	1335	1405	1785	995	1025	1125	745	755	790	
160	**110**	1380	1406	1865	1025	1055	1160	755	770	805	
180	**125**	1580	1670	2150	1180	1220	1350	880	895	940	
200	**140**	1780	1890	2470	1355	1400	1565	1035	1055	1110	
220	**160**	1985	2110	2970	1575	1640	1900	1230	1260	1360	**90°** 
250	**180**	2190	2340	3310	1740	1820	2120	1370	1400	1510	
280	**200**	2360	2520	3640	1890	1970	2330	1490	1530	1660	
320	**220**	2530	2700	3830	2010	2100	2450	1320	1460	1740	1) Adm. Stroke length

Admissible stroke length (dimensions in mm)

Type of mounting CDH3/CGH3/CSH3 [2]: MF3

ØAL	ØMM	Admissible stroke length with									Installation position
		100 bar			210 bar			350 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	28	1370	1415	1600	1020	1035	1075	795	800	810	0° 
50	36	1755	1825	2135	1345	1370	1440	1060	1070	1090	
63	45	2000	2000	2000	1660	1695	1800	1320	1330	1365	
80	56	2000	2000	2000	2000	2000	2000	1600	1620	1665	
100	70	3000	3000	3000	2470	2530	2740	1900	2010	2085	
125	90	3000	3000	3000	3000	3000	3000	2615	2660	2785	45° 
140	100	3000	3000	3000	3000	3000	3000	2875	2920	3000	
160	110	3000	3000	3000	3000	3000	3000	2775	3000	3000	
180	125	3000	3000	3000	3000	3000	3000	3000	3000	3000	
200	140	3000	3000	3000	3000	3000	3000	3000	3000	3000	
220	160	6000	6000	6000	5410	5630	6000	4575	4675	5055	90° 
250	180	6000	6000	6000	5950	6000	6000	4815	5160	5605	
280	200	6000	6000	6000	6000	6000	6000	5005	5565	6000	
320	220	6000	6000	6000	6000	6000	6000	4560	5060	6000	[1] Adm. Stroke length

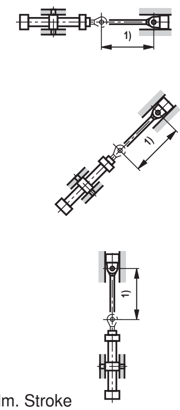
Type of mounting CDH3/CSH3 [2]: MF4

ØAL	ØMM	Admissible stroke length with									Installation position
		100 bar			210 bar			350 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	28	540	565	675	380	385	410	270	275	280	0° 
50	36	735	770	940	540	550	590	400	405	415	
63	45	900	945	1175	670	690	745	505	510	530	
80	56	1080	1140	1450	825	845	930	630	635	665	
100	70	1330	1400	1840	1030	1070	1190	805	820	860	
125	90	1655	1760	2450	1330	1380	1590	1060	1080	1160	45° 
140	100	1830	1940	2700	1470	1530	1760	1175	1200	1285	
160	110	1905	2030	2830	1530	1590	1835	1035	1160	1300	
180	125	2210	2355	3310	1795	1870	2170	1285	1435	1585	
200	140	2400	2565	3000	1965	2050	2420	1410	1590	1765	
220	160	2655	2850	4445	2245	2360	2935	1735	1930	2160	90° 
250	180	2945	3160	4950	2490	2620	3275	1840	2095	2410	
280	200	3170	3410	5455	2705	2850	3615	1870	2140	2665	
320	220	3425	3680	5775	2905	3055	3820	1675	1925	2815	[1] Adm. Stroke length

Admissible stroke length (dimensions in mm)

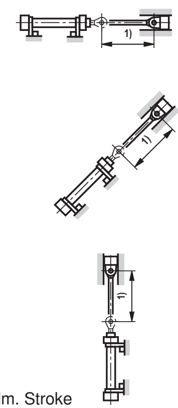
Type of mounting CDH3/CGH3/CSH3 [2]: MT4 trunnion in cylinder center

ØAL	ØMM	Admissible stroke length with									Installation position
		100 bar			210 bar			350 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	28	560	580	640	380	385	395	265	270	275	0°
50	36	760	790	890	353	545	565	390	395	400	
63	45	930	965	1105	665	675	705	490	495	505	
80	56	1125	1170	1365	815	830	875	610	615	625	
100	70	1390	1450	1730	1030	1050	1120	785	790	810	
125	90	1755	1845	2300	1345	1380	1500	1040	1050	1090	45°
140	100	1935	2030	2545	1485	1525	1660	1150	1165	1210	
160	110	2020	2125	2660	1545	1585	1725	1190	1205	1250	
180	125	2300	2420	3000	1770	1820	1990	1370	1390	1445	
200	140	2555	2695	3000	1990	2050	2270	1555	1580	1655	
220	160	2870	3045	4185	2320	2410	2760	1865	1905	2035	90°
250	180	3180	3380	4665	2580	2680	3080	2080	2125	2270	
280	200	3430	3645	5130	2800	2915	3390	2270	2325	2500	
320	220	3700	3925	5435	3000	3115	3585	2065	2295	2640	[1] Adm. Stroke length



Type of mounting CDH3/CGH3/CSH3 [2]: MS2

ØAL	ØMM	Admissible stroke length with									Installation position
		100 bar			210 bar			350 bar			
		0°	45°	90°	0°	45°	90°	0°	45°	90°	
40	28	1265	1310	1500	920	935	970	690	695	710	0°
50	36	1650	1715	2000	1235	1260	1330	950	960	980	
63	45	1995	2000	2000	1520	1550	1655	1180	1190	1220	
80	56	2000	2000	2000	1850	1895	2000	1445	1460	1510	
100	70	2940	3000	3000	2310	2370	2585	1830	1855	1925	
125	90	3000	3000	3000	3000	3000	3000	2640	2685	2810	45°
140	100	3000	3000	3000	3000	3000	3000	2640	2690	2840	
160	110	3000	3000	3000	3000	3000	3000	2510	2760	2955	
180	125	3000	3000	3000	3000	3000	3000	2900	3000	3000	
200	140	3000	3000	3000	3000	3000	3000	3000	3000	3000	
220	160	6000	6000	6000	5065	5280	6000	4225	4330	4705	90°
250	180	6000	6000	6000	5590	5835	6000	4455	4805	5250	
280	200	6000	6000	6000	6000	6000	6000	4645	5205	5790	
320	220	6000	6000	6000	6000	6000	6000	4175	4680	6000	[1] Adm. Stroke length



With longer strokes, an extended guide and/or the use of guide rings may be reasonable for increasing the service life, depending on the respective application and installation position. Recommendation on request.

[2] With CSH3, observe the maximum stroke length „X*max“, pages 24 to 35

End position cushioning

End position cushioning:
The objective is to reduce the velocity of a moved mass, whose center of gravity lies on the cylinder axis to a level, at which neither the cylinder nor the machine into which the cylinder is installed is damaged. For velocities above 20 mm/s, we recommend the use of an end position cushioning feature, which absorbs energy without requiring the use of additional equipment. It must, however, always be verified whether end position cushioning is also required for lower velocities with large masses.

Damping capacity:
When decelerating masses via end position cushioning, the structural-inherent cushioning capacity must not be exceeded. Cylinders with end position cushioning can achieve their full cushioning capacity only over the entire stroke length.

With the adjustable end position cushioning version “E”, a throttle valve is additionally provided when compared with version “D”. End position cushioning version “E” allows cycle times to be optimized. The maximum cushioning capacity can only be achieved when the throttle valve is closed.

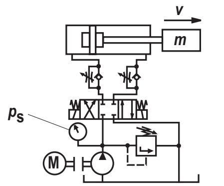
The calculation depends on the factors weight, velocity, system pressure and installation position. For this reason, mass and velocity are used to determine the characteristic $\boldsymbol{D}_\mathrm{m}$ and system pressure and installation position to determine the characteristic $\boldsymbol{D}_\mathrm{p}$.

These two characteristics are used for verifying the admissible damping capacity in the “damping capacity” diagram. The intersection point of the characteristics $\boldsymbol{D}_\mathrm{m}$ and $\boldsymbol{D}_\mathrm{p}$ must always be below the damping capacity curve of the selected cylinder. The values in the diagrams refer to an average oil temperature of +45 to +65 °C with the throttle valve being closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position cushioning versions can be offered on request.

When fixed or adjustable stops are used, special measures must be taken!

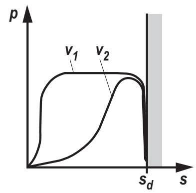
2



Formulas:

$$D_\mathrm{m} = \frac{m}{10^K} \;;\; K = kv\,(0{,}5 - v)$$

m = Moved weight in kg
v = Stroke velocity in m/s
kv = See table page 60



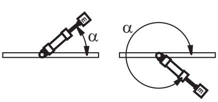
Extension for CDH3 and CSH3

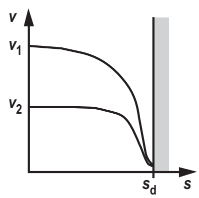
$$D_\mathrm{p} = p_\mathrm{S} - \frac{m \cdot 9{,}81 \cdot \sin\alpha}{A_1 \cdot 10}$$

Retraction for CDH3, CGH3 and CSH3; Extension for CGH3

$$D_\mathrm{p} = p_\mathrm{S} + \frac{m \cdot 9{,}81 \cdot \sin\alpha}{A_3 \cdot 10}$$

p_S = System pressure in bar
A_1 = Piston area in cm^2 (see page 4)
A_3 = Annulus area in cm^2 (see page 4)
α = Angle to the horizontal in degrees





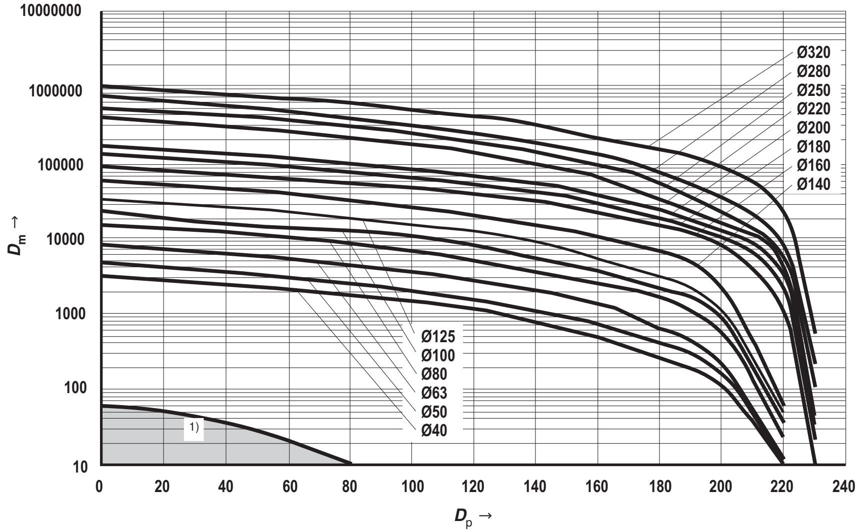
Damping length

ØAL mm	40	50	63	80	100	125	140	160	180	200	220	250	280	320
Head side	21	20	23	25	25	25	33	33	37	37	76	81	86	90
Base side	21	20	23	25	25	25	33	33	37	37	76	81	86	90

End position cushioning

ØAL mm	40	50	63	80	100	125	140	160	180	200	220	250	280	320
kv ①	1,72	1,85	1,51	1,85	2,34	2,02	1,85	1,93	1,84	1,65	1,41	1,45	1,58	1,68
kv ②	2,31	1,85	1,95	1,86	2,25	1,97	1,94	1,92	2,05	1,97	1,64	1,61	1,82	1,94

Damping capacity: Extension for CDH3 and CSH3, with *kv* ①

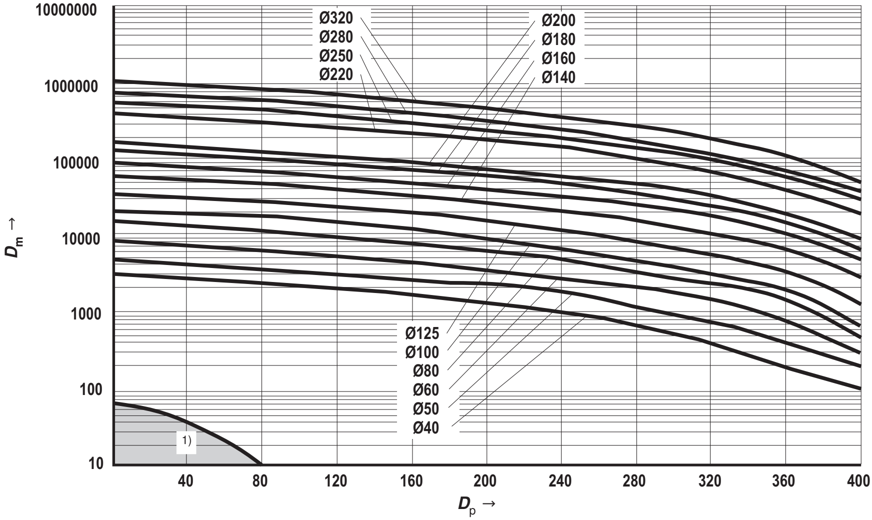


ØAL = Piston Ø

1) If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

End position cushioning

Damping capacity: Retraction for CDH3, CGH3 and CSH3; extension for CGH3 with *kv* ②



ØAL = Piston Ø

1) If with standard applications the calculated intersection point of D_m and D_p is within the marked area, we recommend designing the cylinder without end position cushioning.

Selection criteria for seals

	Work and environmental conditions	Seal versions M	G	V	L	A	B	T	R	S
Medium / temperature	**Medium HL, HLP** / operating temperature medium –20 °C to +80 °C	++	++	++	++	++	++	++	++	++
	Medium HFA / operating temperature medium +5 °C to +55 °C	+/–	+/–	+/–	+/–	+	+/–	++	+/–	+/–
	Medium HFC / operating temperature medium –20 °C to +60 °C	–	++	–	–	+/–	–	++	–	–
	Medium HFD-R / operating temperature medium –15 °C to +80 °C	–	–	++	–	–	++	–	–	++
	Medium HFD-U / operating temperature medium –15 °C to +80 °C	–	–	++	–	–	++	–	–	++
	Ambient and rod temperature in the area of the piston rod from –20 °C to +80 °C [1]	++	+	+ [2]	++	++	+ [2]	+	++	++ [2]
	Extended ambient and rod temperature in the area of the piston rod from +80 °C to +120 °C	–	–	++	–	–	+	–	–	++
Function / velocity...	Static holding function more than 10 minutes: Attention! Application- and temperature-dependent	++	+	+	+	++	++	+	+	+
	Static holding function short-term < 1 minute	++	++	++	++	++	++	++	++	++
	Robust application conditions: Steel works, mining, thin ice	++	++	++	++	++	++	–	++	–
	Zero point control, hardly amplitude, frequency max. 5 Hz, not longer than 5 minutes	–	–	–	+/–	–	–	++	+	++
	Cylinder velocity min. 0.001 m/sec stick-slip behavior	++	+	+	++	–	–	++	++	++
	Cylinder velocity from 0.01 m/sec to 0.5 m/sec [3]	++	+	+	++	+	+	++	++	++
	Cylinder velocity > 0.5 m/sec to max. 0.8 m/sec [3]	–	+/–	+/–	++	–	–	++	+	++
	Stroke > 1.0 m	+/-	++	++	++	++	++	++	++	++
	Standstill period (wear)	++	+/–	+/–	++	+/–	–	++	++	++
	Undissolved air in the oil [4]	–	+	+	+	–	–	+	+	+

++ = very good + = good +/– = conditional, depending on the application parameters – = unsuitable

General technical data in corresponding data sheets will remain valid!

[1] Moreover, observe the corresponding medium temperature range
[2] Lower temperature limit –15 °C
[3] Standard line connections not designed for that velocity
[4] – Seal is destroyed / + Seal is not directly destroyed, leaks may occur

Generally, a medium temperature of approx. 40 °C is recommended. The specified values are to be regarded as guidelines; depending on the application, it may be necessary to check the suitability of the seal system.

Seal kits 1)

CDH3 – Standard

ØAL	ØMM	Material no. for seal design								
		M	G	V	L	A	B	T	R	S
40	28	R900851087	R961006002	R961006037	R961006072	R900859445	R900859770	R900858841	R961006107	R900861001
50	36	R900849392	R961006005	R961006040	R961006075	R900851515	R900860940	R900860277	R961006110	R900861004
63	45	R900847956	R961006008	R961006043	R961006078	R900851638	R900859678	R900847855	R961006113	R900861007
80	56	R900850905	R961006011	R961006046	R961006081	R900854718	R900851205	R900856180	R961006116	R900861010
100	70	R900853382	R961006014	R961006049	R961006084	R900856094	R900860946	R900860285	R961006119	R900861013
125	90	R900857949	R961006017	R961006052	R961006087	R900856095	R900855464	R900856102	R961006122	R900861016
140	100	R900853965	R961006019	R961006054	R961006089	R900856096	R900860952	R900860290	R961006124	R900849080
160	110	R900851146	R961006021	R961006056	R961006091	R900860933	R900860954	R900857536	R961006126	R900861019
180	125	R900848603	R961006024	R961006059	R961006094	R900860935	R900860956	R900860292	R961006129	R900861021
200	140	R900856431	R961006026	R961006061	R961006096	R900860937	R900860958	R900860293	R961006131	R900861023
220	160	R900888101	R961006028	R961006063	R961006098	R900888117	R900888141	R900888109	R961006133	R900888133
250	180	R900888103	R961006030	R961006065	R961006100	R900888119	R900888143	R900888111	R961006135	R900888135
280	200	R900888105	R961006032	R961006067	R961006102	R900888121	R900888145	R900888113	R961006137	R900888137
320	220	R900888107	R961006034	R961006069	R961006104	R900888123	R900888147	R900888115	R961006139	R900888139

ØAL = Piston Ø
ØMM = Piston rod Ø

1) Seal kits for proximity switches and subplate mounting separate material no.

Seal kits 1)

CGH3 – Standard

ØAL	ØMM	Material no. for seal design								
		M	G	V	L	A	B	T	R	S
40	**28**	R900867252	R961006223	R961006258	R961006293	R900866747	R900867133	R900868889	R961006328	R900868943
50	**36**	R900864930	R961006226	R961006261	R961006296	R900866750	R900867136	R900868892	R961006331	R900868946
63	**45**	R900867262	R961006229	R961006264	R961006299	R900866753	R900867139	R900868895	R961006334	R900868949
80	**56**	R900867265	R961006232	R961006267	R961006302	R900866756	R900867142	R900868898	R961006337	R900868952
100	**70**	R900867268	R961006235	R961006270	R961006305	R900866759	R900867146	R900868901	R961006340	R900868955
125	**90**	R900867270	R961006238	R961006273	R961006308	R900866762	R900867149	R900868904	R961006343	R900868957
140	**100**	R900867272	R961006240	R961006275	R961006310	R900866764	R900867151	R900868906	R961006345	R900868959
160	**110**	R900867274	R961006242	R961006277	R961006312	R900866766	R900867153	R900868908	R961006347	R900868961
180	**125**	R900867276	R961006245	R961006280	R961006315	R900866768	R900867155	R900868910	R961006350	R900868963
200	**140**	R900867278	R961006247	R961006282	R961006317	R900866770	R900867157	R900868912	R961006352	R900868965
220	**160**	R900888021	R961006249	R961006284	R961006319	R900888037	R900888061	R900888029	R961006354	R900888053
250	**180**	R900888023	R961006251	R961006286	R961006321	R900888039	R900888063	R900888031	R961006356	R900888055
280	**200**	R900888025	R961006253	R961006288	R961006323	R900888041	R900888065	R900888033	R961006358	R900888057
320	**220**	R900888027	R961006255	R961006290	R961006325	R900888043	R900888067	R900888035	R961006360	R900888059

ØAL = Piston Ø
ØMM = Piston rod Ø

1) Seal kits for proximity switches and subplate mounting separate material no.

Seal kits [1)]

CDH3 – Standard + additional option F

ØAL	ØMM	Material no. for seal design					
		M+F	G+F	V+F	T+F	R+F	S+F
40	28	R900861025	R961006142	R961006169	R900861050	R961006196	R900861100
50	36	R900861028	R961006145	R961006172	R900861053	R961006199	R900861103
63	45	R900861031	R961006148	R961006175	R900861056	R961006202	R900861106
80	56	R900861034	R961006151	R961006178	R900861059	R961006205	R900861109
100	70	R900861037	R961006154	R961006181	R900861062	R961006208	R900861115
125	90	R900861040	R961006157	R961006184	R900861065	R961006211	R900861122
140	100	R900861042	R961006159	R961006186	R900861067	R961006213	R900861126
160	110	R900861044	R961006161	R961006188	R900861069	R961006215	R900861130
180	125	R900861046	R961006164	R961006191	R900861071	R961006218	R900861135
200	140	R900861048	R961006166	R961006193	R900861073	R961006220	R900861143

2

CGH3 – Standard + additional option F

ØAL	ØMM	Material no. for seal design					
		M+F	G+F	V+F	T+F	R+F	S+F
40	28	R900868999	R961006363	R961006390	R900869026	R961006417	R900869093
50	36	R900869002	R961006366	R961006393	R900869029	R961006420	R900869096
63	45	R900869005	R961006369	R961006396	R900869032	R961006423	R900869099
80	56	R900869008	R961006372	R961006399	R900869035	R961006426	R900869102
100	70	R900869013	R961006375	R961006402	R900869038	R961006429	R900869105
125	90	R900869016	R961006378	R961006405	R900869041	R961006432	R900869108
140	100	R900869018	R961006380	R961006407	R900869043	R961006434	R900869110
160	110	R900869020	R961006382	R961006409	R900869045	R961006436	R900869112
180	125	R900869022	R961006385	R961006412	R900869047	R961006439	R900869114
200	140	R900869024	R961006387	R961006414	R900869049	R961006441	R900869116

ØAL = Piston Ø
ØMM = Piston rod Ø

[1)] Seal kits for proximity switches and subplate mounting separate material no.

Seal kits [2)]

CSH3

ØAL	ØMM	Material no. for seal design						
		M	G	V	L	T	R	S
40	28	R900861025	R961006142	R961006169	R961006072	R900861050	R961006196	R900861100
50	36	R900861028	R961006145	R961006172	R961006075	R900861053	R961006199	R900861103
63	45	R900861031	R961006148	R961006175	R961006078	R900861056	R961006202	R900861106
80	56	R900861034	R961006151	R961006178	R961006081	R900861059	R961006205	R900861109
100	70	R900861037	R961006154	R961006181	R961006084	R900861062	R961006208	R900861115
125	90	R900861040	R961006157	R961006184	R961006087	R900861065	R961006211	R900861122
140	100	R900861042	R961006159	R961006186	R961006089	R900861067	R961006213	R900861126
160	110	R900861044	R961006161	R961006188	R961006091	R900861069	R961006215	R900861130
180	125	R900861046	R961006164	R961006191	R961006094	R900861071	R961006218	R900861135
200	140	R900861048	R961006166	R961006193	R961006096	R900861073	R961006220	R900861143
220	160	R900888101	R961006028	R961006063	R961006098	R900888109	R961006133	R900888133
250	180	R900888103	R961006030	R961006065	R961006100	R900888111	R961006135	R900888135
280	200	R900888105	R961006032	R961006067	R961006102	R900888113	R961006137	R900888137
320	220	R900888107	R961006034	R961006069	R961006104	R900888115	R961006139	R900888139

ØAL = Piston Ø
ØMM = Piston rod Ø

2) Seal kits for position measurement system and subplate mounting separate material no.

Seal kits

Only for proximity switches

ØAL	Material no. for seal design								
	M / M+F	T / T+F	G / G+F	L	R / R+F	A	S / S+F	V / V+F	B
40 to 200	R900885938						R900885939		
220 to 320	R900894997						R900894998		

Only for subplate mounting

ØAL	Material no. for seal design	
	M, T, G, L, R, A	S, B, V
40	R961006022	R961006243
50	R961006022	R961006243
63	R961006092	R961006313
80	R961006092	R961006313
100	R961006092	R961006313
125	R961006162	R961006383
140	R961006162	R961006383
160	R961006189	R961006410
180	R961006189	R961006410
200	R961006189	R961006410

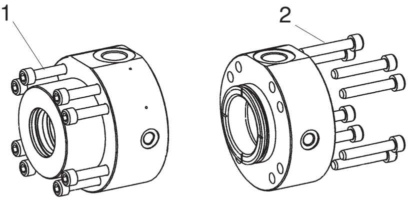
Only for position measurement system

ØAL	Material no. for seal design	
	M, T, G, L, R	S, V
40	R900885935	R900885937
50	R900894958	R900894979
63	R900894959	R900894980
80	R900894960	R900894981
100	R900894961	R900894982
125	R900894962	R900894983
140	R900894963	R900894985
160	R900894964	R900894986
180	R900894973	R900894987
200	R900894974	R900894988
220	R900894975	R900894989
250	R900894976	R900894991
280	R900894977	R900894993
320	R900894978	R900894994

ØAL = Piston Ø

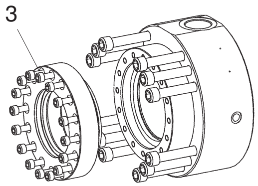
Tightening torques

Screws: Head and base (item 1 and 2)



Series	Piston Ø	Screw	Quantity	Quality class	Tightening torque
CDH3 / CGH3 / CSH3	**40**	M10	4	10.9	40 Nm
CDH3 / CGH3 / CSH3	**50**	M8	8	10.9	25 Nm
CDH3 / CGH3 / CSH3	**63**	M10	8	10.9	50 Nm
CDH3 / CGH3 / CSH3	**80**	M12	8	10.9	90 Nm
CDH3 / CGH3 / CSH3	**100**	M16	8	10.9	175 Nm
CDH3 / CGH3 / CSH3	**125**	M20	8	10.9	350 Nm
CDH3 / CGH3 / CSH3	**140**	M20	8	10.9	450 Nm
CDH3 / CGH3 / CSH3	**160**	M24	8	10.9	670 Nm
CDH3 / CGH3 / CSH3	**180**	M24	12	10.9	580 Nm
CDH3 / CGH3 / CSH3	**200**	M24	12	10.9	720 Nm
CDH3 / CGH3 / CSH3	**220**	M24	16	10.9	750 Nm
CDH3 / CGH3 / CSH3	**250**	M30	16	10.9	1400 Nm
CDH3 / CGH3 / CSH3	**280**	M30	16	10.9	1600 Nm
CDH3 / CGH3 / CSH3	**320**	M42	12	10.9	4200 Nm

Screws: Seal cover (item 3)

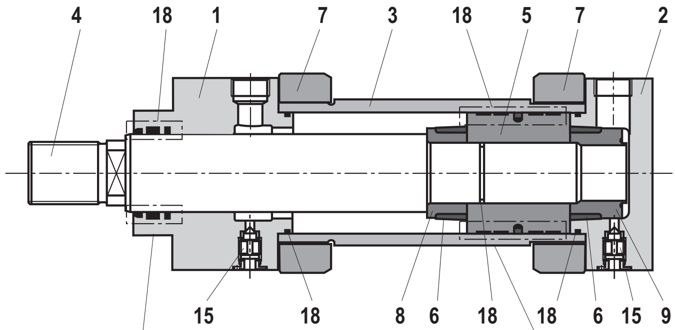


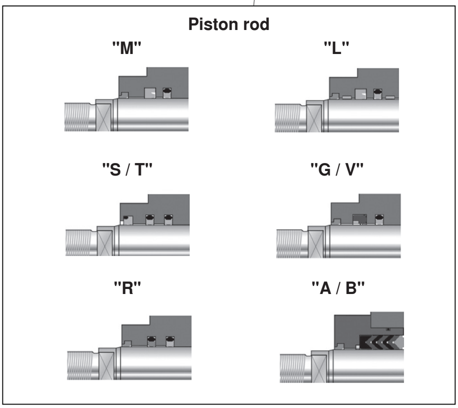
Only with seal design "A" and "B"

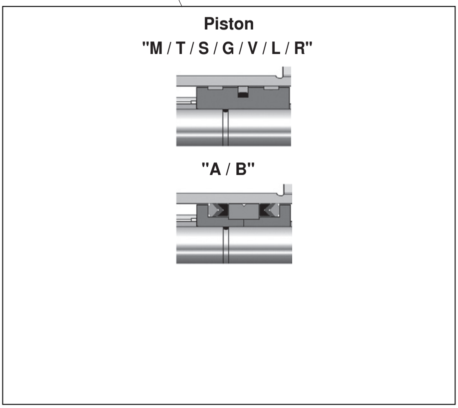
Series	Piston Ø	Piston rod Ø	Screw	Quantity	Quality class	Tightening torque
CDH3 / CGH3	**160**	**110**	M10	16	10.9	60 Nm
CDH3 / CGH3	**180**	**125**	M12	16	10.9	80 Nm
CDH3 / CGH3	**200**	**140**	M12	16	10.9	90 Nm
CDH3 / CGH3	**220**	**160**	M12	24	10.9	90 Nm
CDH3 / CGH3	**250**	**180**	M16	16	10.9	90 Nm
CDH3 / CGH3	**280**	**200**	M16	16	10.9	230 Nm
CDH3 / CGH3	**320**	**220**	M16	24	10.9	230 Nm

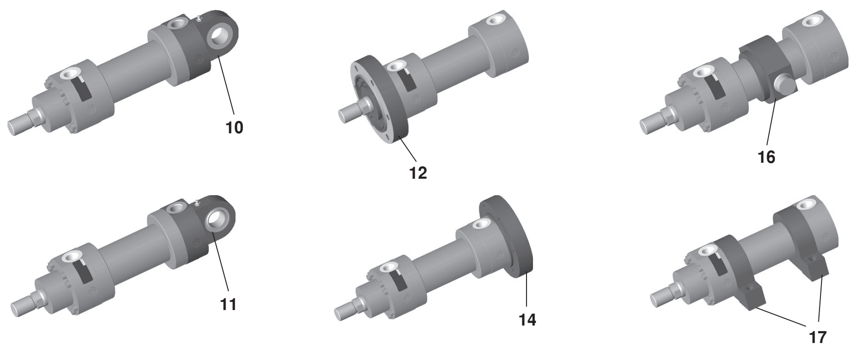
Spare parts: Series CDH3

CDH3





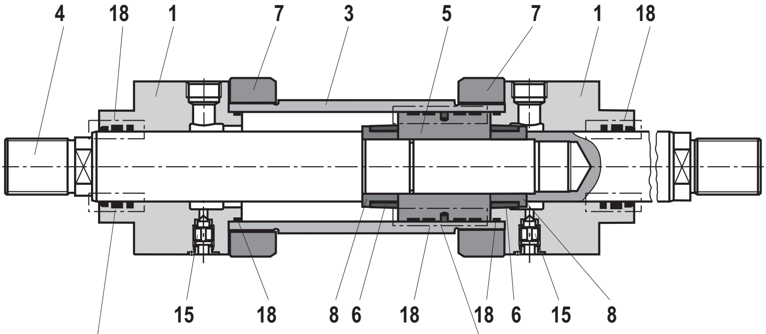


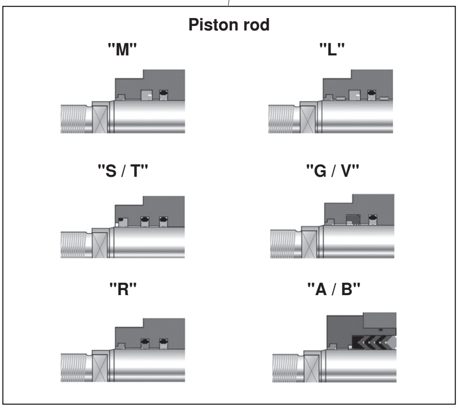


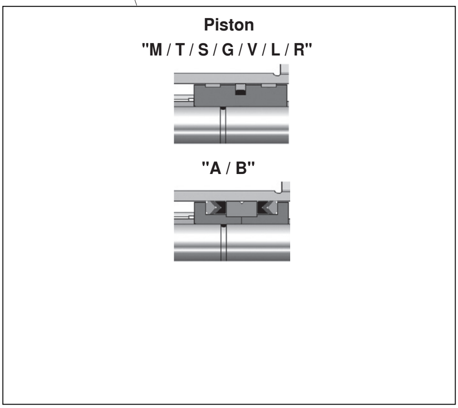
1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Base MP3
11 Base MP5
12 Round flange MF3
14 Round flange MF4
15 Bleeding
16 Trunnion MT4
17 Foot MS2
18 Seal kit:
- Scraper
- Rod seal
- Piston seal
- O-ring
- Guide ring

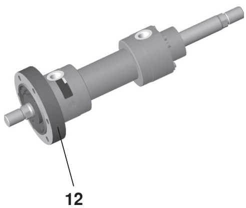
Spare parts: Series CGH3

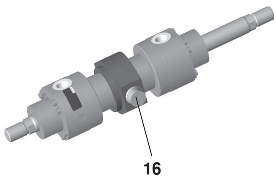
CGH3

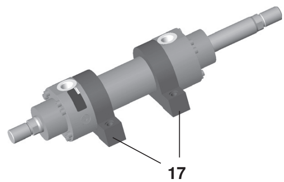








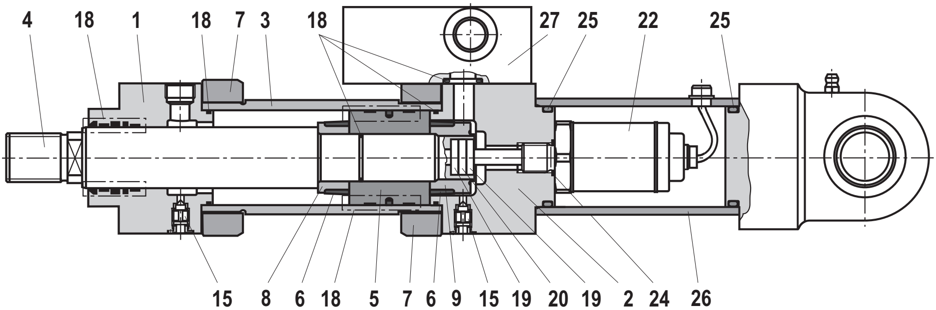




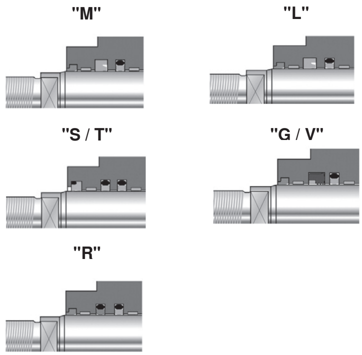
1 Head
3 Pipe
4 Piston rod
5 Piston
6 Damping bush
7 Flange
8 Socket

12 Round flange MF3
15 Bleeding
16 Trunnion MT4
17 Foot MS2
18 Seal kit:
- Scraper
- Rod seal
- Piston seal
- O-ring
- Guide ring

Spare parts: Series CSH3 MP3 and MP5

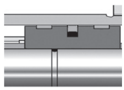


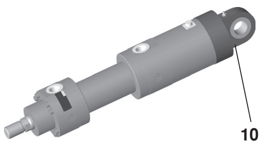
Piston rod

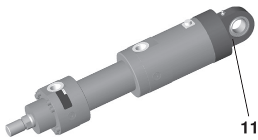


Piston

"M / T / S / G / V / L / R"







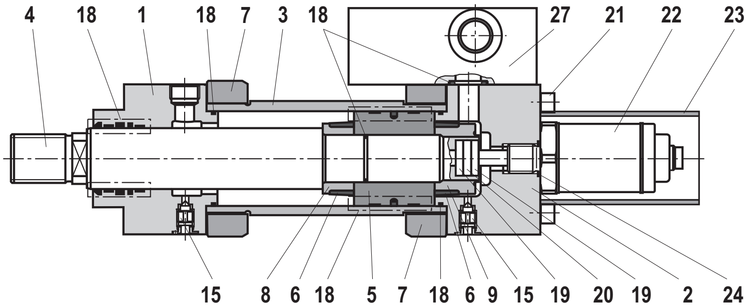
1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston

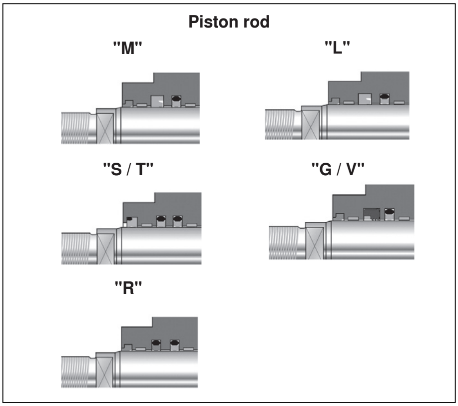
6 Damping bush
7 Flange
8 Socket
9 Socket
10 Base MP3

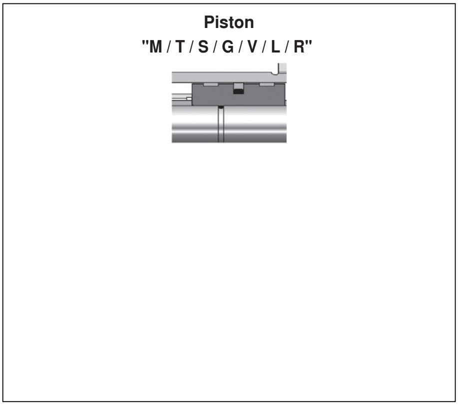
11 Base MP 5
15 Bleeding
18 Seal kit:
Scraper
Rod seal
Piston seal
O-ring
Guide ring

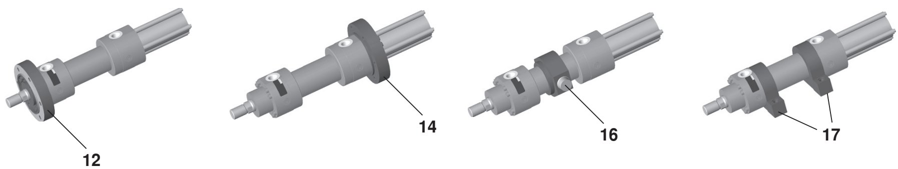
19 Insulating socket
20 Solenoid
22 Position transducer
24 Seal
25 Seal
26 Protective pipe
27 Subplate

Spare parts: Series CSH3 MF3, MF4, MT4 and MS2









1 Head
2 Base
3 Pipe
4 Piston rod
5 Piston
6 Damping bush

7 Flange
8 Socket
9 Socket
12 Round flange MF3
14 Round flange MF4
15 Bleeding

16 Trunnion MT4
17 Foot MS2
18 Seal kit:
Scraper
Rod seal
Piston seal
O-ring
Guide ring

19 Insulating socket
20 Solenoid
21 Hexagon socket head cap screws
22 Position transducer
23 Protective pipe
24 Seal
27 Subplate

Cylinder weight

Piston	Piston rod	CD/CS cylinder with 0 mm stroke length					Per 100 mm stroke length	CG cylinder with 0 mm stroke length			Per 100 mm stroke length
ØAL	**ØMM**	**MP3** 1) **MP5** 1)	**MP3** 2) **MP5** 2)	**MF3 MF4**	**MT4**	**MS2**		**MF3**	**MT4**	**MS2**	
mm	mm	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg
40	**28**	8	14	11	11	9	1,2	12	12	10	1,6
50	**36**	12	20	17	15	15	1,6	19	17	17	2,4
63	**45**	26	41	32	30	32	2,6	37	35	36	3,8
80	**56**	33	44,5	43	40	42	4,2	49	46	48	6,1
100	**70**	58	74,5	72	71	73	5,7	80	79	81	8,8
125	**90**	120	150	148	145	149	11,1	170	166	171	16,1
140	**100**	167	203	205	202	206	13,0	236	233	236	19,1
160	**110**	229	284	276	276	275	16,3	316	316	315	23,8
180	**125**	317	383	387	386	404	19,5	456	455	473	29,1
200	**140**	425	500	506	504	531	24,4	562	560	587	36,5
220	**160**	514	623	653	570	590	37,8	753	671	690	53,6
250	**180**	777	959	939	854	829	46,2	1057	972	948	66,2
280	**200**	915	1147	1073	1028	984	59,7	1224	1179	1135	84,3
320	**220**	1200	1479	1274	1211	1211	68,3	1431	1369	1369	98,1

ØAL = Piston Ø
ØMM = Piston rod Ø
1) Weight without position measurement system
2) Weight with position measurement system

2

Notes

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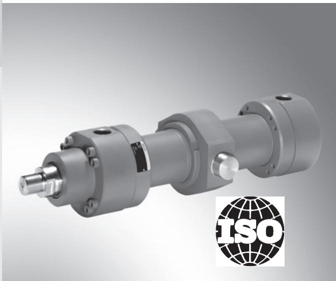
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Hydraulic cylinders
Mill type design

RE 17329/10.07
Replaces: 09.07
17328

1/68

Series CDM1 / CGM1 / CSM1



H4652

Component series 2X
Nominal pressure 160 bar (16 MPa)

Table of contents

Features

- Installation dimensions to ISO 6020/1, NF E 48-015 and VW 39 D 920
- 9 mounting types
- Piston Ø 25 to 200 mm
- Piston rod Ø 14 to 140 mm
- Stroke lengths up to 3000 mm
- Self-adjusting and adjustable end position cushioning

Engineering software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Download of brochures www.boschrexroth.com/business_units/bri/de/downloads/ihc

Technical data (for applications outside these parameters, please consult us!)

Standards:
The installation dimensions and mounting types of the cylinders comply with standards ISO 6020/1, NF E 48-015 and VW 39 D 920

Nominal pressure: 160 bar (16 MPa)
Static test pressure: 240 bar (24 MPa)
Higher operating pressures up to 200 bar on request.
In the case of extreme shock loads, the mounting elements and threaded piston rod connections must be rated for endurance strength.

Minimum pressure:
Depending on the application, a certain minimum pressure is required to ensure proper operation of the cylinder. If no load is applied, we recommend a minimum pressure of 10 bar for single-rod cylinders; for lower pressures and double rod cylinders, please consult us.

Installation position: Optional

Hydraulic fluid:
Mineral oils DIN 51524 (HL, HLP)
Phosphate ester (HFD-R)
Water glycol HFC on request

Hydraulic fluid temperature range: –20 °C to +80 °C

Ambient temperature range: –20 °C to +80 °C

Viscosity range: 2.8 to 380 mm²/s

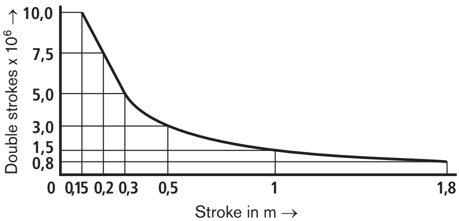
Cleanliness class to ISO
Permissible maximum degree of contamination of the hydraulic fluid to ISO 4406 (c) class 20/18/15.

Stroke velocity: Up to 0.5 m/s
(depending on pipe connection)

Vent as a standard

Primer coating:
As a standard, hydraulic cylinders are primed with one coating (colour: gentian blue, RAL 5010) in a thickness max. 80 µm.

Service life:
Rexroth cylinders fulfill the reliability recommendations for industrial applications.
≥ 10 000 000 double strokes in continuous off-load operation or 3000 km of stroke travel at 70% of the maximum operating pressure without loading of the piston rod at a maximum velocity of 0.5 m/s, with a failure rate of less than 5%.



Acceptance:
Each cylinder is tested according to Bosch Rexrot standard.

Safety notes:
For assembly, commissioning and maintenance cylinders, please take the operating guidelines stated in RE 07100-B into account!

Service and repair work may only be carried out by Bosch Rexroth AG and specifically trained personnel. No warranty claims will be accepted for damage resulting from assembly, maintenance and repair work not carried out by Bosch Rexroth AG.

Checklists for hydraulic cylinders:
Cylinders, the technical and/or operating data of which differ from the paramters given in the data sheet, can only be offered as special variants on request. For the preparation of offers, deviations of technical data and/or operating data must be described in the checklists for hydraulic cylinders (RE 07200).

Engineering software ICS (**I**nteractive **C**atalog **S**ystem)

The ICS (Interactive Catalog System) is a selection and engineering aid for hydraulic cylinders. With the help of the ICS, designers of plant and machinery can quickly and reliably find the optimum hydraulic cylinder solution through logic-guided type code queries. This software helps to solve design and engineering tasks more quickly and efficient. After having been guided through the product selection, the user gets the exact technical data of the selected components as well as 2D and 3D CAD data in the correct file format for all common CAD systems quickly and reliably.

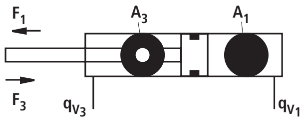
This allows users to reduce costs while increasing their competitiveness.

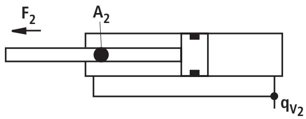
Diameters, areas, forces, flow

Piston	Piston rod	Area ratio	Areas Piston	Areas Rod	Areas Annulus	Force at 160 bar [1] Pressure	Force at 160 bar [1] Diff.	Force at 160 bar [1] Pulling	Flow at 0.1 m/s [2] Out	Flow at 0.1 m/s [2] Diff.	Flow at 0.1 m/s [2] In
AL Ø mm	**MM** Ø mm	φ A_1/A_3	A_1 cm^2	A_2 cm^2	A_3 cm^2	F_1 kN	F_2 kN	F_3 kN	q_{V1} l/min	q_{V2} l/min	q_{V3} l/min
25	**14** **18**	1.46 2.08	4.91	1.54 2.54	3.37 2.36	7.85	2.44 4.07	5.37 3.76	2.9	0.9 1.5	2.0 1.4
32	**18** **22**	1.46 1.90	8.04	2.54 3.80	5.50 4.24	12.80	4.07 6.08	8.78 6.76	4.8	1.5 2.3	3.3 2.5
40	**22** **28**	1.43 1.96	12.56	3.80 6.16	8.76 6.41	20.00	6.08 9.82	14.03 10.24	7.5	2.3 3.7	5.2 3.8
50	**28** **36**	1.46 2.08	19.63	6.16 10.18	13.47 9.46	31.30	9.82 16.29	21.55 15.10	11.8	3.7 6.1	8.1 5.6
63	**36** **45**	1.48 2.04	31.17	10.18 15.90	20.99 15.27	49.80	16.29 25.40	33.56 24.41	18.7	6.1 9.5	12.6 9.2
80	**45** **56**	1.46 1.96	50.26	15.90 24.63	34.36 25.63	80.30	25.40 39.30	54.96 40.99	30.2	9.5 14.8	20.7 15.4
100	**56** **70**	1.46 1.96	78.54	24.63 38.48	53.91 40.06	125.00	39.30 61.50	86.22 64.04	47.1	14.8 23.1	32.3 24.0
125	**70** **90**	1.46 2.08	122.72	38.48 63.62	84.24 59.10	196.00	61.50 101.00	134.7 94.49	73.6	23.1 38.2	50.5 35.4
160	**90** **110**	1.46 1.90	201.06	63.62 95.06	137.44 106.00	321.00	101.00 151.00	219.8 169.5	120.6	38.2 57.0	82.4 63.6
200	**110** **140**	1.43 1.96	314.16	95.06 153.96	219.09 160.20	502.60	152.00 246.30	350.6 256.3	188.5	57.0 92.4	131.5 96.1

1) Theoretical force (without consideration of efficiency)

2) Stroke velocity





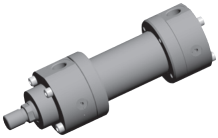
Tolerances according to ISO 8135: 1999E

Installation dimensions	WF	W	WC	XC [1]	XO [1]	XS	SS	XV	ZF [1]	ZP [1]	Stroke tolerances in mm
Mounting type	M00	MF1	MF3	MP3	MP5	MS2	MS2	MT4	MF2	MF4	
Stroke length in mm	Tolerances in mm										
≤ 1250	± 2	± 2	± 2	± 1,5	± 1,5	± 2	± 1,5	± 2	± 1,5	± 1,5	+ 2
> 1250 bis ≤ 3000	± 4	± 4	± 4	± 3	± 3	± 4	± 3	± 4	± 3	± 3	+ 5

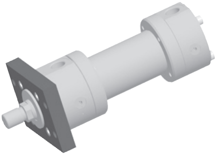
1) Stroke length included

Overview of mounting elements: Series CDM1

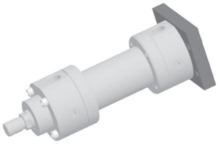
CDM1 M00
See pages 8, 9



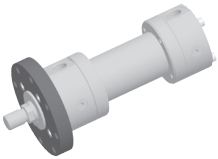
CDM1 MF1
See pages 12, 13



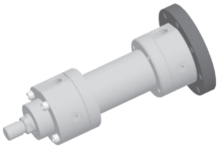
CDM1 MF2
See pages 14, 15



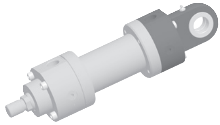
CDM1 MF3
See pages 16, 17



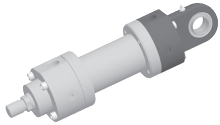
CDM1 MF4
See pages 18, 19



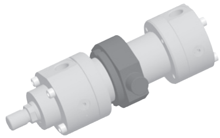
CDM1 MP3
See pages 10, 11



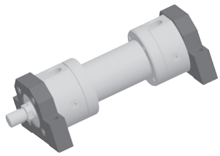
CDM1 MP5
See pages 10, 11



CDM1 MT4
See pages 20, 21



CDM1 MS2
See pages 22, 23



Ordering code

2) = Only available on request
3) = Piston Ø 25 to 125 mm
4) = Always specify dimension "XY" in mm in clear text on the order
5) = Piston Ø 63 to 200 mm
6) = Not for MF2; MF4
7) = Piston Ø 50 to 200 mm
8) = Piston Ø 40 to 200 mm
9) = Piston Ø 40 to 80 mm, only position 11
10) = Piston Ø 63 to 200 mm, only position 11
11) = Piston Ø 125 to 200 mm, only position 11
12) = Piston rod Ø 14 to 110 mm
13) = Piston rod Ø 22 to 140 mm
14) = Subplates only possible with pipe thread (ISO 1179-1)
16) = Subplates for SL and SV valves (isolator valves)
Note: Seal variants T and S are not rated for static holding function!
17) = Per piston Ø, only possible with large piston rod Ø

Order examples:

CDM1MT4/50/28/550A2X/B11CGDMWW, XV = 175 mm

CDM1MF3/200/140/950A2X/B11CHKAWW

☞ **Remark**

Spare cylinder for series 1X

When changing over to series 2X, the bearing blocks (trunnion) must be changed as well!

Ordering code: Series CDM1

CD	M1		/	/	/	A	2X	/								

Single-rod cylinder = **CD**

Series = **M1**

Mounting types

Without mounting [2]	= **M00**
Rectangular flange at head [3]	= **MF1**
Rectangular flange at cap [3]	= **MF2**
Round flange at head	= **MF3**
Round flange at cap	= **MF4**
Plain clevis at cap	= **MP3**
Self-aligning clevis at cap	= **MP5**
Trunnion [4]	= **MT4**
Foot mounting	= **MS2**

Piston Ø (AL)
25 to 200 mm - see page 3

Piston rod Ø (MM)
14 to 140 mm - see page 3

Stroke length in mm

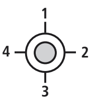
Design principle
Head and cap flanged = **A**

Component series
20 to 29 unchanged installation and connection dimensions = **2X**

Pipe connection/variant

Pipe thread ISO 1179-1		= **B**
Metric ISO thread (DIN/ISO 6149-1)		= **R**
Enlarged pipe thread ISO 1179-1, page 40	5), 6)	= **S**
Rectangular flange connection ISO 6162, page 41	6), 7)	= **F**
Square flange connection ISO 6164, page 41	6), 8)	= **H**
For directional and high-response valves, pages 44, 45		
Subplate size 6	6), 9), 14)	= **P**
Subplate size 10	6), 10), 14)	= **T**
Subplate size 16	6), 11), 14)	= **U**
For SL and SV valves [16], pages 42, 43		
Subplate size 6	6), 9), 14)	= **A**
Subplate size 10	6), 10), 14)	= **E**
Subplate size 20	6), 11), 14)	= **L**

Pipe connection/location at head

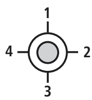


Viewed to piston rod

= 1
= 2
= 3
= 4

Pipe connection/location at cap

1 =
2 =
3 =
4 =



Viewed to piston rod

Piston rod variant

C =	Hard chromium-plated
H = [12]	Hardened and hard chromium-plated
L =	Stainless steel, hard chromium-plated

Piston rod end

G =	Thread (ISO 6020-1) for self-aligning clevis CGKD
H = [17]	Thread (VW standard) for self-aligning clevis CGKD
E = [13]	Female thread, page 40
F = [17]	Piston rod end **H** with self-aligning clevis CGKD mounted
K =	Piston rod end **G** with self-aligning clevis CGKD mounted

End position cushioning

U =	Without
D =	Both sides, self-adjusting
S =	Head side, self-adjusting
K =	Cap side, self-adjusting
E =	Both sides, adjustable

Seal variant

Suitable for mineral oil to DIN 51524 HL, HLP

M =	Standard seal system
T = [8]	Servo performance type/ reduced friction
A = [7]	Chevron seal kit

Suitable for phosphate ester HFD-R

V =	Standard seal system
S = [8]	Servo performance type/ reduced friction

Option 1

W =	Without option
A =	Threaded coupling, both sides
E = [8]	Inductive proximity switches **without** mating connector; mating connector – separate order, see page 24

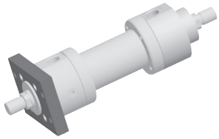
Option 2

W =	Without option
Y =	Indicate piston rod extension LY in mm in clear text

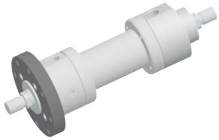
2

Overview of mounting elements: Series CGM1

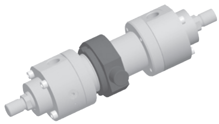
CGM1 MF1
See pages 12, 13



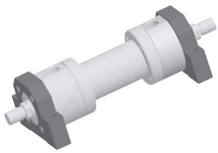
CGM1 MF3
See pages 16, 17



CGM1 MT4
See pages 20, 21



CGM1 MS2
See pages 22, 23



Ordering code

1) = Not standardised
3) = Piston Ø 25 to 125 mm
4) = Always specify dimension “XY“ in mm in clear text on the order
5) = Piston Ø 63 to 200 mm
7) = Piston Ø 50 to 200 mm
8) = Piston Ø 40 to 200 mm
9) = Piston Ø 40 to 80 mm, only position 11
10) = Piston Ø 63 to 200 mm, only position 11
11) = Piston Ø 125 to 200 mm, only position 11
12) = Piston rod Ø 14 to 110 mm
14) = Subplates only possible with pipe thread ISO 1179-1
16) = Subplates for SL and SV valves (isolator valves)
Note: Seal variants T and S are not rated for static holding function!
17) = Per piston Ø, only possible with large piston rod Ø

Ordering code: Series CGM1

CG	M1	/	/	/	A	2X	/								

Double-rod cylinder [1)] **= CG**

Series **= M1**

Mounting types

- Rectangular flange at head [3)] **= MF1**
- Round flange at head **= MF3**
- Trunnion [4)] **= MT4**
- Foot mounting **= MS2**

Piston Ø (AL)
25 to 200 mm - see pages 3

Piston rod Ø (MM)
14 to 140 mm - see pages 3

Stroke length in mm

Design principle
Head and cap flanged **= A**

Component series
20 to 29 unchanged installation and connection dimensions **= 2X**

Pipe connection/variant

- Pipe thread ISO 1179-1 **= B**
- Metric ISO thread (DIN/ISO 6149-1) **= R**
- Enlarged pipe thread ISO 1179-1, page 40 [5)] **= S**
- Rectangular flange connection ISO 6162, page 41 [7)] **= F**
- Square flange connection ISO 6164, page 41 [8)] **= H**

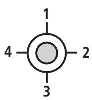
For directional and high-response valves, pages 44, 45

- Subplate size 6 [6), 9), 14)] **= P**
- Subplate size 10 [6), 10), 14)] **= T**
- Subplate size 16 [6), 11), 14)] **= U**

For SL and SV valves [16)], pages 42, 43

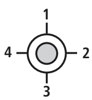
- Subplate size 6 [6), 9), 14)] **= A**
- Subplate size 10 [6), 10), 14)] **= E**
- Subplate size 20 [6), 11), 14)] **= L**

Pipe connection/position at head



Viewed to piston rod **= 1** **= 2** **= 3** **= 4**

Pipe connection/position at cap



Viewed to piston rod **= 1** **= 2** **= 3** **= 4**

Piston rod variant

- **C =** Hard chromium-plated
- **H =** [12)] Hardened and hard chromium-plated
- **L =** Stainless steel, hard chromium-plated

Piston rod end

- **G =** Thread (ISO 6020-1) for self-aligning clevis CGKD
- **H =** [17)] Thread (VW standard) for self-aligning clevis CGKD
- **F =** [17)] Piston rod end **H** with self-aligning clevis CGKD mounted
- **K =** Piston rod end **G** with self-aligning clevis CGKD mounted

End position cushioning

- **U =** Without
- **D =** Both sides, self-adjusting
- **E =** Both sides, adjustable

Seal variant

Suitable for mineral oil to DIN 51524 HL, HLP

- **M =** Standard seal system
- **T =** [8)] Servo performance type/reduced friction
- **A =** [7)] Chevron seal kits

Suitable for phosphate ester HFD-R

- **V =** Standard seal system
- **S =** [8)] Servo performance type/reduced friction

Option 1

- **W =** Without option
- **A =** Threaded coupling, both sides
- **E =** [8)] Inductive proximity switch **without** mating connector, mating connector – separate order, see page 24

Option 2

- **W =** Without Option
- **Y =** Indicate piston rod extension LY in mm in clear text

Order examples:

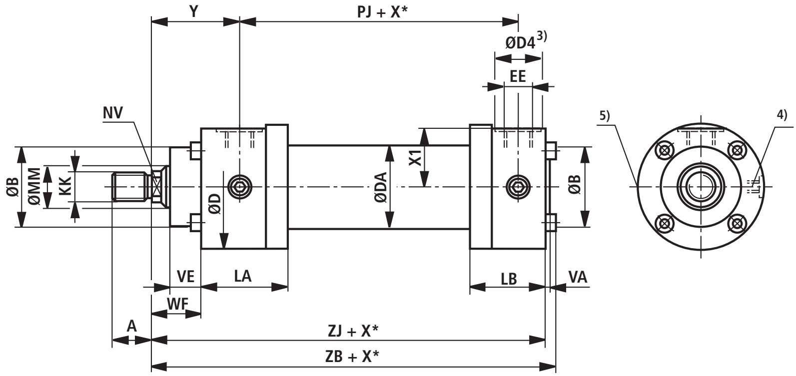
CGM1MT4/50/28/550A2X/B11CGDMWW, XV = 175 mm

CGM1MF3/200/140/950A2X/B11CHDAWW

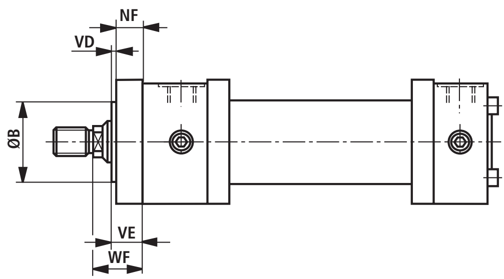
2

Mounting type M00

CDM1 M00



CDM1 M00...2X/...A: as chevron seal variant and AL Ø 50 - 200 mm



Dimensions M00 (dimensions in mm)

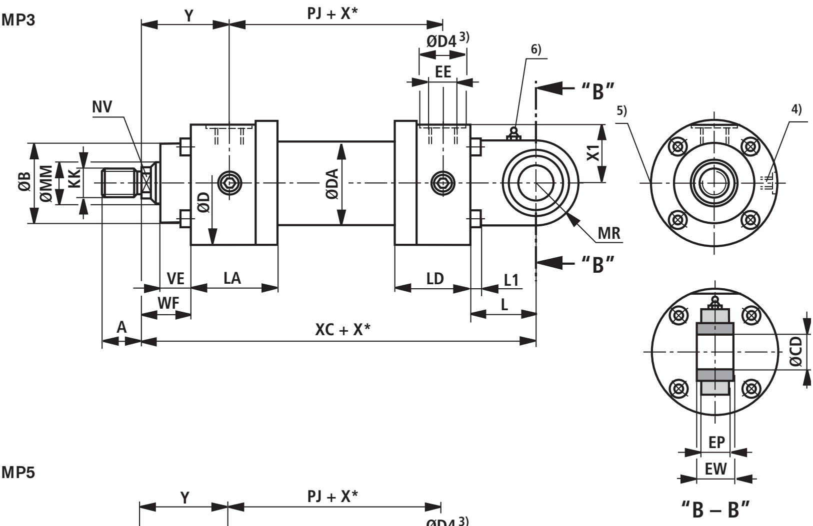
AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)
25	**14** **18**	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	32	56	35	25	G1/4	21	M14x1.5
32	**18** **22**	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	40	67	42	28	G3/8	26	M18x1.5
40	**22** **28**	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	50	78	50	34	G1/2	29	M22x1.5
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2
160	**90** **110**	M64x3 M80x3	85 95	– M64x3	– 85	75 95	160	237	190	58	G1 1/4	52	M42x2
200	**110** **140**	M80x3 M100x3	95 112	– M80x3	– 95	95 120	200	285	230	58	G1 1/4	52	M42x2

AL Ø	MM Ø	Y	PJ	X1	VA	VE	VD	NF	WF	ZB	ZJ	LA	LB
25	**14** **18**	58	77	26	3	15	–	–	28	156	150	58	43
32	**18** **22**	64	89	30.5	3	19	–	–	32	176	170	62	47
40	**22** **28**	71	97	35.5	3	19	–	–	32	196	190	73	56
50	**28** **36**	72	111	44.5	4	24	4	20	38	213	205	74	62
63	**36** **45**	82	117	54.5	4	29	4	25	45	234	224	84	72
80	**45** **56**	91	134	62.5	4	36	4	32	54	260	250	93	81
100	**56** **70**	108	162	75.5	5	37	5	32	57	310	300	117	96
125	**70** **90**	121	174	92.5	5	37	5	32	60	335	325	143	112
160	**90** **110**	143	191	115.5	8	41	5	36	66	380	370	171	130
200	**110** **140**	190	224	138.5	15	45	5	40	75	466	450	230	151

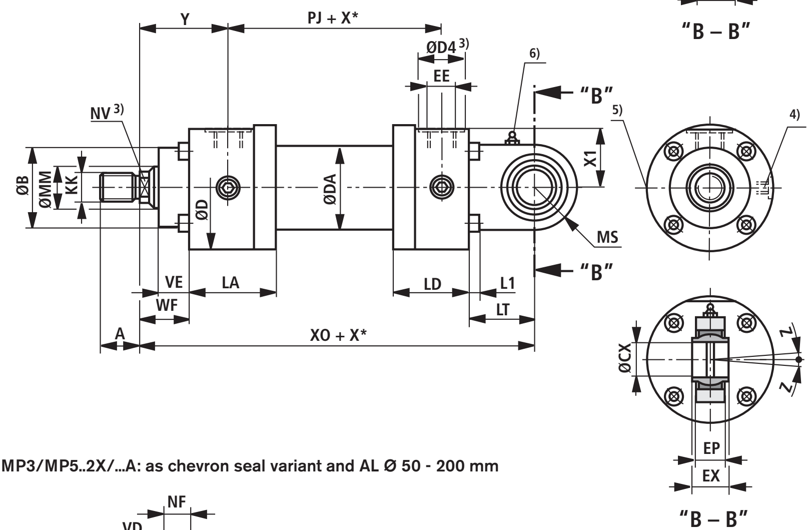
AL = Piston Ø MM = Piston rod Ø
X* = Stroke length
1) = Thread for piston rod end “G“ and “K“
2) = Thread for piston rod end “H“ and “F“
3) = ØD4 countersink max. 0.5 mm deep
4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)
5) = Throttle valve only with end position cushioning “E“ (180° for bleeding)
8) = Pipe connection “B“
9) = Pipe connection “R“

Mounting type MP3/MP5

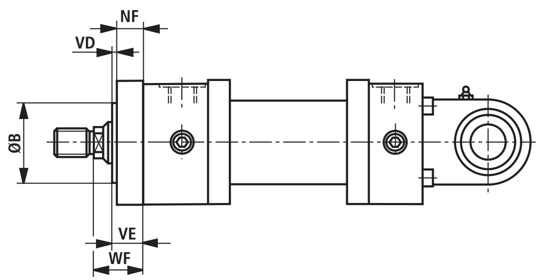
CDM1 MP3



CDM1 MP5



CDM1 MP3/MP5..2X/...A: as chevron seal variant and AL Ø 50 - 200 mm



Dimensions MP3/MP5 (dimensions in mm)

AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ
25	14 18	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	32	56	35	25	G1/4	21	M14x1.5	58	77
32	18 22	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	40	67	42	28	G3/8	26	M18x1.5	64	89
40	22 28	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	50	78	50	34	G1/2	29	M22x1.5	71	97
50	28 36	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111
63	36 45	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117
80	45 56	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134
100	56 70	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162
125	70 90	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174
160	90 110	M64x3 M80x3	85 95	– M64x3	– 85	75 95	160	237	190	58	G1 1/4	52	M42x2	143	191
200	110 140	M80x3 M100x3	95 112	– M80x3	– 95	95 120	200	285	230	58	G1 1/4	52	M42x2	190	224

AL Ø	MM Ø	X1	VE	WF	NF	VD	XC/XO	CD/CX H9/H7	EP	EW/EX h12	L/LT	MR/MS	LA	LD	L1	Z
25	14 18	26	15	28	–	–	178	12	11	12	25	16	58	46	6	2°
32	18 22	30.5	19	32	–	–	206	16	13	16	33	20	62	50	6	2°
40	22 28	35.5	19	32	–	–	231	20	17	20	38	25	73	59	6	2°
50	28 36	44.5	24	38	20	4	257	25	22	25	48	32	74	66	8	2°
63	36 45	54.5	29	45	25	4	289	32	27	32	61	40	84	76	10	4°
80	45 56	62.5	36	54	32	4	332	40	32	40	78	50	93	85	10	4°
100	56 70	75.5	37	57	32	5	395	50	40	50	90	63	117	101	10	4°
125	70 90	92.5	37	60	32	5	428	63	52	63	98	71	143	117	12	4°
160	90 110	115.5	41	66	36	5	505	80	66	80	127	90	171	138	12	4°
200	110 140	138.5	45	75	40	5	615	100	84	100	150	112	230	166	16	4°

AL = Piston Ø MM = Piston rod Ø

X* = Stroke length

1) = Thread for piston rod end "G" and "K"

2) = Thread for piston rod end "H" and "F"

3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)

5) = Throttle valve only with end position cushioning "E" (180° for bleeding)

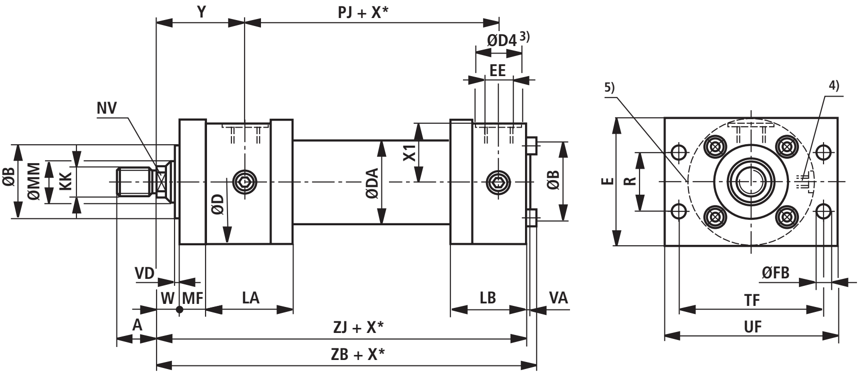
6) = Grease nipple cone head form A to DIN 71412

8) = Pipe connection "B"

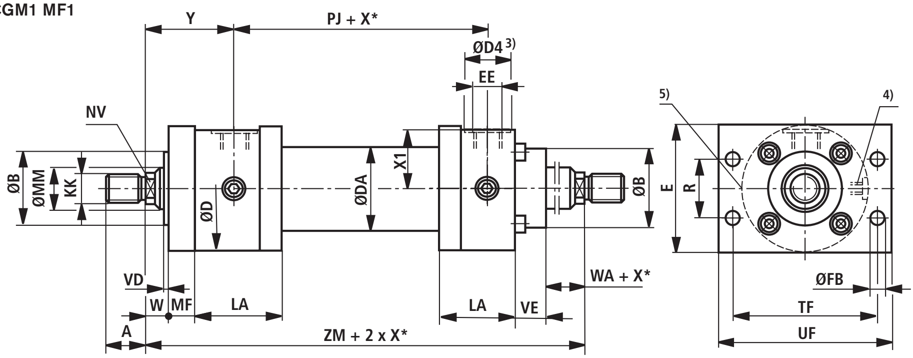
9) = Pipe connection "R"

Mounting type MF1

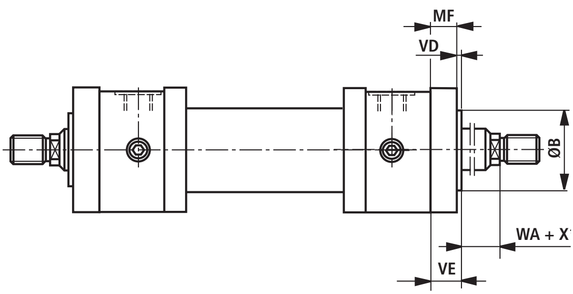
CDM1 MF1



CGM1 MF1



CGM1 MF1..2X/...A: as chevron seal variant and AL Ø 50 - 200 mm



Dimensions MF1 (dimensions in mm)

AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ	X1
25	**14** **18**	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	32	56	35	25	G1/4	21	M14x1.5	58	77	26
32	**18** **22**	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	40	67	42	28	G3/8	26	M18x1.5	64	89	30.5
40	**22** **28**	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	50	78	50	34	G1/2	29	M22x1.5	71	97	35.5
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111	44.5
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117	54.5
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134	62.5
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162	75.5
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174	92.5

AL Ø	MM Ø	VE	WA	MF	VA	VD	W	ZJ	ZB	ZM	E	R js13	TF js13	UF	ØFB H13	LA	LB
25	**14** **18**	15	13	12	3	3	16	150	156	193	60	28.7	69.2	85	6.6	58	43
32	**18** **22**	19	13	16	3	3	16	170	176	217	70	35.2	85	105	9	62	47
40	**22** **28**	19	13	16	3	3	16	190	196	239	80	40.6	98	115	9	73	56
50	**28** **36**	24	14	20	4	4	18	205	213	255	100	48.2	116.4	140	11	74	62
63	**36** **45**	29	16	25	4	4	20	224	234	281	120	55.5	134	160	13.5	84	72
80	**45** **56**	36	18	32	4	4	22	250	260	316	135	63.1	152.5	185	17.5	93	81
100	**56** **70**	37	20	32	5	5	25	300	310	378	160	76.5	184.8	225	22	117	96
125	**70** **90**	37	23	32	5	5	28	325	335	416	195	90.2	217.1	255	22	143	112

AL = Piston Ø MM = Piston rod Ø

X* = Stroke length

1) = Thread for piston rod end "G" and "K"

2) = Thread for piston rod end "H" and "F"

3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)

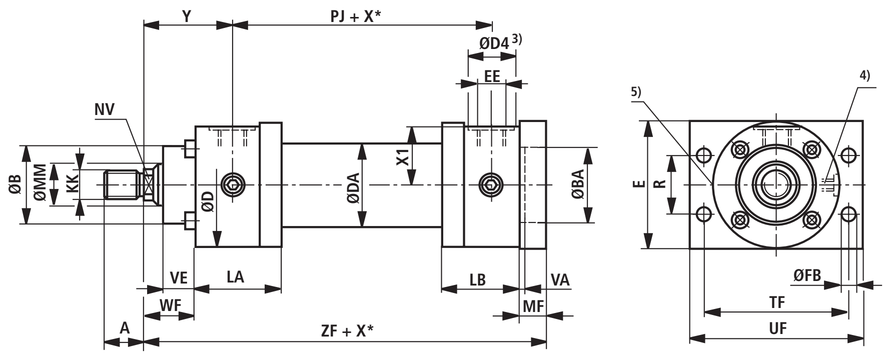
5) = Throttle valve only with end position cushioning "E" (180° for bleeding)

8) = Pipe connection "B"

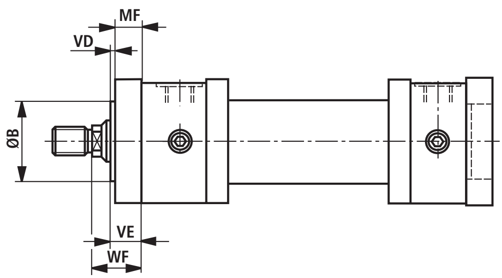
9) = Pipe connection "R"

Mounting type MF2

CDM1 MF2



CDM1 MF2..2X/...A: as chevron seal variant and AL Ø 50 - 200 mm



Dimensions MF2 (dimensions in mm)

AL Ø	MM Ø	KK [1)]	A [1)]	KK [2)]	A [2)]	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ
		ISO 6020/1		VW 39 D 920											
25	**14** **18**	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	32	56	35	25	G1/4	21	M14x1.5	58	77
32	**18** **22**	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	40	67	42	28	G3/8	26	M18x1.5	64	89
40	**22** **28**	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	50	78	50	34	G1/2	29	M22x1.5	71	97
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174

AL Ø	MM Ø	X1	WF	MF	VA	VE	VD	ØBA H8	ZF	E	R js13	TF js13	UF	ØFB H13	LA	LB
25	**14** **18**	26	28	12	3	15	–	32	162	60	28.7	69.2	85	6.6	58	43
32	**18** **22**	30.5	32	16	3	19	–	40	186	70	35.2	85	105	9	62	47
40	**22** **28**	35.5	32	16	3	19	–	50	206	80	40.6	98	115	9	73	56
50	**28** **36**	44.5	38	20	4	24	4	60	225	100	48.2	116.4	140	11	74	62
63	**36** **45**	54.5	45	25	4	29	4	70	249	120	55.5	134	160	13.5	84	72
80	**45** **56**	62.5	54	32	4	36	4	85	282	135	63.1	152.5	185	17.5	93	81
100	**56** **70**	75.5	57	32	5	37	5	106	332	160	76.5	184.8	225	22	117	96
125	**70** **90**	92.5	60	32	5	37	5	132	357	195	90.2	217.1	255	22	143	112

AL = Piston Ø MM = Piston rod Ø

X* = Stroke length

1) = Thread for piston rod end "G" and "K"

2) = Thread for piston rod end "H" and "F"

3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is 90° offset in relation to the pipe connection (clockwise)

5) = Throttle valve only with end position cushioning "E" (180° for bleeding)

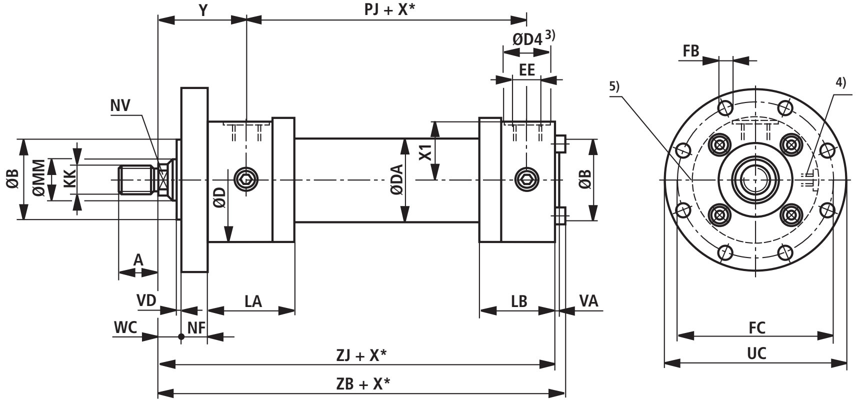
8) = Pipe connection "B"

9) = Pipe connection "R"

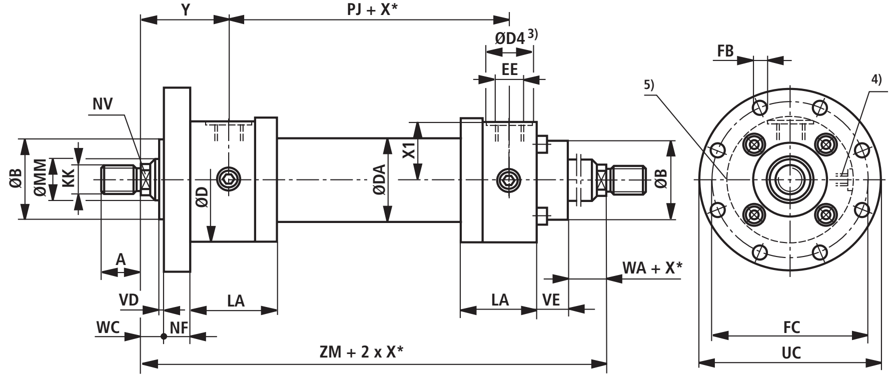
2

Mounting type MF3

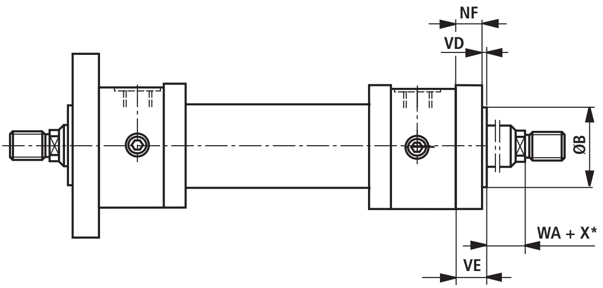
CDM1 MF3



CGM1 MF3



CGM1 MF3..2X/...A: as chevron seal variant and AL Ø 50 - 200 mm



Dimensions MF3 (dimensions in mm)

AL Ø	MM Ø	KK [1] ISO 6020/1	A [1]	KK [2] VW 39 D 920	A [2]	NV	ØB f8	ØD	ØDA	ØD4 [3); 8)]	EE [8)]	ØD4 [3); 9)]	EE [9)]	Y	PJ
25	**14** **18**	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	32	56	35	25	G1/4	21	M14x1.5	58	77
32	**18** **22**	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	40	67	42	28	G3/8	26	M18x1.5	64	89
40	**22** **28**	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	50	78	50	34	G1/2	29	M22x1.5	71	97
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174
160	**90** **110**	M64x3 M80x3	85 95	– M64x3	– 85	75 95	160	237	190	58	G1 1/4	52	M42x2	143	191
200	**110** **140**	M80x3 M100x3	95 112	– M80x3	– 95	95 120	200	285	230	58	G1 1/4	52	M42x2	190	224

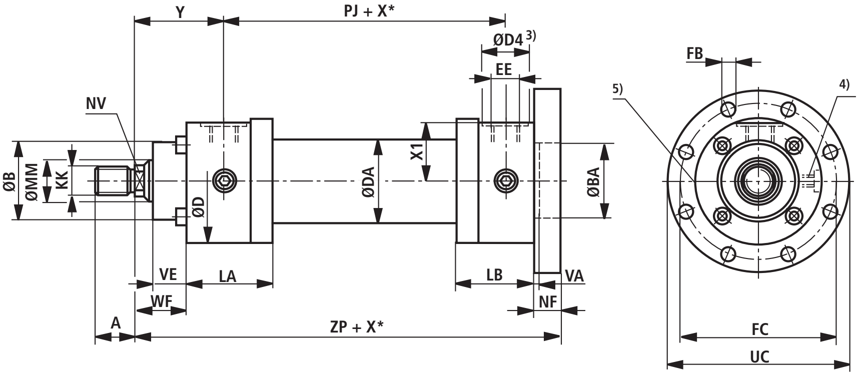
AL Ø	MM Ø	X1	VE	WA	NF	VA	VD	WC	ZJ	ZB	ZM	ØFC js13	ØUC −1	ØFB H13	LA	LB
25	**14** **18**	26	15	13	12	3	3	16	150	156	193	75	90	6.6	58	43
32	**18** **22**	30.5	19	13	16	3	3	16	170	176	217	92	110	9	62	47
40	**22** **28**	35.5	19	13	16	3	3	16	190	196	239	106	125	9	73	56
50	**28** **36**	44.5	24	14	20	4	4	18	205	213	255	126	150	11	74	62
63	**36** **45**	54.5	29	16	25	4	4	20	224	234	281	145	170	13.5	84	72
80	**45** **56**	62.5	36	18	32	4	4	22	250	260	316	165	195	17.5	93	81
100	**56** **70**	75.5	37	20	32	5	5	25	300	310	378	200	240	22	117	96
125	**70** **90**	92.5	37	23	32	5	5	28	325	335	416	235	275	22	143	112
160	**90** **110**	115.5	41	25	36	8	5	30	370	380	477	280	320	22	171	130
200	**110** **140**	138.5	45	30	40	15	5	35	450	466	604	340	385	26	230	151

AL = Piston Ø MM = Piston rod Ø
X* = Stroke length
[1] = Thread for piston rod end "G" and "K"
[2] = Thread for piston rod end "H" and "F"
[3] = ØD4 countersink max. 0.5 mm deep

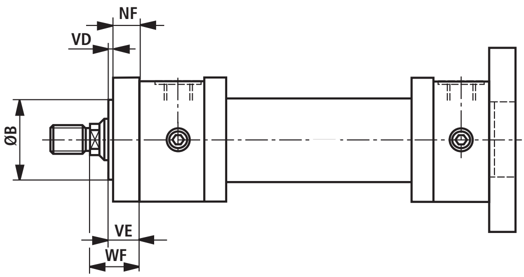
[4] = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)
[5] = Throttle valve only with end position cushioning "E" (180° for bleeding)
[8] = Pipe connection "B"
[9] = Pipe connection "R"

Mounting type MF4

CDM1 MF4



CDM1 MF4..2X/...A: as chevron seal variant and AL Ø 50 - 200 mm



Dimensions MF4 (dimensions in mm)

AL Ø	MM Ø	KK [1] ISO 6020/1	A [1]	KK [2] VW 39 D 920	A [2]	NV	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ
25	14 18	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	56	35	25	G1/4	21	M14x1.5	58	77
32	18 22	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	67	42	28	G3/8	26	M18x1.5	64	89
40	22 28	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	78	50	34	G1/2	29	M22x1.5	71	97
50	28 36	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	95	60	34	G1/2	29	M22x1.5	72	111
63	36 45	M27x2 M33x2	36 45	– M27x2	– 36	30 36	116	78	42	G3/4	34	M27x2	82	117
80	45 56	M33x2 M42x2	45 56	– M33x2	– 45	36 46	130	95	42	G3/4	34	M27x2	91	134
100	56 70	M42x2 M48x2	56 63	– M42x2	– 56	46 60	158	120	47	G1	43	M33x2	108	162
125	70 90	M48x2 M64x3	63 85	– M48x2	– 63	60 75	192	150	47	G1	43	M33x2	121	174
160	90 110	M64x3 M80x3	85 95	– M64x3	– 85	75 95	237	190	58	G1 1/4	52	M42x2	143	191
200	110 140	M80x3 M100x3	95 112	– M80x3	– 95	95 120	285	230	58	G1 1/4	52	M42x2	190	224

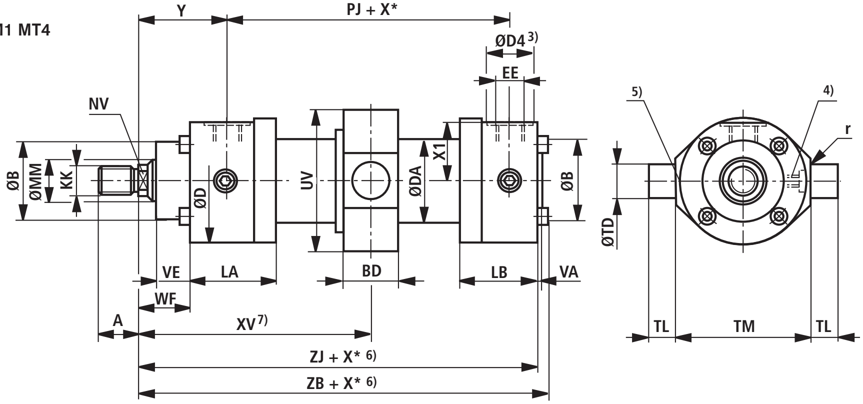
AL Ø	MM Ø	X1	WF	NF	VA	VE	VD	ØB/BA f8/H8	ZP	ØFC js13	ØUC –1	ØFB H13	LA	LB
25	14 18	26	28	12	3	15	–	32	162	75	90	6.6	58	43
32	18 22	30.5	32	16	3	19	–	40	186	92	110	9	62	47
40	22 28	35.5	32	16	3	19	–	50	206	106	125	9	73	56
50	28 36	44.5	38	20	4	24	4	60	225	126	150	11	74	62
63	36 45	54.5	45	25	4	29	4	70	249	145	170	13.5	84	72
80	45 56	62.5	54	32	4	36	4	85	282	165	195	17.5	93	81
100	56 70	75.5	57	32	5	37	5	106	332	200	240	22	117	96
125	70 90	92.5	60	32	5	37	5	132	357	235	275	22	143	112
160	90 110	115.5	66	36	8	41	5	160	406	280	320	22	171	130
200	110 140	138.5	75	40	15	45	5	200	490	340	385	26	230	151

AL = Piston Ø
MM = Piston rod Ø
X* = Stroke length
1) = Thread for piston rod end "G" and "K"
2) = Thread for piston rod end "H" and "F"
3) = ØD4 countersink max. 0.5 mm deep
4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)
5) = Throttle valve only with end position cushioning "E" (180° for bleeding)
8) = Pipe connection "B"
9) = Pipe connection "R"

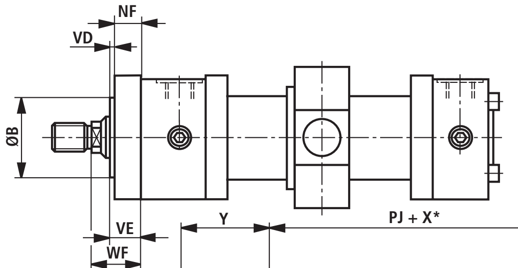
2

Mounting type MT4

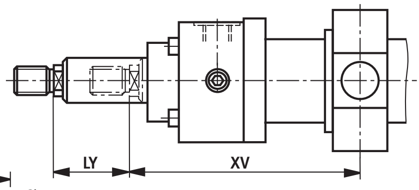
CDM1 MT4



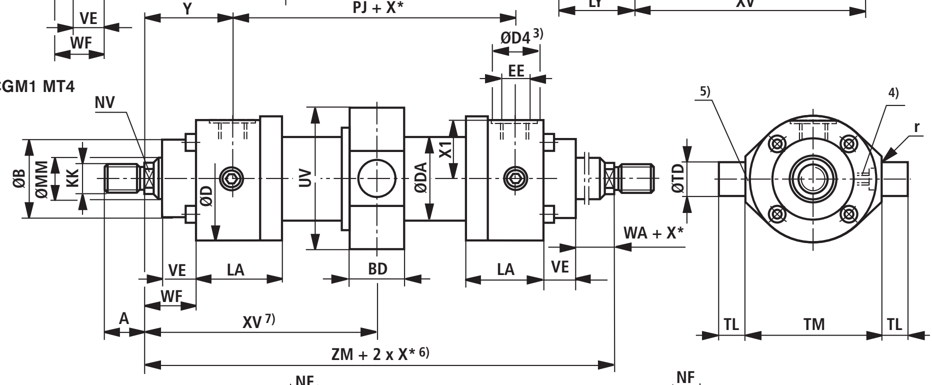
CDM1 MT4..2X/...A: as chevron variant and AL-Ø 50 - 200 mm



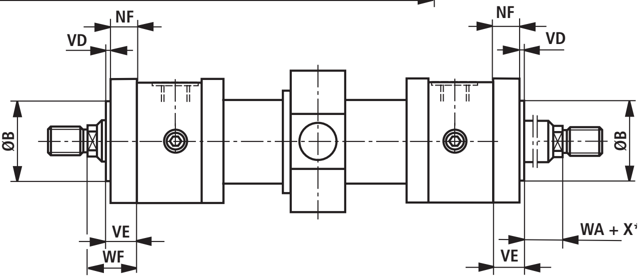
Dimensions for cylinder with piston rod extension "LY" in the retracted condition



CGM1 MT4



CGM1 MT4..2X/...A:
as chevron seal variant
and AL-Ø 50 - 200 mm



Dimensions MT4 (dimensions in mm)

AL Ø	MM Ø	KK [1] ISO 6020/1	A [1]	KK [2] VW 39 D 920	A [2]	NV	ØB f8	ØD	ØDA	ØD4 [3); 8)]	EE [8)]	ØD4 [3); 9)]	EE [9)]	Y	PJ	X1	VE
25	14 18	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	32	56	35	25	G1/4	21	M14x1.5	58	77	26	15
32	18 22	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	40	67	42	28	G3/8	26	M18x1.5	64	89	30.5	19
40	22 28	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	50	78	50	34	G1/2	29	M22x1.5	71	97	35.5	19
50	28 36	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111	44.5	24
63	36 45	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117	54.5	29
80	45 56	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134	62.5	36
100	56 70	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162	75.5	37
125	70 90	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174	92.5	37
160	90 110	M64x3 M80x3	85 95	– M64x3	– 85	75 95	160	237	190	58	G1 1/4	52	M42x2	143	191	115.5	41
200	110 140	M80x3 M100x3	95 112	– M80x3	– 95	95 120	200	285	230	58	G1 1/4	52	M42x2	190	224	138.5	45

AL Ø	MM Ø	WF	WA	NF	VA	VD	ZJ	ZB	ZM	BD	UV [10)]	r	ØTD f8	TL js13	TM h12	XV [7)] min.	XV [7)] max.	X* [6)] min.	LA	LB
25	14 18	28	13	–	3	–	150	156	193	19	58	0.8	12	10	63	107.5	93.5+X*	22	58	43
32	18 22	32	13	–	3	–	170	176	217	24	67	0.8	16	12	75	118	107+X*	19	62	47
40	22 28	32	13	–	3	–	190	196	239	28	78	1	20	16	90	131	116+X*	23	73	56
50	28 36	38	14	20	4	4	205	213	255	33	95	1	25	20	105	141.5	122.5+X*	28	74	62
63	36 45	45	16	25	4	4	224	234	281	38	116	1.5	32	25	120	164	129+X*	47	84	72
80	45 56	54	18	32	4	4	250	260	316	53	130	2	40	32	135	189.5	138.5+X*	63	93	81
100	56 70	57	20	32	5	5	300	310	378	68	158	2	50	40	160	224	166+X*	70	117	96
125	70 90	60	23	32	5	5	325	335	416	78	210	2.5	63	50	195	261	170+X*	106	143	112
160	90 110	66	25	36	8	5	370	380	477	118	250	3	80	63	240	320	177+X*	163	171	130
200	110 140	75	30	40	15	5	450	466	604	148	300	3	100	80	295	403	221+X*	202	230	151

AL = Piston Ø MM = Piston rod Ø
X* = Stroke length

1) = Thread for piston rod end “G“ and “K“

2) = Thread for piston rod end “H“ and “F“

3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)

5) = Throttle valve only with end position cushioning “E“ (180° for bleeding)

6) = Observe min. stroke length “X*min.“

7) = Always specify dimension “XV” in clear text on the order (observe XV_{min} and XV_{max})

8) = Pipe connection “B“

9) = Pipe connection “R“

10) = Tolerances according to EN ISO 9013: Thermal Cutting

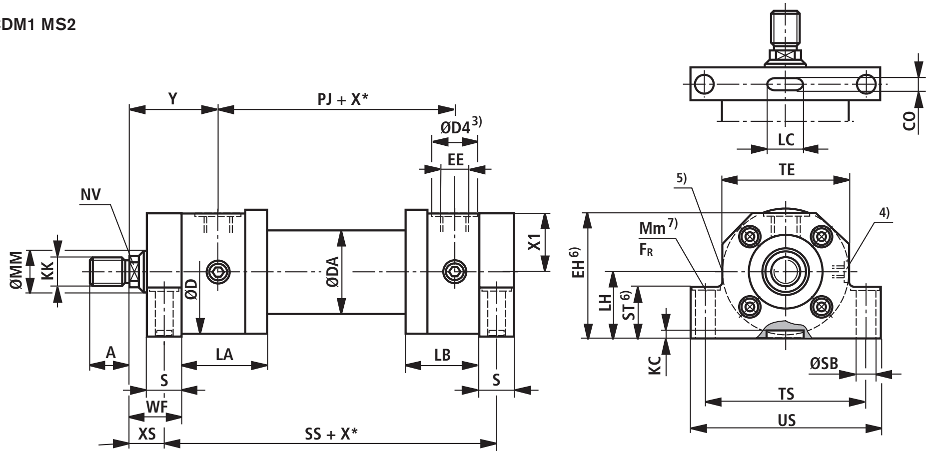
Remark

Spare cylinder for series 1X
When changing over to series 2X, also change the bearing blocks (trunnnion)!

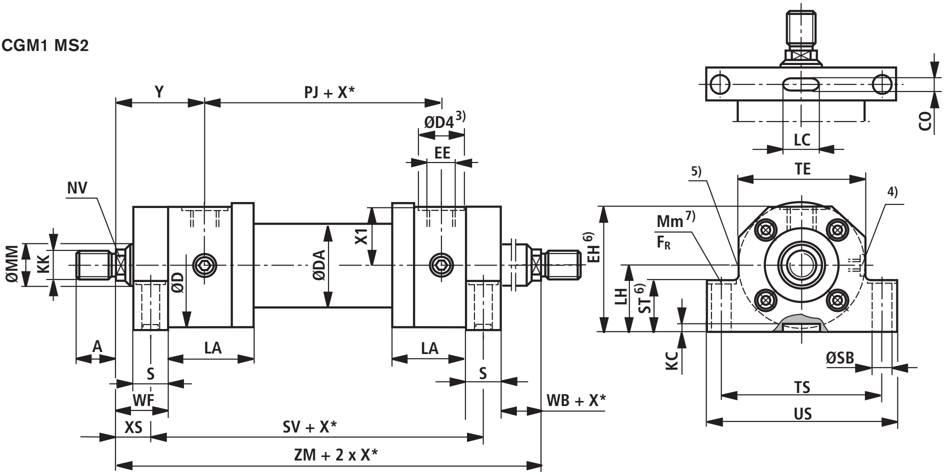
Observe XV_{min}, XV_{max} and X*min.

Mounting type MS2

CDM1 MS2



CGM1 MS2



AL = Piston Ø MM = Piston rod Ø
X* = Stroke length
1) = Thread for piston rod end "G" and "K"
2) = Thread for piston rod end "H" and "F"
3) = ØD4 countersink max. 0.5 mm deep
4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)
5) = Throttle valve only with end position cushioning "E" (180° for bleeding)
6) = The specified dimensions are smaller than the max. dimensions in ISO 6020/1
7) = Countersink max. 2 mm deep, for hexagon socket head cap screws to ISO 4762

The fixing screws must not be subjected to shear stress. Fixing screws to ISO 4762 (strength class 10.9) must be tightened to the specified tightening torque M_m.

If the calculated friction force F_R is lower than the maximum cylinder force, a thrust key be must be installed at the head.

Calculation basis:

- The specified friction force F_R refers to a friction coefficient of 0.2 (steel / steel)
- Foot on head side as fixed bearing
- Foot on cap side as movable bearing

8) = Pipe connection "B"
9) = Pipe connection "R"

Dimensions MS2 (dimensions in mm)

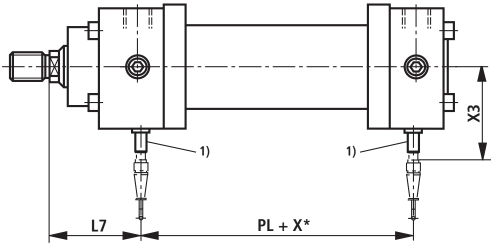
AL Ø	MM Ø	KK [1] ISO 6020/1	A [1]	KK [2] VW 39 D 920	A [2]	NV	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ	X1	WF	WB
25	**14** **18**	M12x1.25 M14x1.5	16 18	– M12x1.25	– 16	12 14	56	35	25	G1/4	21	M14x1.5	58	77	26	28	8
32	**18** **22**	M14x1.5 M16x1.5	18 22	– M14x1.5	– 18	14 18	67	42	28	G3/8	26	M18x1.5	64	89	30.5	32	7
40	**22** **28**	M16x1.5 M20x1.5	22 28	– M16x1.5	– 22	18 22	78	50	34	G1/2	29	M22x1.5	71	97	35.5	32	7
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	95	60	34	G1/2	29	M22x1.5	72	111	44.5	38	6
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	116	78	42	G3/4	34	M27x2	82	117	54.5	45	13
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	130	95	42	G3/4	34	M27x2	91	134	62.5	54	14
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	158	120	47	G1	43	M33x2	108	162	75.5	57	7
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	192	150	47	G1	43	M33x2	121	174	92.5	60	4
160	**90** **110**	M64x3 M80x3	85 95	– M64x3	– 85	75 95	237	190	58	G1 1/4	52	M42x2	143	191	115.5	66	6
200	**110** **140**	M80x3 M100x3	95 112	– M80x3	– 95	95 120	285	230	58	G1 1/4	52	M42x2	190	224	138.5	75	3

AL Ø	MM Ø	XS	SS	SV	CO N9	LC +0,5	ZM	KC +0,5	EH [6] −1	LH h10	S js13	ØSB H13	ST 6)	TE	TS js13	US −1	LA	LB	FR [7] kN	Mm [7] Nm
25	**14** **18**	18	142	157	6	25	193	3,5	57	32	20	9	24	56	75	92	58	43	4,90	30
32	**18** **22**	19,5	163	178	8	36	217	4	67	38	25	11	32	67	90	110	62	47	7,90	60
40	**22** **28**	19,5	183	200	8	36	239	4	77,5	43	25	11	32	78	100	120	73	56	7,90	60
50	**28** **36**	22	199	211	10	40	255	4,5	95	52	32	14	42	95	120	145	74	62	11,10	100
63	**36** **45**	29	211	223	10	40	281	4,5	113	62	32	18	50	116	150	180	84	72	21,15	250
80	**45** **56**	34	236	248	14	63	316	5	129	70	40	22	60	130	170	210	93	81	33,35	490
100	**56** **70**	32	293	314	16	70	378	6	153	82	50	26	70	158	205	250	117	96	48,30	850
125	**70** **90**	32	321	352	18	80	416	6	190	100	56	33	80	192	245	300	143	112	77,80	1710
160	**90** **110**	36	364	405	22	125	477	8	232	119	60	33	90	238	295	350	171	130	77,80	1710
200	**110** **140**	39	447	526	28	160	604	9	282	145	72	39	110	285	350	415	230	151	113,25	2970

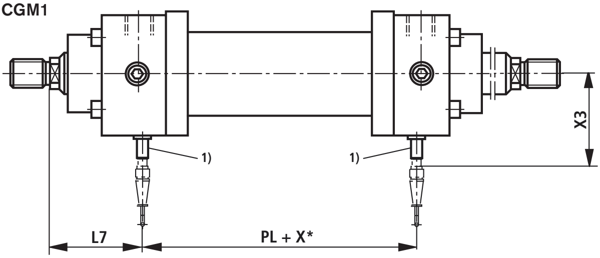
2

Proximity switches (dimensions in mm)

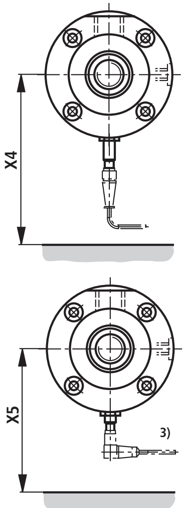
CDM1



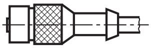
CGM1



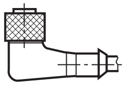
Montagearten



Mating connector with 5 m cable
Material no. **R900026512**
(Mating connector **not** included in the scope of supply, must be ordered separately)



Mating connector, angled, with 5 m cable (position of cable outlet cannot be defined)
Material no. **R900021404**
(Mating connector **not** included in the scope of supply, must be ordered separately)



AL Ø	MM Ø	PL	L7	X3	X4	X5
25 [2]	**14** **18**	–	–	–	–	–
32 [2]	**18** **22**	–	–	–	–	–
40	**22** **28**	97	71	94	170	125
50	**28** **36**	103	76	98	175	130
63	**36** **45**	113	84	103	180	135
80	**45** **56**	124	96	109	185	140
100	**56** **70**	150	114	116	195	150
125	**70** **90**	158	129	126	205	160
160	**90** **110**	181	148	136	215	170
200	**110** **140**	214	195	151	230	185

For main dimensions, see pages 8 to 23

AL = Piston Ø

MM = Piston rod Ø

X* = Stroke length

[1] = The proximity switch is always located opposite to the pipe connection

[2] = Piston Ø 25 to 32 mm
Proximity switch impossible

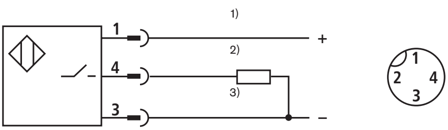
Proximity switches

Inductive proximity switches are used as reliable end position monitors on hydraulic cylinders. They are an important element for reliably and exactly monitoring safety equipment, locking mechanisms and/or other machine functions in their end position by issuing signals. The proximity switches, which are high pressure-resistant up to 500 bar operate contact-free. For this reason, they are not subject to wear. For safety reasons, the proximity switches are protected against excessive screwing in. The switching distance can therefore not be changed. On variants with proximity switches (option 1 "E"), the cylinders are provided with proximity switches on both ends.

Technical data (for applications outside these parameters, please consult us!)

Type of operation			PNP normally open
Permissible pressure		bar	500
Operating voltage		V DC	10 to 30
including residual ripple content		%	≤ 15
Voltage drop		V	≤ 1.5
Rated operating voltage		V DC	24
Rated operating current		mA	200
Idle current		mA	≤ 8
Residual current		µA	≤ 10
Repeatability		%	≤ 5
Hysteresis		%	≤ 15
Ambient temperature range		°C	– 25 to + 80
Temperature drift		%	≤ 10
Switching frequency		Hz	1000
Type of protection	Active area		IP 68 to DIN 40050
	Proximity switches		IP 67 to DIN 40050
Housing material			Material no. 1.4104

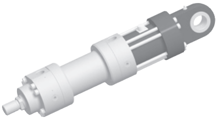
Pin assignment



1) brown
2) black
3) bue

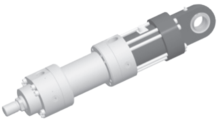
Overview of mounting elements: Series CSM1

CSM1 MP3
See pages 28, 29

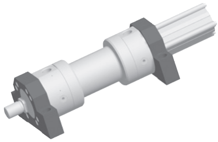


CSM1 MT4
See pages 34, 35

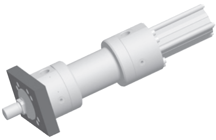
CSM1 MP5
See pages 28, 29



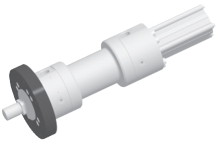
CSM1 MS2
See pages 36, 37



CSM1 MF1
See pages 30, 31



CSM1 MF3
See pages 32, 33



General notes on series CSM1

Series CSM1...2X is based on series CDM1...2X.
(According to ISO 6020/1)
For series CSM1...2X the same general notes are valid as for series CDM1...2X.

Deviations in dimensions or in the type code, which are due to integrated position measuring systems, are listed on the following pages.

[1] = Not standardised
[3] = Piston Ø 40 to 125 mm
[4] = Always specify dimension “XY“ in mm in clear text on the order
[5] = Piston Ø 63 to 200 mm
[6] = Not for MF2; MF4
[7] = Piston Ø 50 to 200 mm
[9] = Piston Ø 40 to 80 mm, only position 11
[10] = Piston Ø 63 to 200 mm, only position 11
[11] = Piston Ø 125 to 200 mm, only position 11
[14] = Subplates only possible with pipe thread ISO 1179-1
[15] = Piston Ø 80 to 200 mm
[16] = Subplates for SL and SV valves (isolator valves)
Note: Seal variants T and S are not rated for static holding functions
[17] = Per piston Ø, only possible with large piston rod Ø

Ordering code

CS	M1	/	/	/	A	2X	/								

Single-rod cylinder with position measuring system [1] **= CS**

Series = M1

Mounting types
- Rectangular flange at head [3] **= MF1**
- Round flange at head **= MF3**
- Plain clevis at cap **= MP3**
- Self-aligning clevis at cap **= MP5**
- Trunnion [4] **= MT4**
- Foot mounting **= MS2**

Piston Ø (AL)
40 to 200 mm - see page 3

Piston rod Ø (MM)
28 to 140 mm - see page 3

Stroke length in mm

Design principle
Head and cap flanged **= A**

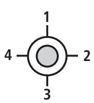
Component series
20 to 29 unchanged installation and connection dimensions **= 2X**

Pipe connection/variant
- Pipe thread ISO 1179-1 **= B**
- Metric ISO thread (DIN/ISO 6149-1) **= R**
- Enlarged pipe thread ISO 1179-1, page 40 [5] **= S**
- Rectangular flange connection ISO 6162, page 41 [7] **= F**
- Square flange connection ISO 6164, page 41 **= H**

for directional and high-response valves, pages 44, 45
- Subplate size 6 [6), 9), 14)] **= P**
- Subplate size 10 [6), 10), 14)] **= T**
- Subplate size 16 [6), 11), 14)] **= U**

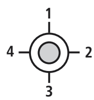
for SL and SV valves [16], pages 42, 43
- Subplate size 6 [6), 9), 14)] **= A**
- Subplate size 10 [6), 10), 14)] **= E**
- Subplate size 20 [6), 11), 14)] **= L**

Pipe connection/position on head



Viewed to piston rod
= 1
= 2
= 3
= 4

Pipe connection/position on cap
1 =
2 =
3 =
4 =



Viewed to piston rod

Piston rod variant
- **C =** Hard chromium-plated
- **L =** Stainless steel, hard chromium-plated

Piston rod end
- **G =** Thread (ISO 6020-1) for self-aligning clevis CGKD
- **H =** [17] Thread (VW standard) for self-aligning clevis CGKD
- **E =** Female thread, page 40
- **F =** [17] Piston rod end **H** with self-aligning clevis CGKD mounted
- **K =** Piston rod end **G** with self-aligning clevis CGKD mounted

End position cushioning
- **U =** Without
- **E =** [15] On both ends, adjustable

Seal variant
Suitable for mineral oil to DIN 51524 HL, HLP
- **M =** Standard seal system
- **T =** Servo performance variant/ reduced friction

Suitable for phosphate ester HFD-R
- **S =** Servo performance variant/ reduced friction

Option 1
- **T =** Position measuring system, magnetostrictive **without** mating connector
Mating connector – separate order, see page 39

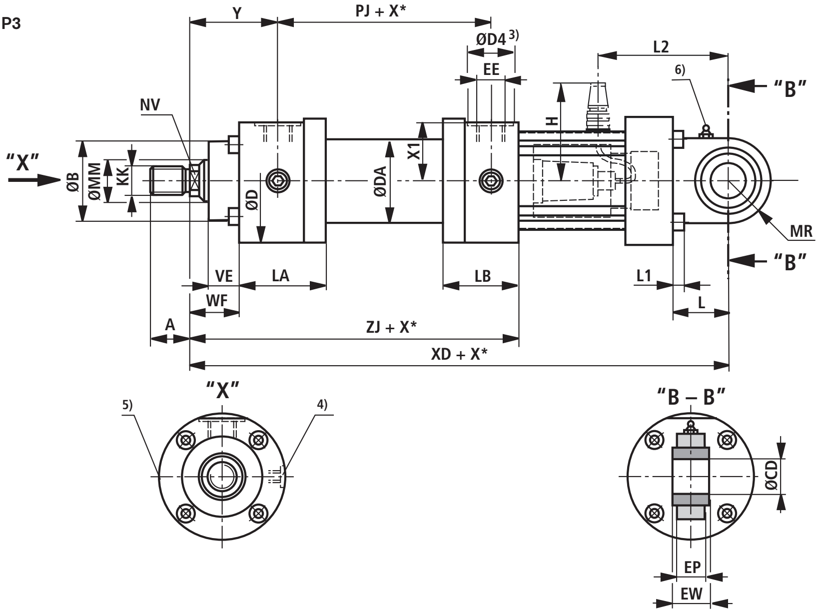
Option 2
- **V =** Prepared for T option 1
- **C =** Analogue output 4-20 mA
- **F =** Analogue output 0-10 V
- **D =** Digital output SSI

Order examples:
CSM1MT4/50/36/300A2X/B11CHUMTC,
XV = 175 mm

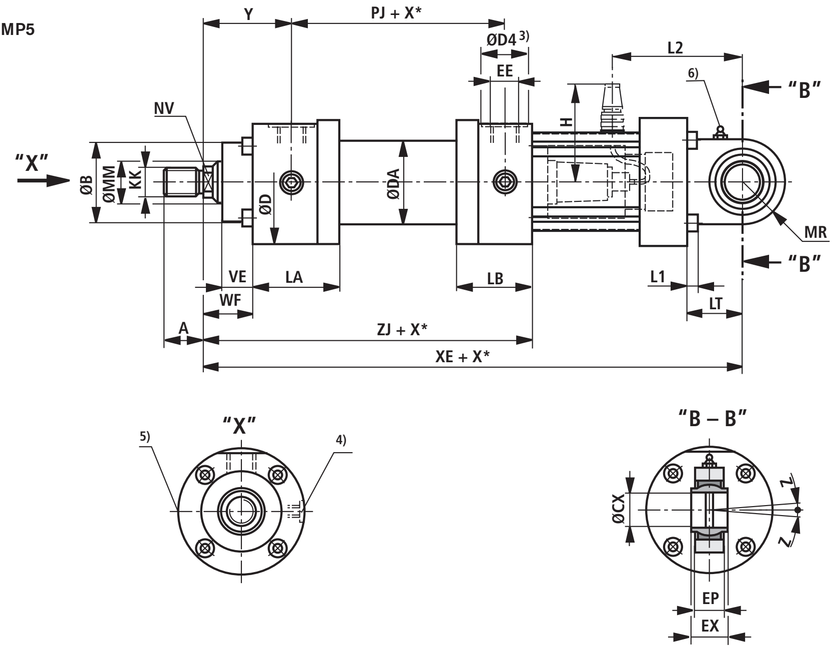
2

Mounting type MP3/MP5

CSM1 MP3



CSM1 MP5



Dimensions MP3/MP5 (dimensions in mm)

AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ
40	**28**	M20x1.5	28	M16x1.5	22	22	50	78	50	34	G1/2	29	M22x1.5	71	97
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174
160	**90** **110**	M64x3 M80x3	85 95	– M64x3	– 85	75 95	160	237	190	58	G1 1/4	52	M42x2	143	191
200	**110** **140**	M80x3 M100x3	95 112	– M80x3	– 95	95 120	200	285	230	58	G1 1/4	52	M42x2	190	224

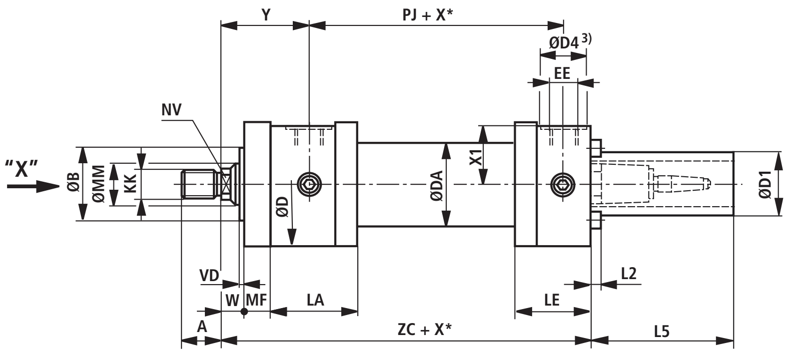
AL Ø	MM Ø	X1	VE	WF	ZJ	XD/XE	CD/CX H9/H7	EP	EW/EX h12	L/LT	L1	MR/MS	H	L2	LA	LB	Z
40	**28**	35.5	19	32	190	381	20	17	20	38	6	25	110	102	73	56	2°
50	**28** **36**	44.5	24	38	205	407	25	22	25	48	8	32	120	120	74	62	2°
63	**36** **45**	54.5	29	45	224	439	32	27	32	61	10	40	130	138	84	72	4°
80	**45** **56**	62.5	36	54	250	482	40	32	40	78	10	50	120	165	93	81	4°
100	**56** **70**	75.5	37	57	300	545	50	40	50	90	10	63	135	200	117	96	4°
125	**70** **90**	92.5	37	60	325	578	63	52	63	98	12	71	145	208	143	112	4°
160	**90** **110**	115.5	41	66	370	655	80	66	80	127	12	90	165	245	171	130	4°
200	**110** **140**	138.5	45	75	450	765	100	84	100	150	16	112	185	278	230	151	4°

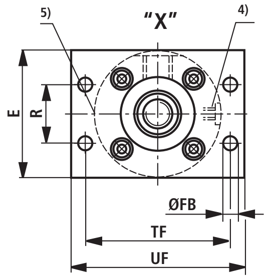
AL = Piston Ø MM = Piston rod Ø
X* = Stroke length
1) = Thread for piston rod end “G“ and “K“
2) = Thread for piston rod end “H“ and “F“
3) = ØD4 countersink max. 0.5 mm deep
4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clock wise)
5) = Throttle valve only with end position cushioning “E“ (180° for bleeding)
6) = Grease nipple cone head form A to DIN 71412
8) = Pipe connection “B“
9) = Pipe connection “R“

2

Mounting type MF1

CSM1 MF1





Dimensions MF1 (dimensions in mm)

AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ
40	**28**	M20x1.5	28	M16x1.5	22	22	50	78	50	34	G1/2	29	M22x1.5	71	97
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174

2

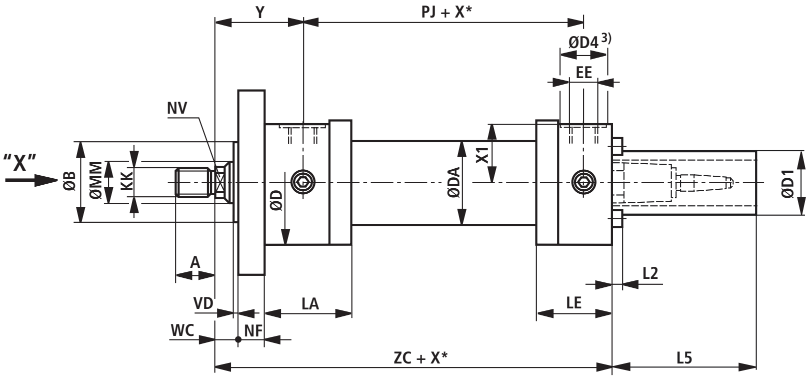
AL Ø	MM Ø	X1	MF	VD	W	ZC	E	R js13	TF js13	UF	ØFB H13	ØD1	L5	LA	LE	L2
40	**28**	35.5	16	3	16	211	80	40.6	98	115	9	80	166	73	77	0
50	**28** **36**	44.5	20	4	18	224	100	48.2	116.4	140	11	96	166	74	81	0
63	**36** **45**	54.5	25	4	20	237	120	55.5	134	160	13.5	96	166	84	85	0
80	**45** **56**	62.5	32	4	22	281	135	63.1	152.5	185	17.5	96	166	93	112	10
100	**56** **70**	75.5	32	5	25	322	160	76.5	184.8	225	22	96	166	117	118	0
125	**70** **90**	92.5	32	5	28	347	195	90.2	217.1	255	22	96	166	143	134	0

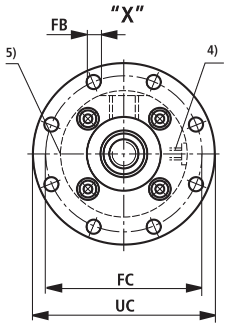
AL = Piston Ø MM = Piston rod Ø
X* = Stroke length
1) = Thread for piston rod end “G“ and “K“
2) = Thread for piston rod end “H“ and “F“
3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)
5) = Throttle valve only with end position cushioning “E“ (180° for bleeding)
8) = Pipe connection “B“
9) = Pipe connection “R“

Mounting type MF3

CSM1 MF3





Dimensions MF3 (dimensions in mm)

AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ
40	**28**	M20x1.5	28	M16x1.5	22	22	50	78	50	34	G1/2	29	M22x1.5	71	97
50	**28** **36**	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	60	95	60	34	G1/2	29	M22x1.5	72	111
63	**36** **45**	M27x2 M33x2	36 45	– M27x2	– 36	30 36	70	116	78	42	G3/4	34	M27x2	82	117
80	**45** **56**	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134
100	**56** **70**	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162
125	**70** **90**	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174
160	**90** **110**	M64x3 M80x3	85 95	– M64x3	– 85	75 95	160	237	190	58	G1 1/4	52	M42x2	143	191
200	**110** **140**	M80x3 M100x3	95 112	– M80x3	– 95	95 120	200	285	230	58	G1 1/4	52	M42x2	190	224

AL Ø	MM Ø	X1	NF	VD	WC	ZC	ØFC js13	ØUC –1	ØFB H13	ØD1	L5	LA	LE	L2
40	**28**	35.5	16	3	16	211	106	125	9	80	166	73	77	0
50	**28** **36**	44.5	20	4	18	224	126	150	11	96	166	74	81	0
63	**36** **45**	54.5	25	4	20	237	145	170	13.5	96	166	84	85	0
80	**45** **56**	62.5	32	4	22	281	165	195	17.5	96	166	93	112	10
100	**56** **70**	75.5	32	5	25	322	200	240	22	96	166	117	118	0
125	**70** **90**	92.5	32	5	28	347	235	275	22	96	166	143	134	0
160	**90** **110**	115.5	36	5	30	390	280	320	22	96	166	171	150	0
200	**110** **140**	138.5	40	5	35	472	340	385	26	96	166	230	173	0

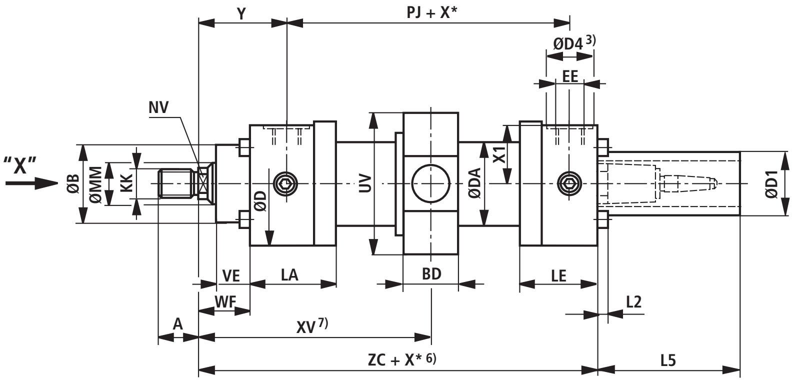
AL = Piston Ø MM = Piston rod Ø
X* = Stroke length
1) = Thread for piston rod end “G“ and “K“
2) = Thread for piston rod end “H“ and “F“
3) = ØD4 countersink max. 0.5 mm deep

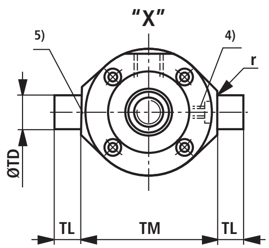
4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)
5) = Throttle valve only with end position cushioning “E“ (180° for bleeding)
8) = Pipe connection “B“
9) = Pipe connection “R“

2

Mounting type MT4

CSM1 MT4





Dimensions MT4 (dimensions in mm)

AL Ø	MM Ø	KK 1) ISO 6020/1	A 1)	KK 2) VW 39 D 920	A 2)	NV	ØB f8	ØD	ØDA	ØD4 3); 8)	EE 8)	ØD4 3); 9)	EE 9)	Y	PJ	X1
40	28	M20x1.5	28	M16x1.5	22	22	50	78	50	34	G1/2	29	M22x1.5	71	97	35.5
50	28 36	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 28	60	95	60	34	G1/2	29	M22x1.5	72	111	44.5
63	36 45	M27x2 M33x2	36 45	– M27x2	– 36	28 36	70	116	78	42	G3/4	34	M27x2	82	117	54.5
80	45 56	M33x2 M42x2	45 56	– M33x2	– 45	36 46	85	130	95	42	G3/4	34	M27x2	91	134	62.5
100	56 70	M42x2 M48x2	56 63	– M42x2	– 56	46 60	106	158	120	47	G1	43	M33x2	108	162	75.5
125	70 90	M48x2 M64x3	63 85	– M48x2	– 63	60 75	132	192	150	47	G1	43	M33x2	121	174	92.5
160	90 110	M64x3 M80x3	85 95	– M64x3	– 85	75 90	160	238	190	58	G1 1/4	52	M42x2	143	191	115.5
200	110 140	M80x3 M100x3	95 112	– M80x3	– 95	90 120	200	285	230	58	G1 1/4	52	M42x2	190	224	138.5

AL Ø	MM Ø	VE	WF	ZC	BD	UV 10)	r	ØTD f8	TL js13	TM h12	XV 7) min.	XV 7) max.	X*6) min.	ØD1	L5	LA	LE	L2
40	28	19	32	211	28	78	1	20	16	90	131	116+X*	23	80	166	73	77	0
50	28 36	24	38	224	33	95	1	25	20	105	141.5	122.5+X*	28	96	166	74	81	0
63	36 45	29	45	237	38	116	1.5	32	25	120	164	129+X*	47	96	166	84	85	0
80	45 56	36	54	281	53	130	2	40	32	135	189.5	138.5+X*	63	96	166	93	112	10
100	56 70	37	57	322	68	158	2	50	40	160	224	166+X*	70	96	166	117	118	0
125	70 90	37	60	347	78	210	2.5	63	50	195	261	170+X*	106	96	166	143	134	0
160	90 110	41	66	390	118	250	3	80	63	240	320	177+X*	163	96	166	171	150	0
200	110 140	45	75	472	148	300	3	100	80	295	403	221+X*	202	96	166	230	173	0

AL = Piston Ø MM = Piston rod Ø

X* = Stroke length

1) = Thread for piston rod end “G“ and “K“

2) = Thread for piston rod end “H“ and “F“

3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)

5) = Throttle valve only with end position cushioning “E“ (180° for bleeding)

6) = Observe min. stroke length “X*min.“

7) = Always specify dimension “XV“ in clear text on the order (take account of XV_{min} and XV_{max})

8) = Pipe connection “B“

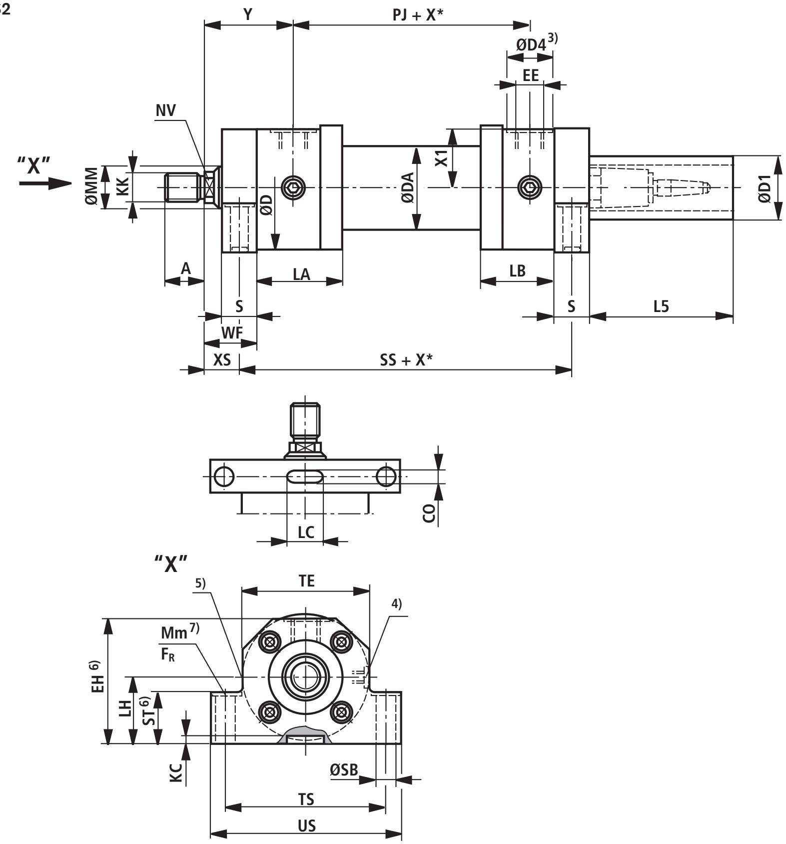
9) = Pipe connection “R“

10) = Tolerances according to EN ISO 9013: Thermal Cutting

2

Mounting type MS2

CSM1 MS2



AL = Piston Ø MM = Piston rod Ø

X* = Stroke length

1) = Thread for piston rod end "G" and "K"

2) = Thread for piston rod end "H" and "F"

3) = ØD4 countersink max. 0.5 mm deep

4) = Bleeding: When viewed to the piston rod, the position is by 90° offset in relation to the pipe connection (clockwise)

5) = Throttle valve only with end position cushioning "E" (180° for bleeding)

6) =The specified dimensions are smaller than the max. dimensions in ISO 6020/1

7) = Countersink max. 2 mm deep, for hexagon socket head cap screws to ISO 4762

The fixing screws must not be subjected to shear stresFixing screws to ISO 4762 (strength class 10.9) must be tightened to the specified tightening torque M_m.

If the calculated friction force F_R is lower than the maximum cylinder force, a thrust key be must be installed at the head.

Calculation basis:

– The specified friction force F_R refers to a friction coefficient of 0.2 (steel / steel)

– Foot on head side as fixed bearing

– Foot on cap side as movable bearing

8) = Pipe connection "B"

9) = Pipe connection "R"

Dimensions MS2 (dimensions in mm)

AL	MM	KK 1)	A 1)	KK 2)	A 2)	NV	ØD	ØDA	ØD4	EE	ØD4	EE	Y	PJ	X1	WF	XS
Ø	Ø	ISO 6020/1		VW 39 D 920					3); 8)	8)	3); 9)	9)					
40	28	M20x1.5	28	M16x1.5	22	22	78	50	34	G1/2	29	M22x1.5	71	97	35.5	32	19.5
50	28 36	M20x1.5 M27x2	28 36	– M20x1.5	– 28	22 30	95	60	34	G1/2	29	M22x1.5	72	111	44.5	38	22
63	36 45	M27x2 M33x2	36 45	– M27x2	– 36	30 36	116	78	42	G3/4	34	M27x2	82	117	54.5	45	29
80	45 56	M33x2 M42x2	45 56	– M33x2	– 45	36 46	130	95	42	G3/4	34	M27x2	91	134	62.5	54	34
100	56 70	M42x2 M48x2	56 63	– M42x2	– 56	46 60	158	120	47	G1	43	M33x2	108	162	75.5	57	32
125	70 90	M48x2 M64x3	63 85	– M48x2	– 63	60 75	192	150	47	G1	43	M33x2	121	174	92.5	60	32
160	90 110	M64x3 M80x3	85 95	– M64x3	– 85	75 95	237	190	58	G1 1/4	52	M42x2	143	191	115.5	66	36
200	110 140	M80x3 M100x3	95 112	– M80x3	– 95	95 120	285	230	58	G1 1/4	52	M42x2	190	224	138.5	75	39

AL	MM	SS	CO	LC	KC	EH 6)	LH	S	ØSB	ST	TE	TS	US	ØD1	L5	LA	LB	FR 7)	Mm 7)
Ø	Ø		N9	+0.5	+0.5	–1	h10	js13	H13	6)		js13	–1					kN	Nm
40	28	183	8	36	4	77.5	43	25	11	32	78	100	120	80	166	73	56	7.90	60
50	28 36	199	10	40	4.5	95	52	32	14	42	95	120	145	96	166	74	62	11.10	100
63	36 45	211	10	40	4.5	113	62	32	18	50	116	150	180	96	166	84	72	21.15	250
80	45 56	236	14	63	5	129	70	40	22	60	130	170	210	96	166	93	81	33.35	490
100	56 70	293	16	70	6	153	82	50	26	70	158	205	250	96	138	117	96	48.30	850
125	70 90	321	18	80	6	190	100	56	33	80	192	245	300	96	132	143	112	77.80	1710
160	90 110	364	22	125	8	232	119	60	33	90	238	295	350	96	126	171	130	77.80	1710
200	110 140	447	28	160	9	282	145	72	39	110	285	350	415	96	116	230	151	113.25	2970

Position measuring system

The measuring system, which is pressure-resistant up to 500 bar operates contact-free and absolute. This position measuring system is based on the magnetostrictive effect. Here, the coincidence of two magnetic fields triggers a torsional pulse.
This pulse runs on a wave guide inside the scale from the measuring point to the sensor head. The running time is constant and almost independent of temperatures. It is proportional to the position of the magnet and hence a measure for the actual position value and is converted within the sensor into a direct analogue or digital output.

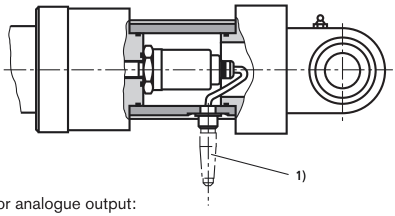
Technical data (for applications outside these parameters, please consult us!)

Operating pressure		bar	250
Analogue output		V	0 to 10
	Load resistance	kΩ	≥ 5
	Resolution		Infinite
Analogue output		mA	4 to 20
	Load resistance	Ω	0 to 500
	Resolution		Infinite
Digital output			SSI 24 bits Gray-coded
	Resolution	µm	5
	Direction of measurement		Forward
Linearity (absolute accuracy)	Analogue	% mm	≤ ±0.02 % (referred to measuring length) min. ±0.05
	Digital	% mm	≤ ±0.01 % (referred to measuring length) min. ±0.04
Reproducibility		% mm	±0.001 (referred to measuring length) min. ±0.0025
Hysteresis		mm	≤ 0.004
Supply voltage		V DC	24 (± 10 % with analogue output)
	Current consumption	mA	100
	Residual ripple	% s-s	≤ 1
	Current consumption	V DC mA	24 (+ 20 %/– 15 % with digital output) 70
	Residual ripple	% s-s	≤ 1
Type of protection	Tube and flange		IP 67
	Sensor electronics		IP 65
Operating temperature	Sensor electronics	°C	– 40 to + 75
Temperature coefficient	Voltage	ppm/°C	70
	Current	ppm/°C	90

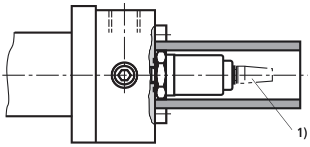
Position measuring system

Mounting types

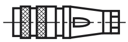
MP3, MP5



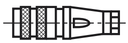
MF3, MF4, MT4, MS2



[1] For analogue output:
6-pin mating connector
Material no. **R900072231**
(The mating connector is **not** included in the scope of supply, but must be ordered separately)
Type of protection: IP 67

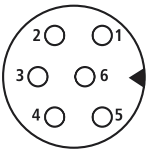


[1] For digital output:
7-pin mating connector, Material no. **R900079551**
(The mating connector is **not** included in the scope of supply, but must be ordered separately)
Type of protection: IP 67



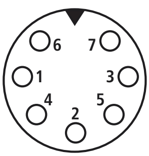
Pin assignment

Position measuring system (analogue output)
Plug-in connector (viewed to pin side)



Pin	Cable	Signal / current	Signal / voltage
1	Grey	4 to 20 mA	0 to 10 V
2	Pink	GND	GND
3	Yellow	n. c.	n. c.
4	Green	n. c.	n. c.
5	Brown	+24 V DC (±10%)	+24 V DC (±10%)
6	White	GND	GND

Position measuring system (digital output)
Plug-in connector (viewed to pin side)

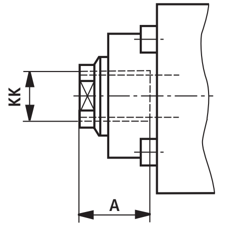


Pin	Cable	Signal / SSi
1	Grey	Data (–)
2	Pink	Data (+)
3	Yellow	Clock pulse (+)
4	Green	Clock pulse (–)
5	Brown	+24 V DC (–15%/+20%)
6	White	0 V (GND)
7	–	n. c.

Piston rod end E (dimensions in mm)

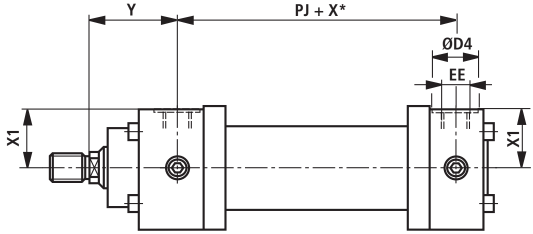
AL Ø	MM Ø	KK	A
		ISO 6020/1	
32	**22**	M16x1.5	22
40	**22** **28**	M16x1.5 M20x1.5	22 28
50	**28** **36**	M20x1.5 M27x2	28 36
63	**36** **45**	M27x2 M33x2	36 45
80	**45** **56**	M33x2 M42x2	45 56

AL Ø	MM Ø	KK	A
		ISO 6020/1	
100	**56** **70**	M42x2 M48x2	56 63
125	**70** **90**	M48x2 M64x3	63 85
160	**90** **110**	M64x3 M80x3	85 95
200	**110** **140**	M80x3 M100x3	95 112

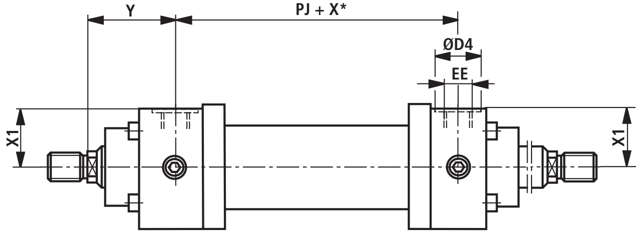


Enlarged pipe connections (dimensions in mm)

CDM1



CGM1



AL Ø	Variant "S" ISO 1179-1 EE	ØD4 1)	Y	PJ	X1
25	–	–	–	–	–
32	–	–	–	–	–
40	–	–	–	–	–
50	–	–	–	–	–
63	G1	47	80	121	53.5
80	G1	47	91	134	60.5
100	G1 1/4	58	108	162	74
125	G1 1/4	58	121	174	92
160	G1 1/2	65	143	191	114.5
200	G1 1/2	65	190	224	138.5

For main dimensions, see pages 8 to 23, and pages 28 to 37

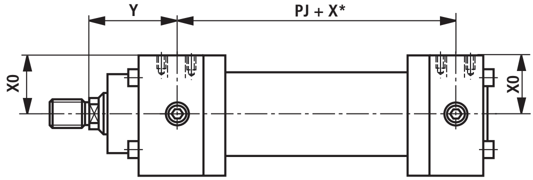
AL = Piston Ø

X* = Stroke length

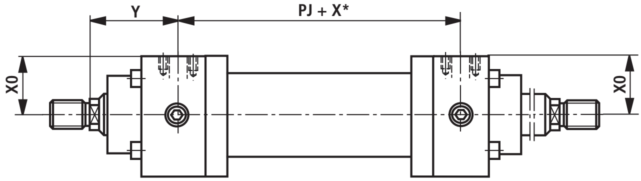
1) = ØD4 countersink max. 0.5 mm deep

Flanged connections (dimensions in mm)

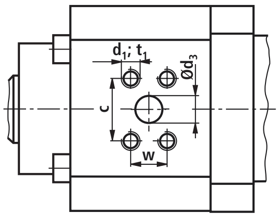
CDM1



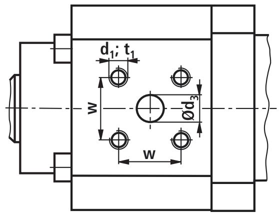
CGM1



Drilling pattern for rectangular flange to ISO 6162-1 (≙ SAE 3000 PSI)



Drilling pattern for square flange to ISO 6164



AL	Variant "F" ISO 6162-1 (≙SAE 3000 PSI) 1)									Variant "H" ISO 6164						
Ø	Y	PJ	X0	d_3 Ø	d_3[1] Ø	c ±0.25	w ±0.25	d_1	t_1[2]	Y	PJ	X0	d_3 Ø	w ±0.25	d_1	t_1[2]
25	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
40	–	–	–	–	–	–	–	–	–	69	101	34.5	10	24.7	M6	13
50	72	111	41	13	1/2"	38.1	17.5	M8	14	72	111	44	10	24.7	M6	13
63	82	117	52	13	1/2"	38.1	17.5	M8	16	82	117	52	13	29.7	M8	16
80	91	134	60	13	1/2"	38.1	17.5	M8	16	91	134	60	13	29.7	M8	16
100	108	162	72	19	3/4"	47.6	22.3	M10	20	108	162	72	19	35.4	M8	16
125	121	174	91	19	3/4"	47.6	22.3	M10	20	121	174	91	19	35.4	M8	16
160	143	191	114	25	1"	52.4	26.2	M10	20	143	191	114	25	43.8	M10	20
200	190	224	138	25	1"	52.4	26.2	M10	20	190	224	138	25	43.8	M10	20

For main dimensions, see pages 8 to 23, and pages 28 to 37

AL = Piston Ø

X* = Stroke length

1) = Flange drilling pattern to ISO 6162-1 corresponds to flange drilling pattern to SAE 3000 PSI

2) = Depth of thread

Subplates for valve mounting (SL and SV valves)

Remark:

Valves, fittings and piping are **not** included in the scope of supply!

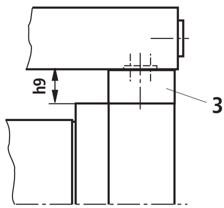
1 Port B to piston side according to ISO 6164
2 Bore for locating pin
3 Adapter plate for mounting type MT4 (included in the scope of supply for MT4)
4 Pipe connection “B“, for dimensions see also pages 9 to 23 and pages 33 to 37

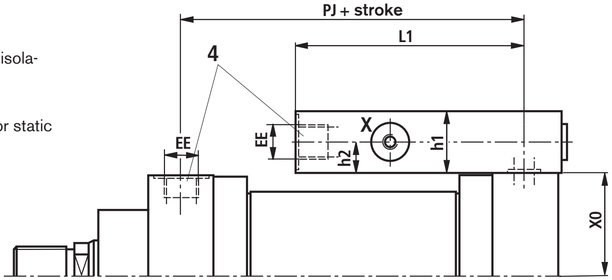
Important note:

Subplates for SL and SV valves (isolator valves)

Note:
Seal variants T and S not rated for static holding function!

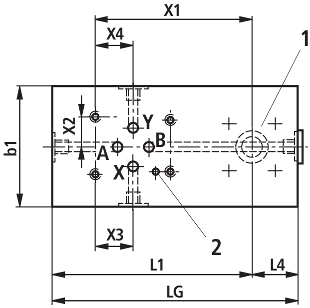
Installation situation with MT4





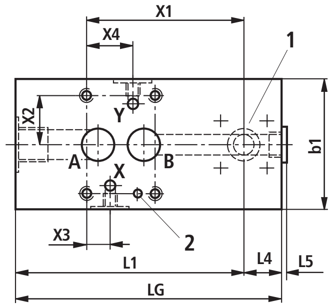
Size 6

Porting pattern to DIN 24340 form A and ISO 4401

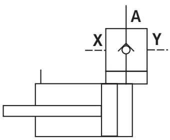


Sizes 10 and 20

Porting pattern to DIN 24340 form D and ISO 5781



Piping symbol

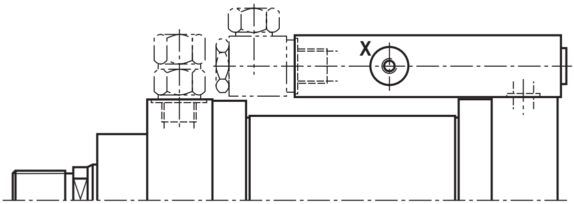


Subplates for valve mounting (SL and SV valves – dimensions in mm)

AL Ø	Valve size	PJ	EE	Minimum stroke 1) 2)	Minimum stroke 1) 3)	X0	Plate dimensions L1	L4	L5	LG	b1	h1	h9	Port size, position of ports h2	A	X	Y	X3	X4	Position point of valve X1	X2
40	6	97	G1/2	100	100	34.5	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21.5	21.5	65.5	15.5
50	6	111	G1/2	100	100	44	90	20	4	110	55	40	10	20	G1/2	G1/4	G1/4	21.5	21.5	65.5	15.5
63	6	117	G3/4	100	100	52	100	25	5	125	55	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	70.5	15.5
	10	117	G3/4	100	100	52	105	25	5	130	85	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	73	33.35
80	6	134	G3/4	100	100	60	100	25	5	125	55	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	70.5	15.5
	10	134	G3/4	100	100	60	105	25	5	130	85	45	10	22.5	G3/4	G1/4	G1/4	21.5	21.5	73	33.35
100	10	162	G1	100	100	72	102	28	5	130	85	50	10	25	G1	G1/4	G1/4	21.5	21.5	70	33.35
125	10	174	G1	100	106	91	102	28	5	130	85	50	20	25	G1	G1/4	G1/4	21.5	21.5	70	33.35
	20	174	G1	100	106	91	137	28	5	165	100	50	20	25	G1	G1/4	G1/4	20.6	39.5	92	39.7
160	10	191	G1 1/4	100	163	114	115	35	5	150	85	60	20	30	G1 1/4	G1/4	G1/4	21.5	21.5	80	33.35
	20	191	G1 1/4	100	163	114	140	35	5	175	100	60	20	30	G1 1/4	G1/4	G1/4	20.6	39.5	95	39.7
200	10	224	G1 1/4	100	202	138	115	35	5	150	85	60	20	30	G1 1/4	G1/4	G1/4	21.5	21.5	80	33.35
	20	224	G1 1/4	100	202	138	140	35	5	175	100	60	20	30	G1 1/4	G1/4	G1/4	20.6	39.5	95	39.7

AL = Piston Ø

1) Indication only valid for the following connection situation!



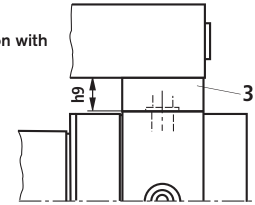
2) Not for MT4
3) Only for MT4

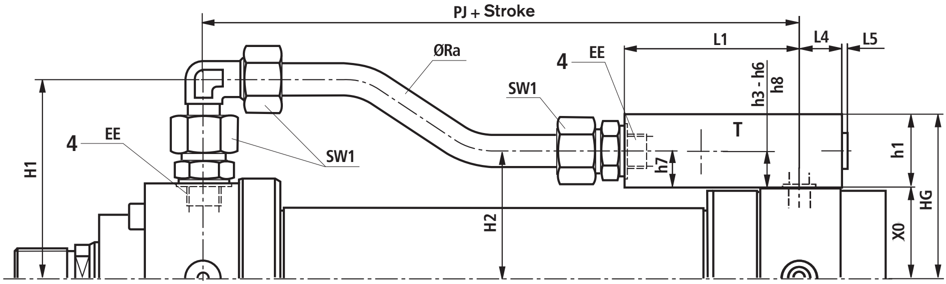
2

Subplates for valve mounting (directional and high-response valves)

1. Port B to piston side according to ISO 6164
2. Bore for locating pin
3. Adapter plate for mounting type MT4 (included in the scope of supply for MT4)
4. Pipe connection "B", for dimensions, see also pages 9 to 23 and pages 33 to 37

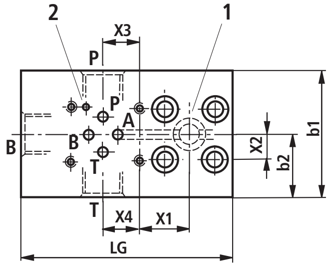
Installation situation with MT4





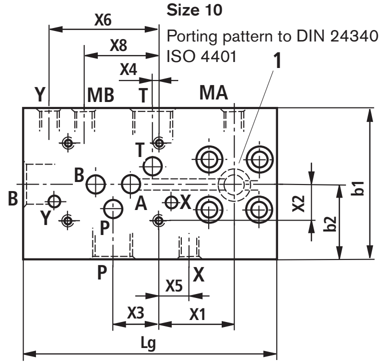
Size 6

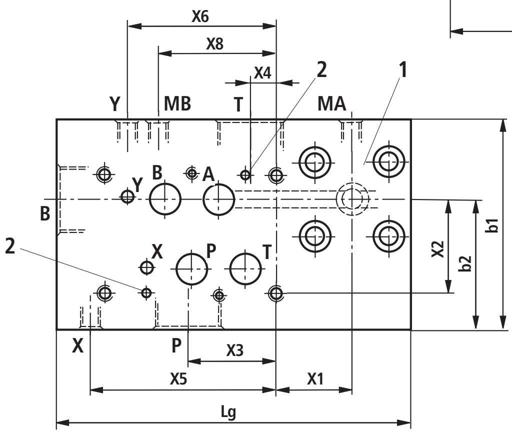
Porting pattern to DIN 24340 form A and ISO 4401



Size 10

Porting pattern to DIN 24340 form A and ISO 4401





Size 16

Porting pattern to DIN 24340 form A and ISO 4401

Subplates for valve mounting (directional and high-response valves – dimensions in mm)

AL Ø	Valve size	PJ	EE	Minimum stroke	Plate and piping dimension L1	L4	$L5_{max}$	H1	H2[1]	H2[2]	SW1	ØRa	b1	h1	lg	HG[1]	HG[2]	b2	X0	h7	h9
40	6	101	G1/2	225	90	20	4	90	54.5	64.5	30	16.0 x 2.5	65	40	110	74.5	84.5	32.5	34.5	20	10
50	6	111	G1/2	215	90	20	4	99	64	74	30	16.0 x 2.5	65	40	110	84	94	32.5	44	20	10
63	6	117	G3/4	250	100	25	5	119	74.5	84.5	36	20.0 x 3.0	75	45	125	97	107	37.5	52	22.5	10
	10	117	G3/4	275	125	25	5	119	75	85	36	20.0 x 3.0	90	70	150	122	132	45	52	23	10
80	6	134	G3/4	235	100	25	5	127	82.5	92.5	36	20.0 x 3.0	75	45	125	105	115	37.5	60	22.5	10
	10	134	G3/4	260	125	25	5	127	83	93	36	20.0 x 3.0	90	70	150	130	140	45	60	23	10
100	10	162	G1	280	132	28	5	148	102	112	46	25.0 x 4.0	90	80	160	152	162	45	72	30	10
125	10	174	G1	270	132	28	5	165	121	141	46	25.0 x 4.0	90	80	160	171	191	45	91	30	20
	16	174	G1	300	162	28	5	165	131	151	46	25.0 x 4.0	120	90	190	181	201	77.5	91	40	20
160	10	191	G1 1/4	295	135	35	5	193.5	149	169	50	30.0 x 5.0	105	95	170	209	229	55	114	35	20
	16	191	G1 1/4	335	175	35	5	193.5	159	179	50	30.0 x 5.0	125	100	210	214	234	77.5	114	45	20
200	10	224	G1 1/4	260	135	35	5	216.5	173	193	50	30.0 x 5.0	105	95	170	233	253	55	138	35	20
	16	224	G1 1/4	300	175	35	5	216.5	183	203	50	30.0 x 5.0	125	100	210	238	258	77.5	138	45	20

AL Ø	Valve size	Port size, position of ports P	X3	h3	T	X4	h4	X	X5	h5	Y	X6	h6	MA	MB	X8	h8
40	6	G1/2	21.5	20	G1/2	21.5	20	–	–	–	–	–	–	–	–	–	–
50	6	G1/2	21.5	20	G1/2	21.5	20	–	–	–	–	–	–	–	–	–	–
63	6	G3/4	21.5	22.5	G3/4	21.5	22.5	–	–	–	–	–	–	–	–	–	–
	10	G3/4	27	33	G3/4	3.5	33	G1/4	18	47	G1/4	65	47	G1/4	G1/4	60	17
80	6	G3/4	21.5	22.5	G3/4	21.5	22.5	-	-	-	-	-	-	-	-	-	-
	10	G3/4	27	33	G3/4	3.5	33	G1/4	18	47	G1/4	65	47	G1/4	G1/4	60	17
100	10	G1	27	30	G1	3.5	40	G1/4	18	57	G1/4	65	57	G1/4	G1/4	58	20
125	10	G1	27	30	G1	3.5	40	G1/4	18	57	G1/4	65	57	G1/4	G1/4	58	20
	16	G1	50	26	G1	17.0	25	G1/4	105	45	G1/4	88	70	G1/4	G1/4	88	35
160	10	G1 1/4	27	35	G1 1/4	3.5	45	G1/4	20	72	G1/4	65	72	G1/4	G1/4	55	25
	16	G1 1/4	52	32	G1 1/4	15.0	32	G1/4	110	55	G1/4	88	80	G1/4	G1/4	88	40
200	10	G1 1/4	27	35	G1 1/4	3.5	45	G1/4	20	72	G1/4	65	72	G1/4	G1/4	55	25
	16	G1 1/4	52	32	G1 1/4	15.0	32	G1/4	110	55	G1/4	88	80	G1/4	G1/4	88	40

AL Ø	Valve size	Position point of valve X1	X2
40	6	25	15.5
50	6	25	15.5
63	6	30	15.5
	10	45	21.6
80	6	30	15.5
	10	45	21.6
100	10	52	21.6
125	10	52	21.6
	16	37	55.6
160	10	55	21.6
	16	45	55.6
200	10	55	21.6
	16	45	55.6

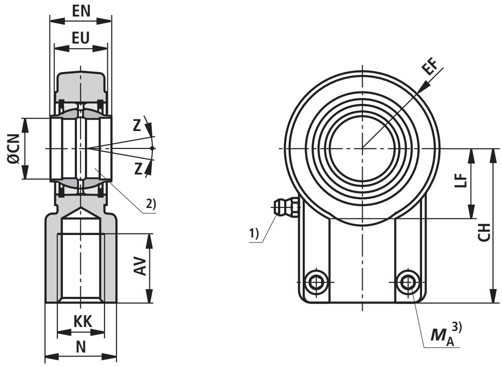
[1] Not for MT4

[2] Only for MT4

Dimensions h3, h4, h5, h6, h8 and X3, X4, X5, X6, determine the position of ports P, T, B, X, Y.

Self-aligning clevis CGKD

ISO 6982
DIN 24338
ISO 8132



AL = Piston Ø
MM = Piston rod Ø
1) = Grease nipple cone head form A to DIN 71412
2) = Associated pin Ø r6
3) = The self-aligning clevis must always be screwed against the piston rod shoulder.
Then, the clamping screws must be tightened to the specified torque.
4) = Weigh of self-aligning clevis
5) = Bearing cannot be lubricated
6) = Self-aligning clevis for piston rod end **G** (ISO 6020/1)
7) = Self-aligning clevis for piston rod end **H** (VW standard VW 39 D920)

Note:

The geometry and dimensions may vary depending on the make.

For combination with other mounting elements, the usability must be verified.

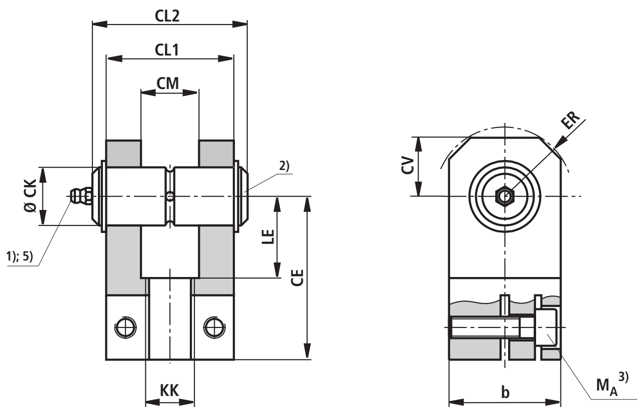
Self-aligning clevis CGKD (dimensions in mm)

AL Ø	MM Ø	Type	Material no.	Nominal force N	AV min.	N max.	CH js13	EF max.	CN H7	EN h12	EU max.
25 5)	14 6) / 18 7)	CGKD 12	R900540998	8,000	17	19	38	16.5	12	12	11
25 32	18 6) 18 6) / 22 7)	CGKD 16	R900308559	12,500	19	22	44	20.5	16	16	14
32 40	22 6) 22 6) / 28 7)	CGKD 20	R900308576	20,000	23	28	52	25	20	20	17.5
40 50	28 6) 28 6) / 36 7)	CGKD 25	R900323332	32,000	29	31	65	32	25	25	22
50 63	36 6) 36 6) / 45 7)	CGKD 32	R900322049	50,000	37	38	80	40	32	32	28
63 80	45 6) 45 6) / 56 7)	CGKD 40	R900322029	80,000	46	47	97	50	40	40	34
80 100	56 6) 56 6) / 70 7)	CGKD 50	R900322719	125,000	57	58	120	63	50	50	42
100 125	70 6) 70 6) / 90 7)	CGKD 63	R900322028	200,000	64	70	140	72.5	63	63	53.5
125 160	90 6) 90 6) / 110 7)	CGKD 80	R900322700	320,000	86	91	180	92	80	80	68
160 200	110 6) 110 6) / 140 7)	CGKD 100	R900322030	500,000	96	110	210	114	100	100	85.5
200	140 6)	CGKD 125	R900322026	800,000	113	135	260	160	125	125	105

AL Ø	MM Ø	Type	KK	LF min.	Clamping screw ISO 4762-10.9	M_T 3) Nm	*m* 4) kg	Z
25 5)	14 6) / 18 7)	CGKD 12	M12 x 1.25	13	M5 x 16	6	0.1	2°
25 32	18 6) 18 6) / 22 7)	CGKD 16	M14 x 1.5	16.5	M6 x 14	10	0.2	2°
32 40	22 6) 22 6) / 28 7)	CGKD 20	M16 x 1.5	20.5	M8 x 20	25	0.35	2°
40 50	28 6) 28 6) / 36 7)	CGKD 25	M20 x 1.5	25.5	M8 x 20	25	0.65	2°
50 63	36 6) 36 6) / 45 7)	CGKD 32	M27 x 2	30	M10 x 25	49	1.15	4°
63 80	45 6) 45 6) / 56 7)	CGKD 40	M33 x 2	39	M10 x 30	49	2.1	4°
80 100	56 6) 56 6) / 70 7)	CGKD 50	M42 x 2	47	M12 x 35	86	4	4°
100 125	70 6) 70 6) / 90 7)	CGKD 63	M48 x 2	58	M16 x 40	210	7.2	4°
125 160	90 6) 90 6) / 110 7)	CGKD 80	M64 x 3	74	M20 x 50	410	15	4°
160 200	110 6) 110 6) / 140 7)	CGKD 100	M80 x 3	94	M24 x 60	710	25.5	4°
200	140 6)	CGKD 125	M100 x 3	116	M24 x 70	710	52.5	4°

Fork clevis head CCKB

ISO 8132



AL = Piston Ø

MM = Piston rod Ø

1) = Grease nipple cone head form A to DIN 71412

2) = Associated pin Ø m6
(Pin and pin locking feature are included in the scope of supply, but are not mounted in the factory)

3) M_T = Tightening torque
The fork clevis head must always be screwed against the piston rod shoulder. Then, the clamping screws must be tightened to the specified torque.

4) *m* = Weight of fork clevis head

5) = Without lubricating bore

6) = Fork clevis head for piston rod end **G** (ISO 6020/1)

7) = Fork clevis head for piston rod end **H** (VW standard VW 39 D920)

8) = On request

Note:

The geometry and dimensions may vary depending on the make.

For combination with other mounting elements, the usability must be verified.

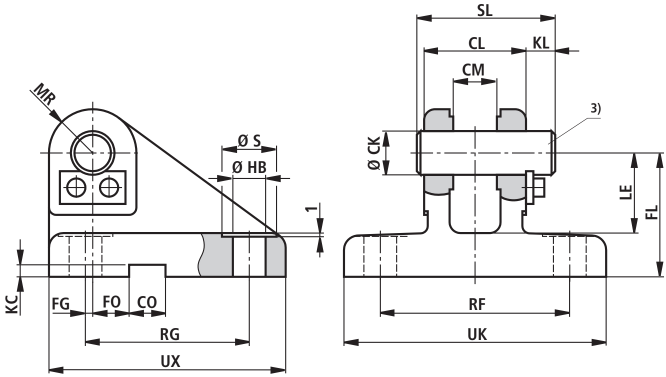
Fork clevis head CCKB (dimensions in mm)

AL Ø	MM Ø	Type	Material no.	Nominal force N	b max.	CE js13	CK H9	CL1 h16	CL2 max.	CM A13	ER max.
25 5)	14 6) / 18 7)	CCKB 12	R900542842	8,000	25	38	12	28	49	12	16
25 32	18 6) 18 6) / 22 7)	CCKB 16	R900542843	12,500	30	44	16	36	57	16	20
32 40	22 6) 22 6) / 28 7)	CCKB 20	R900542844	20,000	40	52	20	45	72	20	25
40 50	28 6) 28 6) / 36 7)	CCKB 25	R900542845	32,000	50	65	25	56	84	25	32
50 63	36 6) 36 6) / 45 7)	CCKB 32	R900542846	50,000	65	80	32	70	105	32	40
63 80	45 6) 45 6) / 56 7)	CCKB 40	R900542847	80,000	80	97	40	90	133	40	50
80 100	56 6) 56 6) / 70 7)	CCKB 50	R900542848	125,000	100	120	50	110	165	50	63
100 125	70 6) 70 6) / 90 7)	CCKB 63	R900542849	200,000	140	140	63	140	185	63	71
125 160	90 6) 90 6) / 110 7)	CCKB 80	R900542850	320,000	180	180	80	170	225	80	90
160 200	110 6) 110 6) / 140 7)	CCKB 100	8)	500,000	220	210	100	210	8)	100	110

AL Ø	MM Ø	Type	KK	LE min.	CV max.	Clamping screw ISO 4762-10.9	M_T 3) Nm	*m* 4) kg
25 5)	14 6) / 18 7)	CCKB 12	M12 x 1.25	18	16	M4 x 16	2.9	0.2
25 32	18 6) 18 6) / 22 7)	CCKB 16	M14 x 1.5	22	20	M6 x 20	10	0.35
32 40	22 6) 22 6) / 28 7)	CCKB 20	M16 x 1.5	27	25	M8 x 30	25	0.7
40 50	28 6) 28 6) / 36 7)	CCKB 25	M20 x 1.5	34	32	M10 x 35	49	1.4
50 63	36 6) 36 6) / 45 7)	CCKB 32	M27x 2	42	40	M12 x 40	85	2.8
63 80	45 6) 45 6) / 56 7)	CCKB 40	M33 x 2	52	50	M16 x 50	210	5.2
80 100	56 6) 56 6) / 70 7)	CCKB 50	M42 x 2	64	63	M20 x 60	425	9.5
100 125	70 6) 70 6) / 90 7)	CCKB 63	M48 x 2	75	71	M24 x 80	730	21.5
125 160	90 6) 90 6) / 110 7)	CCKB 80	M64 x 3	94	90	M30 x 100	1450	38.2
160 200	110 6) 110 6) / 140 7)	CCKB 100	M80 x 3	120	110	M36 x 130	2480	8)

Fork-type mounting block CLCA

ISO 8132, form B



AL = Piston Ø
MM = Piston rod Ø
1) = Assignment for mounting at cap
2) = Assignment for mounting at self-aligning clevis CGKD
3) = Associated pin Ø m6 (Pin and pin locking feature are included in the scope of supply, but are not mounted in the factory)
4) *m* = Weight of fork-type mounting block
6) = Fork-type mounting block for piston rod end **G** (ISO 6020/1)
7) = Fork-type mounting block for piston rod end **H** (VW standard VW 39 D920)
8) = On request

Note:

The geometry and dimensions may vary depending on the make.

For combination with other mounting elements, the usability must be verified.

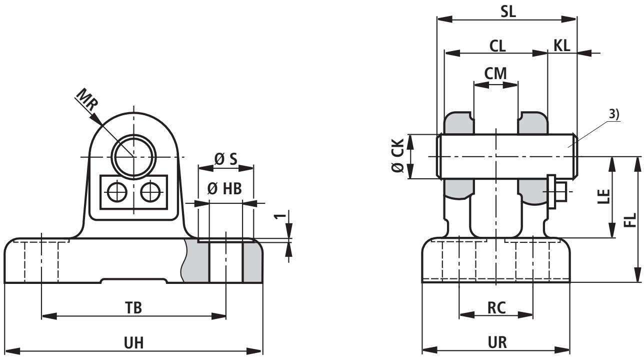
Fork-type mounting block CLCA (dimensions in mm)

AL 1) Ø	AL 2) Ø	MM 2) Ø	Type	Material no.	Nom. force N	CK H9	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14
25	25	14 6) / 18 7)	CLCA 12	R900542861	8,000	12	28	12	10	2	34	10
32	25 32	18 6) 18 6) / 22 7)	CLCA 16	R900542862	12,500	16	36	16	16	3.5	40	10
40	32 40	22 6) 22 6) / 28 7)	CLCA 20	R900542863	20,000	20	45	20	16	7.5	45	10
50	40 50	28 6) 28 6) / 36 7)	CLCA 25	R900542864	32,000	25	56	25	25	10	55	10
63	50 63	36 6) 36 6) / 45 7)	CLCA 32	R900542865	50,000	32	70	32	25	14.5	65	6
80	63 80	45 6) 45 6) / 56 7)	CLCA 40	R900542866	80,000	40	90	40	36	17.5	76	6
100	80 100	56 6) 56 6) / 70 7)	CLCA 50	R900542867	125,000	50	110	50	36	25	95	0
125	100 125	70 6) 70 6) / 90 7)	CLCA 63	R900542868	200,000	63	140	63	50	33	112	0
160	125 160	90 6) 90 6) / 110 7)	CLCA 80	R900542869	320,000	80	170	80	50	45	140	0
200	160 200	110 6) 110 6) / 140 7)	CLCA 100	8)	500,000	100	210	100	63	52.5	180	0
–	200	140 6)	CLCA 125	8)	800,000	125	270	125	80	75	230	0

AL 1) Ø	AL 2) Ø	MM 2) Ø	Type	HB H13	KC +0,3	KL	LE min.	MR max.	RF js14	RG js14	S	SL	UK max.	UX max.	*m* 4) kg
25	25	14 6) / 18 7)	CLCA 12	9	3.3	8	22	12	52	45	15	38	72	65	0.45
32	25 32	18 6) 18 6) / 22 7)	CLCA 16	11	4.3	8	27	16	65	55	18	46	90	80	1
40	32 40	22 6) 22 6) / 28 7)	CLCA 20	11	4.3	10	30	20	75	70	18	58	100	95	1.5
50	40 50	28 6) 28 6) / 36 7)	CLCA 25	13.5	5.4	10	37	25	90	85	20	69	120	115	3
63	50 63	36 6) 36 6) / 45 7)	CLCA 32	17.5	5.4	13	43	32	110	110	26	87	145	145	5
80	63 80	45 6) 45 6) / 56 7)	CLCA 40	22	8.4	16	52	40	140	125	33	110	185	170	9.6
100	80 100	56 6) 56 6) / 70 7)	CLCA 50	26	8.4	19	65	50	165	150	40	133	215	200	15.5
125	100 125	70 6) 70 6) / 90 7)	CLCA 63	33	11.4	20	75	63	210	170	48	164	270	230	27.5
160	125 160	90 6) 90 6) / 110 7)	CLCA 80	39	11.4	26	95	80	250	210	57	202	320	280	47
200	160 200	110 6) 110 6) / 140 7)	CLCA 100	52	12.4	30	120	100	315	250	76	246	405	345	8)
–	200	140 6)	CLCA 125	52	15.4	32	170	125	365	350	76	310	455	450	8)

Fork-type mounting block CLCD

ISO 8132, form A



AL = Piston Ø

MM = Piston rod Ø

1) = Assignment for mounting at cap

2) = Assignment for mounting at self-aligning clevis CGKD

3) = Associated pin Ø m6
(Pin and pin locking feature are included in the scope of supply, but are not mounted in the factory)

4) *m* = Weight of fork-type mounting block

6) = Fork-type mounting block for piston rod end **G** (ISO 6020/1)

7) = Fork-type mounting block for piston rod end **H** (VW standard VW 39 D920)

8) = On request

Note:

The geometry and dimensions may vary depending on the make.

For combination with other mounting elements, the usability must be verified.

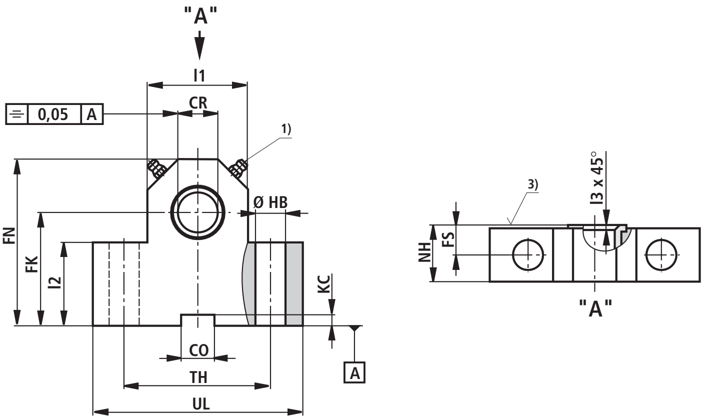
Fork-type mounting block CLCD (dimensions in mm)

AL [1] Ø	AL [2] Ø	MM [2] Ø	Type	Material no.	Nom. force N	CK H9	CL h16	CM A12	FL js12	HB H13	KL	LE min.
25	25	14 [6] / 18 [7]	CLCD 12	R900542879	8,000	12	28	12	34	9	8	22
32	25 32	18 [6] 18 [6] / 22 [7]	CLCD 16	R900542880	12,500	16	36	16	40	11	8	27
40	32 40	22 [6] 22[6] / 28[7]	CLCD 20	R900542881	20,000	20	45	20	45	11	10	30
50	40 50	28[6] 28 [6] / 36[7]	CLCD 25	R900542882	32,000	25	56	25	55	13.5	10	37
63	50 63	36[6] 36[6] / 45[7]	CLCD 32	R900542883	50,000	32	70	32	65	17,5	13	43
80	63 80	45 [6] 45 [6] / 56 [7]	CLCD 40	R900542884	80,000	40	90	40	76	22	16	52
100	80 100	56 [6] 56 [6] / 70 [7]	CLCD 50	R900542885	125,000	50	110	50	95	26	19	65
125	100 125	70 [6] 70 [6] / 90 [7]	CLCD 63	R900542886	200,000	63	140	63	112	33	20	75
160	125 160	90 [6] 90 [6] / 110 [7]	CLCD 80	R900542887	320,000	80	170	80	140	39	26	95
200	160 200	110 [6] 110 [6] / 140 [7]	CLCD 100	[8]	500,000	100	210	100	180	52	30	120
–	200	140 [6]	CLCD 125	[8]	800,000	125	270	125	230	52	32	170

AL [1] Ø	AL [2] Ø	MM [2] Ø	Type	MR max.	RC js14	S	SL	TB js14	UR max.	UH max.	*m* [4] kg
25	25	14 [6] / 18 [7]	CLCD 12	12	20	15	38	50	40	70	0.35
32	25 32	18 [6] 18 [6] / 22 [7]	CLCD 16	16	26	18	46	65	50	90	0.7
40	32 40	22 [6] 22[6] / 28[7]	CLCD 20	20	32	18	58	75	58	98	0.95
50	40 50	28[6] 28 [6] / 36[7]	CLCD 25	25	40	20	69	85	70	113	1.9
63	50 63	36[6] 36[6] / 45[7]	CLCD 32	32	50	26	87	110	85	143	3
80	63 80	45 [6] 45 [6] / 56 [7]	CLCD 40	40	65	33	110	130	108	170	5.5
100	80 100	56 [6] 56 [6] / 70 [7]	CLCD 50	50	80	40	133	170	130	220	10.6
125	100 125	70 [6] 70 [6] / 90 [7]	CLCD 63	63	100	48	164	210	160	270	17
160	125 160	90 [6] 90 [6] / 110 [7]	CLCD 80	80	125	57	202	250	210	320	32
200	160 200	110 [6] 110 [6] / 140 [7]	CLCD 100	100	160	76	246	315	260	400	[8]
–	200	140 [6]	CLCD 125	125	200	76	310	385	320	470	[8]

Trunnion mounting block CLTB (dimensions in mm)

ISO 8132



AL Ø	Type	Material no.	Nominal force N	CR H7	CO N9	FK js12	FN max,	FS js14	HB H13	KC +0.3	I1	I2
25	**CLTB 12**	R900772607 4)	8,000	12	10	34	50	8	9	3.3	24	25
32	**CLTB 16**	R900772608 4)	12,500	16	16	40	60	10	11	4.3	31	30
40	**CLTB 20**	R900772609 4)	20,000	20	16	45	70	10	11	4.3	41	38
50	**CLTB 25**	R900772610 4)	32,000	25	25	55	80	12	13.5	5.4	56	45
63	**CLTB 32**	R900772611 4)	50,000	32	25	65	100	15	17.5	5.4	70	52
80	**CLTB 40**	R900772612 4)	80,000	40	36	76	120	16	22	8.4	88	60
100	**CLTB 50**	R900772613 4)	125,000	50	36	95	140	20	26	8.4	105	75
125	**CLTB 63**	R900772614 4)	200,000	63	50	112	180	25	33	11.4	130	85
160	**CLTB 80**	R900772615 4)	320,000	80	50	140	220	31	39	11.4	170	112
200	**CLTB 100**	8); 4)	500,000	100	63	180	280	45	52	12.4	215	8)

AL Ø	Type	I3	NH max.	TH js14	UL max.	*m* 2) kg
25	**CLTB 12**	1	17	40	63	0.4
32	**CLTB 16**	1	21	50	80	0.85
40	**CLTB 20**	1.5	21	60	90	1.2
50	**CLTB 25**	1.5	26	80	110	2.1
63	**CLTB 32**	2	33	110	150	4.55
80	**CLTB 40**	2.5	41	125	170	7.3
100	**CLTB 50**	2.5	51	160	210	14.5
125	**CLTB 63**	3	61	200	265	23.1
160	**CLTB 80**	3.5	81	250	325	52.3
200	**CLTB 100**	3.5	102	295	385	8)

AL = Piston Ø
1) = Grease nipple cone head form A to DIN 71412
2) *m* = Weight of trunnion mounting block (indication per pair)
3) = Contact face of trunnion (inside)
4) = Mounting blocks are always delivered in pairs
8) = On request

☞ **Note:**

Mounting blocks for piston Ø 160 and 200 mm

For spare parts (series 1X), dimensions are different.
Please consult us!

The geometry and dimensions may vary depending on the make.

For combination with other mounting elements, the usability must be verified.

Buckling

The permissible stroke length with a flexibly guided load and a factor of 3.5 for safety against buckling can be found in the relevant table. For other installation positions of the cylinder, the permissible stroke length must be interpolated. Permissible stroke length for non-guided load on request.

Buckling calculations are carried out according to the following formulas:

1. Calculation according to Euler

$$F = \frac{\pi^2 \cdot E \cdot I}{\nu \cdot L_K^2} \quad \text{if } \lambda > \lambda g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi\ (335 - 0{,}62 \cdot \lambda)}{4 \cdot \nu} \quad \text{if } \lambda \leq \lambda g$$

Explanation:

E = Modulus of elasticity in N/mm^2
= 2.1 x 10^5 for steel

I = Geometrical moment of inertia in mm^4 for circular cross-section $= \frac{d^4 \cdot \pi}{64} = 0.0491 \cdot d^4$

ν = 3.5 (safety factor)

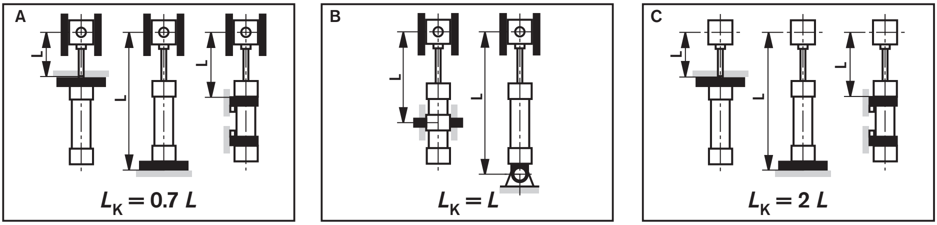
L_K = Free buckling length in mm (depending on mounting type, see sketches A, B, C)

d = Piston rod Ø in mm

λ = Slenderness ratio
$= \frac{4 \cdot L_K}{d}$ $\quad \lambda g = \pi \sqrt{\frac{E}{0.8 \cdot R_e}}$

R_e = Yield strength of piston rod material

Influence on the mounting type on the buckling length:

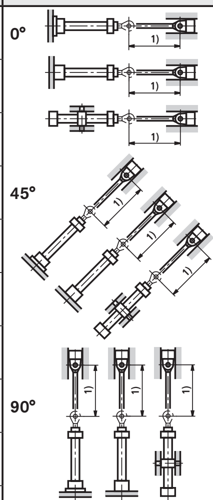


Permissible stroke length (dimensions in mm)

Mounting type MF2, MF4, MT4 trunnion (with XV_{max})

AL Ø	MM Ø	Permissible stroke length at 70 bar 0°	70 bar 45°	70 bar 90°	100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	Max. available stroke length
25	14	260	270	305	215	220	240	160	165	170	600
	18	435	455	485	385	400	460	310	315	340	
32	18	340	355	410	290	295	325	215	220	230	800
	22	510	535	665	450	465	535	365	370	400	
40	22	405	425	495	345	355	395	265	270	285	1000
	28	640	680	875	575	600	710	475	490	535	
50	28	540	560	665	465	480	535	365	370	390	1200
	36	845	895	1180	765	805	970	645	665	735	
63	36	705	740	900	620	640	725	500	510	540	1400
	45	1030	1100	1480	945	990	1220	805	830	930	
80	45	855	900	1120	760	790	905	615	630	680	1700
	56	1230	1310	1700	1130	1190	1490	975	1010	1140	
100	56	1030	1090	1390	925	965	1130	760	780	850	2000
	70	1500	1590	2000	1380	1460	1880	1200	1250	1440	
125	70	1280	1360	1770	1160	1210	1450	970	995	1090	2300
	90	1900	2030	2300	1770	1880	2300	1570	1640	1950	
160	90	1620	1710	2320	1470	1540	1900	1250	1290	1440	2600
	110	2200	2350	2600	2060	2180	2600	1820	1900	2280	
200	110	1890	2010	2760	1730	1820	2260	1470	1520	1720	3000
	140	2720	2910	3000	2560	2720	3000	2290	2400	2980	

Installation position



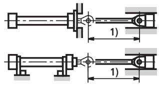
1) Permissible stroke

Permissible stroke length (dimensions in mm)

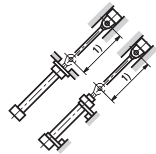
Mounting type MF1, MF3, MS2

AL Ø	MM Ø	Permissible stroke length at 70 bar 0°	70 bar 45°	70 bar 90°	100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	Max. available stroke length	Installation position
25	14 18	350 530	355 550	380 645	300 470	305 485	315 535	235 390	240 400	240 415	600	0°
32	18 22	445 615	455 640	495 660	385 550	390 570	410 625	310 460	315 465	320 490	800	
40	22 28	530 775	545 810	590 980	460 700	470 725	490 815	370 590	375 600	380 635	1000	
50	28 36	670 975	690 1020	770 1300	590 890	600 925	640 1080	475 765	485 785	495 845	1200	45°
63	36 45	845 1170	880 1230	1000 1400	750 1070	770 1120	830 1330	615 920	625 950	645 1040	1400	
80	45 56	1020 1390	1060 1470	1240 1700	910 1280	935 1340	1020 1620	750 1110	765 1150	795 1270	1700	
100	56 70	1240 1680	1290 1780	1540 2000	1110 1560	1150 1640	1280 2000	930 1370	940 1410	990 1590	2000	
125	70 90	1510 2090	1570 2220	1920 2300	1360 1960	1400 2060	1590 2300	1140 1740	1160 1810	1240 2110	2300	90°
160	90 110	1880 2430	1980 2580	2500 2600	1720 2280	1780 2400	2070 2600	1460 2600	1500 2110	1610 2460	2600	
200	110 140	2210 2980	2320 3000	2980 3000	2020 2810	2100 2980	2470 3000	1730 2540	1770 2650	1920 3000	3000	1) Permissible stroke

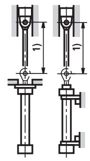
0°



45°



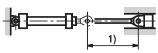
90°



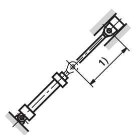
Mounting type: MP3, MP5

AL Ø	MM Ø	Permissible stroke length at 70 bar 0°	70 bar 45°	70 bar 90°	100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	Max. available stroke length	Installation position
25	14 18	155 300	160 310	175 360	120 250	125 260	130 285	75 190	80 195	85 220	600	0°
32	18 22	210 345	220 360	240 420	165 290	170 300	180 330	110 220	115 225	120 235	800	
40	22 28	255 445	265 465	295 560	205 385	210 395	225 445	140 295	145 305	150 320	1000	
50	28 36	350 600	360 630	405 770	285 525	290 540	315 615	205 415	210 425	215 455	1200	45°
63	36 45	470 740	490 780	560 970	395 650	405 680	440 780	290 525	292 535	310 580	1400	
80	45 56	575 890	600 935	700 1190	490 790	505 820	555 960	370 640	375 660	390 715	1700	
100	56 70	705 1085	735 1150	880 1500	600 970	620 1015	695 1215	460 800	470 825	495 910	2000	
125	70 90	890 1400	935 1490	1135 2030	770 1270	800 1340	905 1660	605 1070	615 1110	655 1250	2300	90°
160	90 110	1130 1620	1190 1720	1490 2370	990 1470	1030 1550	1190 1930	790 1240	810 1290	870 1450	2600	
200	110 140	1320 2010	1390 2140	1770 3000	1160 1850	1210 1950	1420 2520	930 1580	955 1650	1040 1910	3000	1) Permissible stroke

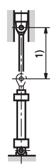
0°



45°



90°



End position cushioning

End position cushioning:
The objective is to reduce the velocity of a moved mass, whose centre of gravity lies on the cylinder axis, to a level, at which neither the cylinder nor the machine, into which the cylinder is installed, is damaged. For velocities above 20 mm/s we recommend the use of an end position cushioning feature, which absorbs energy without requiring the use of additional equipment. It must, however, always be verified, whether end position cushioning is also required in the case of lower velocities with large masses.

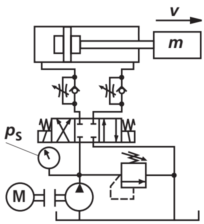
Cushioning capacity:
When decelerating masses via end position cushioning, the design-inherent cushioning capacity must not be exceeded. Cylinders with end position cushioning can achieve their full cushioning capacity only over the entire stroke length.

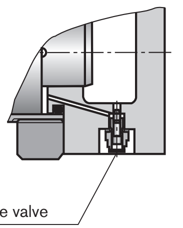
With the adjustable end position cushioning variant "E", a throttle valve is provided additionally when compared with variant "D". End position cushioning variant "E" allows cycle times to be optimised. The max. cushioning capacity can only be achieved when the throttle valve is closed.

The calculation depends on the factors of weight, velocity, system pressure and installation position. For this reason, the variable D_m is derived from the mass and the velocity, and variable D_p from the system pressure and installation position. These two variables are used for verifying the permissible cushioning performance in the diagram "cushioning capacity". The intersection point of variables D_m and D_p must always be below the cushioning capacity curve of the selected cylinder. The values in the diagrams refer to an average oil temperature of + 45 to +65 °C with the throttle valve being closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position cushioning variants can be offered on request.

When fixed or adjustable limit stops are used, special measures must be taken!



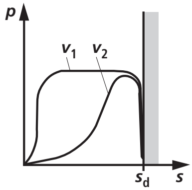


2

Formulas:

$$D_m = \frac{m}{10^K}\ ;\quad K = kv\ (0.5 - v)$$

m = moved mass in kg
v = stroke velocity in m/s
kv = see table on page 58



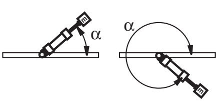
Extending:

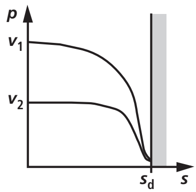
$$D_p = p_S - \frac{m \cdot 9.81 \cdot \sin\alpha}{A_1 \cdot 10}$$

Retracting:

$$D_p = p_S + \frac{m \cdot 9.81 \cdot \sin\alpha}{A_3 \cdot 10}$$

p_S = system pressure in bar
A_1 = piston area in cm^2 (see page 3)
A_3 = annulus area in cm^2 (see page 3)
α = angle in degree in relation to the horizontal plane





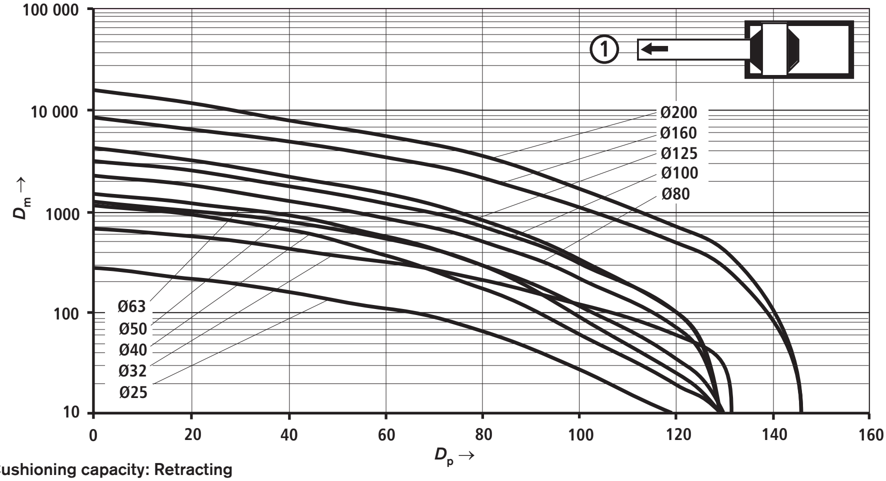
Cushioning length

AL Ø mm	25	32	40	50	63	80	100	125	160	200
Head side	15	19	23	22	27	27	32	33	40	46
Cap side	15	19	23	22	27	27	32	33	40	46

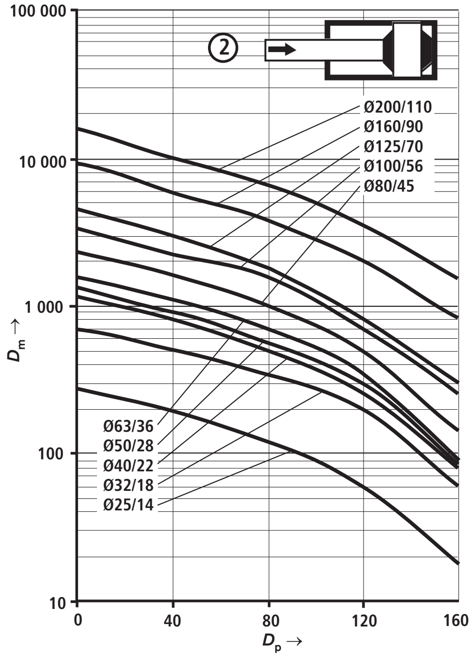
End position cushioning /cushioning capacity

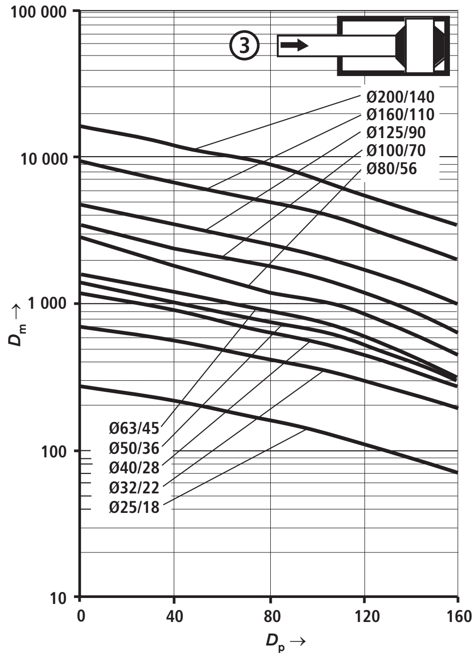
AL Ø mm	25	32	40	50	63	80	100	125	160	200
kv ①	2.97	2.56	2.82	3.51	3.02	2.53	2.65	2.91	2.76	2.95
kv ②	3.15	2.93	2.95	3.45	2.95	2.53	2.93	2.95	2.95	3.1
kv ③	3.1	2.73	3.1	3.51	2.95	2.51	2.91	2.95	2.91	2.93

Cushioning capacity: Extending



Cushioning capacity: Retracting



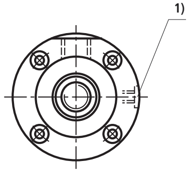


Bleeding / threaded coupling (dimensions in mm)

For piston Ø ≥ 40 mm, a patented safety bleed feature, which is protected against unintended turning out, is provided at the head and the cap as a standard.

For piston Ø 25 and 32 mm, a G1/8 bleed screw is installed at the head and the cap, which is **not** secured.

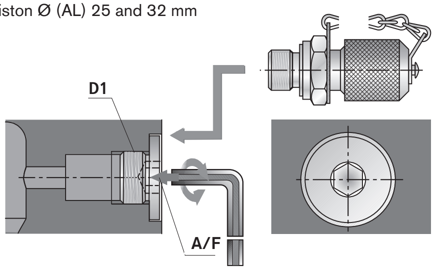
The port allows the installation of a threaded coupling with check valve for pressure measurements or contamination-free bleeding. The threaded coupling features a check valve function, that is, it can also be connected under pressure.



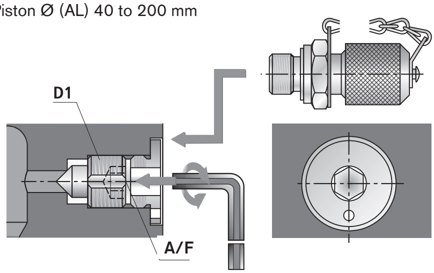
1) = Bleeding: When viewed to the piston rod, the position is always offset by 90° to the pipe port (clockwise)

Connection option for threaded coupling

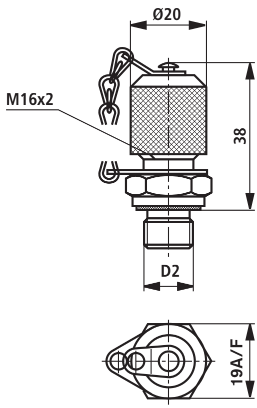
Piston Ø (AL) 25 and 32 mm



Piston Ø (AL) 40 to 200 mm



AL Ø	Bleed screw			Threaded coupling
	D1	Securing	A/F	D2
25 and 32	G1/8	Not secured	5	G1/8
40 and 50	G1/8	Secured	5	G1/8
63 to 200	G1/4	Secured	6	G1/4



Scope of supply: Threaded coupling **G1/8**

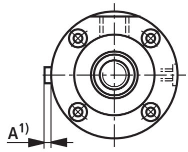
SCHRAUBKUPPLUNG AB 20-11/K3 G1/8 with seal ring made of NBR
Material no. **R900014363**
SCHRAUBKUPPLUNG AB 20-11/K3V G1/8 with seal ring made of FKM
Material no. **R900024710**

Scope of supply: Threaded coupling **G1/4**

SCHRAUBKUPPLUNG AB 20-11/K1 G1/4 with seal ring made of NBR
Material no. **R900009090**
SCHRAUBKUPPLUNG AB 20-11/K1V G1/4 with seal ring made of FKM
Material no. **R900001264**

Throttle valve (dimensions in mm)

AL Ø	25	32	40	50	63	80	100	125	160	200
Projection A 1)	6.5	4	5.5	1.5	0	0	0	0	0	0



AL = Piston Ø

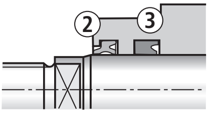
1) = Throttle valve only for end position cushioning "E" (180° for bleeding)

Protrusion A in the closed condition

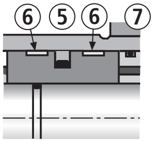
Seal (piston rod/piston)

Variants "**M** and **V**"
Piston Ø (AL) 25 and 32 mm

Piston rod seal

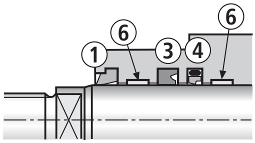


Piston seal

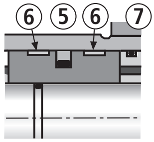


Piston Ø (AL) 40 to 200 mm

Piston rod seal

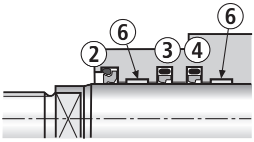


Piston seal

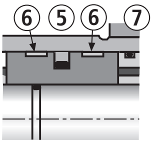


Variants "**T** and **S**"
Piston Ø (AL) 40 to 200 mm

Piston rod seal

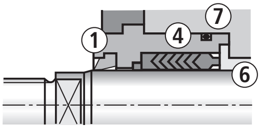


Piston seal

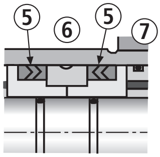


Variants "**A**"
Piston Ø (AL) 50 to 200 mm

Piston rod seal



Piston seal

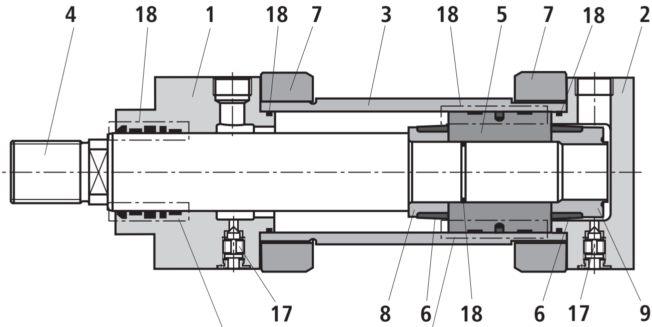


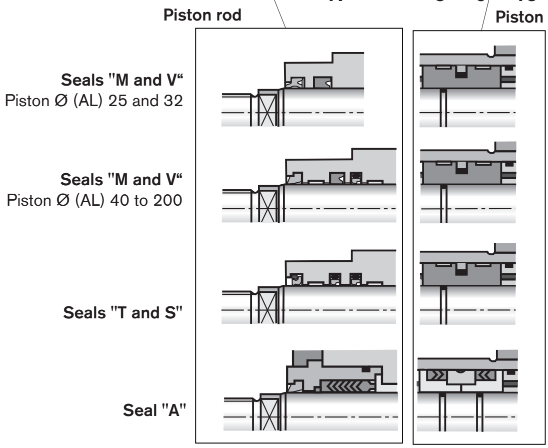
Medium	Seal variant	Compatibility with media / seal materials						
		① Wiper	② Double wiper		③ Piston rod seal		④ Piston rod seal (primary)	⑤ Piston seal
			Piston Ø 25 and 32	Piston Ø 40 to 200	Piston Ø 25 and 32	(secondary) Piston Ø 40 to 200		
HL, HLP	M	TPE	AU	–	AU	AU	PTFE / NBR	TPE / NBR
HL, HLP, HFA, HFC	T	–	–	PTFE / NBR	–	PTFE / NBR	PTFE / NBR	PTFE / NBR
HFD-R	V	TPE	FKM	–	FKM	PTFE / FKM	PTFE / FKM	PTFE / FKM
HFD-R	S	–	–	PTFE / FKM	–	PTFE / FKM	PTFE / FKM	PTFE / FKM
HL, HLP, HFA, HFC	A	TPE	–	–	–	–	POM / NBR	POM / NBR

Medium	Seal variant	⑥ Guide	⑦ O-ring	Features
HL, HLP	M	Fibre compound	NBR	Holding function at piston
HL, HLP, HFA, HFC	T	Fibre compound	NBR	Low friction
HFD-R	V	Fibre compound	FKM	High temperature
HFD-R	S	Fibre compound	FKM	Low friction and high temperature
HL, HLP, HFA, HFC	A	Red cast iron	NBR	Holding function

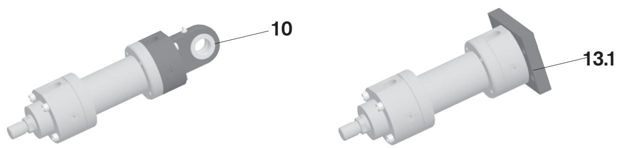
HL, HLP: –20 °C to +80 °C HFA: +5 °C to +55 °C HFC: –20 °C to +60 °C HFD-R: –15 °C to +120 °C

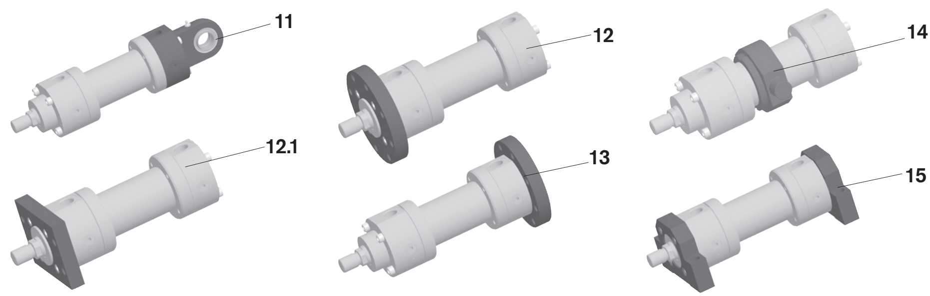
Spare parts: Series CDM1





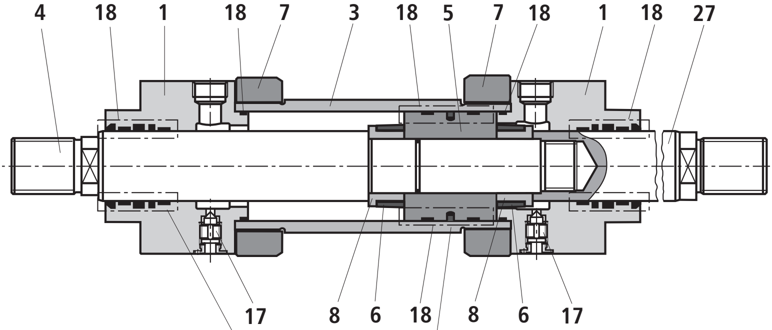
1	Head
2	Cap
3	Barrel
4	Piston rod
5	Piston
6	Cushioning bush
7	Flange
8	Bush
9	Bush
10	Cap MP3
11	Cap MP5
12	Round flange MF3
12.1	Rectangular flange MF1
13	Round flange MF4
13.1	Rectangular flange MF2
14	Trunnion MT4
15	Foot MS2
17	Bleed point
18	Seal kit: Wiper Piston rod seal Piston seal O-ring Back-up ring Guide ring

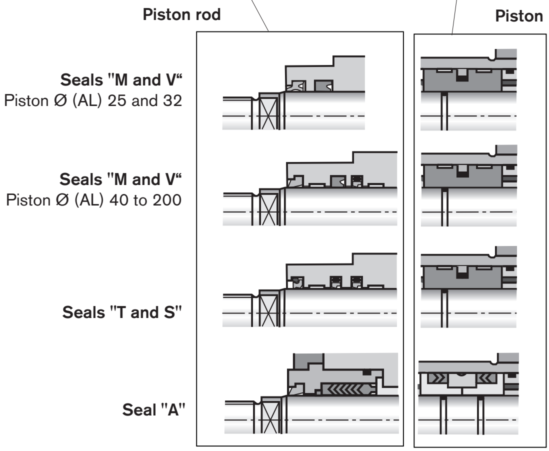




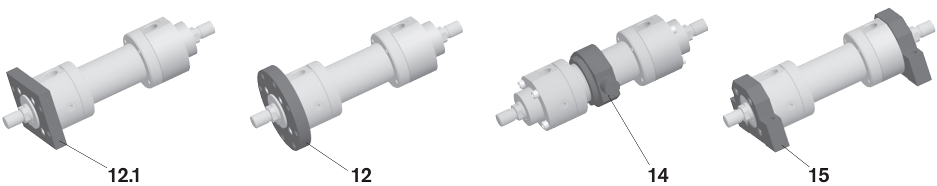
2

Spare parts: Series CGM1

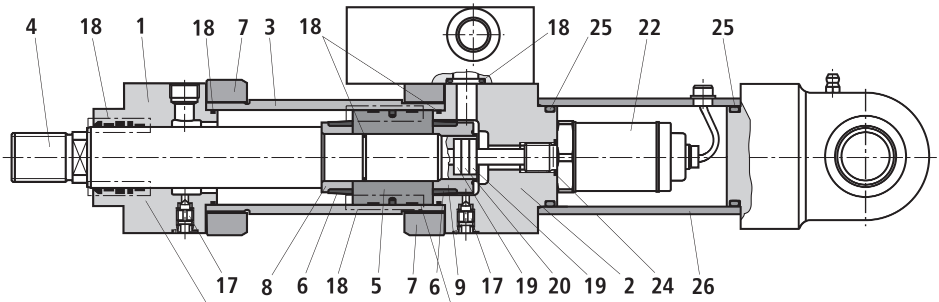




1 Head
3 Barrel
4 Piston rod
5 Piston
6 Cushioning bush
7 Flange
8 Bush
12 Round flange MF3
12.1 Rectangular flange MF1
14 Trunnion MT4
15 Foot MS2
17 Bleed point
18 Seal kit:
Wiper
Piston rod seal
Piston seal
O-ring
Guide ring
27 Piston rod

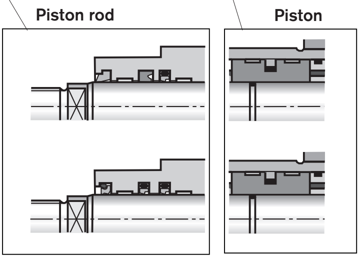


Spare parts: Series CSM1 MP3 and MP5



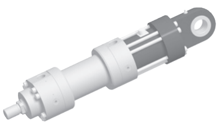
Seal "M

Seals "T and S"

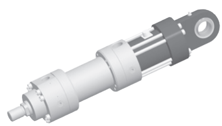


1 Head
2 Cap
3 Barrel
4 Piston rod
5 Piston
6 Cushioning bush
7 Flange
8 Bush
9 Bush
17 Bleed point
18 Seal kit:
Wiper
Piston rod seal
Piston seal
O-ring
Back-up ring
Guide ring
19 Insulating bush
20 Magnet
22 Position transducer
24 Seal
25 Seal
26 Protective tube

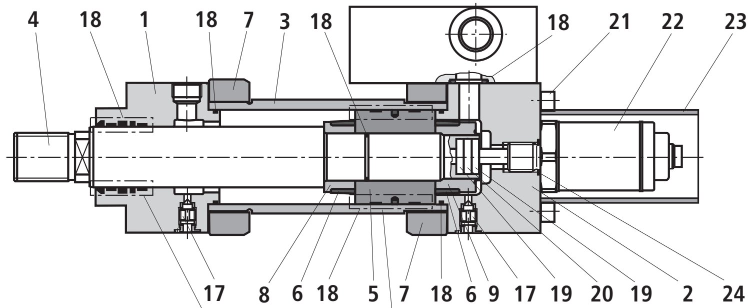
CSM1 MP3
Plain clevis at cap

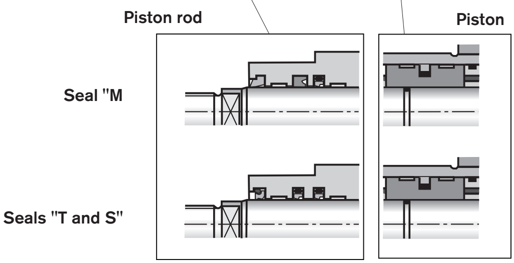


CSM1 MP5
Self-aligning clevis at cap



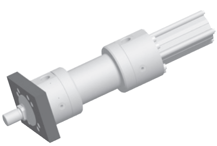
Spare parts: Series CSM1 MF., MT4 and MS2



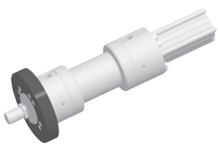


1 Head
2 Cap
3 Barrel
4 Piston rod
5 Piston
6 Cushioning bush
7 Flange
8 Bush
9 Bush
17 Bleed point
18 Seal kit:
Wiper
Piston rod seal
Piston seal
O-ring
Back-up ring
Guide ring
19 Insulating bush
20 Magnet
21 Hexagon socket head cap screw
22 Position transducer
23 Protective tube
24 Seal

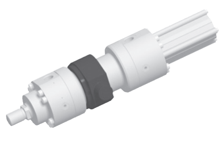
CSM1 MF1
Rectangular flange at head



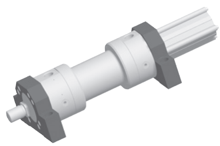
CSM1 MF3
Round flange at head



CSM1 MT4
Trunnion



CSM1 MS2
Foot mounting



Seal kits: Series CDM1 1) / CSM1 2)

AL Ø	MM Ø	Material no. for seal variant M	T	V	S	A
25	14	R407026468	–	R407026567	–	–
	18	R407026529	–	R407026568	–	–
32	18	R407026530	–	R407026569	–	–
	22	R407026531	R407026548	R407026570	R407026587	–
40	22	R407026532	R407026549	R407026571	R407026588	–
	28	R407026533	R407026550	R407026572	R407026589	–
50	28	R407026534	R407026551	R407026573	R407026590	R407026604
	36	R407026535	R407026552	R407026574	R407026591	R407026605
63	36	R407026536	R407026553	R407026575	R407026592	R407026606
	45	R407026537	R407026554	R407026576	R407026593	R407026607
80	45	R407026538	R407026555	R407026577	R407026594	R407026608
	56	R407026539	R407026556	R407026578	R407026595	R407026609
100	56	R407026540	R407026557	R407026579	R407026596	R407026610
	70	R407026541	R407026558	R407026580	R407026597	R407026611
125	70	R407026542	R407026559	R407026581	R407026598	R407026612
	90	R407026543	R407026560	R407026582	R407026599	R407026613
160	90	R407026544	R407026561	R407026583	R407026600	R407026614
	110	R407026545	R407026562	R407026584	R407026601	R407026615
200	110	R407026546	R407026563	R407026585	R407026602	R407026616
	140	R407026547	R407026564	R407026586	R407026603	R407026617

AL = Piston Ø in mm

MM = Piston rod Ø in mm

1) = Seal kits for proximity switches, separate Material no., see page 66

2) = Seal kits for position transducers, separate Material no., see page 66

2

Seal kits: Series CGM1 [3)]

AL Ø	MM Ø	Material no. for seal variant M	T	V	S	A
25	14	R407026792	–	R407026829	–	–
	18	R407026793	–	R407026830	–	–
32	18	R407026794	–	R407026831	–	–
	22	R407026795	R407026812	R407026832	R407026849	–
40	22	R407026796	R407026813	R407026833	R407026850	–
	28	R407026797	R407026814	R407026834	R407026851	–
50	28	R407026798	R407026815	R407026835	R407026852	R407026866
	36	R407026799	R407026816	R407026836	R407026853	R407026867
63	36	R407026800	R407026817	R407026837	R407026854	R407026868
	45	R407026801	R407026818	R407026838	R407026855	R407026869
80	45	R407026802	R407026819	R407026839	R407026856	R407026870
	56	R407026803	R407026820	R407026840	R407026857	R407026871
100	56	R407026804	R407026821	R407026841	R407026858	R407026872
	70	R407026805	R407026822	R407026842	R407026859	R407026873
125	70	R407026806	R407026823	R407026843	R407026860	R407026874
	90	R407026807	R407026824	R407026844	R407026861	R407026875
160	90	R407026808	R407026825	R407026845	R407026862	R407026876
	110	R407026809	R407026826	R407026846	R407026863	R407026877
200	110	R407026810	R407026827	R407026847	R407026864	R407026878
	140	R407026811	R407026828	R407026848	R407026865	R407026879

[3)] = Seal kits for proximity switches, separate Material no., see below

Only for proximity switch

AL Ø	Material no. for seal variant M, T, A	V, S
25 and 32	–	–
40 to 200	R900885938	R900885939

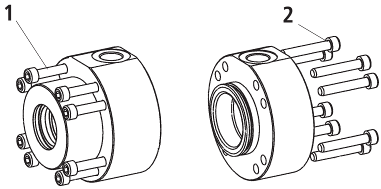
Only for position transducer

AL Ø	Material no. for seal variant M, T	S
40	R407026769	R407026777
50	R407026770	R407026778
63	R407026771	R407026779
80	R407026772	R407026780
100	R407026773	R407026781
125	R407026774	R407026782
160	R407026775	R407026783
200	R407026776	R407026784

AL = Piston Ø in mm
MM = Piston rod Ø in mm

Tightening torques

Screws: Head and cap (items 1 and 2)



Series	Piston Ø	Screw	Qty	Grade	Tightening torque
CDM1 / CGM1 / CSM1	**25**	M6	4	10.9	13 Nm
CDM1 / CGM1 / CSM1	**32**	M6	4	10.9	13 Nm
CDM1 / CGM1 / CSM1	**40**	M6	4	10.9	13 Nm
CDM1 / CGM1 / CSM1	**50**	M8	4	10.9	30 Nm
CDM1 / CGM1 / CSM1	**63**	M10	4	10.9	60 Nm
CDM1 / CGM1 / CSM1	**80**	M10	8	10.9	50 Nm
CDM1 / CGM1 / CSM1	**100**	M10	8	10.9	60 Nm
CDM1 / CGM1 / CSM1	**125**	M12	12	10.9	100 Nm
CDM1 / CGM1 / CSM1	**160**	M12	16	10.9	100 Nm
CDM1 / CGM1 / CSM1	**200**	M16	16	10.9	200 Nm

Cylinder weight

Piston	Piston rod	CD / CS cylinder at 0 mm stroke length							Per 100 mm stroke length	CG cylinder at 0 mm stroke length				Per 100 mm stroke length
AL Ø mm	**MM Ø** mm	**M00** kg	**MP3[1)] MP5[1)]** kg	**MP3[2)] MP5[2)]** kg	**MF1 MF2** kg	**MF3 MF4** kg	**MT4** kg	**MS2** kg	kg	**MF1** kg	**MF3** kg	**MT4** kg	**MS2** kg	kg
25	**14**	2.2	2.3	–	2.6	2.7	2.6	3.2	0.5	3.0	3.1	3.0	3.6	0.6
	18	2.2	2.3	–	2.6	2.7	2.6	3.2	0.6	3.0	3.1	3.0	3.6	0.8
32	**18**	3.1	3.3	–	3.8	4.0	3.7	4.7	0.7	4.3	4.5	4.2	5.2	0.9
	22	3.1	3.3	–	3.8	4.0	3.7	4.7	0.8	4.3	4.5	4.2	5.2	1.1
40	**22**	5.5	5.9	–	6.4	6.7	6.5	7.6	0.9	7.1	7.5	7.3	8.4	1.2
	28	5.6	6.0	10.2	6.5	6.8	6.6	7.7	1.1	7.1	7.5	7.3	8.4	1.5
50	**28**	8.1	8.9	14.4	9.7	10.2	9.8	12.0	1.2	11.0	11.5	11.1	13.3	1.7
	36	8.3	9.1	14.6	9.9	10.4	10.0	12.2	1.5	11.0	11.5	11.1	13.3	2.3
63	**36**	14.0	15.5	25.0	17.0	17.5	17.0	20.0	2.1	18.5	19.0	18.5	22.0	2.9
	45	14.0	15.5	25.0	17.0	17.5	17.0	20.0	2.6	18.5	19.0	18.5	22.0	3.8
80	**45**	20.0	22.5	30.5	24.0	25.0	24.0	29.0	2.9	27.0	28.0	27.0	32.0	4.1
	56	20.0	22.5	30.5	24.0	25.0	24.0	29.0	3.6	27.0	28.0	27.0	32.0	5.5
100	**56**	36.0	41.0	53.0	42.5	44.5	43.5	52.0	5.4	48.0	50.0	49.0	57.5	7.4
	70	37.0	42.0	54.0	43.5	45.5	44.5	53.0	6.5	50.0	52.0	51.0	59.5	9.5
125	**70**	60.0	66.0	84.0	68.0	70.0	73.5	86.0	7.3	78.0	80.0	83.0	96.0	10.3
	90	61.0	67.0	85.0	69.0	71.0	74.5	87.0	9.3	81.0	83.0	86.0	99.0	14.2
160	**90**	107.0	122.0	150.0	–	121.0	136.0	148.0	11.5	–	143.0	158.0	170.0	16.5
	110	108.0	123.0	151.0	–	122.0	137.0	149.0	14.0	–	145.0	160.0	172.0	21.4
200	**110**	193.0	222.0	262.0	–	217.0	245.0	259.0	15.4	–	267.0	295.0	309.0	22.9
	140	196.0	225.0	265.0	–	220.0	248.0	262.0	20.1	–	273.0	301.0	315.0	32.1

1) = Weight for CD cylinder

2) = Weight for CS cylinder

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Tie rod cylinder

Designation	Type	Piston Ø in mm	Series	Nominal pressure in bar	Data sheet	Page
Differential cylinder / Double rod cylinder						
Hydraulic cylinder, Tie rod design	CDT3...Z CGT3...Z CST3...Z	25 ... 200	2X	160	17049	367
Hydraulic cylinder, Tie rod design	CD70 CG70	25 ... 200	1X	70	17016	435
Hydraulic cylinder, Tie rod design	CD210 CG210	40 ... 200	1X	210	17017	515

Designation	Type	Piston Ø in mm	Series	Nominal pressure in bar	Data sheet	Page
Differential cylinder						
Hydraulic cylinder, Tie rod design	VBH	25 ... 125		200	17047	587

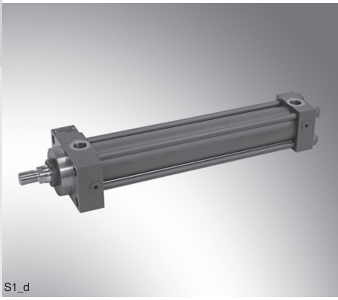
3

Rexroth
Bosch Group

Hydraulic cylinder
Tie rod design

RE 17049/07.13
Replaces: 02.13

Series CDT3…Z; CGT3…Z; CST3…Z


S1_d

Component series 2X
Nominal pressure 160 bar (16 MPa)

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Project planning software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Features

- Installation dimensions according to ISO 6020-2, DIN 24554 and NF/ISO 6020-2
- 13 types of mounting
- Piston Ø **(ØAL)**: 25 to 200 mm
- Piston rod Ø **(ØMM)**: 12 to 140 mm
- Stroke lengths up to 2700 mm
- Integrated guide socket for fast and easy maintenance
- Self-adjusting or adjustable end position cushioning as option
- Patented safety bleeding device for easy and safe bleeding
- Easy assembly thanks to freely selectable position of the line connections at head and base

Technical data (For applications outside these parameters, please consult us!)

Nominal pressure:	160 bar (16 MPa)
Maximum operating pressure (only static load)**:**	210 bar (21 MPa)
Static test pressure:	240 bar (24 MPa)

Cylinders of this series are designed for a nominal pressure of 160 bar and in version CD for a maximum operating pressure of 210 bar with static load.

(Static load: Less than 10,000 load cycles over the entire life cycle)

The admissible dynamic operating pressure amounts to 75 % of the maximum operating pressure with maximum amplitude and oscillatory load.

The specified operating pressures apply to applications with shock-free operation with regard to excess pressure and/or external loads. With extreme loads like e.g. high cycle sequence, mounting elements and threaded piston rod connections must be designed for durability.

Minimum pressure:
Depending on the application, a certain minimum pressure is required in order to guarantee good functioning of the cylinder. Without load, a minimum pressure of 20 bar is recommended for differential cylinders; for lower pressures as well as double-acting cylinders, please contact us.

Installation position: Any

Hydraulic fluid:
Mineral oils DIN 51524 HL, HLP
Oil-in-water emulsion HFA
Water glycol HFCP
Phosphate ester HFD-R

Hydraulic fluid temperature range: See page 61

Ambient temperature range: See page 61

Optimum viscosity range: 20 to 100 mm^2/s

Minimum admissible viscosity: 2.8 mm^2/s

Maximum admissible viscosity: 380 mm^2/s

Cleanliness class according to ISO
Maximum admissible degree of contamination of the hydraulic fluid according to ISO 4406 (c) class 20/18/15.
The cleanliness classes specified for the components need to be met in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter

Bleeding: By default

Primer coat: By default, hydraulic cylinders are primed with a coating (color gentian blue RAL 5010) of min. 40 µm. Other colors upon request.
With cylinders and attachment parts, the following surfaces are not primed or painted:

- All fit diameters to the customer side
- Sealing surfaces for line connection
- Sealing surfaces for flange connection
- Connection surface for valve mounting position measurement system

Accessories that are ordered as separate order item are not primed or painted by default. Corresponding priming and/or painting on request.

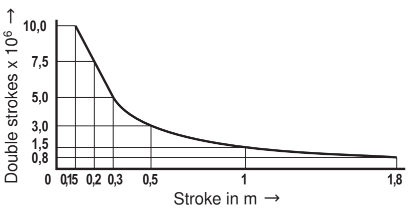
Technical data (For applications outside these parameters, please consult us!)

Boundary and application conditions:

- The mechanical alignment of the movement axis and thus the mounting points of hydraulic cylinder and piston rod must be ensured. Lateral forces on the guides of piston rod and piston are to be avoided. It may be necessary to consider the own weight of the hydraulic cylinder (MP1, MP3, MP5, MT1, MT2 or MT4) or the piston rod.
- The kinking length/kinking load of the piston rod and/or the hydraulic cylinder must be observed (see page topic kinking).
- The maximum admissible stroke velocities with regard to the suitability/load of seals must be observed as must their compatibility with the properties of the fluid type (see page topic seals).
- The maximum admissible velocities/kinetic energies when moving into the end positions, also considering external loads, must be observed.
  Danger: Excess pressure
- The maximum admissible operating pressure must be complied with in any operating state of the hydraulic cylinder. Possible pressure intensification resulting from the area ratio of annulus to piston area and possible throttling points are to be observed.
- Detrimental environmental influences, like e.g. aggressive finest particles, vapors, high temperatures, etc. as well as contaminations and deterioration of the hydraulic fluid are to be avoided.

Notice: This list does not claim to be complete. In case of questions regarding the compatibility with the medium or exceedance of the boundary or application conditions, please contact us.

Life cycle:
Rexroth cylinders correspond to the reliability recommendations for industrial applications.
≥ 10000000 double strokes in idle continuous operation or 3000 km piston travel at 70 % of the maximum operating pressure, without load on the piston rod, with a maximum velocity of 0.5 m/s, with a failure rate of less than 5 %.



Acceptance:
Each cylinder is tested according to Bosch Rexroth standard and in compliance with ISO 10100: 2001.

Safety instructions:
For the assembly, commissioning and maintenance of hydraulic cylinders, the operating instructions data sheet 07100-B have to be observed!
Service and repair works have to be performed by Bosch Rexroth or by personnel especially trained for this purpose. No warranty is accepted for damage as a consequence of assembly, maintenance or repair works not performed by Bosch Rexroth.

Check lists for hydraulic cylinders:
Cylinders the characteristics and/or application parameters of which deviate from the values specified in the data sheet can only be offered as special version upon request. For offers, the deviations of the characteristics and/or application parameters must be described in the check lists for hydraulic cylinders (data sheet 07200).

Double-acting cylinders with continuous piston rod:
With this design type, the friction is considerably higher than with the "CD version" with simple piston rod.

Stroke tolerances:
According to ISO 6020-2, a stroke tolerance of 0/+2 mm is admissible for strokes up to 1250 mm; for larger strokes please contact us.

A tolerance of ±0.3 mm is possible as option, smaller tolerances are not reasonable for tie rod cylinders.

Minimum strokes:
For the "MT4" mounting, the minimum stroke is to be observed due to the trunnion width, see pages 16 and 36.

When using end position cushioning, the minimum stroke must also be observed. With stroke lengths smaller than the cushioning length, we recommend selecting the cylinder without end position cushioning.

Support width extension and tie rod support are possible upon request.

Line connections:
The cylinders of series CDT3/CGT3 are supplied with pipe thread or enlarged pipe thread according to ISO 1179-1 or metric ISO thread according to ISO 6149-1.

The cylinders of series CST3 are supplied with pipe thread according to ISO 1179-1 or with subplate.

Stroke velocity:
See information on stroke length and stroke velocity, higher stroke velocity on request.
If the extension velocity is considerably higher than the retraction velocity of the piston rod, drag-out losses of the medium may result. If necessary, please consult us.

Information on stroke length and stroke velocity

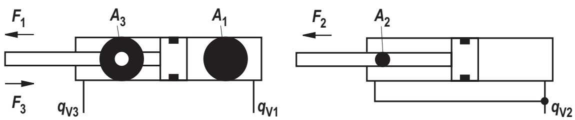
ØAL (mm)		**25**	**32**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**
Min **recommended** stroke in mm	without cushioning	–	–	–	–	–	–	–	–	–	–
	with cushioning	30	32	46	44	50	54	56	68	73	106
Maximum velocity (m/s)	Seal design M; 160 bar	0.50				0.40		0.30		0.25	
	Seal design M; 100 bar	0.70				0.60		0.40		0.35	
	Seal design T, S; 160 bar	1.00				0.80		0.60		0.50	
Recommended minimum velocity (mm/s)	Seal design M	30									
	Seal design T, S	1									

Project planning software ICS (Interactive Catalog System)

The ICS (Interactive Catalog System) is a selection and project planning aid for hydraulic cylinders. The ICS allows designers for machines and systems to quickly and reliably find the perfect hydraulic cylinder solution through logic-guided type key enquiries. This software helps to solve design and project planning tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical date of the selected component as well as 2D and 3D CAD data in the correct file format for all common CAD systems.
This allows users to reduce costs while increasing their competitiveness.

Areas, forces, flow: Series CDT3 (for operating pressure up to 210 bar)

Piston	Piston rod		Area ratio	Areas			Force [1]						Flow at 0.1 m/s [2]			Max. available stroke length (mm)
				Piston	Rod	Ring	Pressure		Diff.		Pulling		Off	Diff.	On	
ØAL mm	ØMM mm		φ A_1/A_3	A_1 cm²	A_2 cm²	A_3 cm²	F_1 kN		F_2 kN		F_3 kN		q_{V1} l/min	q_{V2} l/min	q_{V3} l/min	
	160 bar	210 bar					160 bar	210 bar	160 bar	210 bar	160 bar	210 bar				
25	**12** **18**	**-** **18**	1.3 2.07	4.91	1.13 2.54	3.78 2.37	7.86	- 10.31	1.81 4.06	- 5.33	6.05 3.79	- 4.98	2.9	0.70 1.50	2.30 1.40	600
32	**14** **22**	**-** **22**	1.25 1.90	8.04	1.54 3.80	6.5 4.24	12.86	- 16.88	2.46 6.08	- 7.98	10.40 6.78	- 8.90	4.8	0.90 2.30	3.90 2.50	800
40	**18** **22** [3] **28**	**-** **22** [3] **28**	1.25 1.43 1.96	12.56	2.54 3.80 6.16	10.02 8.76 6.4	20.10	- 26.38	4.06 6.08 9.86	- 7.98 12.94	16.03 14.02 10.24	- 18.40 13.44	7.5	1.50 2.30 3.70	6.00 5.30 3.80	1000
50	**22** **28** [3] **36**	**-** **28** [3] **36**	1.25 1.46 2.08	19.63	3.8 6.16 10.18	15.83 13.47 9.45	31.41	- 41.22	6.08 9.86 16.29	- 12.94 21.38	25.33 21.55 15.12	- 28.29 19.85	11.8	2.30 3.70 6.10	9.50 8.10 5.70	1200
63	**28** **36** [3] **45**	**-** **36** [3] **45**	1.25 1.48 2.04	31.17	6.16 10.18 15.90	25.01 20.99 15.27	49.87	- 65.46	9.86 16.29 25.44	12.94 21.38 33.39	40.02 33.58 24.43	- 44.08 32.07	18.7	3.70 6.10 9.50	15.00 12.60 9.20	1400
80	**36** **45** [3] **56**	**-** **45** [3] **56**	1.25 1.46 1.96	50.26	10.18 15.90 24.63	40.08 34.36 25.63	80.42	- 105.55	16.29 25.44 39.41	21.38 33.39 51.72	64.13 54.98 41.01	- 72.16 53.82	30.2	6.10 9.50 14.80	24.00 20.60 15.40	1700
100	**45** **56** [3] **70**	**-** **56** [3] **70**	1.25 1.46 1.96	78.54	15.90 24.63 38.48	62.64 53.91 40.06	125.66	- 164.93	25.44 39.41 61.57	33.39 51.72 80.81	100.22 86.26 64.10	- 113.21 84.13	47.1	9.50 14.80 23.10	37.60 32.30 24.00	2000
125	**56** **70** [3] **90**	**-** **70** [3; 4] **90** [4]	1.25 1.46 2.08	122.72	24.63 38.48 63.62	98.09 84.24 59.1	196.35	- [4]	39.41 61.57 101.79	51.72 80.81 133.60	156.94 134.78 94.56	- [4] [4]	73.6	14.80 23.10 38.20	58.90 50.50 35.50	2300
160	**70** **110**	- **110** [4]	1.25 1.90	201.06	38.48 95.03	162.58 106.03	321.70	- [4]	61.57 152.05	80.81 199.56	260.13 169.65	- [4]	120.6	23.10 57.00	97.50 63.60	2600
200	**90** **140**	- **140** [4]	1.25 1.96	314.16	63.62 153.94	250.54 160.22	502.66	- [4]	101.79 246.30	133.60 323.27	400.86 256.35	- [4]	188.5	38.20 92.40	150.30 96.10	2700



[1] Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. tilt heads, plates or valves, etc.)

[2] Stroke velocity

[3] Piston rod Ø not standardized

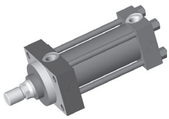
[4] With operating pressures up to 210 bar only on request

3

Overview types of mounting: Series CDT3 (for operating pressure up to 210 bar)

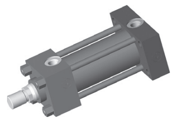
CDT3 ME5 (ISO/DIN/NF)

see page 10, 11



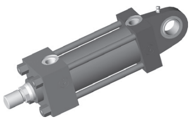
CDT3 ME6 (ISO/DIN/NF)

see page 10, 11



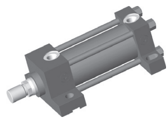
CDT3 MP5 (ISO/DIN/NF)

see page 12, 13



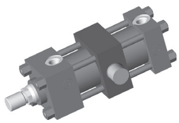
CDT3 MS2 (ISO/DIN/NF)

see page 14, 15



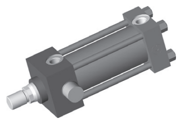
CDT3 MT4 (ISO/DIN/NF)

see page 16, 17



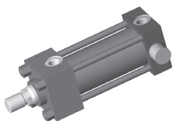
CDT3 MT1 (ISO/DIN/NF)

see page 18, 19



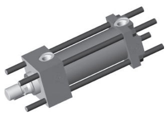
CDT3 MT2 (ISO/DIN/NF)

see page 18, 19



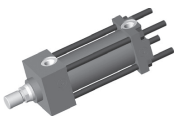
CDT3 MX1 (ISO/DIN/NF)

see page 20, 21



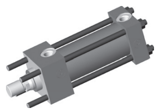
CDT3 MX2 (ISO/DIN/NF)

see page 22, 23



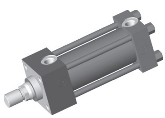
CDT3 MX3 (ISO/DIN/NF)

see page 22, 23



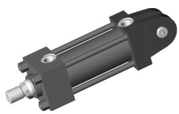
CDT3 MX5 (NF)

see page 24, 25



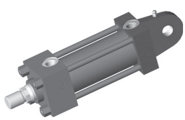
CDT3 MP1 (ISO/DIN/NF)

see page 26, 27



CDT3 MP3 (ISO/DIN/NF)

see page 26, 27



Ordering code: Series CDT3 (for operating pressure up to 210 bar)

The preferred cylinder designs are marked in gray.

CD	T3	/	/	/	Z	2X									*

Differential cylinder **= CD**

Series **= T3**

Types of mounting DIN/ISO

Rectangular flange at head	**= ME5**
Rectangular flange at base	**= ME6**
Self-aligning clevis at base	**= MP5**
Foot mounting	**= MS2**
Trunnion in center [1]	**= MT4**

Types of mounting ISO

Fork at base	**= MP1**
Swivel eye at base	**= MP3**
Trunnion at head	**= MT1**
Trunnion at base	**= MT2**
Extended tie rod, on both sides	**= MX1**
Extended tie rod, at base	**= MX2**
Extended tie rod, at head	**= MX3**
Tapped hole at head [2]	**= MX5**

Piston Ø (ØAL) 25 to 200 mm

Piston rod Ø (ØMM) 12 to 140 mm [13]

Stroke length in mm [11]

Design principle
Head and base connected to tie rod **= Z**

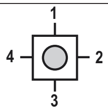
Component series **= 2X**
20 to 29 unchanged installation and connection dimensions

Line connection/design

Pipe thread (ISO 1179-1)	**= B**
Metric ISO thread (ISO 6149-1)	**= R**
Enlarged pipe thread (ISO 1179-1)	**= S**

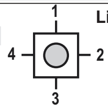
Line connection/position at head
see page 41

View to piston rod



= 1
= 2
= 3
= 4

Line connection/position at base
see page 41



1 =
2 =
3 =
4 =

View to piston rod

Piston rod design

H =	Hardened and hard chromium-plated

Piston rod end
See pages 10 to 27

H = [14]	Thread (DIN/ISO) for tilt head CGKA
D = [15]	Thread (ISO) for tilt head CGKA
E = [12]	Internal thread
F = [5; 14]	With mounted tilt head CGKA (DIN/ISO)
K = [5; 15]	With mounted tilt head CGKA (ISO)
T = [6]	With trunnion

End position cushioning
See pages 56 to 60

U =	Without
D =	On both sides, self-adjusting
S =	Head side, self-adjusting
K =	Base side, self-adjusting
E = [4]	On both sides, adjustable

Seal design

M =	Standard seal system
T =	Reduced friction
S =	High temperature with reduced friction

Option 1

W =	Without option
B = [3; 4; 16]	Leakage oil connection
A =	Threaded coupling, on both sides

Option 2

W =	Without option
Y =	Specify the piston rod extension LY in the clear text in mm

Further details in the plain text

Comments:

1) Trunnion position freely selectable; when ordering, always specify the "XV" dimension in the clear text in mm

2) Not ISO standardized

3) With type of mounting MS2 and piston Ø 25 and end position cushioning, "E" is not possible

4) With piston Ø 25 to 100 mm: Only line connection "B" possible
With piston Ø 125 to 200 mm: Only DIN types of mounting and line connection "B" possible

5) Not possible with type of mounting MX1 and MX3

6) See page 44 (Only with standardized piston rod Ø 22 to 140 mm possible), observe the max. operating pressure

11) Observe the max. stroke length available, page 5, and the admissible stroke length (according to kinking calculation) on pages 52 to 55

12) See page 44 (Only with standardized piston rod Ø 18 to 140 mm possible), observe the max. operating pressure

13) Observe the admissible piston rod Ø and assigned threads at the piston rod end for 210 bar (pages 5 and 10 to 27)

Order example:
CDT3MP5/50/36/300Z2X/B11HHDMWW

When selecting, please observe the limitations on the corresponding catalog pages!

14) For operating pressure up to 160 bar

15) For operating pressure up to 210 bar

16) Not possible with MT1

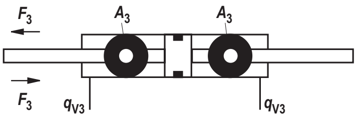
Areas, forces, flow: Series CGT3 (for operating pressure up to 160 bar)

Piston ØAL mm	Piston rod ØMM mm	Areas A_3 cm²	Force at 160 bar [1] F_3 kN	Flow at 0.1 m/s [2] q_{V3} l/min	Max. available stroke length (mm)
25	**12**	3.78	6.04	2.3	600
	18	2.37	3.78	1.4	
32	**14**	6.50	10.40	3.9	800
	22	4.24	6.79	2.5	
40	**18**	10.02	16.03	6.0	1000
	22 [3]	8.77	14.02	5.3	
	28	6.40	10.25	3.8	
50	**22**	15.83	25.33	9.5	1200
	28 [3]	13.48	21.56	8.1	
	36	9.45	15.13	5.7	
63	**28**	25.01	40.02	15.0	1400
	36 [3]	20.99	33.59	12.6	
	45	15.27	24.43	9.2	
80	**36**	40.08	64.14	24.0	1700
	45 [3]	34.36	54.98	20.6	
	56	25.63	41.02	15.4	
100	**45**	62.64	100.21	37.6	2000
	56 [3]	53.91	86.26	32.3	
	70	40.06	64.09	24.0	
125	**56**	98.09	156.94	58.9	2300
	70 [3]	84.23	134.77	50.5	
	90	59.10	94.56	35.5	
160	**70**	162.58	260.12	97.5	2600
	110	106.03	169.64	63.6	
200	**90**	250.54	400.86	150.3	2700
	140	160.22	256.35	96.1	

1) Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. tilt heads, plates or valves, etc.)

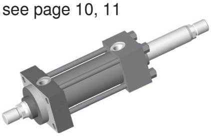
2) Stroke velocity

3) Piston rod Ø not standardized

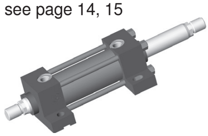


Overview types of mounting: Series CGT3 (for operating pressure up to 160 bar)

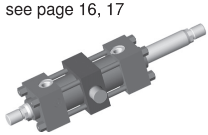
CGT3 ME5
see page 10, 11



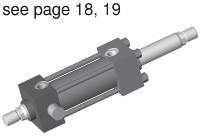
CGT3 MS2
see page 14, 15



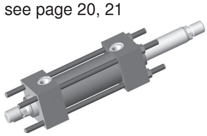
CGT3 MT4
see page 16, 17



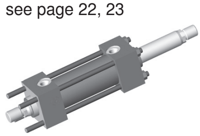
CGT3 MT1
see page 18, 19



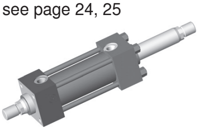
CGT3 MX1
see page 20, 21



CGT3 MX3
see page 22, 23



CGT3 MX5
see page 24, 25



Ordering code: Series CGT3 (for operating pressure up to 160 bar)

CG	T3	/	/	/	Z	2X									*

Double-acting cylinder 10) = **CG**

Series = **T3**

Types of mounting
Rectangular flange at head = **ME5**
Foot mounting = **MS2**
Trunnion in center 1) = **MT4**
Trunnion at head = **MT1**
Extended tie rods, on both sides = **MX1**
Extended tie rods, at head = **MX3**
Tapped hole at head = **MX5**

Piston Ø (ØAL) 25 to 200 mm

Piston rod Ø (ØMM) 12 to 140 mm

Stroke length in mm 14)

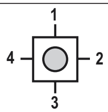
Design principle
Head and base connected to tie rod = **Z**

Component series = **2X**
20 to 29 unchanged installation and connection dimensions

Line connection/design
Pipe thread (ISO 1179-1) = **B**
Metric ISO thread (ISO 6149-1) = **R**
Enlarged pipe thread (ISO 1179-1) = **S**

Line connection/position at head
see page 41

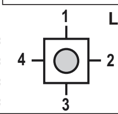
View to piston rod



= **1**
= **2**
= **3**
= **4**

Line connection/position at base
see page 41

View to piston rod



1 =
2 =
3 =
4 =

Piston rod design
H = Hardened and hard chromium-plated

Piston rod end
see pages 10 to 27
H = Thread (DIN/ISO) for tilt head CGKA
D = Thread (ISO) for tilt head CGKA
E = 12) Internal thread
F = 5) With mounted tilt head CGKA (DIN/ISO)
K = 5) With mounted tilt head CGKA (ISO)

End position cushioning
see pages 56 to 60
U = Without
D = On both sides, self-adjusting
S = Head side, self-adjusting
K = Base side, self-adjusting
E = 4) On both sides, adjustable

Seal design
M = Standard seal system
T = Servo quality/reduced friction
S = High temperature with reduced friction

Option 1
W = Without option
B = 3; 4; 16) Leakage oil connection
A = Threaded coupling, on both sides

Option 2
W = Without option
Y = Specify the piston rod extension LY in the clear text in mm

Further details in the plain text

Comments:

1) Trunnion position freely selectable; when ordering, always specify the "XV" dimension in the clear text in mm

3) With type of mounting MS2 and piston Ø 25 and end position cushioning, "E" is not possible

4) With piston Ø 25 to 100 mm: Only line connection "B" possible
With piston Ø 125 to 200 mm: Only DIN types of mounting and line connection "B" possible

5) Not possible with type of mounting MX1 and MX3

10) Not standardized

12) See page 44 (only with standardized piston rod Ø 18 to 140 mm possible), observe the max. operating pressure

14) Observe the max. stroke length available, page 8, and the admissible stroke length (according to kinking calculation) on pages 52 to 55

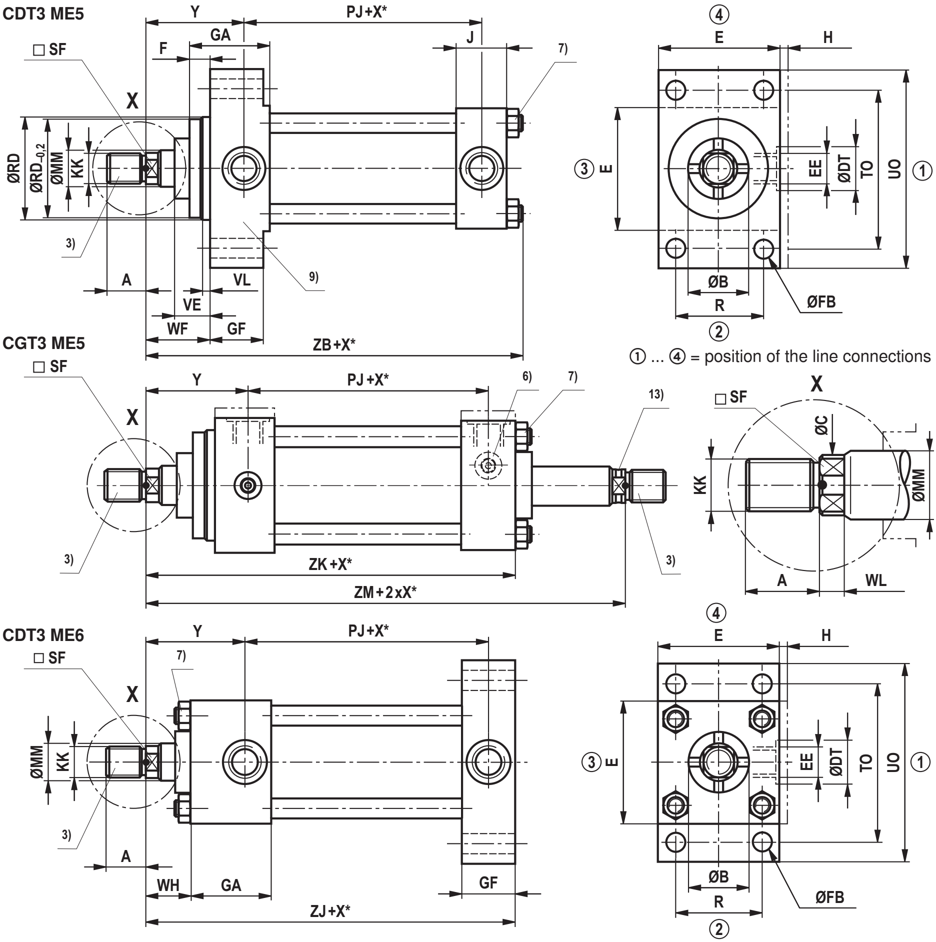
16) Not possible with MT1

Order example:
CGT3ME5/80/56/400Z2X/B11HHDMWW

When selecting, please observe the limitations on the corresponding catalog pages!

3

Dimensions: Type of mounting ME5, ME6 (dimensions in mm)



ØAL	F max	ØFB H13	GF [9)]	R JS13	TO JS13	UO max	VE max	VL min	ZB max	ZJ ± 1	ZK ± 1	ZM ± 2
25	10	5,5	25	27	51	65	16	3	121	114	138	154
32	10	6,6	26,5	33	58	70	22	3	137	128	151	177
40	10	11	38	41	87	110	22	3	166	153	172	196
50	16	14	38	52	105	130	25	4	176	159	183	207
63	16	14	38	65	117	145	29	4	185	168	190	223
80	20	18	45	83	149	180	29	4	212	190	216	246
100	22	18	45	97	162	200	32	5	225	203	230	265
125	22	22	58	126	208	250	32	5	260	232	254	289
160	25	26	58	155	253	300	32	5	279	245	270	302
200	25	33	76	190	300	360	32	5	336	299	324	356

Dimensions: ME5, ME6 (dimensions in mm)

		DIN / ISO [1] (for operating pressure up to 160 bar)					ISO [2] (for operating pressure up to 210 bar)						
ØAL	ØMM	KK [1]	A [1] max	ØC	SF	WL	KK [2]	A [2] max	ØC	SF	WL	ØB f9	ØRD f8
25	12	M10x1.25	14	11	10	5	–	–	–	–	–	24	38
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30	38
32	14	M12x1.25	16	13	12	5	–	–	–	–	–	26	42
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34	42
40	18	M14x1.5	18	16.5	14	5	–	–	–	–	–	30	62
	22 [12]	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34	62
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42	62
50	22	M16x1.5	22	20.5	18	5	–	–	–	–	–	34	74
	28 [12]	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42	74
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50	74
63	28	M20x1.5	28	26	22	7	–	–	–	–	–	42	75
	36 [12]	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50	88
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60	88
80	36	M27x2	36	34	30	8	–	–	–	–	–	50	82
	45 [12]	M27x2	36	43	36	10	M33x2	45	43	36	10	60	105
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72	105
100	45	M33x2	45	43	36	10	–	–	–	–	–	60	92
	56 [12]	M33x2	45	54	46	10	M42x2	56	54	46	10	72	125
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88	125
125	56	M42x2	56	53	46	10	–	–	–	–	–	72	105
	70 [12]	–	–	–	–	–	M48x2 [14]	63	67	60	15	88	150
	90	M42x2	56	86	75	15	M64x3 [14]	85	86	75	15	108	150
160	70	M48x2	63	67	60	15	–	–	–	–	–	88	125
	110	M48x2	63	106	92	18	M80x3 [14]	95	106	92	18	133	170
200	90	M64x3	85	86	75	15	–	–	–	–	–	108	150
	140	M64x3	85	136	125	18	M100x3 [14]	112	136	125	18	163	210

ØAL	E	EE	ØDT	EE	ØDT	GA	H [5]	J	PJ [10] ± 1,25	PJ [11] ± 1,25	WF ± 2	WH ± 2	Y [10] ± 2	Y [11] ± 2
25	40 ± 1,5	G 1/4	25	M14x1,5	21	46,5	5	22,5	53	64,5	25	15	50	38,5
32	45 ± 1,5	G 1/4	25	M14x1,5	21	48	5	25	56	68,5	35	25	60	47,5
40	63 ± 1,5	G 3/8	28	M18x1,5	26	52,5	–	33,5	73	77	35	25	62	58
50	75 ± 1,5	G 1/2	34	M22x1,5	29	57,5	–	33,5	74	78	41	25	67	63
63	90 ± 1,5	G 1/2	34	M22x1,5	29	57,5	–	35,5	80	81	48	32	71	70
80	115 ± 1,5	G 3/4	42	M27x2	34	67	–	41	93	93	51	31	77	77
100	130 ± 2	G 3/4	42	M27x2	34	70	–	43	101	101	57	35	82	82
125	165 ± 2	G 1	47	M33x2	43	73,5	–	51,5	117	117	57	35	86	86
160	205 ± 2	G 1	47	M33x2	43	80,5	–	55,5	130	130	57	32	86	86
200	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	165	165	57	32	98	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

Line connection/ position	Position H	
	ME5 head	ME6 base
1	1	1
2	1	1
3	3	3
4	3	3

5) "H" dimension always in line connection position Exception ME5 head and ME6 base

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 63

9) Flange thickness according to DIN 24554

10) ME5: For line connection position "1" and "3" at head

11) ME5: For line connection position "2" and "4" at head

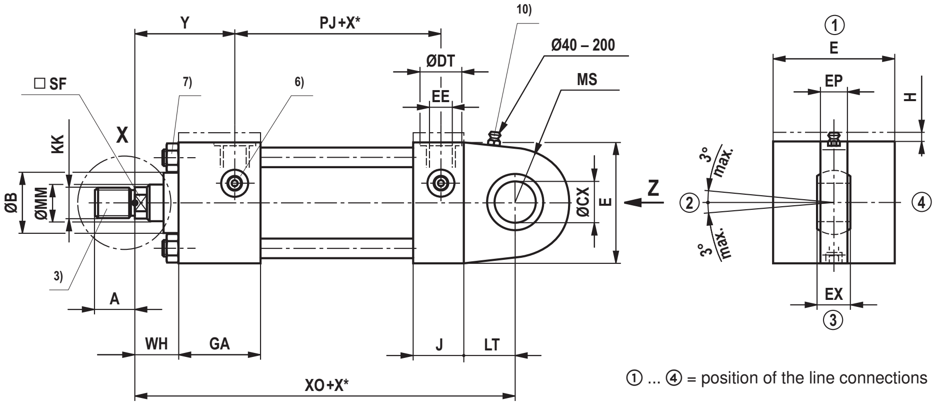
12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

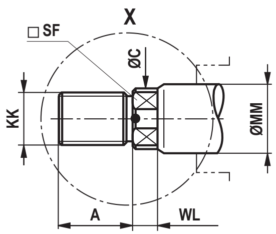
14) With operating pressures up to 210 bar only on request

Dimensions: Type of mounting MP5 (dimensions in mm)

CDT3 MP5



① ... ④ = position of the line connections



ØAL	ØCX	EP h13	EX	LT min	XO ± 1,5	MS max
25	12 – 0.008	8	10 – 0.12	16	130	20
32	16 – 0.008	11	14 – 0.12	20	148	22.5
40	20 – 0.012	13	16 – 0.12	25	178	29
50	25 – 0.012	17	20 – 0.12	31	190	33
63	30 – 0.012	19	22 – 0.12	38	206	40
80	40 – 0.012	23	28 – 0.12	48	238	50
100	50 – 0.012	30	35 – 0.12	58	261	62
125	60 – 0.015	38	44 – 0.15	72	304	80
160	80 – 0.015	47	55 – 0.15	92	337	100
200	100 – 0.020	57	70 – 0.20	116	415	120

Dimensions: MP5 (dimensions in mm)

		DIN / ISO [1] (for operating pressure up to 160 bar)					ISO [2] (for operating pressure up to 210 bar)					
ØAL	ØMM	KK [1]	A [1] max	ØC	SF	WL	KK [2]	A [2] max	ØC	SF	WL	ØB f9
25	12	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	14	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	18	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 [12]	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	22	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 [12]	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	28	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 [12]	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	36	M27x2	36	34	30	8	–	–	–	–	–	50
	45 [12]	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	45	M33x2	45	43	36	10	–	–	–	–	–	60
	56 [12]	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	56	M42x2	56	53	46	10	–	–	–	–	–	72
	70 [12]	–	–	–	–	–	M48x2 [14]	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 [14]	85	86	75	15	108
160	70	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 [14]	95	106	92	18	133
200	90	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 [14]	112	136	125	18	163

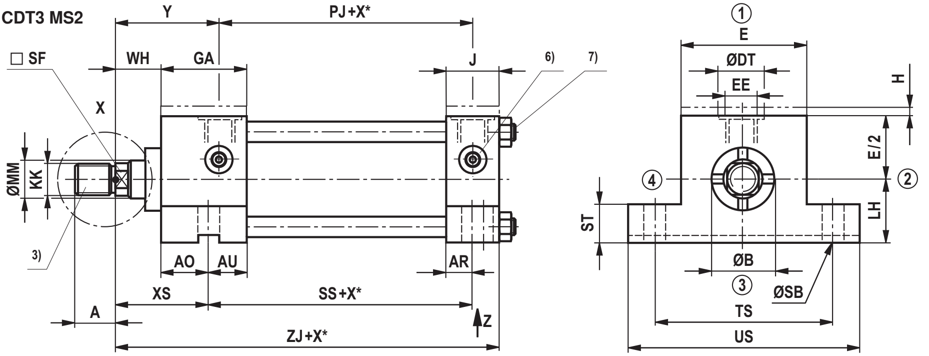
ØAL	E	EE	ØDT	EE	ØDT	GA	H [5]	J	PJ ± 1,25	WH ± 2	Y ± 2
25	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	53	15	50
32	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	56	25	60
40	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	73	25	62
50	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	74	25	67
63	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	80	32	71
80	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	93	31	77
100	130 ± 2	G 3/4	42	M27x2	34	70	–	43	101	35	82
125	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	117	35	86
160	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	130	32	86
200	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	165	32	98

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
3) For piston rod ends "E" and "T" see page 44
5) "H" dimension always in line connection position
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
10) Lubricating nipple M6 DIN 71412 from piston Ø 40 mm
12) Piston rod Ø not standardized
14) With operating pressures up to 210 bar only on request

3

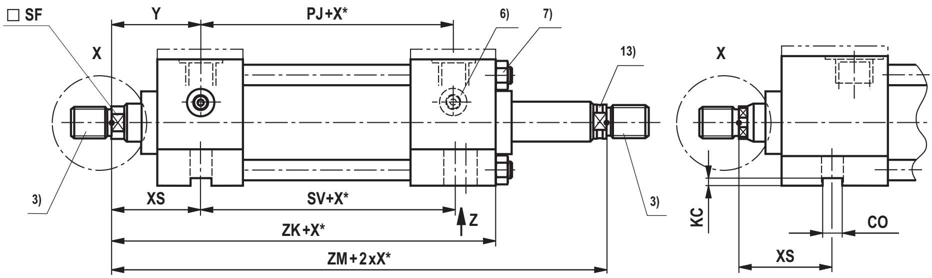
Dimensions: Type of mounting MS2 (dimensions in mm)

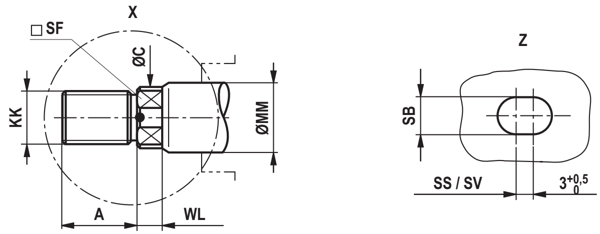
CDT3 MS2



CGT3 MS2

① ... ④ = position of the line connections





ØAL	CO N9	KC $^{+0,2}_{0}$	LH h10	ØSB H13	SS ± 1,25	ST	SV ± 1	TS JS13	US max	XS ± 2	ZJ ± 1	ZK ± 1	ZM ± 2	AO	AU
25	12	3	19	6.6	72	8.5	87	54	72	33	114	138	154	18	28.5
32	12	4	22	9	72	12.5	87	63	84	45	128	151	177	20	28
40	12	4	31	11	97	12.5	105	83	103	45	153	172	196	20	32.5
50	12	4.5	37	14	91	19	99	102	127	54	159	183	207	29.5	28
63	16	4.5	44	18	85	26	92	124	161	65	168	190	223	33	24.5
80	16	5	57	18	104	26	110	149	186	68	190	216	246	39	28
100	16	6	63	26	101	32	107	172	216	79	203	230	265	44	26
125	20	5	82	26	131	32	131	210	254	79	232	254	289	44	29.5
160	–	–	101	33	130	38	130	260	318	86	245	270	302	54	26.5
200	–	–	122	39	172	44	172	311	381	92	299	324	356	60	41

Dimensions: MS2 (dimensions in mm)

		DIN / ISO [1] (for operating pressure up to 160 bar)					ISO [2] (for operating pressure up to 210 bar)					
ØAL	ØMM	KK [1]	A [1] max	ØC	SF	WL	KK [2]	A [2] max	ØC	SF	WL	ØB f9
25	12	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	14	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	18	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 [12]	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	22	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 [12]	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	28	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 [12]	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	36	M27x2	36	34	30	8	–	–	–	–	–	50
	45 [12]	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	45	M33x2	45	43	36	10	–	–	–	–	–	60
	56 [12]	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	56	M42x2	56	53	46	10	–	–	–	–	–	72
	70 [12]	–	–	–	–	–	M48x2 [14]	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 [14]	85	86	75	15	108
160	70	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 [14]	95	106	92	18	133
200	90	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 [14]	112	136	125	18	163

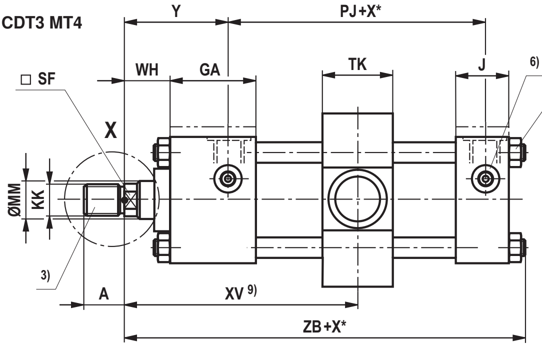
ØAL	E	EE	ØDT	EE	ØDT	GA	H [5]	J	PJ ± 1,25	WH ± 2	Y ± 2	AR
25	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	53	15	50	13.5
32	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	56	25	60	14
40	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	73	25	62	22.5
50	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	74	25	67	19.5
63	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	80	32	71	17.5
80	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	93	31	77	23
100	130 ± 2	G 3/4	42	M27x2	34	70	–	43	101	35	82	20
125	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	117	35	86	29.5
160	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	130	32	86	26.5
200	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	165	32	98	41

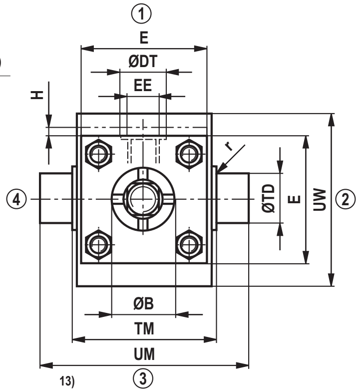
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
3) For piston rod ends "E" and "T" see page 44
5) "H" dimension always in line connection position
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
12) Piston rod Ø not standardized
13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load
14) With operating pressures up to 210 bar only on request

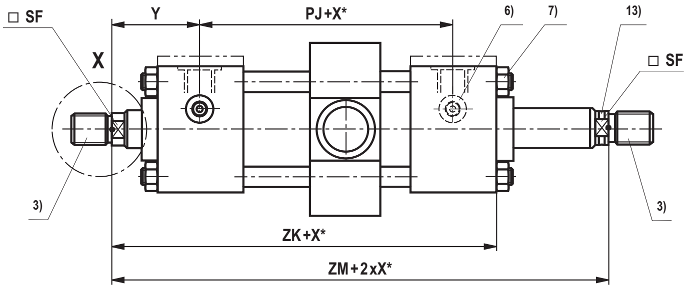
Dimensions: Type of mounting MT4 (dimensions in mm)

CDT3 MT4





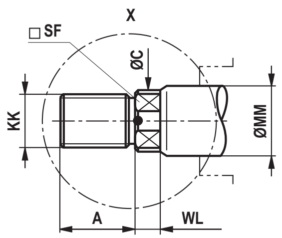
CGT3 MT4

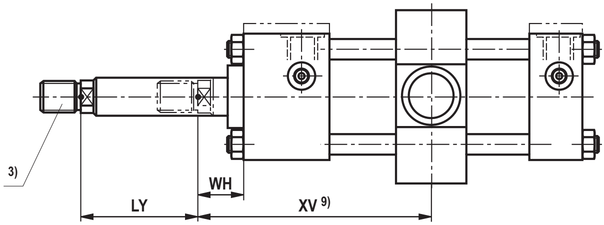


① ... ④ = position of the line connections

We recommend lubricating the trunnions on a regular basis.

Dimensions for cylinder with piston rod extension "LY" in retracted state.





ØAL	r	ØTD f8	TK max	TM h14	UM h15	UW max	X* min	XV min	XV max	ZB max	ZK ± 1	ZM ± 2
25	1	12	20	48	68	43	0	74	80 + Hub	121	138	154
32	1	16	25	55	79	53	0	88	89 + Hub	137	151	177
40	1.6	20	30	76	108	74	0	95	104 + Hub	166	172	196
50	1.6	25	40	89	129	81	0	105	105 + Hub	176	183	207
63	2	32	50	100	150	97	10	117	107 + Hub	185	190	223
80	2.5	40	60	127	191	124	12	130	118 + Hub	212	216	246
100	2.5	50	70	140	220	137	18	142	124 + Hub	225	230	265
125	3.2	63	90	178	278	175	25	157	132 + Hub	260	254	289
160	3.2	80	110	215	341	221	40	171	131 + Hub	279	270	302
200	3.2	100	130	279	439	281	48	202	154 + Hub	336	324	356

Dimensions: MT4 (dimensions in mm)

		DIN / ISO 1) (for operating pressure up to 160 bar)					ISO 2) (for operating pressure up to 210 bar)					
ØAL	**ØMM**	**KK** 1)	**A** 1) max	**ØC**	**SF**	**WL**	**KK** 2)	**A** 2) max	**ØC**	**SF**	**WL**	**ØB** f9
25	**12**	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	**14**	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	**18**	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 12)	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**22**	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 12)	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**28**	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 12)	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**36**	M27x2	36	34	30	8	–	–	–	–	–	50
	45 12)	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**45**	M33x2	45	43	36	10	–	–	–	–	–	60
	56 12)	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**56**	M42x2	56	53	46	10	–	–	–	–	–	72
	70 12)	–	–	–	–	–	M48x2 14)	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 14)	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 14)	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 14)	112	136	125	18	163

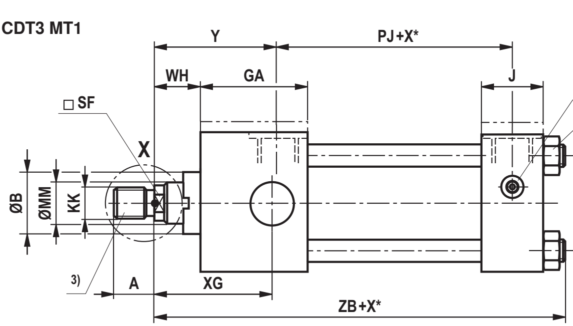
ØAL	**E**	**EE**	**ØDT**	**EE**	**ØDT**	**GA**	**H** 5; 11)	**J**	**PJ** ± 1,25	**WH** ± 2	**Y** ± 2
25	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	53	15	50
32	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	56	25	60
40	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	73	25	62
50	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	74	25	67
63	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	80	32	71
80	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	93	31	77
100	130 ± 2	G 3/4	42	M27x2	34	70	–	43	101	35	82
125	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	117	35	86
160	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	130	32	86
200	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	165	32	98

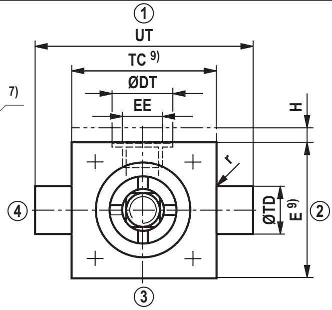
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
3) For piston rod ends "E" and "T" see page 44
5) "H" dimension always in line connection position
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
9) "XV" dimension in mm, always specify in the plain text
11) Piston Ø 25 and 32 mm: "H" dimension with line connection
12) Piston rod Ø not standardized
13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load
14) With operating pressures up to 210 bar only on request

Dimensions: Type of mounting MT1, MT2 (dimensions in mm)

CDT3 MT1

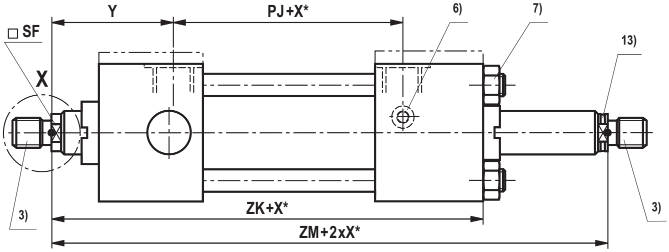


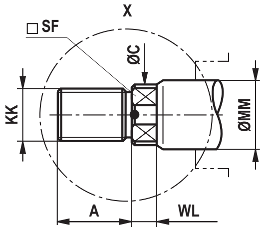


① ... ④ = position of the line connections

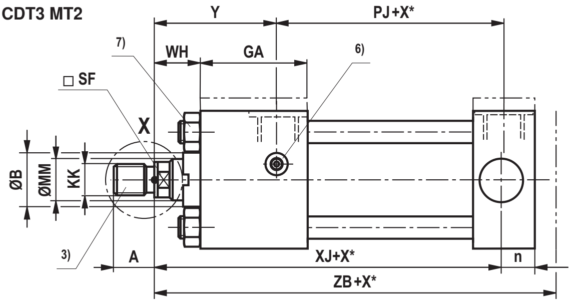
We recommend lubricating the trunnions on a regular basis.

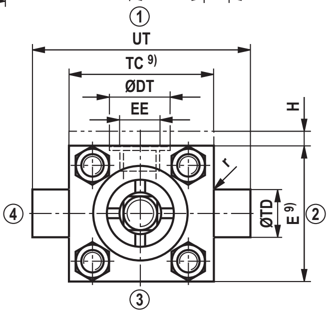
CGT3 MT1





CDT3 MT2





ØAL	n	r	TC h14	ØTD f8	UT h15	XG ± 2	XJ ± 1,25	ZB max	ZK ± 1	ZM ± 2
25	13	1	38	12	58	44	101	121	138	154
32	13	1	44	16	68	54	115	137	151	177
40	19	1.6	63	20	95	57	134	166	172	196
50	19	1.6	76	25	116	64	140	176	183	207
63	19	2	89	32	139	70	149	185	190	223
80	23	2.5	114	40	178	76	168	212	216	246
100	28	2.5	127	50	207	71	187	225	230	265
125	51	3.2	165	63	265	75	209	260	254	289
160	40	3.2	203	80	329	75	230	279	270	302
200	53	4.5	241	100	401	85	276	336	324	356

Dimensions: MT1, MT2 (dimensions in mm)

		DIN / ISO [1] (for operating pressure up to 160 bar)					ISO [2] (for operating pressure up to 210 bar)					
ØAL	ØMM	KK [1]	A [1] max	ØC	SF	WL	KK [2]	A [2] max	ØC	SF	WL	ØB f9
25	12	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	14	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	18	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 [12]	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	22	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 [12]	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	28	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 [12]	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	36	M27x2	36	34	30	8	–	–	–	–	–	50
	45 [12]	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	45	M33x2	45	43	36	10	–	–	–	–	–	60
	56 [12]	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	56	M42x2	56	53	46	10	–	–	–	–	–	72
	70 [12]	–	–	–	–	–	M48x2 [14]	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 [14]	85	86	75	15	108
160	70	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 [14]	95	106	92	18	133
200	90	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 [14]	112	136	125	18	163

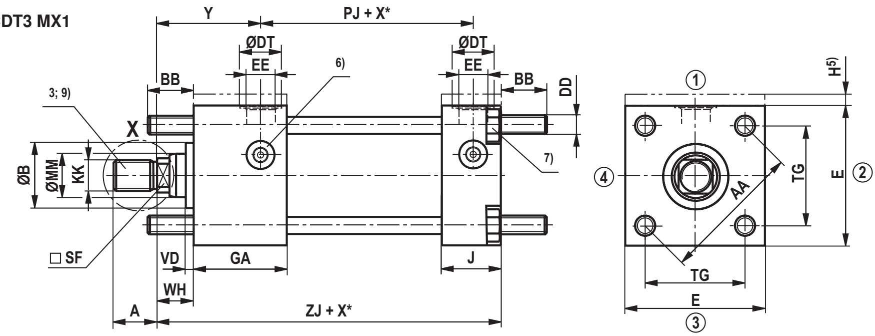
ØAL	E	EE	ØDT	EE	ØDT	GA		H [5]	J	PJ	WH	Y
						MT1	MT2			± 1,25	± 2	± 2
25	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5		5	22.5	53	15	50
32	45 ± 1.5	G 1/4	25	M14x1.5	21	48		5	25	56	25	60
40	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5		–	33.5	73	25	62
50	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5		–	33.5	74	25	67
63	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5		–	35.5	80	32	71
80	115 ± 1.5	G 3/4	42	M27x2	34	67		–	41	93	31	77
100	130 ± 2	G 3/4	42	M27x2	34	70		–	43	101	35	82
125	165 ± 2	G 1	47	M33x2	43	74.9	73.5	–	51.5	117	35	86
160	205 ± 2	G 1	47	M33x2	43	86.4	80.5	–	55.5	130	32	86
200	245 ± 2	G 1 1/4	58	M42x2	52	106.4	101	–	76	165	32	98

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
[1] Thread for piston rod ends "F" and "H"
[2] Thread for piston rod ends "D" and "K"
[3] For piston rod ends "E" and "T" see page 44
[5] "H" dimension always in line connection position
[6] For the position of the line connections and the bleeding see page 41
[7] Tightening torque see page 63
[9] With short strokes, observe "TC" and "E"
[12] Piston rod Ø not standardized
[13] CG design: Piston rod marked with groove, only admissible for 50 bar tensile load
[14] With operating pressures up to 210 bar only on request

3

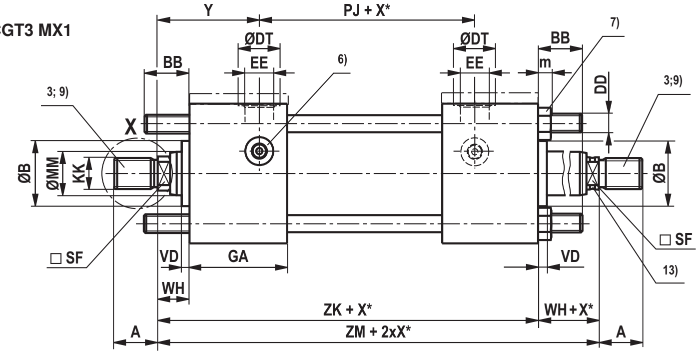
Dimensions: Type of mounting MX1 (dimensions in mm)

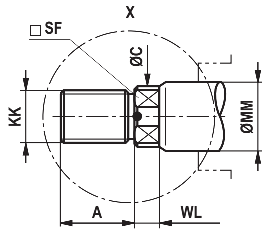
CDT3 MX1



① ... ④ = position of the line connections

CGT3 MX1





ØAL	AA	BB 9) + 3	TG js13	VD	ZJ ± 1,25	ZK ± 1	ZM ± 2
25	40	19	28.3	6	114	138	154
32	47	24	33.2	12	128	151	177
40	59	35	41.7	12	153	172	196
50	74	46	52.3	9	159	183	207
63	91	46	64.3	13	168	190	223
80	117	59	82.7	9	190	216	246
100	137	59	96.9	10	203	230	265
125	178	81	125.9	9	232	254	289
160	219	92	154.9	7	245	270	302
200	269	115	190.2	7	299	324	356

Dimensions: MX1 (dimensions in mm)

		DIN / ISO 1) (for operating pressure up to 160 bar)					ISO 2) (for operating pressure up to 210 bar)					
ØAL	ØMM	KK 1)	A 1) max	ØC	SF	WL	KK 2)	A 2) max	ØC	SF	WL	ØB f9
25	12	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	14	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	18	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 12)	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	22	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 12)	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	28	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 12)	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	36	M27x2	36	34	30	8	–	–	–	–	–	50
	45 12)	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	45	M33x2	45	43	36	10	–	–	–	–	–	60
	56 12)	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	56	M42x2	56	53	46	10	–	–	–	–	–	72
	70 12)	–	–	–	–	–	M48x2 14)	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 14)	85	86	75	15	108
160	70	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 14)	95	106	92	18	133
200	90	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 14)	112	136	125	18	163

ØAL	DD	E	EE	ØDT	EE	ØDT	GA	H 5)	J	m	PJ ± 1,25	WH ± 2	Y ± 2
25	M5x0.8	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	4	53	15	50
32	M6x1	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	5	56	25	60
40	M8x1	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	6.5	73	25	62
50	M12x1.25	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	10	74	25	67
63	M12x1.25	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	10	80	32	71
80	M16x1.5	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	13	93	31	77
100	M16x1.5	130 ± 2	G 3/4	42	M27x2	34	70	–	43	13	101	35	82
125	M22x1.5	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	18	117	35	86
160	M27x2	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	22	130	32	86
200	M30x2	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	24	165	32	98

ØAL = Piston Ø

ØMM = Piston rod Ø

X* = Stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

3) For piston rod ends "E" and "T" see page 44

5) "H" dimension always in line connection position

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 63

9) Observe the "BB" dimension for the tilt head assembly

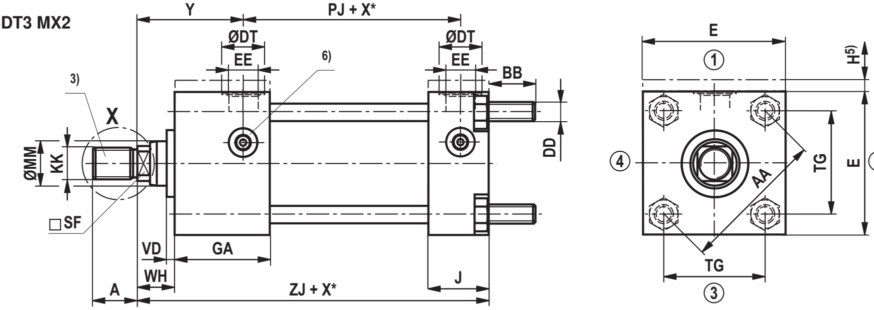
12) Piston rod Ø not standardized

13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load

14) With operating pressures up to 210 bar only on request

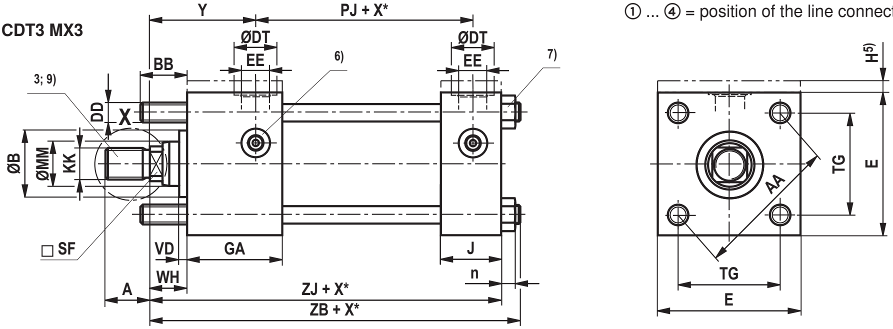
Dimensions: Type of mounting MX2, MX3 (dimensions in mm)

CDT3 MX2

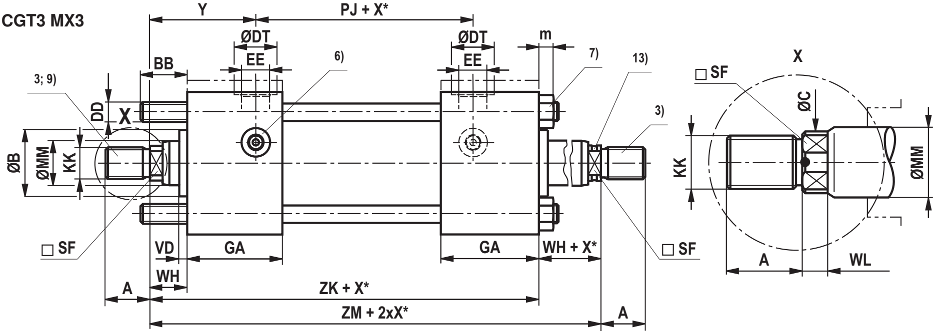


① ... ④ = position of the line connections

CDT3 MX3



CGT3 MX3



ØAL	AA	BB 9) + 3	TG js13	VD	ZB max	ZJ ± 1	ZK ± 1	ZM ± 2
25	40	19	28.3	6	121	114	138	154
32	47	24	33.2	12	137	128	151	177
40	59	35	41.7	12	166	153	172	196
50	74	46	52.3	9	176	159	183	207
63	91	46	64.3	13	185	168	190	223
80	117	59	82.7	9	212	190	216	246
100	137	59	96.9	10	225	203	230	265
125	178	81	125.9	9	260	232	254	289
160	219	92	154.9	7	279	245	270	302
200	269	115	190.2	7	336	299	324	356

Dimensions: MX2, MX3 (dimensions in mm)

		DIN / ISO 1) (for operating pressure up to 160 bar)					ISO 2) (for operating pressure up to 210 bar)					
ØAL	**ØMM**	**KK** 1)	**A** 1) max	**ØC**	**SF**	**WL**	**KK** 2)	**A** 2) max	**ØC**	**SF**	**WL**	**ØB** f9
25	**12**	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	**14**	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	**18**	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 12)	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**22**	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 12)	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**28**	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 12)	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**36**	M27x2	36	34	30	8	–	–	–	–	–	50
	45 12)	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**45**	M33x2	45	43	36	10	–	–	–	–	–	60
	56 12)	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**56**	M42x2	56	53	46	10	–	–	–	–	–	72
	70 12)	–	–	–	–	–	M48x2 14)	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 14)	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 14)	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 14)	112	136	125	18	163

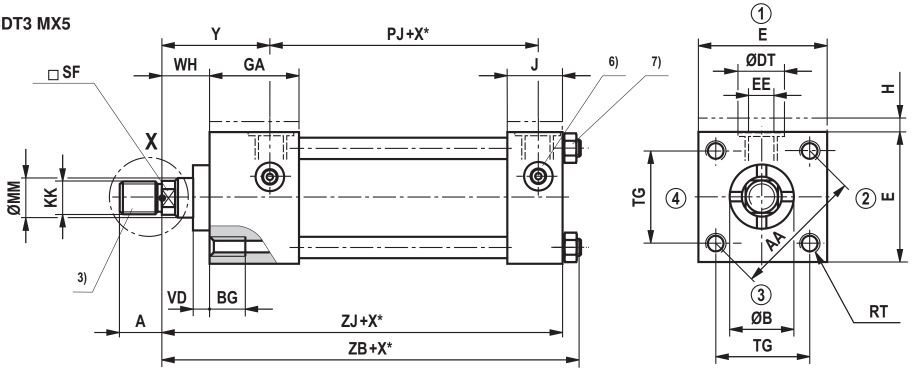
ØAL	**DD**	**E**	**EE**	**ØDT**	**EE**	**ØDT**	**GA**	**H** 5)	**J**	**m**	**PJ** ± 1,25	**WH** ± 2	**Y** ± 2
25	M5x0.8	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	4	53	15	50
32	M6x1	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	5	56	25	60
40	M8x1	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	6.5	73	25	62
50	M12x1.25	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	10	74	25	67
63	M12x1.25	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	10	80	32	71
80	M16x1.5	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	13	93	31	77
100	M16x1.5	130 ± 2	G 3/4	42	M27x2	34	70	–	43	13	101	35	82
125	M22x1.5	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	18	117	35	86
160	M27x2	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	22	130	32	86
200	M30x2	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	24	165	32	98

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

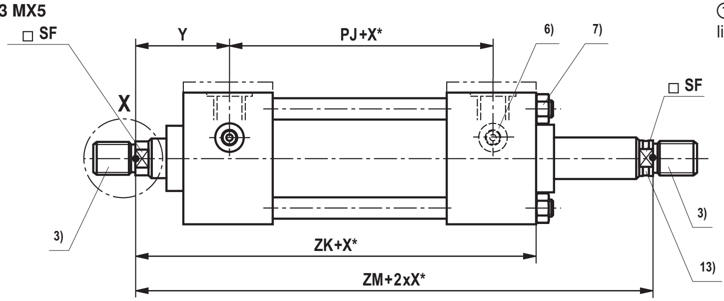
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
3) For piston rod ends "E" and "T" see page 44
5) "H" dimension always in line connection position
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
9) Observe the "BB" dimension for the tilt head assembly
12) Piston rod Ø not standardized
13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load
14) With operating pressures up to 210 bar only on request

Dimensions: Type of mounting MX5 (dimensions in mm)

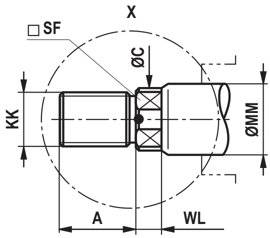
CDT3 MX5



CGT3 MX5



① ... ④ = position of the line connections



ØAL	AA	BG min	RT 6H	TG js13	VD	ZB max	ZJ ± 1,25	ZK ± 1	ZM ± 2
25	40	8	M5x0.8	28.3	6	121	114	138	154
32	47	9	M6x1	33.2	12	137	128	151	177
40	59	12	M8x1.25	41.7	12	166	153	172	196
50	74	18	M12x1.75	52.3	9	176	159	183	207
63	91	18	M12x1.75	64.3	13	185	168	190	223
80	117	24	M16x2	82.7	9	212	190	216	246
100	137	24	M16x2	96.9	10	225	203	230	265
125	178	27	M22x2.5	125.9	9	260	232	254	289
160	219	32	M27x3	154.9	7	279	245	270	302
200	269	40	M30x3.5	190.2	7	336	299	324	356

Dimensions: MX5 (dimensions in mm)

		DIN / ISO 1) (for operating pressure up to 160 bar)					ISO 2) (for operating pressure up to 210 bar)					
ØAL	**ØMM**	**KK 1)**	**A 1)** max	**ØC**	**SF**	**WL**	**KK 2)**	**A 2)** max	**ØC**	**SF**	**WL**	**ØB** f9
25	**12**	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	**14**	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	**18**	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 12)	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**22**	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 12)	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**28**	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 12)	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**36**	M27x2	36	34	30	8	–	–	–	–	–	50
	45 12)	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**45**	M33x2	45	43	36	10	–	–	–	–	–	60
	56 12)	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**56**	M42x2	56	53	46	10	–	–	–	–	–	72
	70 12)	–	–	–	–	–	M48x2 14)	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 14)	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 14)	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 14)	112	136	125	18	163

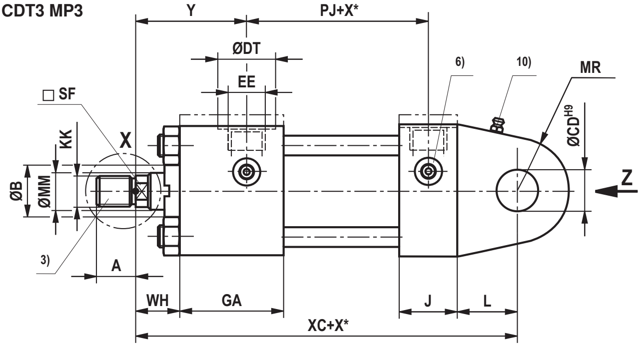
ØAL	**E**	**EE**	**ØDT**	**EE**	**ØDT**	**GA**	**H 5)**	**J**	**PJ** ± 1,25	**WH** ± 2	**Y** ± 2
25	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	53	15	50
32	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	56	25	60
40	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	73	25	62
50	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	74	25	67
63	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	80	32	71
80	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	93	31	77
100	130 ± 2	G 3/4	42	M27x2	34	70	–	43	101	35	82
125	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	117	35	86
160	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	130	32	86
200	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	165	32	98

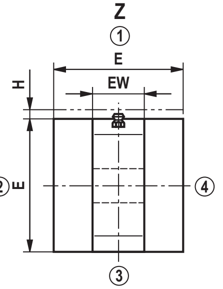
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
3) For piston rod ends "E" and "T" see page 44
5) "H" dimension always in line connection position
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63

12) Piston rod Ø not standardized
13) CG design: Piston rod marked with groove, only admissible for 50 bar tensile load
14) With operating pressures up to 210 bar only on request

Dimensions: Type of mounting MP1, MP3 (dimensions in mm)

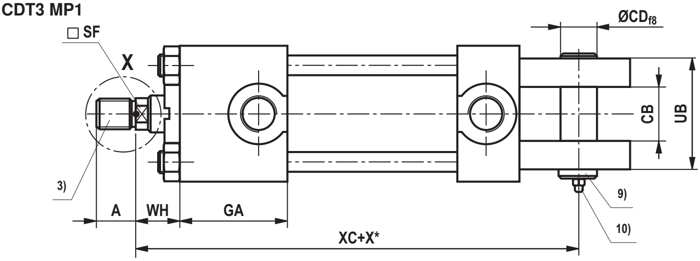
CDT3 MP3

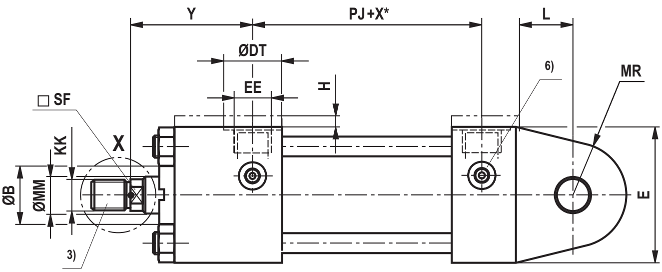


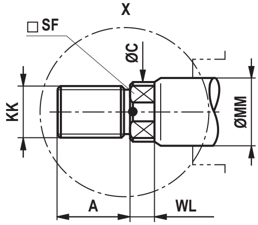


① ... ④ = position of the line connections

CDT3 MP1







ØAL	CB A16	ØCD H9; f8	EW h14	L min	MR max	UB max	XC ± 1,25
25	12	10	12	13	12	25	127
32	16	12	16	19	17	34	147
40	20	14	20	19	17	42	172
50	30	20	30	32	29	62	191
63	30	20	30	32	29	62	200
80	40	28	40	39	34	83	229
100	50	36	50	54	50	103	257
125	60	45	60	57	53	120	289
160	70	56	70	63	59	140	308
200	80	70	80	82	78	160	381

Dimensions: MP1, MP3 (dimensions in mm)

		DIN / ISO 1) (for operating pressure up to 160 bar)					ISO 2) (for operating pressure up to 210 bar)					
ØAL	ØMM	KK 1)	A 1) max	ØC	SF	WL	KK 2)	A 2) max	ØC	SF	WL	ØB f9
25	12	M10x1.25	14	11	10	5	–	–	–	–	–	24
	18	M10x1.25	14	16.5	14	5	M14x1.5	18	16.5	14	5	30
32	14	M12x1.25	16	13	12	5	–	–	–	–	–	26
	22	M12x1.25	16	20.5	18	5	M16x1.5	22	20.5	18	5	34
40	18	M14x1.5	18	16.5	14	5	–	–	–	–	–	30
	22 12)	M14x1.5	18	20.5	18	5	M16x1.5	22	20.5	18	5	34
	28	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	22	M16x1.5	22	20.5	18	5	–	–	–	–	–	34
	28 12)	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	28	M20x1.5	28	26	22	7	–	–	–	–	–	42
	36 12)	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	36	M27x2	36	34	30	8	–	–	–	–	–	50
	45 12)	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	45	M33x2	45	43	36	10	–	–	–	–	–	60
	56 12)	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	56	M42x2	56	53	46	10	–	–	–	–	–	72
	70 12)	–	–	–	–	–	M48x2 14)	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3 14)	85	86	75	15	108
160	70	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3 14)	95	106	92	18	133
200	90	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3 14)	112	136	125	18	163

ØAL	E	EE	ØDT	EE	ØDT	GA	H 5)	J	PJ ± 1,25	WH ± 2	Y ± 2
25	40 ± 1.5	G 1/4	25	M14x1.5	21	46.5	5	22.5	53	15	50
32	45 ± 1.5	G 1/4	25	M14x1.5	21	48	5	25	56	25	60
40	63 ± 1.5	G 3/8	28	M18x1.5	26	52.5	–	33.5	73	25	62
50	75 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	33.5	74	25	67
63	90 ± 1.5	G 1/2	34	M22x1.5	29	57.5	–	35.5	80	32	71
80	115 ± 1.5	G 3/4	42	M27x2	34	67	–	41	93	31	77
100	130 ± 2	G 3/4	42	M27x2	34	70	–	43	101	35	82
125	165 ± 2	G 1	47	M33x2	43	73.5	–	51.5	117	35	86
160	205 ± 2	G 1	47	M33x2	43	80.5	–	55.5	130	32	86
200	245 ± 2	G 1 1/4	58	M42x2	52	101	–	76	165	32	98

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length

1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
3) For piston rod ends "E" and "T" see page 44
5) "H" dimension always in line connection position
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
9) Bolt included in the scope of delivery
10) Lubricating nipple M6 DIN 71412
12) Piston rod Ø not standardized
14) With operating pressures up to 210 bar only on request

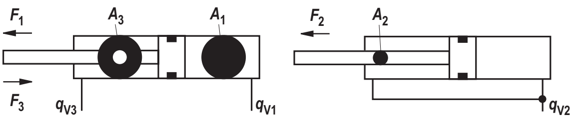
Areas, forces, flow: Series CST3 (for operating pressure up to 160 bar)

Piston ØAL mm	Piston rod ØMM mm	Area ratio φ A_1/A_3	Areas Piston A_1 cm²	Areas Rod A_2 cm²	Areas Ring A_3 cm²	Force at 160 bar [1] Pressure F_1 kN	Force at 160 bar [1] Diff. F_2 kN	Force at 160 bar [1] Pulling F_3 kN	Flow at 0.1 m/s [2] Off q_{V1} l/min	Flow at 0.1 m/s [2] Diff. q_{V2} l/min	Flow at 0.1 m/s [2] On q_{V3} l/min
40	**28**	1.96	12.56	6.16	6.40	20.11	9.85	10.25	7.5	3.7	3.8
50	**28** [3] **36**	1.46 2.08	19.63	6.16 10.18	13.48 9.45	31.42	9.85 16.29	21.56 15.13	11.8	3.7 6.1	8.1 5.7
63	**36** [3] **45**	1.48 2.04	31.17	10.18 15.90	20.99 15.27	49.88	16.29 25.45	33.59 24.43	18.7	6.1 9.5	12.6 9.2
80	**45** [3] **56**	1.46 1.96	50.26	15.90 24.63	34.36 25.63	80.42	25.45 39.41	54.98 41.02	30.2	9.5 14.8	20.6 15.4
100	**56** [3] **70**	1.46 1.96	78.54	24.63 38.48	53.91 40.06	125.66	39.41 61.58	86.26 64.09	47.1	14.8 23.1	32.3 24.0
125	**70** [3] **90**	1.46 2.08	122.72	38.48 63.62	84.23 59.10	196.35	61.58 101.79	134.77 94.56	73.6	23.1 38.2	50.5 35.5
160	**70** **110**	1.25 1.90	201.06	38.48 95.03	162.58 106.03	321.70	61.58 152.05	260.12 169.64	120.6	23.1 57.0	97.5 63.6
200	**90** **140**	1.25 1.96	314.16	63.62 153.94	250.54 160.22	502.65	101.79 246.30	400.86 256.35	188.5	38.2 92.4	150.3 96.1

1) Theoretical static cylinder force (without consideration of the efficiency and admissible load for attachment parts like e.g. tilt heads, plates or valves, etc.)

2) Stroke velocity

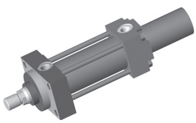
3) Piston rod Ø not standardized



Overview types of mounting: Series CST3 (only for operating pressure up to 160 bar)

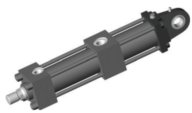
CST3 ME5

see page 30, 31



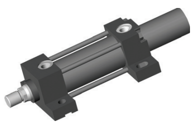
CST3 MP5

see page 32, 33



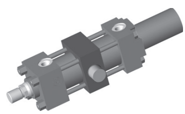
CST3 MS2

see page 34, 35



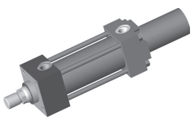
CST3 MT4

see page 36, 37



CST3 MX5

see page 38, 39



Ordering code: Series CST3 (for operating pressure up to 160 bar)

CS	T3	/	/	/	Z	2X									*

Differential cylinder with position measurement system 10) = CS

Series = T3

Types of mounting DIN/ISO
Rectangular flange at head = **ME5**
Self-aligning clevis at base = **MP5**
Foot mounting 8) = **MS2**
Trunnion in center 1) = **MT4**
Tapped hole at head = **MX5**

Piston Ø (ØAL) 40 to 200 mm

Piston rod Ø (ØMM) 28 to 140 mm

Stroke length in mm 11)

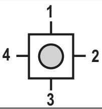
Design principle
Head and base connected to tie rod = **Z**

Component series = **2X**
20 to 29 unchanged installation and connection dimensions

Line connection/design
Pipe thread (ISO 1179-1) = **B**
Subplate size 6 8; 9) = **P**
Subplate size 10 8) = **T**
Subplate size 16 8; 15) = **U**

Line connection/position at head
see page 41

View to piston rod

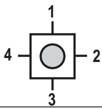


= **1**
= **2**
= **3**
= **4**

Line connection/position at base
See page 41

View to piston rod

1 =
2 =
3 =
4 =



Piston rod design
H = Hardened and hard chromium-plated

Piston rod end
see pages 30 to 39
H = Thread (DIN/ISO) for tilt head CGKA/CGKD
D = Thread (ISO) for tilt head CGKA/CGKD
F = With mounted tilt head CGKA/CGKD (DIN/ISO)
K = With mounted tilt head CGKA/CGKD (DIN/ISO)

End position cushioning
U = Without

Seal design
M = Standard seal system
T = Servo quality/reduced friction
S = High temperature with reduced friction

Option 1
T = Position measurement system (magnetostrictive) without mating connector
Mating connector – separate order see page 46

Option 2
V = Prepared for position measurement system
C = Analog output 4-20 mA
F = Analog output 0-10 V
D = Digital output SSI

Further details in the plain text

Order example:
CST3ME5/50/36/300Z2X/P11HDUTTD

When selecting, please observe the limitations on the corresponding catalog pages!

Comments:

1) Trunnion position freely selectable; when ordering, always specify the "XV" dimension in the clear text in mm

8) Only position 11 possible

9) Only up to piston Ø 80 mm

10) Not standardized

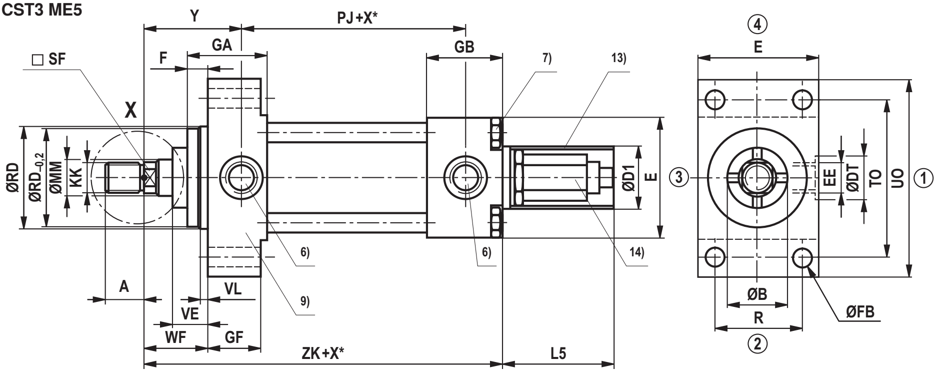
11) Observe the max. and min. stroke length on pages 30 to 39 and the admissible stroke length (according to kinking calculation) on pages 52 to 55

15) Only piston Ø 100 – 200 mm

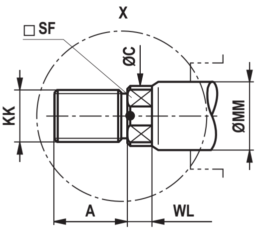
3

Dimensions: Type of mounting ME5 (dimensions in mm)

CST3 ME5



① ... ④ = position of the line connections



ØAL	ØMM	PJ 10) ± 1,25	PJ 11) ± 1,25	R JS13	TO JS13	UO max	VE max	VL min	ZK ± 1	L5	ØD1 max	X* max	X* min **without** subplate	X* min **with** subplate
40	**28**	73	77	41	87	110	22	3	195	–	–	600	–	50
50	**28** **36**	74	78	52	105	130	25	4	194	–	–	500 800	–	50
63	**36** **45**	80	81	65	117	145	29	4	205	82	96	650 1000	–	45
80	**45** **56**	93	93	83	149	180	29	4	234	82	96	800 1200	–	32
100	**56** **70**	101	101	97	162	200	32	5	248	82	96	1000 1370	–	57
125	**70** **90**	117	117	126	208	250	32	5	260.5	82	96	1200 1420	–	35
160	**70** **110**	130	130	155	253	300	32	5	272.5	82	96	1000 1410	20	20
200	**90** **140**	160	160	190	300	360	32	5	329	82	96	1300 1350	20	20

Dimensions: ME5 (dimensions in mm)

		DIN / ISO 1)					ISO 2)						
ØAL	**ØMM**	**KK 1)**	**A 1)** max	**ØC**	**SF**	**WL**	**KK 2)**	**A 2)** max	**ØC**	**SF**	**WL**	**ØB** f9	**ØRD** f8
40	**28**	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42	62
50	**28**	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42	74
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50	74
63	**36**	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50	88
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60	88
80	**45**	M27x2	36	43	36	10	M33x2	45	43	36	10	60	105
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72	105
100	**56**	M33x2	45	54	46	10	M42x2	56	54	46	10	72	125
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88	125
125	**70**	–	–	–	–	–	M48x2	63	67	60	15	88	150
	90	M42x2	56	86	75	15	M64x3	85	86	75	15	108	150
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88	125
	110	M48x2	63	106	92	18	M80x3	95	106	92	18	133	170
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108	150
	140	M64x3	85	136	125	18	M100x3	112	136	125	18	163	210

ØAL	**F** max	**ØFB** H13	**GF 9)**	**E**	**EE**	**ØDT**	**GA**	**GB**	**WF** ± 2	**Y 10)** ± 2	**Y 11)** ± 2
40	10	11	38	63 ± 1.5	G 3/8	28	52.5	75.5	35	62	58
50	16	14	38	75 ± 1.5	G 1/2	34	57.5	68.5	41	67	63
63	16	14	38	90 ± 1.5	G 1/2	34	57.5	72.5	48	71	70
80	20	18	45	115 ± 1.5	G 3/4	42	67	85	51	77	77
100	22	18	45	130 ± 2	G 3/4	42	70	88	57	82	82
125	22	22	58	165 ± 2	G 1	47	80	73.5	57	86	86
160	25	26	58	205 ± 2	G 1	47	83	80.5	57	86	86
200	25	33	76	245 ± 2	G 1 1/4	58	101	101	57	98	98

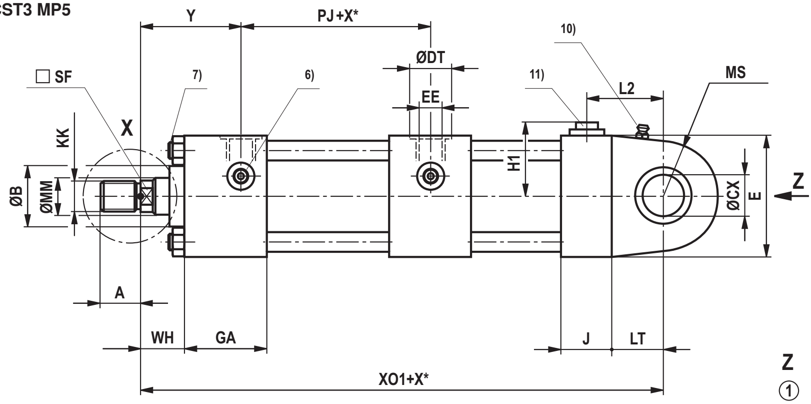
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length
X*max = Max. stroke length

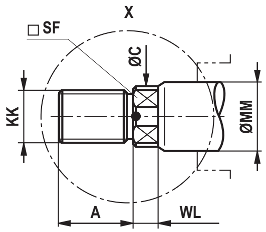
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
9) Flange thickness according to DIN 24554
10) ME5: For line connection position "1" and "3" at head
11) ME5: For line connection position "2" and "4" at head
13) With piston Ø 40 – 50 mm without protective pipe
14) Installation space for position measurement system at least 200 mm

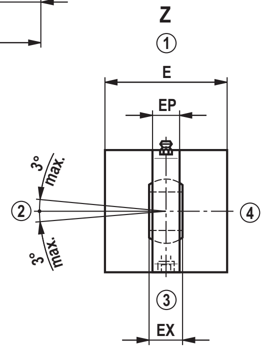
3

Dimensions: Type of mounting MP5 (dimensions in mm)

CST3 MP5







① ... ④ = position of the line connections

ØAL	ØMM	ØCX	EP h13	EX	LT min	XO1 ± 1,5	MS max	X* max	X* min **without** subplate	X* min **with** subplate
40	**28**	20 – 0.012	13	16 – 0.12	25	348	29	390	–	50
50	**28** **36**	25 – 0.012	17	20 – 0.12	31	365	33	325 520	–	50
63	**36** **45**	30 – 0.012	19	22 – 0.12	38	383	40	420 650	–	45
80	**45** **56**	40 – 0.012	23	28 – 0.12	48	410	50	520 780	–	32
100	**56** **70**	50 – 0.012	30	35 – 0.12	58	436	62	650 940	–	57
125	**70** **90**	60 – 0.015	38	44 – 0.15	72	487	80	780 1240	–	35
160	**70** **110**	80 – 0.015	47	55 – 0.15	92	528	100	650 1410	20	20
200	**90** **140**	100 – 0.020	57	70 – 0.20	116	632	120	850 1350	20	20

Dimensions: MP5 (dimensions in mm)

		DIN / ISO 1)					ISO 2)					
ØAL	**ØMM**	**KK** 1)	**A** 1) max	**ØC**	**SF**	**WL**	**KK** 2)	**A** 2) max	**ØC**	**SF**	**WL**	**ØB** f9
40	**28**	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**28**	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**36**	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**45**	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**56**	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**70**	–	–	–	–	–	M48x2	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3	112	136	125	18	163

ØAL	**H1**	**L2**	**E**	**EE**	**ØDT**	**GA**	**J**	**PJ** ± 1,25	**WH** ± 2	**Y** ± 2
40	40	43.5	63 ± 1.5	G 3/8	28	52.5	33.5	73	25	62
50	45.5	49	75 ± 1.5	G 1/2	34	57.5	33.5	74	25	67
63	53	55	90 ± 1.5	G 1/2	34	57.5	35.5	80	32	71
80	65.5	68	115 ± 1.5	G 3/4	42	67	41	93	31	77
100	73	78	130 ± 2	G 3/4	42	70	43	101	35	82
125	90.5	101	165 ± 2	G 1	47	73.5	51.5	117	35	86
160	110.5	120.5	205 ± 2	G 1	47	80.5	55.5	130	32	86
200	130.5	157	245 ± 2	G 1 1/4	58	101	76	165	32	98

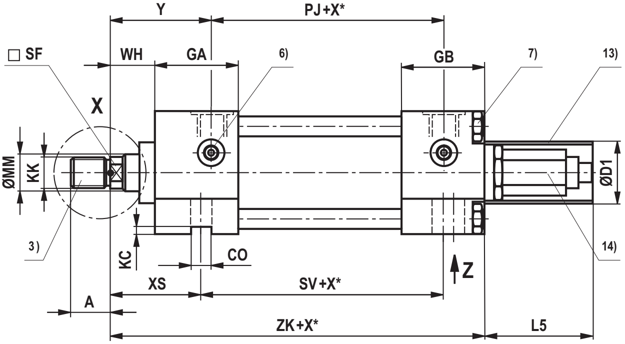
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length
X*max = Max. stroke length
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"

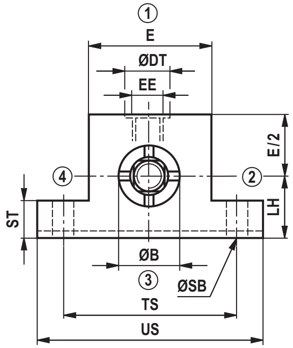
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
10) Lubricating nipple M6 DIN 71412
11) Only in line connection position 1 at base

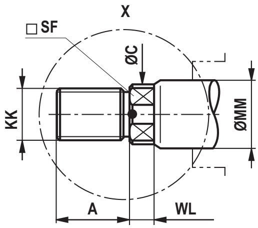
3

Dimensions: Type of mounting MS2 (dimensions in mm)

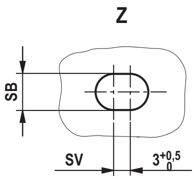
CST3 MS2







① ... ④ = position of the line connections



ØAL	CO N9	KC +0,2 0	LH h10	PJ ± 1,25	ØSB H13	ST	SV ± 1	TS JS13	US max
40	12	4	31	73	11	12.5	106.5	83	103
50	12	4.5	37	74	14	19	99.5	102	127
63	16	4.5	44	80	18	26	91.5	124	161
80	16	5	57	93	18	26	110.5	149	186
100	16	6	63	101	26	32	106.5	172	216
125	20	6	82	117	26	32	131	210	254
160	30	8	101	130	33	38	130	260	318
200	40	8	122	160	39	44	172	311	381

Dimensions: MS2 (dimensions in mm)

		DIN / ISO [1]					ISO [2]					
ØAL	**ØMM**	**KK** [1]	**A** [1] max	**ØC**	**SF**	**WL**	**KK** [2]	**A** [2] max	**ØC**	**SF**	**WL**	**ØB** f9
40	**28**	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**28**	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**36**	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**45**	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**56**	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**70**	–	–	–	–	–	M48x2	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3	112	136	125	18	163

ØAL	**E**	**EE**	**ØDT**	**GA**	**GB**	**WH** ± 2	**Y** ± 2
40	63 ± 1.5	G 3/8	28	52.5	75.5	25	62
50	75 ± 1.5	G 1/2	34	57.5	68.5	25	67
63	90 ± 1.5	G 1/2	34	57.5	72.5	32	71
80	115 ± 1.5	G 3/4	42	67	85	31	77
100	130 ± 2	G 3/4	42	70	88	35	82
125	165 ± 2	G 1	47	73.5	73.5	35	86
160	205 ± 2	G 1	47	80.5	80.5	32	86
200	245 ± 2	G 1 1/4	58	101	101	32	98

ØAL	**ØMM**	**XS** ± 2	ZK ± 1	**L5**	**ØD1** max	**X*** max	**X*** min **without** subplate	**X*** min **with** subplate
40	**28**	45	195	–	–	600	–	50
50	**28** **36**	54	194	–	–	500 800	–	50
63	**36** **45**	65	205	82	96	650 1000	–	45
80	**45** **56**	68	234	82	96	800 1200	–	32
100	**56** **70**	79	248	82	96	1000 1370	–	57
125	**70** **90**	79	254	82	96	1200 1420	–	35
160	**70** **110**	86	270	82	96	1000 1410	20	20
200	**90** **140**	92	324	82	96	1300 1350	20	20

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length
X*max = Max. stroke length

1) Thread for piston rod ends "F" and "H"

2) Thread for piston rod ends "D" and "K"

6) For the position of the line connections and the bleeding see page 41

7) Tightening torque see page 63

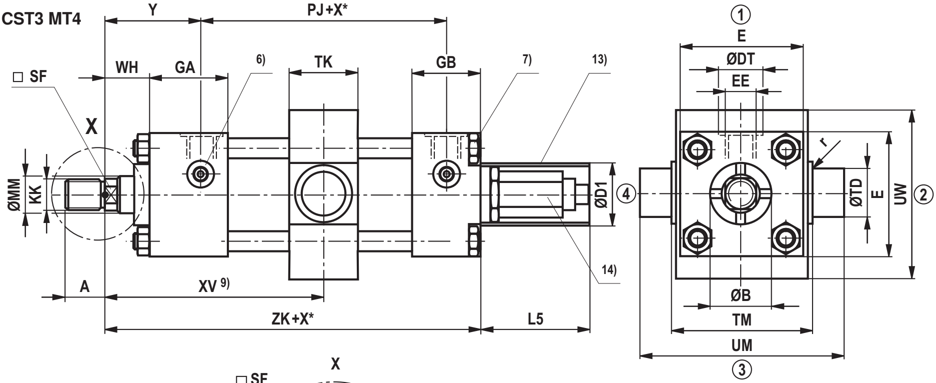
13) With piston Ø 40 – 50 mm without protective pipe

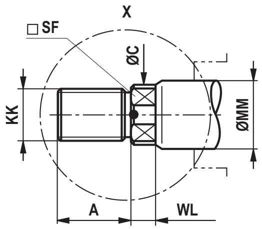
14) Installation space for position measurement system at least 200 mm

3

Dimensions: Type of mounting MT4 (dimensions in mm)

CST3 MT4

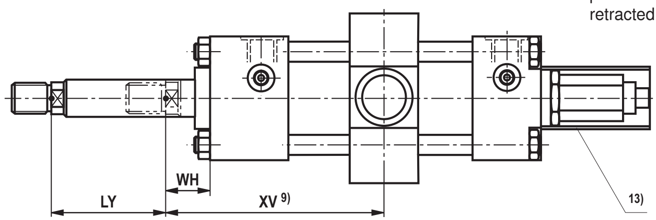




① ... ④ = position of the line connections

We recommend lubricating the trunnions on a regular basis.

Dimensions for cylinder with piston rod extension "LY" in retracted state.



ØAL	ØMM	Line connection "B"			Line connection "P", "T", "U"			X* max	ZK ± 1	L5	ØD1 max
		X* min	XV min ± 2	XV max ± 2	X* min	XV min ± 2	XV max ± 2				
40	28	–	95	104 + Hub	50	95	76 + Hub	390	195	–	–
50	28 36	–	105	105 + Hub	50	105	77 + Hub	325 520	194	–	–
63	36 45	10	117	107 + Hub	45	117	82 + Hub	420 650	205	82	96
80	45 56	12	130	118 + Hub	35	130	96 + Hub	520 780	234	82	96
100	56 70	18	142	124 + Hub	57	142	101 + Hub	650 940	248	82	96
125	70 90	25	157	132 + Hub	63	157	94 + Hub	780 1240	254	82	96
160	70 110	40	171	131 + Hub	74	171	97 + Hub	650 1410	270	82	96
200	90 140	48	202	154 + Hub	73	202	129 + Hub	850 1350	324	82	96

Dimensions: MT4 (dimensions in mm)

		DIN / ISO [1]					ISO [2]					
ØAL	**ØMM**	**KK** [1]	**A** [1] max	**ØC**	**SF**	**WL**	**KK** [2]	**A** [2] max	**ØC**	**SF**	**WL**	**ØB** f9
40	**28**	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**28**	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**36**	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**45**	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**56**	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**70**	–	–	–	–	–	M48x2	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3	112	136	125	18	163

ØAL	**PJ** ±1,25	**TK** max	**TM** h14	**UM** h15	**UW** max	**r**	**ØTD** f8	**E**	**EE**	**ØDT**	**GA**	**GB**	**WH** ±2	**Y** ±2
40	73	30	76	108	74	1.2	20	63 ± 1.5	G 3/8	28	52.5	75.5	25	62
50	74	40	89	129	81	1.6	25	75 ± 1.5	G 1/2	34	57.5	68.5	25	67
63	80	50	100	150	97	1.6	32	90 ± 1.5	G 1/2	34	57.5	72.5	32	71
80	93	60	127	191	124	2.4	40	115 ± 1.5	G 3/4	42	67	85	31	77
100	101	70	140	220	137	2.4	50	130 ± 2	G 3/4	42	70	88	35	82
125	117	90	178	278	175	3.2	63	165 ± 2	G 1	47	73.5	73.5	35	86
160	130	110	215	341	221	3.2	80	205 ± 2	G 1	47	80.5	80.5	32	86
200	160	130	279	439	281	3.2	100	245 ± 2	G 1 1/4	58	101	101	32	98

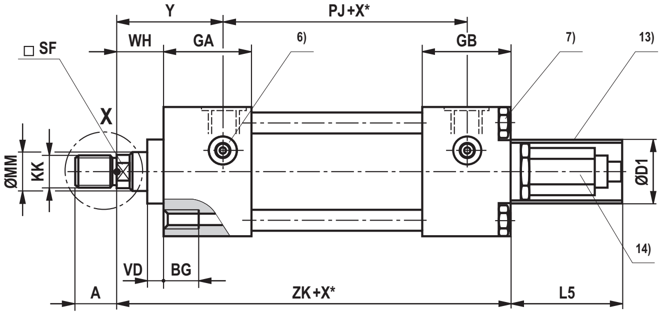
ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length
X*max = Max. stroke length

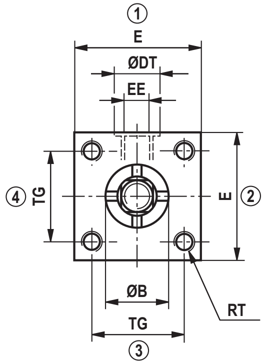
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
9) "XV" dimension in mm, always specify in the plain text
13) With piston Ø 40 – 50 mm without protective pipe
14) Installation space for position measurement system at least 200 mm

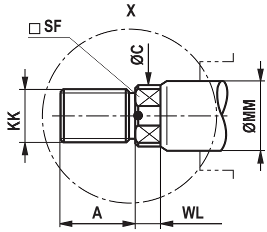
3

Dimensions: Type of mounting MX5 (dimensions in mm)

CST3 MX5







① ... ④ = position of the line connections

ØAL	ØMM	BG min	PJ ± 1,25	RT 6H	TG js13	VD	ZK ± 1	X* max	X* min **without** subplate	X* min **with** subplate
40	**28**	12	73	M8x1.25	41.7	12	195	600	–	50
50	**28** **36**	18	74	M12x1.75	52.3	9	194	500 800	–	50
63	**36** **45**	18	80	M12x1.75	64.3	13	205	650 1000	–	45
80	**45** **56**	24	93	M16x2	82.7	9	234	800 1200	–	32
100	**56** **70**	24	101	M16x2	96.9	10	248	1000 1370	–	57
125	**70** **90**	27	117	M22x2.5	125.9	9	254	1200 1420	–	35
160	**70** **110**	32	130	M27x3	154.9	7	270	1000 1410	20	20
200	**90** **140**	40	160	M30x3.5	190.2	7	324	1300 1350	20	20

Dimensions: MX5 (dimensions in mm)

		DIN / ISO 1)					ISO 2)					
ØAL	**ØMM**	**KK** 1)	**A** 1) max	**ØC**	**SF**	**WL**	**KK** 2)	**A** 2) max	**ØC**	**SF**	**WL**	**ØB** f9
40	**28**	M14x1.5	18	26	22	7	M20x1.5	28	26	22	7	42
50	**28**	M16x1.5	22	26	22	7	M20x1.5	28	26	22	7	42
	36	M16x1.5	22	34	30	8	M27x2	36	34	30	8	50
63	**36**	M20x1.5	28	34	30	8	M27x2	36	34	30	8	50
	45	M20x1.5	28	43	36	10	M33x2	45	43	36	10	60
80	**45**	M27x2	36	43	36	10	M33x2	45	43	36	10	60
	56	M27x2	36	54	46	10	M42x2	56	54	46	10	72
100	**56**	M33x2	45	54	46	10	M42x2	56	54	46	10	72
	70	M33x2	45	68	60	15	M48x2	63	68	60	15	88
125	**70**	–	–	–	–	–	M48x2	63	67	60	15	88
	90	M42x2	56	86	75	15	M64x3	85	86	75	15	108
160	**70**	M48x2	63	67	60	15	–	–	–	–	–	88
	110	M48x2	63	106	92	18	M80x3	95	106	92	18	133
200	**90**	M64x3	85	86	75	15	–	–	–	–	–	108
	140	M64x3	85	136	125	18	M100x3	112	136	125	18	163

ØAL	**L5**	**ØD1** max	**E**	**EE**	**DT**	**GA**	**GB**	**WH** ± 2	**Y** ± 2
40	–	–	63 ± 1.5	G 3/8	28	52.5	75.5	25	62
50	–	–	75 ± 1.5	G 1/2	34	57.5	68.5	25	67
63	82	96	90 ± 1.5	G 1/2	34	57.5	72.5	32	71
80	82	96	115 ± 1.5	G 3/4	42	67	85	31	77
100	82	96	130 ± 2	G 3/4	42	70	88	35	82
125	82	96	165 ± 2	G 1	47	73.5	73.5	35	86
160	82	96	205 ± 2	G 1	47	80.5	80.5	32	86
200	82	96	245 ± 2	G 1 1/4	58	101	101	32	98

ØAL = Piston Ø
ØMM = Piston rod Ø
X* = Stroke length
X*min = Min. stroke length
X*max = Max. stroke length
1) Thread for piston rod ends "F" and "H"
2) Thread for piston rod ends "D" and "K"
6) For the position of the line connections and the bleeding see page 41
7) Tightening torque see page 63
13) With piston Ø 40 – 50 mm without protective pipe
14) Installation space for position measurement system at least 200 mm

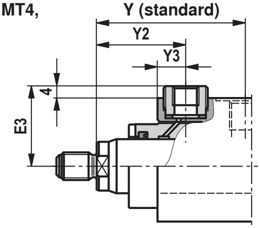
Leakage oil connection/enlarged line connection (dimensions in mm)

Leakage oil connection

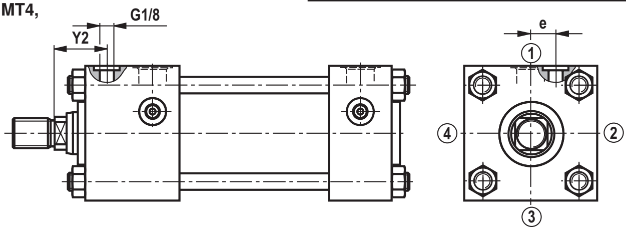
If technical high-quality seals are used, use of a leakage oil connection is generally not necessary. A drag oil collection connection is only recommended in special cases such as extension velocity more than 2 times retraction velocity with larger strokes, permanent pressurization and the like. In case the extension velocities are more than 5 times the retraction velocity, please contact us.

		MS2, MT4 ME6, MP5				ME5	
ØAL	**ØMM**	**e**	**Y2**	**Y3**	**E3**	**e**	**Y2**
25		0	25.5	10.5	29.5	17	35
32		0	35.5	10.5	32	18	45
40		0	36	11	36	22	47
50		14.5	39	–	–	34	52
63		16	45.5	–	–	43	59
80		16	48	–	–	27	62
100	**45**	16	52	–	–	30	68
100	**70**	16	55	–	–	30	68
125	**56**	16	54	–	–	45	68
125	**90**	18	57	–	–	45	68
160	**70**	16	54	–	–	45	68
160	**110**	16	54	–	–	47	68
200	**90**	16	55	–	–	45	68
200	**140**	24	61	–	–	45	72

ME6, MP5, MS2, MT4, Ø 25, 32, 40



ME5, ME6, MP5, MS2, MT4, Ø 50 to Ø 200

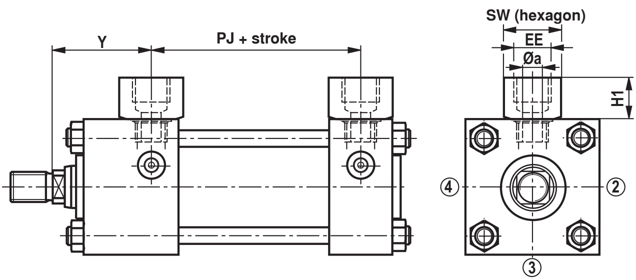


Enlarged line connection

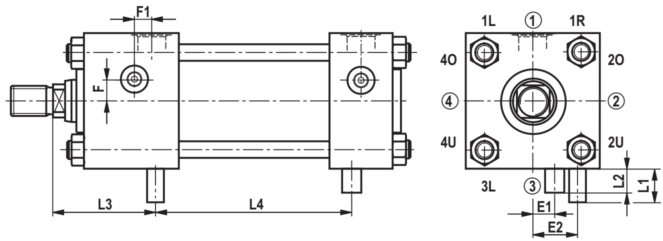
The oil ports of this series are generously dimensioned according to the standard; with high velocities, the pressure drop Δ*p* can be reduced by using larger oil ports; sometimes, it is, however, no longer possible to comply with the standard dimensions, see table.

Cannot be realized for the types of mounting ME 5 / 6 with connection position 2 or 4.

ØAL	**EE**	**H1**	**Y** ±2	**PJ** ±1.25	**SW**	**Øa**
25	G3/8	20	50	53	27	9
32	G3/8	20	60	56	27	9
40	G1/2	23	62	73	32	11
50	G3/4	29	67	74	41	14
63	G3/4	29	71	80	41	14
80	G1	33	77	93	46	18
100	G1	33	82	101	46	18
125	G11/4	39	86	117	60	23
160	G11/4	–	86	130	–	–
200	G11/2	–	98	165	–	–



Position of line connections/bleeding/leakage oil/throttle valve



		CDT3 / CST3					CGT3						
Mounting	Line connection	Bleeding Head	Bleeding Base	Leakage oil Head [1]	Throttle valve Head [1]	Throttle valve Base [1]		Bleeding Head 1	Bleeding Head 2	Leakage oil Head 1	Leakage oil Head 2	Throttle valve Head 1	Throttle valve Head 2
MP5. MT4. MP1. MP3. MX1. MX2. MX3. MX5	1	2	2	1	3R	3R	MT4. MX1. MX3	2	4	1	1	3R	3L
	2	3	3	2	4U	4U		3	1	2	2	4U	4O
	3	4	4	3	1L	1L		4	2	3	3	1L	1R
	4	1	1	4	2O	2O		1	3	4	4	2O	2U
ME5	1	2	2	1R	3R	3R	ME5	2	4	1R	1	3R	3L
	2	3R	3	1R	1L	4U		3R	1	1R	2	1L	4O
	3	4	4	3L	1L	1L		4	2	3L	3	1L	1R
	4	1L	1	3L	3R	2O		1L	3	3L	4	3R	2U
MS2	1	2O	2O	1	4O	4O	MS2	2O	4O	1	1	4O	2O
MT1	1	3L	2	–	3R	3R	MT1	3L	4	–	–	3R	3L
	3	1R	4	–	1L	1L		1R	2	–	–	1L	1R
MT2	1	2	3L	1	3R	3R							
	3	4	1R	3	1L	1L							
ME6	1	2	2	1	3R	3R							
	2	3	3	2	4U	1L							
	3	4	4	3	1L	1L							
	4	1	1	4	2O	3R							

[1] Not possible with CST3
[2] Protrusion 3 mm
[3] Types of mounting ME5, ME6, MP5, MT4, MP1, MP3, MT2, MX1, MX2, MX3 and MX5

ØAL	Bleeding						Throttle valve adjustable on both sides					
							Protrusion		Center offset		Dimension	
	F Head/base offset			F1 Connection 1/3	F1 Connection 2/4	SW Allen wrench	L1 (Head)	L2 (Base)	E1 (Head)	E2 (Base)	L3	L4
	[3]	MT1	MS2	ME5								
25	0	6	5	11.5	0	5 [2]	12	12	6	6	48	57 + Hub
32	0	5	5	12.5	0	5 [2]	12	12	9	9	57.5	61 + Hub
40	10	10	10	0	10	5	5.5	5.5	8	8	61.5	74 + Hub
50	10	10	10	0	10	5	3	3	10	10	67	74 + Hub
63	14	14	14	0	14	5	0	0	15	15	72	78 + Hub
80	10	10	10	0	10	6	0	0	14	14	81	85 + Hub
100	12	12	12	0	12	6	0	0	13	13	86	93 + Hub
125	0	0	0	0	–	6	–	–	22	22	91.5	109 + Hub
160	0	0	0	0	–	6	4	–	30	30	93.5	115 + Hub
200	0	0	0	0	–	6	4	–	30	30	114	128 + Hub

3

Bleeding/threaded coupling (dimensions in mm)

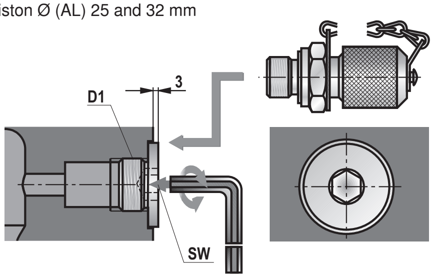
By default, a patented safety bleeding device against unintended screwing out in head and base is delivered for piston Ø ≥ 40 mm.

For piston Ø 25 and 32 mm, a bleed screw G1/8 is installed in head and base which is **not** secured against screwing out.

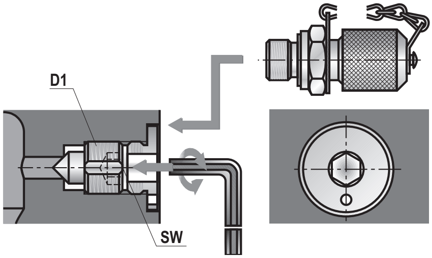
The port allows for the installation of a threaded coupling with check valve for pressure measurement or contamination-free bleeding. Threaded coupling with check valve function, i.e. it can also be connected when the system is pressurized.

Connection possibility for threaded coupling

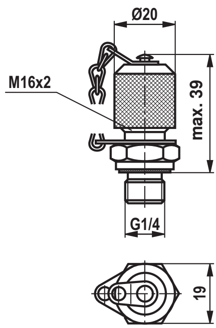
Piston Ø (AL) 25 and 32 mm



Piston Ø (AL) 40 to 200 mm



	Bleed screw			Threaded coupling
ØAL	**D1**	**Fuse**	**SW**	**D2**
25 and 32	G1/8	not secured	5	G1/8
40 and 63	G1/8	secured	5	G1/8
80 to 200	G1/4	secured	6	G1/4



Scope of delivery: Threaded coupling **G1/8**

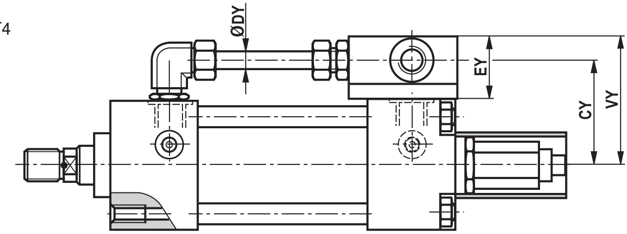
SCREW JOINT AB 20-11/K3 G1/8 with seal ring of NBR
Material no. **R900014363**
SCREW JOINT AB 20-11/K3V G1/8 with seal ring of FKM
Material no. **R900024710**

Scope of delivery: Threaded coupling **G1/4**

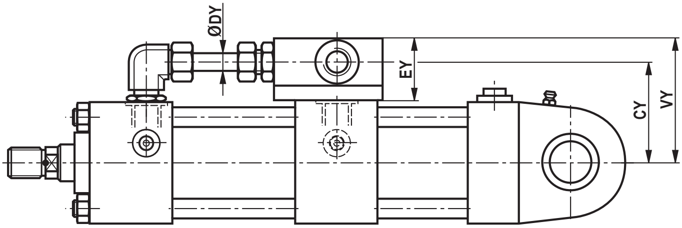
SCREW JOINT AB 20-11/K1 G1/4 with seal ring of NBR
Material no. **R900009090**
SCREW JOINT AB 20-11/K1V G1/4 with seal ring of FKM
Material no. **R900001264**

Subplates for valve mounting – dimensions and porting pattern (dimensions in mm)

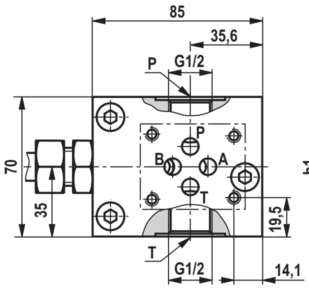
MX5
ME5, MS2, MT4



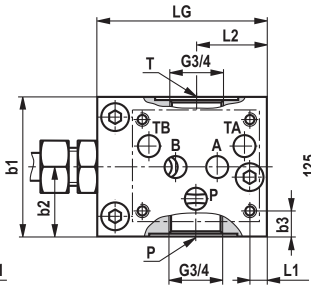
MP5



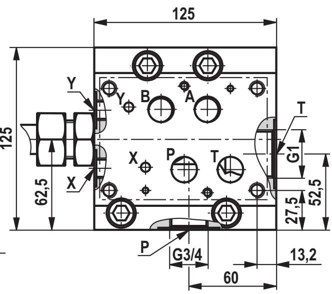
Size 6
Porting pattern according to ISO 4401



Size 10
Porting pattern according to ISO 4401



Size 16
Porting pattern according to ISO 4401



ØAL	Size 6				Size 10										Size 16			
	CY	EY	VY	ØDY	CY	EY	VY	ØDY	LG	L1	L2	b1	b2	b3	CY	EY	VY	ØDY
40	63.2	49.7	81.2	15	63.2	49.7	81.2	15	85	8.5	35.5	70	35	13	–	–	–	–
50	69.2	49.7	87.2	15	69.2	49.7	87.2	15	85	8.5	35.5	70	35	13	–	–	–	–
63	76.7	49.7	94.7	15	76.7	49.7	94.7	15	85	8.5	35.5	70	35	13	–	–	–	–
80	89.2	49.7	107.2	15	89.2	49.7	107.2	15	85	8.5	35.5	70	35	13	–	–	–	–
100	–	–	–	–	106.4	64.7	129.7	20	110	27	52	125	62.5	39.5	104	79.7	144.7	20
125	–	–	–	–	123.9	64.7	147.2	20	110	27	52	125	62.5	39.5	121.5	79.7	162.2	20
160	–	–	–	–	143.9	64.7	167.2	20	110	27	52	125	62.5	39.5	141.5	79.7	182.2	20
200	–	–	–	–	163.9	64.7	187.2	20	110	27	52	125	62.5	39.5	161.5	79.7	202.2	20

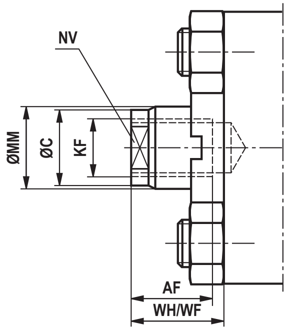
For the weight of the subplates refer to page 44.

Weight: Subplates

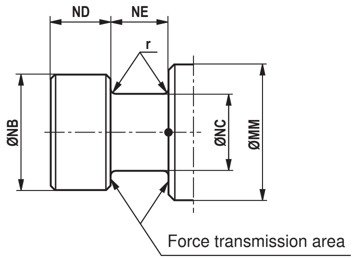
ØAL	Size 6 in kg	Size 10 in kg	Size 16 in kg
40	2.3	2.3	–
50	2.3	2.3	–
63	2.3	2.3	–
80	2.3	2.3	–
100	–	7.0	9.8
125	–	7.0	9.8
160	–	7.0	9.8
200	–	7.0	9.8

Piston rod ends E and T (dimensions in mm)

Internal thread E



Trunnion T



ØAL	ØMM	Stroke [2] min	KF	AF	ØC	NV	ØNB h13	ØNC h13	ND / NE h13 / H11	r	p max. [1] bar
25	**18**	14	M12x1.25	18	17	15	–	–	–	–	–
32	**22**	17	M16x1.5	22	21	18	18	11.2	8	0.5	160
40	**18**	20	M12x1.25	18	17	15	–	–	–	–	–
	28	36	M20x1.5	28	25	22	22.4	14	10	0.5	160
50	**22**	27	M16x1.5	22	21	18	18	11.2	8	0.5	105
	36	56	M27x2	36	33	30	28	18	12.5	0.8	190
63	**28**	33	M20x1.5	28	25	22	22.4	14	10	0.5	95
	45	61	M33x2	45	42	36	35.5	22.4	16	0.8	160
80	**36**	47	M27x2	36	33	30	28	18	12.5	0.8	105
	56	64	M42x2	56	53	46	45	28	20	1.2	160
100	**45**	0	M33x2	45	42	36	35.5	22.4	16	0.8	90
	70	0	M48x2	63	67	60	56	35.5	25	1.2	160
125	**56**	0	M42x2	56	53	46	45	28	20	1.2	100
	90	30	M64x3	85	86	75	78	45	30	1.5	160
160	**70**	5	M48x2	63	67	60	56	35.5	25	1.5	90
	110	45	M80x3	95	106	92	106	65	35	1.5	160
200	**90**	35	M64x3	85	86	75	78	45	30	1.5	90
	140	67	M100x3	112	136	125	136	70	45	1.5	160

[1] with pulling load

[2] = minimum stroke length with piston rod end "E" and only with CGT3

Position measurement system

The position measurement system that is pressure-resistant up to 500 bar works in a contactless and absolute manner. The basis of this position measurement system is the magnetostrictive effect. Here, the coincidence of two magnetic fields triggers a torsion pulse. This pulse runs on the waveguide inside the gauge from the measuring point to the sensor head. The running time is constant and almost temperature-independent. It is proportional to the position of the solenoid and thus a measure for the actual position value and is converted in the sensor into a direct analog or digital output.

Technical data: Position measurement system

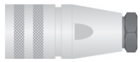
(For applications outside these parameters, please consult us!)

Operating pressure		bar	160
Analog output		V	0 to 10
	Load resistance	kΩ	≥ 5
	Resolution		unlimited
Analog output		mA	4 to 20
	Load resistance	Ω	0 to 500
	Resolution		unlimited
Digital output			SSI 24 bit gray-coded
	Resolution	μm	5
	Direction of measurement		asynchronously forward
Linearity (absolute accuracy)	Analog	% mm	≤ ±0.02 % (referred to measurement length) min. ±0.05
	Digital	% mm	≤ ±0.01 % (referred to measurement length) min. ±0.04
Reproducibility		% mm	±0.001 (referred to measurement length) min. ±0.0025
Hysteresis		mm	≤ 0.004
Supply voltage		V DC	24 (±10 % with analog output)
	Current consumption	mA	100
	Residual ripple	% s-s	≤ 1
	Currentconsumption	V DC mA	24 (+20 %/–15 % with digital output) 70
	Residual ripple	% s-s	≤ 1
Protection class	Pipe and flange		IP 67
	Sensor electronics		IP 65
Operating temperature	Sensor electronics	°C	–40 to +75
Temperature coefficient	Voltage	ppm/°C	70
	Current	ppm/°C	90

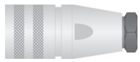
3

Position measurement system

[1] For analog output:
6-pole amphenol mating connector, material no. **R900072231**
(Mating connector is **not** included in the scope of delivery, must be ordered separately)

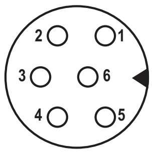


[1] For digital output:
7-pole amphenol mating connector, material no. **R900079551**
(Mating connector is **not** included in the scope of delivery, must be ordered separately)



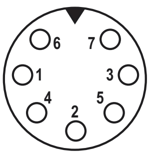
Pin assignment

Position measurement system (analog output)
Connector (view to pin side)



Pin	Cable	Signal / current	Signal / voltage
1	gray	4 … 20 mA	0 … 10 V
2	pink	DC ground	DC ground
3	yellow	not used	not used
4	green	DC ground	DC ground
5	brown	+24 V DC (+20 % / –15 %)	+24 V DC (+20 % / –15 %)
6	white	DC ground (0 V)	DC ground (0 V)

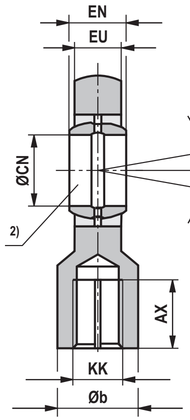
Position measurement system (digital output)
Connector (view to pin side)

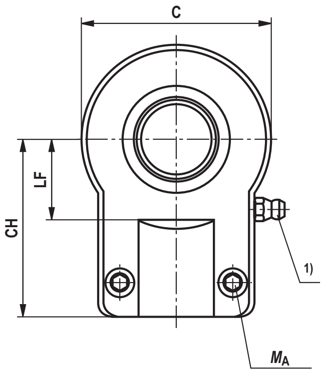


Pin	Cable	Signal / SSi
1	gray	Data (–)
2	pink	Data (+)
3	yellow	Clock (+)
4	green	Clock (–)
5	brown	+24 V DC(+20 % / –15 %)
6	white	DC ground (0 V)
7	–	not used

Tilt head CGKA - AP 6 (clampable) (dimensions in mm)

ISO 8133
DIN 24555





Type	Material no.	KK	AX min	Øb	C max	CH js13	ØCN	EN	EU max	LF min	M_A [7] Nm	m [8] kg	C_0 [9] (head) kN	F_{adm} [10] kN
CGKA 12 [3]	R900327186	M10 x1,25	15	17	40	42	$12_{-0,008}$	$10_{-0,12}$	8	16	9,5	0,15	17	6,3
CGKA 16 [4]	R900327192	M12x1,25	17	21	45	48	$16_{-0,008}$	$14_{-0,12}$	11	20	9,5	0,25	28,5	10,5
CGKA 20 [4]	R900306874	M14x1,5	19	25	55	58	$20_{-0,012}$	$16_{-0,12}$	13	25	23	0,43	42,5	15,7
CGKA 25	R900327191	M16x1,5	23	30	65	68	$25_{-0,012}$	$20_{-0,12}$	17	30	23	0,73	67	24,7
CGKA 30	R900327187	M20x1,5	29	36	80	85	$30_{-0,012}$	$22_{-0,12}$	19	35	46	1,3	108	39,9
CGKA 40	R900327188	M27x2	37	45	100	105	$40_{-0,012}$	$28_{-0,12}$	23	45	46	2,3	156	57,6
CGKA 50	R900327368	M33x2	46	55	125	130	$50_{-0,012}$	$35_{-0,12}$	30	58	80	4,4	245	90,4
CGKA 60	R900327369	M42x2	57	68	160	150	$60_{-0,012}$	$44_{-0,12}$	38	68	195	8,4	380	140,2
CGKA 80	R900327370	M48x2	64	90	205	185	$80_{-0,015}$	$55_{-0,15}$	47	82 [6]	385	15,6	585	215,9
CGKA 100	R900327371	M64x3	86	110	240	240	$100_{-0,02}$	$70_{-0,2}$	57	116	660	28	865	319,2
CGKD 100 [5]	R900322030	M80x3	96	110	210	210	100 H7	100 h12	84	98	385	28	1060	391,1
CGKD 125 [5]	R900322026	M100x3	113	135	262	260	125 H7	125 h12	102	120	385	43	1200	442,8

Note:

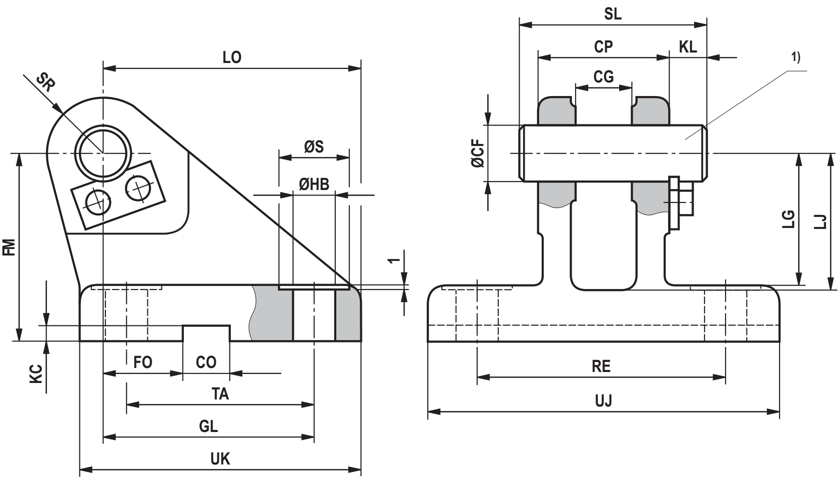
Geometry and dimensions may differ depending on the manufacturer.

In case of combination with other mounting elements, the usability must be checked.

1) Lubricating nipple, cone head form A according to DIN 71412
2) Related bolt Ø h6
3) Cannot be re-lubricated
4) Can be re-lubricated via lubricating hole
5) Tilt head according to ISO 8132, related bolt Ø m6
6) Dimensions may differ from the standard depending on the manufacturer
7) M_A = tightening torque
The tilt head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws have to be tightened applying the specified tightening torque.
8) m = Weight tilt head in kg
9) C_0 = static load rating of the tilt head
10) F_{adm} = maximum admissible load of the tilt head with oscillatory or alternating loads

Clevis bracket CLCB - AB 5 (clampable) (dimensions in mm)

ISO 8133
DIN 24556



Type	Material no.	Nominal force kN	ØCF K7 1)	CP h14	CG + 0,1 + 0,3	CO N9	FO js14	FM js11	GL js13	ØHB	ØS
CLCB 12	R900326960	8	12	30	10	10	16	40	46	9	15
CLCB 16	R900327372	12,5	16	40	14	16	18	50	61	11	18
CLCB 20	R900327373	20	20	50	16	16	20	55	64	14 3)	20
CLCB 25	R900326961	32	25	60	20	25	22	65	78	16 3)	24
CLCB 30	R900327374	50	30	70	22	25	24	85	97	18 3)	26
CLCB 40	R900327375	80	40	80	28	36	24	100	123	22	33
CLCB 50	R900327376	125	50	100	35	36	35	125	155	30	48
CLCB 60	R900327377	200	60	120	44	50	35	150	187	39	60
CLCB 80	R900327378	320	80	160	55	50	35	190	255	45	80
CLCB 100	R900327379	500	100	200	70	63	35	210	285	48	80

Clevis bracket CLCB - AB 5 (clampable) (dimensions in mm)

Type	KC + 0,3 0	KL	LG	LJ	LO	RE js13	SL	SR max.	TA js13	UJ	UK	*m* [2)] kg
CLCB 12	3,3	8	28	29	56	55	40	12	40	75	60	0,6
CLCB 16	4,3	8	37	38	74	70	50	16	55	95	80	1,3
CLCB 20	4,3	10	39	40	80	85	62	20	58	120	90	2,1
CLCB 25	5,4	10	48	49	98	100	72	25	70	140	110	3,2
CLCB 30	5,4	13	62	63	120	115	85	30	90	160	135	6,5
CLCB 40	8,4	16	72	73	148	135	100	40	120	190	170	12,0
CLCB 50	8,4	19	90	92	190	170	122	50	145	240	215	23,0
CLCB 60	11,4	20	108	110	225	200	145	60	185	270	260	37,0
CLCB 80	11,4	26	140	142	295	240	190	80	260	320	340	79,0
CLCB 100	12,4	30	150	152	335	300	235	100	300	400	400	140,0

Note:

Geometry and dimensions may differ depending on the manufacturer.

In case of combination with other mounting elements, the usability must be checked.

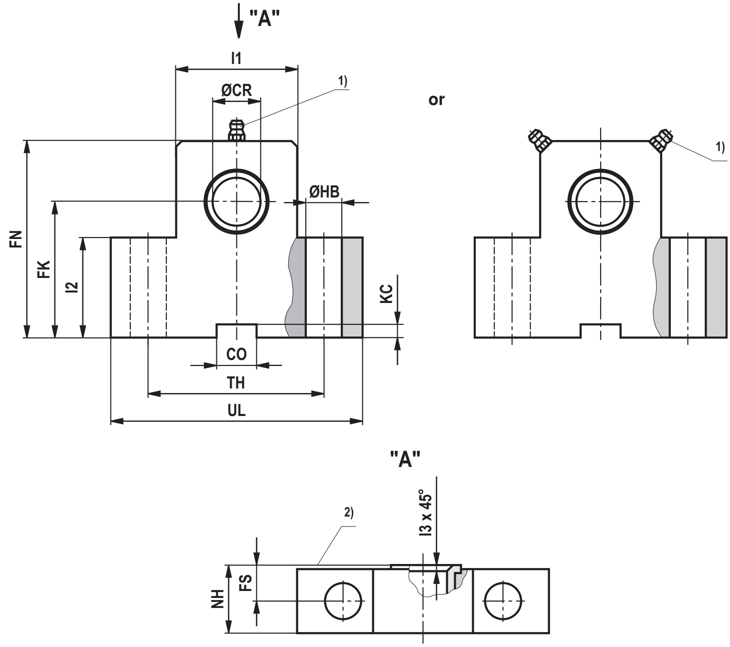
1) Related bolt Ø h6, suitable for tilt head CGKA...
(bolt and bolt lock are included in the scope of delivery)

2) *m* = Weight clevis bracket in kg

3) Dimensions may differ from the standard depending on the manufacturer

Trunnion bearing block CLTA - AT 4 (dimensions in mm)

CLTA 12 to 20



ØAL	Type	Material no.	Nominal force kN [4]	ØCR H7	CO N9	FK js12	FN max	FS js14	ØHB H13	KC +0,3 0	NH max	TH js14	UL max	l1	l2	l3	*m* [5] kg
25	**CLTA 12**	R901071355	8	12	10	38	55	8	9	3,3	17 [3]	40	63	25	25	1	0,5
32	**CLTA 16**	R901071364	12,5	16	16	45	65	10	11	4,3	21	50	80	30	30	1	0,9
40	**CLTA 20**	R901071365	20	20	16	55	80	10	11	4,3	21	60	90	40	38	1,5	1,35

Note:

Geometry and dimensions may differ depending on the manufacturer.

In case of combination with other mounting elements, the usability must be checked.

ØAL = Kolben-Ø

1) Lubricating nipple, cone form A according to DIN 71412

2) Inside

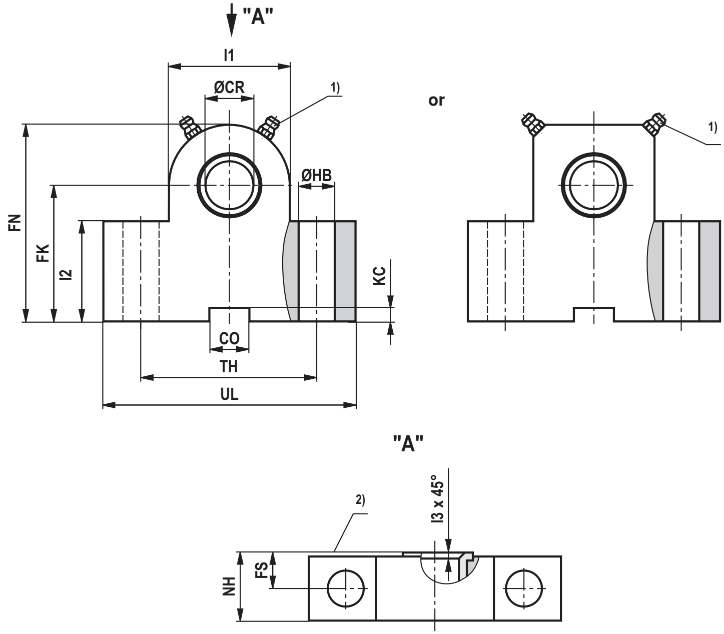
3) Dimensions may differ depending on the manufacturer

4) Nominal force applies to applications in pairs

5) *m* = weight per pair, bearing blocks are delivered in pairs

Trunnion bearing block CLTA - AT 4 (dimensions in mm)

CLTA 25 to 100



ØAL	Type	Material no.	Nominal force kN 4)	ØCR H7	CO N9	FK js12	FN max	FS js14	ØHB H13	KC +0,3 0	NH max	TH js14	UL max	l1	l2	l3	*m* 5) kg
50	**CLTA 25**	R901071368	32	25	25	65	90	12	14 3)	5,4	26	80	110	56	45	1,5	2,4
63	**CLTA 32**	R901071377	50	32	25	75	110	15	18 3)	5,4	33	110	150	70	52	2	5,0
80	**CLTA 40**	R901071380	80	40	36	95	140	16	22	8,4	41	125	170	88	60	2,5	8,5
100	**CLTA 50**	R901071385	125	50	36	105	150	20	26	8,4	51	160	210	90	72	2,5	15
125	**CLTA 63**	R901071395	200	63	50	125	195	25	33	11,4	61	200	265	136	87	3	30
160	**CLTA 80**	R901071398	320	80	50	150	230	31	39	11,4	81	250	325	160	112	3,5	59
200	**CLTA 100**	R901071400	500	100	63	200	300	42	52	12,4	101	320	410	200	150	4,5	131

Note:

Geometry and dimensions may differ depending on the manufacturer.
In case of combination with other mounting elements, the usability must be checked.

ØAL = Kolben-Ø

1) Lubricating nipple, cone form A according to DIN 71412
2) Inside
3) Dimensions may differ depending on the manufacturer
4) Nominal force applies to applications in pairs
5) ***m*** = weight per pair, bearing blocks are delivered in pairs

Kinking

The admissible stroke length with flexibly guided load and a factor of 3.5 for safety against kinking can be seen from the relevant table. For other installation positions of the cylinder, the admissible stroke length must be interpolated. Admissible stroke length for non-guided load on request.

Kinking calculations are carried out according to the following formulas:

1. Calculation according to Euler

$$F = \frac{\pi^2 \cdot E \cdot I}{v \cdot L_K^2} \quad \text{if } \lambda > \lambda_g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi\,(335\text{-}0{,}62 \cdot \lambda)}{4 \cdot v} \quad \text{if } \lambda \leq \lambda_g$$

Explanation:

E = bodule of elasticity in N/mm²
= 2.1×10^5 for steel

I = geometrical moment of inertia in mm⁴
for circular cross-section = $\frac{d^4 \cdot \pi}{64} = 0.0491 \cdot d^4$

v = 3.5 (safety factor)

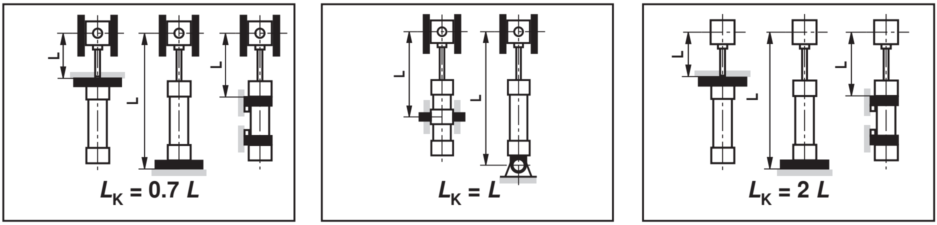
L_K = free kinking length in mm (depending on the type of mounting see sketches A, B, C)

d = piston rod Ø in mm

λ = slenderness ratio
$= \frac{4 \cdot L_K}{d} \qquad \lambda_g = \pi \sqrt{\frac{E}{0.8 \cdot R_e}}$

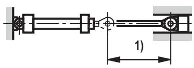
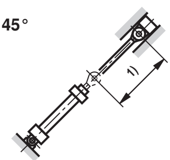
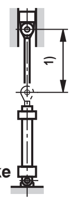
R_e = yield strength of the piston rod material

Influence of the type of mounting on the kinking length:



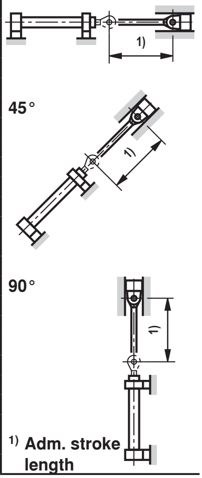
Admissible stroke length (dimensions in mm)

Type of mounting MP1, MP3, MP5

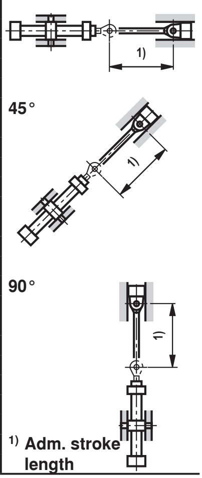
ØAL	ØMM	Admissible stroke length with 70 bar 0°	70 bar 45°	70 bar 90°	100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	210 bar 0°	210 bar 45°	210 bar 90°	Installation position
25	12	115	120	125	85	85	90	50	50	55				
	18	315	330	375	270	275	300	205	210	220	180	180	185	0°
32	14	115	120	125	85	85	90	50	50	55				
	22	370	385	440	315	325	350	240	245	255	210	210	215	
40	18	160	165	175	120	125	130	75	75	80				
	22	310	320	350	260	265	290	195	200	205	130	130	135	
	28	465	485	580	400	415	465	315	320	340	280	285	290	
50	22	205	210	220	155	160	165	100	100	105				45° 
	28	420	430	475	355	360	380	270	275	280	190	195	195	
	36	620	650	790	545	565	640	435	445	475	395	400	410	
63	28	280	285	305	220	225	230	150	150	155				
	36	560	580	645	480	490	520	375	380	390	280	280	285	
	45	770	810	995	680	710	805	555	565	605	500	510	530	
80	36	380	390	415	305	310	320	210	215	220				
	45	695	715	800	600	610	650	470	475	490	350	355	360	
	56	945	995	1225	840	870	995	685	670	745	615	625	655	
100	45	480	495	540	390	400	420	280	285	290				90° 
	56	850	880	1000	740	760	820	590	600	625	445	450	460	
	70	1150	1210	1550	1030	1075	1260	855	875	955	780	790	830	
125	56	595	615	685	490	500	535	360	365	375				
	70	1065	1105	1290	940	965	1060	765	775	810	570	575	595	
	90	1445	1535	2110	1315	1380	1690	1115	1150	1285	1035	1055	1130	
160	70	730	755	850	610	625	670	455	460	475				
	110	1715	1815	2450	1565	1640	2015	1335	1380	1540	1205	1235	1320	
200	90	945	985	1140	800	825	900	610	620	645				1) **Adm. stroke length**
	140	2120	2255	2700	1955	2060	2625	1690	1755	2010	1540	1580	1725	

Admissible stroke length (dimensions in mm)

Type of mounting MS2

ØAL	ØMM	Admissible stroke length with 70 bar 0°	70 bar 45°	70 bar 90°	100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	210 bar 0°	210 bar 45°	210 bar 90°	Installation position
25	12	500	510	530	420	425	435	325	325	330				
	18	600	600	600	600	600	600	600	600	600	600	600	600	0°
32	14	525	535	555	435	440	450	335	335	340				
	22	800	800	800	800	800	800	800	800	800	780	790	800	
40	18	700	715	750	590	595	610	455	460	465				
	22	975	1000	1000	855	875	940	690	700	720	610	610	620	
	28	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
50	22	835	850	895	705	710	730	545	550	555				45°
	28	855	1200	1200	1100	1130	1200	895	910	945	795	800	815	
	36	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	
63	28	1060	1086	1160	900	915	950	705	710	720				
	36	1400	1400	1400	1400	1400	1400	1185	1200	1255	1045	1055	1080	
	45	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
80	36	1370	1405	1525	1175	1195	1250	930	935	955				
	45	1700	1700	1700	1700	1700	1700	1460	1480	1555	1295	1305	1340	
	56	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	
100	45	1685	1735	1910	1460	1485	1570	1165	1175	1205				90°
	56	2000	2000	2000	2000	2000	2000	1800	1835	1950	1595	1615	1670	
	70	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
125	56	2075	2140	2300	1810	1845	1970	1455	1470	1515				
	70	2300	2300	2300	2300	2300	2300	2240	2290	2300	2010	2035	2120	
	90	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	
160	70	2515	2595	2600	2200	2245	2415	1780	1800	1855				
	110	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	
200	90	2700	2700	2700	2700	2700	2700	2700	2700	2700				1) Adm. stroke
	140	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	length

Type of mounting MT4 (trunnion position in cylinder center)

ØAL	ØMM	Admissible stroke length with 70 bar 0°	70 bar 45°	70 bar 90°	100 bar 0°	100 bar 45°	100 bar 90°	160 bar 0°	160 bar 45°	160 bar 90°	210 bar 0°	210 bar 45°	210 bar 90°	Installation position
25	12	190	190	200	150	150	155	105	105	105				
	18	455	470	535	395	405	435	310	315	325	275	280	285	0°
32	14	195	200	205	150	155	155	105	105	105				
	22	535	555	625	460	470	510	365	365	380	320	325	330	
40	18	265	270	290	215	215	225	150	155	155				
	22	430	445	480	360	370	385	275	280	285	230	230	235	
	28	670	700	825	590	605	670	475	480	505	430	435	445	
50	22	330	335	355	265	270	280	190	195	195				45°
	28	570	590	645	485	495	520	375	380	390	315	315	320	
	36	885	925	1115	785	810	910	640	655	690	580	590	610	
63	28	435	445	470	355	360	375	265	265	270				
	36	755	780	865	650	660	700	510	575	530	430	430	440	
	45	1095	1145	1390	975	1010	1140	800	815	870	725	735	765	
80	36	585	595	630	480	485	505	340	360	365				
	45	890	920	1025	760	775	830	590	595	615	535	540	550	
	56	1340	1400	1700	1195	1240	1405	1000	1010	1075	885	900	940	
100	45	725	745	805	605	615	645	415	440	475				90°
	56	1090	1130	1295	940	965	1045	740	750	782	675	680	695	
	70	1615	1700	2000	1460	1515	1770	1225	1255	1355	1115	1130	1185	
125	56	900	925	1015	760	775	820	485	520	605				
	70	1340	1395	1640	1170	1205	1330	940	955	1000	855	865	890	
	90	2035	2150	2300	1860	1945	2300	1590	1635	1815	1480	1510	1605	
160	70	1100	1300	1255	935	955	1015	730	735	760				
	110	2410	2550	2600	2210	2315	2600	1905	1960	2180	1720	1755	1875	
200	90	1420	1470	1680	1225	1255	1360	770	830	1020				1) Adm. stroke
	140	2700	2700	2700	2700	2700	2700	2415	2495	2700	2195	2250	2240	length

3

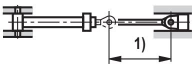
Admissible stroke length (dimensions in mm)

Type of mounting MT2

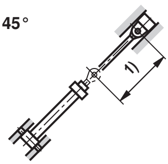
ØAL	ØMM	Admissible stroke length with 70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	130	130	135	100	100	105	65	65	65			
	18	330	340	390	285	290	315	220	225	230	195	195	200
32	14	135	135	140	100	100	105	65	65	65			
	22	390	405	455	335	340	370	260	260	270	230	230	235
40	18	180	185	200	145	145	150	95	95	100			
	22	305	315	340	250	260	270	185	190	195	155	155	155
	28	485	505	600	425	435	485	335	345	360	305	305	315
50	22	230	235	245	180	185	190	125	125	125			
	28	410	425	465	345	350	370	260	265	270	220	220	225
	36	645	675	815	570	590	665	460	470	500	420	425	440
63	28	310	315	335	250	250	260	180	180	180			
	36	550	565	630	465	475	505	360	365	375	305	305	315
	45	800	840	1025	710	735	835	580	595	630	530	535	555
80	36	415	425	450	340	345	355	250	250	255			
	45	675	700	780	580	590	630	450	455	470	380	385	395
	56	980	1030	1260	875	905	1030	720	735	780	645	655	685
100	45	515	530	575	430	435	455	320	320	330			
	56	825	855	980	710	730	795	565	570	595	480	485	500
	70	1185	1245	1585	1065	1110	1300	890	915	990	815	830	870
125	56	640	660	730	540	550	580	410	410	425			
	70	1015	1060	1240	890	915	1010	715	725	760	615	625	640
	90	1495	1580	2110	1365	1425	1735	1160	1195	1330	1080	1105	1175
160	70	785	810	905	665	675	720	505	515	530			
	110	1770	1870	2505	1620	1695	2070	1390	1430	1595	1260	1290	1375
200	90	1015	1055	1210	870	895	970	680	685	715			
	140	2190	2325	2700	2025	2125	2695	1760	1825	2080	1610	1650	1790

Installation position

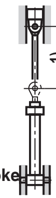
0°



45°



90°



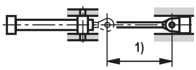
1) Adm. stroke length

Type of mounting MT1

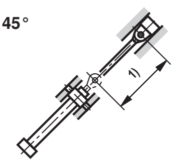
ØAL	ØMM	Admissible stroke length with 70 bar			100 bar			160 bar			210 bar		
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°
25	12	325	325	330	260	260	265	190	190	190			
	18	600	600	600	600	600	600	500	510	520	445	450	455
32	14	335	335	345	265	270	270	190	190	190			
	22	800	800	800	735	750	800	580	590	605	520	520	530
40	18	460	465	475	370	375	375	270	270	275			
	22	690	705	760	585	595	620	455	460	465	385	390	390
	28	1000	1000	1000	945	970	1000	760	770	800	685	690	705
50	22	550	555	570	450	450	455	330	330	335			
	28	905	930	1015	775	790	830	615	620	630	515	520	525
	36	1200	1200	1200	1200	1200	1200	1010	1025	1075	915	925	955
63	28	715	725	750	590	590	600	440	440	445			
	36	1175	1210	1335	1015	1035	1100	805	810	835	695	695	705
	45	1400	1400	1400	1400	1400	1400	1245	1270	1345	1135	1150	1190
80	36	940	955	995	780	785	805	590	590	600			
	45	1465	1510	1675	1270	1300	1375	1015	1025	1055	860	865	880
	56	1700	1700	1700	1700	1700	1700	1525	1555	1655	1385	1405	1460
100	45	1190	1210	1270	995	1005	1030	740	760	770			
	56	1790	1850	2000	1570	1600	1730	1270	1285	1330	1085	1095	1115
	70	2000	2000	2000	2000	2000	2000	1900	1945	2000	1740	1765	1850
125	56	1480	1505	1595	1245	1260	1300	965	970	980			
	70	2190	2270	2300	1935	1990	2175	1585	1605	1675	1375	1385	1420
	90	2300	2300	2300	2300	2300	2300	2300	2300	2300	2290	2300	2300
160	70	1805	1840	1965	1525	1545	1600	1185	1195	1210			
	110	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600
200	90	2340	2400	2610	2000	2035	2135	1575	1585	1620			
	140	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700

Installation position

0°



45°



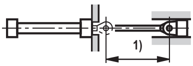
90°

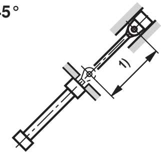
1) Adm. stroke length

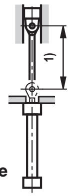
Admissible stroke length (dimensions in mm)

Type of mounting ME5, MX3, MX5

ØAL	ØMM	Admissible stroke length with 70 bar			100 bar			160 bar			210 bar			Installation position
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°	
25	12	510	520	540	430	435	445	335	335	340				
	18	600	600	600	600	600	600	600	600	600	600	600	600	0°
32	14	535	545	565	445	450	460	345	345	350				
	22	800	800	800	800	800	800	800	800	800	790	800	800	
40	18	710	725	755	600	605	620	465	470	475				
	22	990	1000	1000	870	890	955	705	715	735	620	625	635	
	28	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
50	22	850	865	910	720	725	750	560	565	570				45°
	28	1200	1200	1200	1125	1150	1200	920	930	965	810	815	830	
	36	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	
63	28	1080	1100	1170	920	930	965	720	725	740				
	36	1400	1400	1400	1400	1400	1400	1205	1225	1280	1065	1075	1100	
	45	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	
80	36	1390	1425	1545	1195	1215	1270	950	955	975				
	45	1700	1700	1700	1700	1700	1700	1485	1510	1580	1310	1325	1360	
	56	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	
100	45	1710	1760	1935	1480	1510	1590	1185	1195	1225				90°
	56	2000	2000	2000	2000	2000	2000	1815	1850	1965	1620	1635	1690	
	70	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	
125	56	2100	2165	2300	1830	1865	1990	1200	1280	1540				
	70	2300	2300	2300	2300	2300	2300	2255	2300	2300	2030	2060	2140	
	90	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	
160	70	2540	2600	2600	2225	2275	2440	1805	1825	1885				
	110	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	
200	90	2700	2700	2700	2700	2700	2700	2360	2395	2510				1) Adm. stroke
	140	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	2700	length

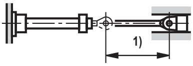


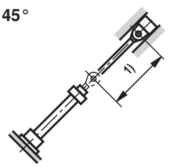


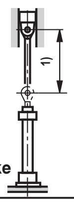


Type of mounting ME6, MX1, MX2

ØAL	ØMM	Admissible stroke length with 70 bar			100 bar			160 bar			210 bar			Installation position
		0°	45°	90°	0°	45°	90°	0°	45°	90°	0°	45°	90°	
25	12	195	200	220	160	160	170	115	115	120				
	18	445	465	585	395	410	475	325	330	360	295	295	310	0°
32	14	205	210	230	165	170	180	120	120	120				
	22	525	550	685	465	485	560	385	390	420	345	350	365	
40	18	270	280	315	225	230	245	165	165	170				
	22	435	455	520	375	385	420	295	300	310	245	250	255	
	28	645	680	895	580	605	730	485	500	555	450	460	480	
50	22	335	350	390	280	285	305	210	210	220				45°
	28	580	600	700	505	515	565	400	405	425	335	340	350	
	36	845	895	1200	770	805	990	655	675	755	605	620	655	
63	28	445	460	520	375	385	415	285	290	300				
	36	760	795	940	670	690	765	540	550	580	465	470	490	
	45	1045	1105	1400	955	1140	1240	815	845	955	765	780	835	
80	36	590	610	690	505	515	555	390	395	410				
	45	940	980	1160	830	855	950	675	685	720	580	585	610	
	56	1275	1350	1700	1170	1225	1520	1005	1035	1175	930	950	1025	
100	45	725	755	885	630	645	710	495	505	530				90°
	56	1145	1200	1465	1025	1060	1205	850	865	920	730	740	770	
	70	1530	1625	2000	1415	1485	1925	1230	1280	1485	1170	1195	1300	
125	56	885	925	1110	775	800	900	620	635	670				
	70	1380	1450	1835	1245	1290	1500	1040	1065	1155	915	935	980	
	90	1900	2025	2300	1770	1875	2300	1570	1640	1980	1525	1570	1745	
160	70	1080	1130	1370	950	985	1110	770	785	835				
	110	2250	2395	2600	2105	2225	2600	1870	1950	2360	1780	1835	2045	
200	90	1375	1445	1825	1225	1275	1485	1010	1035	1120				1) Adm. stroke
	140	2700	2700	2700	2605	2700	2700	2340	2450	2700	2245	2325	2660	length







End position cushioning

End position cushioning:

The objective is to reduce the velocity of a moved reduced mass, whose center of gravity lies on the cylinder axis to a level, at which neither the cylinder nor the machine into which the cylinder is installed is damaged.

For velocities above 20 mm/s, we recommend the use of an end position cushioning feature, which absorbs energy without requiring the use of additional equipment.

Series CDT3/CGT3 is equipped with a progressive cushioning system.

Advantages of this cushioning system:

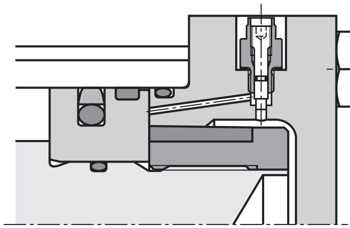
- Progressive delay.
- Short cushioning time.
- Cushioning length depending on the velocity.
- Due to low cushioning pressures and no pressure peaks, safety and the life cycle of the cylinder and the machine are increased.
- Insensitive to changes in pressure, temperature and the moved masses.
- Controlled end stop velocity of the piston – more safety and reliability.
- Quick start-up due to special check valve and floating bushing.

Cylinders with end position cushioning can achieve their full cushioning capacity only over the entire stroke length.

With the adjustable end position cushioning version "E", a throttle valve is additionally provided when compared with version "D". End position cushioning "E" allows for optimization of the cycle times.
The max. cushioning capacity can only be achieved when the throttle valve is closed.

For special applications with very short stroke times, high velocities or large masses, cylinders with special end position cushioning versions can be offered on request.

When fixed or adjustable stops are used, special measures must be taken!

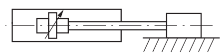


Cushioning capacity:

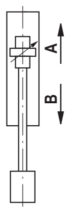
When decelerating masses via the end position cushioning, the structural-inherent cushioning capacity must not be exceeded.

To this end, the kinetic energy and potential energy of the moved mass are to be calculated and compared to the admissible values form the diagram son pages 58, 59.

Energy determination

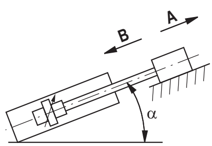


$\boldsymbol{E} = \frac{1}{2}\ \boldsymbol{m} \cdot \boldsymbol{v}^2$



1 Retract (A): $\boldsymbol{E} = \frac{1}{2}\ \boldsymbol{mv}^2 - \boldsymbol{mg} \cdot \boldsymbol{l}_a$

1 Extend (B): $\boldsymbol{E} = \frac{1}{2}\ \boldsymbol{mv}^2 + \boldsymbol{mg} \cdot \boldsymbol{l}_a$



1 Extend (A): $\boldsymbol{E} = \frac{1}{2}\ \boldsymbol{mv}^2 - \boldsymbol{mg} \cdot \boldsymbol{l}_a \cdot \sin \boldsymbol{\alpha}$

1 Retract (B): $\boldsymbol{E} = \frac{1}{2}\ \boldsymbol{mv}^2 + \boldsymbol{mg} \cdot \boldsymbol{l}_a \cdot \sin \boldsymbol{\alpha}$

$\boldsymbol{E}$	[Nm] [joule]	Maximum value see pages 56 to 59
$\boldsymbol{m}$	[kg]	Total moved mass incl. piston and rod
$\boldsymbol{v}$	[m/s]	Max. velocity
$\boldsymbol{g}$	[m/s²]	9.81
$\boldsymbol{l}_a$	[m]	Cushioning length, see page 57

End position cushioning

Cushioning lengths and masses

Cylinder Ø		25		32		40			50			63		
		12	18	14	22	18	22 [12)]	28	22	28 [12)]	36	28	36 [12)]	45
l_a in mm	Head	15	15	16	16	23	23	23	22	22	22	25	25	25
	Base	15	15	16	16	23	23	23	22	22	22	25	25	25
m in kg	Piston	0.15	0.2	0.25	0.4	0.6	0.6	0.7	0.8	1	1.2	1.4	1.7	2.0
(kg/100 mm)	Rod	0.1	0.2	0.12	0.3	0.2	0.3	0.5	0.3	0.5	0.8	0.5	0.8	1.2
v_{max} [1)]	(m/s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4

Cylinder Ø		80			100			125			160		200	
		36	45 [12)]	56	45	56 [12)]	70	56	70 [12)]	90	70	110	90	140
l_a in mm	Head	27	27	27	28	28	28	33	33	33	38	38	57	57
	Base	27	27	27	28	28	28	46	46	46	46	46	64	64
m in kg	Piston	2.6	3	3.6	4.7	5.3	6.3	8.0	9.2	11	16	20	30	38
(kg/100 mm)	Rod	0.8	1.2	2.0	1.2	2	3.0	2.0	3	5.0	3.0	7.5	5.0	12
v_{max} [1)]	(m/s)	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.25	0.25	0.25	0.25

[1)] In case v_{max} is exceeded, please contact us.

[12)] Piston rod Ø not standardized

3

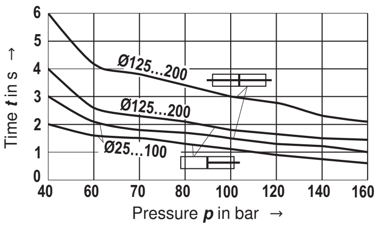
The diagrams on pages 58, 59 are based on the preceding table, the maximum velocities specified referring to "M" seals with closed throttle screw.

With slower velocities, the absorbing energy decreases according to the formula.

$$E_U = E_{max} \cdot \frac{v_U}{v_{max}}$$

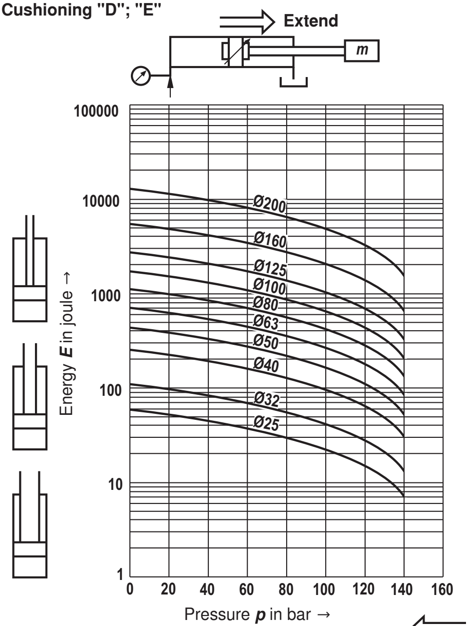
E_U = energy absorbing
E_{max} = energy max. see characteristic curve
v_U = stroke velocity
v_{max} = velocity max. for seal version "M"

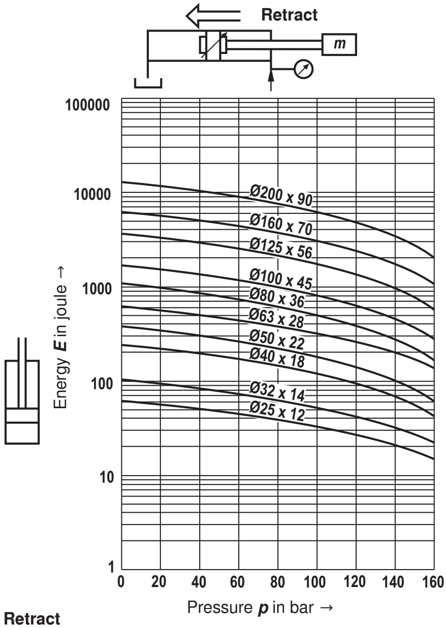
Max. cushioning time "D"; "E"

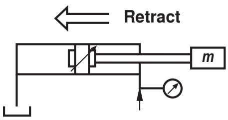


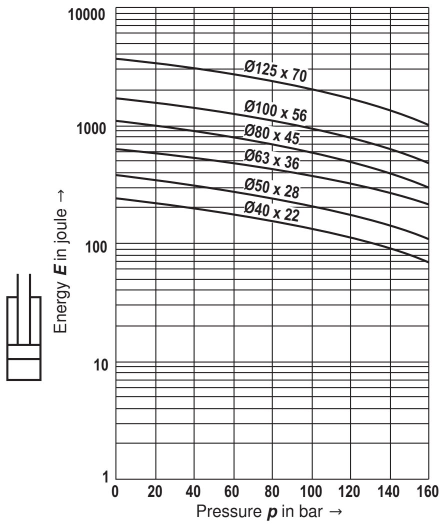
End position cushioning

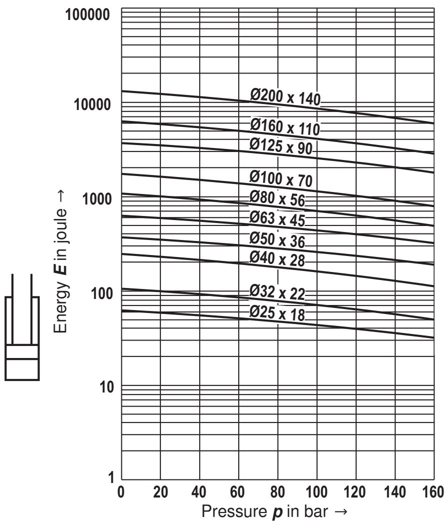
Cushioning "D"; "E"







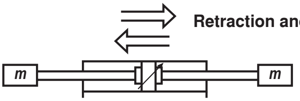


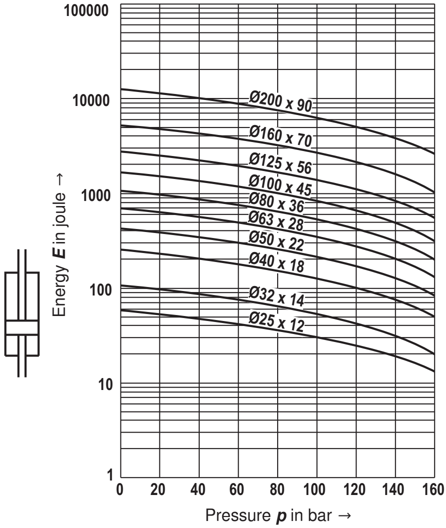


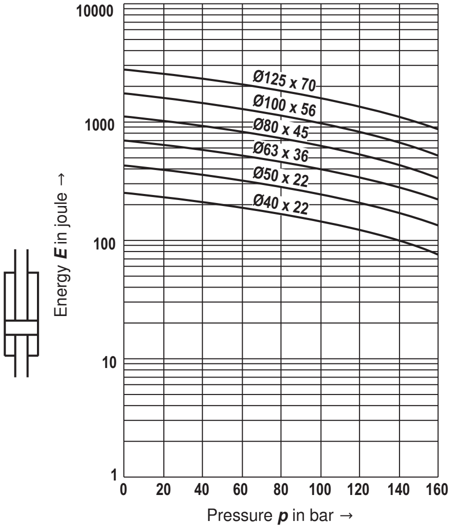
End position cushioning

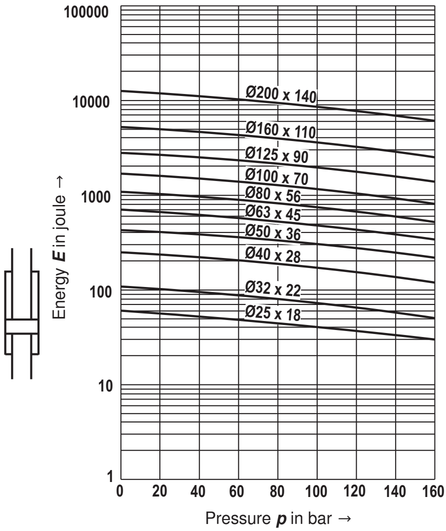
Cushioning "D"; "E"

Retraction and extension





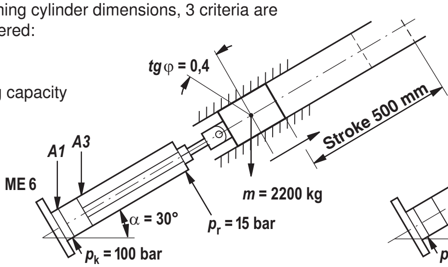


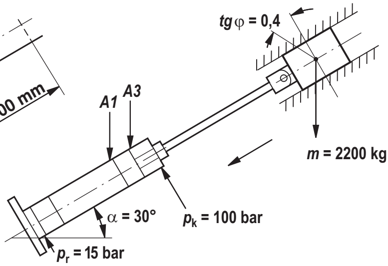


3

Calculation example

When designing cylinder dimensions, 3 criteria are to be considered:
- Force
- Kinking
- Cushioning capacity





Example:
Stroke time = 2 seconds
Load friction coefficient = $\boldsymbol{tg\ \varphi}$ = 0.4 (estimated)
Available pressure $\boldsymbol{p}_k$ = 100 bar
Return flow pressure $\boldsymbol{p}_r$ = 15 bar
A1 = piston surface, ***A3*** = piston ring surface
$\boldsymbol{\varphi}$ = surface ratio ***A1*** / ***A3***, see page 5
m = total moved mass, ***v*** = velocity
$\boldsymbol{l}_a$ = cushioning length, see page 57

To be determined:
Piston and piston rod diameter

Extend piston rod:
Total efficiency $\boldsymbol{\eta} = \boldsymbol{\eta 1} \cdot \boldsymbol{\eta 2}$
$\boldsymbol{\eta 1}$ = cylinder efficiency = 0.9 (estimated)
$\boldsymbol{\eta 2}$ = system efficiency

$$\boldsymbol{\eta 2} = \frac{p_k \cdot A1 - p_r \cdot A3}{p_k \cdot A1} = 1 - \frac{p_r}{p_k \cdot \varphi^{1)}} = \frac{15}{100 \cdot 1.25} = 0{,}88$$

$$\boldsymbol{\eta} = 0.9 \cdot 0.88 = 0.79$$

1) Assuming the smallest "$\boldsymbol{\varphi}$"

Force required to move the mass:
F = frictional force plus potential energy
$= \boldsymbol{tg\ \varphi \cdot m \cdot g} \cdot \cos \boldsymbol{\alpha} + \boldsymbol{m \cdot g} \cdot \sin \boldsymbol{\alpha}$
$= 0.4 \cdot 2200 \cdot 9.81 \cdot 0.866 + 2200 \cdot 9.81 \cdot 0.5 = 18270$ N
= 18.27 kN
This theoretical force 18.27 kN with $\boldsymbol{\eta}$ = 0.79 results in a required force = 23.13 kN and thus, a cylinder piston diameter = 63 mm is necessary for $\boldsymbol{p}_k$ = 100 bar, see page 5

Retract piston rod:
F = frictional force minus potential energy
$= \boldsymbol{tg\ \varphi \cdot m \cdot g} \cdot \cos \boldsymbol{\alpha} - \boldsymbol{m \cdot g} \cdot \sin \boldsymbol{\alpha}$
$= 0.4 \cdot 2200 \cdot 9.81 \cdot 0.866 - 2200 \cdot 9.81 \cdot 0.5$
= – 3315 N = – 3.3 kN no force problem during retraction

Test of kinking length:
For $\boldsymbol{p}_k$ = 100 bar and cylinder 63 / 28, the table on page 55 results in a maximum admissible stroke = 385 mm:
So the cylinder kinks

There are 2 possibilities:
- Select piston rod diameter 45, max. admissible stroke = 1140 mm, i.e. kinking-proof
- Change the type of mounting, e.g. MS2 with a maximum admissible stroke = 915 mm

Test of the end position cushioning

Average velocity 0.5 / 2 = 0.25 m/s
Max. velocity $\boldsymbol{v}_u$ = 0.275 m/s
(estimated correction coefficient = 1.1 due to start-up and braking)

Cushioning capacity required for piston rod extension =

$$\frac{\boldsymbol{m} \cdot \boldsymbol{v}_u^2}{2} - \boldsymbol{m} \cdot \boldsymbol{g} \cdot \boldsymbol{l}_a \cdot \sin \boldsymbol{\alpha} = \frac{2200 \cdot 0.275^2}{2} - 2200 \cdot 9.81 \cdot 0.025 \cdot 0.5 = -186 \text{ joules}$$

No cushioning problem for piston rod extension

Cushioning capacity required for piston rod retraction =

$$\frac{\boldsymbol{m} \cdot \boldsymbol{v}_u^2}{2} + \boldsymbol{m} \cdot \boldsymbol{g} \cdot \boldsymbol{l}_a \cdot \sin \boldsymbol{\alpha} = \frac{2200 \cdot 0.275^2}{2} + 2200 \cdot 9.81 \cdot 0.025 \cdot 0.5 = 353 \text{ joules}$$

Diagram on page 55 results in 445 joules for $\boldsymbol{p}_k$ = 100 bar and $\boldsymbol{v}_{max}$ = 0.4 m/s, i.e. the cylinder can absorb energy for 0.275 m/s (see page 57):

$$\boldsymbol{E}_u = \boldsymbol{E}_{max} \cdot \frac{\boldsymbol{v}_u}{\boldsymbol{v}_{max}} = 445 \cdot \frac{0.275}{0.4} = 306 \text{ joules}$$

So the cylinder cannot absorb the necessary cushioning capacity: you have to select the next larger diameter 80/56.

Selection criteria for seals

	Work and environmental conditions	Seal versions M	Seal versions T	Seal versions S
Medium/temperature	**Medium HL, HLP**/operating temperature medium –20 °C to +80 °C	++	++	++
	Medium HFA/operating temperature medium +5 °C to +55 °C	+/–	++	+/–
	Medium HFC/operating temperature medium –20 °C to +60 °C	–	++	–
	Medium HFD-R/operating temperature medium –15 °C to +80 °C	–	–	++
	Medium HFD-U/operating temperature medium –15 °C to +80 °C	–	–	++
	Ambient and rod temperature in the area of the piston rod from –20 °C to +80 °C [1]	++	+	++ [2]
	Extended ambient and rod temperature in the area of the piston rod from +80 °C to +120 °C	–	–	++
Function/velocity...	Static holding function more than 10 minutes: Attention! Application- and temperature-dependent	++	+	+
	Static holding function short-term < 1 minute	++	++	++
	Robust application conditions: Steel works, mining, thin ice	++	–	–
	Zero point control, hardly any amplitude, frequency max. 5 Hz, not longer than 5 minutes	–	++	++
	Cylinder velocity min. 0.001 m/sec stick-slip behavior	++	++	++
	Cylinder velocity from 0.01 m/sec to 0.5 m/sec [3]	++	++	++
	Cylinder velocity > 0.5 m/sec to max. 0.8 m/sec [3]	–	++	++
	Stroke > 1.0 m	+/–	++	++
	Standstill period (wear)	++	++	++
	Undissolved air in the oil [4]	–	+	+

++ = very good + = good +/– = conditional, depending on the application parameters – = unsuitable

General technical data in corresponding data sheets will remain valid!

1) Moreover, observe the corresponding medium temperature range

2) Lower temperature limit –15 °C

3) Standard line connections not designed for that velocity

4) – seal is destroyed / + seal is not directly destroyed, leaks may occur

Generally, a medium temperature of approx. 40 °C is recommended. The specified values are to be regarded as guidelines; depending on the application, it may be necessary to check the suitability of the seal system.

3

Seal kits

Seal kit complete

ØAL	ØMM	Material no. for seal design CDT3			Material no. for seal design CGT3		
		M	T	S	M	T	S
25	12	R961008000	R961008026	R961008052	R961008078	R961008104	R961008130
	18	R961008001	R961008027	R961008053	R961008079	R961008105	R961008131
32	14	R961008002	R961008028	R961008054	R961008080	R961008106	R961008132
	22	R961008003	R961008029	R961008055	R961008081	R961008107	R961008133
40	18	R961008004	R961008030	R961008056	R961008082	R961008108	R961008134
	22	R961008005	R961008031	R961008057	R961008083	R961008109	R961008135
	28	R961008006	R961008032	R961008058	R961008084	R961008110	R961008136
50	22	R961008007	R961008033	R961008059	R961008085	R961008111	R961008137
	28	R961008008	R961008034	R961008060	R961008086	R961008112	R961008138
	36	R961008009	R961008035	R961008061	R961008087	R961008113	R961008139
63	28	R961008010	R961008036	R961008062	R961008088	R961008114	R961008140
	36	R961008011	R961008037	R961008063	R961008089	R961008115	R961008141
	45	R961008012	R961008038	R961008064	R961008090	R961008116	R961008142
80	36	R961008013	R961008039	R961008065	R961008091	R961008117	R961008143
	45	R961008014	R961008040	R961008066	R961008092	R961008118	R961008144
	56	R961008015	R961008041	R961008067	R961008093	R961008119	R961008145
100	45	R961008016	R961008042	R961008068	R961008094	R961008120	R961008146
	56	R961008017	R961008043	R961008069	R961008095	R961008121	R961008147
	70	R961008018	R961008044	R961008070	R961008096	R961008122	R961008148
125	56	R961008019	R961008045	R961008071	R961008097	R961008123	R961008149
	70	R961008020	R961008046	R961008072	R961008098	R961008124	R961008150
	90	R961008021	R961008047	R961008073	R961008099	R961008125	R961008151
160	70	R961008022	R961008048	R961008074	R961008100	R961008126	R961008152
	110	R961008023	R961008049	R961008075	R961008101	R961008127	R961008153
200	90	R961008024	R961008050	R961008076	R961008102	R961008128	R961008154
	140	R961008025	R961008051	R961008077	R961008103	R961008129	R961008155

Seal kit CST3 only for cylinder [1)]

ØAL	ØMM	Material no. for seal design CST3		
		M	T	S
40	28	R961008006	R961008032	R961008058
50	28	R961008008	R961008034	R961008060
	36	R961008009	R961008035	R961008061
63	36	R961008011	R961008037	R961008063
	45	R961008012	R961008038	R961008064
80	45	R961008014	R961008040	R961008066
	56	R961008015	R961008041	R961008067
100	56	R961008017	R961008043	R961008069
	70	R961008018	R961008044	R961008070
125	70	R961008020	R961008046	R961008072
	90	R961008021	R961008047	R961008073
160	70	R961008022	R961008048	R961008074
	110	R961008023	R961008049	R961008075
200	90	R961008024	R961008050	R961008076
	140	R961008025	R961008051	R961008077

ØAL = Piston Ø
ØMM = Piston rod Ø

1) Seal kits for position measurement system and subplate mounting separate material no.

Seal kits

Only for subplate mounting

Subplates Size	Material number for seal design M, T	S
6	R961008236	R961008239
10, 16	R961008237	R961008240

Only for position measurement system

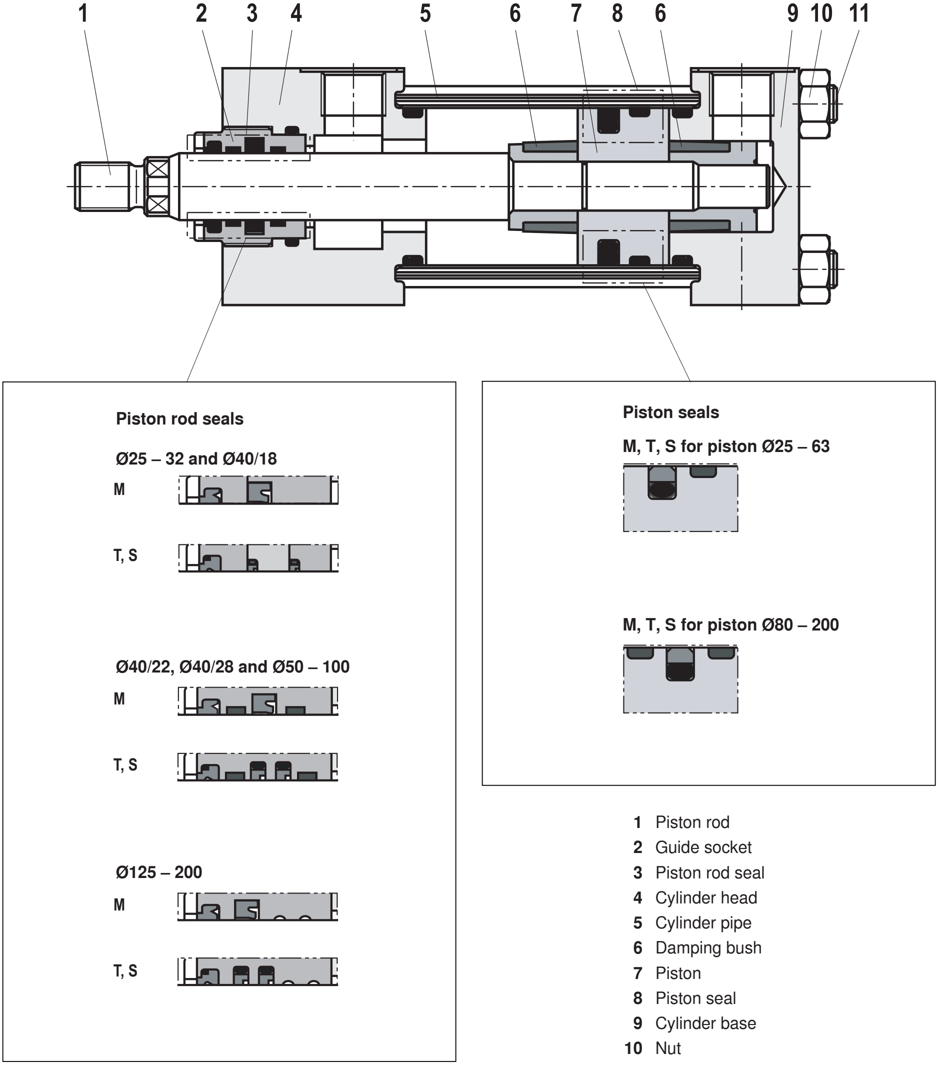
ØAL	Material number for seal design M, T	S
40	R961008156	R961008161
50	R961008157	R961008162
63	R961008158	R961008163
80	R961008159	R961008164
100	R961008160	R961008165
125	R961008222	R961008221
160	R961008223	R961008225
200	R961008224	R961008226

Tightening torques

ØAL	ØMM	Tightening torque for tie rod nut in Nm for types of mounting: ME5/6, MP1/3/5, MS2, MT1/2/4, MX3/5	MX1/2
25	12 18	5,5	3
32	14 22	8	6,5
40	18 22 28	20	12
50	22 28 36	50	37
63	28 36 45	60	40
80	36 45 56	125	90
100	45 56 70	190	100
125	56 70 90	400	240
160	70 110	800	450
200	90 140	1250	600

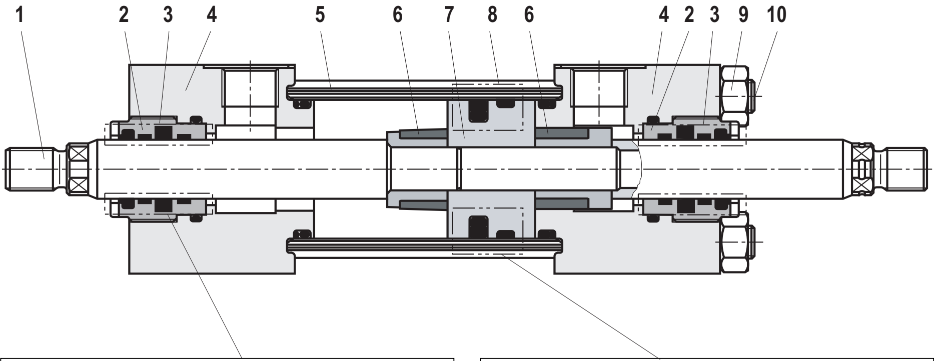
3

Spare parts: Series CDT3



1 Piston rod
2 Guide socket
3 Piston rod seal
4 Cylinder head
5 Cylinder pipe
6 Damping bush
7 Piston
8 Piston seal
9 Cylinder base
10 Nut
11 Tie rod

Spare parts: Series CGT3



Piston rod seals

Ø25 – 32 and Ø40/18

M

T, S

Ø40/22, Ø40/28 and Ø50 – 100

M

T, S

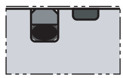
Ø125 – 200

M

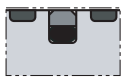
T, S

Piston seals

M, T, S for piston Ø25 – 63

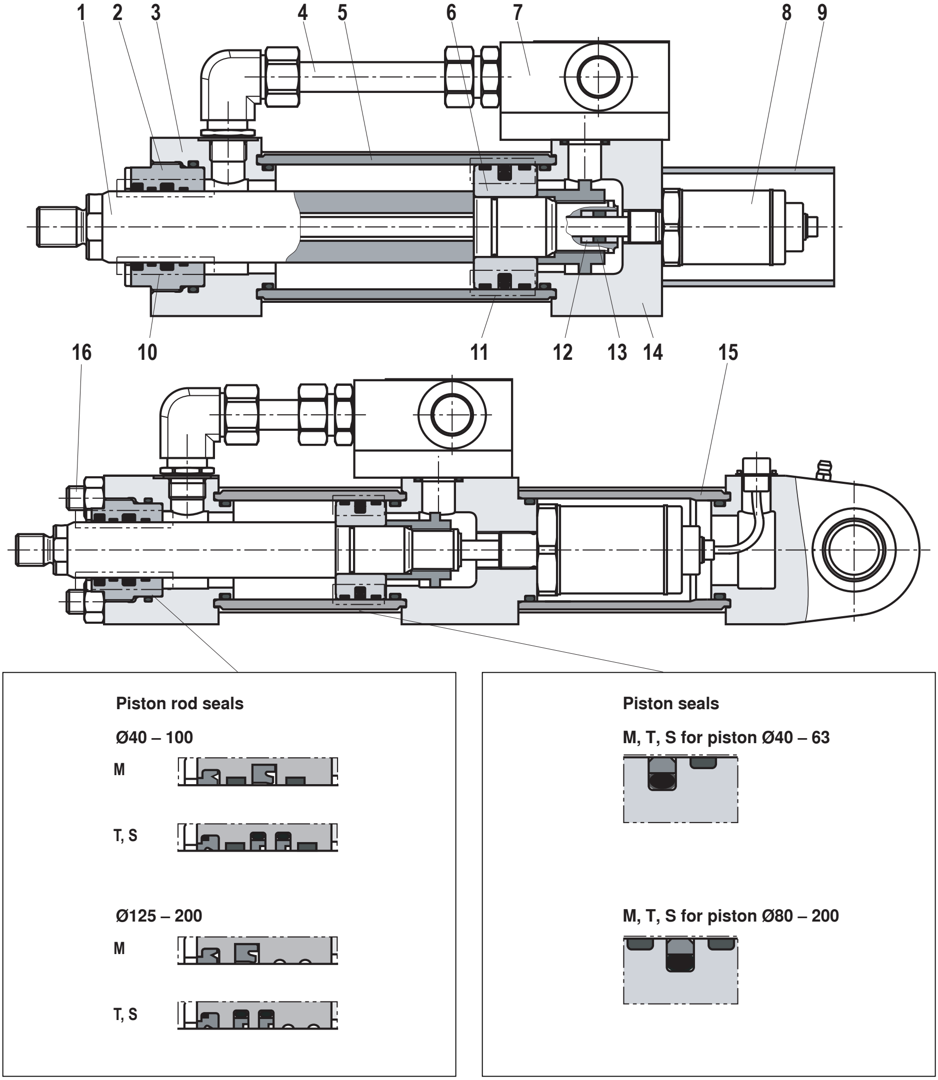


M, T, S for piston Ø80 – 200



1 Piston rod
2 Guide socket
3 Piston rod seal
4 Cylinder head
5 Cylinder pipe
6 Damping bush
7 Piston
8 Piston seal
9 Nut
10 Tie rod

Spare parts: Series CST3



1	Piston rod	**7**	Subplate	**12**	Insulating socket
2	Guide socket	**8**	Position measurement system	**13**	Solenoid
3	Cylinder head	**9**	Protective pipe	**14**	Cylinder base
4	Piping	**10**	Piston rod seal	**15**	Connection pipe
5	Cylinder pipe	**11**	Piston seal	**16**	Tie rod
6	Piston				

Weight for cylinder (in kg)

CDT3 / CGT3

ØAL	ØMM	MX1, ME5, MS2		ME6, MP3, MP1		MP5		MT4		MX2, MX3, MX5 (in case of CGT3 without MX2)		MT1, MT2 (in case of CGT3 without MT2)		Stroke 100 mm	
		CDT3	CGT3	CDT3	CGT3	CDT3	CGT3	CDT3	CGT3	CDT3	CGT3	CDT3	CGT3	CDT3	CGT3
25	12	1.1	1.2	1.1	–	1.0	–	1.3	1.4	1.0	1.1	1.1	1.2	0.4	0.5
	18	1.2	1.4	1.2	–	1.1	–	1.4	1.6	1.1	1.3	1.2	1.4	0.6	0.8
32	14	1.5	1.6	1.6	–	1.4	–	1.8	1.9	1.4	1.5	1.5	1.6	0.5	0.6
	22	1.6	1.9	1.7	–	1.5	–	1.9	2.2	1.5	1.8	1.6	1.9	0.6	0.9
40	18	3.4	3.6	3.4	–	3.2	–	4.1	4.3	3.1	3.3	3.2	3.4	0.8	1.0
	22 [12)]	3.4	3.8	3.4	–	3.2	–	4.1	4.5	3.1	3.5	3.2	3.6	0.9	1.2
	28	3.5	4.0	3.5	–	3.3	–	4.2	4.7	3.2	3.7	3.3	3.8	1.1	1.6
50	22	5.3	5.7	5.3	–	4.9	–	6.6	7.0	4.8	5.2	4.9	5.3	1.1	1.4
	28 [12)]	5.4	6.0	5.4	–	5	–	6.7	7.3	4.9	5.5	5	5.6	1.3	1.8
	36	5.5	6.4	5.5	–	5.1	–	6.8	7.7	5.0	5.9	5.1	6.0	1.6	2.4
63	28	7.7	8.3	7.7	–	7.3	–	9.2	9.8	7.0	7.6	7.3	7.9	1.4	1.9
	36 [12)]	7.9	8.8	7.8	–	7.4	–	9.3	10.3	7.1	8.1	7.4	8.4	1.7	2.5
	45	8.2	9.7	8.0	–	7.6	–	9.5	11	7.3	8.8	7.6	9.1	2.2	3.4
80	36	14	15	14	–	14	–	18	19	12	13	15	15	2.2	3.0
	45 [12)]	14	16	14	–	14	–	17	20	13	14	14	16	2.6	3.8
	56	15	17	15	–	15	–	19	21	14	16	15	17	3.3	5.2
100	45	20	22	20	–	20	–	24	26	19	20	22	24	3.3	4.5
	56 [12)]	20	23	20	–	19	–	24	27	18	21	22	25	4.1	6.1
	70	21	25	21	–	21	–	25	29	19	23	23	27	5.1	8.1
125	56	38	41	39	–	38	–	46	49	35	39	43	46	6.3	8.2
	70 [12)]	38	43	39	–	38	–	46	51	35	41	43	48	7.3	10.3
	90	39	46	40	–	39	–	48	55	37	44	44	51	9.3	14
160	70	62	68	67	–	63	–	78	83	59	65	64	69	8.7	12
	110	64	75	69	–	65	–	80	91	61	72	67	79	13.2	21
200	90	112	124	120	–	115	–	147	158	107	118	114	126	13.4	18
	140	115	137	123	–	117	–	149	171	109	131	117	138	20.5	33

Tilt head, clevis bracket and trunnion bearing block see pages 47 to 51

Subplates see page 44

12) Piston rod Ø not standardized

Weight for cylinder (in kg)

CST3

ØAL	ØMM	ME5, MS2	MP5	MT4	MX5	Stroke 100 mm
40	**28**	3.5	3.8	4.2	3.2	1.1
50	**28** [12)]	5.4	5.8	6.7	4.9	1.3
	36	5.5	5.9	6.8	5.0	1.6
63	**36** [12)]	7.9	8.5	9.3	7.1	1.7
	45	8.2	8.7	9.5	7.3	2.2
80	**45** [12)]	14	16.1	17	13	2.6
	56	15	17.3	19	14	3.3
100	**56** [12)]	20	21.8	24	18	4.1
	70	21	24.1	25	19	5.1
125	**70** [12)]	38	43.7	46	35	7.3
	90	39	44.8	48	37	9.3
160	**70**	62	72.5	78	59	8.7
	110	64	74.8	80	61	13.2
200	**90**	112	132	147	107	13.4
	140	115	134.5	149	109	20.5

Tilt head, clevis bracket and trunnion bearing block see pages 47 to 51

Subplates see page 44

[12)] Piston rod Ø not standardized

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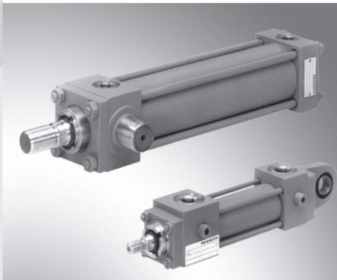
Hydraulic cylinders tie-rod design

RE 17016/08.08
Replaces: 07.03

Series CD70 / CG70

Nominal pressure 70 bar (7 MPa)
Piston Ø 25 to 200 mm
Piston rod Ø 12 to 140 mm
16 types of mounting



K4639-10

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Engineering software **I**nteractive **C**atalog **S**ystem

Online	www.boschrexroth.com/ics
Brochure download	www.boschrexroth.com/business_units/bri/de/downloads/ihc

Features

– Service-friendly modular construction kit system:
  - Cylinder head and cap are mounted to the cylinder barrel by means of tie rods.
    This ensures trouble-free removal and disassembly when maintenance work is to be carried out.
  - The pipe connection threads are optionally pipe threads according to ISO 228/1 or metric ISO threads.
  - Bleed points as standard
  - Adjustable end position cushioning
  - Identical installation lengths for cylinder variants with or without end position cushioning.
  - Strokes can be freely selected within the available maximum stoke length

Note!

For the selection of the cylinder variant, please observe the Explanations on page 6!

Technical data (for applications outside these parameters, please consult us!)

Nominal pressure: 70 bar [7 MPa]

Static test pressure: Permissible operating pressure x 1.3 (depending on piston Ø and type of mounting)

Maximum operating pressure: 105 bar [15 MPa] (depending on piston Ø and type of mounting)
The given operating pressures are valid for applications with jerk-free operation.
In the case of extreme loads, e.g. rapid cycle sequence, mounting elements and threaded piston rod connections must be rated for durability.

Installation position: Optional

Hydraulic fluid:
Mineral oils DIN 51524 (HL, HLP)
Phosphate ester (HFD-R)

Hydraulic fluid temperature range: –20 °C to +80 °C

Ambient temperature range: –20 °C to +80 °C

Optimum viscosity range: 20 to 100 mm^2/s
Min. viscosity: 12 mm^2/s
Max. viscosity: 380 mm^2/s

Cleanliness class to ISO
Permissible maximum degree of contamination of the hydraulic fluid to ISO 4406 (c) Class 20/18/15.
The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components. For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Stroke velocity: Up to 0.5 m/s (depending on line connection)

Bleed points as standard

Tolerances:
For stroke tolerances, permissible installation lengths and position tolerances, see page 73.

Primer coating:
As standard, hydraulic cylinders are primered with one coating (color: gentian blue, RAL 5010) in a thickness of max. 80 µm.

The following surfaces on cylinders and attached parts are not primered or paint-coated:
– All diameters of fit to the customer side
– Sealing faces for the line connection
– Sealing faces for flanged connections
– Inductive proximity switches

Surfaces that are not paint-coated are protected by an anticorrosion agent (MULTICOR LF 80).

Acceptance:
Each cylinder is tested according to Bosch Rexroth standard.

General notes

Safety notes:
For the installation, commissioning and maintenance of hydraulic cylinders, observe operating instructions RE 07100-B!

Servicing and repair work must be carried out by Bosch Rexroth AG or personnel having undergone special training in this field. No warranty is granted for damage resulting from installation, maintenance or repair work not carried out by Bosch Rexroth AG.

Checklists for hydraulic cylinders:
Cylinders, the operating data of which differ from the specified values, can only be offered as special variants on request. For the preparation of offers, the deviations of technical data and/or operating data must be described in the checklists for hydraulic cylinders (RE 07200).

Engineering software ICS (Interactive Catalog System)

The ICS (Interactive Catalog System) is a selection and engineering aid for hydraulic cylinders. With the help of the ICS, designers of plant and machinery can quickly and reliably find the optimum hydraulic cylinder solution through logic-guided type code queries. This software helps to solve design and engineering tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical data of the selected components as well as 2D and 3D CAD data in the correct file format for all common CAD systems.

This allows users to reduce costs while increasing their competitiveness.

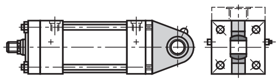
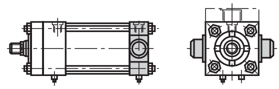
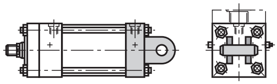
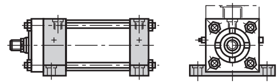
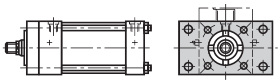
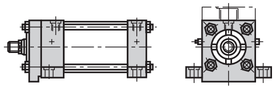
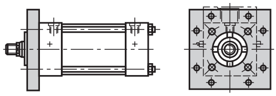
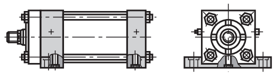
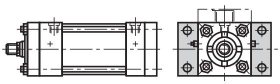
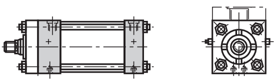
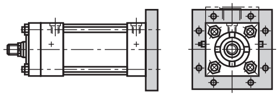
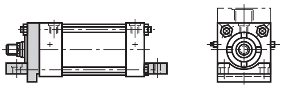
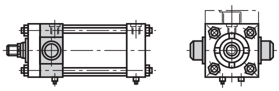
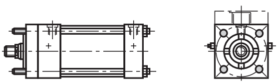
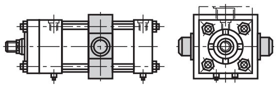
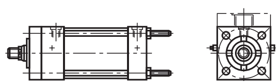
Forces and areas

Operating pressure in bar	Piston Ø	mm	25		32			40			50		
	Piston rod Ø	mm	**12**	**16**	**18**	**22**	**25**	**16**	**18**	**25**	**22**	**25**	**36**
40	Force on piston side	kN	1.96		3.22			5.03			7.85		
	Force on piston rod side	kN	1.55	1.19	2.19	1.69	1.25	4.21	3.99	3.06	6.32	5.87	3.78
50	Force on piston side	kN	2.46		4.02			6.29			9.82		
	Force on piston rod side	kN	1.94	1.49	2.74	2.11	1.56	5.27	5.00	3.83	7.91	7.35	4.73
70	Force on piston side	kN	3.44		5.63			8.80			13.75		
	Force on piston rod side	kN	2.71	2.08	3.84	2.96	2.19	7.38	7.01	5.40	11.08	10.31	6.62
105	Force on piston side	kN	5.16		8.45			13.20			20.62		
	Force on piston rod side	kN	3.96	3.04	5.77	4.44	3.28	11.07	10.52	8.03	16.62	15.44	9.93
Piston area		cm^2	4.91		8.04			12.56			19.63		
Annulus area		cm^2	3.78	2.90	5.50	4.24	3.13	10.55	10.02	7.65	15.83	14.71	9.46
Area ratio		φ	1.25:1	1.6:1	1.4:1	2:1	2.5:1	1.2:1	1.25:1	1.6:1	1.25:1	1.35:1	2:1
Cushioning area	Force on piston side	cm^2	2.63		5.77			10.30			15.11		
	Force on piston rod side	cm^2	2.63	2.63	4.90	3.52	2.50	8.70	8.76	7.05	14.33	13.47	8.29

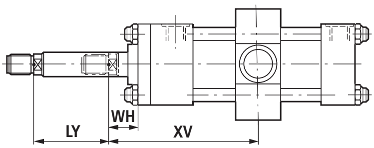
Operating pressure in bar	Piston Ø	mm	63				80			100		
	Piston rod Ø	mm	**25**	**28**	**36**	**45**	**36**	**45**	**56**	**45**	**50**	**70**
40	Force on piston side	kN	12.47				20.10			31.42		
	Force on piston rod side	kN	10.49	9.99	8.38	6.00	16.02	13.73	10.25	25.04	23.55	16.01
50	Force on piston side	kN	15.59				25.10			39.27		
	Force on piston rod side	kN	13.12	12.50	10.49	7.62	20.03	17.16	12.80	31.29	29.43	20.02
70	Force on piston side	kN	21.82				35.18			54.98		
	Force on piston rod side	kN	18.36	17.50	14.68	10.68	28.04	24.03	17.93	43.80	41.20	28.01
105	Force on piston side	kN	–				–			–		
	Force on piston rod side	kN	–	–	–	–	–	–	–	–	–	–
Piston area		cm^2	31.16				50.24			78.50		
Annulus area		cm^2	26.25	25.01	20.98	15.26	40.07	34.34	25.62	62.60	58.88	40.04
Area ratio		φ	1.2:1	1.25:1	1.4:1	2:1	1.25:1	1.4:1	2:1	1.25:1	1.35:1	2:1
Cushioning area	Force on piston side	cm^2	26.65				40.64			58.90		
	Force on piston rod side	cm^2	23.13	23.13	19.80	13.08	37.70	30.60	20.07	58.90	54.70	31.97

Operating pressure in bar	Piston Ø	mm	125				150				200		
	Piston rod Ø	mm	**50**	**56**	**63**	**90**	**63**	**70**	**80**	**100**	**90**	**100**	**140**
40	Force on piston side	kN	49.09				70.68				125.66		
	Force on piston rod side	kN	41.20	39.20	36.59	23.63	58.17	55.25	50.54	39.23	100.13	94.16	64.03
50	Force on piston side	kN	61.35				88.35				–		
	Force on piston rod side	kN	51.49	49.01	45.83	29.53	72.71	69.06	63.16	49.05	–	–	–
70	Force on piston side	kN	85.90				–				–		
	Force on piston rod side	kN	72.10	68.60	64.03	41.35	–	–	–	–	–	–	–
105	Force on piston side	kN	–				–				–		
	Force on piston rod side	kN	–	–	–	–	–	–	–	–	–	–	–
Piston area		cm^2	122.66				176.63				314.00		
Annulus area		cm^2	103.03	98.04	91.50	59.08	145.47	138.17	126.38	98.13	250.42	235.50	160.14
Area ratio		φ	1.2:1	1.25:1	1.35:1	2:1	1.2:1	1.25:1	1.4:1	1.8:1	1.25:1	1.35:1	2:1
Cushioning area	Force on piston side	cm^2	103.08				138.23				275.68		
	Force on piston rod side	cm^2	92.50	92.50	47.20	47.20	130.10	130.10	81.70	81.70	238.70	219.00	137.50

Mounting types

Self-aligning clevis at cylinder cap **B**		Trunnion at cylinder cap **S**	
Fork clevis at cylinder cap **G**		Foot mounting **F**	
Rectangular flange at cylinder head **C**		Foot mounting with splined key **L**	
Square flange at cylinder head **H**		Foot mounting with seal ring for subplate mounting **M**	
Rectangular flange at cylinder cap **D**		Threaded bores in cylinder head and cap **N**	
Square flange at cylinder cap **K**		Foot mounting at front face with splined key **T**	
Trunnion at cylinder head **R**		Extended tie rods at cylinder head **P**	
Trunnion at the center of the cylinder **E**		Extended tie rods at cylinder cap **Q**	

[1] Not possible with piston Ø 25
[2] Not possible with piston Ø 200
[3] Position of the trunnion can be freely selected. Always indicate dimension "XY" in mm in clear text on the order. In the case of piston Ø 25, the trunnions are always fitted at the cylinder head.
[4] Dimensions for cylinders with trunnion and piston rod extension "LY" in the retracted condition:
[5] Note permissible stroke lengths, pages 69 to 71
[6] The pipe connection sizes are assigned to the piston Ø.
[7] Always specify mounting of inductive proximity switches or piston rod extension "LY" in clear text on the order.



Ordering code

	70		/	–	Z	1X /						–			*

Cylinder
Single-rod cylinder **= CD**
Double-rod cylinder **= CG**

Series **= 70**

Mounting types
Self-aligning clevis at cylinder cap **= B**
Fork clevis at cylinder cap 1) **= G**
Rectangular flange at cylinder head 2) **= C**
Square flange at cylinder head **= H**
Rectangular flange at cylinder cap 2) **= D**
Square flange at cylinder cap **= K**
Trunnion at cylinder head 1) **= R**
Trunnion at the center of the cylinder 3); 4) **= E**
Trunnion at cylinder cap **= S**
Foot mounting **= F**
Foot mounting with splined key 2) **= L**
Foot mounting with seal ring for subplate mounting **= M**
Threaded bores in cylinder head and cap **= N**
Foot mounting at front face with splined key 1); 2) **= T**
Extended tie rods at cylinder head **= P**
Extended tie rods at cylinder cap **= Q**

Piston Ø (25 to 200 mm) see page 3

Piston rod Ø (12 to 140 mm) see page 3

Stroke length in mm 5)

Component series 11 to 19 **= 1X**
(11 to 19 unchanged installation and connection dimensions)

Pipe connection 6)
00 = Flanged connection with seal ring; only possible with type of mounting "M"
01 = Pipe thread to ISO 228/1
02 = Metric ISO thread
13 = Enlarged pipe connection Pipe thread to ISO 228/1
14 = Enlarged pipe connection Metric ISO thread

Piston rod version
H = Hardened and chromium hard-plated up to piston rod Ø ≤ 100 mm
C = Chromium hard-plated, from Ø ≥ 80 mm on

Piston rod end
B = Male thread, pages 8 to 67
C = Male thread, pages 8 to 67
E = Female thread
F = Thread for self-aligning clevis
T = With self-aligning clevis CGK mounted

End position cushioning
U = Without
K = (Detail "Y") on cap side
S = (Detail "X") on head side
D = On both sides

Hydraulic fluid
M = Seals, suitable for mineral oil to DIN 51524 (HL, HLP)
V = FKM seals suitable for phosphate ester (HFD-R)

Pipe connection - cylinder head
Enter position
Observe table on page 6!

Pipe connection - cylinder cap
Enter position
Observe table on page 6

Seals
A = Standard versions
T = Version for low-friction operation

Enter stop tube extension

Further details in clear text 7)

3

Order example: CD 70 B50/22-200Z1X/01HBDM1-1A

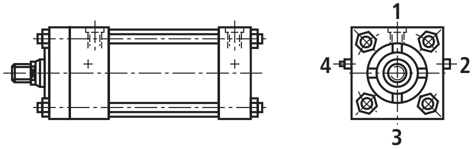
In the case of special variants, an “X” must be entered at the relevant place in the type code, and an SO number must be added at the end.

Position of line ports

By turning the cylinder head and/or cylinder cap the position of pipe ports can be varied for most of the cylinder mounting types during installation. The options can be seen in the table below.

The throttle and check valves change their position accordingly.

In the case of mounting types F, L, N and T, as well as on the cylinder cap for type of mounting G, the throttle and check valves are located at position 1 when the pipe connection is rotated.



	Selectable position of line ports															
Mounting types	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**K**	**L**	**M**	**N**	**P**	**Q**	**R**	**S**	**T**
At cylinder head	1	1	1	1	1	1	1	1	1	–	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	–	2	2	2	–	2	2
	3	3	3	3	–	3	3	3	–	3	–	3	3	3	3	–
	4	4	4	4	4	4	4	4	4	–	4	4	4	–	4	4
At cylinder cap	1	1	1	1	1	1	1	1	1	–	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	–	2	2	2	2	–	2
	3	3	3	3	–	3	3	3	–	3	–	3	3	3	3	–
	4	4	4	4	4	4	4	4	4	–	4	4	4	4	–	4

= Position 2 and 4 not possible for:
- Piston Ø 25 to 100 with enlarged pipe connection, versions 13 and 14
- Piston Ø 25, 32/22 and 32/25 with pipe connection, versions 01 and 02
- Piston Ø 32/18, 40/25, 50/36 and 63/45, each with cushioning feature

= Position 2 and 4 not possible for:
- Piston Ø 25
- Piston Ø 32 to 100 with enlarged pipe connection, versions 13 and 14

= Position 2 and 4 not possible for piston Ø 25

= Position 2 and 4 not possible for piston Ø 25 with enlarged pipe connection, versions 13 and 14

= Position 2 and 4 not possible for:
- Piston Ø 25 to 200 with enlarged pipe connection, versions 13 and 14
- Piston Ø 25, 32 and 40 with pipe connection, versions 01 and 02
- Piston Ø 50/36 and 63/45 with cushioning feature

= Position 2 and 4 not possible for:
- Piston Ø 25 to 63 with enlarged pipe connection, versions 13 and 14

Explanations (explanation of items on pages 8 to 67)

1 Selectable position of line ports (see page 6).

2 Raised cylinder head for version with enlarged pipe connection 13 and 14.

3 Raised cylinder head, except for piston rod Ø 18 without piston rod-sided end position cushioning.

4 Raised cylinder head for piston rod Ø 25 with piston rod-sided end position cushioning.

5 Raised cylinder head for piston rod Ø 36 with piston rod-sided end position cushioning.

6 Raised cylinder head for piston rod Ø 45 with piston rod-sided end position cushioning.

7 Raised cylinder head through screwed-on adapter, for version with enlarged pipe connection 13 and 14.

8 Raised cylinder cap for version with enlarged pipe connection 13 and 14.

9 Raised cylinder cap through screwed-on adapter, for version with enlarged pipe connection 13 and 14.

10 Countersink Ø D1 is suitable for seal ring fittings only on the head side.

11 Countersink Ø D1 is suitable for seal ring fittings only on the head side for pipe connection 01 and 02.

12 Check valve and bleed point. Bleed point is standard.

13 Adjustable throttle valve for end position cushioning.

14 Thread versions B and C. Thread versions E and F, as well as the associated self-aligning clevis, are given on the last page of each piston Ø.

16 Associated pin Ø with fit m6.
Minimum strength of pin material $\sigma_{0.2}$ = 600 N/mm^2 (pin is not included in the scope of supply).

17 Pins and split pins are included in the scope of supply.

18 6 usable mounting bores for raised cylinder head.

19 6 usable mounting bores for raised cylinder cap.

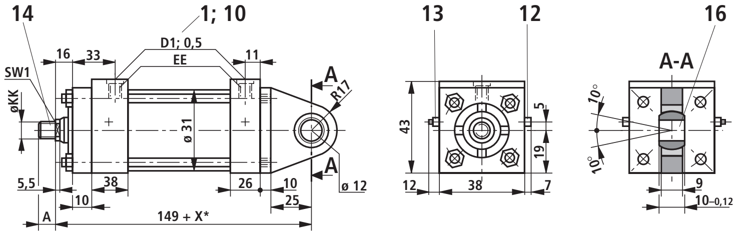
20 Grease nipple; cone head form A to DIN 71412.
As lubrication greases, commercial, anti-corrosion greases on lithium soap base can be used.

21 Lubrication possible via lubrication bore in the housing.

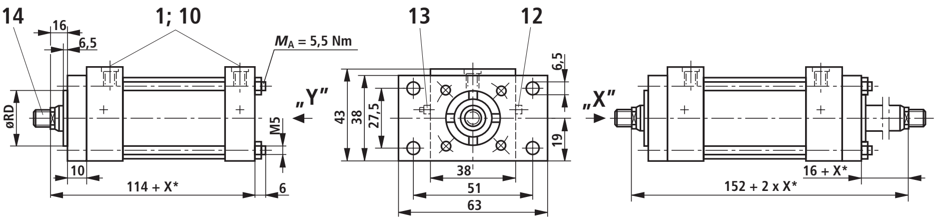
Piston Ø 25 (dimensions in mm)

For explanations of items, see page 7

Type of mounting B Operating pressure 105 bar



Type of mounting C Operating pressure with piston rod Ø 12 and 16: 40 bar on cap side; 105 bar on piston rod side



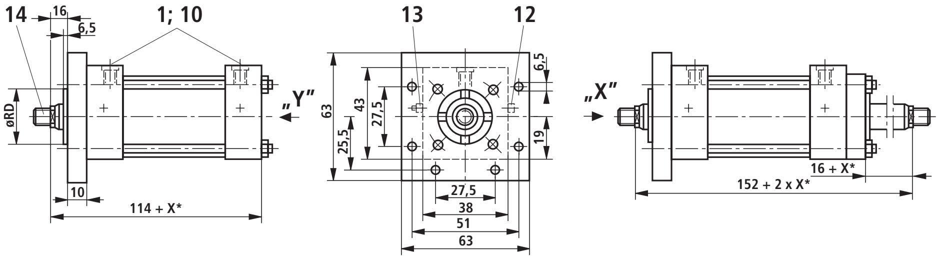
Stroke$_{min}$ = 25 mm with thread version "E" (only for double-rod cylinder)

Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
12	M8 x 1.25	M10 x 1.5	M10	15	15	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
16	M10 x 1.5	M12 x 1.5	M10	19	15								

X* = stroke length

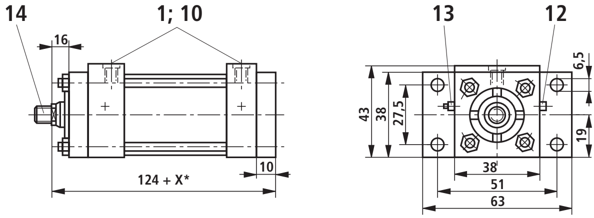
Piston Ø 25 (dimensions in mm) For explanations of items, see page 7

Type of mounting H Operating pressure 105 bar

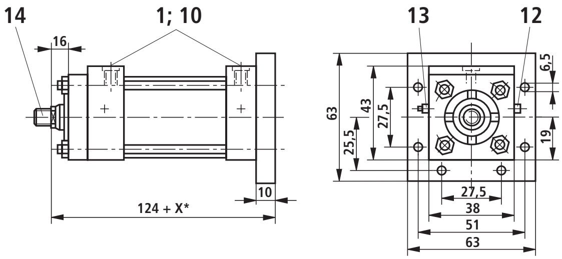


Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 105 bar



Type of mounting K Operating pressure 105 bar



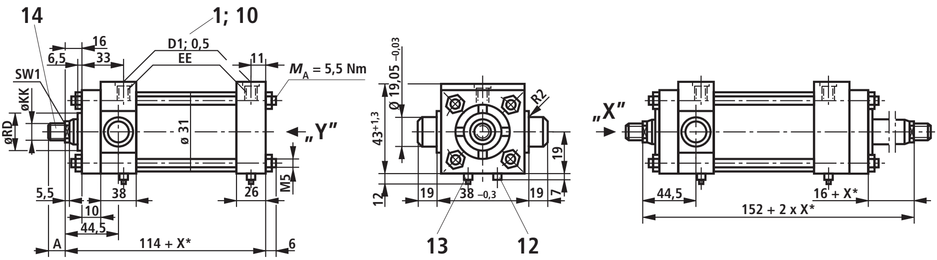
Piston rod Ø	ØRD f7									SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
12	25.5									10	22	23
16	28.5									13		

X* = stroke length

Piston Ø 25 (dimensions in mm)

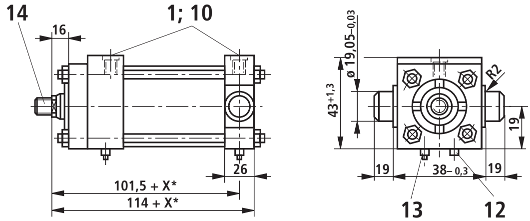
For explanations of items, see page 7

Type of mounting E Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 105 bar



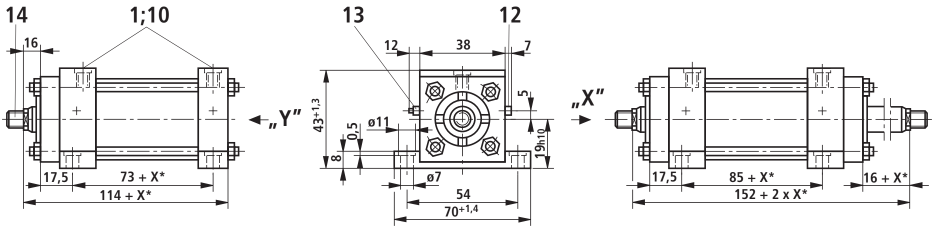
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
12	M8 x 1.25	M10 x 1.5	M10	15	15	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
16	M10 x 1.5	M12 x 1.5	M10	19	15								

X* = stroke length

Piston Ø 25 (dimensions in mm)

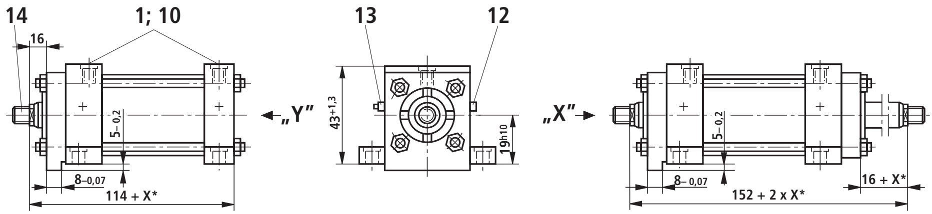
For explanations of items, see page 7

Type of mounting F Operating pressure 105 bar



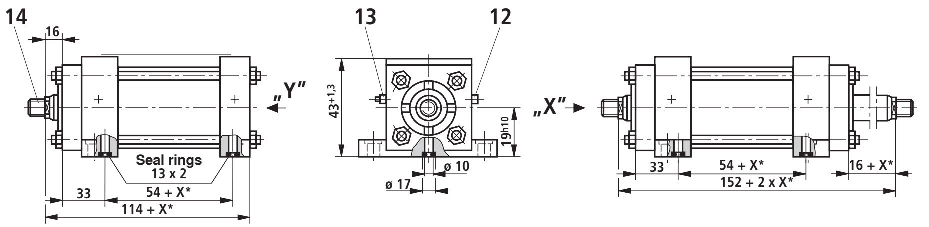
Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

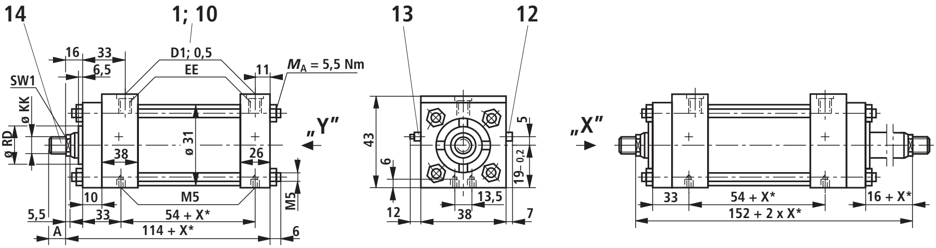
Piston rod Ø	ØRD f7									SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
12	25.5									10	22	23
16	28.5									13		

X* = stroke length

Piston Ø 25 (dimensions in mm)

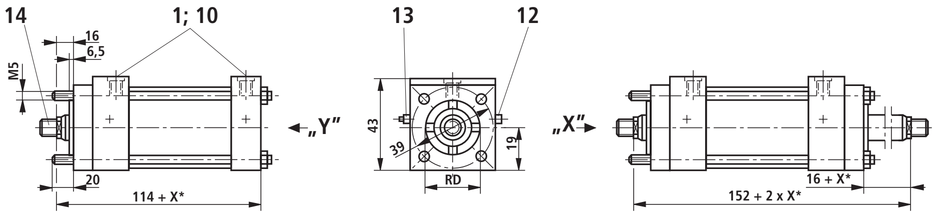
For explanations of items, see page 7

Type of mounting N Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting P Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

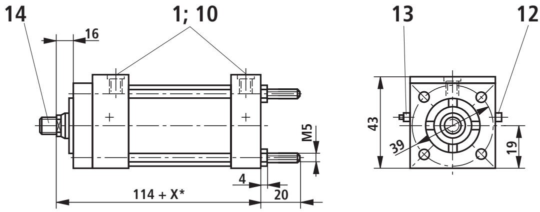
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>12</td><td>M8 x 1.25</td><td>M10 x 1.5</td><td>M10</td><td>15</td><td>15</td><td rowspan="4">G 1/4</td><td rowspan="4">G 3/8</td><td rowspan="4">M14 x 1.5</td><td rowspan="4">M16 x 1.5</td><td rowspan="4">25</td><td rowspan="4">28</td><td rowspan="4">25</td><td rowspan="4">28</td></tr>
<tr><td>16</td><td>M10 x 1.5</td><td>M12 x 1.5</td><td>M10</td><td>19</td><td>15</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length

Piston Ø 25 (dimensions in mm)

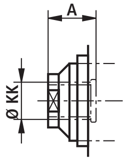
For explanations of items, see page 7

Type of mounting Q Operating pressure 105 bar

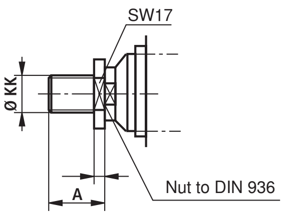


Additional thread versions

Thread version "E"



Thread version "F"



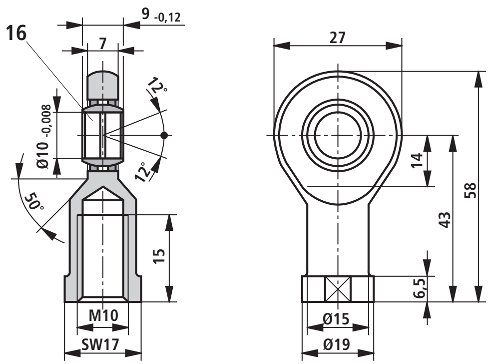
Self-aligning clevis CGK 10

suitable for

thread version "F"

Material no.: R900001653

Weight: 0.07 kg



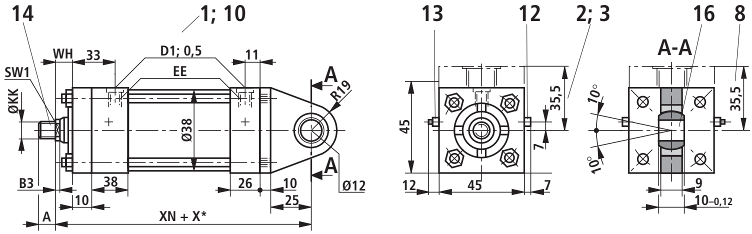
Piston rod Ø	ØRD f7									SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
12	25.5									10	22	23
16	28.5									13		

X* = stroke length

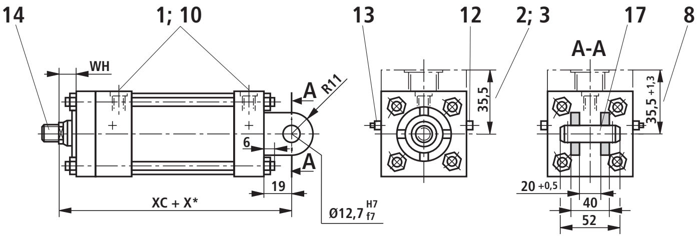
Piston Ø 32 (dimensions in mm)

For explanations of items, see page 7

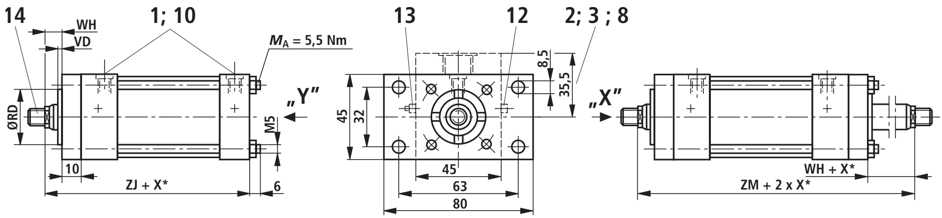
Type of mounting B Operating pressure 105 bar



Type of mounting G Operating pressure 105 bar



Type of mounting C Operating pressure with piston rod Ø 18: 45 bar on cap side; 105 bar on piston rod side
Operating pressure with piston rod Ø 22 and 25: 25 bar on cap side; 105 bar on piston rod side



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

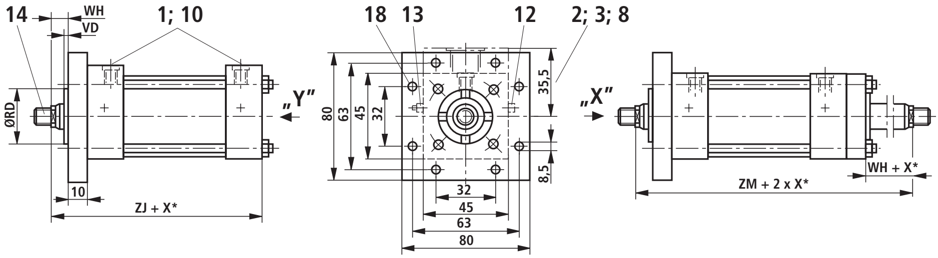
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
18	M10 x 1.5	M12 x 1.5	M12	19	18								
22	M16 x 1.5	M20 x 1.5	M12	28	18	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
25	M20 x 1.5	M22 x 1.5	M12	28	18								

X* = stroke length

Piston Ø 32 (dimensions in mm)

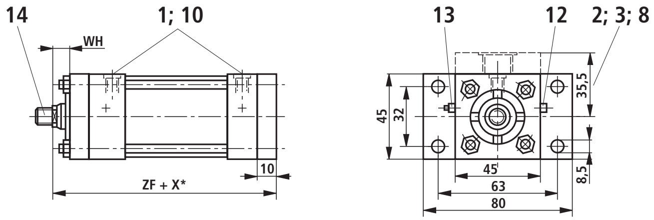
For explanations of items, see page 7

Type of mounting H Operating pressure 105 bar

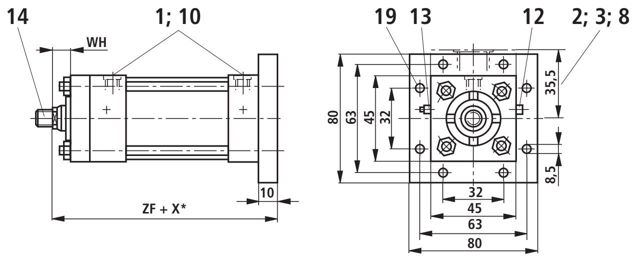


Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 105 bar



Type of mounting K Operating pressure 105 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths	
											piston side	piston rod side
18	32	6	16	134	150	125	115	153	5,5	14	22	23
22	34	13	25	143	159	134	124	171	8	19		
25	38	13	25	143	159	134	124	171	8	22		

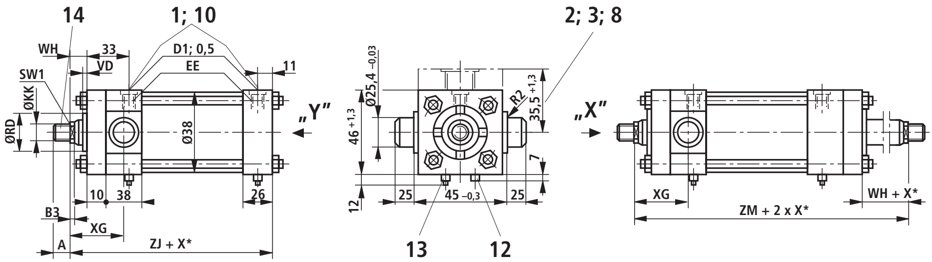
X* = stroke length

3

Piston Ø 32 (dimensions in mm)

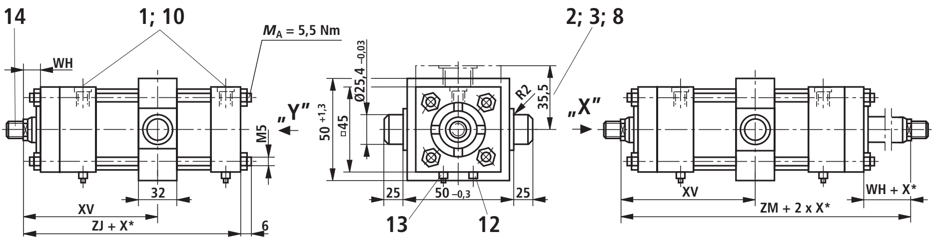
For explanations of items, see page 7

Type of mounting R Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 105 bar

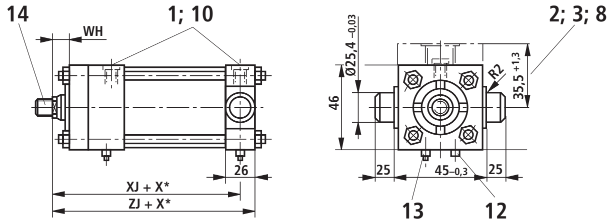


Stroke$_{min}$ = 10 mm
Always enter dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Note:
Dimension for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 25 mm
with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 105 bar



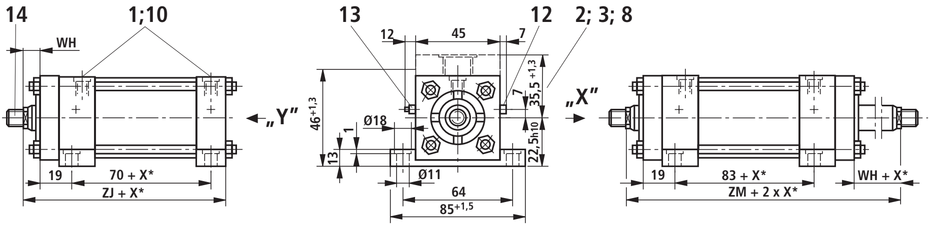
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
18	M10 x 1.5	M12 x 1.5	M12	19	18								
22	M16 x 1.5	M20 x 1.5	M12	28	18	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
25	M20 x 1.5	M22 x 1.5	M12	28	18								

X* = stroke length

Piston Ø 32 (dimensions in mm)

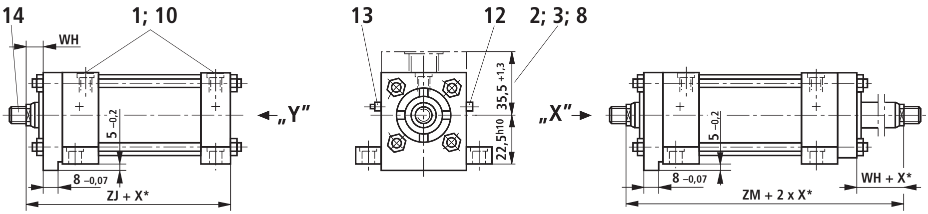
For explanations of items, see page 7

Type of mounting F Operating pressure 105 bar



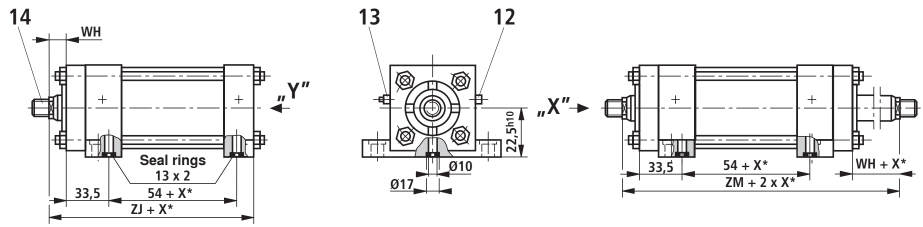
Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
18	32	6	16	44.5	102	80	73 + X*	115	153	5.5	14	22	23
22	34	13	25	53.5	111	89	82 + X*	124	171	8	19		
25	38	13	25	53,5	111	89	82 + X*	124	171	8	22		

X* = stroke length

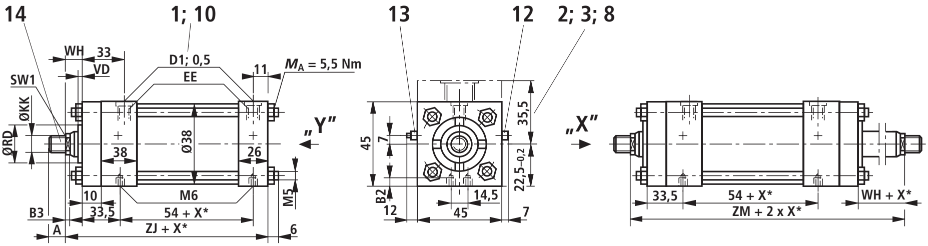
[1] Always state "XV" in clear text on the order (observe XV_{min} and XV_{max})

3

Piston Ø 32 (dimensions in mm)

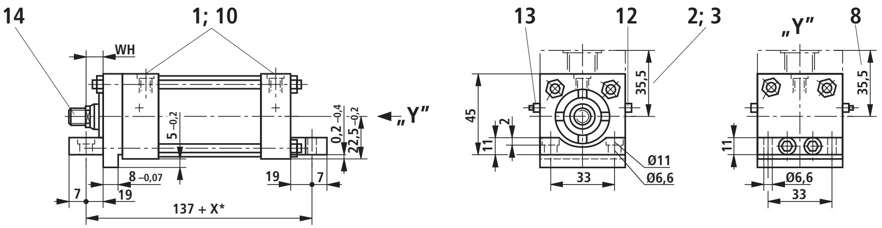
For explanations of items, see page 7

Type of mounting N Operating pressure 105 bar

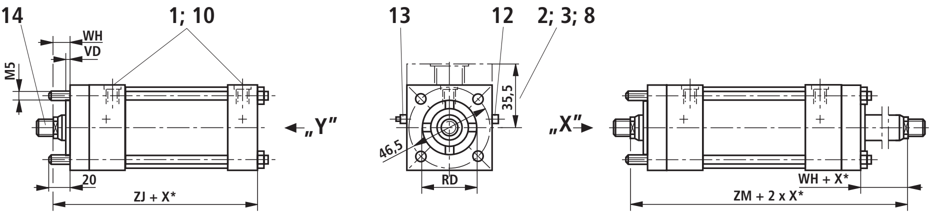


Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 105 bar



Type of mounting P Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

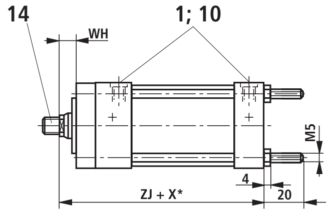
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
18	M10 x 1.5	M12 x 1.5	M12	19	18	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
22	M16 x 1.5	M20 x 1.5	M12	28	18								
25	M20 x 1.5	M22 x 1.5	M12	28	18								

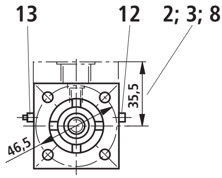
X* = stroke length

Piston Ø 32 (dimensions in mm)

For explanations of items, see page 7

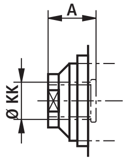
Type of mounting Q Operating pressure 105 bar



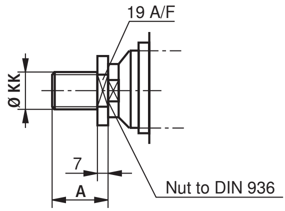


Additional thread versions

Thread version “E”



Thread version “F“



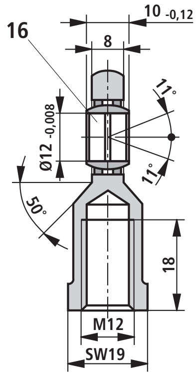
Self-aligning clevis CGK 12

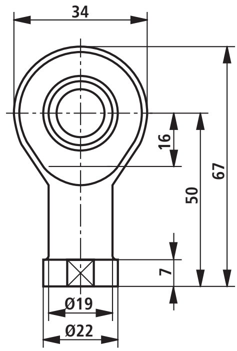
suitable for

thread version “F”

Material no.: R900001327

Weight: 0.1 kg





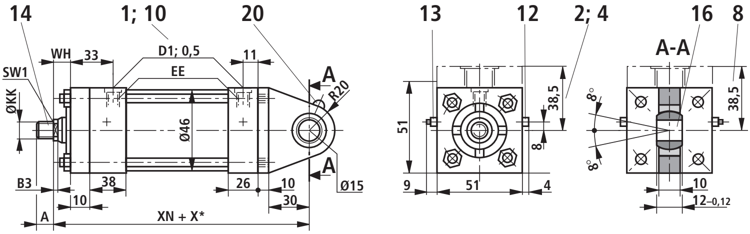
Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
18	32		6	16	115	153		9	5.5	14		
22	34		13	25	124	171		7	8	19	22	23
25	38		13	25	124	171		7	8	22		

X* = stroke length

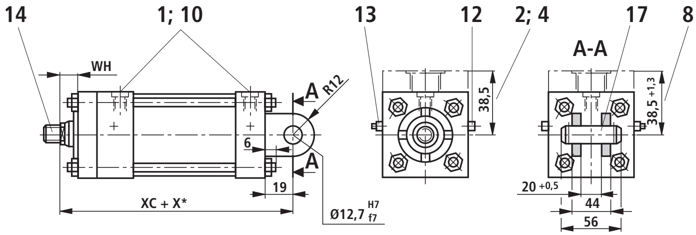
Piston Ø 40 (dimensions in mm)

For explanations of items, see page 7

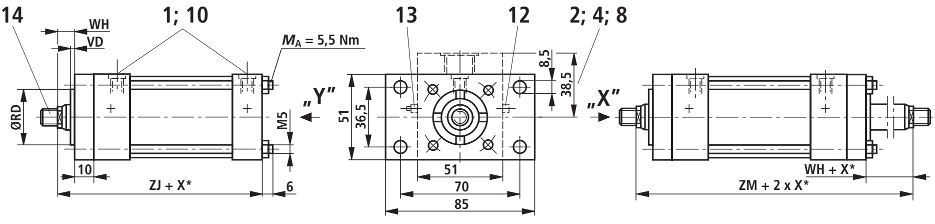
Type of mounting B Operating pressure 105 bar



Type of mounting G Operating pressure 105 bar



Type of mounting C Operating pressure with piston rod Ø 16 and 18: 45 bar on cap side; 105 bar on piston rod side
Operating pressure with piston rod Ø 25: 25 bar on cap side; 105 bar on piston rod side



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

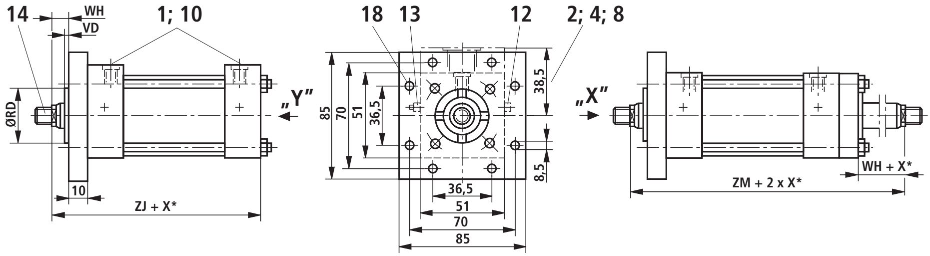
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
16	M10 x 1.5	M12 x 1.5	M14	19	21	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
18	M10 x 1.5	M12 x 1.5	M14	19	21								
25	M20 x 1.5	M22 x 1.5	M14	28	21								

X* = stroke length

Piston Ø 40 (dimensions in mm)

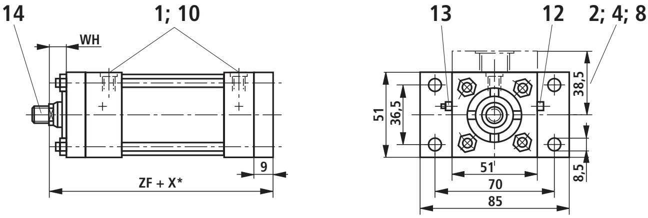
For explanations of items, see page 7

Type of mounting H Operating pressure 105 bar

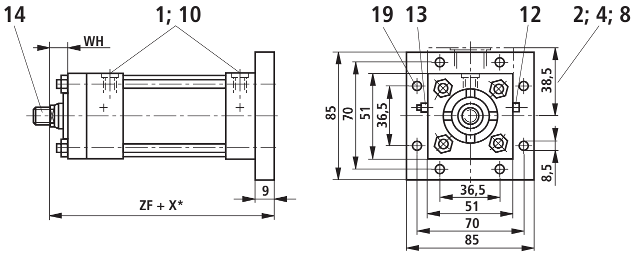


Stroke$_{min}$ = 25 mm with thread version "E" (only for double-rod cylinder)

Type of mounting D Operating pressure 105 bar



Type of mounting K Operating pressure 105 bar

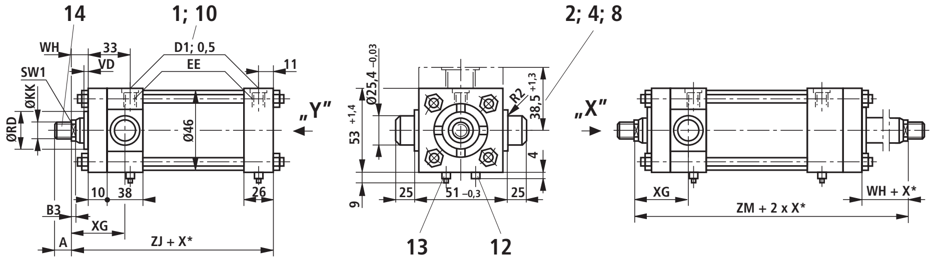


Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths	
											piston side	piston rod side
16	28.5	6	16	137	158	127	118	156	5.5	13	22	23
18	32	6	16	137	158	127	118	156	5.5	14		
25	38	13	25	146	167	136	127	174	8	22		

X* = stroke length

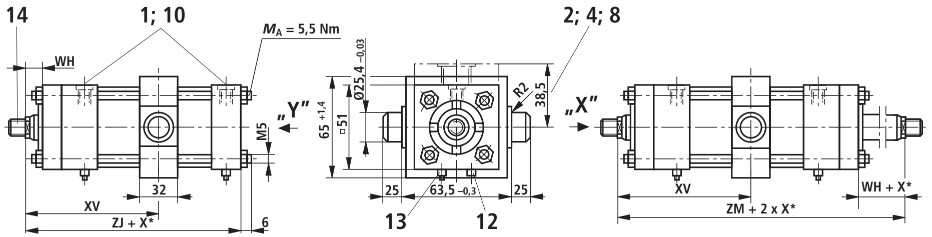
Piston Ø 40 (dimensions in mm) For explanations of items, see page 7

Type of mounting R Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 105 bar

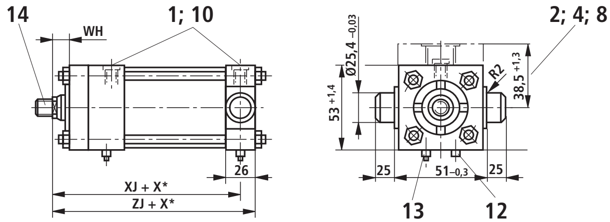


Stroke$_{min}$ = 10 mm
Always state dimension "XV"
in clear text on the order
(observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 25 mm
with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 105 bar



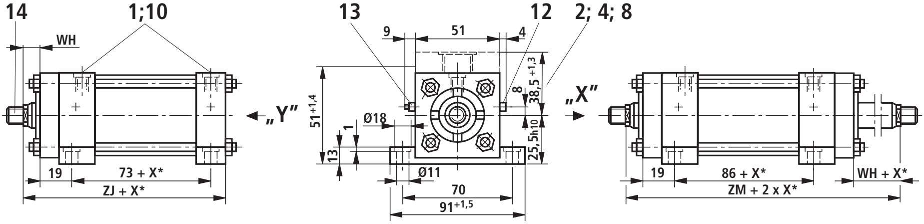
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
16	M10 x 1.5	M12 x 1.5	M14	19	21								
18	M10 x 1.5	M12 x 1.5	M14	19	21	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
25	M20 x 1.5	M22 x 1.5	M14	28	21								

X* = stroke length

Piston Ø 40 (dimensions in mm)

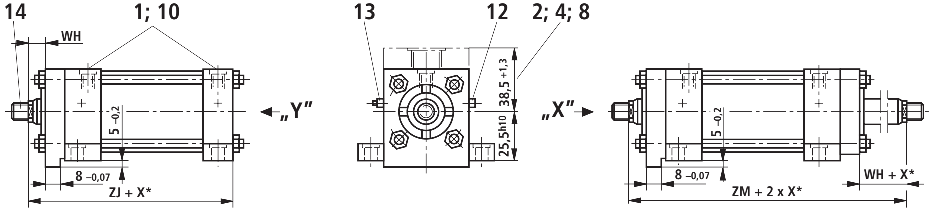
For explanations of items, see page 7

Type of mounting F Operating pressure 105 bar



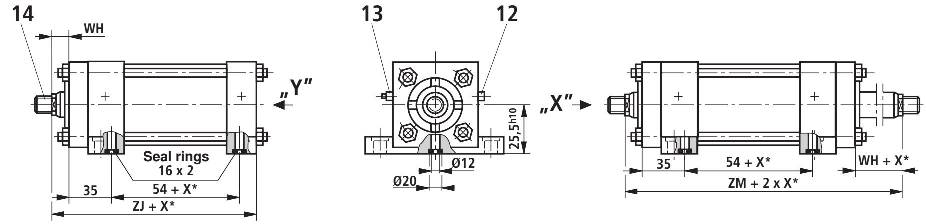
$Stroke_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 105 bar



$Stroke_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 105 bar



$Stroke_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
16	28.5	6	16	44.5	105	80	76 + X*	118	156	5.5	13	22	23
18	32	6	16	44.5	105	80	76 + X*	118	156	5.5	14		
25	38	13	25	53.5	114	89	85 + X*	127	174	8	22		

X* = stroke length

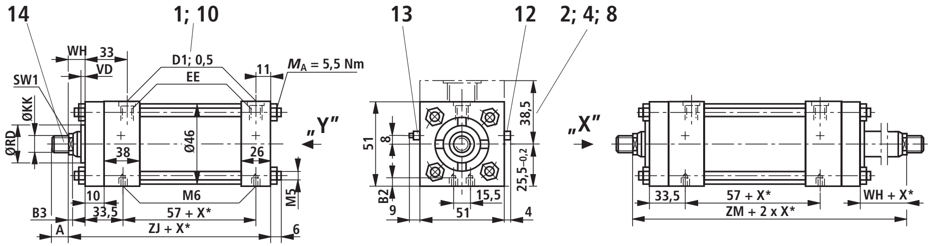
[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

3

Piston Ø 40 (dimensions in mm)

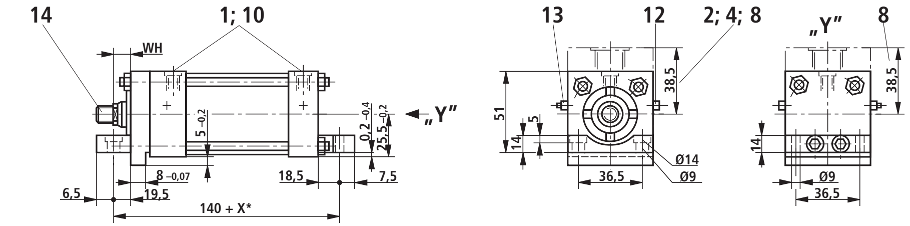
For explanations of items, see page 7

Type of mounting N Operating pressure 105 bar

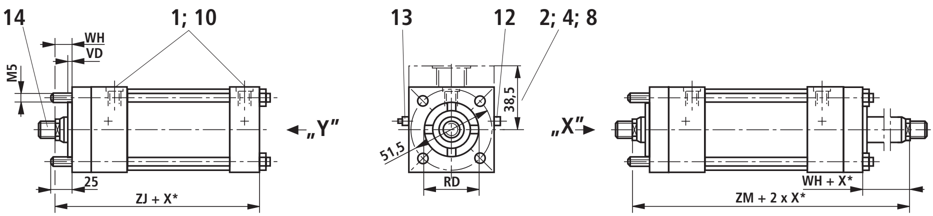


Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 105 bar



Type of mounting P Operating pressure 105 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

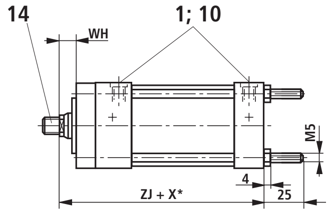
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
16	M10 x 1.5	M12 x 1.5	M14	19	21	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
18	M10 x 1.5	M12 x 1.5	M14	19	21								
25	M20 x 1.5	M22 x 1.5	M14	28	21								

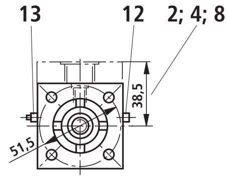
X* = stroke length

Piston Ø 40 (dimensions in mm)

For explanations of items, see page 7

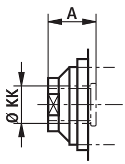
Type of mounting Q Operating pressure 105 bar



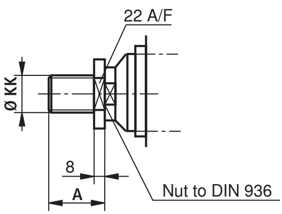


Additional thread versions

Thread version "E"



Thread version "F"



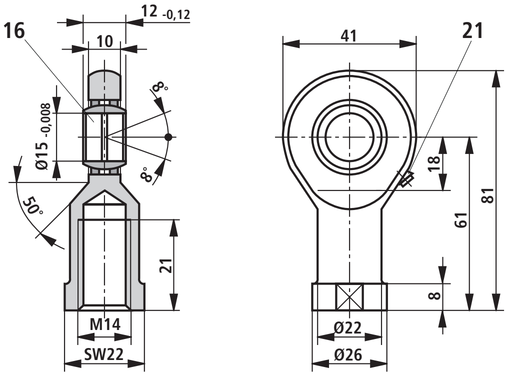
Self-aligning clevis CGK 15

suitable for

thread version "F"

Material no.: R900001328

Weight: 0.16 kg



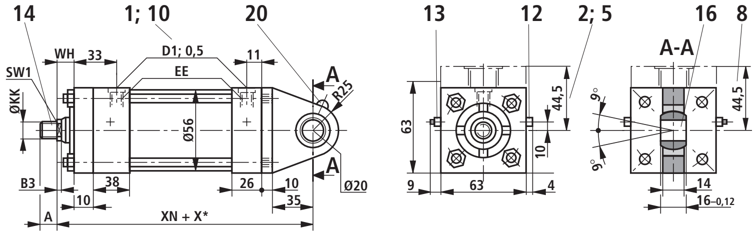
Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2	B3	SW1	Cushioning lengths	
											piston side	piston rod side
16	28,5		6	16	118	156		9	5.5	13	22	23
18	32		6	16	118	156		6	5.5	14		
25	38		13	25	127	174		6	8	22		

X* = stroke length

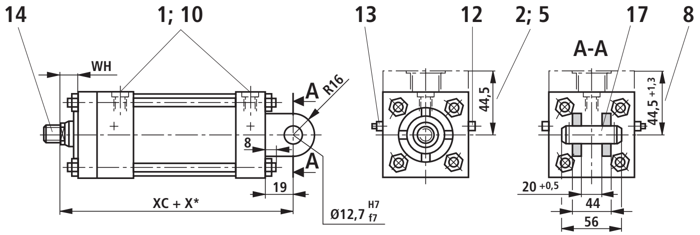
Piston Ø 50 (dimensions in mm)

For explanations of items, see page 7

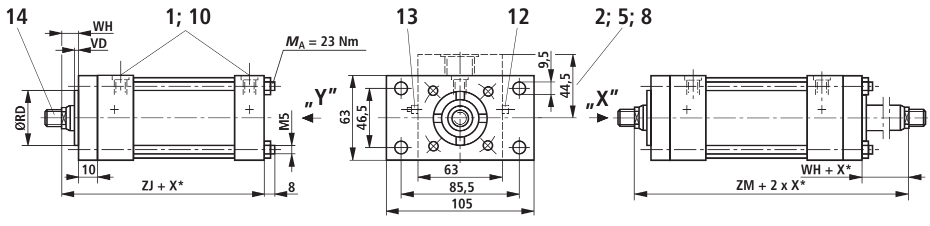
Type of mounting B Operating pressure 105 bar



Type of mounting G Operating pressure 105 bar



Type of mounting C Operating pressure with piston rod Ø 22 and 25: 25 bar on cap side; 105 bar on piston rod side
Operating pressure with piston rod Ø 36: 15 bar on cap side; 105 bar on piston rod side



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

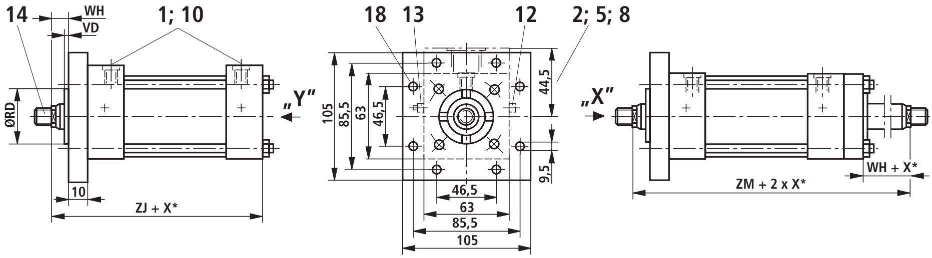
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
22	M16 x 1.5	M20 x 1.5	M20 x 1.5	28	30	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
25	M20 x 1.5	M22 x 1.5	M20 x 1.5	28	30								
36	M26 x 1.5	M30 x 2	M20 x 1.5	41	30								

X* = stroke length

Piston Ø 50 (dimensions in mm)

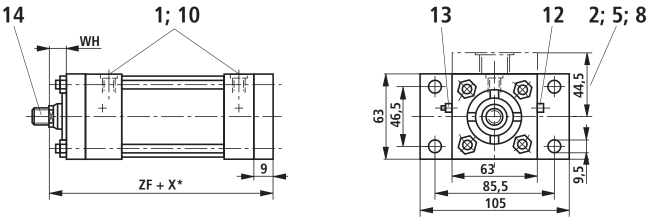
For explanations of items, see page 7

Type of mounting H Operating pressure 105 bar

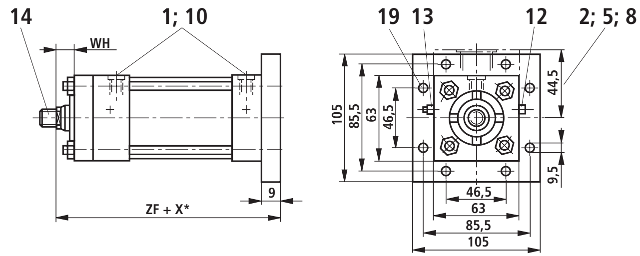


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 105 bar



Type of mounting K Operating pressure 105 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths	
											piston side	piston rod side
22	38	13	25	146	172	136	127	174	8	19	22	23
25	38	13	25	146	172	136	127	174	8	22		
36	50	16	32	153	179	143	134	188	10	30		

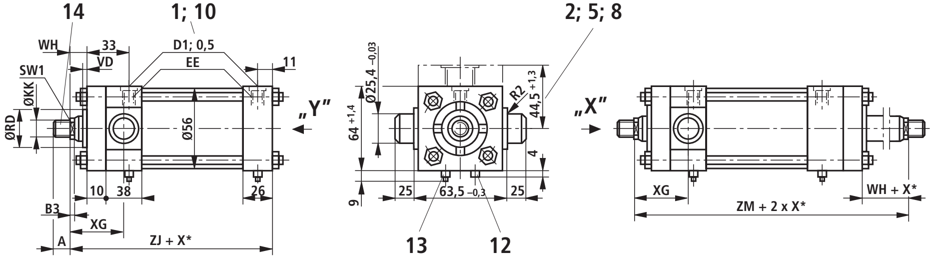
X* = stroke length

3

Piston Ø 50 (dimensions in mm)

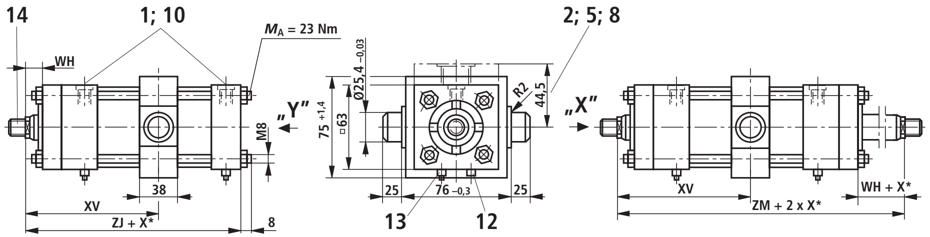
For explanations of items, see page 7

Type of mounting R Operating pressure 105 bar



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 105 bar

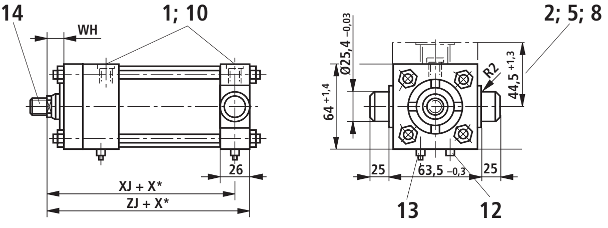


Stroke$_{min}$ = 10 mm
Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 105 bar



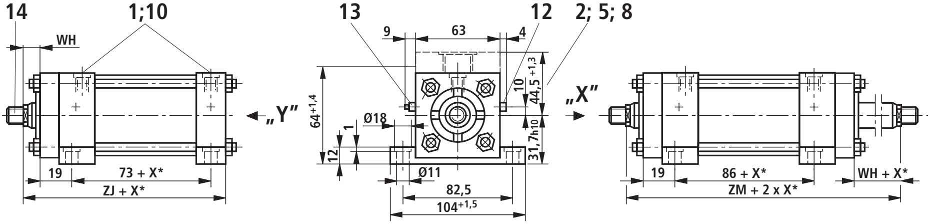
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
22	M16 x 1.5	M20 x 1.5	M20 x 1.5	28	30	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
25	M20 x 1.5	M22 x 1.5	M20 x 1.5	28	30								
36	M26 x 1.5	M30 x 2	M20 x 1.5	41	30								

X* = stroke length

Piston Ø 50 (dimensions in mm)

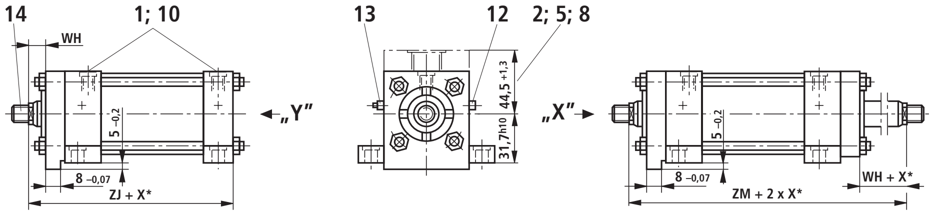
For explanations of items, see page 7

Type of mounting F Operating pressure 105 bar



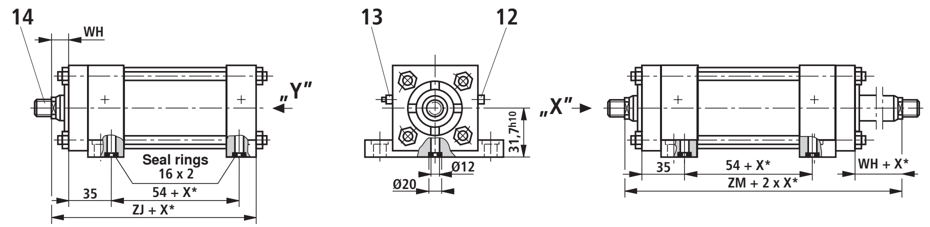
Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 105 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 105 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths	
												piston side	piston rod side
22	38	13	25	53.5	114	92	82 + X*	127	174	8	19	22	23
25	38	13	25	53.5	114	92	82 + X*	127	174	8	22		
36	50	16	32	60.5	121	99	89 + X*	134	188	10	30		

X* = stroke length

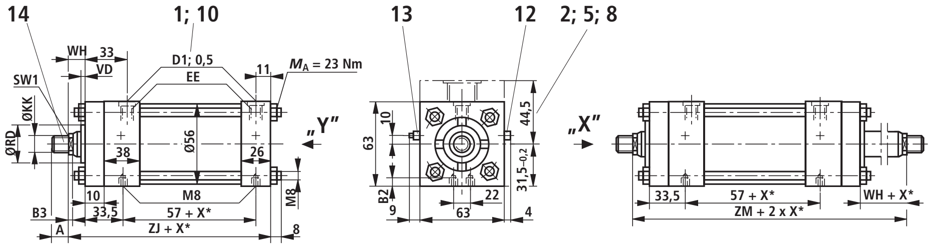
[1] Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

3

Piston Ø 50 (dimensions in mm)

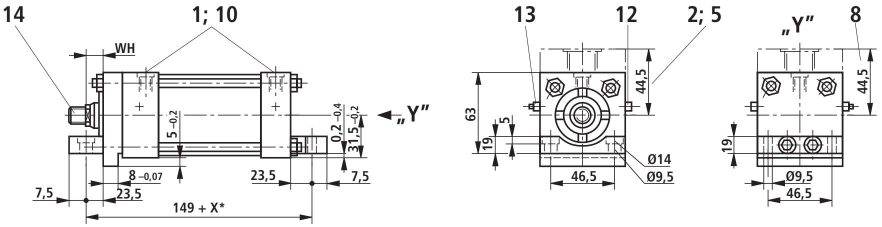
For explanations of items, see page 7

Type of mounting N Operating pressure 105 bar

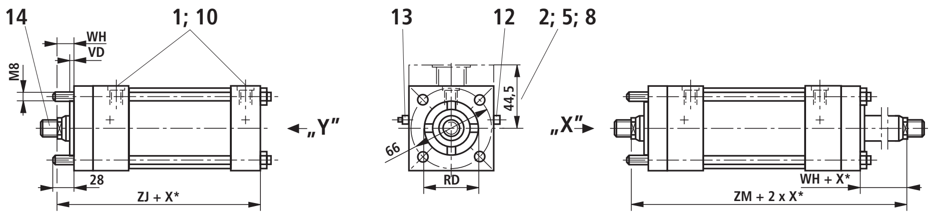


Stroke$_{min}$ = 30 mm with thread version “E“ (only for double-rod cylinder)

Type of mounting T Operating pressure 105 bar



Type of mounting P Operating pressure 105 bar



Stroke$_{min}$ = 30 mm with thread version “E“ (only for double-rod cylinder)

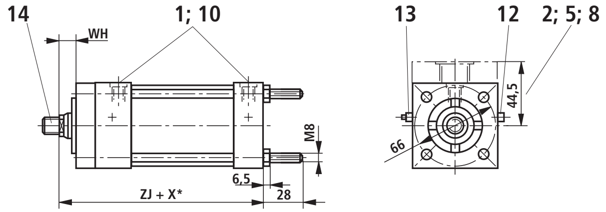
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>22</td><td>M16 x 1.5</td><td>M20 x 1.5</td><td>M20 x 1.5</td><td>28</td><td>30</td><td rowspan="4">G 1/4</td><td rowspan="4">G 3/8</td><td rowspan="4">M14 x 1.5</td><td rowspan="4">M16 x 1.5</td><td rowspan="4">25</td><td rowspan="4">28</td><td rowspan="4">25</td><td rowspan="4">28</td></tr>
<tr><td>25</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M20 x 1.5</td><td>28</td><td>30</td></tr>
<tr><td>36</td><td>M26 x 1.5</td><td>M30 x 2</td><td>M20 x 1.5</td><td>41</td><td>30</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length

Piston Ø 50 (dimensions in mm)

For explanations of items, see page 7

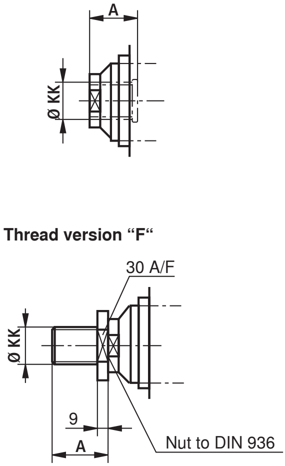
Type of mounting Q Operating pressure 105 bar



Additional thread versions

Thread version "E"

Thread version "F"



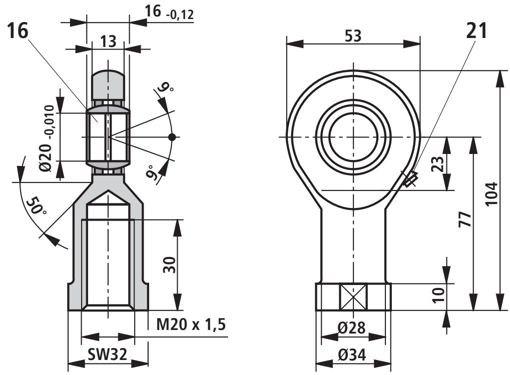
Self-aligning clevis CGK 20

suitable for

Thread version "F"

Material no.: R900001329

Weight: 0.34 kg



Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
22	38		13	25	127	174		12	8	19	22	23
25	38		13	25	127	174		12	8	22		
36	50		16	32	134	188		8	10	30		

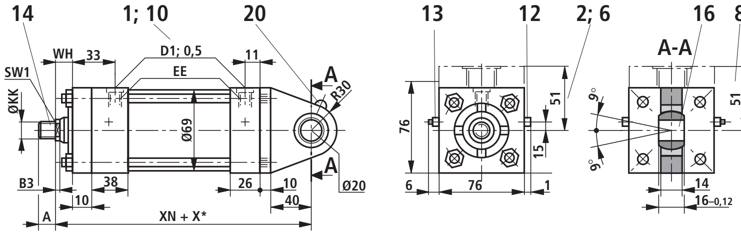
X* = stroke length

3

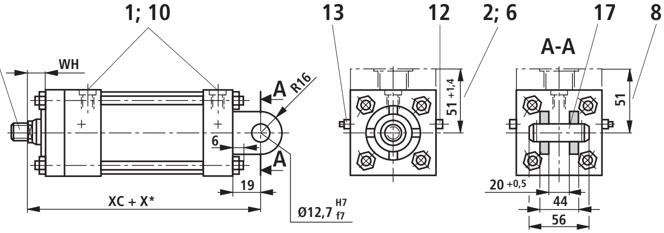
Piston Ø 63 (dimensions in mm)

For explanations of items, see page 7

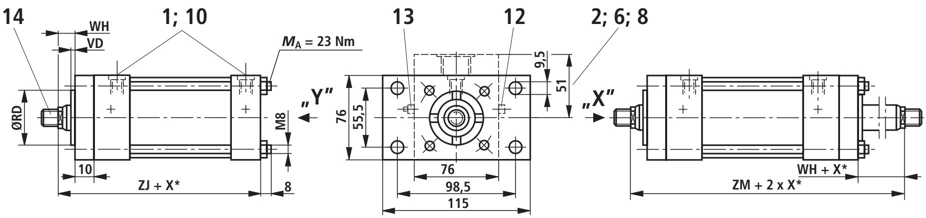
Type of mounting B Operating pressure 70 bar



Type of mounting G Operating pressure 70 bar



Type of mounting C Operating pressure with piston rod Ø 25 and 28: 20 bar on cap side; 70 bar on piston rod side
Operating pressure with piston rod Ø 36 and 45: 10 bar on cap side; 70 bar on piston rod side



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

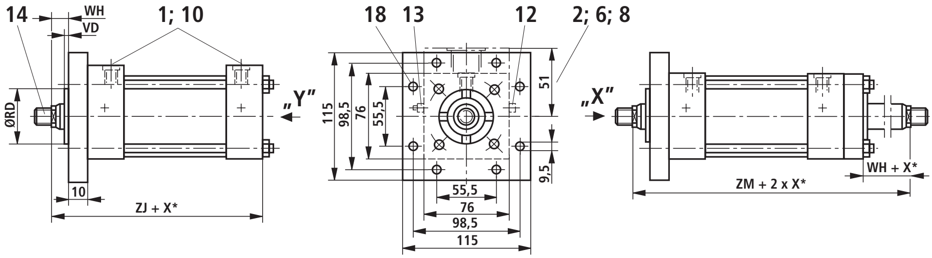
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>25</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M24 x 2</td><td>28</td><td>36</td><td rowspan="4">G 1/4</td><td rowspan="4">G 3/8</td><td rowspan="4">M14 x 1.5</td><td rowspan="4">M16 x 1.5</td><td rowspan="4">25</td><td rowspan="4">28</td><td rowspan="4">25</td><td rowspan="4">28</td></tr>
<tr><td>28</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M24 x 2</td><td>28</td><td>36</td></tr>
<tr><td>36</td><td>M26 x 1.5</td><td>M30 x 2</td><td>M24 x 2</td><td>41</td><td>36</td></tr>
<tr><td>45</td><td>M33 x 2</td><td>M39 x 2</td><td>M24 x 2</td><td>51</td><td>36</td></tr>
</table>

X* = stroke length

Piston Ø 63 (dimensions in mm)

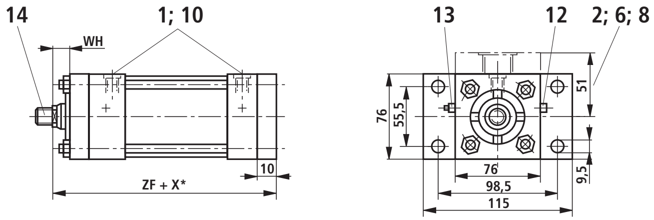
For explanations of items, see page 7

Type of mounting H Operating pressure 70 bar

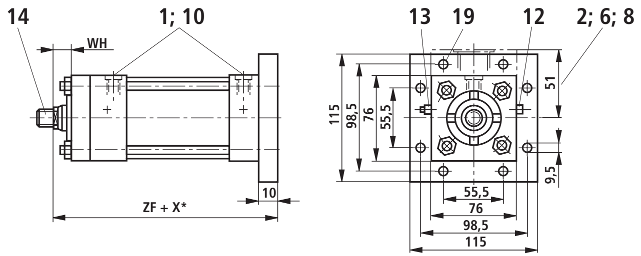


Stroke$_{min}$ = 30 mm with thread version “E“
(only for double-rod cylinder)

Type of mounting D Operating pressure 70 bar



Type of mounting K Operating pressure 70 bar



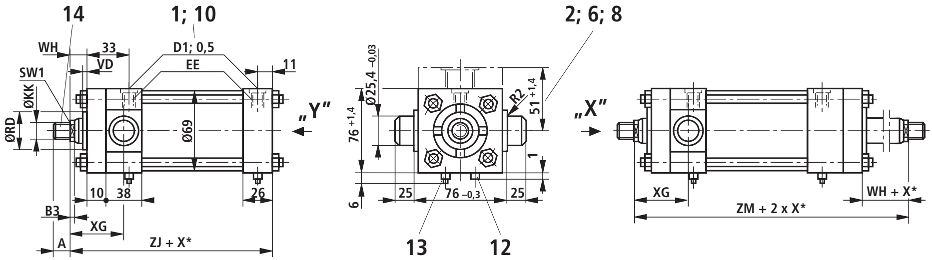
Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths	
											piston side	piston rod side
25	38	13	25	149	180	140	130	177	8	22	22	23
28	42	13	25	149	180	140	130	177	8	22		
36	50.7	16	32	156	187	147	137	191	10	30		
45	60	19	38	162	193	153	143	203	12	41		

X* = stroke length

3

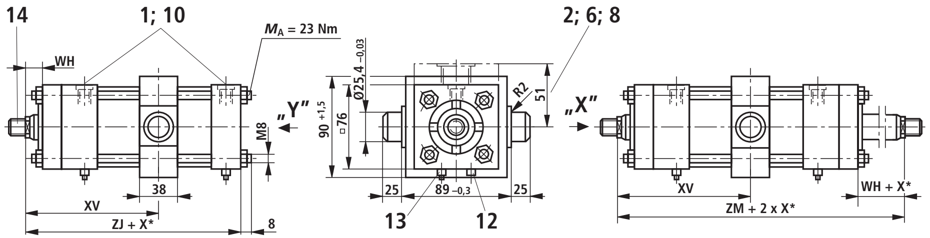
Piston Ø 63 (dimensions in mm) For explanations of items, see page 7

Type of mounting R Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 70 bar

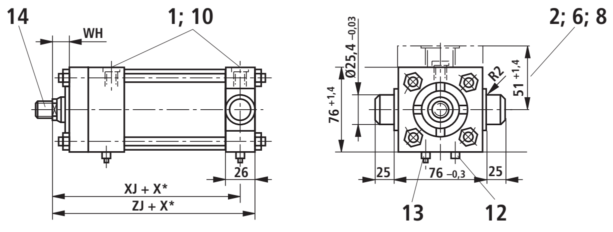


Stroke$_{min}$ = 10 mm
Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 70 bar



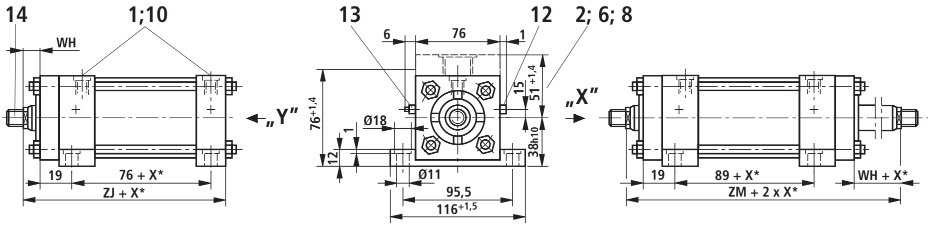
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
25	M20 x 1.5	M22 x 1.5	M24 x 2	28	36	G 1/4	G 3/8	M14 x 1.5	M16 x 1.5	25	28	25	28
28	M20 x 1.5	M22 x 1.5	M24 x 2	28	36								
36	M26 x 1.5	M30 x 2	M24 x 2	41	36								
45	M33 x 2	M39 x 2	M24 x 2	51	36								

X* = stroke length

Piston Ø 63 (dimensions in mm)

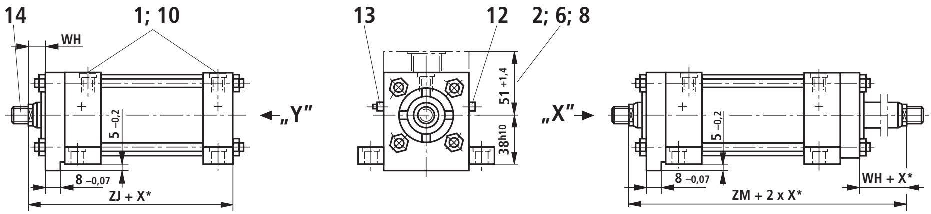
For explanations of items, see page 7

Type of mounting F Operating pressure 70 bar



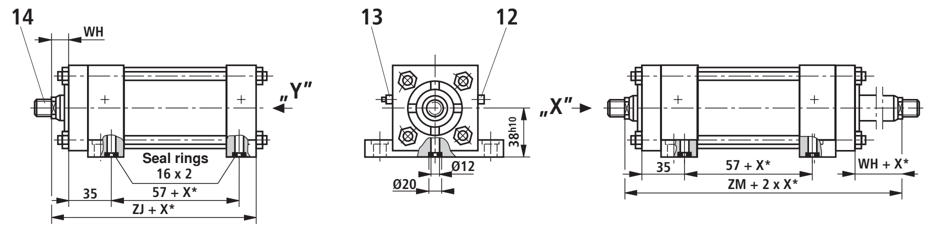
Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths on piston rod side
25	38	13	25	53.5	117	92	85 + X*	130	177	8	22	22	23
28	42	13	25	53.5	117	92	85 + X*	130	177	8	22		
36	50.7	16	32	60.5	124	99	92 + X*	137	191	10	30		
45	60	19	38	66.5	130	105	98 + X*	143	203	12	41		

X* = stroke length

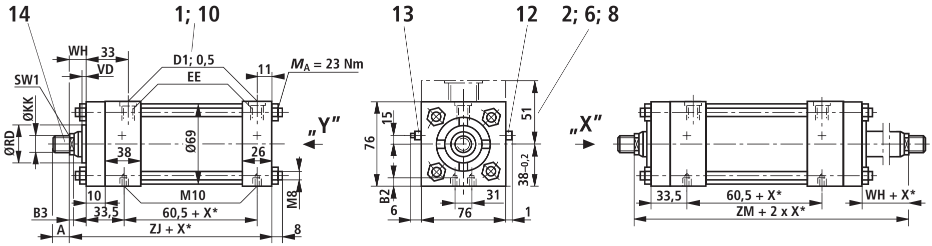
[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

3

Piston Ø 63 (dimensions in mm)

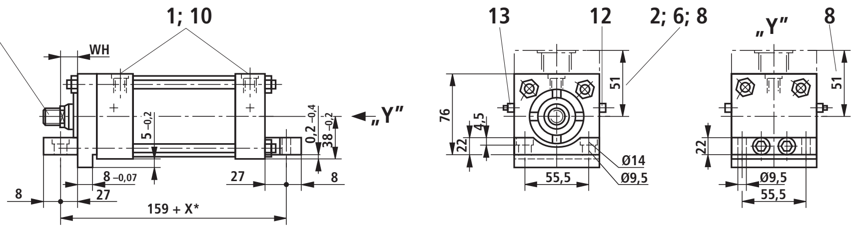
For explanations of items, see page 7

Type of mounting N Operating pressure 70 bar

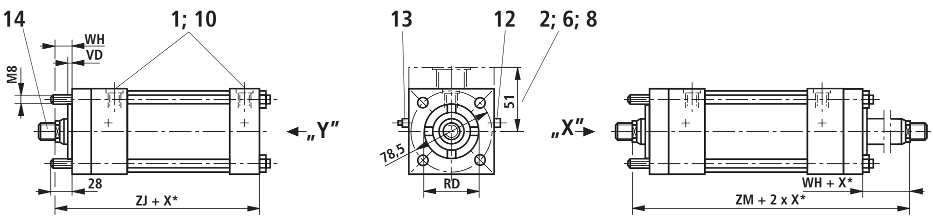


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 70 bar



Type of mounting P Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

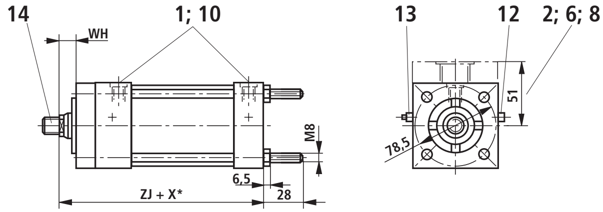
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>25</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M24 x 2</td><td>28</td><td>36</td><td rowspan="4">G 1/4</td><td rowspan="4">G 3/8</td><td rowspan="4">M14 x 1.5</td><td rowspan="4">M16 x 1.5</td><td rowspan="4">25</td><td rowspan="4">28</td><td rowspan="4">25</td><td rowspan="4">28</td></tr>
<tr><td>28</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M24 x 2</td><td>28</td><td>36</td></tr>
<tr><td>36</td><td>M26 x 1.5</td><td>M30 x 2</td><td>M24 x 2</td><td>41</td><td>36</td></tr>
<tr><td>45</td><td>M33 x 2</td><td>M39 x 2</td><td>M24 x 2</td><td>51</td><td>36</td></tr>
</table>

X* = stroke length

Piston Ø 63 (dimensions in mm)

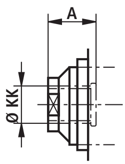
For explanations of items, see page 7

Type of mounting Q Operating pressure 70 bar

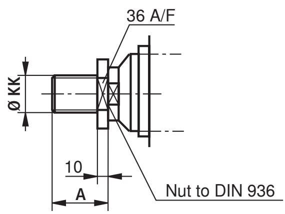


Additional thread versions

Thread version "E"



Thread version "F"



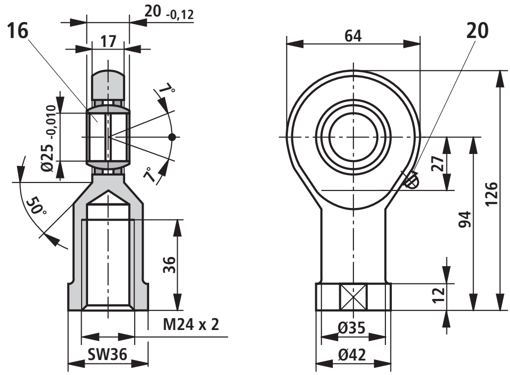
Self-aligning clevis CGK 25

suitable for

thread version "F"

Material no.: R900001330

Weight: 0.6 kg



Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2	B3	SW1	Cushioning lengths	
											piston side	piston rod side
25	38		13	25	130	177		15	8	22	22	23
28	42		13	25	130	177		16	8	22		
36	50.7		16	32	137	191		9	10	30		
45	60		19	38	143	203		9	12	41		

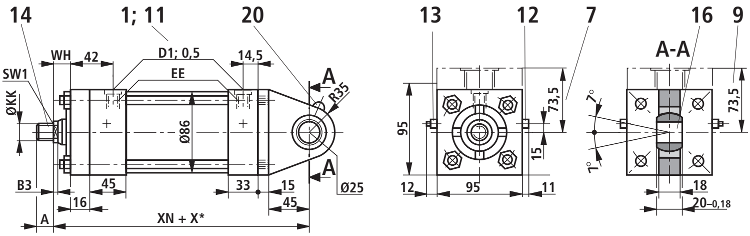
X* = stroke length

3

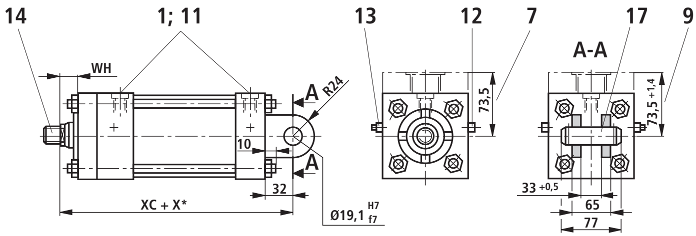
Piston Ø 80 (dimensions in mm)

For explanations of items, see page 7

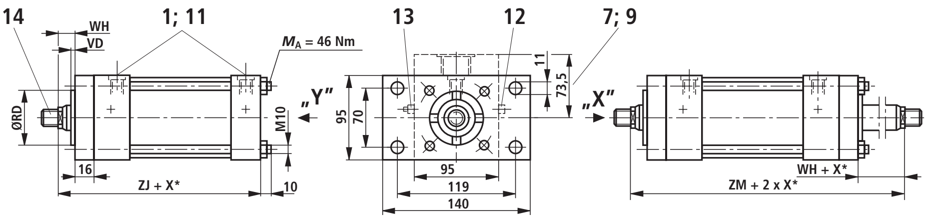
Type of mounting B Operating pressure 70 bar



Type of mounting G Operating pressure 70 bar



Type of mounting C Operating pressure with piston rod Ø 36 and 45: 30 bar on cap side; 70 bar on piston rod side
Operating pressure with piston rod Ø 56: 25 bar on cap side; 70 bar on piston rod side



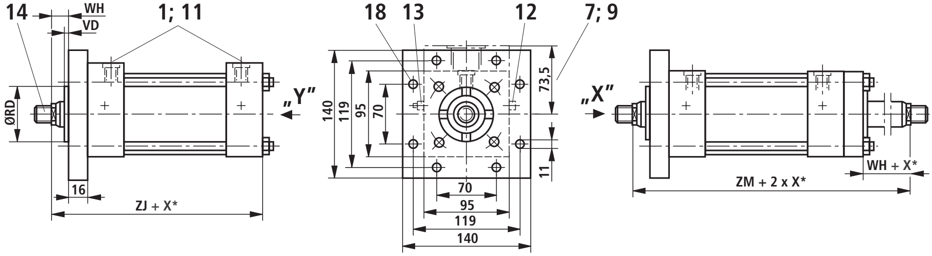
Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>36</td><td>M26 x 1.5</td><td>M30 x 2</td><td>M30 x 2</td><td>41</td><td>45</td><td rowspan="4">G 1/2</td><td rowspan="4">G 3/4</td><td rowspan="4">M22 x 1.5</td><td rowspan="4">M26 x 1.5</td><td rowspan="4">34</td><td rowspan="4">34</td><td rowspan="4">34</td><td rowspan="4">34</td></tr>
<tr><td>45</td><td>M33 x 2</td><td>M39 x 2</td><td>M30 x 2</td><td>51</td><td>45</td></tr>
<tr><td>56</td><td>M39 x 2</td><td>M45 x 2</td><td>M30 x 2</td><td>57</td><td>45</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length

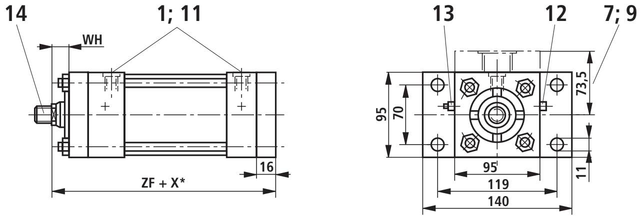
Piston Ø 80 (dimensions in mm) For explanations of items, see page 7

Type of mounting H Operating pressure 70 bar

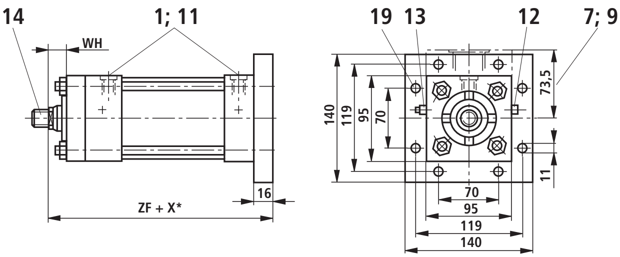


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 70 bar



Type of mounting K Operating pressure 70 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths	
											piston side	piston rod side
36	50	10	25	181	209	165	149	202	10	30	27	25
45	60	13	32	188	216	172	156	216	12	41		
56	70	13	35	191	219	175	159	222	15	46		

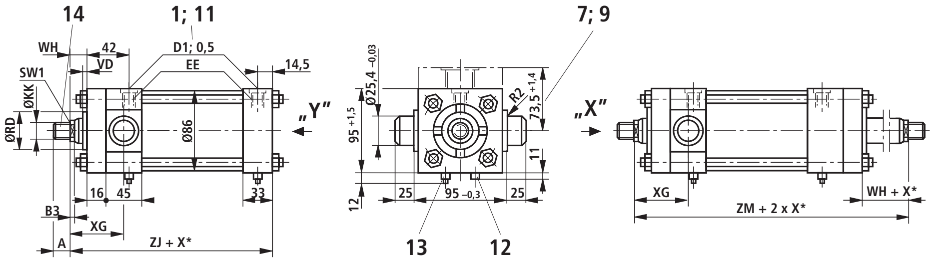
X* = stroke length

3

Piston Ø 80 (dimensions in mm)

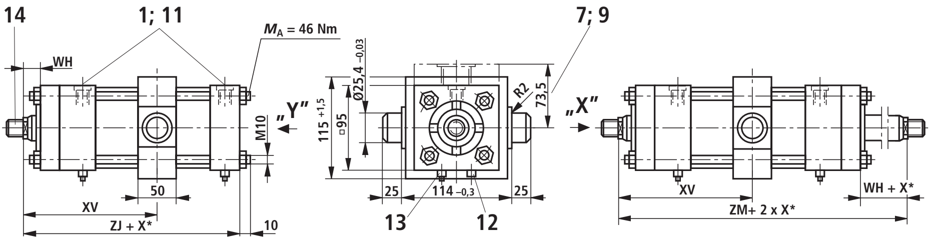
For explanations of items, see page 7

Type of mounting R Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 70 bar

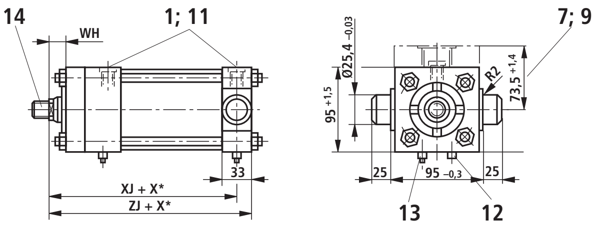


Stroke$_{min}$ = 20 mm
Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 70 bar



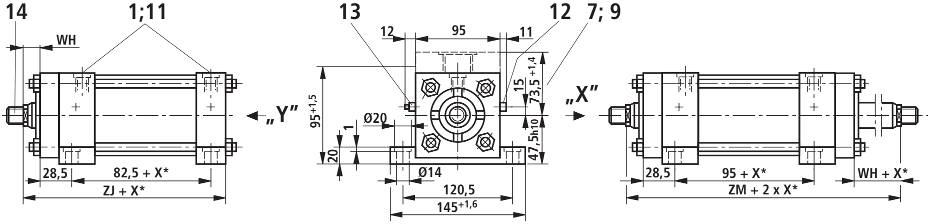
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
36	M26 x 1.5	M30 x 2	M30 x 2	41	45	G 1/2	G 3/4	M22 x 1.5	M26 x 1.5	34	34	34	34
45	M33 x 2	M39 x 2	M30 x 2	51	45								
56	M39 x 2	M45 x 2	M30 x 2	57	45								

X* = stroke length

Piston Ø 80 (dimensions in mm)

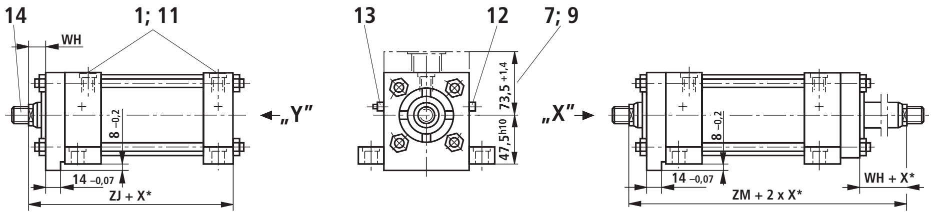
For explanations of items, see page 7

Type of mounting F Operating pressure 70 bar



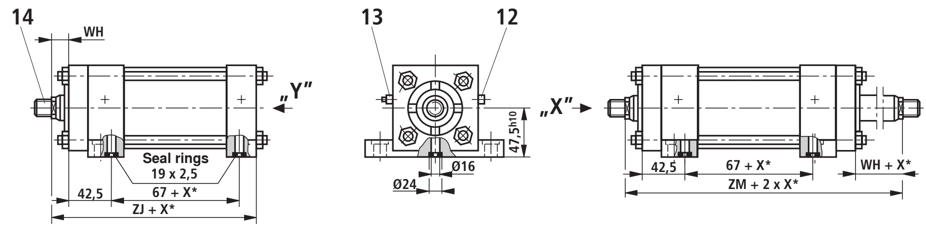
Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
36	50	10	25	63.5	133	111	91 + X*	149	202	10	30	27	25
45	60	13	32	70.5	140	118	98 + X*	156	216	12	41		
56	70	13	35	73.5	143	121	101 + X*	159	222	15	46		

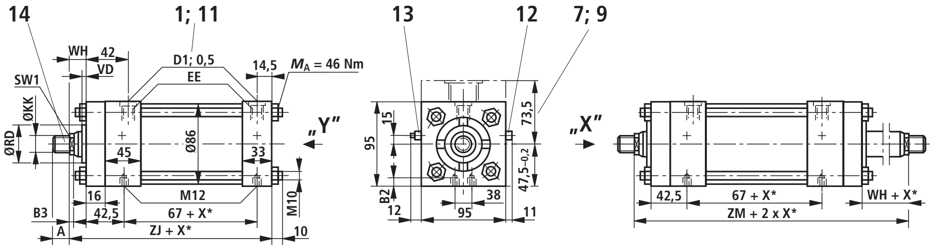
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Piston Ø 80 (dimensions in mm)

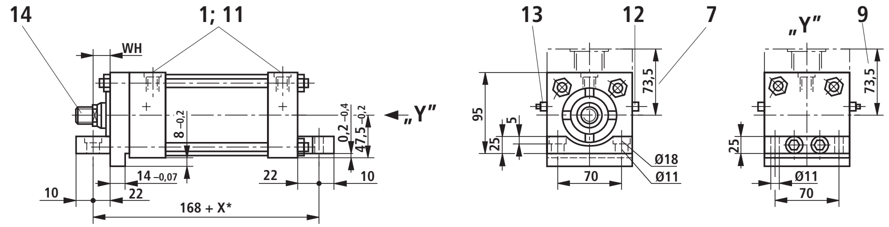
For explanations of items, see page 7

Type of mounting N Operating pressure 70 bar

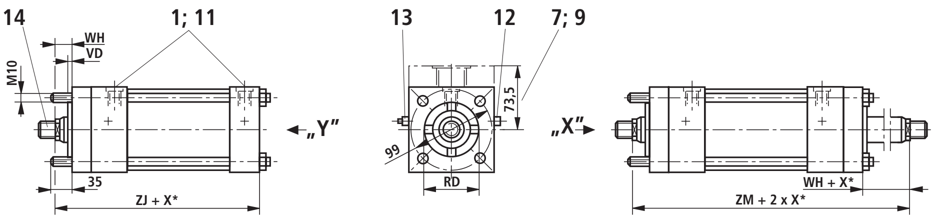


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 70 bar



Type of mounting P Operating pressure 70 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

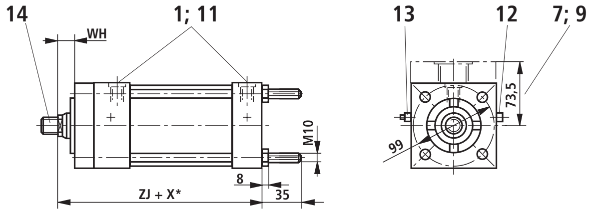
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>36</td><td>M26 x 1.5</td><td>M30 x 2</td><td>M30 x 2</td><td>41</td><td>45</td><td rowspan="4">G 1/2</td><td rowspan="4">G 3/4</td><td rowspan="4">M22 x 1.5</td><td rowspan="4">M26 x 1.5</td><td rowspan="4">34</td><td rowspan="4">34</td><td rowspan="4">34</td><td rowspan="4">34</td></tr>
<tr><td>45</td><td>M33 x 2</td><td>M39 x 2</td><td>M30 x 2</td><td>51</td><td>45</td></tr>
<tr><td>56</td><td>M39 x 2</td><td>M45 x 2</td><td>M30 x 2</td><td>57</td><td>45</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length

Piston Ø 80 (dimensions in mm)

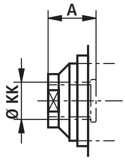
For explanations of items, see page 7

Type of mounting Q Operating pressure 70 bar

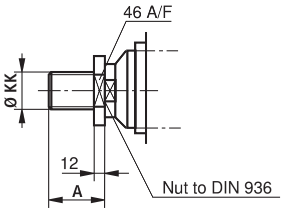


Additional thread versions

Thread version "E"



Thread version "F"



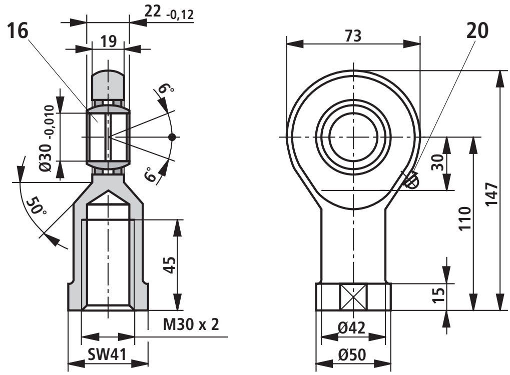
Self-aligning clevis CGK 30

suitable for

thread version "F"

Material no.: R900001331

Weight: 0.9 kg



3

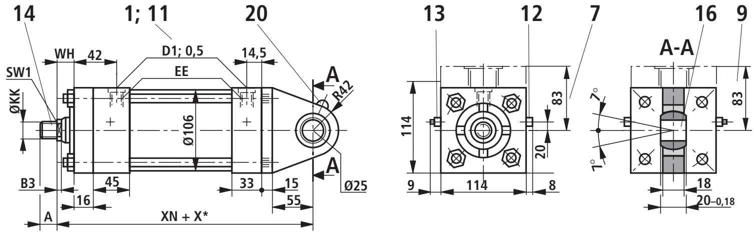
Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
36	50		10	25	149	202		20	10	30	27	25
45	60		13	32	156	216		13	12	41		
56	70		13	35	159	222		13	15	46		

X* = stroke length

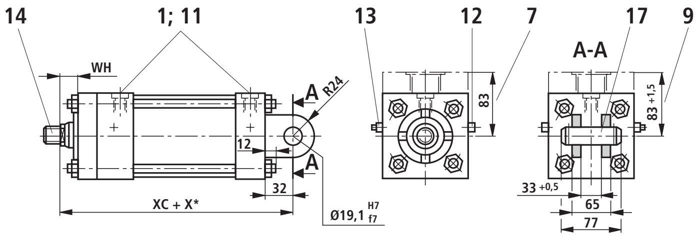
Piston Ø 100 (dimensions in mm)

For explanations of items, see page 7

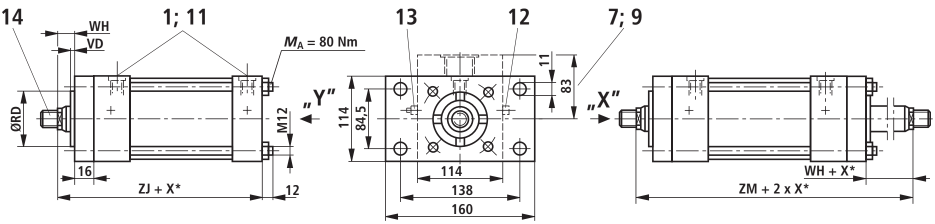
Type of mounting B Operating pressure 70 bar



Type of mounting G Operating pressure 70 bar



Type of mounting C Operating pressure with piston rod Ø 45 and 50: 25 bar on cap side; 70 bar on piston rod side
Operating pressure with piston rod Ø 70: 15 bar on cap side; 70 bar on piston rod side



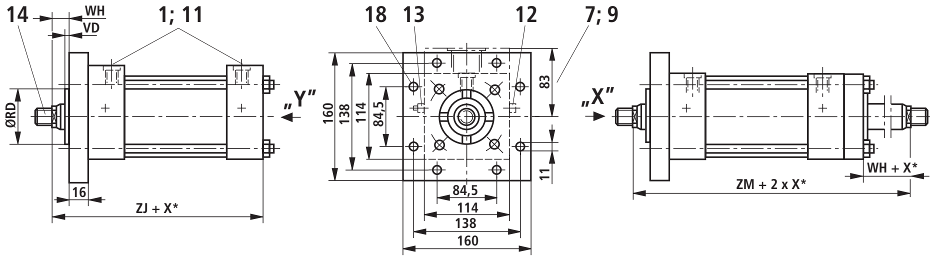
$Stroke_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
45	M33 x 2	M39 x 2	M39 x 3	51	65	G 1/2	G 3/4	M22 x 1.5	M26 x 1.5	34	34	34	34
50	M39 x 2	M45 x 2	M39 x 3	57	65								
70	M48 x 2	M56 x 2	M39 x 3	76	65								

X* = stroke length

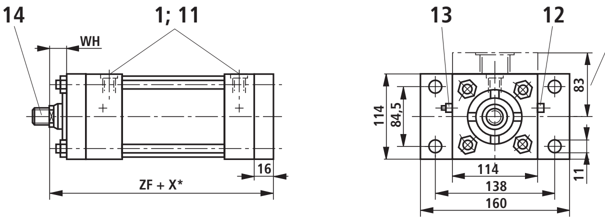
Piston Ø 100 (dimensions in mm) For explanations of items, see page 7

Type of mounting H Operating pressure 70 bar

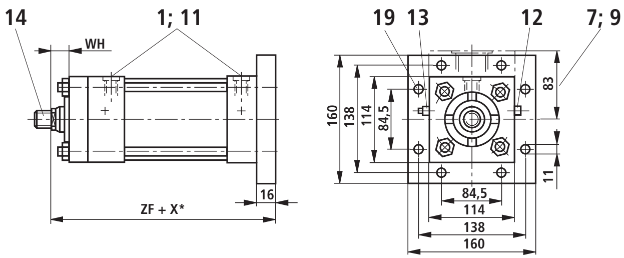


Stroke$_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 70 bar



Type of mounting K Operating pressure 70 bar



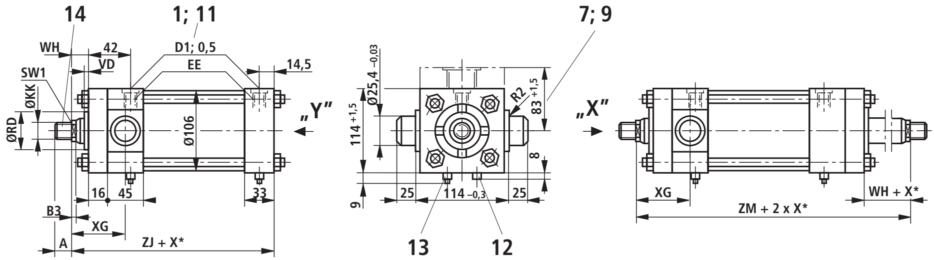
Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths	
											piston side	piston rod side
45	60	13	32	188	226	172	156	216	12	41	27	25
50	66.6	13	35	191	229	175	159	222	15	46		
70	90	16	41	197	235	181	165	234	15	60		

X* = stroke length

Piston Ø 100 (dimensions in mm)

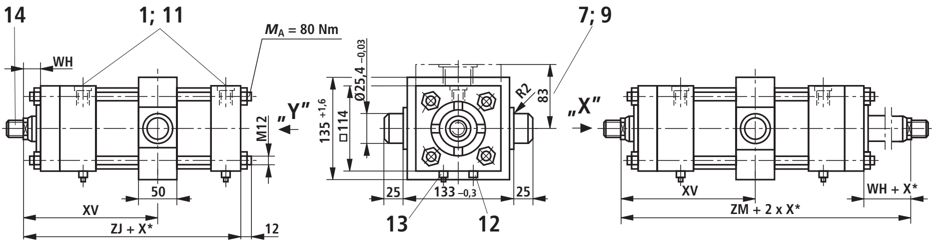
For explanations of items, see page 7

type of mounting R Operating pressure 70 bar



Stroke$_{min}$ = 45 mm with thread version “E“
(only for double-rod cylinder)

Type of mounting E Operating pressure 70 bar

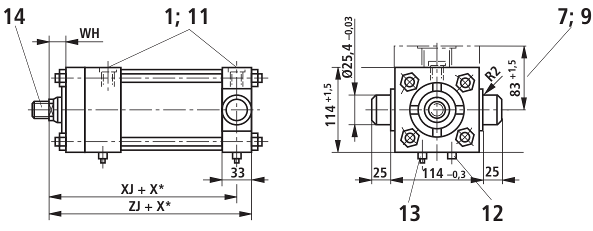


Stroke$_{min}$ = 20 mm
Always specify dimension “XV” in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension “LY“ in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 45 mm with thread version “E“ (only for double-rod cylinder)

Type of mounting S Operating pressure 70 bar



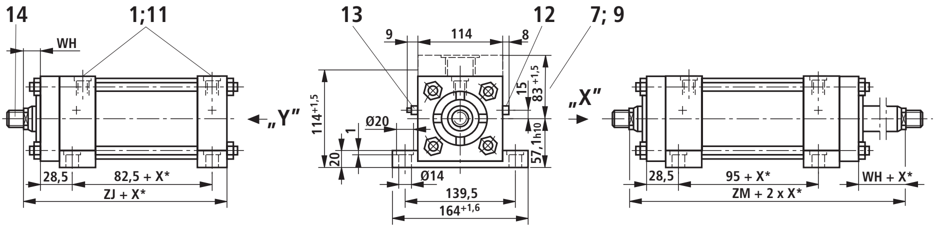
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>45</td><td>M33 x 2</td><td>M39 x 2</td><td>M39 x 3</td><td>51</td><td>65</td><td rowspan="4">G 1/2</td><td rowspan="4">G 3/4</td><td rowspan="4">M22 x 1.5</td><td rowspan="4">M26 x 1.5</td><td rowspan="4">34</td><td rowspan="4">34</td><td rowspan="4">34</td><td rowspan="4">34</td></tr>
<tr><td>50</td><td>M39 x 2</td><td>M45 x 2</td><td>M39 x 3</td><td>57</td><td>65</td></tr>
<tr><td>70</td><td>M48 x 2</td><td>M56 x 2</td><td>M39 x 3</td><td>76</td><td>65</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length

Piston Ø 100 (dimensions in mm)

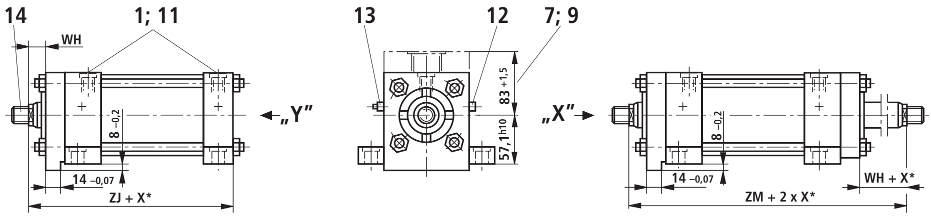
For explanations of items, see page 7

Type of mounting F Operating pressure 70 bar



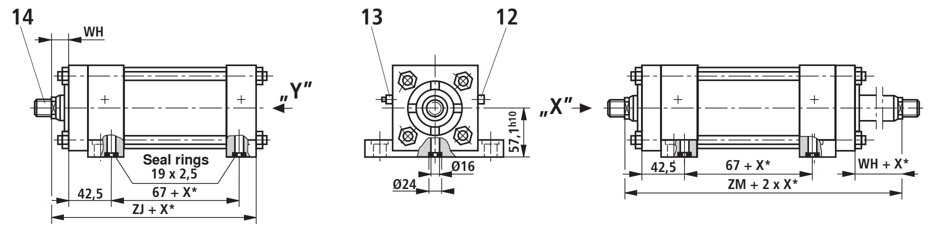
Stroke$_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 70 bar



Stroke$_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 70 bar



Stroke$_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV 1) min.	XV 1) max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
45	60	13	32	70	140	118	98 + X*	156	216	12	41	27	25
50	66.6	13	35	73	143	121	101 + X*	159	222	15	46		
70	90	16	41	79	149	127	107 + X*	165	234	15	60		

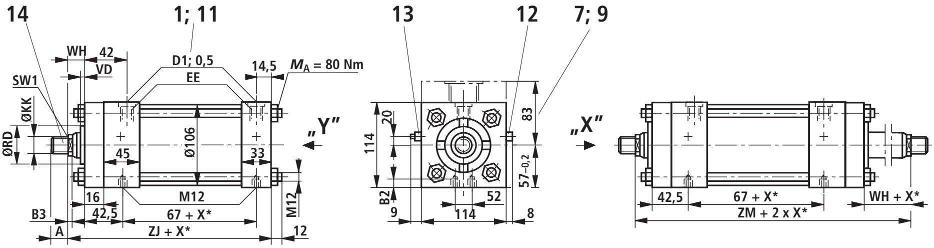
X* = stroke length

1) Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Piston Ø 100 (dimensions in mm)

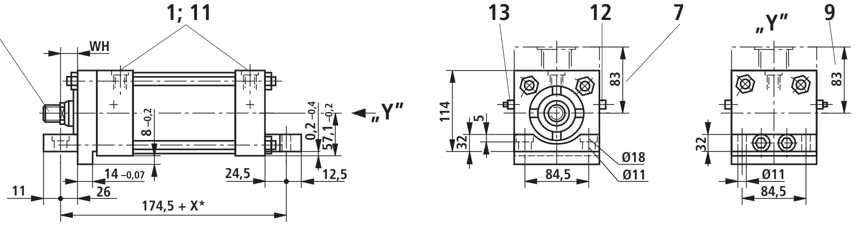
For explanations of items, see page 7

Type of mounting N Operating pressure 70 bar

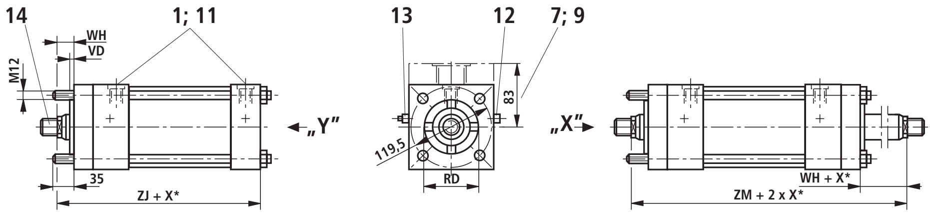


Stroke$_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 70 bar



Type of mounting P Operating pressure 70 bar



Stroke$_{min}$ = 45 mm with thread version "E"
(only for double-rod cylinder)

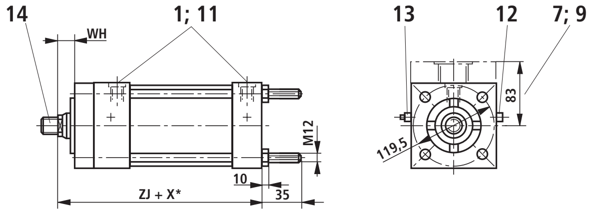
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
45	M33 x 2	M39 x 2	M39 x 3	51	65	G 1/2	G 3/4	M22 x 1.5	M26 x 1.5	34	34	34	34
50	M39 x 2	M45 x 2	M39 x 3	57	65								
70	M48 x 2	M56 x 2	M39 x 3	76	65								

X* = stroke length

Piston Ø 100 (dimensions in mm)

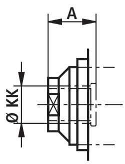
For explanations of items, see page 7

Type of mounting Q Operating pressure 70 bar

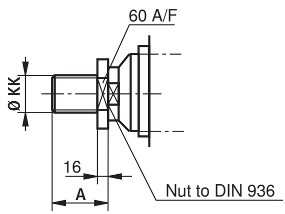


Additional thread versions

Thread version "E"



Thread version "F"



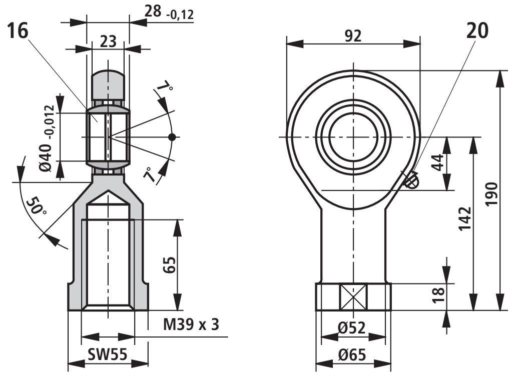
Self-aligning clevis CGK 40

suitable for

thread version "F"

Material no.: R900001332

Weight: 2 kg



Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
45	60		13	32	156	216		25	12	41	27	25
50	66.6		13	35	159	222		20	15	46		
70	90		16	41	165	234		15	15	60		

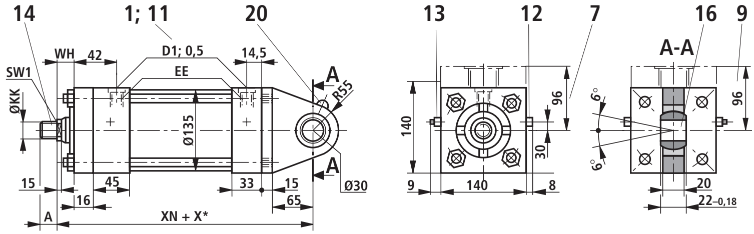
X* = stroke length

3

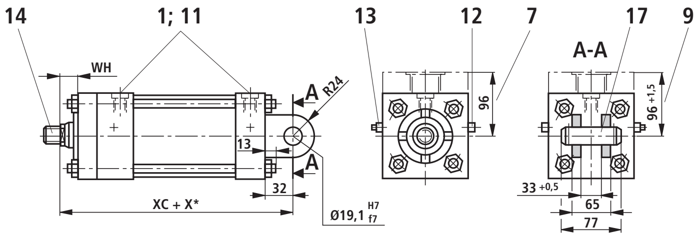
Piston Ø 125 (dimensions in mm)

For explanations of items, see page 7

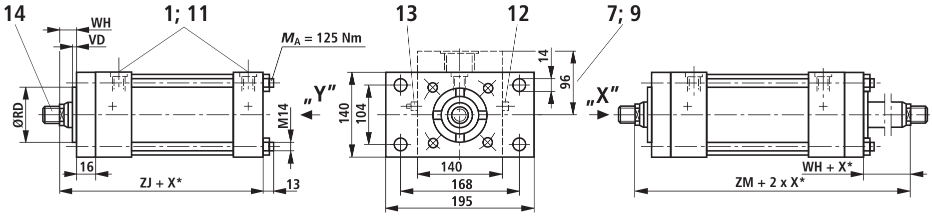
Type of mounting B Operating pressure 70 bar



Type of mounting G Operating pressure 70 bar



Type of mounting C Operating pressure with piston rod Ø 50 and 56: 15 bar on cap side; 70 bar on piston rod side
Operating pressure with piston rod Ø 63 and 90: 10 bar on cap side; 70 bar on piston rod side



Stroke$_{min}$ = 55 mm with thread version "E" (only for double-rod cylinder)

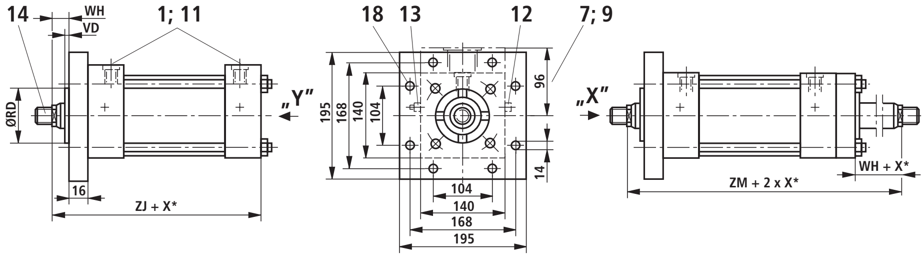
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
50	M39 x 2	M45 x 2	M42 x 3	57	65	G 1/2	G 3/4	M22 x 1.5	M26 x 1.5	34	34	34	34
56	M39 x 2	M45 x 2	M42 x 3	57	65								
63	M48 x 2	M56 x 2	M42 x 3	76	65								
90	M64 x 2	M76 x 2	M42 x 3	89	65								

X* = stroke length

Piston Ø 125 (dimensions in mm)

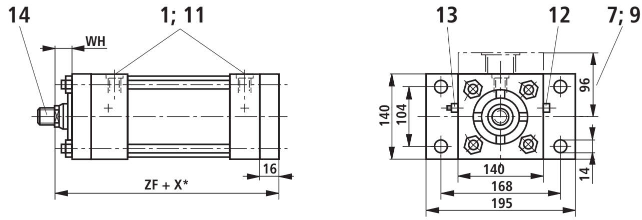
For explanations of items, see page 7

Type of mounting H Operating pressure 70 bar

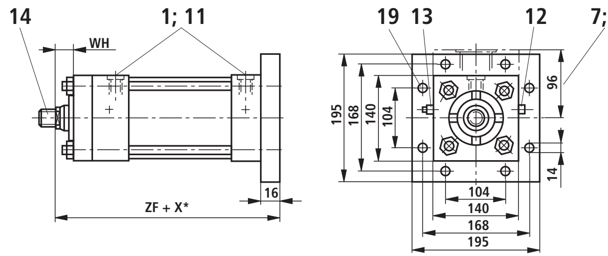


Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 70 bar



Type of mounting K Operating pressure 70 bar



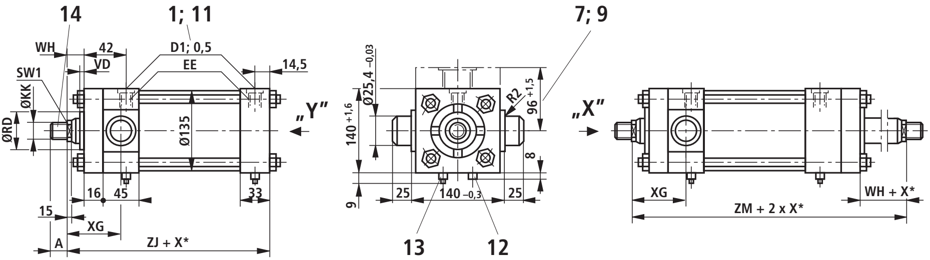
Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM		SW1	Cushioning lengths piston side	piston rod side
50	66.6	13	35	197	245	181	165	228		46	27	25
56	70	13	35	197	245	181	165	228		46		
63	79.3	16	41	203	251	187	171	240		55		
90	108	16	41	203	251	187	171	240		75		

X* = stroke length

Piston Ø 125 (dimensions in mm)

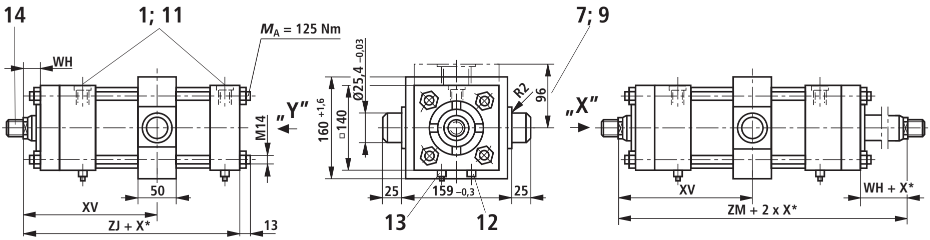
For explanations of items, see page 7

Type of mounting R Operating pressure 70 bar



Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 70 bar

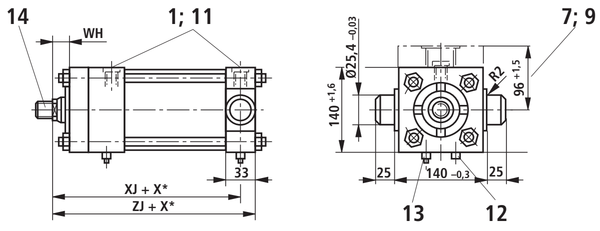


Stroke$_{min}$ = 20 mm
Always specify dimension "XV"
in clear text on the order
(observe XV_{min} and XV_{max})

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 55 mm
with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 70 bar



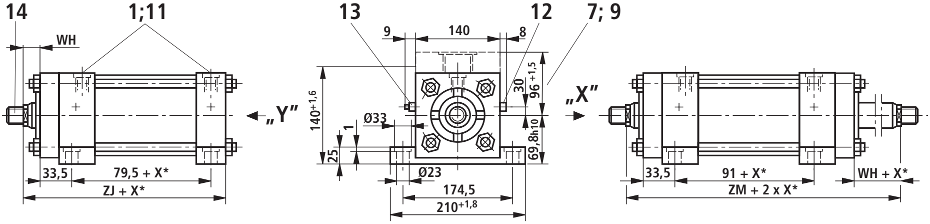
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
50	M39 x 2	M45 x 2	M42 x 3	57	65	G 1/2	G 3/4	M22 x 1.5	M26 x 1.5	34	34	34	34
56	M39 x 2	M45 x 2	M42 x 3	57	65								
63	M48 x 2	M56 x 2	M42 x 3	76	65								
90	M64 x 2	M76 x 2	M42 x 3	89	65								

X* = stroke length

Piston Ø 125 (dimensions in mm)

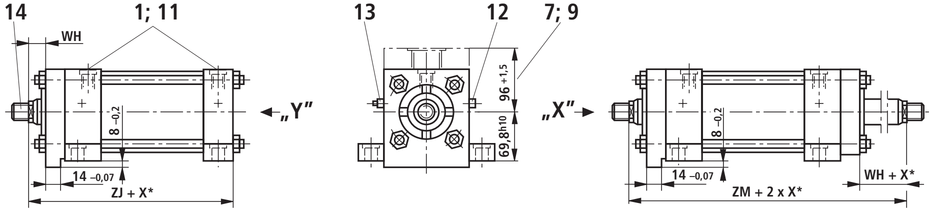
For explanations of items, see page 7

Type of mounting F Operating pressure 70 bar



$Stroke_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

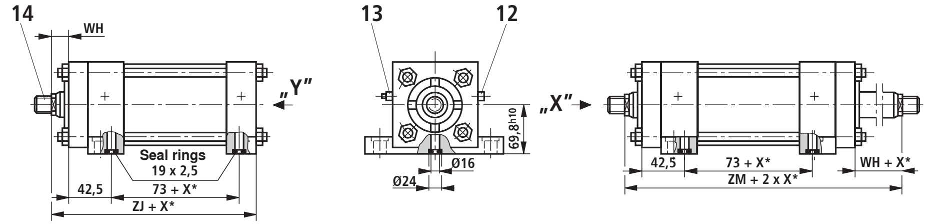
Type of mounting L Operating pressure 70 bar



$Stroke_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

3

Type of mounting M Operating pressure 70 bar



$Stroke_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM		SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
50	66.6	13	35	73	149.5	121	107 + X*	165	228		46	27	25
56	70	13	35	73	149.5	121	107 + X*	165	228		46		
63	79.3	16	41	79	155.5	127	113 + X*	171	240		55		
90	108	16	41	79	155.5	127	113 + X*	171	240		75		

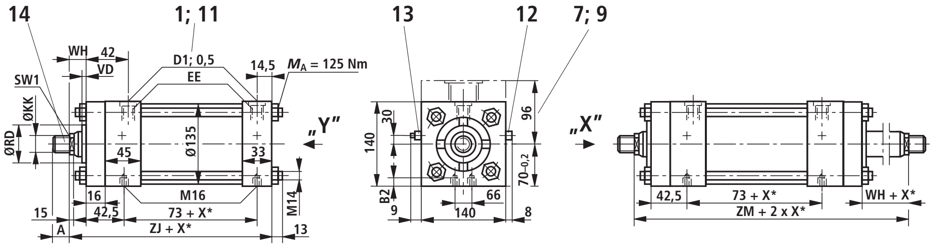
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Piston Ø 125 (dimensions in mm)

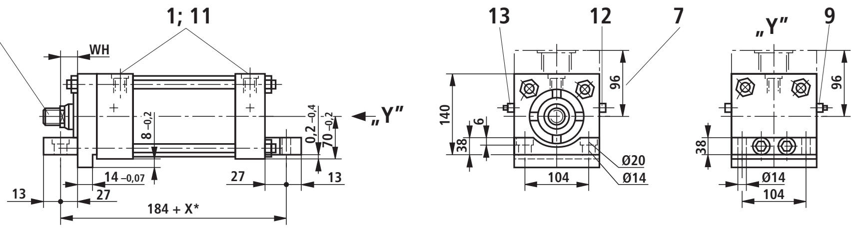
For explanations of items, see page 7

Type of mounting N Operating pressure 70 bar

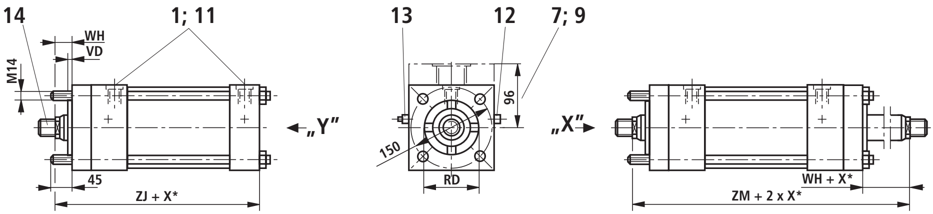


Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 70 bar



Type of mounting P Operating pressure 70 bar



Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

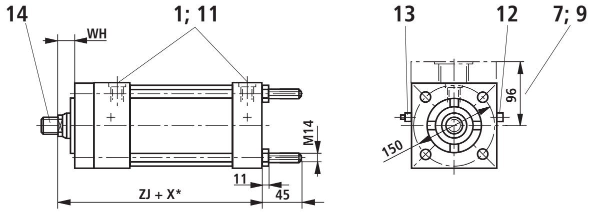
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
50	M39 x 2	M45 x 2	M42 x 3	57	65	G 1/2	G 3/4	M22 x 1.5	M26 x 1.5	34	34	34	34
56	M39 x 2	M45 x 2	M42 x 3	57	65								
63	M48 x 2	M56 x 2	M42 x 3	76	65								
90	M64 x 2	M76 x 2	M42 x 3	89	65								

X* = stroke length

Piston Ø 125 (dimensions in mm)

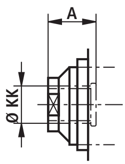
For explanations of items, see page 7

Type of mounting Q Operating pressure 70 bar

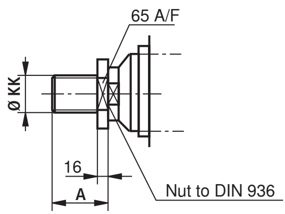


Additional thread versions

Thread version "E"



Thread version "F"



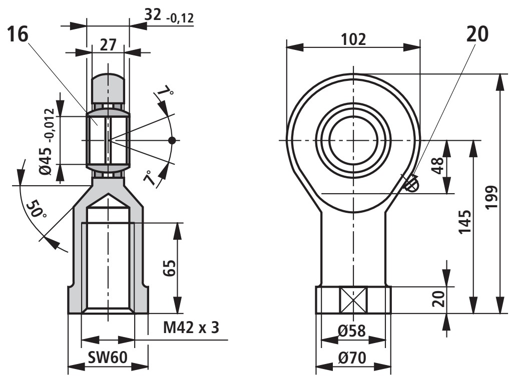
Self-aligning clevis CGK 45

suitable for

thread version "F"

Material no.: R900001333

Weight: 2.7 kg



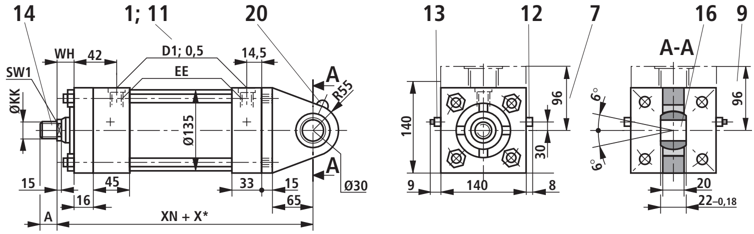
Piston rod Ø	ØRD f7		VD	WH	ZJ	ZM		B2		SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
50	66.6		13	35	165	228		25		46	27	25
56	70		13	35	165	228		25		46		
63	79.3		16	41	171	240		19		55		
90	108		16	41	171	240		19		75		

X* = stroke length

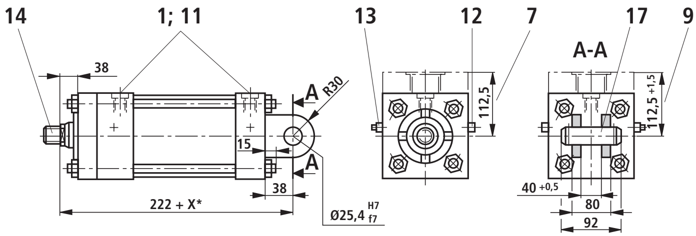
Piston Ø 150 (dimensions in mm)

For explanations of items, see page 7

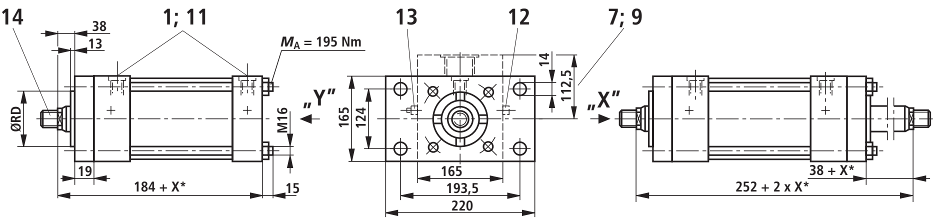
Type of mounting B Operating pressure 50 bar



Type of mounting G Operating pressure 50 bar



Type of mounting C Operating pressure with piston rod Ø 63 and 70: 20 bar on cap side; 50 bar on piston rod side
Operating pressure with piston rod Ø 80 and 100: 15 bar on cap side; 50 bar on piston rod side



Stroke$_{min}$ = 75 mm with thread version "E"
(only for double-rod cylinder)

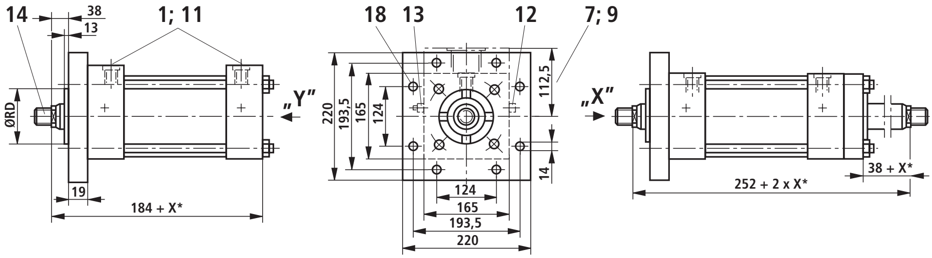
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
63	M48 x 2	M56 x 2	M45 x 3	76	68	G 3/4	G 1	M26 x 1.5	M33 x 2	42	42	42	42
70	M48 x 2	M56 x 2	M45 x 3	76	68								
80	M58 x 2	M68 x 2	M45 x 3	89	68								
100	M76 x 2	M95 x 2	M45 x 3	101	68								

X* = stroke length

Piston Ø 150 (dimensions in mm)

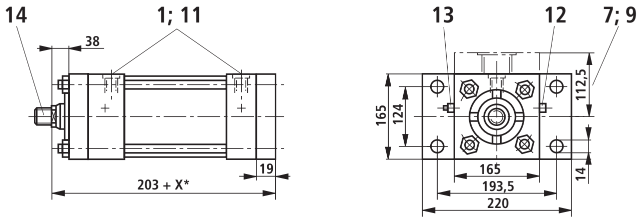
For explanations of items, see page 7

Type of mounting H Operating pressure 50 bar

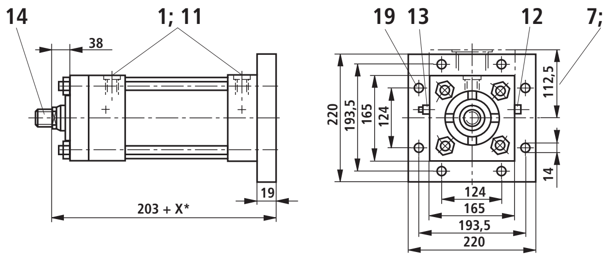


Stroke$_{min}$ = 75 mm with thread version “E“
(only for double-rod cylinder)

Type of mounting D Operating pressure 50 bar



Type of mounting K Operating pressure 50 bar



Piston rod Ø	ØRD f7									SW1	Cushioning lengths	
											piston side	piston rod side
63	79.3									55	32	30
70	90									60		
80	95.2									75		
100	120									85		

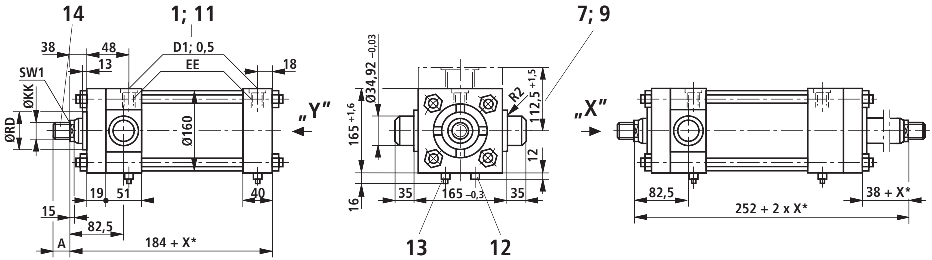
X* = stroke length

3

Piston Ø 150 (dimensions in mm)

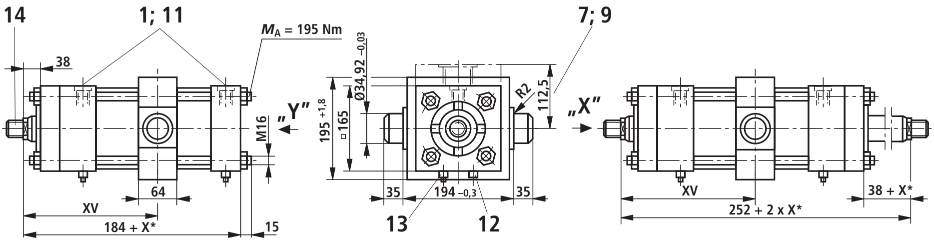
For explanations of items, see page 7

Type of mounting R Operating pressure 50 bar



Stroke$_{min}$ = 75 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 50 bar

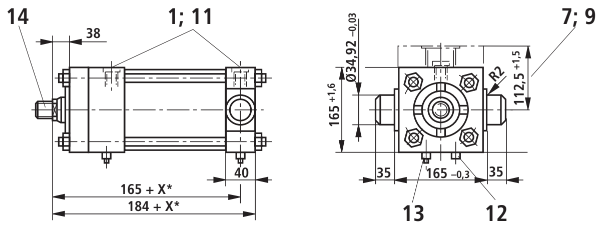


Stroke$_{min}$ = 30 mm
Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 75 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 50 bar



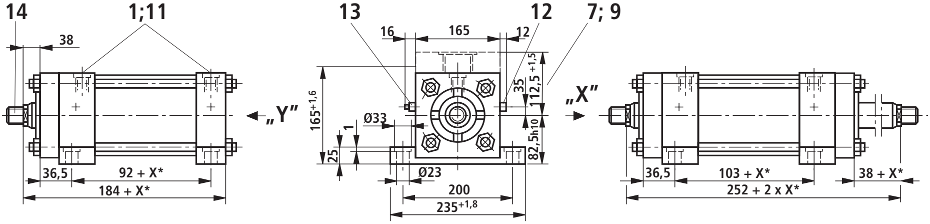
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="5">Thread version</th><th colspan="8">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>63</td><td>M48 x 2</td><td>M56 x 2</td><td>M45 x 3</td><td>76</td><td>68</td><td rowspan="4">G 3/4</td><td rowspan="4">G 1</td><td rowspan="4">M26 x 1.5</td><td rowspan="4">M33 x 2</td><td rowspan="4">42</td><td rowspan="4">42</td><td rowspan="4">42</td><td rowspan="4">42</td></tr>
<tr><td>70</td><td>M48 x 2</td><td>M56 x 2</td><td>M45 x 3</td><td>76</td><td>68</td></tr>
<tr><td>80</td><td>M58 x 2</td><td>M68 x 2</td><td>M45 x 3</td><td>89</td><td>68</td></tr>
<tr><td>100</td><td>M76 x 2</td><td>M95 x 2</td><td>M45 x 3</td><td>101</td><td>68</td></tr>
</table>

X* = stroke length

Piston Ø 150 (dimensions in mm)

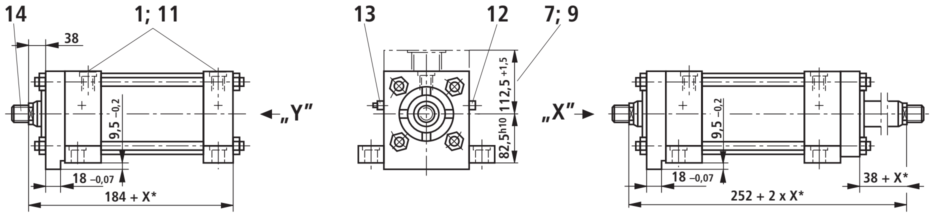
For explanations of items, see page 7

Type of mounting F Operating pressure 50 bar



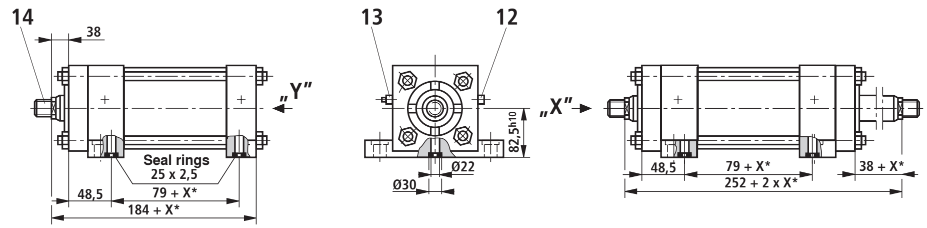
Stroke$_{min}$ = 75 mm with thread version "E" (only for double-rod cylinder)

Type of mounting L Operating pressure 50 bar



Stroke$_{min}$ = 75 mm with thread version "E" (only for double-rod cylinder)

Type of mounting M Operating pressure 50 bar



Stroke$_{min}$ = 75 mm with thread version "E" (only for double-rod cylinder)

Piston rod Ø	ØRD f7	XV [1] min.	XV [1] max.							SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
63	79.3	140	112 + X*							55	32	30
70	90	140	112 + X*							60		
80	95.2	140	112 + X*							75		
100	120	140	112 + X*							85		

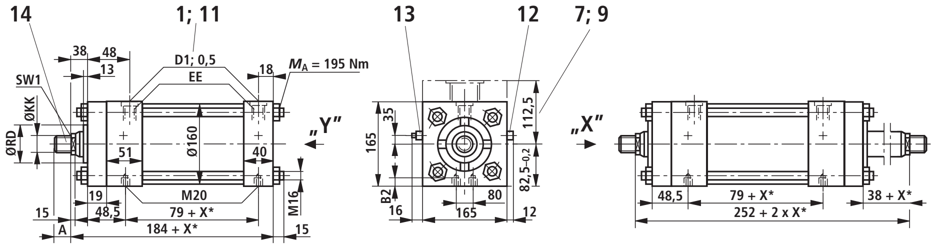
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Piston Ø 150 (dimensions in mm)

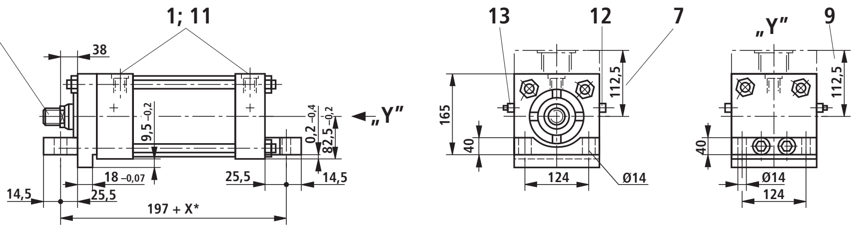
For explanations of items, see page 7

Type of mounting N Operating pressure 50 bar

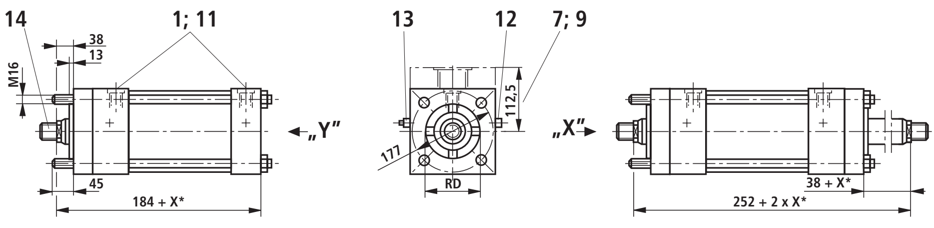


Stroke$_{min}$ = 75 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 50 bar



Type of mounting P Operating pressure 50 bar



Stroke$_{min}$ = 75 mm with thread version "E"
(only for double-rod cylinder)

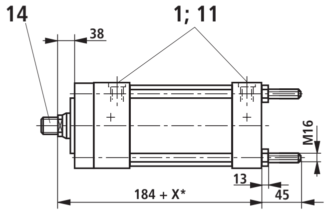
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
63	M48 x 2	M56 x 2	M45 x 3	76	68	G 3/4	G 1	M26 x 1.5	M33 x 2	42	42	42	42
70	M48 x 2	M56 x 2	M45 x 3	76	68								
80	M58 x 2	M68 x 2	M45 x 3	89	68								
100	M76 x 2	M95 x 2	M45 x 3	101	68								

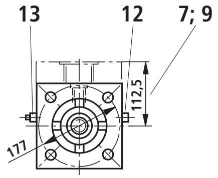
X* = stroke length

Piston Ø 150 (dimensions in mm)

For explanations of items, see page 7

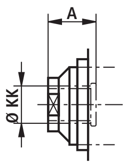
Type of mounting Q Operating pressure 50 bar



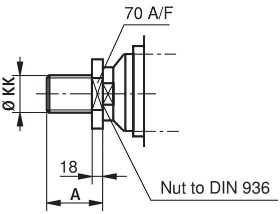


Additional thread versions

Thread version "E"



Thread version "F"



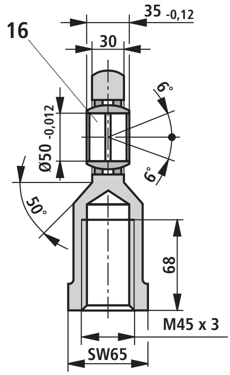
Self-aligning clevis CGK 50

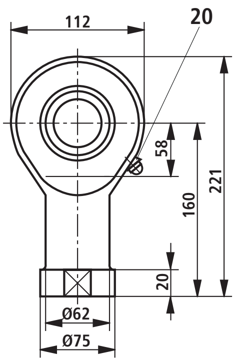
suitable for

thread version "F"

Material no.: R900001334

Weight: 3.5 kg





Piston rod Ø	ØRD f7							B2		SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
63	79.3							35		55	32	30
70	90							35		60		
80	95.2							30		75		
100	120							25		85		

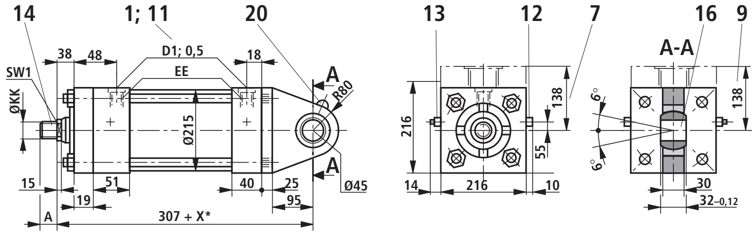
X* = stroke length

3

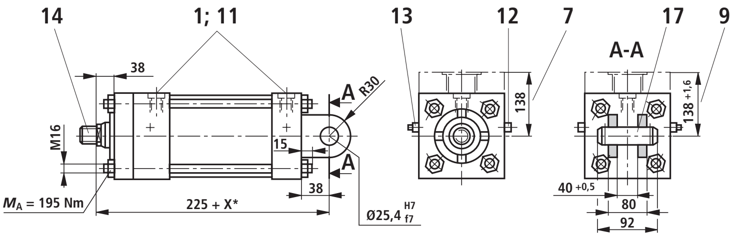
Piston Ø 200 (dimensions in mm)

For explanations of items, see page 7

Type of mounting B Operating pressure 40 bar



Type of mounting G Operating pressure 40 bar



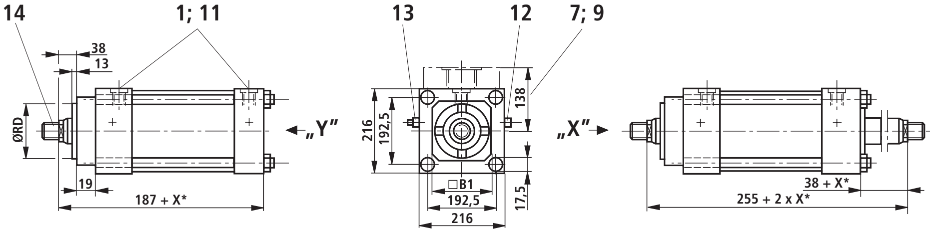
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
90	M64 x 2	M76 x 2	M52 x 3	89	70								
100	M76 x 2	M95 x 2	M52 x 3	101	70	G 3/4	G 1	M26 x 1.5	M33 x 2	42	42	42	42
140	M100 x 2	M130 x 2	M52 x 3	140	70								

X* = stroke length

Piston Ø 200 (dimensions in mm)

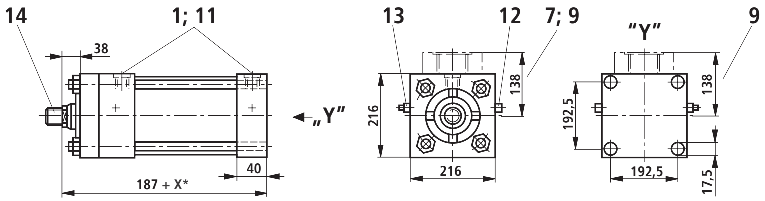
For explanations of items, see page 7

Type of mounting H Operating pressure 40 bar



Stroke$_{min}$ = 115 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting K Operating pressure 40 bar



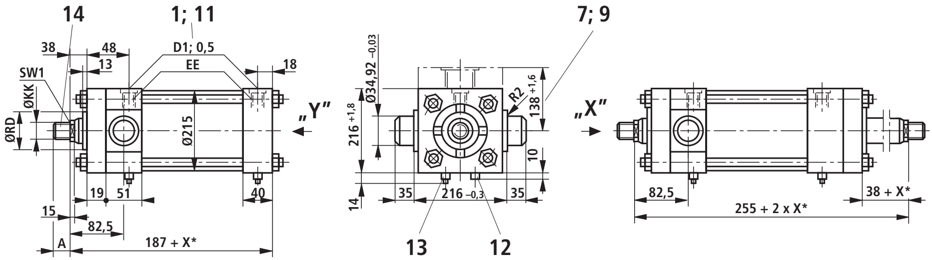
Piston rod Ø	ØRD f7								B1	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
90	108								140	75		
100	120								140	85	32	30
140	158								178	120		

X* = stroke length

Piston Ø 200 (dimensions in mm)

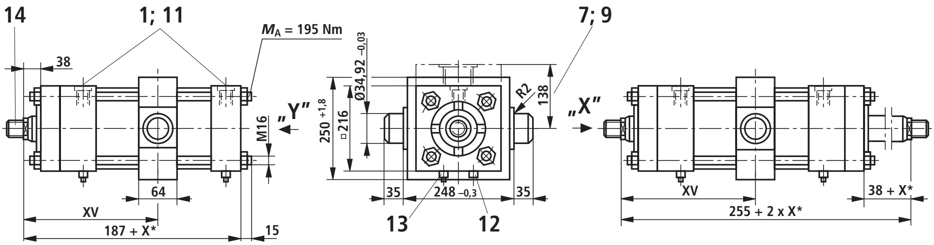
For explanations of items, see page 7

Type of mounting R Operating pressure 40 bar



Stroke$_{min}$ = 115 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 40 bar

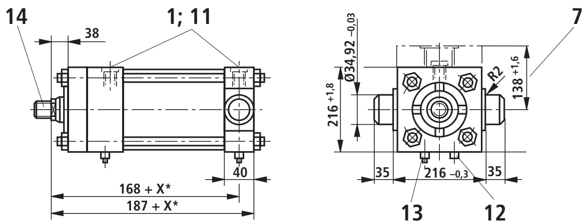


Stroke$_{min}$ = 30 mm
Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 4 on page 4.

Stroke$_{min}$ = 115 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 40 bar



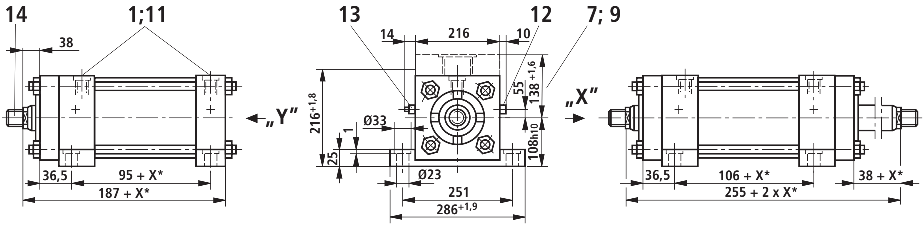
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
90	M64 x 2	M76 x 2	M52 x 3	89	70	G 3/4	G 1	M26 x 1.5	M33 x 2	42	42	42	42
100	M76 x 2	M95 x 2	M52 x 3	101	70								
140	M100 x 2	M130 x 2	M52 x 3	140	70								

X* = stroke length

Piston Ø 200 (dimensions in mm)

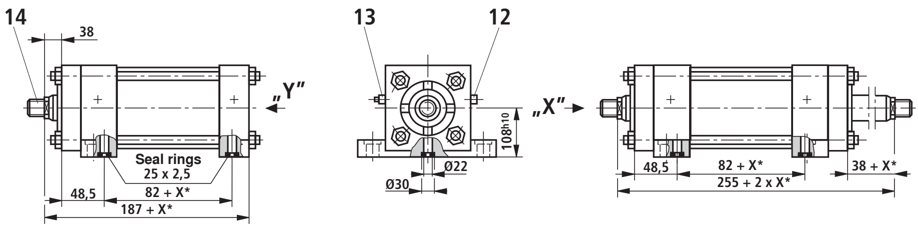
For explanations of items, see page 7

Type of mounting F Operating pressure 40 bar



Stroke$_{min}$ = 115 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 40 bar



Stroke$_{min}$ = 115 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	XV [1] min.	XV [1] max.							SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
90	108	140	115 + X*							75	32	30
100	120	140	115 + X*							85		
140	158	140	115 + X*							120		

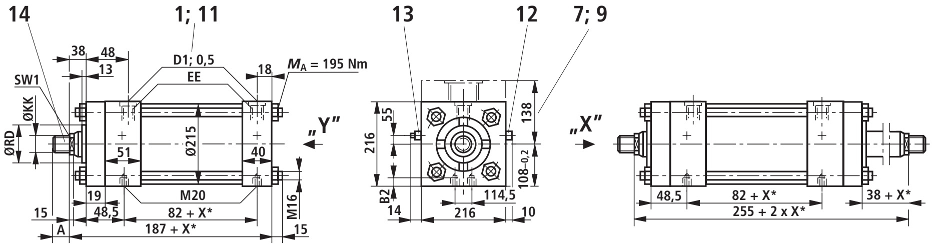
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Piston Ø 200 (dimensions in mm)

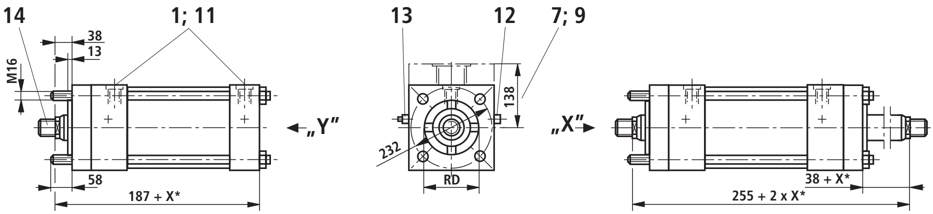
For explanations of items, see page 7

Type of mounting N Operating pressure 40 bar



Stroke$_{min}$ = 115 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting P Operating pressure 40 bar



Stroke$_{min}$ = 115 mm with thread version "E"
(only for double-rod cylinder)

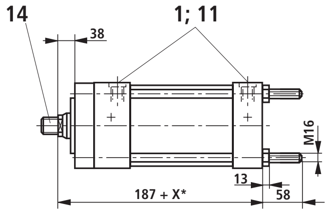
Piston rod Ø	KK			A		EE				D1			
	Thread version					Pipe connection							
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
90	M64 x 2	M76 x 2	M52 x 3	89	70	G 3/4	G 1	M26 x 1.5	M33 x 2	42	42	42	42
100	M76 x 2	M95 x 2	M52 x 3	101	70								
140	M100 x 2	M130 x 2	M52 x 3	140	70								

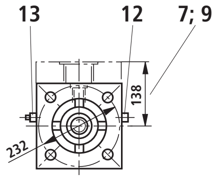
X* = stroke length

Piston Ø 200 (dimensions in mm)

For explanations of items, see page 7

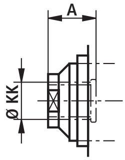
Type of mounting Q Operating pressure 40 bar



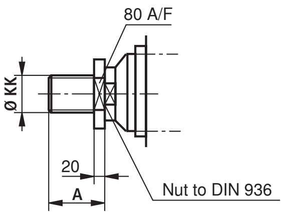


Additional thread versions

Thread version "E"



Thread version "F"



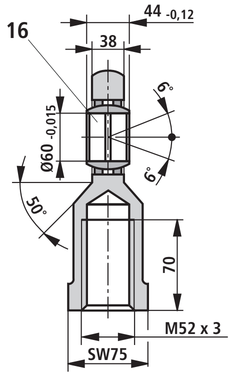
Self-aligning clevis CGK 60

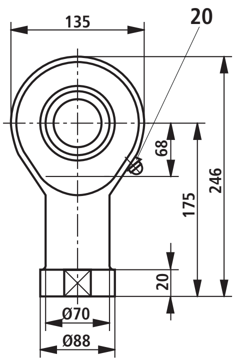
suitable for

thread version "F"

Material no.: R900001335

Weight: 5.6 kg





Piston rod Ø	ØRD f7							B2		SW1	Cushioning lengths piston side	piston rod side
90	108							40		75	32	30
100	120							40		85		
140	158							28		120		

X* = stroke length

Weight

Piston Ø	mm	**25**		**32**			**40**			**50**		
Piston rod Ø	mm	**12**	**16**	**18**	**22**	**25**	**16**	**18**	**25**	**22**	**25**	**36**
Weight in kg per 100 mm stroke	Single-rod cylinder	0.3	0.37	0.5	0.6	0.7	0.55	0.6	0.8	0.9	1.0	1.3
	Double-rod cylinder	0.4	0.52	0.7	0.9	1.0	0.75	0.8	1.2	1.2	1.3	2.1
	Type of mounting	CD	CG	CD		CG	CD		CG	CD		CG
Weight in kg with 0 stroke	B	1.2	–	1.9		–	2.4		–	4.0		–
	G	–	–	1.7		–	2.2		–	3.7		–
	E	1.2	1.5	2.2		2.5	2.9		3.5	4.5		6.0
	H	1.2	1.5	1.9		2.4	2.5		3.0	4.0		5.3
	K, D	1.4	–	2.2		–	2.7		–	4.5		–
	C, F, L, M, R, S, T	1.1	1.4	1.8		2.3	2.3		2.8	3.7		5.0
	N, P, Q	1.1	1.4	1.5		2.0	2.0		2.6	3.4		4.7

Piston Ø	mm	**63**				**80**			**100**			
Piston rod Ø	mm	**25**	**28**	**36**	**45**	**36**	**45**	**56**	**45**	**50**	**70**	
Weight in kg per 100 mm stroke	Single-rod cylinder	1.1	1.2	1.5	1.9	1.7	2.2	2.8	2.4	2.7	4.1	
	Double-rod cylinder	1.5	1.6	2.1	3.0	2.5	3.4	4.7	3.6	4.3	7.1	
	Type of mounting	CD		CG		CD		CG	CD		CG	
Weight in kg with 0 stroke	B	5.9		–		10.8		–	16.2		–	
	G	5.5		–		10.0		–	15.2		–	
	E	6.7		8.5		12.4		16.2	25.3		31.4	
	H	5.9		8.0		10.7		14.4	15.3		21.7	
	K, D	6.5		–		11.8		–	17.6		–	
	C, F, L, M, R, S, T	5.5		7.6		9.9		13.7	14.9		21.4	
	N, P, Q	5.2		7.3		9.2		12.9	13.5		20.0	

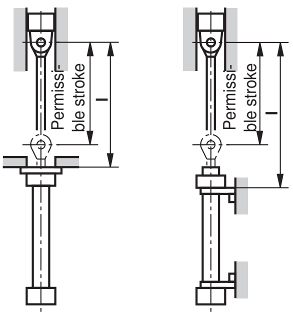
Piston Ø	mm	**125**				**150**				**200**		
Piston rod Ø	mm	**50**	**56**	**63**	**90**	**63**	**70**	**80**	**100**	**90**	**100**	**140**
Weight in kg per 100 mm stroke	Single-rod cylinder	3.5	3.9	4.4	7.9	5.1	5.6	6.6	8.7	9.5	10.7	17.7
	Double-rod cylinder	5.4	5.8	6.9	12.0	7.6	8.6	10.6	14.8	14.5	16.9	29.8
	Type of mounting	CD		CG		CD		CG		CD		CG
Weight in kg with 0 stroke	B	26.7		–		40.7		–		75.4		–
	G	25.5		–		39.0		–		72.0		–
	E	29.3		40.1		47.1		62.1		84.8		111.1
	H	26.9		37.7		40.7		55.7		68.2		94.5
	K, D	29.3		–		44.8		–		70.4		–
	C, F, L, M, R, S, T	25.2		36.0		38.5		53.5		71.6		98.0
	N, P, Q	24.1		34.9		37.2		52.2		70.7		97.0

CD = single-rod cylinder
CG = double-rod cylinder

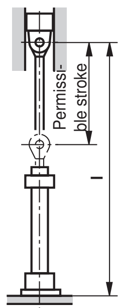
Permissible stroke lengths

Piston Ø in mm	Piston rod Ø in mm	Mounting types: C, F, H, L, M, N, P, T – Operating pressure in bar				Mounting types: D, K, Q – Operating pressure in bar				Available maximum stroke length in mm (standard)
		40	50	70	105	40	50	70	105	
		Permissible max. stroke in mm				Permissible max. stroke in mm				
25	**12**	600	600	530	425	460	410	330	250	600
	16	600	600	600	600	600	600	600	520	
32	**18**	800	800	800	800	580	500	420	325	800
	22	800	800	800	800	800	760	630	500	
	25	800	800	800	800	800	800	800	745	
40	**16**	805	715	585	465	350	300	240	175	1000
	18	1000	920	770	610	450	390	320	250	
	25	1000	1000	1000	1000	900	780	635	500	
50	**22**	1200	1090	900	720	540	460	360	280	1200
	25	1200	1200	1200	965	765	670	550	430	
	36	1200	1200	1200	1200	1200	1200	1110	890	
63	**25**	1255	1115	920	–	570	500	405	–	1400
	28	1400	1400	1130	–	700	610	490	–	
	36	1400	1400	1400	–	1310	1160	960	–	
	45	1400	1400	1400	–	1400	1400	1390	–	
80	**36**	1700	1700	1545	–	910	800	630	–	1700
	45	1700	1700	1700	–	1620	1435	1190	–	
	56	1700	1700	1700	–	1700	1700	1670	–	
100	**45**	2000	2000	1930	–	1170	1020	820	–	2000
	50	2000	2000	2000	–	1580	1395	1155	–	
	70	2000	2000	2000	–	2000	2000	2000	–	
125	**50**	2300	2300	2300	–	1220	1075	885	–	2300
	56	2300	2300	2300	–	1470	1290	1140	–	
	63	2300	2300	2300	–	2035	1805	1500	–	
	90	2300	2300	2300	–	2300	2300	2300	–	
150	**63**	2600	2600	–	–	1670	1465	–	–	2600
	70	2600	2600	–	-	1890	1680	–	–	
	80	2600	2600	–	–	2600	2470	–	–	
	100	2600	2600	–	–	2600	2600	–	–	
200	**90**	3000	–	–	–	2380	–	–	–	3000
	100	3000	–	–	–	3000	–	–	–	
	140	3000	–	–	–	3000	–	–	–	

$s_K = l \cdot \sqrt{\frac{1}{2}}$



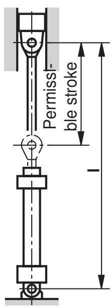
$s_K = l \cdot \sqrt{\frac{1}{2}}$



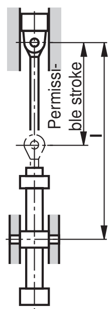
Permissible stroke lengths

Piston Ø in mm	Piston rod Ø in mm	Mounting types: B, G, S				Type of mounting: E (Position: Trunnion at the center of the cylinder)				Available maximum stroke length in mm (standard)
		Operating pressure in bar				Operating pressure in bar				
		40	**50**	**70**	**105**	**40**	**50**	**70**	**105**	
		Permissible max. stroke in mm				Permissible max. stroke in mm				
25	**12**	175	145	110	70	460	410	330	250	600
	16	390	340	275	200	600	600	600	520	
32	**18**	390	340	300	200	580	500	420	325	800
	22	600	550	450	335	800	760	630	500	
	25	800	745	615	480	800	800	800	690	
40	**16**	200	165	120	80	320	275	215	160	1000
	18	240	220	190	100	450	390	320	250	
	25	600	550	450	335	900	780	635	500	
50	**22**	375	300	245	170	540	460	360	280	1200
	25	480	420	335	250	700	615	500	390	
	36	1200	1000	820	700	1200	1200	1110	890	
63	**25**	345	295	225	–	520	450	360	–	1400
	28	500	410	340	–	700	610	490	–	
	36	860	755	615	–	1205	1065	880	–	
	45	1400	1250	1000	–	1400	1400	1390	–	
80	**36**	680	580	420	–	680	580	420	–	1700
	45	1070	940	765	–	1495	1325	1095	–	
	56	1700	1500	1250	–	1700	1500	1250	–	
100	**45**	800	740	600	–	800	740	600	–	2000
	50	1030	900	730	–	1450	1275	1055	–	
	70	2000	1900	1600	–	2000	1900	1600	–	
125	**50**	775	670	535	–	1120	985	805	–	2300
	56	1050	880	750	–	1050	880	750	–	
	63	1345	1185	965	–	1880	1665	1375	–	
	90	2300	2300	2200	–	2300	2300	2200	–	
150	**63**	1065	925	–	–	1525	1340	–	–	2600
	70	1350	1220	–	–	1350	1220	–	–	
	80	1855	1635	–	–	2580	2285	–	–	
	100	2600	2600	–	–	2600	2600	–	–	
200	**90**	1750	–	–	–	1750	–	–	–	3000
	100	2175	–	–	–	3000	–	–	–	
	140	3000	–	–	–	3000	–	–	–	

$s_K = l$



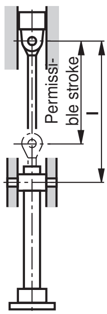
$s_K = l$



Permissible stroke lengths

Piston Ø in mm	Piston rod Ø in mm	Type of mounting: R – Operating pressure in bar – Permissible max. stroke in mm				Available maximum stroke length in mm (standard)
		40	50	70	105	
25	12	–	–	–	–	600
	16	–	–	–	–	
32	18	800	800	670	520	800
	22	800	800	800	800	
	25	800	800	800	800	
40	16	510	445	355	270	1000
	18	720	625	510	400	
	25	1000	1000	1000	800	
50	22	865	735	575	450	1200
	25	1085	955	785	615	
	36	1200	1200	1200	1200	
63	25	810	710	575	–	1400
	28	1120	975	785	–	
	36	1400	1400	1355	–	
	45	1400	1400	1400	–	
80	36	1455	1280	1010	–	1700
	45	1700	1700	1675	–	
	56	1700	1700	1700	–	
100	45	1870	1630	1310	–	2000
	50	2000	1955	1620	–	
	70	2000	2000	2000	–	
125	50	1720	1515	1245	–	2300
	56	2300	2065	1680	–	
	63	2300	2300	2105	–	
	90	2300	2300	2300	–	
150	63	2330	2055	–	–	2600
	70	2600	2600	–	–	
	80	2600	2600	–	–	
	100	2600	2600	–	–	
200	90	3000	–	–	–	3000
	100	3000	–	–	–	
	140	3000	–	–	–	

$s_K = l$



3

Calculation of buckling

Buckling calculations are usually carried out according to Euler, because piston rods are in most of the cases to be considered as slender rods.

Buckling load $\boldsymbol{K} = \dfrac{\pi^2 \cdot \boldsymbol{E} \cdot \boldsymbol{J}}{\boldsymbol{s}_K^{\,2}}$ in N

i.e. under this load, the rod buckles!

Max. operating load $\boldsymbol{F} = \dfrac{\boldsymbol{K}}{\boldsymbol{S}}$ in N

$\boldsymbol{s}_K$ = free buckling length in mm

$\boldsymbol{E}$ = modulus of elasticity in N/mm^2 = 2.1 • 10^5 for steel

$\boldsymbol{J}$ = Mass moment of inertia in mm^4 for circular cross-section

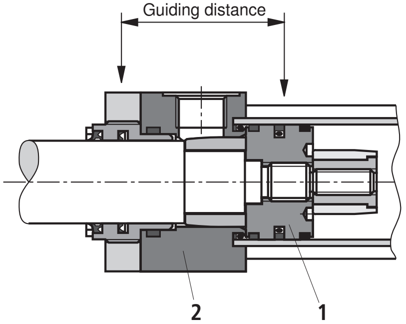
$= \dfrac{\boldsymbol{d}^4 \cdot \pi}{64} = 0.0491 \cdot \boldsymbol{d}^4$

$\boldsymbol{S}$ = safety (3.5)

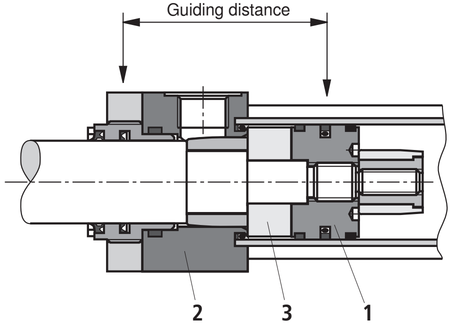
Stop tube extension

For long strokes and compressive loads, the use of a stop tube extension is recommended to avoid bearing stress when the piston rod is extended. With this solution, a spacer bushing (3) is installed between piston (1) and cylinder head (2). This spacer bushing extends the lever arm, thus reducing the load on the bearings.

Without stop tube extension



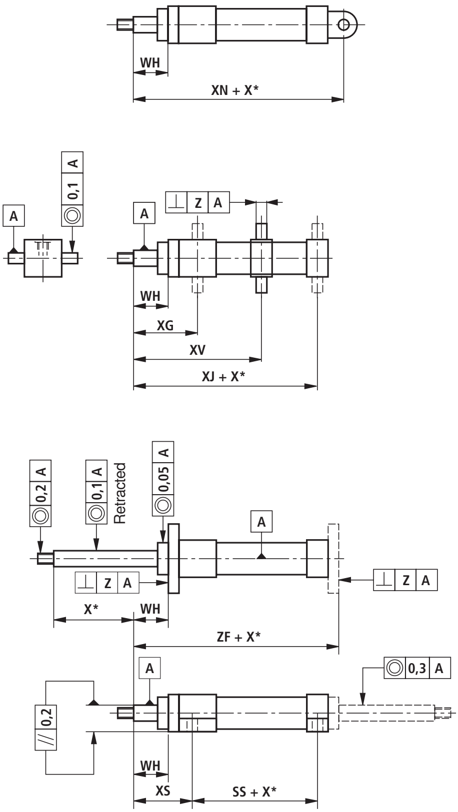
With stop tube extension



Type of mounting	Ordering code for stop tube extension in mm for all piston Ø							
	–	25	50	75	100	125	150	175
	Stroke length in mm							
B, G, S	Up to 500	501 to 625	626 to 750	751 to 875	876 to 1000	1001 to 1125	1126 to 1250	1251 to 3000
C, F, H, L	Up to 1425	1426 to 1785	1786 to 2150	2151 to 2500	2501 to 2860	2861 to 3000	–	–
D, E, K, Q	Up to 665	666 to 835	836 to 1000	1001 to 1165	1166 to 1335	1336 to 1500	1501 to 1665	1666 to 3000
R	Up to 1000	1001 to 1250	1251 to 1500	1501 to 1750	1751 to 2000	2001 to 2250	2251 to 2500	2501 to 3000
M, N, P, T	Up to 1425	1426 to 1785	1786 to 2150	2151 to 2500	2501 to 2860	2861 to 3000	–	–

Installation length of cylinder with stop tube extension:
Installation length according to unit dimensions + stop tube extension
(The trunnion position of type of mounting E and R remains unchanged.)

Installation lengths and position tolerances

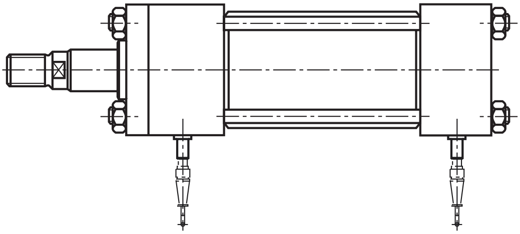


Stroke length in mm	Up to 1250	1251 to 2000	2001 to 3000
Stroke toler-ance in mm	+1	+1	+1
	–1.5	–2	–3
WH	±2	±2	+3
			–2
ZF	±1	±1.5	±2
XS	±2	±2	+3
			–2
SS	±1.25	+1.5	+1.5
		–2	–3
XG	±2	±2	+3
			–2
XV	±2	±2	±2
XJ	±2	±2	±2
XN	±1.25	±2	±2
Z	0.1 / 100		

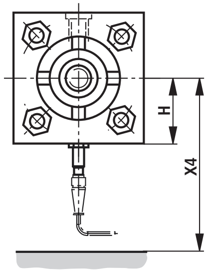
Always specify dimension “XV“ in clear text on the order (observe XV_{min} and XV_{max})

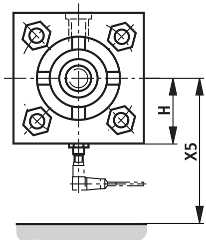
X* = stroke length

Inductive proximity switch (please state in clear text on the order)

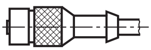


Types of mounting

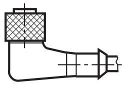




Mating connector with 5 m cable
Material no. **R900026512**
(The mating connector is **not** included in the scope of supply and must be ordered separately)



Mating connector, angled with 5 m cable
(Position of cable outlet cannot be defined)
Material no. **R900021404**
(The mating connector is **not** included in the scope of supply and must be ordered separately)



Piston Ø in mm	Piston rod Ø in mm	H	X4	X5
40	**16**	42.5	172	127
	18			
	25			
50	**22**	44.5	175	130
	25			
	36	48		
63	**25**	51	180	135
	28			
	36			
	45	53		
80	**36**	73.5	185	140
	45			
	56			

Piston Ø in mm	Piston rod Ø in mm	H	X4	X5
100	**45**	57	195	150
	50			
	70	83		
125	**50**	70	205	160
	56			
	63	–		
	90	96		
150	**63**	82.5	230	185
	70			
	80			
	100			
200	**90**	108	245	200
	100			
	140			

Notes:
- Installation position: 180° opposite to the line connections
- Pipe connection: For enlarged line connections, please consult us
- Type of mounting: With mounting types F, L, M, N and T, the installation 180° opposite to the line connection is impossible
- For mounting types and unit dimensions, see pages 8 to 67

Proximity switch

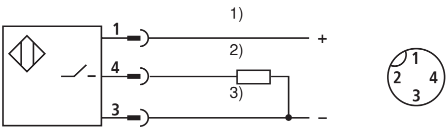
Inductive proximity switches are used for reliably checking the end positions of hydraulic cylinders. They are an important component for reliably and precisely monitoring safety equipment, locking mechanisms and/or other machine functions in their end position by issuing corresponding signals.

The proximity switch, which is high pressure-tight up to 500 bar, operates contact-free and floating. For this reason, it is wear-free. For safety reasons, the proximity switch is protected against being screwed in too deeply. The switching distance can therefore not be adjusted. Cylinder variants with proximity switch (option 1 “E“) are fitted with proximity switches on both sides.

Technical data (for applications outside these parameters, please consult us!)

Operating principle			PNP normally open
Permissible pressure		bar	500
Operating voltage		V DC	10 to 30
Including residual ripple content		%	≤ 15
Voltage drop		V	≤ 1.5
Rated operating voltage		V DC	24
Rated operating current		mA	200
No-load current		mA	≤ 8
Residual current		µA	≤ 10
Repeatability		%	≤ 5
Hysteresis		%	≤ 15
Ambient temperature range		°C	–25 to +80
Thermal drift		%	≤ 10
Switching frequency		Hz	1000
Type of protection to	Active area		IP 68
DIN EN 60529	Proximity switch		IP 67
Housing material			Material no. 1.4104

Pinout

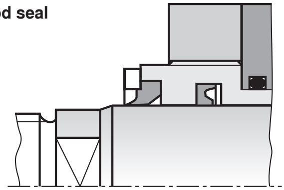


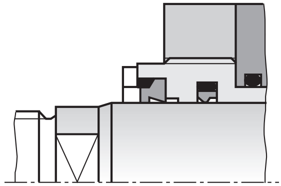
1) Brown
2) Black
3) Blue

3

Seals (standard versions)

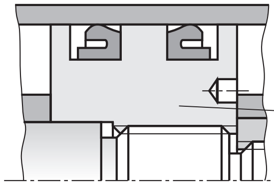
Piston rod seal





Variant for piston Ø 32/25
Variant for piston rod Ø 50, 63 and 80 mm

Piston seal



Version "T"
Slide ring for low-friction operation

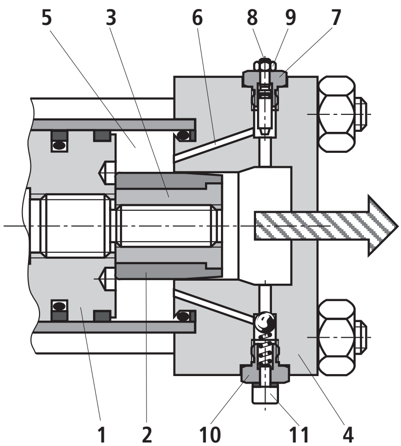
Version "A"
Lip seal rings for leak-free operation under steady-state conditions

End position cushioning

End position cushioning at cylinder cap.

Piston (1) is screwed directly to the piston rod, cushioning bush (2) by means of threaded bushing (3).

As the tapered cushioning bush retracts into the bore of cylinder cap (4) the cross-section for the fluid flowing out of piston chamber (5) reduces until it becomes zero. The fluid can then only flow out of piston chamber (5) through bore (6) and adjustable throttle valve (7). The cushioning effect can be regulated on throttle valve (7). The smaller the flow cross-section, the greater the effect of end position cushioning.



Adjustable throttle valve for end position cushioning

The design of the throttle valve prevents throttling pin (8) from being turned out completely when end position cushioning is adjusted.

The setting made for end position cushioning is secured by locknut (9).

Check valve with bleed screw

Check valve (10) serves as extension aid from the end position. It by-passes the throttling point while the cylinder is extending.
The cylinder is bled via bleed screw (11).

This bleed screw is provided as standard on cylinders without end position cushioning.

Throttle valve and check valve are designed as installation kits and can be interchanged.

Calculation of braking force

End position cushioning must ensure a controlled deceleration (braking) of the stroke velocity in both end positions.

The total of the effective energies must not exceed the maximum work capacity of cushioning.

The energy to be decelerated is converted into heat in the cushioning zone, which operates according to the principle of fluid flow throttling.

Calculation of braking force

The braking force of a horizontally installed hydraulic cylinder can be calculated as follows:

Extension movement:

$$\boxed{F_B = m \cdot a + A_K \cdot p}$$

Retraction movement:

$$\boxed{F_B = m \cdot a + A_R \cdot p}$$

v = stroke velocity in m/s

s = cushioning length in m

A_K = piston area in cm²

A_R = annulus area in cm²

p = system pressure in N/cm²

F_B = braking force in N

m = moved mass in kg

a = deceleration in m/s²

$$\boxed{a = \frac{v^2}{2 \cdot s}}$$

$\boxed{1 \text{ bar} \sim 10 \text{ N/cm}^2}$

For vertical strokes of the cylinders, the weight force (consisting of external load, piston and piston rod) must be added to or subtracted from braking force F_B depending on the direction of movement.

The cylinder‘s internal friction is neglected in this calculation.

Calculation of the average cushioning pressure

Under normal operating conditions, the cushioning pressure must not exceed the nominal pressure of the cylinder.

$$\boxed{p_D = \frac{F_B}{A_D}}$$

p_D = average cushioning pressure in N/cm²

F_B = braking force in N

A_D = effective cushioning area in cm²

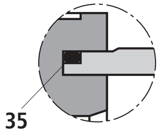
$\boxed{1 \text{ bar} \sim 10 \text{ N/cm}^2}$

If this calculation results in too high a value, the cushioning length must be extended or the system pressure reduced.

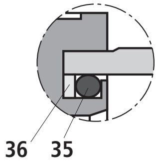
3

Spare parts drawing

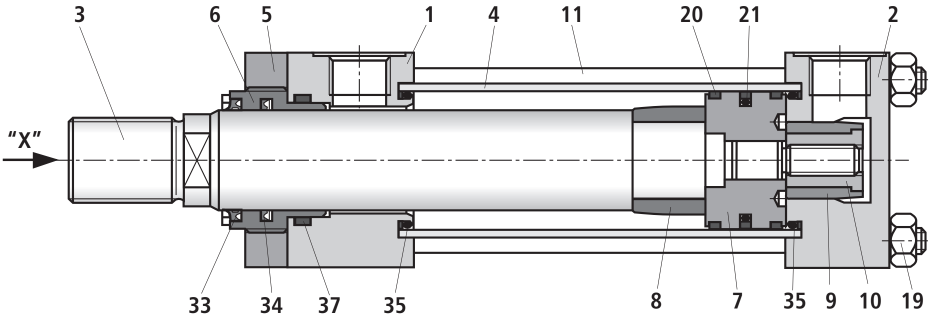
Variant for
piston Ø 25 and 32



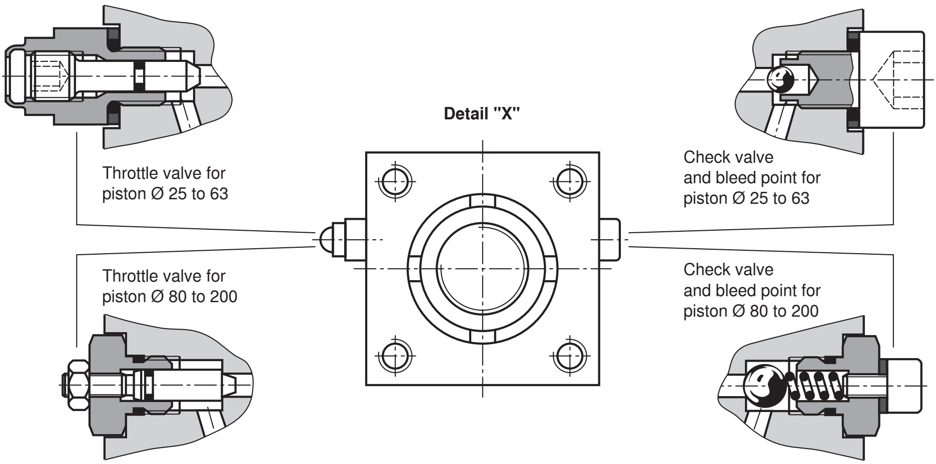
Variant for
piston Ø 40 to 200



1	Head	**10**	Threaded ring
2	Cap	**11**	Tie rod
3	Piston rod	**19**	Nut
4	Cylinder barrel	**20**	Guide ring
5	Flange	**21**	Piston seal
6	Guide bush	**33**	Wiper
7	Piston	**34**	Piston rod seal
8	Cushioning bush	**35**	Seal ring
9	Cushioning bush	**36**	Back-up ring
		37	Seal ring



Throttle and check valve in cylinder head and cylinder cap



Ordering spare parts:

– When ordering individual parts, please indicate the designation and item no. from the spare parts drawing with complete type code of the hydraulic cylinder.

– For seal kits, please indicate the complete type code of the hydraulic cylinder.

Notes

3

Notes

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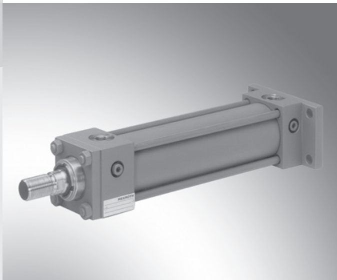
Hydraulic cylinders

RE 17017/08.08
Replaces: 05.03

Series CD210 / CG210

Component series 1X
Nominal pressure 210 bar (21 MPa)



K4639-5

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Engineering software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Brochure download www.boschrexroth.com/business_units/bri/de/downloads/ihc

Features

- Service-friendly modular construction kit system, mounting of head and cap according to the tie rod principle
- Operating pressure up to max. 210 bar
- 16 mounting types
- Piston Ø: 40 to 200 mm
- Piston rod Ø: 16 to 140 mm

☞ **Note!**
For the selection of the cylinder variant, please observe the Explanations on page 6!

Technical data (for applications outside these parameters, please consult us!)

Nominal pressure: 210 bar [21 MPa]

Static test pressure: Permissible operating pressure x 1.3 (depending on piston Ø and type of mounting)

Maximum operating pressure: 210 bar [21 MPa]
(depending on piston Ø and type of mounting)
The given operating pressures are valid for applications with jerk-free operation.
In the case of extreme loads, e.g. rapid cycle sequence, mounting elements and threaded piston rod connections must be rated for durability.

Installation position: Optional

Hydraulic fluid:
Mineral oils DIN 51524 (HL, HLP)
Phosphate ester (HFD-R)

Hydraulic fluid temperature range: –20 °C to +80 °C

Ambient temperature range: –20 °C to +80 °C

Optimum viscosity range: 20 to 100 mm^2/s
Min. viscosity: 12 mm^2/s
Max. viscosity: 380 mm^2/s

Cleanliness class to ISO
Permissible maximum degree of contamination of the hydraulic fluid to ISO 4406 (c) Class 20/18/15.
The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087, RE 50088.

Stroke velocity: Up to 0.5 m/s
(depending on line connection)

Bleed points standard

Tolerances:
For stroke tolerances, permissible installation lengths and position tolerances, see page 67.

Primer coating:
As a standard, hydraulic cylinders are primered with one coating (color: gentian blue, RAL 5010) in a thickness of max. 80 µm.

The following surfaces on cylinders and attached parts are not primered or paint-coated:

- All diameters of fit to the customer side
- Sealing faces for the line connection
- Sealing faces for flanged connections
- Inductive proximity switches

Surfaces that are not paint-coated are protected by an anti-corrosion agent (MULTICOR LF 80).

Acceptance:
Each cylinder is tested according to Bosch Rexroth standard.

General notes

Safety notes:
For the installation, commissioning and maintenance of hydraulic cylinders, observe operating instructions RE 07100-B!

Servicing and repair work must be carried out by Bosch Rexroth AG or personnel having undergone special training in this field. No warranty is granted for damage resulting from installation, maintenance or repair work not carried out by Bosch Rexroth AG.

Checklists for hydraulic cylinders:
Cylinders, the operating data of which differ from the specified values, can only be offered as special variants on request. For the preparation of offers, the deviations of technical data and/or operating data must be described in the checklists for hydraulic cylinders (RE 07200).

Engineering software ICS (**I**nteractive **C**atalog **S**ystem)

The ICS (Interactive Catalog System) is a selection and engineering aid for hydraulic cylinders. With the help of the ICS, designers of plant and machinery can quickly and reliably find the optimum hydraulic cylinder solution through logic-guided type code queries. This software helps to solve design and engineering tasks more quickly and efficiently. After having been guided through the product selection, the user quickly and reliably gets the exact technical data of the selected components as well as 2D and 3D CAD data in the correct file format for all common CAD systems.

This allows users to reduce costs while increasing their competitiveness.

Forces and areas

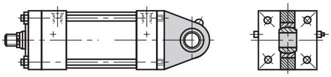
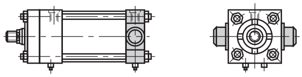
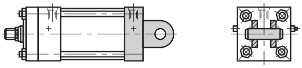
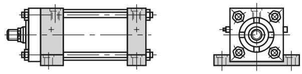
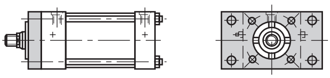
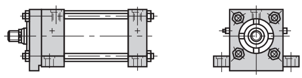
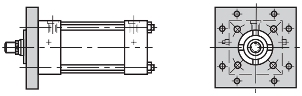
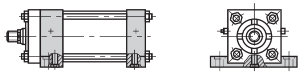
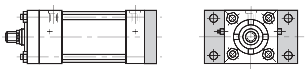
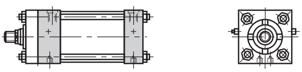
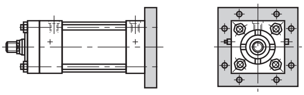
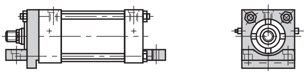
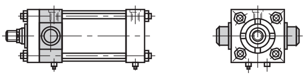
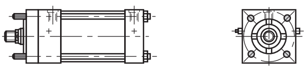
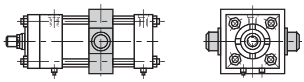
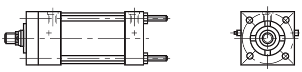
Operating pressure in bar	Piston Ø	mm	40			50			63			
	Piston rod Ø	mm	16	18	25	22	25	36	25	28	36	45
75	Force; piston side	kN	9.43			14.73			23.38			
	Force; piston rod side	kN	7.91	7.51	5.37	11.88	11.04	7.10	19.69	18.76	15.74	11.44
100	Force; piston side	kN	12.56			19.64			31.18			
	Force; piston rod side	kN	10.56	10.03	7.66	15.84	14.71	9.47	26.26	25.03	20.99	15.26
150	Force; piston side	kN	18.85			29.45			46.76			
	Force; piston rod side	kN	15.84	15.04	11.48	23.76	22.08	14.20	39.40	37.53	31.49	22.90
210	Force; piston side	kN	26.39			41.24			65.46			
	Force; piston rod side	kN	22.17	21.05	16.05	33.27	30.91	19.88	55.15	52.55	44.08	32.06
Piston area		cm^2	12.56			19.63			31.16			
Annulus area		cm^2	10.55	10.02	7.65	15.83	14.71	9.46	26.25	25.01	20.98	15.26
Area ratio		φ	1.2:1	1.25:1	1.6:1	1.25:1	1.35:1	2:1	1.2:1	1.25:1	1.4:1	2:1
Cushioning area	Piston side	cm^2	6.84			13.91			22.10			
	Piston rod side	cm^2	8.76	8.76	6.41	14.33	13.47	8.29	23.10	23.10	19.80	13.10

Operating pressure in bar	Piston Ø	mm	80			100			125			
	Piston rod Ø	mm	36	45	56	45	50	70	50	56	63	90
75	Force; piston side	kN	37.70			58.91			92.04			
	Force; piston rod side	kN	30.07	25.77	19.22	46.97	44.18	30.05	77.31	73.57	68.66	44.33
100	Force; piston side	kN	50.27			78.54			122.72			
	Force; piston rod side	kN	40.10	34.36	25.63	62.63	58.91	40.06	103.08	98.10	91.55	59.11
150	Force; piston side	kN	75.40			117.81			184.08			
	Force; piston rod side	kN	60.14	51.54	38.45	93.95	88.37	60.10	154.63	147.13	137.32	88.66
210	Force; piston side	kN	210.56			164.94			257.71			
	Force; piston rod side	kN	84.20	72.15	53.83	131.53	123.71	84.13	216.48	206.00	192.25	124.13
Piston area		cm^2	50.24			78.50			122.66			
Annulus area		cm^2	40.07	34.34	25.62	62.60	58.88	40.04	103.03	98.04	91.50	59.08
Area ratio		φ	1.25:1	1.4:1	2:1	1.25:1	1.35:1	2:1	1.2:1	1.25:1	1.35:1	2:1
Cushioning area	Piston side	cm^2	30.63			58.90			92.50			
	Piston rod side	cm^2	36.40	30.60	20.10	57.30	54.70	31.97	92.50	92.50	47.20	47.20

Operating pressure in bar	Piston Ø	mm	150				180			200		
	Piston rod Ø	mm	63	70	80	100	80	90	125	90	100	140
75	Force; piston side	kN	132.54				190.85			235.62		
	Force; piston rod side	kN	109.16	103.68	94.84	73.63	153.16	143.14	98.81	187.92	176.72	120.17
100	Force; piston side	kN	176.72				254.47				314.16	
	Force; piston rod side	kN	145.55	138.24	126.45	98.18	204.21	190.85	131.75	250.56	235.63	160.23
150	Force; piston side	kN	265.08				381.70			471.24		
	Force; piston rod side	kN	218.33	207.38	189.68	147.28	306.32	286.28	197.63	375.85	353.45	240.34
210	Force; piston side	kN	371.10				534.39			659.74		
	Force; piston rod side	kN	305.65	290.32	265.55	206.20	428.85	400.80	276.70	526.18	494.83	336.50
Piston area		cm^2	176.63				254.34			314.00		
Annulus area		cm^2	145.47	138.17	126.38	98.13	204.10	190.75	131.68	250.42	235.50	160.14
Area ratio		φ	1.2:1	1.25:1	1.4:1	1.8:1	1.25:1	1.35:1	2:1	1.25:1	1.35:1	2:1
Cushioning area	Piston side	cm^2	126.50				193.6			235.60		
	Piston rod side	cm^2	130.10	130.10	81.70	81.70	179.00	179.00	109.20	238.70	219.00	137.50

3

Mounting types

Self-aligning clevis at cylinder cap **B**		Trunnion at cylinder cap **S**	
Fork clevis at cylinder cap **G**		Foot mounting **F**	
Rectangular flange at cylinder head **C**		Foot mounting with splined key **L**	
Square flange at cylinder head **H**		Foot mounting with seal ring for subplate mounting **M**	
Rectangular flange at cylinder cap **D**		Threaded bores in cylinder head and cap **N**	
Square flange at cylinder cap **K**		Foot mounting at front face with splined key **T**	
Trunnion at cylinder head **R**		Extended tie rods at cylinder cap **P**	
Trunnion at the center of the cylinder **E**		Trunnion at the center of the cylinder **Q**	

Ordering code

	210		/	–	Z	1X	/					–			*

Cylinder
Single-rod cylinder = **CD**
Double-rod cylinder = **CG**

Series = 210

Mounting types
Self-aligning clevis at cylinder cap = **B**
Fork clevis at cylinder cap = **G**
Rectangular flange at cylinder head = **C**
Square flange at cylinder head = **H**
Rectangular flange at cylinder cap = **D**
Square flange at cylinder cap = **K**
Trunnion at cylinder head = **R**
Trunnion at the center of the cylinder [1); 2)] = **E**
Trunnion at cylinder cap = **S**
Foot mounting = **F**
Foot mounting with splined key = **L**
Foot mounting with seal ring for subplate mounting = **M**
Threaded bores in cylinder head and cap = **N**
Foot mounting at front face with splined key = **T**
Extended tie rod at cylinder head = **P**
Extended tie rod at cylinder cap = **Q**

Piston Ø (40 to 200 mm)
see page 3

Piston rod Ø (16 to 140 mm)
see page 3

Stroke length in mm [3)]

Component series 11 to 19 = **1X**
(11 to 19 unchanged installation and connection dimensions)

Pipe connection [4)]
00 = Flanged connection with seal ring; only possible with type of mounting "M"
01 = Pipe thread to ISO 228/1
02 = Metric ISO thread
13 = [5)] Enlarged pipe connection Pipe thread to ISO 228/1
14 = [5)] Enlarged pipe connection Metric ISO thread

Piston rod variant
H = Hardened and chromium hard-plated up to piston rod Ø ≤ 100 mm
C = Chromium hard-plated, from piston Ø ≥ 80 mm

Piston rod end
B = Male thread, see pages 8 to 61
C = Male thread, see pages 8 to 61
E = Female thread
F = Thread for self-aligning clevis
T = [6)] With self-aligning clevis CGK mounted
L = [7)] With self-aligning clevis CGA mounted
M = [7)] With self-aligning clevis CGAK mounted

End position cushioning
U = Without
K = (View "Y") on cap side
S = (View "X") on head side
D = On both sides

Hydraulic fluid
M = Seals, suitable for mineral oil to DIN 51524 (HL, HLP)
V = (FKM) seals suitable for Phosphate ester (HFD-R)

Pipe connection- cylinder head
Enter position
Observe table on page 6!

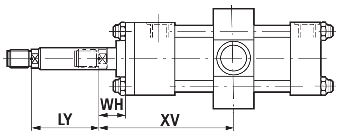
Pipe connection- cylinder cap
Enter position
Observe table on page 6

Seals
A = Standard version
T = Version for low-friction operation

Enter **stop tube extension**

Further details in clear text [8)]

1) The position of the trunnion can be freely selected. Always indicate dimension "XV" in clear text in mm on the order.
2) Dimension for cylinder with trunnion and piston rod extension "LY" in the retracted condition:



3) Observe permissible stroke length, pages 63 to 65
4) The pipe connection sizes are assigned to the piston Ø.
5) Not possible with piston Ø 200 mm
6) Only possible with Ø 40/16 to 180/80
7) Only possible with Ø 180/90 to 200/140
8) Always state mounting of inductive proximity switches or piston rod extension "LY" in clear text on the order.

Order example: CD 210 B50/22-200Z1X/01HBDM1-1A

In the case of special variants, an "X" must be entered at the relevant place in the type code, and an SO number must be added at the end.

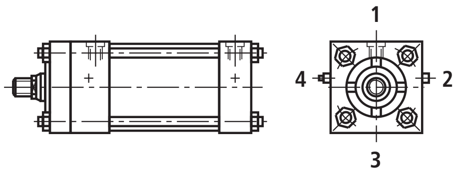
3

Position of line ports

By turning the cylinder head and/or cylinder cap the position of pipe ports can be varied for most of the cylinder mounting types during installation. The options can be seen in the table below.

The throttle and check valves change their position accordingly.

In the case of mounting types F, L, N and T, as well as on the cylinder cap for type of mounting G, the throttle and check valves are located at position 1 when the pipe connection is rotated.



	Selectable position of line ports															
Mounting types	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**K**	**L**	**M**	**N**	**P**	**Q**	**R**	**S**	**T**
At cylinder head	1	1	1	1	1	1	1	1	1	–	1	1	1	1	1	1
	2	2	2	2	□ 2	2	2	2	□ 2	–	■ 2	2	2	–	2	2
	3	3	3	3	–	3	3	3	–	3	–	3	3	3	3	–
	4	4	4	4	□ 4	4	4	4	□ 4	–	■ 4	4	4	–	4	4
At cylinder cap	1	1	1	1	1	1	1	1	1	–	1	1	1	1	1	1
	2	2	■ 2	2	□ 2	2	2	2	□ 2	–	■ 2	2	2	2	–	2
	3	3	3	3	–	3	3	3	–	3	–	3	3	3	3	–
	4	4	■ 4	4	□ 4	4	4	4	□ 4	–	■ 4	4	4	4	–	4

■ = Position 2 and 4 not possible for:
Piston Ø **40** with enlarged pipe connection 13 and 14

□ = Position 2 and 4 not possible for piston Ø **40; 50** and **63**

Explanations (explanation of items on pages 8 to 61)

1 Selectable position of line ports (see page 6).

12 Check valve and bleed point.
The bleed point is provided as standard.

13 Adjustable throttle valve for end position cushioning.

14 Thread versions B and C. Thread versions E and F as well as the associated self-aligning clevis are given on the last page of each piston Ø.

15 Observe the permissible loading for the screwed-on self-aligning clevis.

16 Associated pin Ø with fit m6.
Minimum strength of pin material $\sigma_{0.2}$= 600 N/mm^2
(is not included in the scope of supply).

17 Pins and split pins are included in the scope of supply.

20 Grease nipple, cone head form A to DIN 71412. As lubrication greases, commercial, anti-corrosion greases on lithium soap base can be used.

21 Lubrication possible via lubrication bore in the housing.

22 In conjunction with line connection 13 and 14, countersink Ø D1 on cap side is not suitable for seal ring fittings.

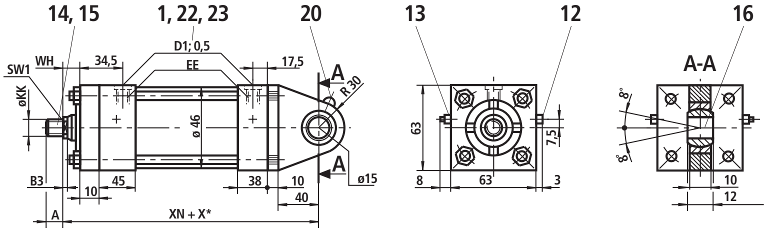
23 On the version with enlarged line connection 13 and 14 the distance between the two ports changes.

24 Double-rod cylinder CG,
max. tensile loading 13 kN on side “Y”

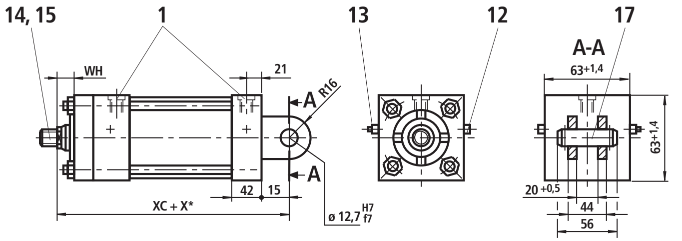
Piston Ø 40 (dimensions in mm)

For explanations of items, see page 7

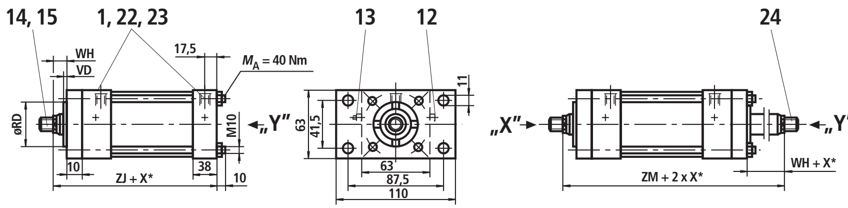
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 16 and 18: 180 bar on cap side; 210 bar on piston rod side
Operating pressure with piston rod Ø 25: 110 bar on cap side; 210 bar on piston rod side



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

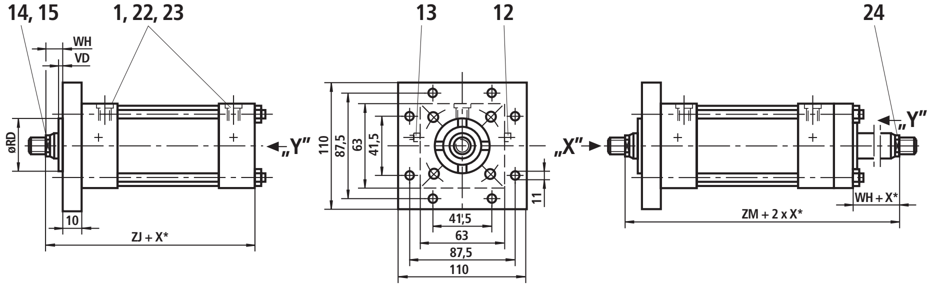
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
16	M10 x 1.5◥	M12 x 1.5	M14	19	35	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
18	M10 x 1.5◥	M12 x 1.5	M14	19	35								
25	M20 x 1.5	M22 x 1.5	M20 x 1.5	28	45								

X* = stroke length ◥ max. tensile load 13 kN

Piston Ø 40 (dimensions in mm)

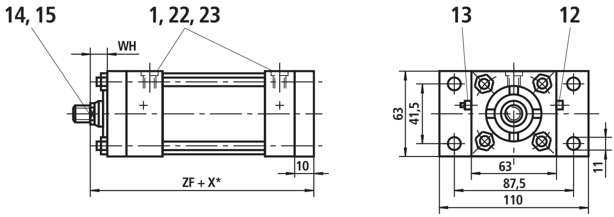
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

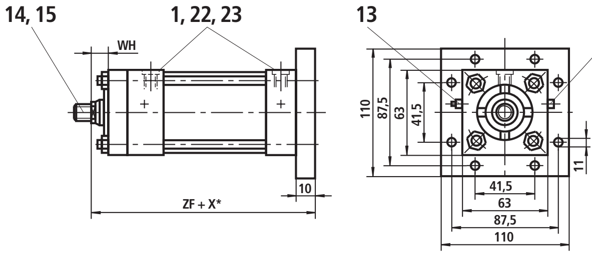


Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 210 bar



Type of mounting K Operating pressure 210 bar



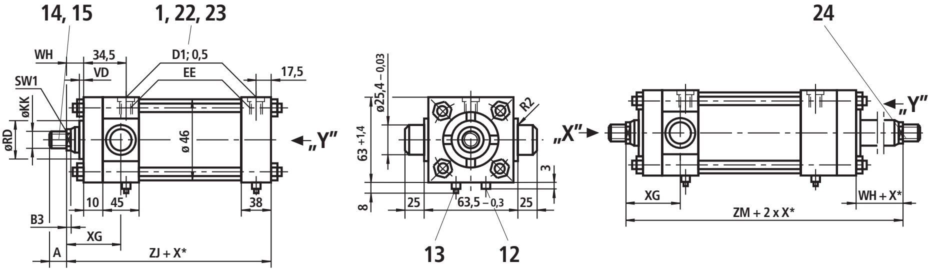
Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
16	28.5	6	16	162	193	153	143	176	5	13	30	30
18	32	6	16	162	193	153	143	176	5	14		
25	38	13	25	171	202	162	152	194	7	22		

X* = stroke length

Piston Ø 40 (dimensions in mm)

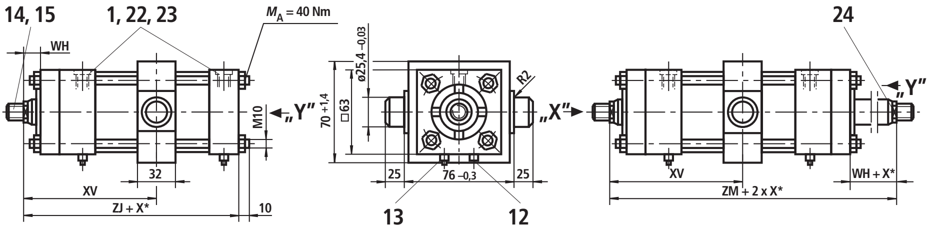
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

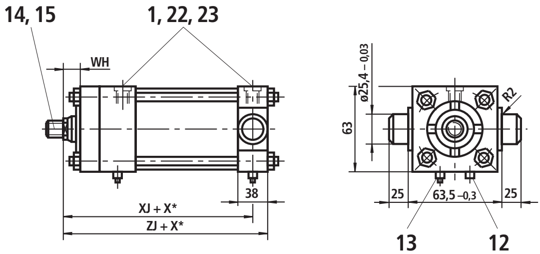


Stroke$_{min}$ = 10 mm
Always specify dimension "XV"
in clear text on the order
(obseve XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 25 mm
with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



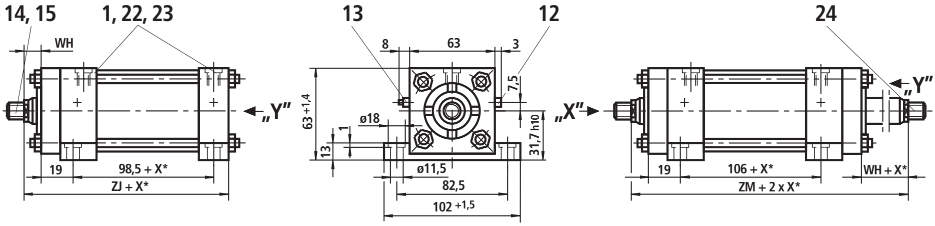
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="3">Thread version</th><th colspan="2">Thread version</th><th colspan="4">Pipe connection</th><th colspan="4">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>16</td><td>M10 x 1.5◥</td><td>M12 x 1.5</td><td>M14</td><td>19</td><td>35</td><td rowspan="4">G1/2</td><td rowspan="4">G3/4</td><td rowspan="4">M22 x 1.5</td><td rowspan="4">M27 x 2</td><td rowspan="4">34</td><td rowspan="4">42</td><td rowspan="4">34</td><td rowspan="4">42</td></tr>
<tr><td>18</td><td>M10 x 1.5◥</td><td>M12 x 1.5</td><td>M14</td><td>19</td><td>35</td></tr>
<tr><td>25</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M20 x 1.5</td><td>28</td><td>45</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length ◥ max. tensile load 13 kN

Piston Ø 40 (dimensions in mm)

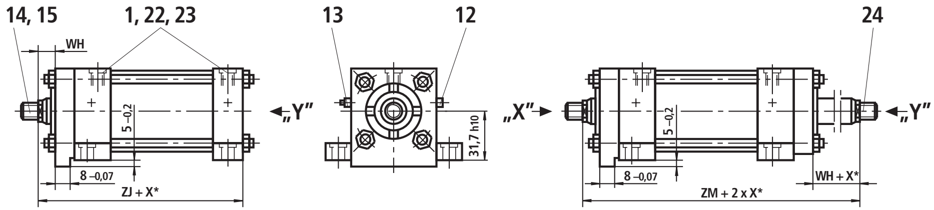
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



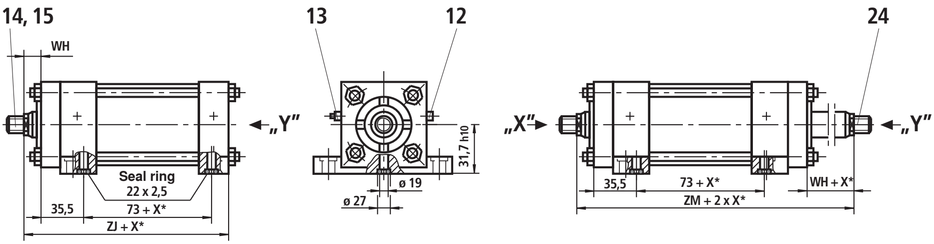
Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV 1) min.	XV 1) max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	piston rod side
16	28.5	6	16	48	124	87	89 + X*	143	176	5	13	30	30
18	32	6	16	48	124	87	89 + X*	143	176	5	14		
25	38	13	25	57	133	96	98 + X*	152	194	7	22		

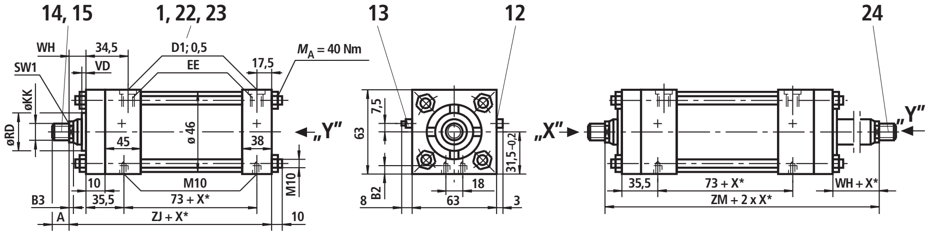
X* = stroke length

1) Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Piston Ø 40 (dimensions in mm)

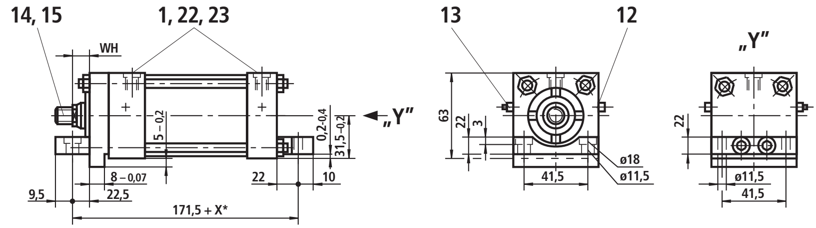
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

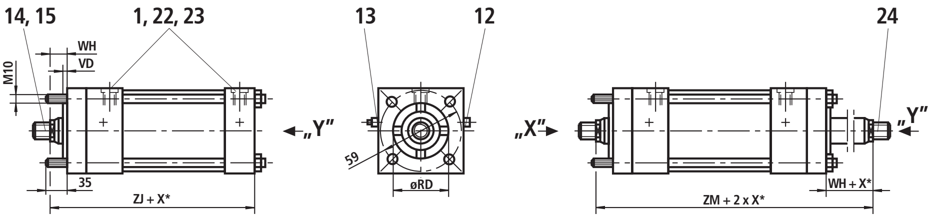


Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 25 mm with thread version "E"
(only for double-rod cylinder)

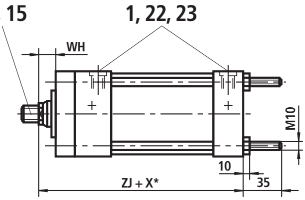
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
16	M10 x 1.5◥	M12 x 1.5	M14	19	35	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
18	M10 x 1.5◥	M12 x 1.5	M14	19	35								
25	M20 x 1.5	M22 x 1.5	M20 x 1.5	28	45								

X* = stroke length ◥ max. tensile load 13 kN

Piston Ø 40 (dimensions in mm)

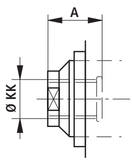
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

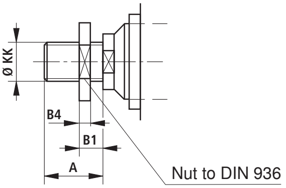


Additional thread versions

Thread version "E"

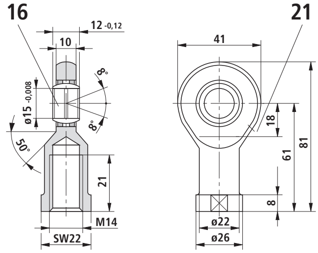


Thread version "F"



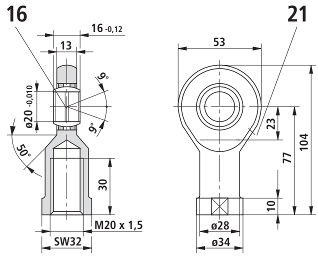
Self-aligning clevis CGK 15

suitable for thread version "F"
Material no.: **R900001328**
Weight: 0.16 kg
Permissible load: 18 kN



Self-aligning clevis CGK 20

suitable for thread version "F"
Material no.: **R900001329**
Weight: 0.34 kg
Permissible load: 30 kN



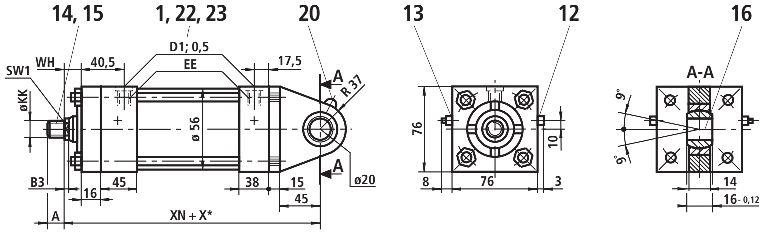
Piston rod Ø	ØRD f7	B4	VD	WH	ZJ	ZM	B1	B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
16	28.5	8	6	16	143	176	14	12	5	13	30	30
18	32	8	6	16	143	176	14	12	5	14		
25	38	9	13	25	152	194	15	12	7	22		

X* = stroke length

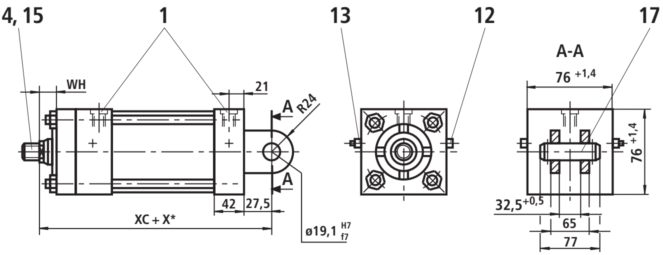
Piston Ø 50 (dimensions in mm)

For explanations of items, see page 7

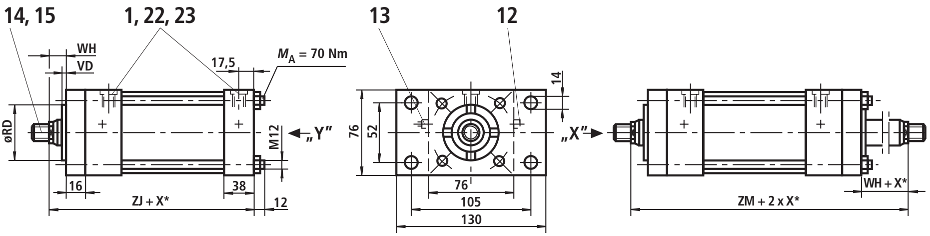
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 22 and Ø 25: 180 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 36: 110 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

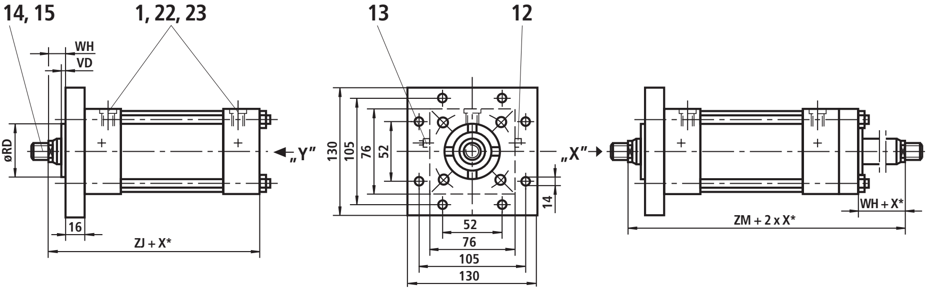
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
22	M16 x 1.5	M20 x 1.5	M20 x 1.5	28	45								
25	M20 x 1.5	M22 x 1.5	M20 x 1.5	28	45	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
36	M26 x 1.5	M30 x 2	M24 x 2	41	55								

X* = stroke length

Piston Ø 50 (dimensions in mm)

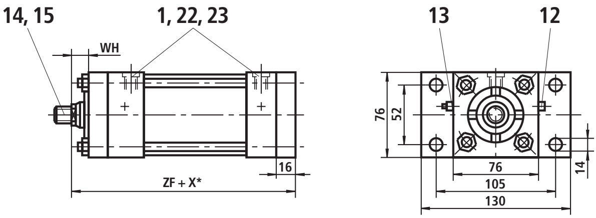
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

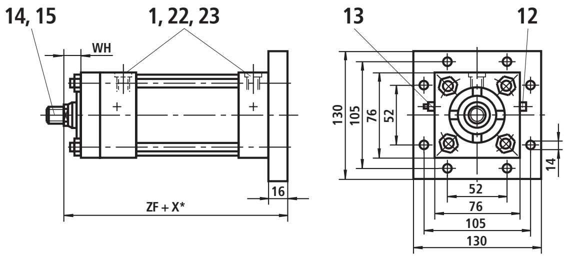


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 210 bar



Type of mounting K Operating pressure 210 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
22	38	6	19	184	212.5	168.5	152.5	194.5	8	19	30	30
25	38	7	19	184	212.5	168.5	152.5	194.5	8	22		
36	50	10	25.5	190.5	219	175	159	207.5	8	30		

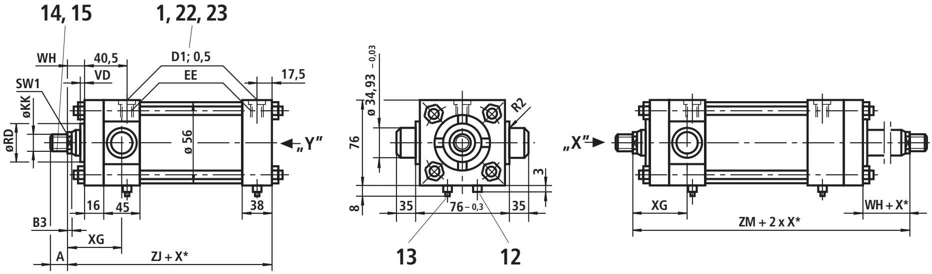
X* = stroke length

3

Piston Ø 50 (dimensions in mm)

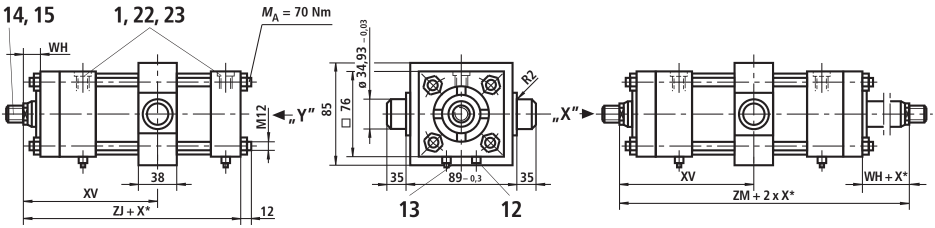
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

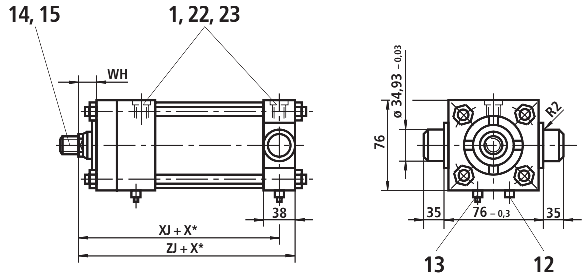


Stroke$_{min}$ = 10 mm
Always specify dimension "XV"
in clear text on the order
(observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 30 mm
with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



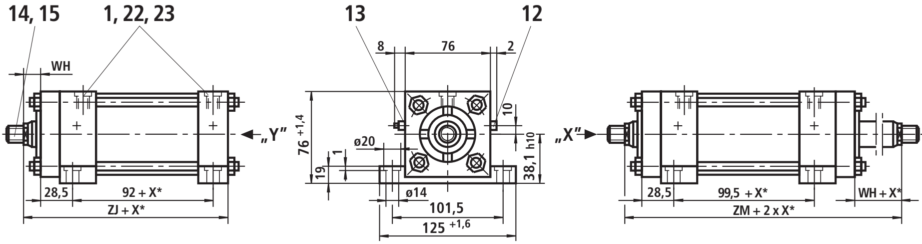
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="3">Thread version</th><th colspan="2">Thread version</th><th colspan="4">Pipe connection</th><th colspan="4">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>22</td><td>M16 x 1.5</td><td>M20 x 1.5</td><td>M20 x 1.5</td><td>28</td><td>45</td><td rowspan="4">G1/2</td><td rowspan="4">G3/4</td><td rowspan="4">M22 x 1.5</td><td rowspan="4">M27 x 2</td><td rowspan="4">34</td><td rowspan="4">42</td><td rowspan="4">34</td><td rowspan="4">42</td></tr>
<tr><td>25</td><td>M20 x 1.5</td><td>M22 x 1.5</td><td>M20 x 1.5</td><td>28</td><td>45</td></tr>
<tr><td>36</td><td>M26 x 1.5</td><td>M30 x 2</td><td>M24 x 2</td><td>41</td><td>55</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

X* = stroke length

Piston Ø 50 (dimensions in mm)

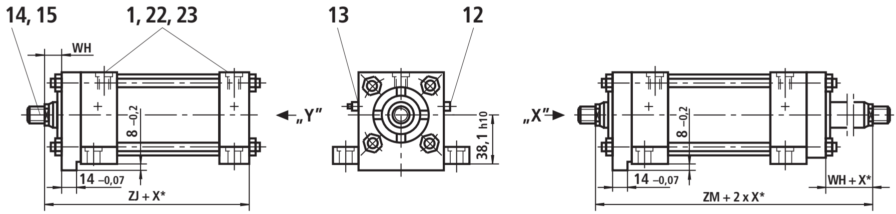
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



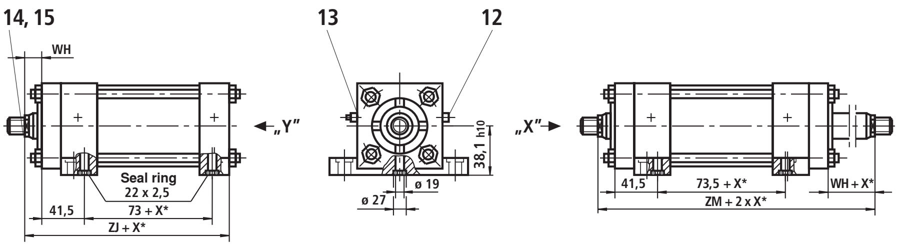
Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV 1) min.	XV 1) max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
22	38	6	19	57	133.5	99	95 + X*	152.5	194.5	8	19		
25	38	7	19	57	133.5	99	95 + X*	152.5	194.5	8	22	30	30
36	50	10	25.5	63.5	140	105.5	102 + X*	159	207.5	8	30		

X* = stroke length

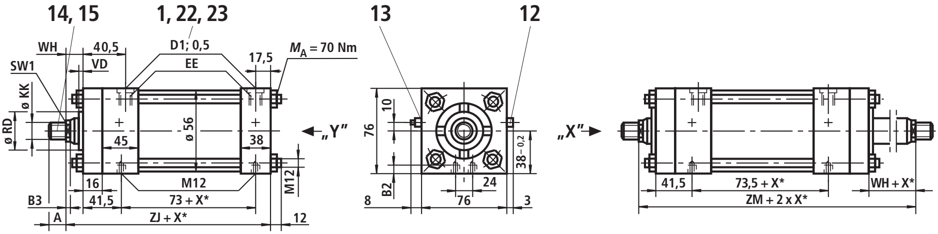
1) Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

3

Piston Ø 50 (dimensions in mm)

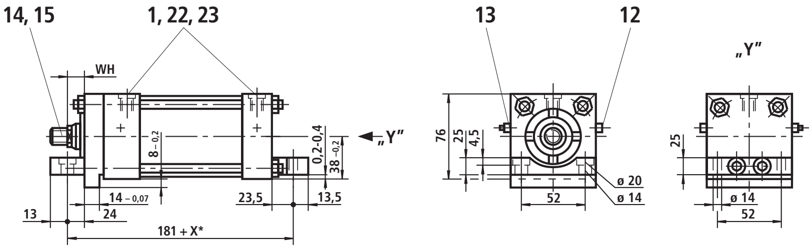
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

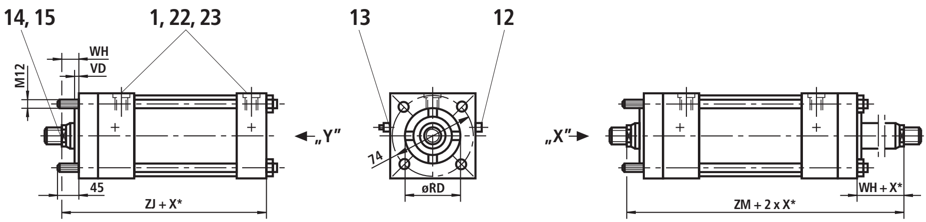


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

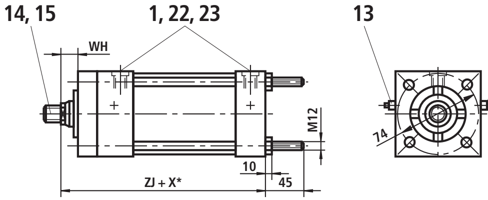
Piston rod Ø	KK Thread version			A Thread version		EE Pipe connection				D1 Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
22	M16 x 1.5	M20 x 1.5	M20 x 1.5	28	45	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
25	M20 x 1.5	M22 x 1.5	M20 x 1.5	28	45								
36	M26 x 1.5	M30 x 2	M24 x 2	41	55								

X* = stroke length

Piston Ø 50 (dimensions in mm)

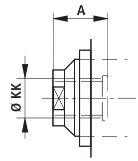
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

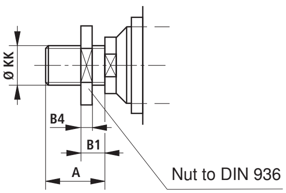


Additional thread versions

Thread version "E"

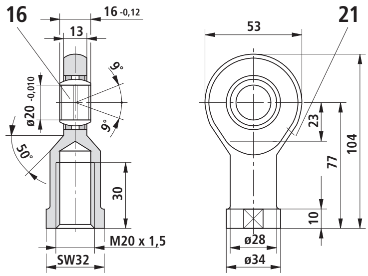


Thread version "F"



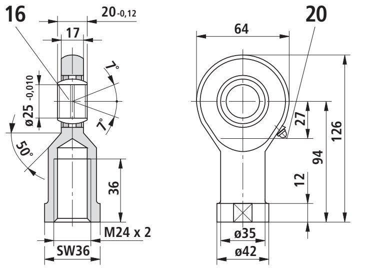
Self-aligning clevis CGK 20

suitable for thread version "F"
Material no.: **R900001329**
Weight: 0.34 kg
Permissible load: 30 kN



Self-aligning clevis CGK 25

suitable for thread version "F"
Material no.: **R900001330**
Weight: 0.6 kg
Permissible load: 42 kN



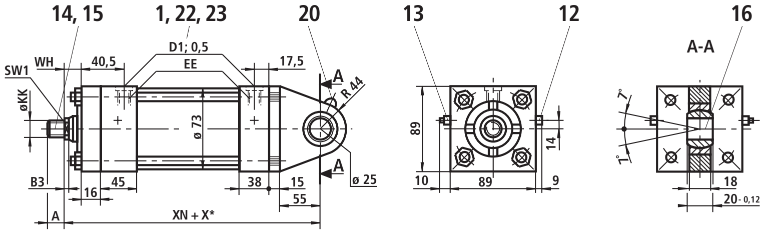
Piston rod Ø	ØRD f7	B4	VD	WH	ZJ	ZM	B1	B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
22	38	9	6	19	152.5	194.5	15	16	8	19	30	30
25	38	9	7	19	152.5	194.5	15	16	8	22		
36	50	10	10	25.5	159	207.5	19	12	8	30		

X* = stroke length

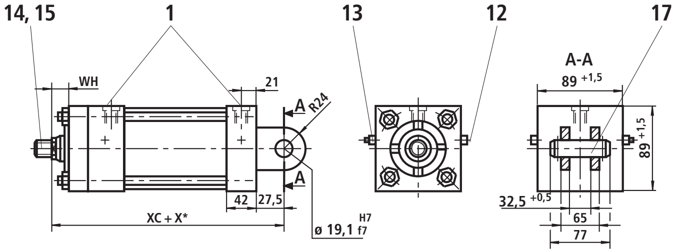
Piston Ø 63 (dimensions in mm)

For explanations of items, see page 7

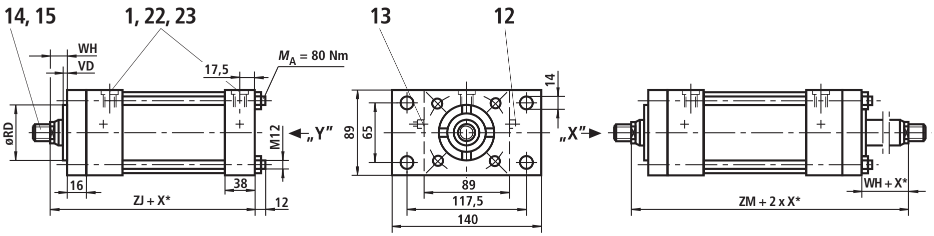
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 25 and Ø 28: 180 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 36 and Ø 45:110 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

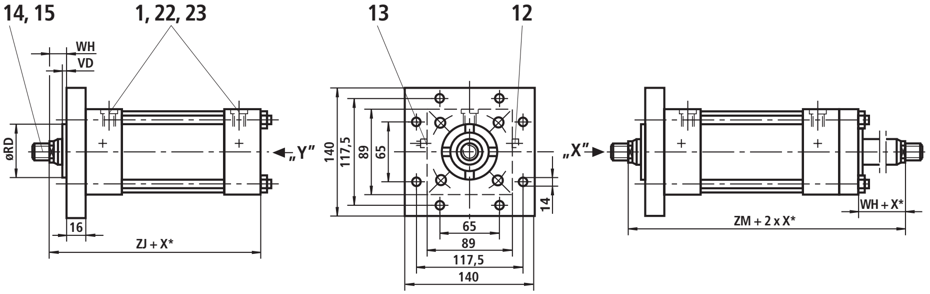
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
25	M20 x 1.5	M22 x 1.5	M24 x 2	28	55	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
28	M20 x 1.5	M22 x 1.5	M24 x 2	28	55								
36	M26 x 1.5	M30 x 2	M30 x 2	41	65								
45	M33 x 2	M39 x 2	M30 x 2	50	65								

X* = stroke length

Piston Ø 63 (dimensions in mm)

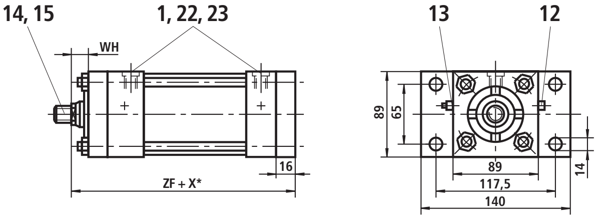
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

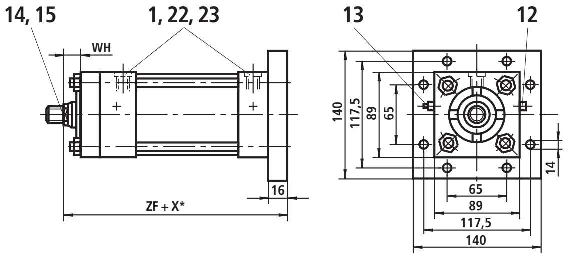


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 210 bar



Type of mounting K Operating pressure 210 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths piston side	piston rod side
25	38	6	19	187	225.5	171.5	155.5	197.5	8	22	30	30
28	42	6	19	187	225.5	171.5	155.5	197.5	8	22		
36	50.7	10	25.5	193.5	232	178	162	210.5	10	30		
45	60	13	32	200	238.5	184.5	168.5	223.5	12	41		

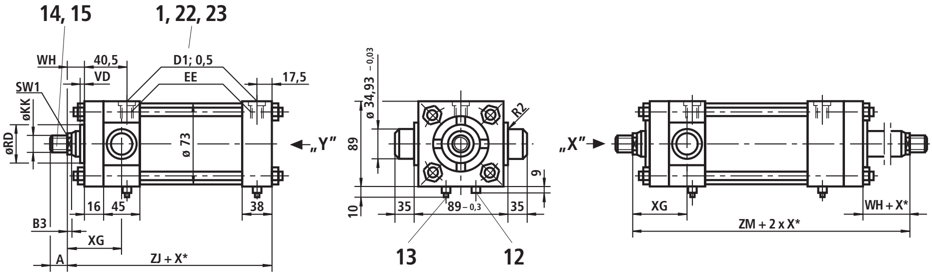
X* = stroke length

3

Piston Ø 63 (dimensions in mm)

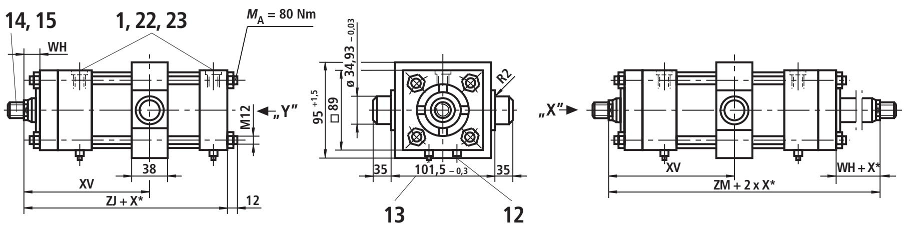
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

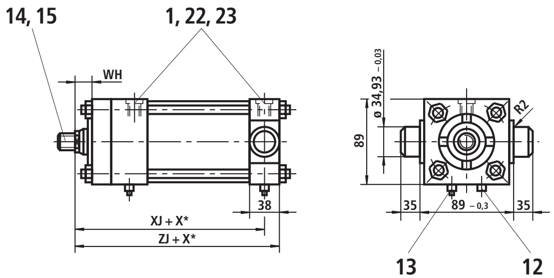


Stroke$_{min}$ = 10 mm
Always specify dimension "XV"
in clear text on the order
(observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 30 mm
with thread version "E"
(only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



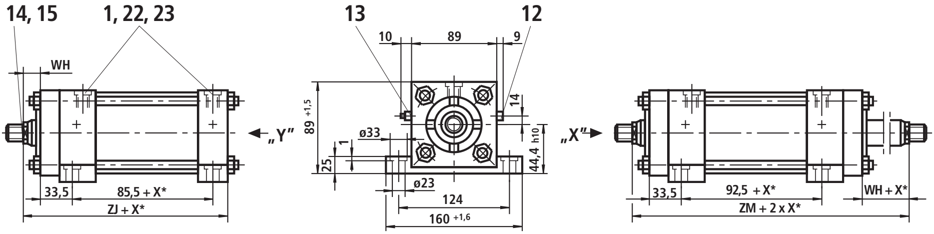
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
25	M20 x 1.5	M22 x 1.5	M24 x 2	28	55	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
28	M20 x 1.5	M22 x 1.5	M24 x 2	28	55								
36	M26 x 1.5	M30 x 2	M30 x 2	41	65								
45	M33 x 2	M39 x 2	M30 x 2	50	65								

X* = stroke length

Piston Ø 63 (dimensions in mm)

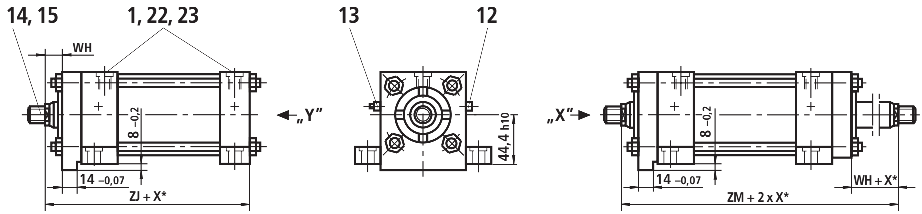
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



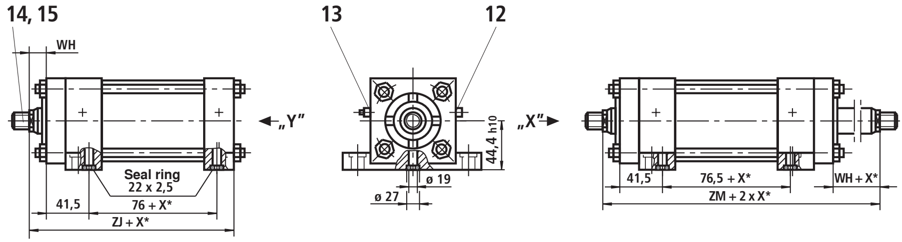
Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	piston rod side
25	38	6	19	57	136.5	99	98.5 + X*	155.5	197.5	8	22	30	30
28	42	6	19	57	136.5	99	98.5 + X*	155.5	197.5	8	22		
36	50.7	10	25.5	3.5	143	105.5	105 + X*	162	210.5	10	30		
45	60	13	32	70	149.5	112	111.5 + X*	168.5	223.5	12	41		

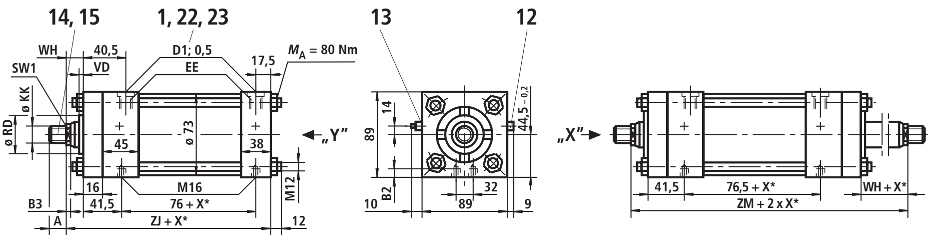
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Piston Ø 63 (dimensions in mm)

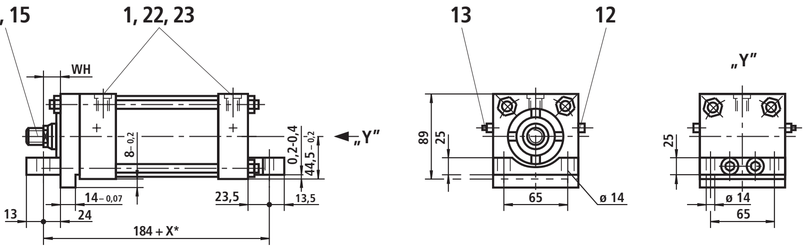
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

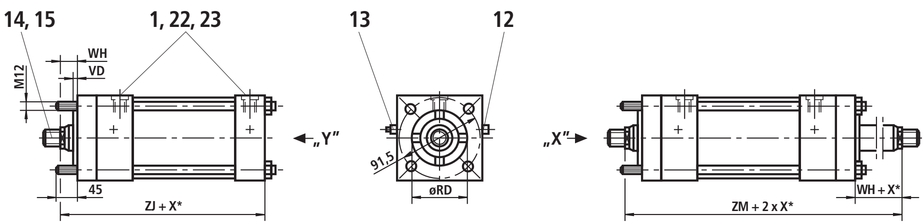


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

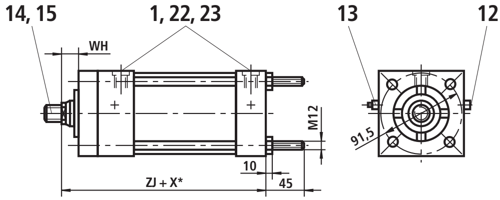
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C. E	B	F	C. E. B	F	01	13	02	14	01	13	02	14
25	M20 x 1.5	M22 x 1.5	M24 x 2	28	55	G1/2	G3/4	M22 x 1.5	M27 x 2	34	42	34	42
28	M20 x 1.5	M22 x 1.5	M24 x 2	28	55								
36	M26 x 1.5	M30 x 2	M30 x 2	41	65								
45	M33 x 2	M39 x 2	M30 x 2	50	65								

X* = stroke length

Piston Ø 63 (dimensions in mm)

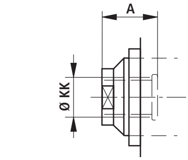
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

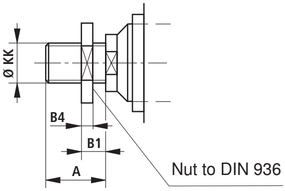


Additional thread versions

Thread version "E"

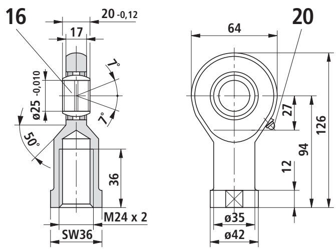


Thread version "F"



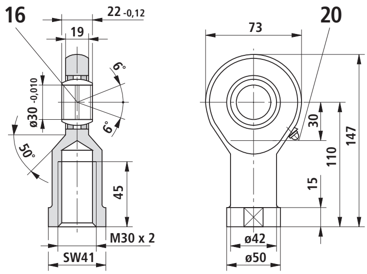
Self-aligning clevis CGK 25

suitable for thread version "F"
Material no.: **R900001330**
Weight: 0.6 kg
Permissible load: 42 kN



Self-aligning clevis CGK 30

suitable for thread version "F"
Material no.: **R900001331**
Weight: 0.9 kg
Permissible load: 55 kN



Piston rod Ø	ØRD f7	B4	VD	WH	ZJ	ZM	B1	B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
25	38	10	6	19	155.5	197.5	19	20	8	22	30	30
28	42	10	6	19	155.5	197.5	19	20	8	22		
36	50.7	12	10	25.5	162	210.5	20	14	10	30		
45	60	12	13	32	168.5	223.5	20	14	12	41		

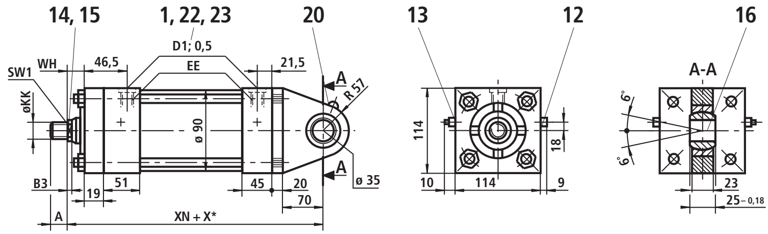
X* = stroke length

3

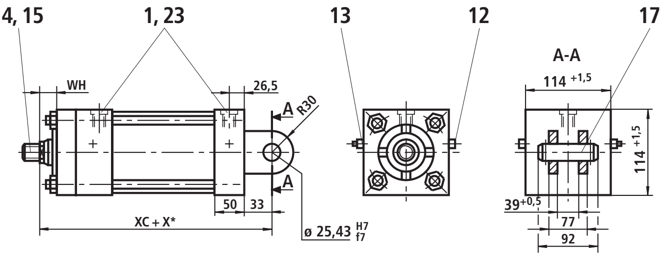
Piston Ø 80 (dimensions in mm)

For explanations of items, see page 7

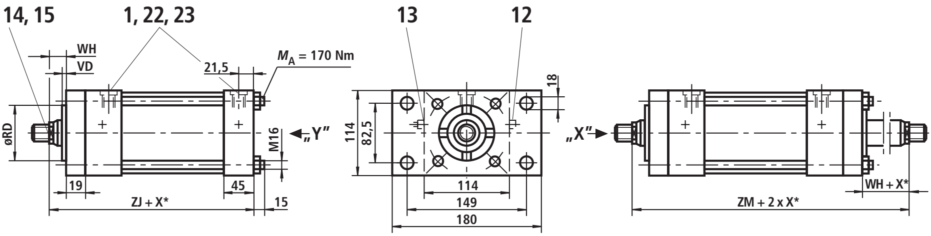
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 36: 180 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 45 and Ø 56: 110 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

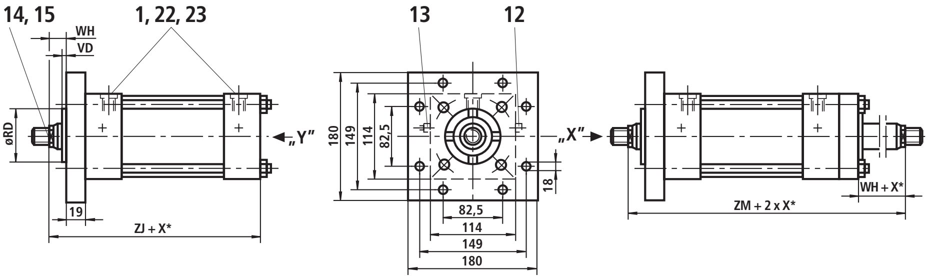
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
36	M26 x 1.5	M30 x 2	M30 x 2	41	65								
45	M33 x 2	M39 x 2	M36 x 3	51	80	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
56	M39 x 2	M45 x 2	M39 x 3	57	90								

X* = stroke length

Piston Ø 80 (dimensions in mm)

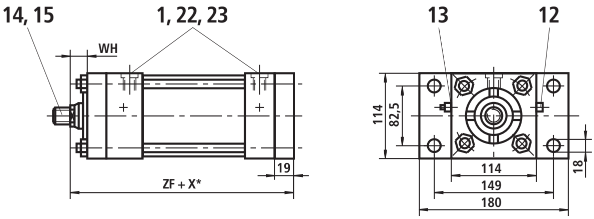
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

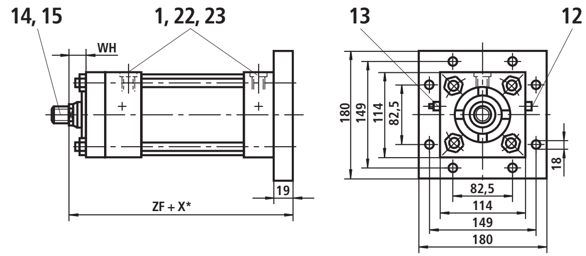


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 210 bar



Type of mounting K Operating pressure 210 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
36	50	6	22	219	271	200	181	228	9	30	35	35
45	60	10	28.5	225.5	277.5	206.5	187.5	241	12	41		
56	70	10	32	229	281	210	191	248	15	46		

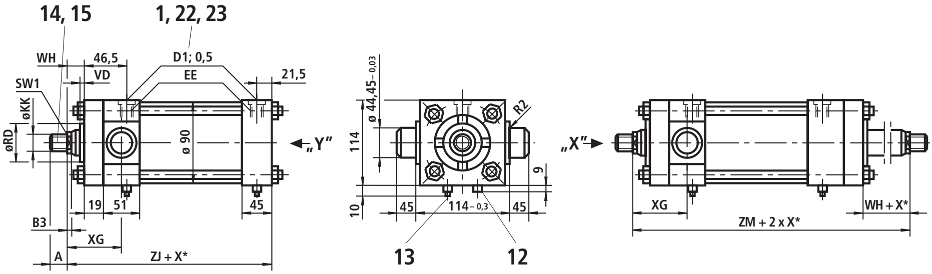
X* = stroke length

3

Piston Ø 80 (dimensions in mm)

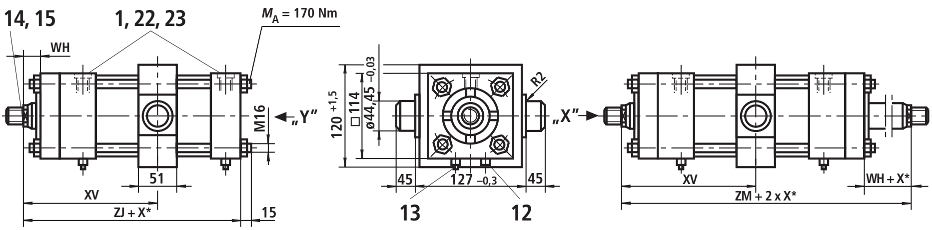
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

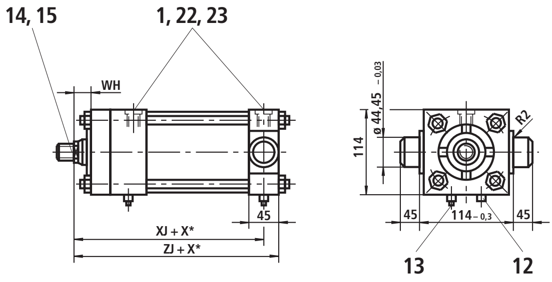


Stroke$_{min}$ = 20 mm
Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



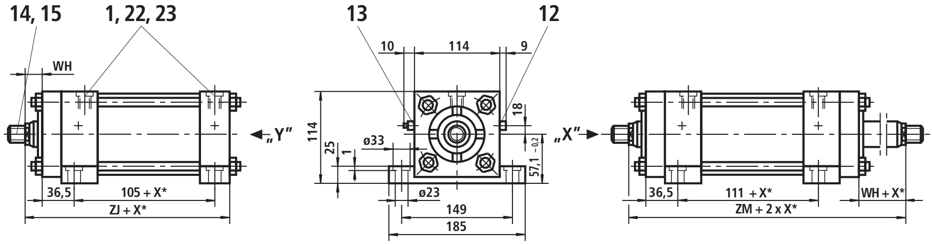
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
36	M26 x 1.5	M30 x 2	M30 x 2	41	65								
45	M33 x 2	M39 x 2	M36 x 3	51	80	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
56	M39 x 2	M45 x 2	M39 x 3	57	90								

X* = stroke length

Piston Ø 80 (dimensions in mm)

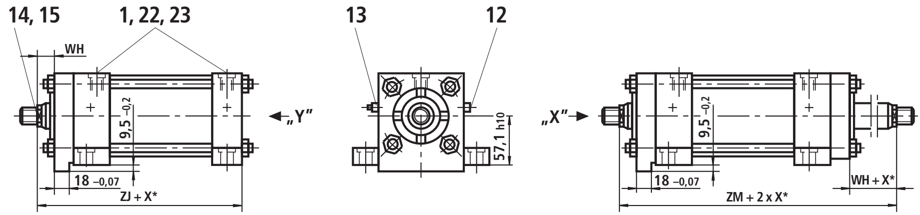
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



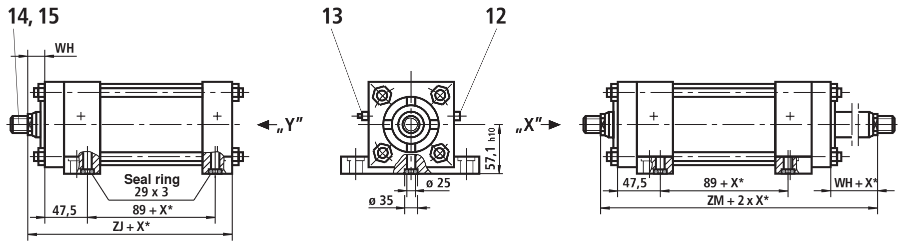
Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E" (only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths on piston rod side
36	50	6	22	66.5	158.5	117.5	110.5 + X*	181	228	9	30	35	35
45	60	10	28.5	73	165	124	117 + X*	187.5	241	12	41		
56	70	10	32	76.5	168.5	127.5	120.5 + X*	191	248	15	46		

X* = stroke length

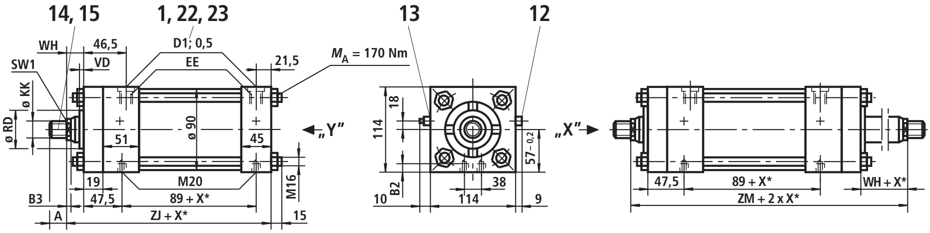
[1] Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

3

Piston Ø 80 (dimensions in mm)

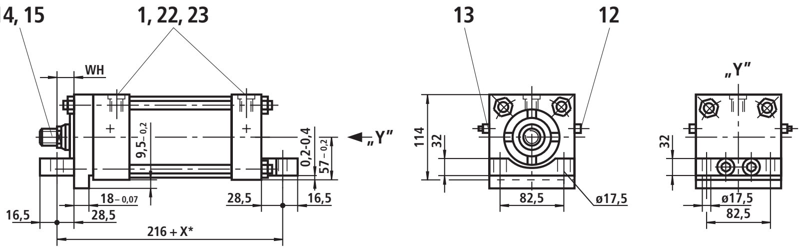
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

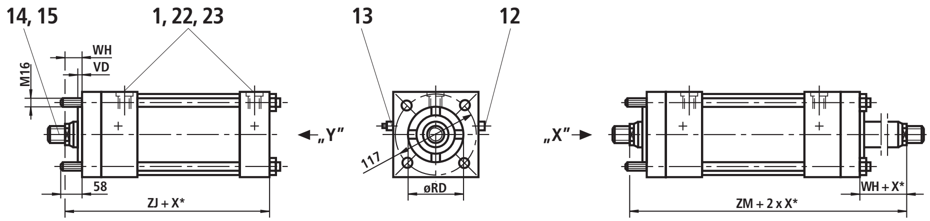


Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 30 mm with thread version "E"
(only for double-rod cylinder)

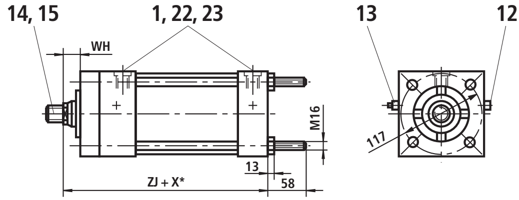
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
36	M26 x 1.5	M30 x 2	M30 x 2	41	65								
45	M33 x 2	M39 x 2	M36 x 3	51	80	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
56	M39 x 2	M45 x 2	M39 x 3	57	90								

X* = stroke length

Piston Ø 80 (dimensions in mm)

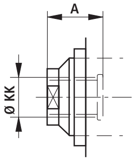
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

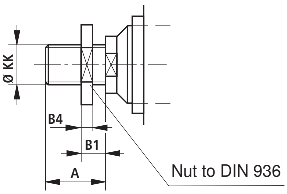


Additional thread versions

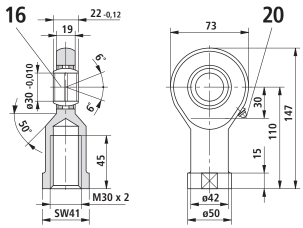
Thread version "E"



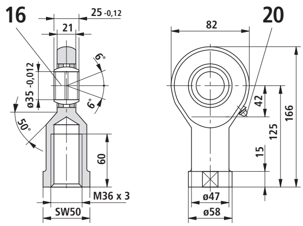
Thread version "F"



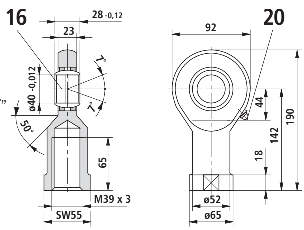
Self-aligning clevis CGK 30
suitable for thread version "F"
Material no.: **R900001331**
Weight: 0.9 kg
Permissible load: 55 kN



Self-aligning clevis CGK 35
suitable for thread version "F"
Material no.: **R900012486**
Weight: 1.4 kg
Permissible load: 73 kN



Self-aligning clevis CGK 40
suitable for thread version "F"
Material no.: **R900001332**
Weight: 2 kg
Permissible load: 90 kN

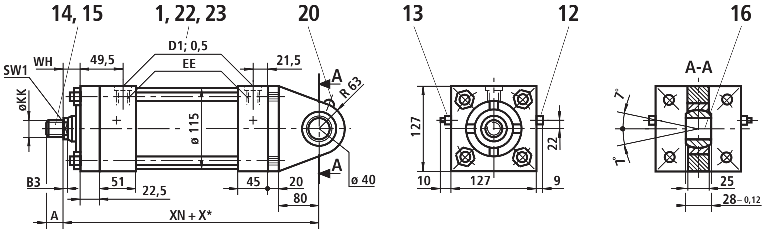


Piston rod Ø	ØRD f7	B4	VD	WH	ZJ	ZM	B1	B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
36	50	12	6	22	181	228	20	20	9	30	35	35
45	60	14	10	28.5	187.5	241	20	15	12	41		
56	70	16	10	32	191	248	25	15	15	46		

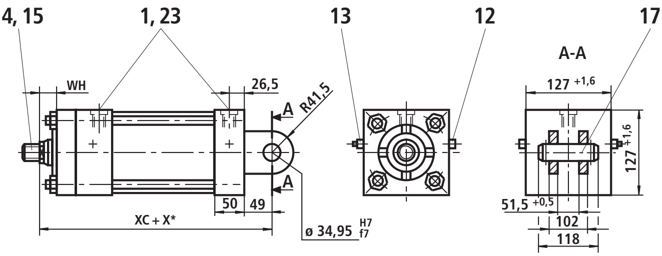
X* = stroke length

Piston Ø 100 (dimensions in mm) For explanations of items, see page 7

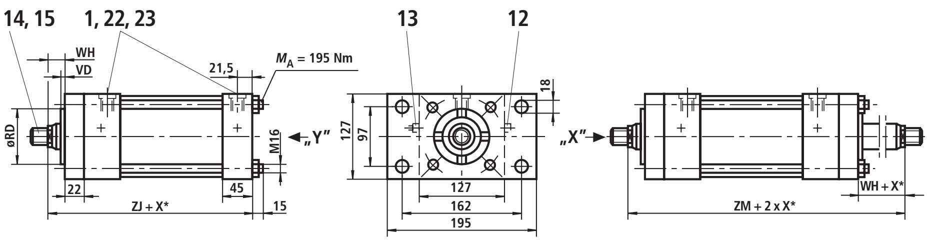
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 45 and Ø 50: 180 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 70: 110 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

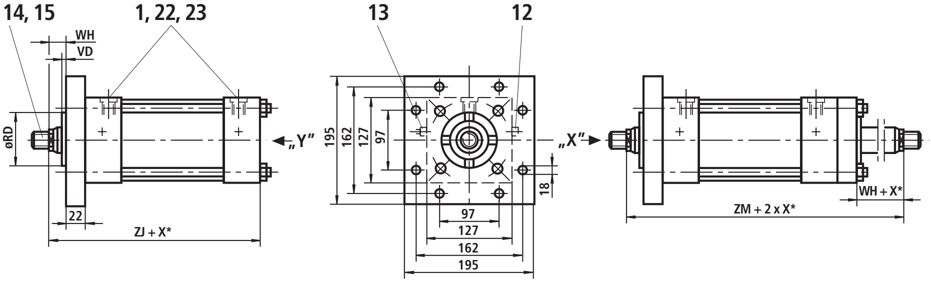
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
45	M33 x 2	M39 x 2	M42 x 3	51	90	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
50	M39 x 2	M45 x 2	M45 x 3	57	100								
70	M48 x 2	M56 x 2	M45 x 3	76	100								

X* = stroke length

Piston Ø 100 (dimensions in mm)

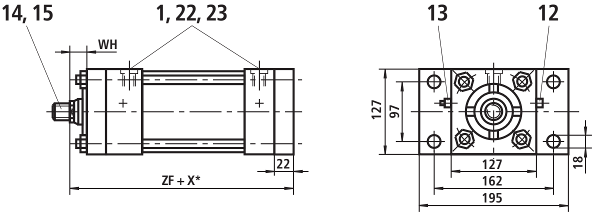
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

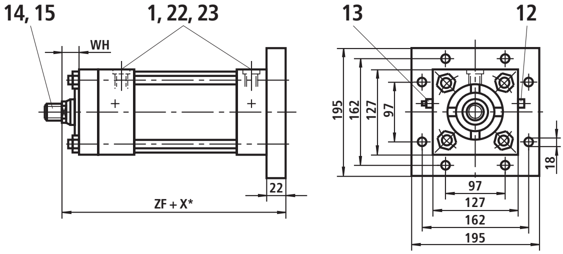


Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting D Operating pressure 210 bar



Type of mounting K Operating pressure 210 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
45	60	6	25.5	248	294	216	194	247.5	12	41	35	35
50	66.6	6	28.5	251	297	219	197	253.5	15	46		
70	90	10	35	257.5	303.5	225.5	203.5	266.5	15	60		

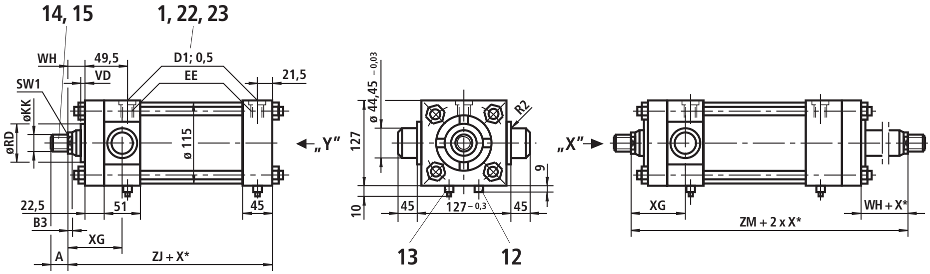
X* = stroke length

3

Piston Ø 100 (dimensions in mm)

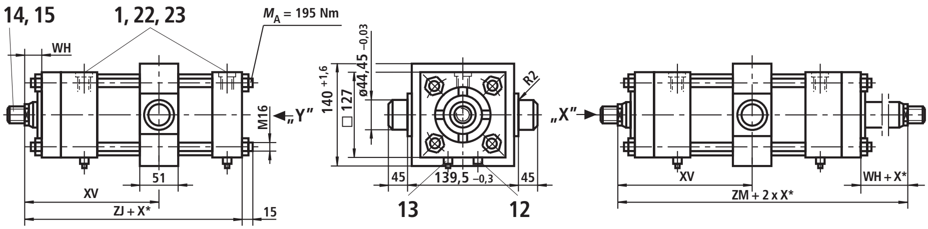
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 55 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

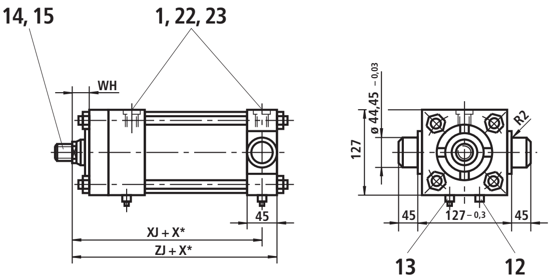


Stroke$_{min}$ = 20 mm
Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 55 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



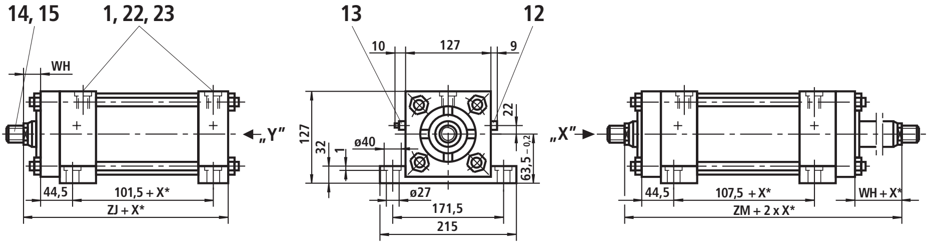
Piston rod Ø	KK Thread version			A Thread version		EE Pipe connection				D1 Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
45	M33 x 2	M39 x 2	M42 x 3	51	90	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
50	M39 x 2	M45 x 2	M45 x 3	57	100								
70	M48x 2	M56 x 2	M45 x 3	76	100								

X* = stroke length

Piston Ø 100 (dimensions in mm)

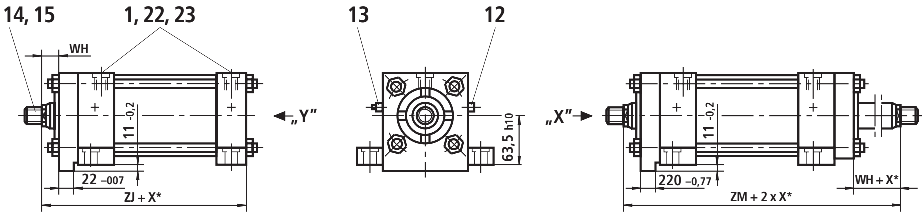
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



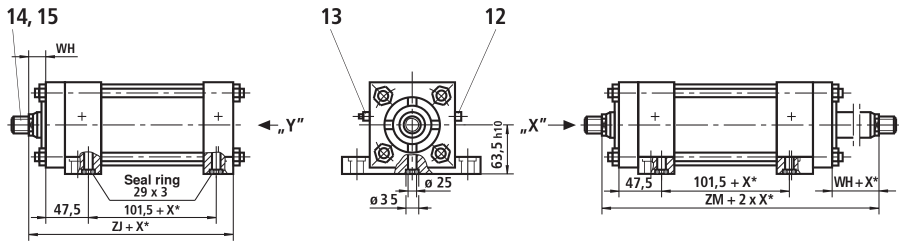
Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 55 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV 1) min.	XV 1) max.	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
45	60	6	25.5	73	171.5	124.5	123.5 + X*	194	247.5	12	41		
50	66.6	6	28.5	76	174.5	127.5	126.5 + X*	197	253.5	15	46	35	35
70	90	10	35	82.5	181	134	133 + X*	203.5	266.5	15	60		

X* = stroke length

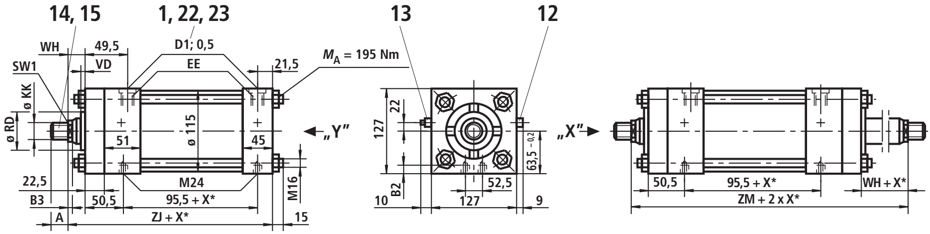
1) Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

3

Piston Ø 100 (dimensions in mm)

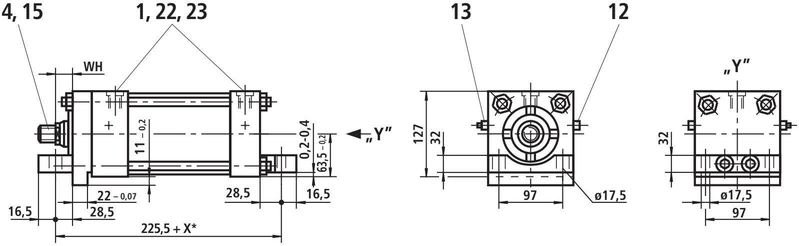
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

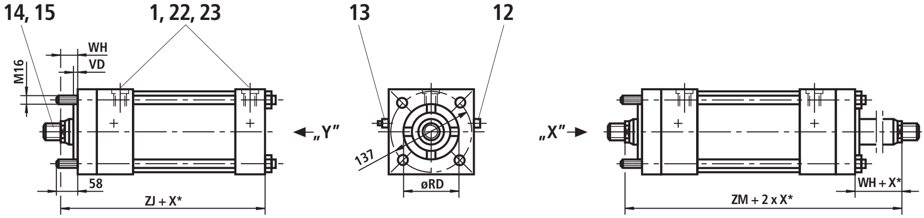


Stroke$_{min}$ = 55 mm with thread version "E" (only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 55 mm with thread version "E" (only for double-rod cylinder)

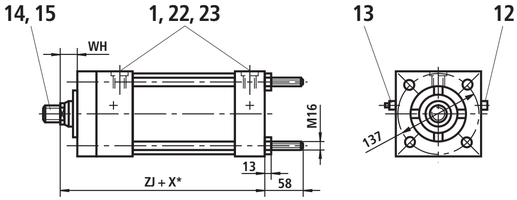
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
45	M33 x 2	M39 x 2	M42 x 3	51	90								
50	M39 x 2	M45 x 2	M45 x 3	57	100	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
70	M48 x 2	M56 x 2	M45 x 3	76	100								

X* = stroke length

Piston Ø 100 (dimensions in mm)

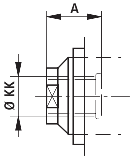
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

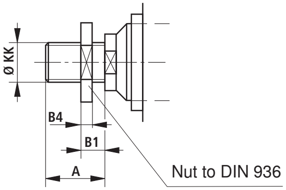


Additional thread versions

Thread version "E"

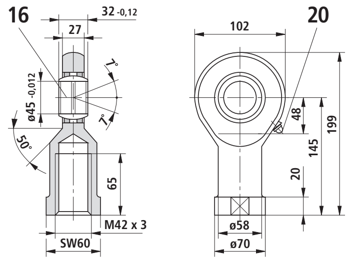


Thread version "F"



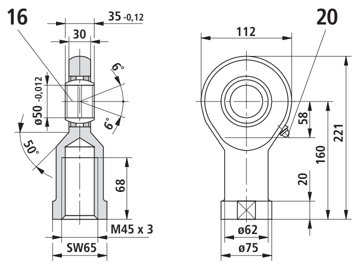
Self-aligning clevis CGK 45

suitable for thread version "F"
Material no.: **R900001333**
Weight: 2.7 kg
Permissible load: 120 kN



Self-aligning clevis CGK 50

suitable for thread version "F"
Material no.: **R900001334**
Weight: 3.5 kg
Permissible load: 145 kN



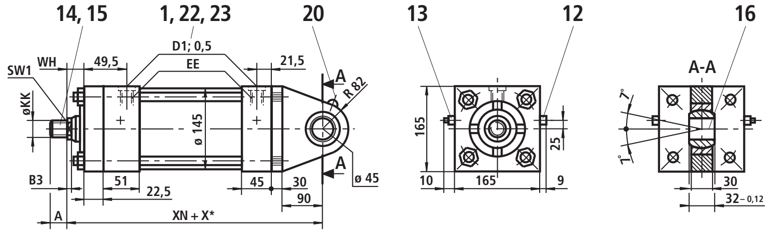
Piston rod Ø	ØRD f7	B4	VD	WH	ZJ	ZM	B1	B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
45	60	16	6	25.5	194	247.5	25	25	12	41		
50	66.6	18	6	28.5	197	253.5	32	25	15	46	35	35
70	90	18	10	35	203.5	266.5	32	15	15	60		

X* = stroke length

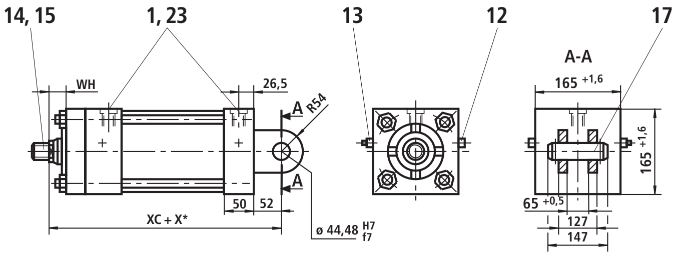
Piston Ø 125 (dimensions in mm)

For explanations of items, see page 7

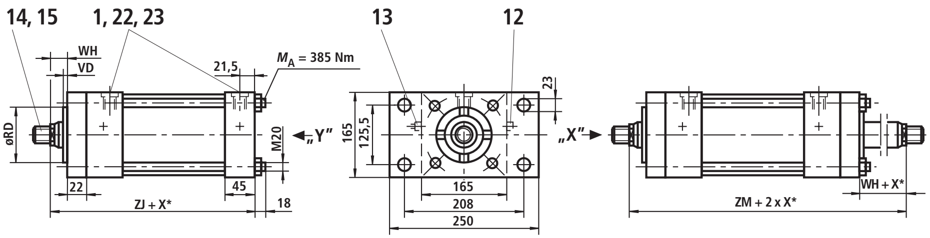
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 50 and Ø 56: 160 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 63 and Ø 90: 60 bar on cap side, 210 bar on piston rod side



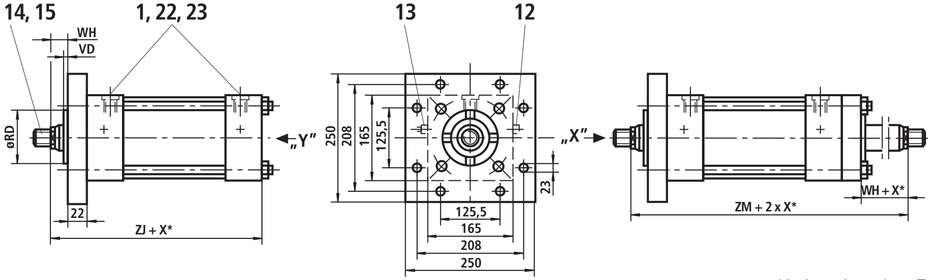
Str_{okemin} = 70 mm with thread version "E" (only for double-rod cylinder)

Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
50	M39 x 2	M45 x 2	M45 x 3	57	100	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
56	M39 x 2	M45 x 2	M45 x 3	57	100								
63	M48 x 2	M56 x 2	M52 x 3	76	115								
90	M64 x 2	M76 x 2	M52 x 3	89	115								

X* = stroke length

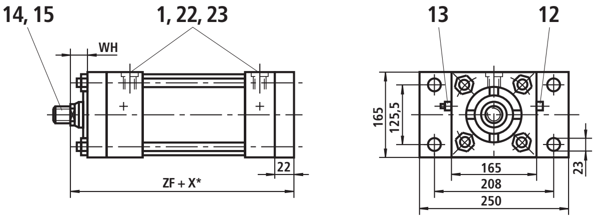
Piston Ø 125 (dimensions in mm) For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

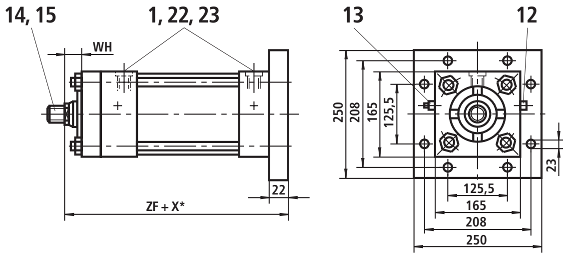


Stroke$_{min}$ = 70 mm with thread version “E“ (only for double-rod cylinder)

Type of mounting D Operating pressure with piston rod Ø 50, 56 and Ø 63: 210 bar on cap side, 150 bar on piston rod side
Operating pressure with piston rod Ø 90: 210 bar on cap side, 210 bar on piston rod side



Type of mounting K Operating pressure 210 bar



Piston rod Ø	ØRD f7	VD	WH	XC	XN	ZF	ZJ	ZM	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
50	66.6	6	28.5	266.5	329.5	231.5	209.5	266	14	46	33	35
56	70	7	28.5	266.5	329.5	231.5	209.5	266	14	46		
63	79.3	10	35	273	336	238	216	279	15	55		
90	108	10	35	273	336	238	216	279	15	75		

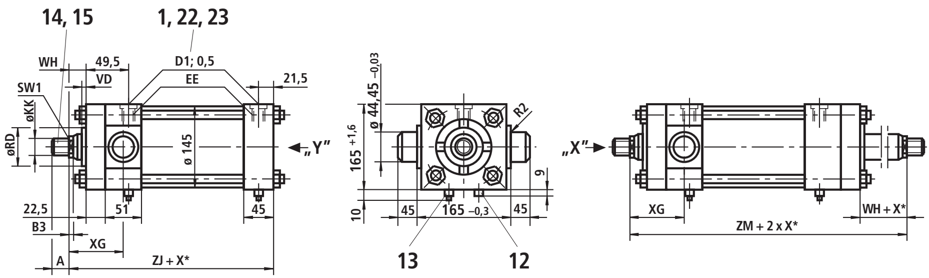
X* = stroke length

3

Piston Ø 125 (dimensions in mm)

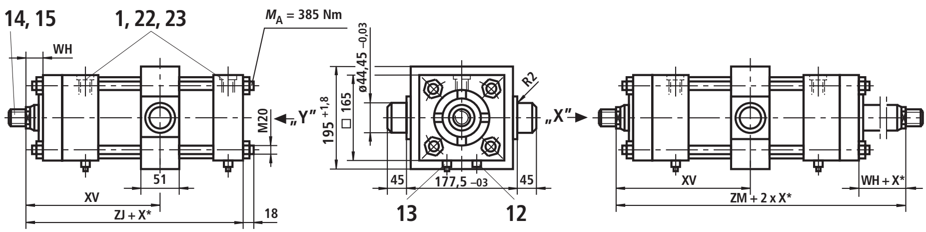
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 70 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

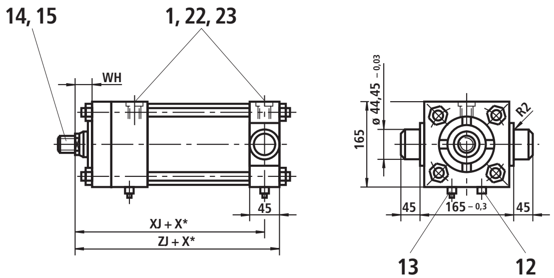


Stroke$_{min}$ = 20 mm
Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 70 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



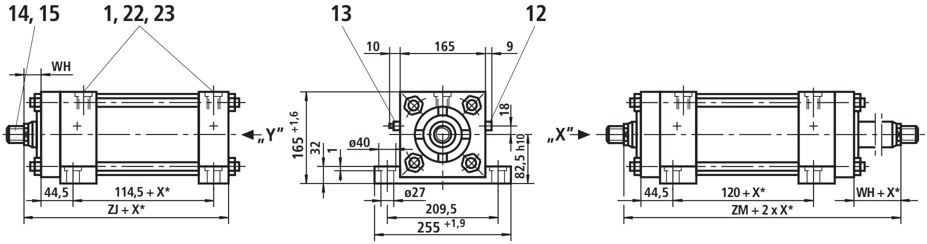
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
50	M39 x 2	M45 x 2	M45 x 3	57	100	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
56	M39 x 2	M45 x 2	M45 x 3	57	100								
63	M48 x 2	M56 x 2	M52 x 3	76	115								
90	M64 x 2	M76 x 2	M52 x 3	89	115								

X* = stroke length

Piston Ø 125 (dimensions in mm)

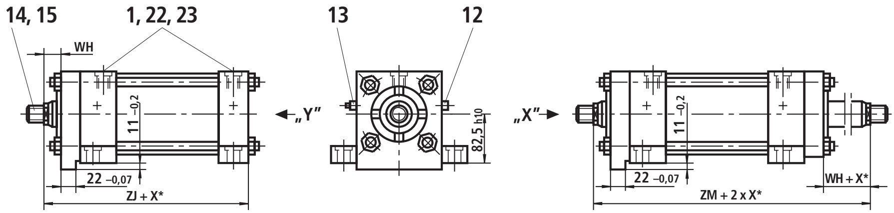
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



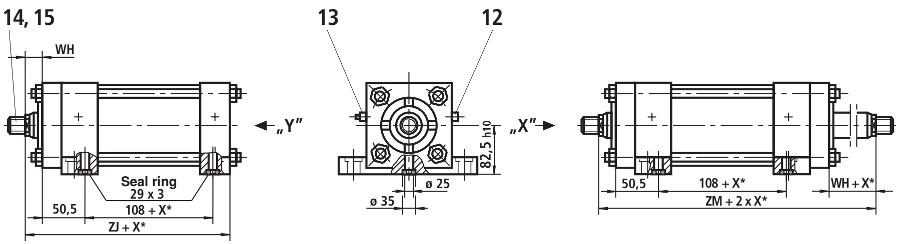
Stroke$_{min}$ = 70 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 70 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 70 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	VD	WH	XG	XJ	XV [1] min.	XV [1] max.	ZJ	ZM	B3	SW1	Cushioning lengths kolben seitig	Cushioning lengths on piston rod side
50	66.6	6	28.5	76	187	127.5	139 + X*	209.5	266	14	46	33	35
56	70	7	28.5	76	187	127.5	139 + X*	209.5	266	14	46		
63	79.3	10	35	82.5	193.5	134	145.5 + X*	216	279	15	55		
90	108	10	35	82.5	193.5	134	145.5 + X*	216	279	15	75		

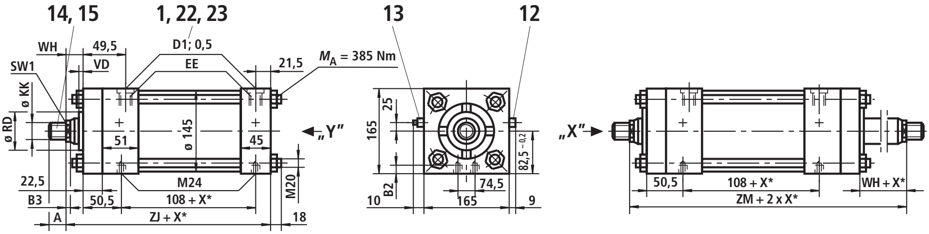
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Piston Ø 125 (dimensions in mm)

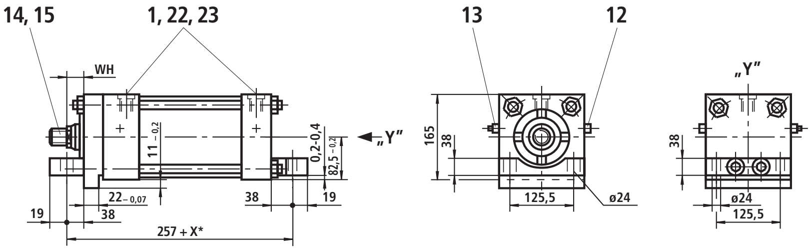
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

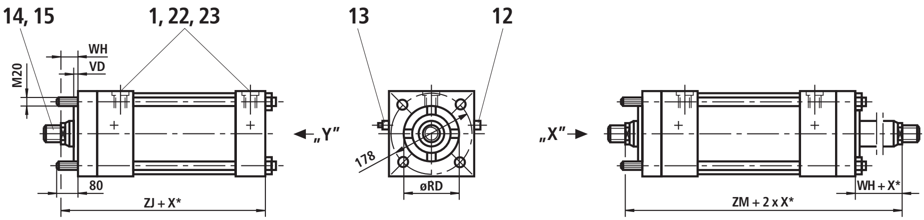


Stroke$_{min}$ = 70 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 70 mm with thread version "E"
(only for double-rod cylinder)

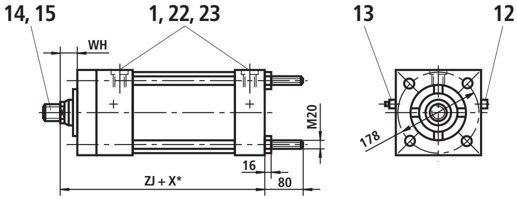
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
50	M39 x 2	M45 x 2	M45 x 3	57	100	G3/4	G1	M27 x 2	M33 x 2	42	47	42	47
56	M39 x 2	M45 x 2	M45 x 3	57	100								
63	M48 x 2	M56 x 2	M52 x 3	76	115								
90	M64 x 2	M76 x 2	M52 x 3	89	115								

X* = stroke length

Piston Ø 125 (dimensions in mm)

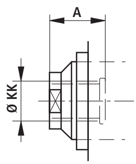
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

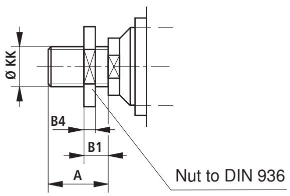


Additional thread versions

Thread version "E"

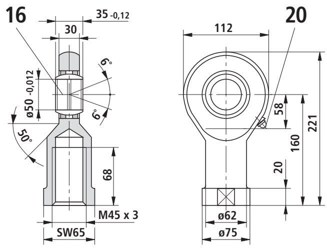


Thread version "F"



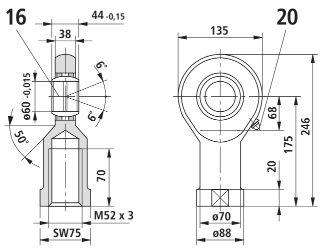
Self-aligning clevis CGK 50

suitable for thread version "F"
Material no.: **R900001334**
Weight: 3.5 kg
Permissible load: 145 kN



Self-aligning clevis CGK 60

suitable for thread version "F"
Material no.: **R900001335**
Weight: 5.6 kg
Permissible load: 225 kN



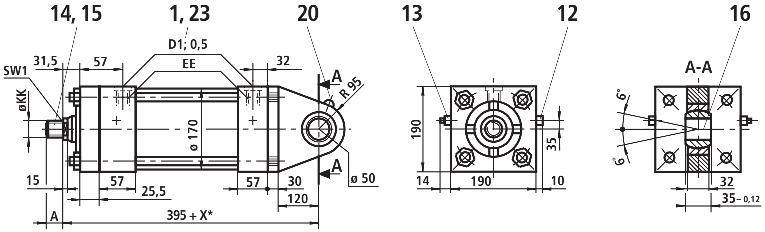
Piston rod Ø	ØRD f7	B4	VD	WH	ZJ	ZM	B1	B2	B3	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
50	66.6	18	6	28.5	209.5	266	32	40	14	46	33	35
56	70	18	7	28.5	209.5	266	32	40	14	46		
63	79.3	20	10	35	216	279	45	25	15	55		
90	108	20	10	35	216	279	45	25	15	75		

X* = stroke length

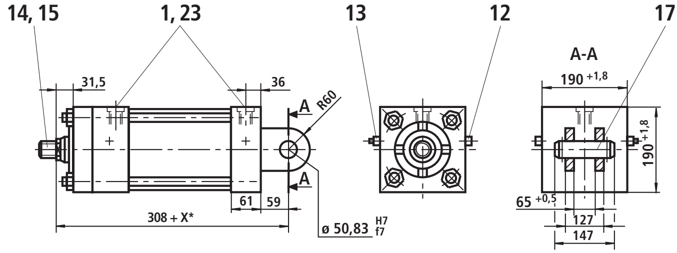
Piston Ø 150 (dimensions in mm)

For explanations of items, see page 7

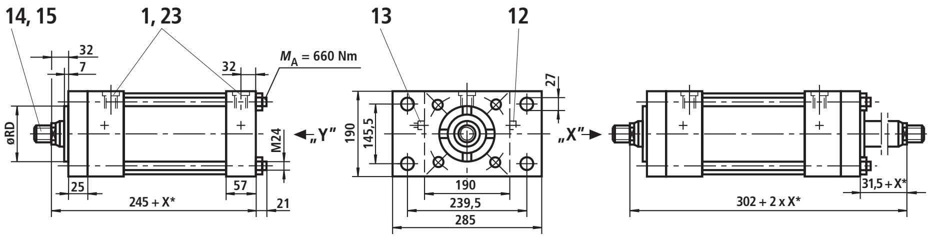
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 63 and Ø 70: 130 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 80 and Ø 100: 60 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 85 mm with thread version "E"
(only for double-rod cylinder)

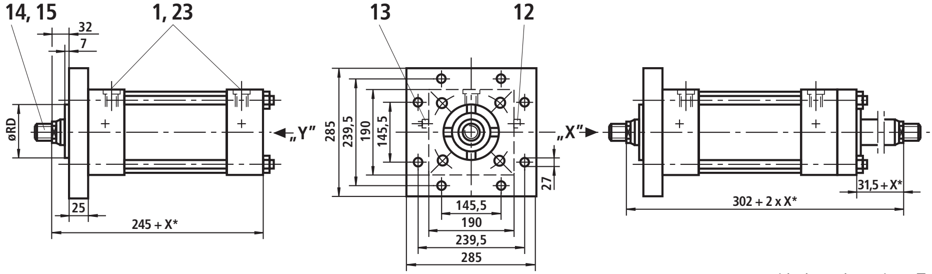
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
63	M48 x 2	M56 x 2	M52 x 3	76	115	G1	G1 1/4	M33 x 2	M42 x 2	47	58	47	58
70	M48 x 2	M56 x 2	M52 x 3	76	115								
80	M58 x 2	M68 x 2	M64 x 4	89	145								
100	M76 x 2	M95 x 2	M64 x 4	101	145								

X* = stroke length

Piston Ø 150 (dimensions in mm)

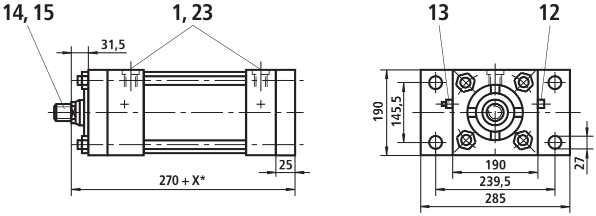
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

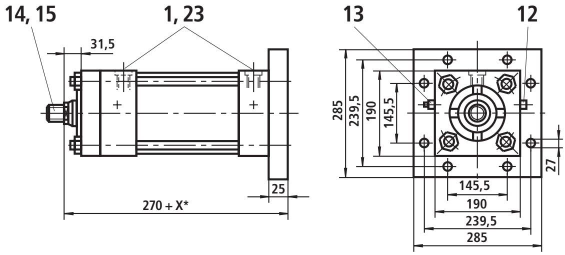


Stroke$_{min}$ = 85 mm with thread version "E" (only for double-rod cylinder)

Type of mounting D Operating pressure with piston rod Ø 63 and Ø 70: 210 bar on cap side, 150 bar on piston rod side
Operating pressure with piston rod Ø 80 and Ø 100: 210 bar on cap side, 210 bar on piston rod side



Type of mounting K Operating pressure 210 bar



Piston rod Ø	ØRD f7									SW1	Cushioning lengths piston side	piston rod side
63	79.3									55	38	35
70	90									60		
80	95.2									75		
100	120									85		

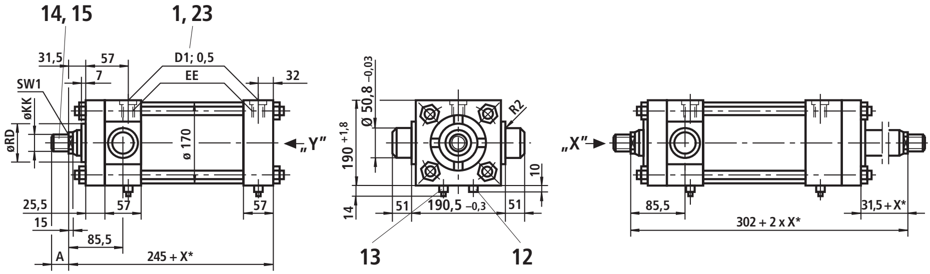
X* = stroke length

3

Piston Ø 150 (dimensions in mm)

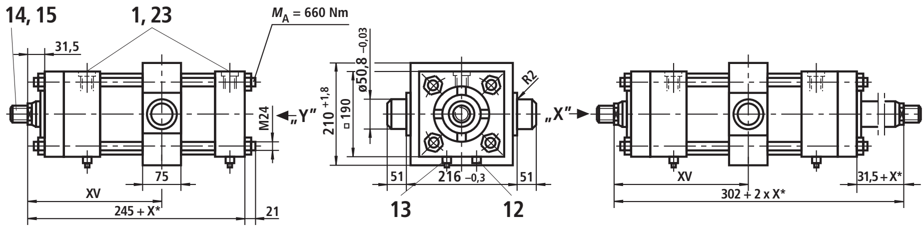
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 85 mm with thread version “E“
(only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

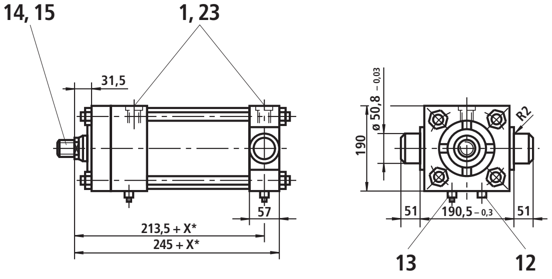


Stroke$_{min}$ = 20 mm
Always specify dimension “XV”
in clear text on the order
(observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension “LY“ in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 85 mm
with thread version “E“
(only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



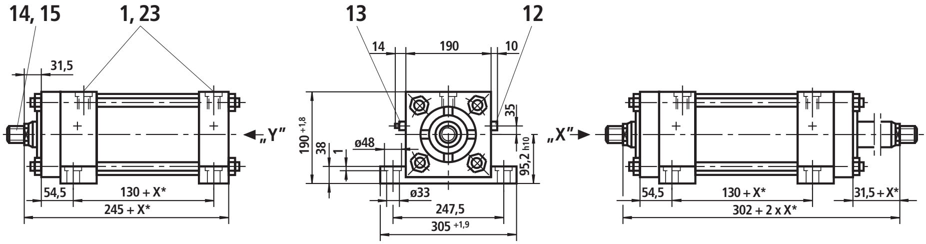
<table>
<tr><th rowspan="3">Piston rod Ø</th><th colspan="3">KK</th><th colspan="2">A</th><th colspan="4">EE</th><th colspan="4">D1</th></tr>
<tr><th colspan="3">Thread version</th><th colspan="2">Thread version</th><th colspan="4">Pipe connection</th><th colspan="4">Pipe connection</th></tr>
<tr><th>C, E</th><th>B</th><th>F</th><th>C, E, B</th><th>F</th><th>01</th><th>13</th><th>02</th><th>14</th><th>01</th><th>13</th><th>02</th><th>14</th></tr>
<tr><td>63</td><td>M48 x 2</td><td>M56 x 2</td><td>M52 x 3</td><td>76</td><td>115</td><td rowspan="4">G1</td><td rowspan="4">G1 1/4</td><td rowspan="4">M33 x 2</td><td rowspan="4">M42 x 2</td><td rowspan="4">47</td><td rowspan="4">58</td><td rowspan="4">47</td><td rowspan="4">58</td></tr>
<tr><td>70</td><td>M48 x 2</td><td>M56 x 2</td><td>M52 x 3</td><td>76</td><td>115</td></tr>
<tr><td>80</td><td>M58 x 2</td><td>M68 x 2</td><td>M64 x 4</td><td>89</td><td>145</td></tr>
<tr><td>100</td><td>M76 x 2</td><td>M95 x 2</td><td>M64 x 4</td><td>101</td><td>145</td></tr>
</table>

X* = stroke length

Piston Ø 150 (dimensions in mm)

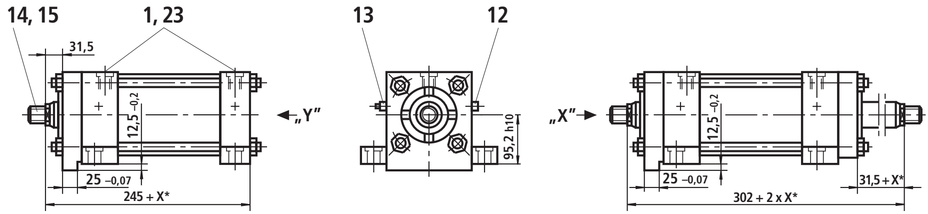
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



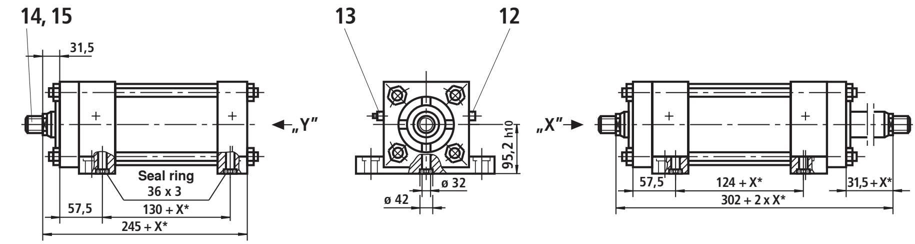
Stroke$_{min}$ = 85 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 85 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 85 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	**ØRD** f7	**XV** [1] min.	**XV** [1] max.							**SW1**	**Cushioning lengths** piston side	piston rod side
63	79.3	151.5	150.5 + X*							55	38	35
70	90	151.5	150.5 + X*							60		
80	95.2	151.5	150.5 + X*							75		
100	120	151.5	150.5 + X*							85		

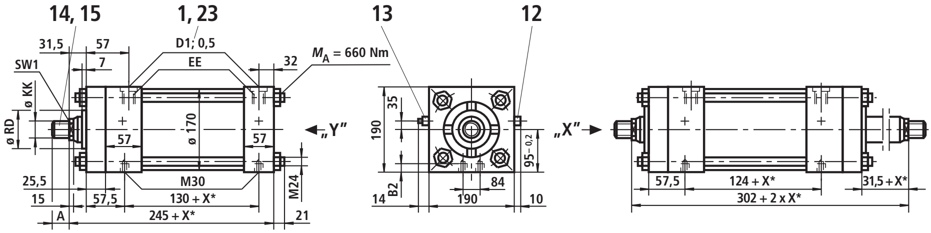
X* = stroke length

[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

Piston Ø 150 (dimensions in mm)

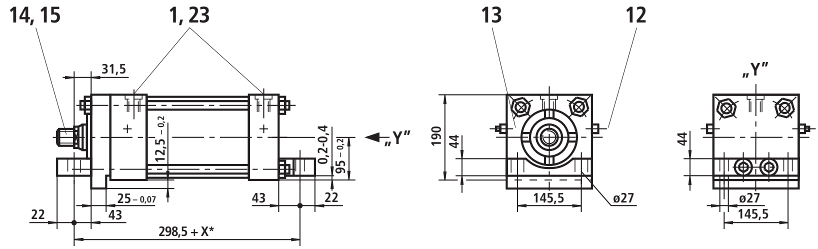
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

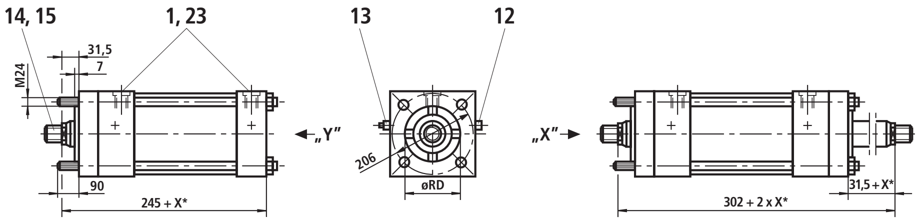


Stroke$_{min}$ = 85 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



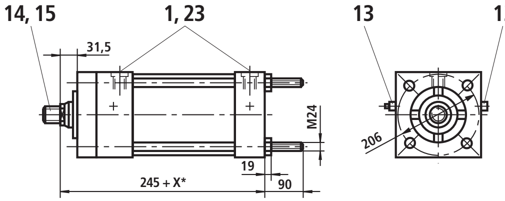
Stroke$_{min}$ = 85 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
63	M48 x 2	M56 x 2	M52 x 3	76	115	G1	G1 1/4	M33 x 2	M42 x 2	47	58	47	58
70	M48 x 2	M56 x 2	M52 x 3	76	115								
80	M58 x 2	M68 x 2	M64 x 4	89	145								
100	M76 x 2	M95 x 2	M64 x 4	101	145								

X* = stroke length

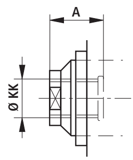
Piston Ø 150 (dimensions in mm) For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

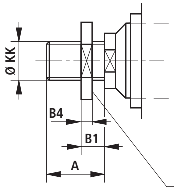


Additional thread versions

Thread version “E”



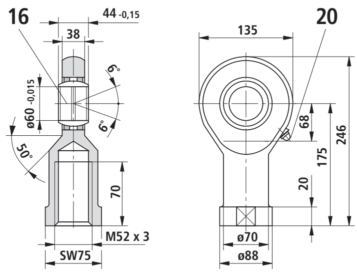
Thread version “F”



Nut to DIN 936
Nut M64 x 4 DIN 934

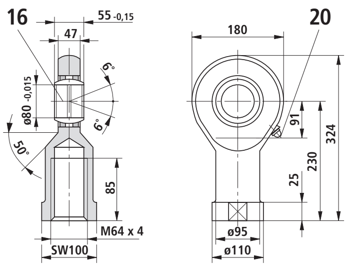
Self-aligning clevis CGK 60

suitable for thread version “F”
Material no.: **R900001335**
Weight: 5.6 kg
Permissible load: 225 kN



Self-aligning clevis CGK 80

suitable for thread version “F”
Material no.: **R900001928**
Weight: 13.1 kg
Permissible load: 371 kN



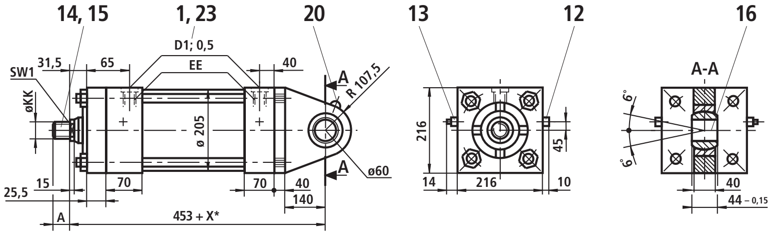
Piston rod Ø	ØRD f7	B4					B1	B2		SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
63	79.3	20					45	45		55	38	35
70	90	20					45	45		60		
80	95.2	51					60	30		75		
100	120	51					60	30		85		

X* = stroke length

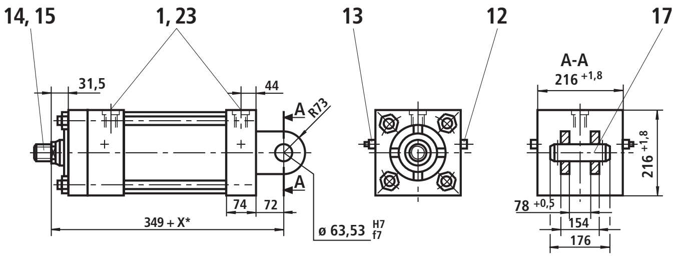
Piston Ø 180 (dimensions in mm)

For explanations of items, see page 7

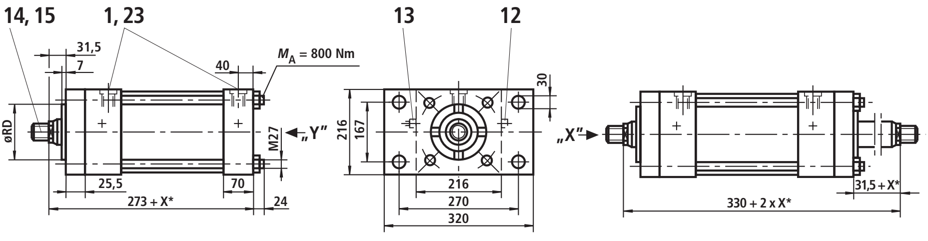
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 80 and Ø 90: 110 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 125: 60 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 105 mm with thread version "E"
(only for double-rod cylinder)

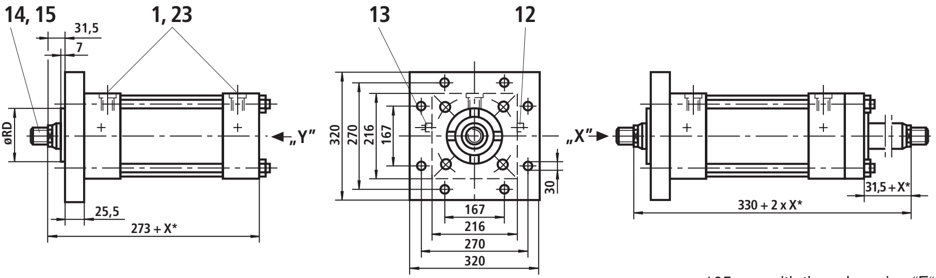
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
80	M58 x 2	M68 x 2	M64 x 4	89	145								
90	M64 x 2	M76 x 2	M80 x 2	89	80	G1 1/4	G1 1/2	M242 x 2	M48 x 2	58	65	58	65
125	M90 x 2	M110 x 2	M100 x 2	127	100								

X* = stroke length

Piston Ø 180 (dimensions in mm)

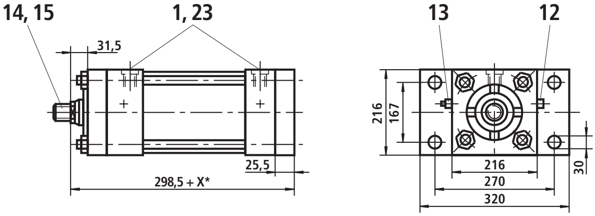
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar



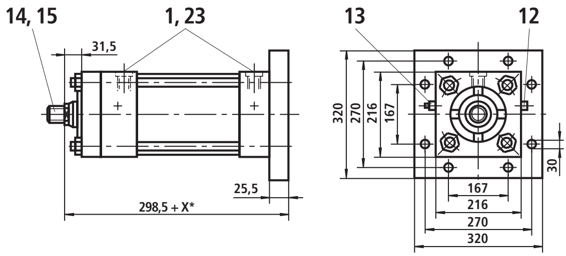
Stroke$_{min}$ = 105 mm with thread version "E" (only for double-rod cylinder)

Type of mounting D Operating pressure with piston rod Ø 80 and Ø 90: 210 bar on cap side, 110 bar on piston rod side
Operating pressure with piston rod Ø 125: 210 bar on cap side, 150 bar on piston rod side



3

Type of mounting K Operating pressure 210 bar



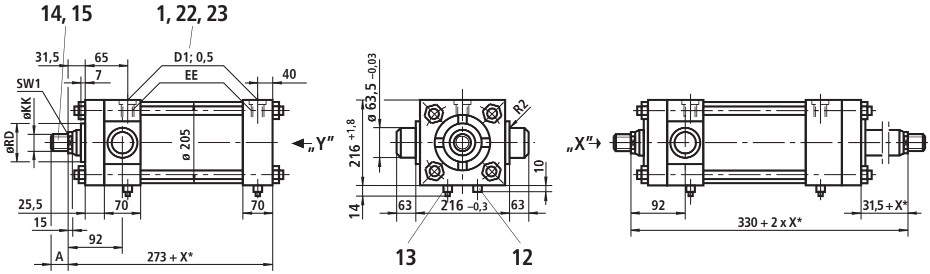
Piston rod Ø	ØRD f7									SW1	Cushioning lengths	
											piston side	piston rod side
80	95.2									75		
90	108									75	50	50
125	146									115		

X* = stroke length

Piston Ø 180 (dimensions in mm)

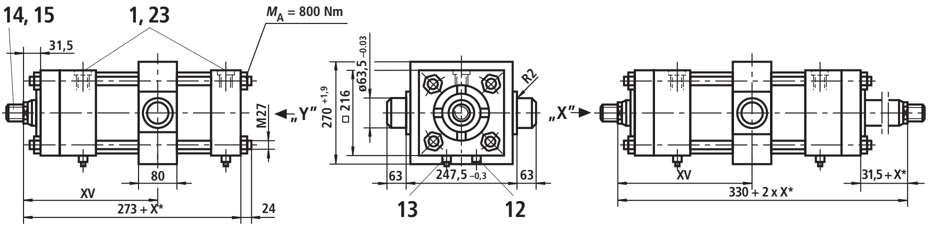
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 105 mm with thread version “E“
(only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

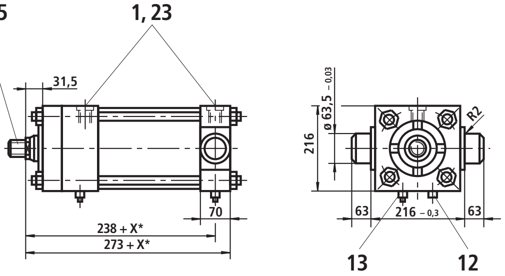


Stroke$_{min}$ = 25 mm
Always specify dimension “XV”
in clear text on the order
(observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension “LY“ in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 105 mm
with thread version “E“
(only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



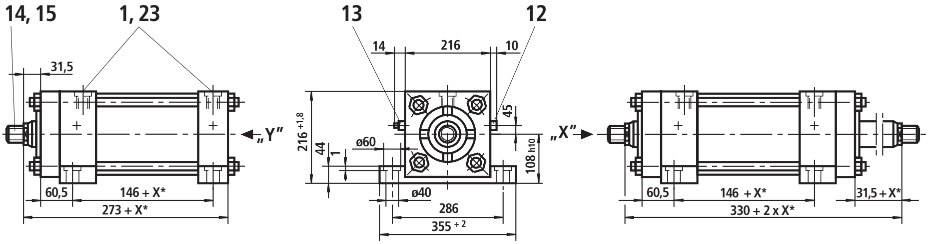
Piston rod Ø	KK Thread version C, E	KK Thread version B	KK Thread version F	A Thread version C, E, B	A Thread version F	EE Pipe connection 01	EE 13	EE 02	EE 14	D1 Pipe connection 01	D1 13	D1 02	D1 14
80	M58 x 2	M68 x 2	M64 x 4	89	145								
90	M64 x 2	M76 x 2	M80 x 2	89	80	G1 1/4	G1 1/2	M242 x 2	M48 x 2	58	65	58	65
125	M90 x 2	M110 x 2	M100 x 2	127	100								

X* = stroke length

Piston Ø 180 (dimensions in mm)

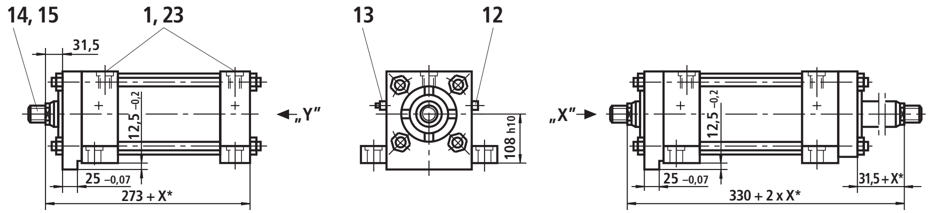
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



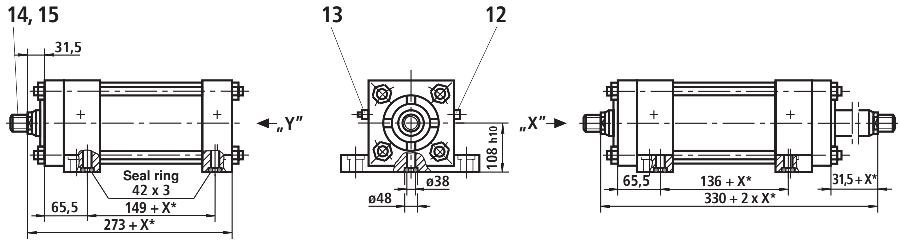
Stroke$_{min}$ = 105 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 105 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 105 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	XV [1] min.	XV [1] max.							SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
80	95.2	167	163 + X*							75	50	50
90	108	167	163 + X*							75		
125	146	167	163 + X*							115		

X* = stroke length

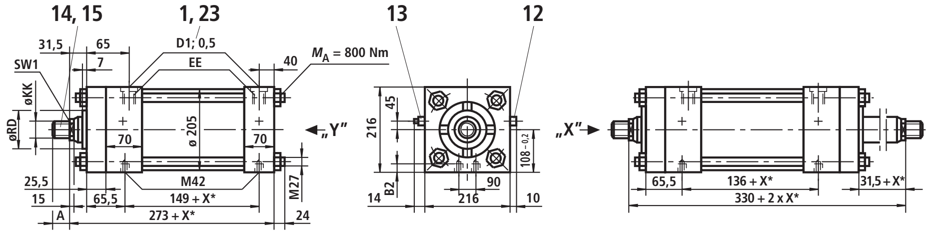
[1] Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

3

Piston Ø 180 (dimensions in mm)

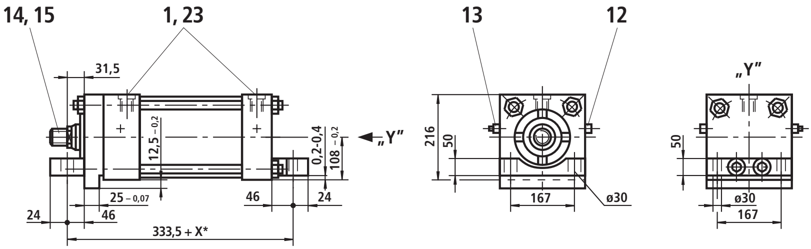
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

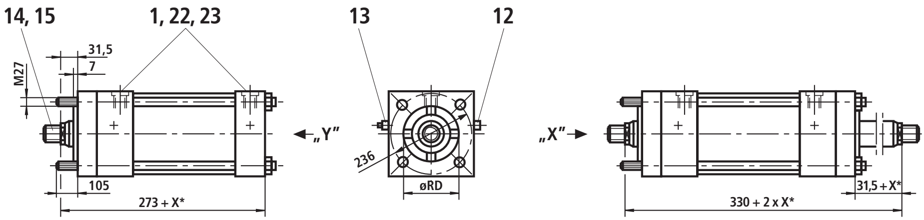


Stroke$_{min}$ = 105 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



Stroke$_{min}$ = 105 mm with thread version "E"
(only for double-rod cylinder)

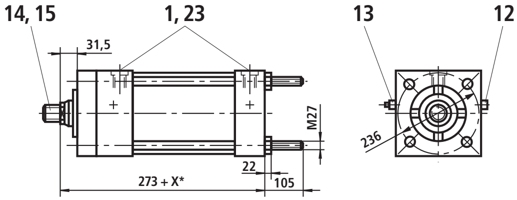
Piston	KK			A		EE				D1			
rod	Thread version			Thread version		Pipe connection				Pipe connection			
Ø	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
80	M58 x 2	M68 x 2	M64 x 4	89	145								
90	M64 x 2	M76 x 2	M80 x 2	89	80	G1 1/4	G1 1/2	M242 x 2	M48 x 2	58	65	58	65
125	M90 x 2	M110 x 2	M100 x 2	127	100								

X* = stroke length

Piston Ø 180 (dimensions in mm)

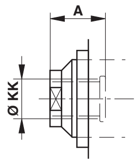
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

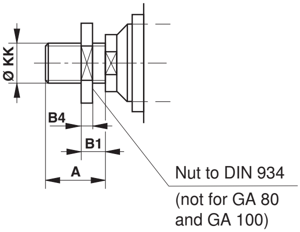


Additional thread versions

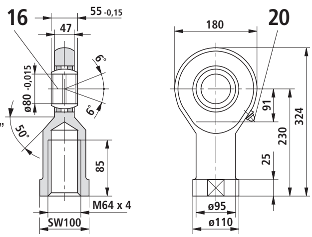
Thread version "E"



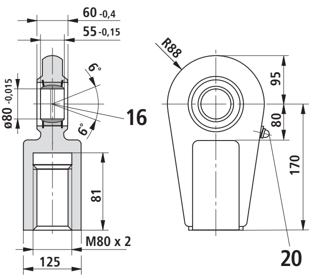
Thread version "F"



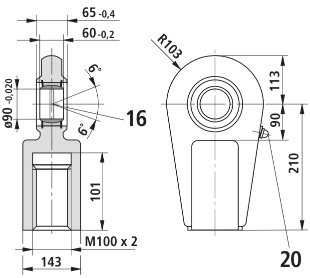
Self-aligning clevis
CGK 80
suitable for thread version "F"
Material no.: **R900001928**
Weight: 13.1 kg
Permissible load: 375 kN



Self-aligning clevis
CGA 80
suitable for thread version "F"
Material no.: **R900303132**
Weight: 12.2 kg
Permissible load: 385 kN



Self-aligning clevis
CGA 100
suitable for thread version "F"
Material no.: **R900303133**
Weight: 21.5 kg
Permissible load: 535 kN



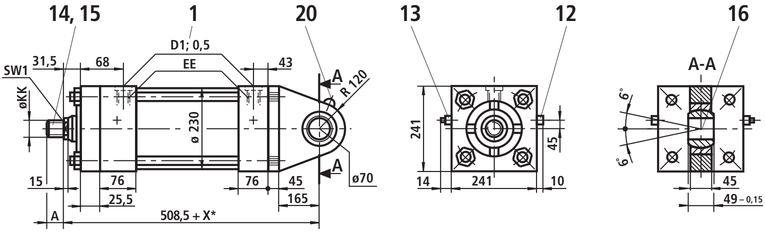
Piston rod Ø	ØRD f7	B4						B1	B2	SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
80	95.2	51						60	40	75	50	50
90	108	–						–	40	75		
125	146	–						–	28	115		

X* = stroke length

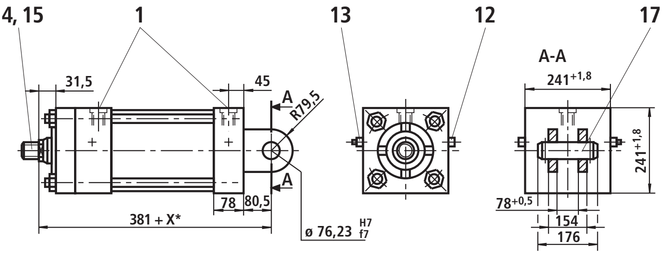
Piston Ø 200 (dimensions in mm)

For explanations of items, see page 7

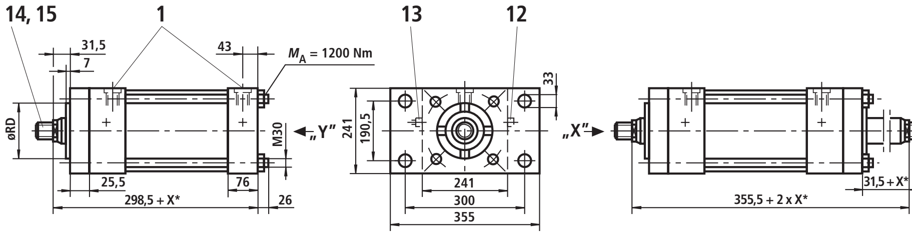
Type of mounting B Operating pressure 210 bar



Type of mounting G Operating pressure 210 bar



Type of mounting C Operating pressure with piston rod Ø 90 and Ø 100: 70 bar on cap side, 210 bar on piston rod side
Operating pressure with piston rod Ø 140: 40 bar on cap side, 210 bar on piston rod side



Stroke$_{min}$ = 120 mm with thread version "E"
(only for double-rod cylinder)

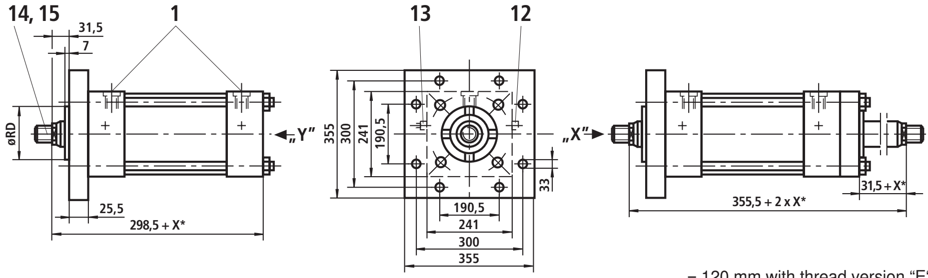
Piston rod Ø	KK Thread version			A Thread version		EE Pipe connection				D1 Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
90	M64 x 2	M76 x 2	M80 x 2	89	80								
100	M76 x 2	M95 x 2	M80 x 2	101	80	G1 1/2	–	M48 x 2	–	65	–	65	–
140	M100 x 2	M130 x 2	M110 x 2	140	110								

X* = stroke length

Piston Ø 200 (dimensions in mm)

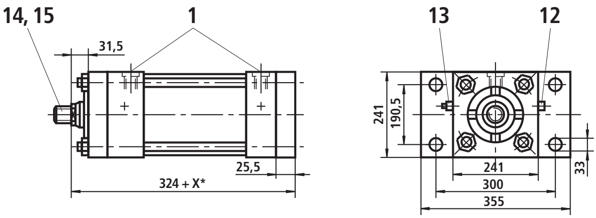
For explanations of items, see page 7

Type of mounting H Operating pressure 210 bar

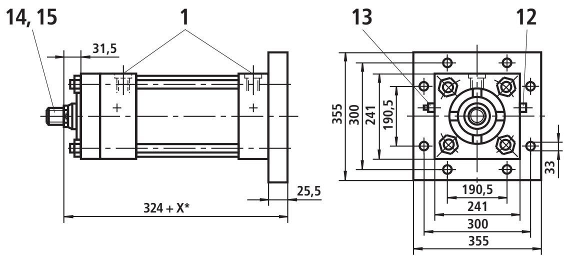


Stroke$_{min}$ = 120 mm with thread version “E“ (only for double-rod cylinder)

Type of mounting D Operating pressure with piston rod Ø 90 and Ø 100: 210 bar on cap side, 110 bar on piston rod side
Operating pressure with piston rod Ø 140: 210 bar on cap side, 150 bar on piston rod side



Type of mounting K Operating pressure 210 bar



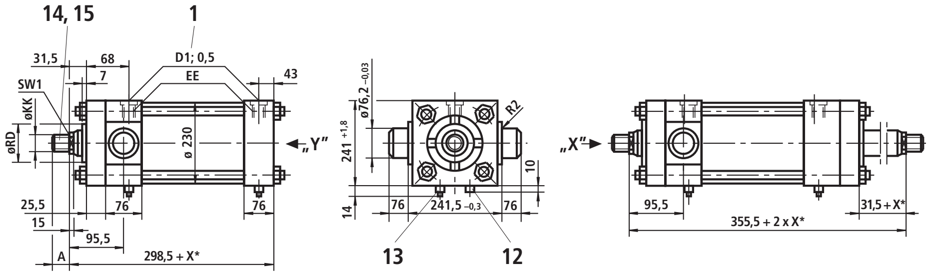
Piston rod Ø	ØRD f7									SW1	Cushioning lengths piston side	Cushioning lengths piston rod side
90	108									75	50	50
100	120									85		
140	158									120		

X* = stroke length

Piston Ø 200 (dimensions in mm)

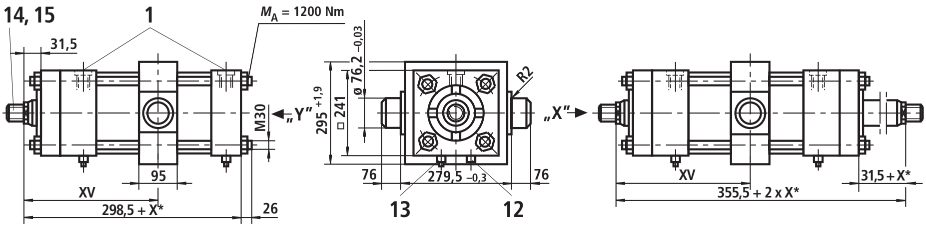
For explanations of items, see page 7

Type of mounting R Operating pressure 210 bar



Stroke$_{min}$ = 120 mm with thread version "E" (only for double-rod cylinder)

Type of mounting E Operating pressure 210 bar

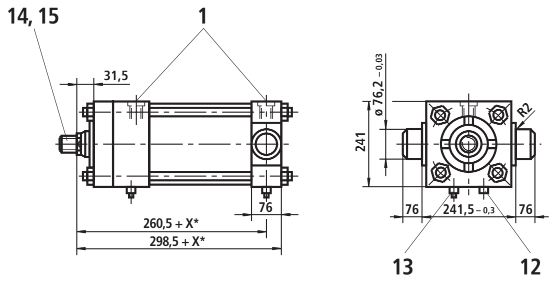


Stroke$_{min}$ = 25 mm
Always specify dimension "XV" in clear text on the order (observe XV$_{min}$ and XV$_{max}$)

Note:
Dimensions for cylinder with piston rod extension "LY" in the retracted condition, see index 2 on page 5.

Stroke$_{min}$ = 120 mm with thread version "E" (only for double-rod cylinder)

Type of mounting S Operating pressure 210 bar



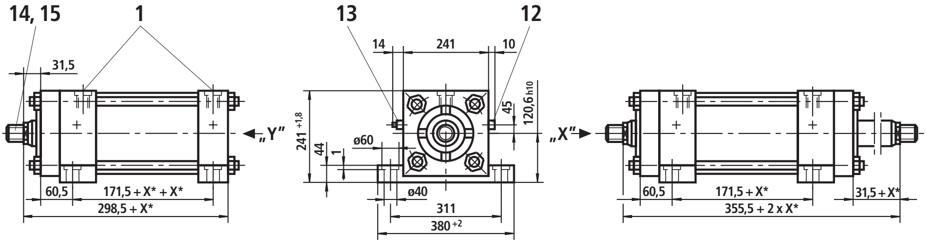
Piston rod Ø	KK			A		EE				D1			
	Thread version			Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
90	M64 x 2	M76 x 2	M80 x 2	89	80								
100	M76 x 2	M95 x 2	M80 x 2	101	80	G1 1/2	–	M48 x 2	–	65	–	65	–
140	M100 x 2	M130 x 2	M110 x 2	140	110								

X* = stroke length

Piston Ø 200 (dimensions in mm)

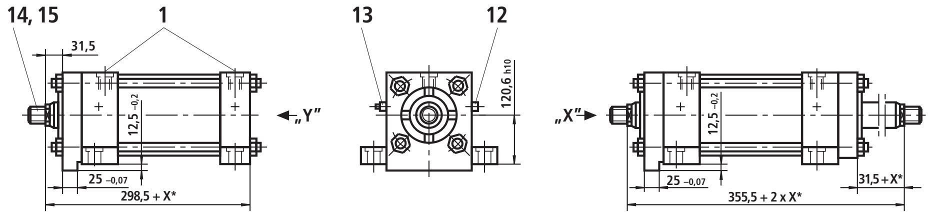
For explanations of items, see page 7

Type of mounting F Operating pressure 210 bar



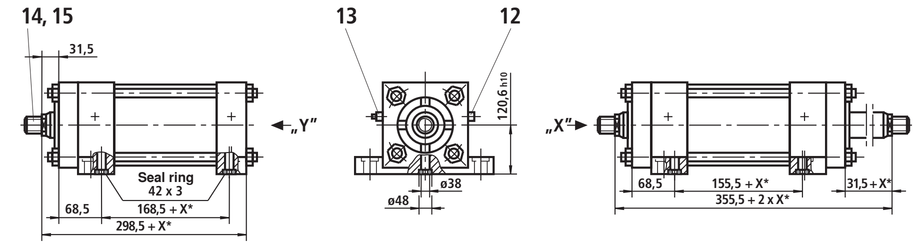
Stroke$_{min}$ = 120 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting L Operating pressure 210 bar



Stroke$_{min}$ = 120 mm with thread version "E"
(only for double-rod cylinder)

Type of mounting M Operating pressure 210 bar



Stroke$_{min}$ = 120 mm with thread version "E"
(only for double-rod cylinder)

Piston rod Ø	ØRD f7	XV [1] min.	XV [1] max.							SW1	Cushioning lengths	
											piston side	piston rod side
90	108	180.5	175 + X*							75	50	50
100	120	180.5	175 + X*							85		
140	158	180.5	175 + X*							120		

X* = stroke length

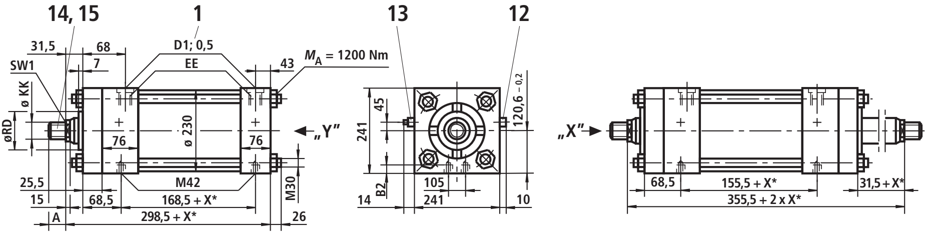
[1] Always specify dimension "XV" in clear text on the order (observe XV_{min} and XV_{max})

3

Piston Ø 200 (dimensions in mm)

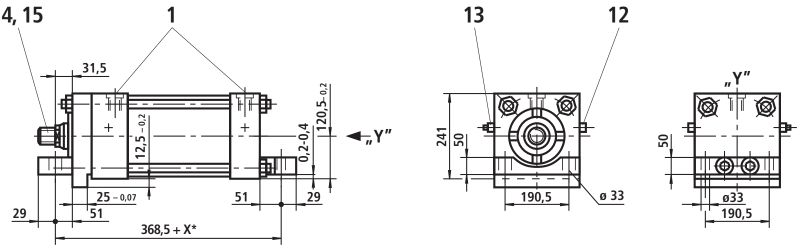
For explanations of items, see page 7

Type of mounting N Operating pressure 210 bar

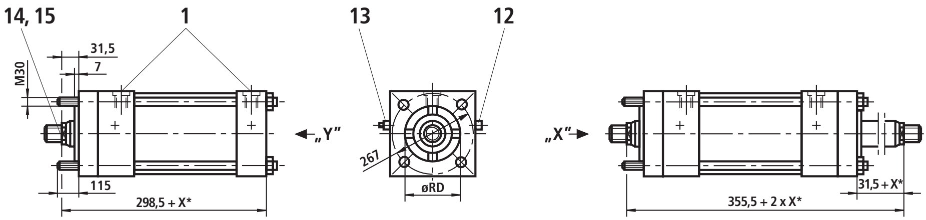


$Stroke_{min}$ = 120 mm with thread version “E“
(only for double-rod cylinder)

Type of mounting T Operating pressure 210 bar



Type of mounting P Operating pressure 210 bar



$Stroke_{min}$ = 120 mm with thread version “E“
(only for double-rod cylinder)

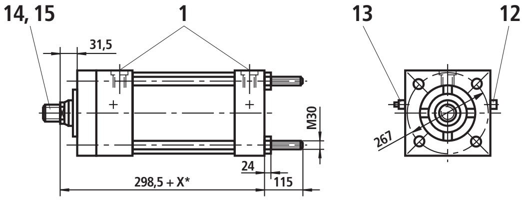
Piston rod Ø		KK		A		EE				D1			
		Thread version		Thread version		Pipe connection				Pipe connection			
	C, E	B	F	C, E, B	F	01	13	02	14	01	13	02	14
90	M64 x 2	M76 x 2	M80 x 2	89	80								
100	M76 x 2	M95 x 2	M80 x 2	101	80	G1 1/2	–	M48 x 2	–	65	–	65	–
140	M100 x 2	M130 x 2	M110 x 2	140	110								

X* = stroke length

Piston Ø 200 (dimensions in mm)

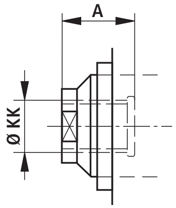
For explanations of items, see page 7

Type of mounting Q Operating pressure 210 bar

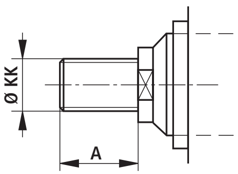


Additional thread versions

Thread version “E”

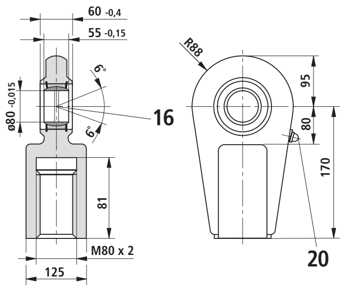


Thread version “F”



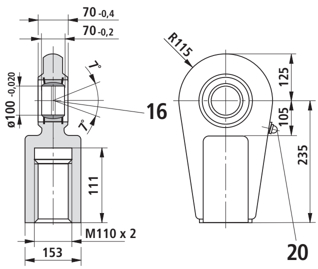
Self-aligning clevis CGA 80

suitable for thread version “F”
Material no.: **R900303132**
Weight: 12.2 kg
Permissible load: 385 KN



Self-aligning clevis CGA 110

suitable for thread version “F”
Material no.: **R900303134**
Weight: 27.5 kg
Permissible load: 660 KN



Piston rod Ø	ØRD f7							B2		SW1	Cushioning lengths piston side	piston rod side
90	108							55		75	50	50
100	120							55		85		
140	158							32		120		

X* = stroke length

Weight

Piston Ø mm		**40**			**50**			**63**			
Piston rod Ø mm		**16**	**18**	**25**	**22**	**25**	**36**	**25**	**28**	**36**	**45**
Weight in kg per 100 mm stroke	Single-rod cylinder	0.55	0.6	0.8	0.9	1.0	1.3	1.6	1.7	2.0	2.4
	Double-rod cylinder	0.75	0.8	1.2	1.2	1.3	2.1	2.0	2.2	2.6	3.6

	Type of mounting	CD (40)	CG (40)	CD (50)	CG (50)	CD (63)	CG (63)
Weight in kg with 0 stroke	B	4.7	–	7.5	–	11.3	–
	G	4.3	–	7.2	–	10.5	–
	E	5.0	5.7	8.2	9.8	11.1	13.6
	H	4.6	5.3	7.7	9.3	10.6	13.0
	K, D	4.9	–	8.4	–	11.6	–
	C, F, L, M, R, S, T	4.2	4.9	6.9	8.4	10.3	12.7
	N, P, Q,	4.0	4.7	6.4	8.0	9.3	11.7

Piston Ø mm		**80**			**100**			**125**			
Piston rod Ø mm		**36**	**45**	**56**	**45**	**50**	**70**	**50**	**56**	**63**	**90**
Weight in kg per 100 mm stroke	Single-rod cylinder	2.5	3.0	3.6	3.9	4.2	5.6	5.9	6.3	6.8	9.3
	Double-rod cylinder	3.3	4.2	5.5	4.1	5.8	8.6	7.8	8.2	9.3	14.3

	Type of mounting	CD (80)	CG (80)	CD (100)	CG (100)	CD (125)	CG (125)
Weight in kg with 0 stroke	B	21.0	–	29.5	–	54.7	–
	G	19.5	–	28.6	–	48.2	–
	E	21.3	25.5	28.3	35.1	49.5	60.5
	H	20.0	24.0	27.3	34.0	48.8	61.0
	K, D	21.8	–	27.7	–	52.5	–
	C, F, L, M, R, S, T	18.7	23.0	25.6	33.0	45.0	57.3
	N, P, Q,	17.3	21.3	23.8	30.5	42.5	54.7

Piston Ø mm		**150**				**180**			**200**		
Piston rod Ø mm		**63**	**70**	**80**	**100**	**80**	**90**	**125**	**90**	**100**	**140**
Weight in kg per 100 mm stroke	Single-rod cylinder	7.9	8.4	9.4	11.5	11.6	12.7	17.3	15.2	16.4	22.2
	Double-rod cylinder	10.4	14.0	13.4	17.7	15.6	17.7	26.9	20.2	22.6	34.3

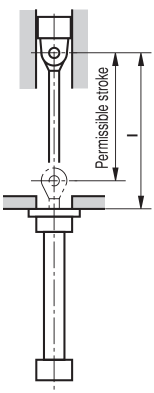
	Type of mounting	CD (150)	CG (150)	CD (180)	CG (180)	CD (200)	CG (200)
Weight in kg with 0 stroke	B	81.3	–	132.2	–	181.5	–
	G	72.0	–	119.0	–	160.0	–
	E	76.5	91.5	117.5	142.0	165.0	197.0
	H	73.5	88.5	110.5	135.0	151.0	183.0
	K, D	80.6	–	120.0	–	162.5	–
	C, F, L, M, R, S, T	68.6	83.6	106.3	131.0	145.0	177.0
	N, P, Q,	66.0	81.0	101.3	126.0	140.0	172.0

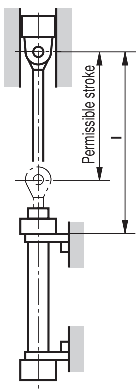
CD = Single-rod cylinder
CG = Double-rod cylinder

Permissible stroke lengths

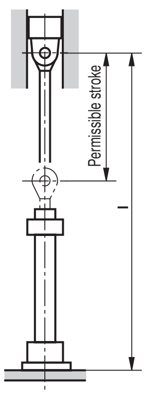
Piston Ø in mm	Piston rod Ø in mm	Mounting types: C, F, H, L, M, N, P, T				Mounting types: D, K, Q				Available maximum stroke length in mm (standard version)
		Operating pressure in bar				Operating pressure in bar				
		75	100	150	210	75	100	150	210	
		Permissible max. stroke in mm				Permissible max. stroke in mm				
40	16	560	470	370	295	195	155	105	70	1000
	18	745	635	505	415	285	230	170	130	
	25	1000	1000	1000	845	620	520	405	325	
50	22	880	750	595	490	340	280	205	155	1200
	25	1160	990	785	645	465	385	290	225	
	36	1200	1200	1200	1200	1090	925	730	600	
63	25	880	745	655	470	330	265	225	140	1400
	28	1145	975	775	640	460	380	285	220	
	36	1400	1400	1325	1100	820	690	535	430	
	45	1400	1400	1400	1400	1365	1165	920	755	
80	36	1505	1285	1025	845	615	510	390	305	1700
	45	1700	1700	1645	1365	1025	860	670	540	
	56	1700	1700	1700	1700	1670	1425	1130	925	
100	45	1875	1600	1275	1050	775	645	495	390	2000
	50	2000	1990	1585	1300	975	820	630	500	
	70	2000	2000	2000	2000	2000	1800	1430	1180	
125	50	1820	1545	1220	1000	735	610	455	350	2300
	56	2300	2005	1605	1325	990	830	640	510	
	63	2300	2300	2035	1680	1270	1070	830	665	
	90	2300	2300	2300	2300	2300	2300	1960	1625	
150	63	2450	2085	1655	1360	1010	845	645	505	2600
	70	2600	2600	2115	1755	1315	1110	865	700	
	80	2600	2600	2600	2280	1740	1465	1140	920	
	100	2600	2600	2600	2600	2600	2465	1965	1620	
180	80	2800	2800	2245	1845	1390	1165	895	710	2800
	90	2800	2800	2800	2515	1900	1615	1275	1044	
	125	2800	2800	2800	2800	2800	2800	2645	2195	
200	90	3000	3000	2690	2240	1675	1420	1120	910	3000
	100	3000	3000	3000	2845	2150	1830	1450	1190	
	140	3000	3000	3000	3000	3000	3000	2990	2485	

$S_K = l \cdot \sqrt{\frac{1}{2}}$





$S_K = l \cdot \sqrt{\frac{1}{2}}$



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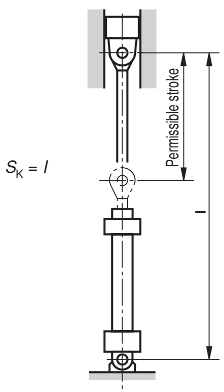
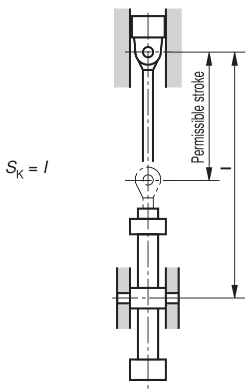
Permissible stroke lengths

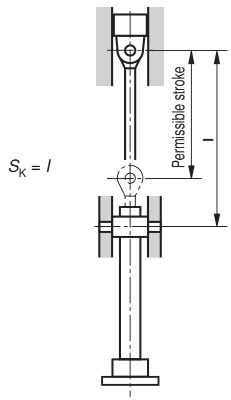
Piston Ø in mm	Piston rod Ø in mm	Mounting types: B, G, S				Mounting types: E (Position: Trunnion at the center of the cylinder)				Available maximum stroke length in mm (standard version)
		Operating pressure in bar				Operating pressure in bar				
		75	100	150	210	75	100	150	210	
		Permissible max. stroke in mm				Permissible max. stroke in mm				
40	16	95	65	30	10	195	155	105	70	1000
	18	160	120	75	45	285	230	170	130	
	25	415	340	250	190	620	520	405	325	
50	22	195	150	95	60	340	280	205	155	1200
	25	295	235	160	115	465	385	290	225	
	36	760	635	490	390	1090	925	730	600	
63	25	185	140	105	45	330	265	225	140	1400
	28	280	220	150	105	460	380	285	220	
	36	555	455	340	260	820	690	535	430	
	45	960	810	630	505	1365	1165	920	755	
80	36	380	305	215	150	615	510	390	305	1700
	45	690	570	425	325	1025	860	670	540	
	56	1175	990	770	615	1670	1425	1130	925	
100	45	495	400	285	205	775	645	495	390	2000
	50	650	530	385	290	975	820	630	500	
	70	1495	1265	990	800	2000	1800	1430	1180	
125	50	455	360	245	165	735	610	455	350	2300
	56	640	525	380	285	990	830	640	510	
	63	855	700	525	400	1270	1070	830	665	
	90	2035	1730	1365	1115	2300	2300	1960	1625	
150	63	640	510	360	255	1010	845	645	505	2600
	70	865	710	530	405	1315	1110	865	700	
	80	1180	975	735	570	1740	1465	1140	920	
	100	2045	1725	1355	1095	2600	2465	1965	1620	
180	80	900	725	525	390	1390	1165	895	710	2800
	90	1280	1065	815	640	1900	1615	1275	1044	
	125	2740	2325	1840	1500	2800	2800	2645	2195	
200	90	1095	905	675	520	1675	1420	1120	910	3000
	100	1445	1205	920	725	2150	1830	1450	1190	
	140	3000	2630	2080	1700	3000	3000	2990	2485	





Permissible stroke lengths

Piston Ø in mm	Piston rod Ø in mm	Type of mounting: R — Operating pressure in bar: 75	100	150	210	Available maximum stroke length in mm (standard version)
		Permissible max. stroke in mm				
40	16	330	270	200	150	1000
	18	455	365	270	210	
	25	990	830	650	520	
50	22	545	450	325	250	1200
	25	770	620	480	380	
	36	1200	1200	1170	960	
63	25	540	445	380	255	1400
	28	735	610	455	350	
	36	1275	1080	845	685	
	45	1400	1400	1400	1210	
80	36	985	815	625	490	1700
	45	1585	1340	1055	855	
	56	1700	1700	1700	1480	
100	45	1240	1030	790	625	2000
	50	1515	1280	995	800	
	70	2000	2000	2000	1890	
125	50	1160	970	740	585	2300
	56	1585	1330	1025	815	
	63	1965	1660	1300	1050	
	90	2300	2300	2300	2300	
150	63	1585	1330	1030	825	2600
	70	2100	1775	1385	1120	
	80	2600	2265	1780	1445	
	100	2600	2600	2600	2590	
180	80	2160	1820	1415	1135	2800
	90	2680	2270	1790	1455	
	125	2800	2800	2800	2800	
200	90	2680	2270	1790	1455	3000
	100	3000	2825	2260	1865	
	140	3000	3000	3000	3000	



Calculation of buckling

Buckling calculations are usually carried out according to Euler, because piston rods are in most of the cases to be considered as slender rods

Buckling load $K = \dfrac{\pi^2 \cdot E \cdot J}{s_K^{\,2}}$ in N

i.e. under this load, the rod buckles!

Max. operating load $F = \dfrac{K}{S}$ in N

s_K = free buckling length in mm

E = modulus of elasticity in N/mm^2 = $2.1 \cdot 10^5$ for steel

J = Mass moment of inertia in mm^4 for circular cross-section

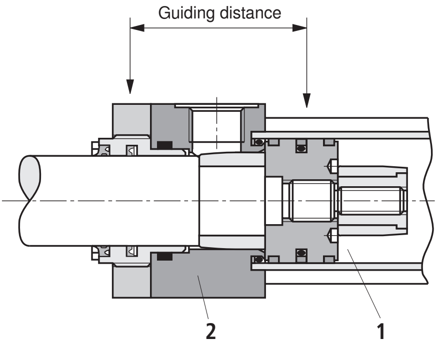
$= \dfrac{d^4 \cdot \pi}{64} = 0.0491 \cdot d^4$

S = safety (3.5)

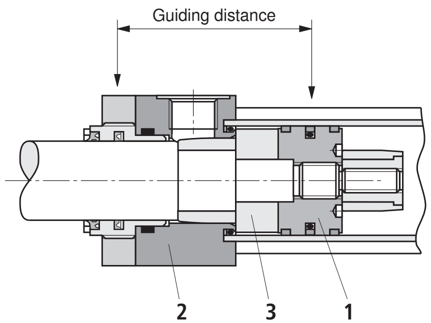
Stop tube extension

For long stroke and compressive loads, the use of a stop tube extension is recommended to avoid bearing stress when the piston rod is extended. With this solution, a spacer bushing (3) is installed between piston (1) and cylinder head (2). This spacer bushing extends the lever arm, thus reducing the load on the bearings.

Without stop tube extension



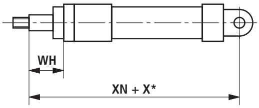
With stop tube extension

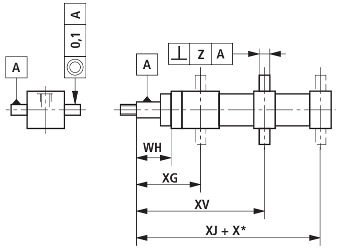


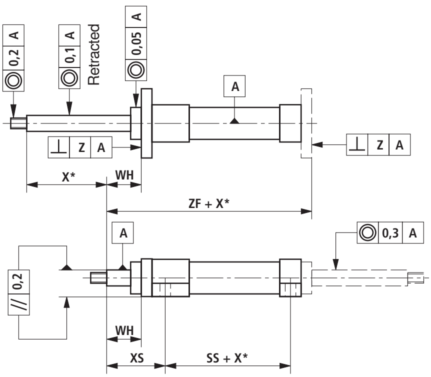
Ordering code	Stop tube extension in mm for all piston Ø							
	–	25	50	75	100	125	150	175
Type of mounting	**Stroke length in mm**							
B, G, S	Up to 500	501 to 625	626 to 750	751 to 875	876 to 1000	1001 to 1125	1126 to 1250	1251to 3000
C, F, H, L	Up to 1425	1426 to 1785	1786 to 2150	2151 to 2500	2501 to 2860	2861 to 3000	–	–
D, E, K, Q	Up to 665	666 to 835	836 to 1000	1001 to 1165	1166 to 1335	1336 to 1500	1501 to 1665	1666 to 3000
R	Up to 1000	1001 to 1250	1251 to 1500	1501 to 1750	1751 to 2000	2001 to 2250	2251 to 2500	2501 to 3000
M, N, P, T	Up to 1425	1426 to 1785	1786 to 2150	2151 to 2500	2501 to 2860	2861 to 3000	–	–

Installation length of cylinder with stop tube extension:
Installation length according to unit dimensions + stop tube extension
(The trunnion position of type of mounting E and R remains unchanged.)

Installation lengths and position tolerances





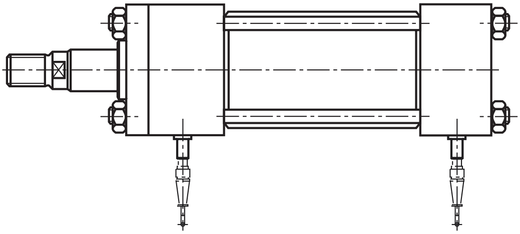


Stroke length in mm	Up to 1250	1251 to 2000	2001 to 3000
Stroke tolerance in mm	+1 –1.5	+1 –2	+1 –3
WH	±2	±2	+3 –2
ZF	±1	±1.5	±2
XS	±2	±2	+3 –2
SS	±1.25	+1.5 –2	+1.5 –3
XG	±2	±2	+3 –2
XV	±2	±2	±2
XJ	±2	±2	±2
XN	±1.25	±2	±2
Z	0.1 / 100		

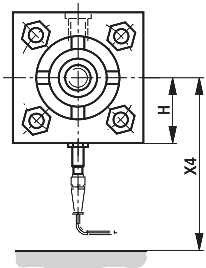
Always specify dimension “XV” in clear text on the order (observe XV_{min} and XV_{max})

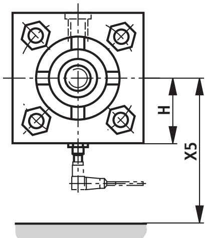
X* = stroke length

Inductive proximity switch (please state in clear text on the order, dimensions in mm)

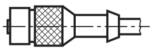


Types of mounting

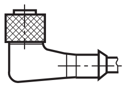




Mating connector with 5 m cable
Material no. **R900026512**
(Mating connector is **not** included in the scope of supply, but must be ordered separately)



Mating connector, angled with 5 m cable
(Position of cable outlet cannot be defined)
Material no. **R900021404**
(Mating connector is **not** included in the scope of supply, but must be ordered separately)



Piston Ø	Piston rod Ø	H	X4	X5
40	**16**	42.5	172	127
	18			
	25			
50	**22**	42.5	175	130
	25			
	36	48		
63	**25**	44.5	180	135
	28			
	36	53		
	45			
80	**36**	57	185	140
	45	60		
	56			

Piston Ø	Piston rod Ø	H	X4	X5
100	**45**	63.5	195	150
	50			
	70	67.5		
125	**50**	82.5	205	160
	56			
	63			
	90			
150	**63**	85	230	185
	70			
	80			
	100			
180	**80**	108	235	190
	90			
	125			
200	**90**	120.5	245	200
	100			
	140			

Notes:
- Installation position: 180° opposite to the line connections
- Pipe connection: For enlarged line connections, please consult us
- Type of mounting: With mounting types F, L, M, N and T, the installation 180° opposite to the line connection is impossible
- For mounting types and unit dimensions, see pages 8 to 61

Proximity switch

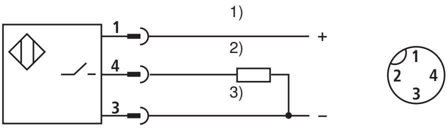
Inductive proximity switches are used for reliably checking the end positions of hydraulic cylinders. They are an important component for reliably and precisely monitoring safety equipment, locking mechanisms and/or other machine functions in their end position by issuing corresponding signals.

The proximity switch, which is high pressure-tight up to 500 bar, operates contact-free and floating. For this reason, it is wear-free. For safety reasons, the proximity switch is protected against being screwed in too deeply. The switching distance can therefore not be adjusted. Cylinder variants with proximity switch (option 1 “E“) are fitted with proximity switches on both sides.

Technical data (for applications outside these parameters, please consult us!)

Operating principle		PNP normally open
Permissible pressure	bar	500
Operating voltage	V DC	10 to 30
Including residual ripple content	%	≤ 15
Voltage drop	V	≤ 1.5
Rated operating voltage	V DC	24
Rated operating current	mA	200
No-load current	mA	≤ 8
Residual current	µA	≤ 10
Repeatability	%	≤ 5
Hysteresis	%	≤ 15
Ambient temperature range	°C	–25 to +80
Thermal drift	%	≤ 10
Switching frequency	Hz	1000
Type of protection to	Active area	IP 68
DIN EN 60529	Proximity switch	IP 67
Housing material		Material no. 1.4104

Pinout

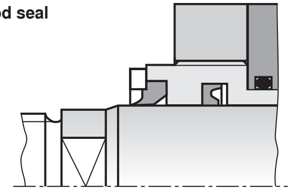


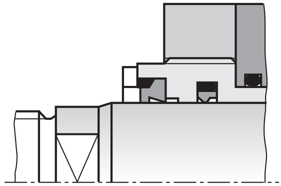
1) Brown
2) Black
3) Blue

3

Seals (standard versions)

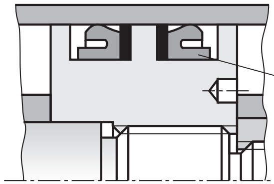
Piston rod seal





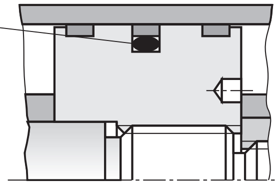
Variant for piston rod Ø 50,
63 and 80 mm

Piston seal



Version "T"
Slide ring for low-friction operation

Version "A"
Lip seal rings for leak-free operation under steady-state conditions



End position cushioning

End position cushioning at cylinder cap

Piston (1) is screwed directly to the piston rod, cushioning bush (2) by means of threaded bushing (3).

As the tapered cushioning bush retracts into the bore of cylinder cap (4) the cross-section for the fluid flowing out of piston chamber (5) reduces until it becomes zero. The fluid can then only flow out of piston chamber (5) through bore (6) and adjustable throttle valve (7). The cushioning effect can be regulated on throttle valve (7). The smaller the flow cross-section, the greater the effect of end position cushioning.

Adjustable throttle valve for end position cushioning

The design of the throttle valve prevents throttling pin (8) from being turned out completely when end position cushioning is adjusted.

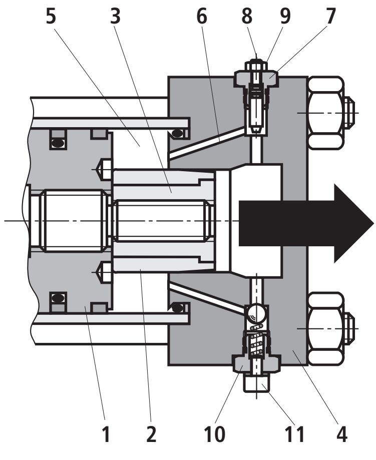
The setting made for end position cushioning is secured by locknut (9).

Check valve with bleed screw

Check valve (10) serves as extension aid from the end position. It by-passes the throttling point while the cylinder is extending.
The cylinder is bled via bleed screw (11).

This bleed screw is provided as standard on cylinders without end position cushioning.

Throttle valve and check valve are designed as installation kits and can be interchanged.



Calculation of braking force

End position cushioning must ensure a controlled deceleration (braking) of the stroke velocity in both end positions.

The total of the effective energies must not exceed the maximum work capacity of cushioning.

The energy to be decelerated is converted into heat in the cushioning zone, which operates according to the principle of fluid flow throttling.

Calculation of braking force

The braking force of a horizontally installed hydraulic cylinder can be calculated as follows:

Extension movement:

$$\boxed{F_B = m \cdot a + A_K \cdot p}$$

Retraction movement

$$\boxed{F_B = m \cdot a + A_R \cdot p}$$

F_B = braking force in N
m = moved mass in kg
a = deceleration in m/s²

$$\boxed{a = \frac{v^2}{2 \cdot s}}$$

v = stroke velocity in m/s
s = cushioning length in m
A_K = piston area in cm²
A_R = annulus area in cm²
p = system pressure in N/cm²

$$\boxed{1 \text{ bar} \sim 10 \text{ N/cm}^2}$$

For vertical strokes of the cylinders, the weight force (consisting of external load, piston and piston rod) must be added to or subtracted from braking force $\boldsymbol{F}_B$ depending on the direction of movement.

The cylinder‘s internal friction is neglected in this calculation.

Calculation of the average cushioning pressure

Under normal operating conditions, the cushioning pressure must not exceed the nominal pressure of the cylinder.

$$\boxed{p_D = \frac{F_B}{A_D}}$$

p_D = average cushioning pressure in N/cm²
F_B = braking force in N
A_D = effective cushioning area in cm²

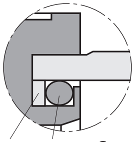
$$\boxed{1 \text{ bar} \sim 10 \text{ N/cm}^2}$$

If this calculation results in too high a value, the cushioning length must be extended or the system pressure reduced.

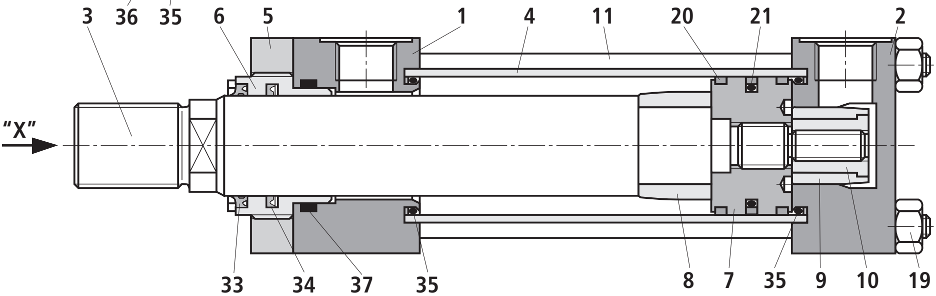
3

Spare parts drawing

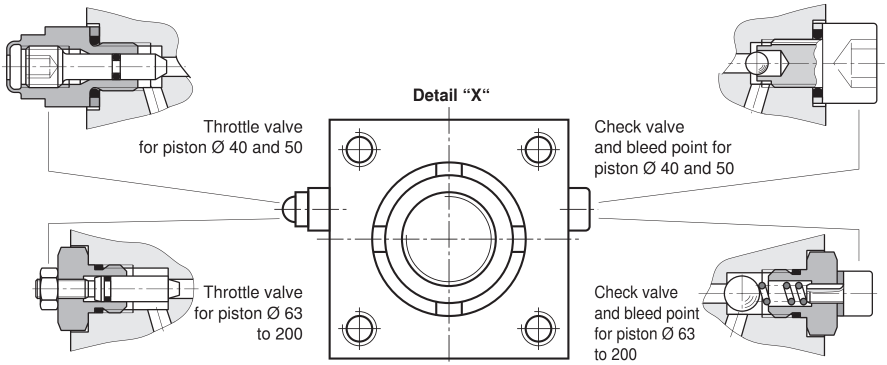
Variant for piston Ø 40 to 200



1	Head	**6**	Guide bush	**11**	Tie rod	**33**	Wiper
2	Cap	**7**	Piston	**19**	Nut	**34**	Piston rod seal
3	Piston rod	**8**	Cushioning bush	**20**	Guide band	**35**	Seal ring
4	Cylinder barrel	**9**	Cushioning bush	**21**	Piston seal (variant "T")	**36**	Back-up ring
5	Flange	**10**	Threaded bushing			**37**	Seal ring



Throttle and check valve in cylinder head and cylinder cap



Ordering spare parts:

- When ordering individual parts, please indicate the designation and item no. from the spare parts drawing with complete type code of the hydraulic cylinder
- For seal kits, please indicate the complete type code of the hydraulic cylinder.

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Bosch Rexroth Teknik AB
Varuvägen 7, Älvsjö
S-125 81 Stockholm
Phone +46 (08) 72 79 20 0
Fax +46 (08) 86 87 21
cyl.hyd@boschrexroth.se
www.boschrexroth.se

Bosch Rexroth SA
BP 37 - Z.I. Les Fourmis
F-74131 Bonneville Cedex
Phone +33 (0) 4 50 25 35 45
Fax +33 (0) 4 50 25 35 19
www.boschrexroth.fr

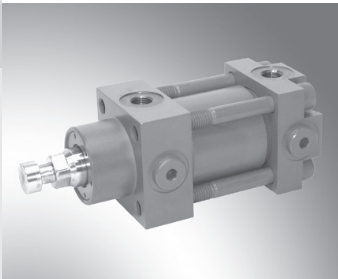
Rexroth
Bosch Group

Hydraulic cylinder
Tie rod design

RE 17047/11.03

Type VBH

Nominal pressure 200 bar (20 Mpa)
Piston Ø 25 to 125 mm
Piston rod Ø 16 to 70 mm
4 mounting styles



17047.tif

Overview of contents

Features

– Standards: CNOMO 05-07-65 to 05-07-70
– Standard stroke lengths from 5 to 160 mm
– Without end position cushioning
– 3 / 2 connections at cylinder head and base

Ordering details

					G

Design

Differential cylinder	= **HVBS**
Differential cylinder with sensor rod	= **HVBD**

Piston Ø / Piston rod Ø in mm

25 / 16	= **02**
32 / 18	= **03**
40 / 22	= **04**
50 / 28	= **05**
63 / 36	= **06**
80 / 45	= **08**
100 / 56	= **10**
125 / 70	= **12**

Stroke length (standard) in mm 1)

5	= **A**
10	= **B**
16	= **C**
25	= **D**
40	= **E**
63	= **F**
100	= **G** 2)
160	= **H** 3)

Mounting style + Piston rod end 4)

	Mounting style		Piston rod end
1 =	Threads in cylinder head	+	Thread
2 =	Rectangular flange at head	+	Thread
3 =	Foot mounting at head	+	Thread
4 =	Self-aligning clevis at base	+	Thread
5 =	Threads in cylinder head	+	Spigot
6 =	Rectangular flange at head	+	Spigot
7 =	Foot mounting at head	+	Spigot
8 =	Self-aligning clevis at base	+	Spigot

Seal version

H = Normal temperature

V 5) = High temperature

Pipe connections

G = Pipe thread to ISO 228/1

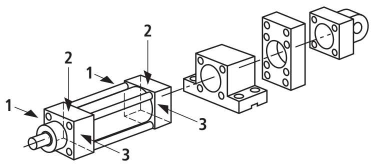
1) Intermediates stroke with pressure limitation on request!

2) Only piston Ø 32 to 125 mm

3) Only piston Ø 40 to 125 mm

4) Other piston rod end versions on request!

5) Only for the HVBS version!
The HVBD version can be supplied as a special variant with V-seals (with the exception of the seals on the sensor rod), please consult ourselves.



The cylinders have, as standard, 3 or 2 pipe connections at the cylinder head and base, this is dependent on the mounting style. See table to the right.

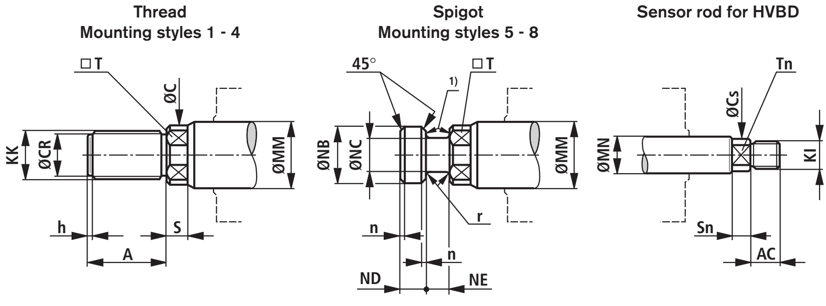
Orientation 2 is supplied, the other connections are plugged with easy to remove plugs.

	Connection orientation	
Mounting style	**Head end**	**Base end**
1, 2, 5, 6	2 + 3	1 + 2 + 3
4, 8	2 + 3	
3, 7	1 + 2 + 3	

This range of cylinders with their integrated mounts and no-end position cushioning are of a very short design and are therefore preferred for applications were the available installation space is very small, short strokes, low speed, low weight and low internal leakage for maintaining the pressure is required.

Example: Clamping devises, core ejectors or parts involved in mould manufacturing

Piston rod ends (in mm)



1) Force transmission surface

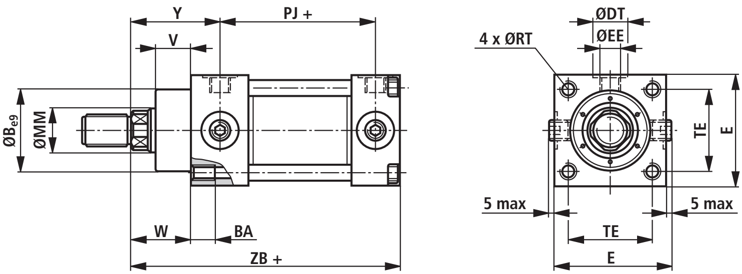
AL Ø	MM Ø	KK	A	CR	h	C	T	S	NB h13	NC h13	ND h13	NE H11	n	r	p_{max} bar	MN	AC	KI	Cs	Sn	Tn
25	**16**	M12x1.25	20	9.5	2.5	14	12	8	14	8	6	6	0.2	0.3	180	10	10	M8x1.25	9.5	5	8
32	**18**	M12x1.25	20	9.5	2.5	15	13	8	15	9	6	6	0.2	0.3	115	10	10	M8x1.25	9.5	5	8
40	**22**	M16x1.5	25	13	3	19	17	8	18	11.2	8	8	0.2	0.5	125	12	12	M10x1.5	12	6	10
50	**28**	M20x1.5	32	17	3	25	22	8	22.4	14	10	10	0.2	0.5	115	12	12	M10x1.5	12	6	10
63	**36**	M27x2	40	23.5	3	33	30	12.5	28	18	12.5	12.5	0.3	0.8	130	12	12	M10x1.5	12	6	10
80	**45**	M33x2	50	29.5	3	42	36	12.5	35.5	22.4	16	16	0.3	0.8	110	12	12	M10x1.5	12	6	10
100	**56**	M42x2	63	38.5	5	53	46	14	45	28	20	20	0.5	1.2	125	16	16	M12x1.25	15	8	13
125	**70**	M56x2	80	48.5	5	67	60	14	56	35.5	25	25	0.5	1.2	115	16	16	M12x1.25	15	8	13

Technical data (for applications outside these parameters, please consult us!)

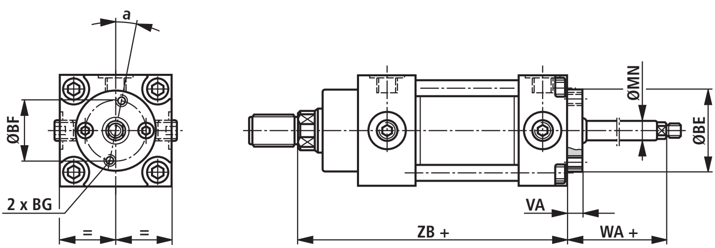
General			
Installation			Optional
Maximum stroke speed	v_{max}	m/s	0.2 for piston Ø < 80
		m/s	0.1 for piston Ø > 80
Recommended maximum end stop velocity		mm/s	< 10
Stroke tolerance		mm	+2
Hydraulic			
Maximum operating pressure	p_{max}	bar	200 bar for standard strokes (cover attached by means of screws) with external threads; limited to 160 bar for intermediate strokes and tie rods (special version); for piston rod end spigots see dimension table
Pressure fluid temperature range	H-seals	°C	–20 to +80
	V-seals	°C	–20 to +160
Cleanliness class to ISO code			Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15
Viscosity range		mm^2/s	2.8 to 380

Mounting styles 1 and 5: threads on cylinder head (in mm)

HVBS to CNOMO 05.07.66



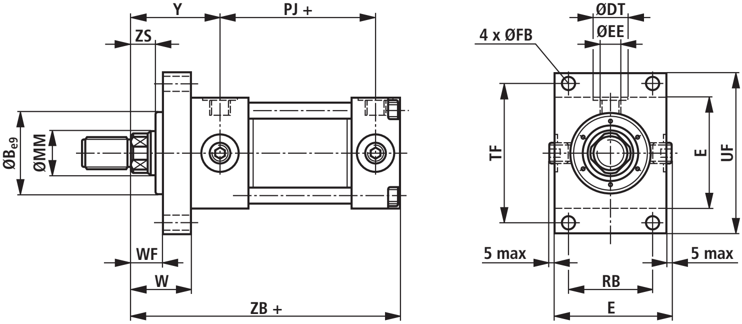
HVBD sensor rod to CNOMO 05.07.70



AL Ø	MM Ø	a	B e9	BA	BE	BF	BG	DT	E	EE	MN	PJ	RT	TE	V	VA	W	WA	Y	ZB
25	**16**	–	36	12	36	25	M5	19	45	1/8	10	34	M6	34	16	8	28	20	46	92
32	**18**	–	40	12	36	25	M5	19	56	1/8	10	45	M8	42	20	8	32	20	48	102
40	**22**	–	45	12	42	32	M6	25	63	1/4	12	45	M10	45	25	12	40	32	55	115
50	**28**	–	56	12	42	32	M6	25	75	1/4	12	53	M10	56	28	12	40	32	57	125
63	**36**	15°	63	18	63	50	M6	28	85	3/8	12	56	M12	65	28	12	45	32	71	145
80	**45**	–	80	18	63	50	M6	28	106	3/8	12	63	M16	80	32	12	50	32	74	152
100	**56**	–	100	24	80	63	M8	34	125	1/2	16	70	M18	97,5	38	15	58	35	81	177
125	**70**	–	125	24	80	63	M8	34	160	1/2	16	80	M20	125	40	15	63	35	93	198

Mounting styles 2 and 6: rectangular flange at head (in mm)

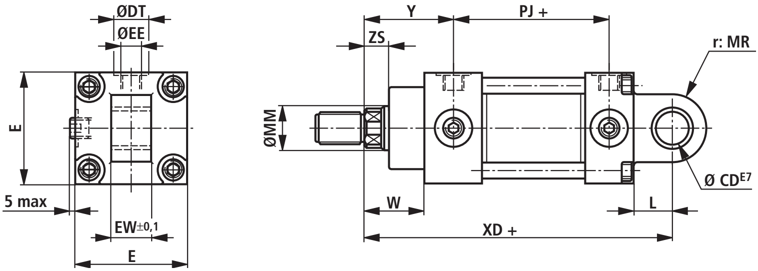
HVBS to CNOMO 05.07.67



HVBD sensor rod: see page 4

Mounting styles 4 and 8: self-aligning clevis at base (in mm)

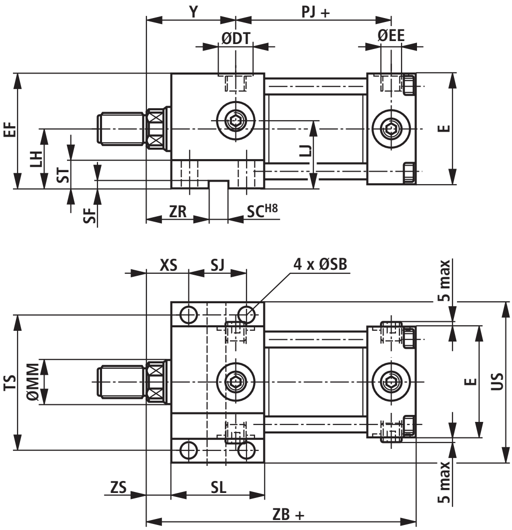
HVBS to CNOMO 05.07.69



AL Ø	MM Ø	B e9	CD E7	DT	E	EE	EW ± 0,1	L	MR	PJ	RB	TF	UF	W	WF	XD	Y	ZB	ZS
25	**16**	36	12	19	45	1/8	16	20	14	34	34	56	70	28	16	112	46	92	12
32	**18**	40	12	19	56	1/8	16	20	14	45	36	71	86	32	16	122	48	102	12
40	**22**	45	16	25	63	1/4	20	25	16	45	45	80	100	40	20	140	55	115	15
50	**28**	56	20	25	75	1/4	25	25	20	53	50	95	115	40	16	150	57	125	12
63	**36**	63	25	28	85	3/8	32	32	25	56	65	104	124	45	21	177	71	145	17
80	**45**	80	32	28	106	3/8	40	40	32	63	80	132	160	50	22	192	74	152	18
100	**56**	100	40	34	125	1/2	50	56	40	70	98	155	185	58	24	233	81	177	20
125	**70**	125	50	34	160	1/2	63	63	50	80	125	195	230	63	27	261	93	198	23

Mounting styles 3 and 7: foot mounting at head (in mm)

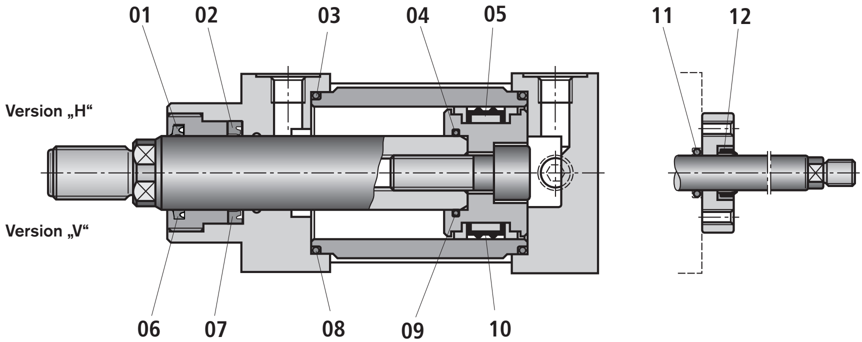
HVBS **to CNOMO 05.07.68**



HVBD **sensor rod: see page 4**

AL Ø	MM Ø	DT	E	EE	EF	LH	LJ	PJ	SB	SC H8	SF	SJ	SL	ST	TS	US	XS	Y	ZB	ZR	ZS
25	**16**	19	45	1/8	47.5	25	30	34	6.6	12	4	32	45	12	56	70	18.5	46	92	28.5	12
32	**18**	19	56	1/8	59	31	32	45	9	12	4	32	50	12	71	86	21	48	102	31	12
40	**22**	25	63	1/4	67.5	36	45	45	11	12	6	36	55	20	80	100	24.5	55	115	36.5	15
50	**28**	25	75	1/4	80	42.5	45	53	11	12	6	40	60	20	95	115	22	57	125	36	12
63	**36**	28	85	3/8	87.5	45	57	56	14	16	6	45	70	25	104	124	29.5	71	145	44	17
80	**45**	28	106	3/8	109	56	60	63	18	16	6	50	80	25	132	160	33	74	152	50	18
100	**56**	34	125	1/2	129.5	67	70	70	20	16	6	56	90	32	155	185	37	81	177	57	20
125	**70**	34	160	1/2	162	82	82	80	22	20	6	63	100	36	195	230	41.5	93	198	63	23

Spare parts



AL	Seal version			
	H	V	H	Tightening torque
Ø	Pos. 01 – 05	Pos. 06 – 10	Pos. 11 + 12	Nm
25	1 817 010 900	1 817 010 908	7472 Z0Z 850	6,5
32	1 817 010 901	1 817 010 909	7472 Z0Z 850	16
40	1 817 010 902	1 817 010 910	7472 Z0Z 851	31
50	1 817 010 903	1 817 010 911	7472 Z0Z 851	35
63	1 817 010 904	1 817 010 912	7472 Z0Z 852	60
80	1 817 010 905	1 817 010 913	7472 Z0Z 852	90
100	1 817 010 906	1 817 010 914	7472 Z0Z 853	200
125	1 817 010 907	1 817 010 915	7472 Z0Z 853	320

Weight (in kg)

AL	Mounting style				Stroke
Ø	1 / 5	2 / 6	3 / 7	4 / 8	100 mm
25	1.0	1.2	1.1	1.1	0.55
32	1.7	2.2	1.8	1.8	0.70
40	2.5	3.3	2.7	2.7	0.90
50	3.5	4.7	3.8	3.8	1.50
63	5.3	6.7	5.8	5.8	2.30
80	8.6	10.8	9.4	9.6	3.80
100	14.0	18.0	15.3	16.2	5.60
125	26.0	33.0	27.8	30.6	8.90

Notes

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Cylinder accessories

4

The Drive & Control Company

Rexroth
Bosch Group

Mounting elements for hydraulic cylinders

Mounting elements

RE 17042
Edition: 2013-07
Replaces: 13.06

H3121_d

Features

Mounting elements:

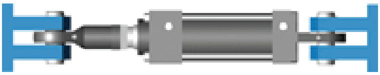
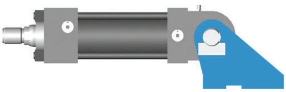
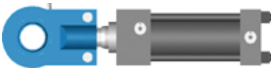
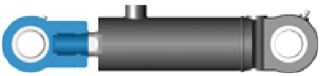
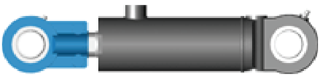
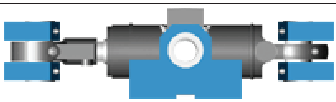
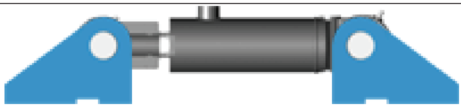
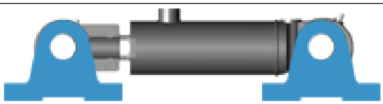
- Plain clevis
- Swivel head
- Fork clevis
- Bearing bracket
- Clevis bracket and eye bracket
- Trunnion bracket
- Bolts

Contents

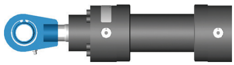
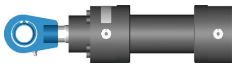
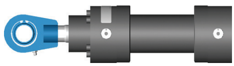
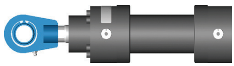
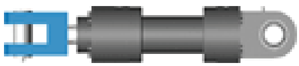
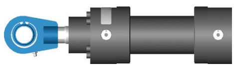
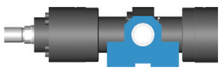
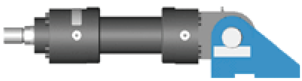
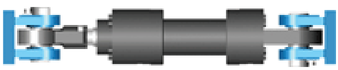
Project planning software **I**nteractive **C**atalog **S**ystem

Online www.boschrexroth.com/ics

Mounting element overview

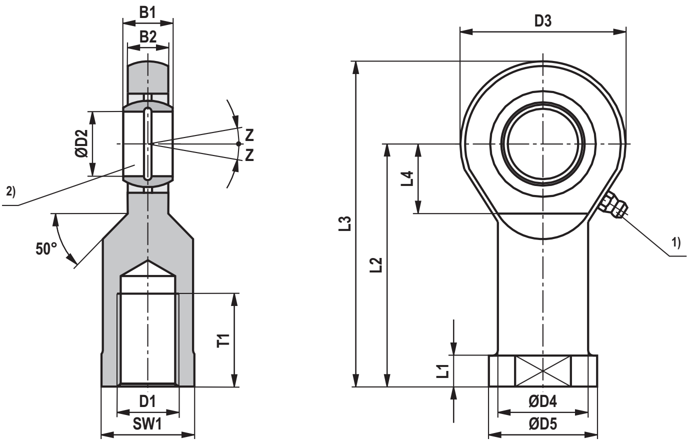
Assembly (symbolic representation)	Denomination / type	To be attached to series	Page
	Swivel head CGK ISO 12240-4	CD70/CG70 CD210/CG210	4, 5
	Clevis bracket CLCC		6, 7
	Fork clevis CCKA		8
	Eye bracket CLEA		9
	Clevis bracket (clampable) CLCB ISO 8133 DIN 24556	CDT3/CGT3/CST3	10, 11
	Trunnion bracket CLTA		12, 13
	Swivel head (clampable) CGKA ISO 8133 DIN 24555		14
	Swivel head CGKL ISO 12240-4	CDL2	15
	Swivel head (clampable) CGKD ISO 8132		16, 17
	Trunnion bracket CLTB ISO 8132		18, 19
	Clevis bracket (clampable) CLCA ISO 8132 form B		20, 21
	Clevis bracket (clampable) CLCD ISO 8132 form A		22, 23

Mounting element overview

Assembly (symbolic representation)	Denomination / type	To be attached to series	Page
	Plain clevis CSA	CDH1/CGH1/CSH1 CDH3/CGH3/CSH3	24, 25
	Swivel head CGA		26, 27
	Swivel head (clampable) CGAK		28, 29
	Swivel head (clampable) CGAS		30, 31
	Fork clevis (clampable) CCKB ISO 8132	CDH2/CGH2/CSH2 CDM1/CGM1/CSM1	32, 33
	Swivel head (clampable) CGKD ISO 8132		34, 35
	Trunnion bracket CLTB ISO 8132		36, 37
	Clevis bracket (clampable) CLCA ISO 8132 form B		38, 39
	Clevis bracket (clampable) CLCD ISO 8132 form A		40, 41

Dimensions: Swivel head CGK for series CD70/CG70 and CD210/CG210 (dimensions in mm)

ISO 12240-4



Series CD70 / CG70 ØAL	Series CD210 / CG210 ØAL	Series CD210 / CG210 ØMM	Type	Material no.	B1 -0,12	B2	D1	ØD2 h5	D3 max.	ØD4 max.	ØD5 max.
25	–	–	CGK 10 [3]	R900001653	9	7	M10	10	30	16	20
32	–	–	CGK 12 [3]	R900001327	10	8	M12	12	35	19	23
40	40	16	CGK 15 [4]	R900001328	12	10	M14	15	41	22	27
		18									
50	40	25	CGK 20 [4]	R900001329	16	13	M20x1,5	20	54	28	36
	50	22									
		25									
63	50	36	CGK 25	R900001330	20	17	M24x2	25	65	35	44
	63	25									
		28									
80	63	36	CGK 30	R900001331	22	19	M30x2	30	75	42	52
		45									
	80	36									
–	80	45	CGK 35	R900012486	25	21	M36x3	35	84	47	60
100	80	56	CGK 40	R900001332	28	23	M39x3	40	94	52	67
125	100	45	CGK 45	R900001333	32	27	M42x3	45	104	58	72
150	100	50	CGK 50	R900001334	35	30	M45x3	50	114	62	77
		70									
	125	50									
		56									
200	125	63	CGK 60	R900001335	44	38	M52x3	60	137	70	90
		63									
	150	90									
		70									
–	150	80	CGK 80	R900001928	55	47	M64x4	80	182	95	112
		100									
	180	80									

Dimensions: Swivel head CGK for series CD70/CG70 and CD210/CG210 (dimensions in mm)

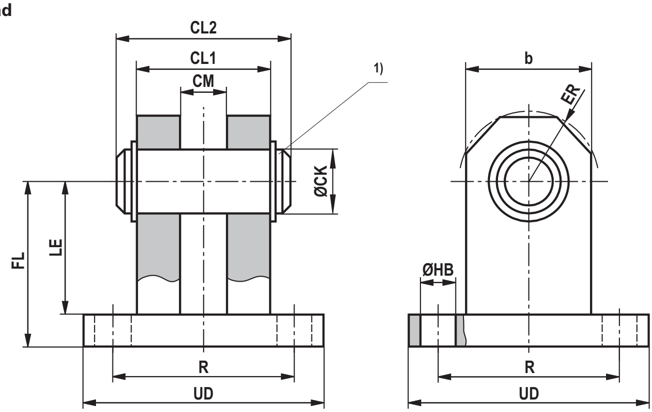
Series CD70 / CG70 ØAL	CD210 / CG210 ØAL	CD210 / CG210 ØMM	Type	L1	L2	L3 max.	L4 min.	T1 min.	SW1 5)	Z 5)	*m* kg	C_0 6) kN	F_{adm} 7) kN
25	**–**	**–**	**CGK 10** 3)	6,5	43	60	13	15	15 / 16	12° – 15°	0,07	17,6	5,8
32	**–**	**–**	**CGK 12** 3)	7	50	69	17	18	19	10° – 11°	0,1	24,5	8,1
40	**40**	**16**	**CGK 15** 4)	8	61	83	19	21	22	8° – 12°	0,16	36	11,9
		18											
50	**40**	**25**	**CGK 20** 4)	10	77	106	24	30	30 / 32	9°	0,34	60	19,8
	50	**22**											
		25											
63	**50**	**36**	**CGK 25**	12	94	128	30	36	36	7°	0,6	83	27,4
	63	**25**											
		28											
80	**63**	**36**	**CGK 30**	15	110	149	34	45	41 / 46	6°	0,9	110	36,3
		45											
	80	**36**											
–	**80**	**45**	**CGK 35**	15	125	169	40	60	50	6°	1,4	146	48,2
100	**80**	**56**	**CGK 40**	18	142	191	46	65	55	7°	2,0	180	59,4
125	**100**	**45**	**CGK 45**	20	145	199	50	65	60 / 65	7°	2,7	240	79,2
150	**100**	**50**	**CGK 50**	20	160	219	58	68	65 / 70	6°	3,5	290	95,7
		70											
	125	**50**											
		56											
200	**125**	**63**	**CGK 60**	20	175	246	73	70	75	6°	5,6	450	148,5
		63											
	150	**90**											
		70											
–	**150**	**80**	**CGK 80**	25	230	324	98	85	100	6°	13,1	750	247,5
		100											
	180	**80**											

ØAL = piston Ø
ØMM = piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Bolt Ø m6 required
3) Cannot be re-lubricated
4) Can be re-lubricated via lubricating hole in housing
5) Dimensions may differ depending on the manufacturer
6) C_0 = static load rating of the swivel head
7) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

Notice!
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Clevis bracket CLCC for series CD70/CG70 and CD210/CG210 (dimensions in mm)

Suitable for swivel head type CGK... or CGA...



Series CD70 / CG70 ØAL [2]	CD70 / CG70 ØAL [3]	CD210 / CG210 ØAL	CD210 / CG210 ØMM	CD210 / CG210 ØAL [3]	Type	Material no.	ØCK H9 [1]	CL1 h16	CL2 max.	CM A12	FL js12
25	–	–	–	–	CLCC 10	R900318440	10	25	37	9	35
32	25	–	–	–	CLCC 12	R900318423	12	25	37	10	35
	32	–	–								
40	40	40	16	40	CLCC 15	R900318468	15	35	48	12	45
			18								
50	50	40	25	50	CLCC 20	R900318469	20	50	64	16	58
	63	50	22								
			25								
63	80	50	36	63	CLCC 25	R900318470	25	60	74	20	75
	100	63	25								
			28								
80	125	63	36	–	CLCC 30	R900318471	30	60	74	22	75
			45								
		80	36								
–	150	80	45	80	CLCC 35	R900318472	35	70	93	25	90
100	–	80	56	100	CLCC 40	R900318473	40	70	93	28	90
125	200	100	45	125	CLCC 45	R900318481	45	110	133	32	125
150	–	100	50	150	CLCC 50	R900318482	50	110	133	35	125
			70								
		125	50								
			56								
200	–	125	63	180	CLCC 60	R900318483	60	125	148	44	155
			90								
		150	63								
			70								
–	–	150	80	–	CLCC 80	R900318477	80	140	163	55	130
			100								
		180	80								
–	–	180	90	–	CLCC 81	R900318478	80	140	163	60	150
		200	90								
			100								
–	–	180	125	–	CLCC 90	R900318479	90	140	163	65	150
–	–	200	140	–	CLCC 100	R900318480	100	150	175	70	165
–	–	–		200	CLCC 70	R900318484	70	125	148	49	155

Dimensions: Clevis bracket CLCC for series CD70/CG70 and CD210/CG210 (dimensions in mm)

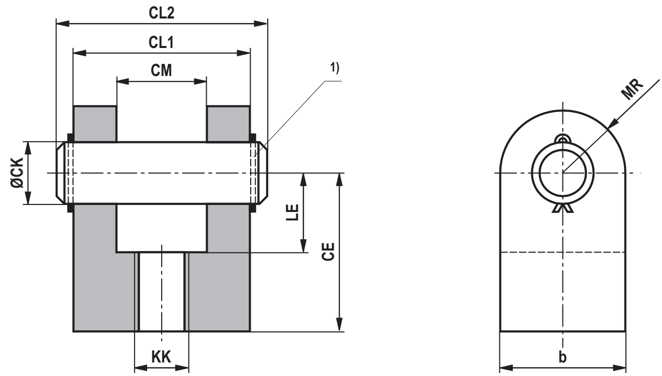
Series					Type	ØHB	ER	LE	UD	R	b	*m*
CD70 / CG70		CD210 / CG210				H13	max.	min.	max.	js14	max.	kg
ØAL 2)	ØAL 3)	ØAL	ØMM	ØAL 3)								
25	**–**	**–**	**–**	**–**	**CLCC 10**	5,5	13	25	45	33	24	0,3
32	**25**	**–**	**–**	**–**	**CLCC 12**	5,5	13	25	45	33	24	0,3
	32	**–**	**–**									
40	**40**	**40**	**16**	**40**	**CLCC 15**	11	17	35	75	50	32	0,8
			18									
50	**50**	**40**	**25**	**50**	**CLCC 20**	13,5	22	42	90	65	40	1,8
	63	**50**	**22**									
			25									
63	**80**	**50**	**36**	**63**	**CLCC 25**	13,5	25	59	95	70	45	2,5
	100	**63**	**25**									
			28									
80	**125**	**63**	**36**	**–**	**CLCC 30**	13,5	25	59	95	70	45	2,5
			45									
		80	**36**									
–	**150**	**80**	**45**	**80**	**CLCC 35**	17,5	35	68	130	95	65	6,0
100	**–**	**80**	**56**	**100**	**CLCC 40**	17,5	35	68	130	95	65	6,0
125	**200**	**100**	**45**	**125**	**CLCC 45**	26	46	100	180	135	85	15,0
150	**–**	**100**	**50**	**150**	**CLCC 50**	26	46	100	180	135	85	15,0
			70									
		125	**50**									
			56									
200	**–**	**125**	**63**	**180**	**CLCC 60**	33	66	125	225	170	125	28,0
			90									
		150	**63**									
			70									
–	**–**	**150**	**80**	**–**	**CLCC 80**	33	75	100	245	190	140	33,0
			100									
		180	**80**									
–	**–**	**180**	**90**	**–**	**CLCC 81**	33	75	120	245	190	140	34,0
		200	**90**									
			100									
–	**–**	**180**	**125**	**–**	**CLCC 90**	33	75	120	245	190	140	35,0
–	**–**	**200**	**140**	**–**	**CLCC 100**	33	95	135	255	200	170	41,0
–	**–**	**–**		**200**	**CLCC 70**	33	80	125	225	170	145	28,0

4

ØAL = piston Ø
ØMM = piston rod Ø
1) Bolt Ø m6 required (bolt and bolt lock are included in the scope of delivery)
2) When mounted on the piston rod with CGK... or CGA
3) When mounted on the cylinder base (mounting type "**B**")

Notice!
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Fork clevis CCKA for series CD70/CG70 and CD210/CG210 (dimensions in mm)



Series CD70 / CG70 ØMM	Series CD210 / CG210 ØMM	Type [2]	Material no.	ØCK H7 [1]	CL1 h16	CL2 max.	CM A12	CE js12	KK	LE min.	MR max.	b max.	*m* kg
16	16	**CCKA 10**	R900318486	12,7	44	56	20	38	M10x1,5	19	13	26	0,2
18	18												
22	22	**CCKA 16**	R900318488	19,1	65	77	32,5	54	M16x1,5	26	19	38	1,0
25	25	**CCKA 20**	R900318487	19,1	65	77	32,5	54	M20x1,5	26	19	38	1,0
28	28												
36	36	**CCKA 26**	R900318489	25,43	77	92	39	75	M26x1,5	34	26	52	2,4
45	45	**CCKA 33**	R900318491	34,95	100	118	51,5	95	M33x2	45	35	70	4,5
50	50	**CCKA 39**	R900318494	44,48	127	147	65	114	M39x2	57	45	90	8,5
56	56												
63	63	**CCKA 48**	R900318496	50,83	127	147	65	140	M48x2	64	50	100	13,0
70	70												
80	80	**CCKA 58**	R900541067	63,5	154	176	78	165	M58x2	76	65	130	23,0
90	90	**CCKA 64**	R900318498	76,23	154	176	78	172	M64x2	83	70	140	25,0

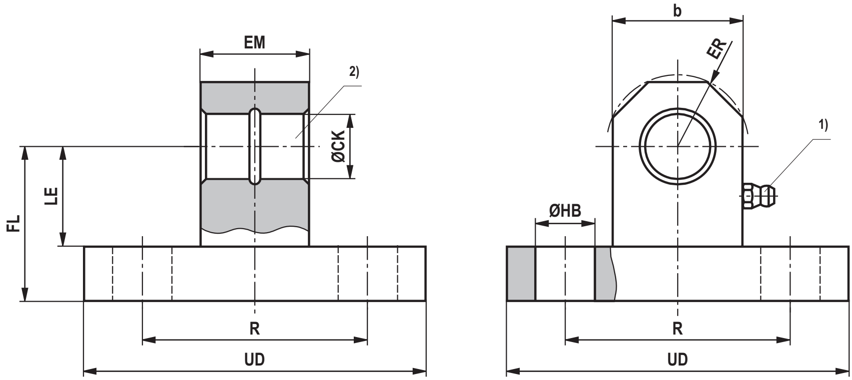
ØMM = piston rod Ø

1) Bolt Ø f7 required
(bolt and bolt lock are included in the scope of delivery)

2) Only possible with thread design "C".

Notice!
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Eye bracket CLEA for series CD70/CG70 and CD210/CG210 (dimensions in mm)



Series				Type	Material no.	ØCK H7 2)	EM h13	FL js12	ØHB H13	ER max.	LE min.	UD max.	R js14	b	*m* kg
CD70 / CG70		CD210 / CG210													
ØAL 3)	**ØMM** 4)	**ØAL** 3)	**ØMM** 4)												
32	**16**	**40**	**16**	**CLEA 10**	R900318516	12,7	20	28,5	11	13	18,5	63	41,5	24	0,4
40															
50	**18**		**18**												
63															
80	**22**	**50**	**22**	**CLEA 20**	R900318518	19,1	32,5	47,5	13,5	22	31,5	89	65	40	1,6
100	**25**	**63**	**25**												
125	**28**		**28**												
150	**36**	**80**	**36**	**CLEA 26**	R900318519	25,43	39	57	17,5	30	38	114	82,5	55	2,3
200															
–	**45**	**100**	**45**	**CLEA 33**	R900318520	34,95	51,5	76	17,5	41	54	127	97	75	5,8
–	**50**	**125**	**50**	**CLEA 39**	R900318521	44,48	65	79,5	22	49	57	165	126	90	10,0
	56		**56**												
–	**63**	**150**	**63**	**CLEA 48**	R900318522	50,83	65	89	26	56	64	190	145,5	105	14,0
	70		**70**												
–	**80**	**180**	**80**	**CLEA 58**	R900318524	63,53	78	101,5	30	69	77	216	167	130	21,0
–	**90**	**200**	**90**	**CLEA 64**	R900318523	76,23	78	108	33	77	83	242	190,5	145	26,0

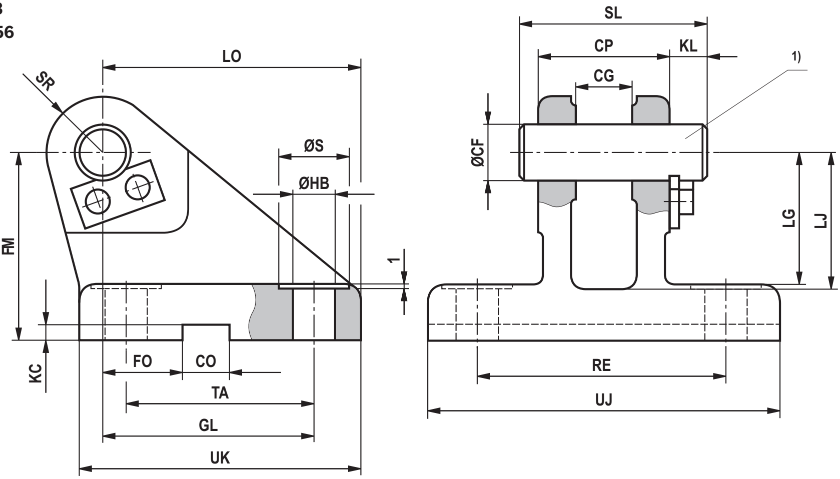
4

ØAL = piston Ø
ØMM = piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Suitable for fork clevis type CCKA...
3) When mounted on the cylinder base (mounting type "**G**")
4) When mounted on the piston rod with CCKA...

Notice!
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Clevis bracket CLCB - AB 5 (clampable) for series CDT3/CGT3/CST3 (dimensions in mm)

ISO 8133
DIN 24556



Type	Material no.	**Nominal force** kN	**ØCF** K7 1)	**CP** h14	**CG** +0,1 +0,3	**CO** N9	**FO** js14	**FM** js11	**GL** js13	**ØHB**	**ØS**
CLCB 12	R900326960	8	12	30	10	10	16	40	46	9	15
CLCB 16	R900327372	12,5	16	40	14	16	18	50	61	11	18
CLCB 20	R900327373	20	20	50	16	16	20	55	64	14 3)	20
CLCB 25	R900326961	32	25	60	20	25	22	65	78	16 3)	24
CLCB 30	R900327374	50	30	70	22	25	24	85	97	18 3)	26
CLCB 40	R900327375	80	40	80	28	36	24	100	123	22	33
CLCB 50	R900327376	125	50	100	35	36	35	125	155	30	48
CLCB 60	R900327377	200	60	120	44	50	35	150	187	39	60
CLCB 80	R900327378	320	80	160	55	50	35	190	255	45	80
CLCB 100	R900327379	500	100	200	70	63	35	210	285	48	80

Dimensions: Clevis bracket CLCB - AB 5 (clampable) for series CDT3/CGT3/CST3 (dimensions in mm)

Type	KC +0,3 0	KL	LG	LJ	LO	RE js13	SL	SR max.	TA js13	UJ	UK	*m* 2) kg
CLCB 12	3,3	8	28	29	56	55	40	12	40	75	60	0,6
CLCB 16	4,3	8	37	38	74	70	50	16	55	95	80	1,3
CLCB 20	4,3	10	39	40	80	85	62	20	58	120	90	2,1
CLCB 25	5,4	10	48	49	98	100	72	25	70	140	110	3,2
CLCB 30	5,4	13	62	63	120	115	85	30	90	160	135	6,5
CLCB 40	8,4	16	72	73	148	135	100	40	120	190	170	12,0
CLCB 50	8,4	19	90	92	190	170	122	50	145	240	215	23,0
CLCB 60	11,4	20	108	110	225	200	145	60	185	270	260	37,0
CLCB 80	11,4	26	140	142	295	240	190	80	260	320	340	79,0
CLCB 100	12,4	30	150	152	335	300	235	100	300	400	400	140,0

1) Bolt Ø h6 required, suitable for swivel head CGKA...
(bolt and bolt lock are included in the scope of delivery)

2) ***m*** = weight of clevis bracket in kg

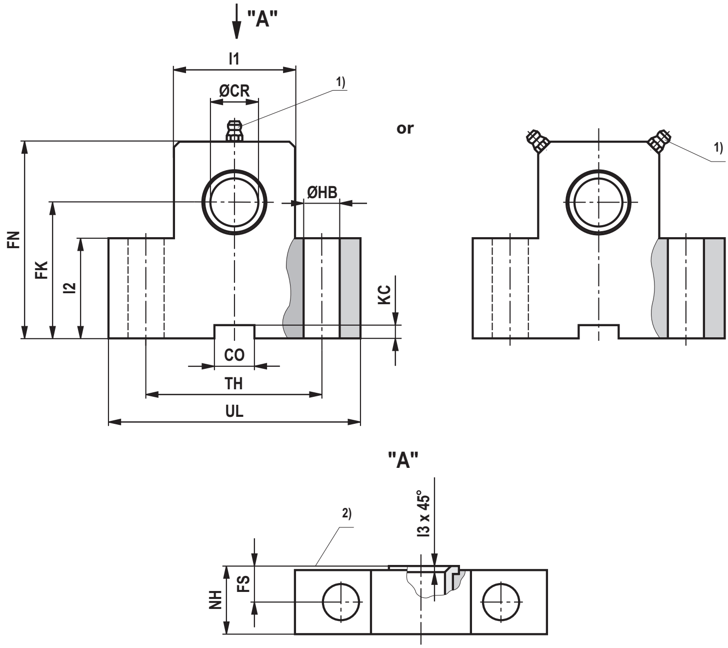
3) Dimensions may differ from the standard depending on the manufacturer

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

4

Dimensions: Trunnion bracket CLTA - AT 4 for series CDT3/CGT3/CST3 (dimensions in mm)

CLTA 12-20



Series CDT3 / CGT3 / CST3 ØAL	Type	Material no.	Nominal force kN [4]	ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13	KC +0,3 0	NH max.	TH js14	UL max.	l1	l2	l3	*m* [5] kg
25	**CLTA 12**	R901071355	8	12	10	38	55	8	9	3,3	17 [3]	40	63	25	25	1	0,5
32	**CLTA 16**	R901071364	12,5	16	16	45	65	10	11	4,3	21	50	80	30	30	1	0,9
40	**CLTA 20**	R901071365	20	20	16	55	80	10	11	4,3	21	60	90	40	38	1,5	1,35

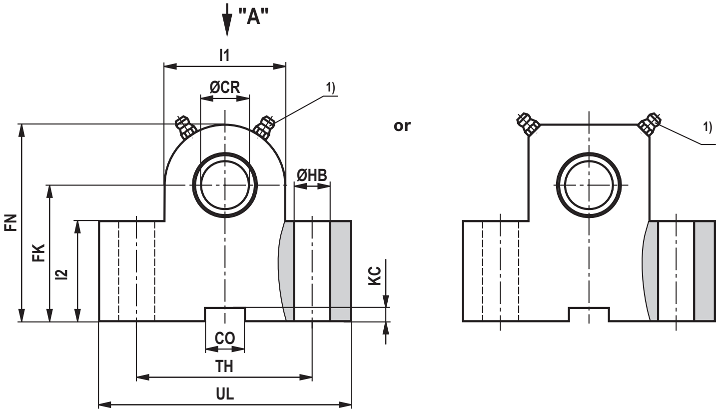
ØAL = piston Ø

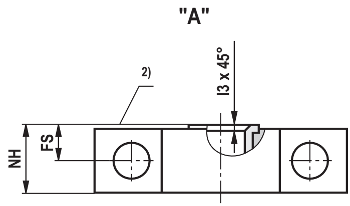
1) Lubricating nipple, cone form A according to DIN 71412
2) Inside
3) Dimensions may differ depending on the manufacturer
4) Nominal force applies to applications in pairs
5) ***m*** = weight per pair in kg, brackets are delivered in pairs

Notice!
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Trunnion bracket CLTA - AT 4 for series CDT3/CGT3/CST3 (dimensions in mm)

CLTA 25-100





Series CDT3 / CGT3 / CST3 ØAL	Type	Material no.	Nominal force kN 4)	ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13	KC +0,3 0	NH max.	TH js14	UL max.	l1	l2	l3	*m* 5) kg
50	**CLTA 25**	R901071368	32	25	25	65	90	12	14 3)	5,4	26	80	110	56	45	1,5	2,4
63	**CLTA 32**	R901071377	50	32	25	75	110	15	18 3)	5,4	33	110	150	70	52	2	5,0
80	**CLTA 40**	R901071380	80	40	36	95	140	16	22	8,4	41	125	170	88	60	2,5	8,5
100	**CLTA 50**	R901071385	125	50	36	105	150	20	26	8,4	51	160	210	90	72	2,5	15
125	**CLTA 63**	R901071395	200	63	50	125	195	25	33	11,4	61	200	265	136	87	3	30
160	**CLTA 80**	R901071398	320	80	50	150	230	31	39	11,4	81	250	325	160	112	3,5	59
200	**CLTA 100**	R901071400	500	100	63	200	300	42	52	12,4	101	320	410	200	150	4,5	131

4

ØAL = piston Ø

1) Lubricating nipple, cone form A according to DIN 71412

2) Inside

3) Dimensions may differ depending on the manufacturer

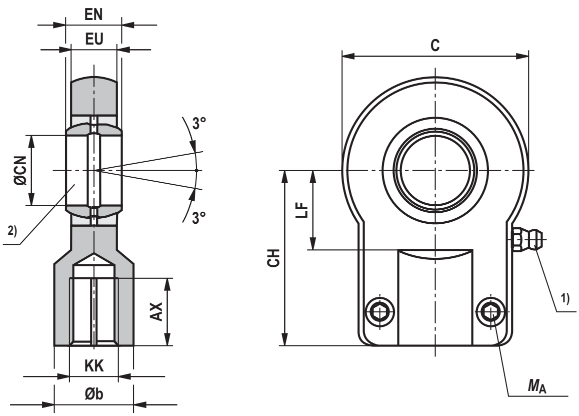
4) Nominal force applies to applications in pairs

5) ***m*** = weight per pair in kg, brackets are delivered in pairs

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Swivel head CGKA - AP 6 (clampable) for series CDT3/CGT3/CST3 (dimensions in mm)

ISO 8133
DIN 24555



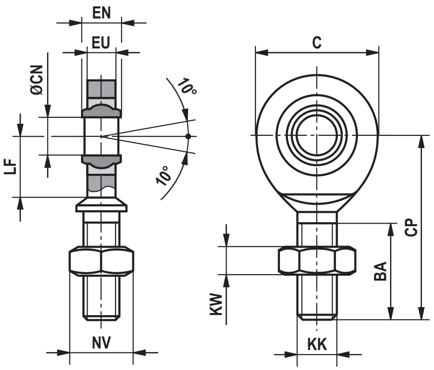
Type	Material no.	KK	AX min.	Øb	C max.	CH js13	ØCN 2)	EN	EU max.	LF min.	M_A 7) Nm	*m* 8) kg	C_0 9) (head) kN	F_{adm} 10) kN
CGKA 12 3)	R900327186	M10x1,25	15	17	40	42	$12_{-0,008}$	$10_{-0,12}$	8	16	9,5	0,15	17	6,3
CGKA 16 4)	R900327192	M12x1,25	17	21	45	48	$16_{-0,008}$	$14_{-0,12}$	11	20	9,5	0,25	28,5	10,5
CGKA 20 4)	R900306874	M14x1,5	19	25	55	58	$20_{-0,012}$	$16_{-0,12}$	13	25	23	0,43	42,5	15,7
CGKA 25	R900327191	M16x1,5	23	30	65	68	$25_{-0,012}$	$20_{-0,12}$	17	30	23	0,73	67	24,7
CGKA 30	R900327187	M20x1,5	29	36	80	85	$30_{-0,012}$	$22_{-0,12}$	19	35	46	1,3	108	39,9
CGKA 40	R900327188	M27x2	37	45	100	105	$40_{-0,012}$	$28_{-0,12}$	23	45	46	2,3	156	57,6
CGKA 50	R900327368	M33x2	46	55	125	130	$50_{-0,012}$	$35_{-0,12}$	30	58	80	4,4	245	90,4
CGKA 60	R900327369	M42x2	57	68	160	150	$60_{-0,012}$	$44_{-0,12}$	38	68	195	8,4	380	140,2
CGKA 80	R900327370	M48x2	64	90	205	185	$80_{-0,015}$	$55_{-0,15}$	47	82 6)	385	15,6	585	215,9
CGKA 100	R900327371	M64x3	86	110	240	240	$100_{-0,02}$	$70_{-0,2}$	57	116	660	28	865	319,2
CGKD 100 5)	R900322030	M80x3	96	110	210	210	100 H7	100 h12	84	98	385	28	1060	391,1
CGKD 125 5)	R900322026	M100x3	113	135	262	260	125 H7	125 h12	102	120	385	43	1200	442,8

1) Lubricating nipple, cone head form A according to DIN 71412
2) Bolt Ø h6 required
3) Cannot be re-lubricated
4) Can be re-lubricated via lubricating hole
5) Swivel head according to ISO 8132, bolt Ø m6 required
6) Dimensions may differ from the standard depending on the manufacturer
7) M_A = tightening torque
The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.
8) ***m*** = weight of swivel head in kg
9) C_0 = static load rating of the swivel head
10) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Dimensions: Swivel head CGKL for series CDL2 (dimensions in mm)

ISO 12240-4



Series CDL2 ØAL	ØMM	Type	Material no.	KK	BA min.	C	ØCN -0,008	CP max.	EN h12	EU max.	KW	LF min.	NV	*m* [1] kg	C_0 [2] kN	F_{adm} [3] kN
25	**14**	**CGKL 10**	3712500031	M10	26	29	10	48	9	7,5	5	15	16	0,1	22	8,1
32	**18**	**CGKL 12**	3713200031	M12	28	34	12	54	10	8,5	6	18	18	0,1	30,4	11,2

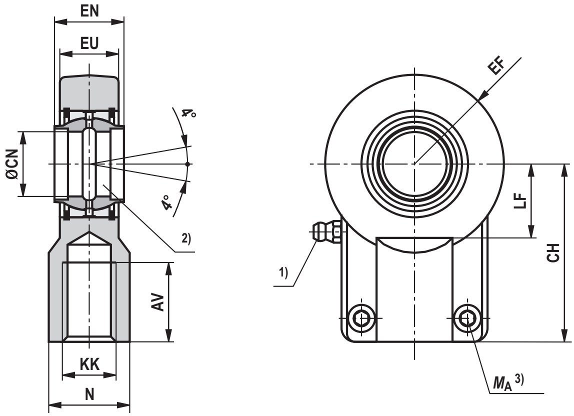
ØAL = piston Ø
ØMM = piston rod Ø
1) ***m*** = weight of swivel head in kg
2) C_0 = static load rating of the swivel head in kN
3) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

4

Dimensions: Swivel head CGKD (clampable) for series CDL2 (dimensions in mm)

ISO 8132



Series CDL2 ØAL	Series CDL2 ØMM	Type	Material no.	Nominal force kN	AV min.	N max.	CH js13	EF max.	ØCN H7 2)	EN h12	EU max.
40	**22**	**CGKD 20**	R900308576	20	23	28	52	25	20	20	17,5
40	**25**	**CGKD 25**	R900323332	32	29	31	65	32	25	25	22
50	**28**										
50	**32**	**CGKD 32**	R900322049	50	37	38	80	40	32	32	28
63	**36**										
63	**40**	**CGKD 40**	R900322029	80	46	47	97	50	40	40	34
80	**45**										
80	**50**	**CGKD 50**	R900322719	125	57	58	120	63	50	50	42
100	**56**										
100	**63**	**CGKD 63**	R900322028	200	64	70	140	72,5	63	63	53,5
125	**70**										
125	**80**	**CGKD 80**	R900322700	320	86	91	180	92	80	80	68
160	**100**	**CGKD 100**	R900322030	500	96	110	210	114	100	100	85,5
200	**125**	**CGKD 125**	R900322026	800	113	135	260	160	125	125	105

Dimensions: Swivel head CGKD (clampable) for series CDL2 (dimensions in mm)

Series CDL2 ØAL	Series CDL2 ØMM	Type	KK	LF min.	Clamping screws ISO 4762-10.9	M_A [3] Nm	m [4] kg	C_0 [5] kN	F_{adm} [6] kN
40	**22**	**CGKD 20**	M16x1,5	20,5	M8x20	25	0,35	48	17,7
40	**25**	**CGKD 25**	M20x1,5	25,5	M8x20	30	0,65	78	28,8
50	**28**								
50	**32**	**CGKD 32**	M27x2	30	M10x25	59	1,15	114	42,1
63	**36**								
63	**40**	**CGKD 40**	M33x2	39	M10x30	59	2,1	204	75,3
80	**45**								
80	**50**	**CGKD 50**	M42x2	47	M12x35	100	4	310	114,4
100	**56**								
100	**63**	**CGKD 63**	M48x2	58	M16x40	250	7,2	430	158,7
125	**70**								
125	**80**	**CGKD 80**	M64x3	74	M20x50	490	15	695	265,5
160	**100**	**CGKD 100**	M80x3	94	M24x60	840	25,5	1060	391,1
200	**125**	**CGKD 125**	M100x3	116	M24x70	840	52,5	1430	527,7

ØAL = piston Ø
ØMM = piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Bolt Ø m6 required
3) M_A = tightening torque in Nm
The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque
4) m = weight of swivel head in kg
5) C_0 = static load rating of the swivel head in kN
6) F_{adm} = maximum admissible load on the swivel head in kN during oscillatory or alternating loads

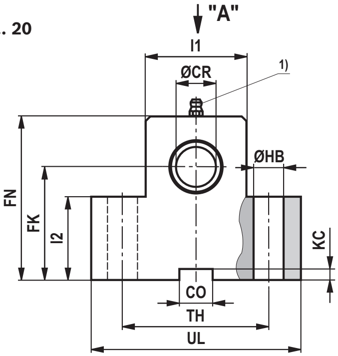
☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

4

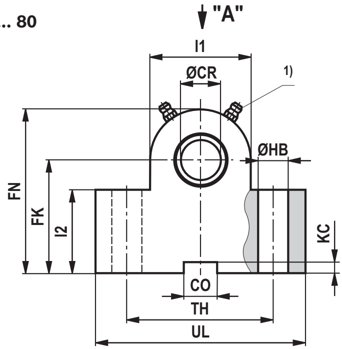
Dimensions: Trunnion bracket CLTB for series CDL2 (dimensions in mm)

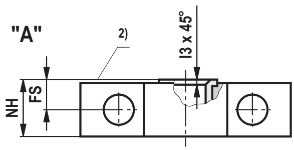
ISO 8132

CLTB 12 ... 20



CLTB 25 ... 80





Series CDL2 ØAL	Series CDL2 ØMM	Type 3)	Material no.	Nominal force kN 4)	ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13
25	**14**	**CLTB 12**	R900772607	8	12	10	34	50	8	9
32	**18**	**CLTB 16**	R900772608	12,5	16	16	40	60	10	11
40	**22**	**CLTB 20**	R900772609	20	20	16	45	70	10	11
40	**25**	**CLTB 25**	R900772610	32	25	25	55	80	12	13,5
50	**28**									
50	**32**	**CLTB 32**	R900772611	50	32	25	65	100	15	17,5
63	**36**									
63	**40**	**CLTB 40**	R900772612	80	40	36	76	120	16	22
80	**45**									
80	**50**	**CLTB 50**	R900772613	125	50	36	95	140	20	26
100	**56**									
100	**63**	**CLTB 63**	R900772614	200	63	50	112	180	25	33
125	**70**									
125	**80**	**CLTB 80**	R900772615	320	80	50	140	220	31	39

Dimensions: Trunnion bracket CLTB for series CDL2 (dimensions in mm)

Series CDL2 ØAL	Series CDL2 ØMM	Type [3]	KC +0,3	l1	l2	l3	NH max.	TH js14	UL max.	*m* [5] kg
25	**14**	**CLTB 12**	3,3	25	25	1	17	40	63	0,4
32	**18**	**CLTB 16**	4,3	30	30	1	21	50	80	0,85
40	**22**	**CLTB 20**	4,3	40	38	1,5	21	60	90	1,2
40	**25**	**CLTB 25**	5,4	56	45	1,5	26	80	110	2,1
50	**28**									
50	**32**	**CLTB 32**	5,4	70	52	2	33	110	150	4,55
63	**36**									
63	**40**	**CLTB 40**	8,4	88	60	2,5	41	125	170	7,3
80	**45**									
80	**50**	**CLTB 50**	8,4	100	75	2,5	51	160	210	14,5
100	**56**									
100	**63**	**CLTB 63**	11,4	130	85	3	61	200	265	23,1
125	**70**									
125	**80**	**CLTB 80**	11,4	160	112	3,5	81	250	325	52,3

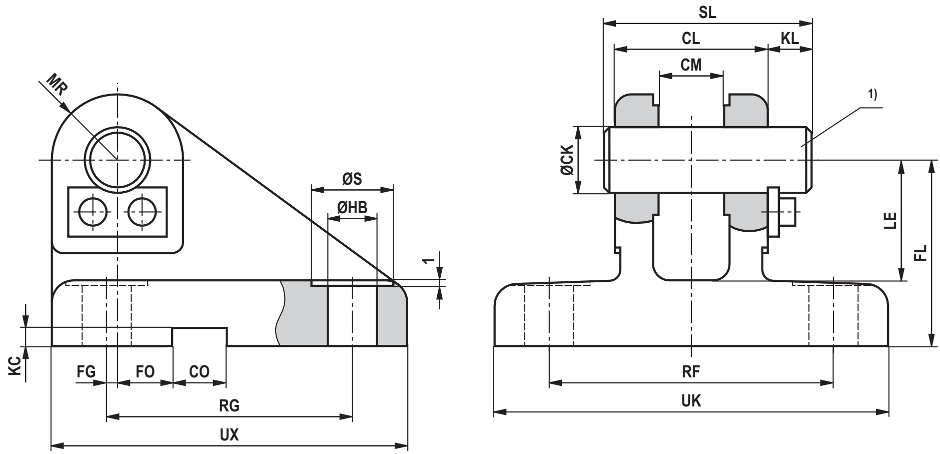
ØAL = piston Ø
ØMM = piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Contact surface trunnion (inside)
3) Bearing blocks are always supplied in pairs
4) Nominal force applies to applications in pairs
5) *m* = weight of trunnion bracket in kg (specified per pair)

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The trunnion brackets are suitable for mounting type MT4.

4

Dimensions: Clevis bracket CLCA (clampable) for series CDL2 (dimensions in mm)

ISO 8132, form B



Series CDL2 ØAL	ØMM	Type	Material no.	Nominal force kN	ØCK H9 1)	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14	ØHB H13
25	14	CLCA 10 2)	3)	5	10	24	10	8	2	32	10	6,6
32	18	CLCA 12 2)	R900542861	8	12	28	12	10	2	34	10	9
40	22	CLCA 20	R900542863	20	20	45	20	16	7,5	45	10	11
40	25	CLCA 25	R900542864	32	25	56	25	25	10	55	10	13,5
50	28											
50	32	CLCA 32	R900542865	50	32	70	32	25	14,5	65	6	17,5
63	36											
63	40	CLCA 40	R900542866	80	40	90	40	36	17,5	76	6	22
80	45											
80	50	CLCA 50	R900542867	125	50	110	50	36	25	95	0	26
100	56											
100	63	CLCA 63	R900542868	200	63	140	63	50	33	112	0	33
125	70											
125	80	CLCA 80	R900542869	320	80	170	80	50	45	140	0	39
160	100	CLCA 100	3)	500	100	210	100	63	52,5	180	0	52
200	125	CLCA 125	3)	800	125	270	125	80	75	230	0	52

Dimensions: Clevis bracket CLCA (clampable) for series CDL2 (dimensions in mm)

Series CDL2 ØAL	Series CDL2 ØMM	Type	KC +0,3	KL	LE min.	MR max.	RF js14	RG js14	ØS	SL	UK max.	UX max.	*m* [4] kg
25	**14**	**CLCA 10** [2]	3,3	8	22	10	39	44	11	34	56	60	0,33
32	**18**	**CLCA 12** [2]	3,3	8	22	12	52	45	15	38	72	65	0,45
40	**22**	**CLCA 20**	4,3	10	30	20	75	70	18	58	100	95	1,5
40	**25**	**CLCA 25**	5,4	10	37	25	90	85	20	69	120	115	3
50	**28**												
50	**32**	**CLCA 32**	5,4	13	43	32	110	110	26	87	145	145	4,5
63	**36**												
63	**40**	**CLCA 40**	8,4	16	52	40	140	125	33	110	185	170	8,5
80	**45**												
80	**50**	**CLCA 50**	8,4	19	65	50	165	150	40	133	215	200	13,5
100	**56**												
100	**63**	**CLCA 63**	11,4	20	75	63	210	170	48	164	270	230	23,4
125	**70**												
125	**80**	**CLCA 80**	11,4	26	95	80	250	210	57	202	320	280	38,5
160	**100**	**CLCA 100**	12,4	30	120	100	315	250	76	246	405	345	99,2
200	**125**	**CLCA 125**	15,4	32	170	125	365	350	76	310	455	450	174,1

ØAL = piston Ø

ØMM = piston rod Ø

[1] Bolt Ø m6 required (bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)

[2] 2 washers for mounting required
- for CLCA 10: Washer DIN 988 10x16x0.5 Material no. R900061310
- for CLCA 12: Washer DIN 988 12x18x1 Material no. R900006948

[3] Upon request

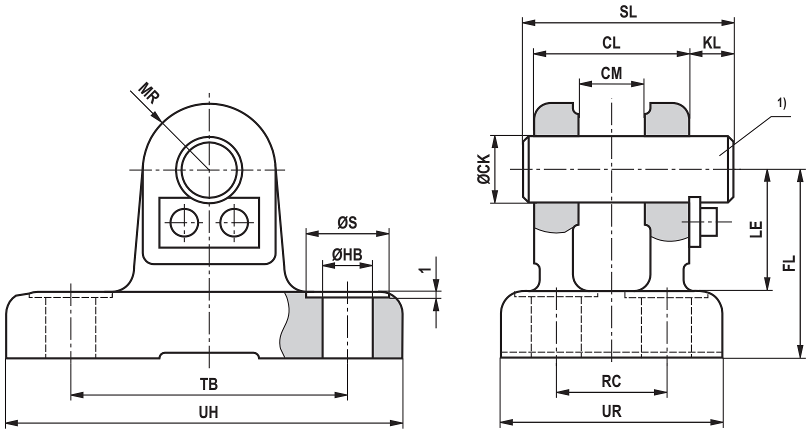
[4] *m* = weight of clevis bracket in kg

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The clevis brackets are suitable for mounting type MP5 and for mounting on the swivel head.

4

Dimensions: Clevis bracket CLCD (clampable) for series CDL2 (dimensions in mm)

ISO 8132, form A



Series CDL2 ØAL	Series CDL2 ØMM	Type	Material no.	Nominal force kN	ØCK H9 1)	CL h16	CM A12	FL js12	ØHB H13	KL	LE min.
25	**14**	**CLCD 10** 2)	3)	5	10	24	10	32	6,6	8	22
32	**18**	**CLCD 12** 2)	R900542879	8	12	28	12	34	9	8	22
40	**22**	**CLCD 20**	R900542881	20	20	45	20	45	11	10	30
40	**25**	**CLCD 25**	R900542882	32	25	56	25	55	13,5	10	37
50	**28**										
50	**32**	**CLCD 32**	R900542883	50	32	70	32	65	17,5	13	43
63	**36**										
63	**40**	**CLCD 40**	R900542884	80	40	90	40	76	22	16	52
80	**45**										
80	**50**	**CLCD 50**	R900542885	125	50	110	50	95	26	19	65
100	**56**										
100	**63**	**CLCD 63**	R900542886	200	63	140	63	112	33	20	75
125	**70**										
125	**80**	**CLCD 80**	R900542887	320	80	170	80	140	39	26	95
160	**100**	**CLCD 100**	3)	500	100	210	100	180	45	30	120
200	**125**	**CLCD 125**	3)	800	125	270	125	230	52	32	170

Dimensions: Clevis bracket CLCD (clampable) for series CDL2 (dimensions in mm)

Series CDL2 ØAL	ØMM	Type	MR max.	RC js14	ØS	SL	TB js14	UR max.	UH max.	*m* 3) kg
25	**14**	**CLCD 10** 2)	10	17	11	34	42	33	60	0,27
32	**18**	**CLCD 12** 2)	12	20	15	38	50	40	70	0,35
40	**22**	**CLCD 20**	20	32	18	58	75	58	98	0,95
40	**25**	**CLCD 25**	25	40	20	69	85	70	113	1,9
50	**28**									
50	**32**	**CLCD 32**	32	50	26	87	110	85	143	3
63	**36**									
63	**40**	**CLCD 40**	40	65	33	110	130	108	170	5,5
80	**45**									
80	**50**	**CLCD 50**	50	80	40	133	170	130	220	10,6
100	**56**									
100	**63**	**CLCD 63**	63	100	48	164	210	160	270	17
125	**70**									
125	**80**	**CLCD 80**	80	125	57	202	250	210	320	32
160	**100**	**CLCD 100**	100	160	66	246	315	260	400	74
200	**125**	**CLCD 125**	125	200	76	310	385	320	470	129

ØAL = piston Ø
ØMM = piston rod Ø
1) Bolt Ø m6 required
(bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)
2) 2 washers for mounting required
- for CLCA 10: Washer DIN 988 10x16x0.5
  Material no. R900061310
- for CLCA 12: Washer DIN 988 12x18x1
  Material no. R900006948

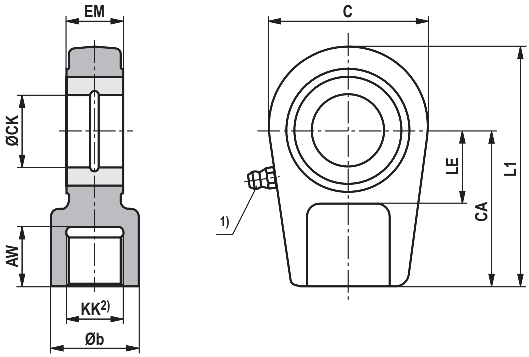
3) Upon request
4) *m* = weight of clevis bracket in kg

Notice!
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The clevis brackets are suitable for mounting type MP5 and for mounting on the swivel head.

4

Dimensions: Plain clevis CSA for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimension in mm)

AL-Ø 40 ... 200 mm



Series		Type	Material no.	AW	Øb	C	CA	ØCK H11	EM -0,4
CDH1 / CGH1 / CSH1 ØAL	**CDH3 / CGH3 / CSH3 ØAL**								
40	**–**	**CSA 16**	R900303150	17	28	56	50	25	23
50	**40**	**CSA 22**	R900303151	23	34	64	60	30	28
63	**50**	**CSA 28**	R900303152	29	44	78	70	35	30
80	**63**	**CSA 35**	R900303153	36	55	94	85	40	35
100	**80**	**CSA 45**	R900303154	46	70	116	105	50	40
125	**100**	**CSA 58**	R900303155	59	87	130	130	60	50
140	**125**	**CSA 65**	R900303156	66	93	154	150	70	55
160	**140**	**CSA 80**	R900303157	81	125	176	170	80	60
180	**160**	**CSA100**	R900303158	101	143	206	210	90	65
200	**180**	**CSA110**	R900303159	111	153	230	235	100	70
–	**200**	**CSA120**	R900303160	125	176	265	265	110	80

Dimensions: Plain clevis CSA for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimension in mm)

Series		Type	KK	LE	L1	*m* 3) kg	C_0 4) kN	F_{adm} 5) kN
CDH1 / CGH1 / CSH1 ØAL	**CDH3 / CGH3 / CSH3 ØAL**							
40	**–**	**CSA 16**	M16x1,5	25	80	0,43	72	25,9
50	**40**	**CSA 22**	M22x1,5	30	94	0,7	106	38,2
63	**50**	**CSA 28**	M28x1,5	40	112	1,1	153	55,1
80	**63**	**CSA 35**	M35x1,5	45	135	2,0	250	90,0
100	**80**	**CSA 45**	M45x1,5	55	168	3,3	365	131,4
125	**100**	**CSA 58**	M58x1,5	65	200	5,5	400	144,0
140	**125**	**CSA 65**	M65x1,5	75	232	8,6	540	194,4
160	**140**	**CSA 80**	M80x2	80	265	12,2	670	241,2
180	**160**	**CSA100**	M100x2	90	323	21,5	980	352,8
200	**180**	**CSA110**	M110x2	105	360	27,5	1120	403,2
–	**200**	**CSA120**	M120x2	115	407,5	40,7	1700	612,0

ØAL = piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) The plain clevis must always be screwed against the shoulder of the piston rod

3) ***m*** = weight of plain clevis in kg

4) C_0 = static load rating of the plain clevis

5) F_{adm} = maximum admissible load on the plain clevis during oscillatory or alternating loads

☞ **Notice!**

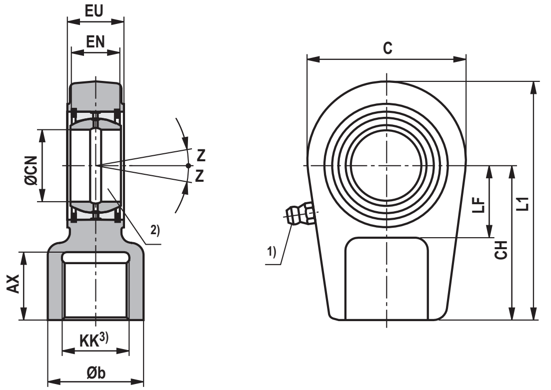
The specified dimensions are maximum values and may differ depending on the manufacturer.

The following values are excluded: CA, CK, EM, KK

4

Dimensions: Swivel head CGA for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimensions in mm)

AL-Ø 40 ... 280 mm



Series CDH1 / CGH1 / CSH1 ØAL	Series CDH3 / CGH3 / CSH3 ØAL	Type	Material no.	AX min.	Øb max.	C	CH	ØCN 2)	EN	EU -0,4
40	**–**	**CGA 16**	R900303125	17	26	56	50	$25_{-0,010}$	$20_{-0,12}$	23
50	**40**	**CGA 22**	R900303126	23	33	64	60	$30_{-0,010}$	$22_{-0,12}$	28
63	**50**	**CGA 28**	R900303127	29	41	78	70	$35_{-0,012}$	$25_{-0,12}$	30
80	**63**	**CGA 35**	R900303128	36	50	94	85	$40_{-0,012}$	$28_{-0,12}$	35
100	**80**	**CGA 45**	R900303129	46	62	116	105	$50_{-0,012}$	$35_{-0,12}$	40
125	**100**	**CGA 58**	R900303130	59	76	130	130	$60_{-0,015}$	$44_{-0,15}$	50
140	**125**	**CGA 65**	R900303131	66	87	154	150	$70_{-0,015}$	$49_{-0,15}$	55
160	**140**	**CGA 80**	R900303132	81	106	176	170	$80_{-0,015}$	$55_{-0,15}$	60
180	**160**	**CGA100**	R900303133	101	125	206	210	$90_{-0,020}$	$60_{-0,20}$	65
200	**180**	**CGA110**	R900303134	111	139	230	235	$100_{-0,020}$	$70_{-0,20}$	70
220	**200**	**CGA120**	R900303135	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80
250	**220**	**CGA120**	R900303135	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80
280	**250**	**CGA130**	R900303136	135	173	340	310	$120_{-0,020}$	$85_{-0,20}$	90

Dimensions: Swivel head CGA for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimensions in mm)

AL-Ø 40 ... 280 mm

Series		Type	KK	L1	LF	Z	m [4]	C_0 [5]	F_{adm} [6]
CDH1 / CGH1 / CSH1 ØAL	CDH3 / CGH3 / CSH3 ØAL				min.		kg	kN	kN
40	**–**	**CGA 16**	M16x1,5	80	28	7°	0,43	72	25,9
50	**40**	**CGA 22**	M22x1,5	94	30	6°	0,7	106	38,2
63	**50**	**CGA 28**	M28x1,5	112	38	6°	1,1	153	55,1
80	**63**	**CGA 35**	M35x1,5	135	45	7°	2,0	250	90,0
100	**80**	**CGA 45**	M45x1,5	168	55	6°	3,3	365	131,4
125	**100**	**CGA 58**	M58x1,5	200	65	6°	5,5	400	144,0
140	**125**	**CGA 65**	M65x1,5	232	75	6°	8,6	540	194,4
160	**140**	**CGA 80**	M80x2	265	80	6°	12,2	670	241,2
180	**160**	**CGA100**	M100x2	323	90	5°	21,5	980	352,8
200	**180**	**CGA110**	M110x2	360	105	7°	27,5	1120	403,2
220	**200**	**CGA120**	M120x3	407,5	115	6°	40,7	1700	612,0
250	**220**	**CGA120**	M120x3	407,5	115	6°	40,7	1700	612,0
280	**250**	**CGA130**	M130x3	490	140	6°	76,4	2900	1044,0

ØAL = piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Bolt Ø m6 required;
Bolt Ø j6 required with maintenance-free spherical bearing

3) The swivel head must always be screwed against the shoulder of the piston rod

4) m = weight of swivel head in kg

5) C_0 = static load rating of the swivel head

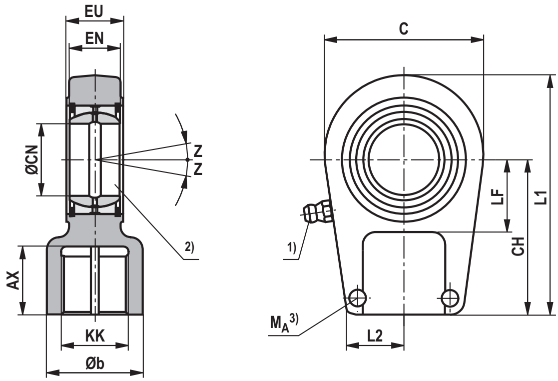
6) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

☞ **Notice!**
The specified dimensions are maximum values and may differ depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

4

Dimensions: Swivel head CGAK (clampable) for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimensions in mm)

AL-Ø 40 ... 280 mm



Series CDH1 / CGH1 / CSH1 ØAL	Series CDH3 / CGH3 / CSH3 ØAL	Type	Material no.	AX min.	Øb max.	C	CH	ØCN 2)	EN	EU -0,4	KK
40	**–**	**CGAK 16**	R900303162	17	26	56	50	$25_{-0,010}$	$20_{-0,12}$	23	M16x1,5
50	**40**	**CGAK 22**	R900303163	23	33	64	60	$30_{-0,010}$	$22_{-0,12}$	28	M22x1,5
63	**50**	**CGAK 28**	R900303164	29	41	78	70	$35_{-0,012}$	$25_{-0,12}$	30	M28x1,5
80	**63**	**CGAK 35**	R900303165	36	50	94	85	$40_{-0,012}$	$28_{-0,12}$	35	M35x1,5
100	**80**	**CGAK 45**	R900303166	46	62	116	105	$50_{-0,012}$	$35_{-0,12}$	40	M45x1,5
125	**100**	**CGAK 58**	R900303167	59	76	130	130	$60_{-0,015}$	$44_{-0,15}$	50	M58x1,5
140	**125**	**CGAK 65**	R900303168	66	87	154	150	$70_{-0,015}$	$49_{-0,15}$	55	M65x1,5
160	**140**	**CGAK 80**	R900303169	81	106	176	170	$80_{-0,015}$	$55_{-0,15}$	60	M80x2
180	**160**	**CGAK100**	R900321655	101	125	206	210	$90_{-0,020}$	$60_{-0,20}$	65	M100x2
200	**180**	**CGAK110**	R900321691	111	139	231	235	$100_{-0,020}$	$70_{-0,20}$	70	M110x2
220	**200**	**CGAK120**	R900321621	125	155	266	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3
250	**220**	**CGAK120**	R900321621	125	153	265	265	$110_{-0,020}$	$70_{-0,20}$	80	M120x3
280	**250**	**CGAK130**	R900322015	135	173	340	310	$120_{-0,020}$	$85_{-0,20}$	90	M130x3

Dimensions: Swivel head CGAK (clampable) for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimensions in mm)

Series		Type	L1	L2 max.	LF	Z	Clamping screws ISO 4762-10.9	M_A 3) Nm	m 4) kg	C_0 5) kN	F_{adm} 6) kN
CDH1 / CGH1 / CSH1 ØAL	**CDH3 / CGH3 / CSH3 ØAL**										
40	**–**	**CGAK 16**	80	24	28	7°	M8	30	0,43	72	25,9
50	**40**	**CGAK 22**	94	26	30	6°	M8	30	0,7	106	38,2
63	**50**	**CGAK 28**	112	34	38	6°	M10	54	1,1	153	55,1
80	**63**	**CGAK 35**	135	39	45	7°	M10	59	2,0	250	90,0
100	**80**	**CGAK 45**	168	46	55	6°	M12	100	3,3	365	131,4
125	**100**	**CGAK 58**	200	61	65	6°	M16	250	5,5	400	144,0
140	**125**	**CGAK 65**	232	66	75	6°	M16	250	8,6	540	194,4
160	**140**	**CGAK 80**	265	81	80	6°	M20	490	12,2	670	241,2
180	**160**	**CGAK100**	323	91	90	5°	M20	490	21,5	980	352,8
200	**180**	**CGAK110**	360	101	105	7°	M24	840	27,5	1120	403,2
220	**200**	**CGAK120**	407,5	111	115	6°	M24	840	40,7	1700	612,0
250	**220**	**CGAK120**	407,5	111	115	6°	M24	840	40,7	1700	612,0
280	**250**	**CGAK130**	490	129	140	6°	M24	840	76,4	2900	1044,0

ØAL = piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Bolt Ø m6 required;
Bolt Ø j6 required with maintenance-free spherical bearing

3) M_A = tightening torque
The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

4) m = weight of swivel head in kg

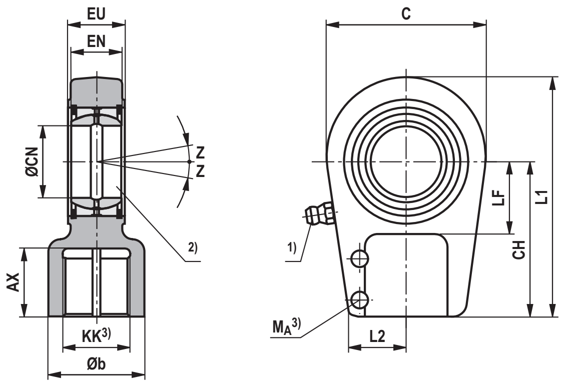
5) C_0 = static load rating of the swivel head

6) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

☞ **Notice!**
The specified dimensions are maximum values and may differ depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

4

Dimensions: Swivel head CGAS (clampable) for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimensions in mm)



Series CDH1 / CGH1 / CSH1 ØAL	Series CDH3 / CGH3 / CSH3 ØAL	Type	Material no.	AX min.	Øb max.	C max.	CH	ØCN 2)	EN	EU -0,4	KK
40	**–**	**CGAS 25**	R900303137	30	28	56	65	25$_{-0,010}$	20$_{-0,12}$	23	M18x2
50	**40**	**CGAS 30**	R900303138	35	34	64	75	30$_{-0,010}$	22$_{-0,12}$	28	M24x2
63	**50**	**CGAS 35**	R900303139	46	46	78	90	35$_{-0,012}$	25$_{-0,12}$	30	M30x2
80	**63**	**CGAS 40**	R900303140	56	57	94	105	40$_{-0,012}$	28$_{-0,12}$	35	M39x3
100	**80**	**CGAS 50**	R900303141	76	70	116	135	50$_{-0,012}$	35$_{-0,12}$	40	M50x3
125	**100**	**CGAS 60**	R900303142	96	87	130	170	60$_{-0,015}$	44$_{-0,15}$	50	M64x3
140	**125**	**CGAS 70**	R900303143	112	111	154	195	70$_{-0,015}$	49$_{-0,15}$	55	M80x3
160	**140**	**CGAS 80**	R900303144	122	129	176	210	80$_{-0,015}$	55$_{-0,15}$	60	M90x3
180	**160**	**CGAS 90**	R900303145	142	153	211	250	90$_{-0,020}$	60$_{-0,20}$	65	M100x3
200	**180**	**CGAS100**	R900303146	152	170	230	275	100$_{-0,020}$	70$_{-0,20}$	70	M110x4
220	**200**	**CGAS110**	R900303147	162	180	264	300	110$_{-0,020}$	70$_{-0,20}$	80	M120x4
250	**220**	**CGAS110**	R900303147	162	180	264	300	110$_{-0,020}$	70$_{-0,20}$	80	M120x4
280	**250**	**CGAS120**	R900303148	192	210	340	360	120$_{-0,020}$	85$_{-0,20}$	90	M150x4
320	**280**	**CGAS140**	R900317314	210	230	380	420	140$_{-0,025}$	90$_{-0,25}$	110	M160x4
–	**320**	**CGAS160**	R900303149	221	260	480	460	160$_{-0,025}$	105$_{-0,25}$	110	M180x4

Dimensions: Swivel head CGAS (clampable) for series CDH1/CGH1/CSH1 and CDH3/CGH3/CSH3 (dimensions in mm)

Series CDH1 / CGH1 / CSH1 ØAL	Series CDH3 / CGH3 / CSH3 ØAL	Type	L1 max.	L2 max.	LF min.	Z 3)	Clamping screws ISO 4762-10.9	M_A 4) Nm	m 5) kg	C_0 6) kN	F_{adm} 7) kN
40	**–**	**CGAS 25**	95	24	25	7-8°	M8	30	0,65	82	27,1
50	**40**	**CGAS 30**	109	28	30	6-7°	M8	30	1,0	122	40,3
63	**50**	**CGAS 35**	132	36	40	6-7°	M10	59	1,5	177	58,4
80	**63**	**CGAS 40**	155	39	44	7°	M12	100	2,4	287	94,7
100	**80**	**CGAS 50**	198	45	55	6-7°	M12	100	4,8	422	139,3
125	**100**	**CGAS 60**	240	59	65	6-7°	M16	250	8,6	522	172,3
140	**125**	**CGAS 70**	279	70	75	6°	M16	250	12,2	707	233,3
160	**140**	**CGAS 80**	305	85	80	6°	M20	490	18,4	870	287,1
180	**160**	**CGAS 90**	366	91	90	5°	M20	490	31,6	1284	423,7
200	**180**	**CGAS100**	400	95	105	7°	M20	490	34	1460	481,8
220	**200**	**CGAS110**	443	106	115	6°	M24	840	44	2024	667,9
250	**220**	**CGAS110**	443	106	115	6°	M24	840	44	2024	667,9
280	**250**	**CGAS120**	540	122	140	6°	M24	840	75	2970	980,1
320	**280**	**CGAS140**	620	129	185	7°	M30	1700	160	3350	1105,5
–	**320**	**CGAS160**	710	146	200	8°	M30	1700	235	4302	1419,7

ØAL = piston Ø

1) Lubricating nipple, cone head form A according to DIN 71412

2) Bolt Ø m6 required;
Bolt Ø j6 required with maintenance-free spherical bearing

3) Dimensions may differ depending on the manufacturer

4) M_A = tightening torque
The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.

5) m = weight of swivel head in kg

6) C_0 = static load rating of the swivel head

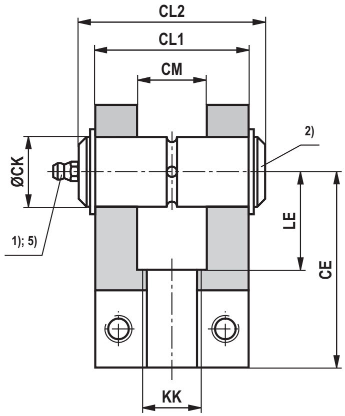
7) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads

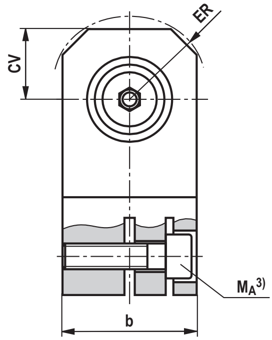
☞ **Notice!**
The specified dimensions are maximum values and may differ depending on the manufacturer.
The following values are excluded: CH, CN, EN, EU, KK

4

Dimensions: Fork clevis CCKB (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

ISO 8132





Series CDH2 / CGH2 / CSH2 ØAL	Series CDH2 / CGH2 / CSH2 ØMM	Series CDM1 / CGM1 / CSM1 ØAL	Series CDM1 / CGM1 / CSM1 ØMM	Type	Material no.	Nominal force kN	b max.	CE js13	ØCK H9 2)	CL1 h16	CL2 max.	CM A13	ER max.
–	–	25	14 / 18	CCKB 12 5)	R900542842	8	25	38	12	28	49	12	16
–	–	25	18	CCKB 16	R900542843	12,5	30	44	16	36	57	16	20
		32	18 / 22										
–	–	32	22	CCKB 20	R900542844	20	40	52	20	45	72	20	25
		40	22 / 28										
40	25 / 28	40	28	CCKB 25	R900542845	32	50	65	25	56	84	25	32
		50	28 / 36										
50	32 / 36	50	36	CCKB 32	R900542846	50	65	80	32	70	105	32	40
		63	36 / 45										
63	40 / 45	63	45	CCKB 40	R900542847	80	80	97	40	90	133	40	50
		80	45 / 56										
80	50 / 56	80	56	CCKB 50	R900542848	125	100	120	50	110	165	50	63
		100	56 / 70										
100	63 / 70	100	70	CCKB 63	R900542849	200	140	140	63	140	185	63	71
		125	70 / 90										
125	80 / 90	125	90	CCKB 80	R900542850	320	180	180	80	170	225	80	90
		160	90 / 110										
140	90 / 100	–	–	CCKB 90	6)	400	200	195	90	190	6)	90	100
160	100 / 110	160	110	CCKB 100	6)	500	220	210	100	210	6)	100	110
		200	110 / 140										

Dimensions: Fork clevis CCKB (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

Series				Type	KK	LE min.	CV max.	Clamping screws ISO 4762-10.9	M_A [3] Nm	m [4] kg
CDH2 / CGH2 / CSH2		CDM1 / CGM1 / CSM1								
ØAL	ØMM	ØAL	ØMM							
–	–	25	14 / 18	CCKB 12 [5]	M12x1,25	18	16	M4x16	2,9	0,2
–	–	25	18	CCKB 16	M14x1,5	22	20	M6x20	10	0,35
		32	18 / 22							
–	–	32	22	CCKB 20	M16x1,5	27	25	M8x30	25	0,7
		40	22 / 28							
40	25 / 28	40	28	CCKB 25	M20x1,5	34	32	M10x35	49	1,4
		50	28 / 36							
50	32 / 36	50	36	CCKB 32	M27x2	41	40	M12x40	85	2,8
		63	36 / 45							
63	40 / 45	63	45	CCKB 40	M33x2	51	50	M16x50	210	5,2
		80	45 / 56							
80	50 / 56	80	56	CCKB 50	M42x2	63	63	M20x60	425	9,5
		100	56 / 70							
100	63 / 70	100	70	CCKB 63	M48x2	75	71	M24x80	730	21,5
		125	70 / 90							
125	80 / 90	125	90	CCKB 80	M64x3	94	90	M30x100	1450	38,2
		160	90 / 110							
140	90 / 100	–	–	CCKB 90	M72x3	108	100	M36x120	2480	[6]
160	100 / 110	160	110	CCKB 100	M80x3	114	110	M36x130	2480	[6]
		200	110 / 140							

ØAL = piston Ø
ØMM = piston rod Ø

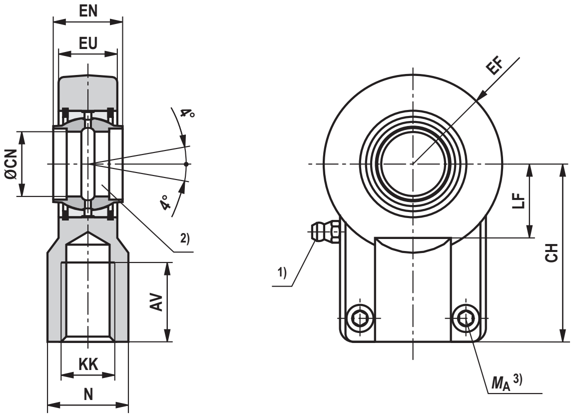
1) Lubricating nipple, cone head form A according to DIN 71412
2) Bolt Ø m6 required (bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)
3) M_A = tightening torque. The fork clevis must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.
4) m = weight of the fork clevis in kg
5) Without lubrication bore
6) Upon request

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

4

Dimensions: Swivel head CGKD (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

ISO 8132



Series CDH2 / CGH2 / CSH2 ØAL	Series CDH2 / CGH2 / CSH2 ØMM	Series CDM1 / CGM1 / CSM1 ØAL	Series CDM1 / CGM1 / CSM1 ØMM	Type	Material no.	Nominal force kN	AV min.	N max.	CH js13	EF max.	ØCN H7 [2]	EN h12	EU max.
–	–	25	14 / 18	CGKD 12 [7]	R900540998	8	17	19	38	16,5	12	12	11
–	–	25	18	CGKD 16	R900308559	12,5	19	22	44	20,5	16	16	14
		32	18 / 22										
–	–	32	22	CGKD 20	R900308576	20	23	28	52	25	20	20	17,5
		40	22 / 28										
40	25 / 28	40	28	CGKD 25	R900323332	32	29	31	65	32	25	25	22
		50	28 / 36										
50	32 / 36	50	36	CGKD 32	R900322049	50	37	38	80	40	32	32	28
		63	36 / 45										
63	40 / 45	63	45	CGKD 40	R900322029	80	46	47	97	50	40	40	34
		80	45 / 56										
80	50 / 56	80	56	CGKD 50	R900322719	125	57	58	120	63	50	50	42
		100	56 / 70										
100	63 / 70	100	70	CGKD 63	R900322028	200	64	70	140	72,5	63	63	53,5
		125	70 / 90										
125	80 / 90	125	90	CGKD 80	R900322700	320	86	91	180	92	80	80	68
		160	90 / 110										
140	90 / 100	–	–	CGKD 90 [8]	R900325702	400	91	100	195	101	90	90	72
160	100 / 110	160	110	CGKD 100	R900322030	500	96	110	210	114	100	100	85,5
		200	110 / 140										
180	110 / 125	–	–	CGKD 110 [8]	R900308153	635	106	125	235	129	110	110	88
200	125 / 140	200	140	CGKD 125	R900322026	800	113	135	260	160	125	125	105
220	140 / 160	–	–	CGKD 160	R900300718	1.520	126	165	310	200	160	160	133
250	160 / 180	–	–										
280	180 / 200	–	–	CGKD 200	R900324814	2.000	161	215	390	250	200	200	165
320	200 / 220	–	–										

Dimensions: Swivel head CGKD (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm))

Series				Type	KK	LF min.	Clamping screws ISO 4762-10.9	M_A 3) Nm	m 4) kg	C_0 5) kN	F_{adm} 6) kN
CDH2 / CGH2 / CSH2		CDM1 / CGM1 / CSM1									
ØAL	ØMM	ØAL	ØMM								
–	–	25	14 / 18	CGKD 12 7)	M12x1,25	13	M5x16	6	0,1	24,5	9,0
–	–	25	18	CGKD 16	M14x1,5	16,5	M6x14	10	0,2	36,5	13,5
		32	18 / 22								
–	–	32	22	CGKD 20	M16x1,5	20,5	M8x20	25	0,35	48	17,7
		40	22 / 28								
40	25 / 28	40	28	CGKD 25	M20x1,5	25,5	M8x20	30	0,65	78	28,8
		50	28 / 36								
50	32 / 36	50	36	CGKD 32	M27x2	30	M10x25	59	1,15	114	42,1
		63	36 / 45								
63	40 / 45	63	45	CGKD 40	M33x2	39	M10x30	59	2,1	204	75,3
		80	45 / 56								
80	50 / 56	80	56	CGKD 50	M42x2	47	M12x35	100	4	310	114,4
		100	56 / 70								
100	63 / 70	100	70	CGKD 63	M48x2	58	M16x40	250	7,2	430	158,7
		125	70 / 90								
125	80 / 90	125	90	CGKD 80	M64x3	74	M20x50	490	15	695	265,5
		160	90 / 110								
140	90 / 100	–	–	CGKD 90 8)	M72x3	85	M20x60	490	19	750	276,8
160	100 / 110	160	110	CGKD 100	M80x3	94	M24x60	840	25,5	1060	391,1
		200	110 / 140								
180	110 / 125	–	–	CGKD 110 8)	M90x3	105	M24x60	840	36,5	1200	442,8
200	125 / 140	200	140	CGKD 125	M100x3	116	M24x70	840	52,5	1430	527,7
220	140 / 160	–	–	CGKD 160	M125x4	145	M24x80	840	82,5	2200	811,8
250	160 / 180	–	–								
280	180 / 200	–	–	CGKD 200	M160x4	190	M30x100	1700	168	3650	1346,9
320	200 / 220	–	–								

ØAL = piston Ø
ØMM = piston rod Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Bolt Ø m6 required
3) M_A = tightening torque
The swivel head must always be screwed against the shoulder of the piston rod. Afterwards, the clamping screws must be tightened with the specified tightening torque.
4) m = weight of swivel head in kg
5) C_0 = static load rating of the swivel head
6) F_{adm} = maximum admissible load on the swivel head during oscillatory or alternating loads
7) Bearing cannot be re-lubricated
8) Not contained in the standard

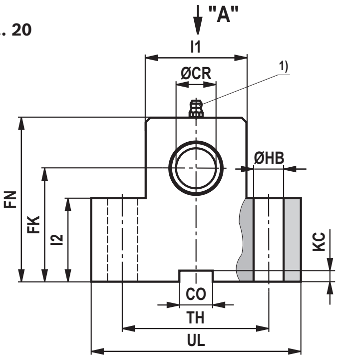
☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

4

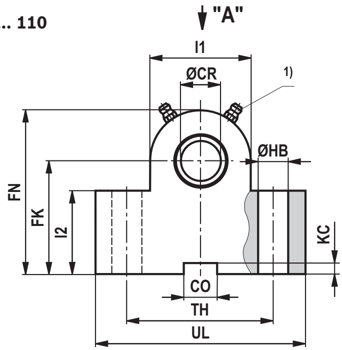
Dimensions: Trunnion bracket CLTB for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

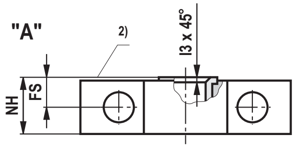
ISO 8132

CLTB 12 ... 20



CLTB 25 ... 110





Series		Type 3)	Material no.	Nominal force kN 4)	ØCR H7	CO N9	FK js12	FN max.	FS js14	ØHB H13	KC +0,3
CDH2 / CGH2 / CSH2 ØAL	CDM1 / CGM1 / CSM1 ØAL										
–	25	CLTB 12	R900772607	8	12	10	34	50	8	9	3,3
–	32	CLTB 16	R900772608	12,5	16	16	40	60	10	11	4,3
–	40	CLTB 20	R900772609	20	20	16	45	70	10	11	4,3
40	50	CLTB 25	R900772610	32	25	25	55	80	12	13,5	5,4
50	63	CLTB 32	R900772611	50	32	25	65	100	15	17,5	5,4
63	80	CLTB 40	R900772612	80	40	36	76	120	16	22	8,4
80	100	CLTB 50	R900772613	125	50	36	95	140	20	26	8,4
100	125	CLTB 63	R900772614	200	63	50	112	180	25	33	11,4
125	160 6)	CLTB 80	R900772615	320	80	50	140	220	31	39	11,4
140	–	CLTB 90	R901364220	385	90	63	160	250	40	45	12,4
160	200 6)	CLTB 100	R901205929	500	100	63	180	280	45	52	12,4
180	–	CLTB 110	R901364223	630	110	80	200	310	50	52	15,4

Dimensions: Trunnion bracket CLTB for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

Series		Type 3)	l1	l2	l3	NH	TH	UL	*m* 5)
CDH2 / CGH2 / CSH2 ØAL	CDM1 / CGM1 / CSM1 ØAL					max.	js14	max.	kg
–	**25**	**CLTB 12**	25	25	1	17	40	63	0,4
–	**32**	**CLTB 16**	30	30	1	21	50	80	0,85
–	**40**	**CLTB 20**	40	38	1,5	21	60	90	1,2
40	**50**	**CLTB 25**	56	45	1,5	26	80	110	2,1
50	**63**	**CLTB 32**	70	52	2	33	110	150	4,55
63	**80**	**CLTB 40**	88	60	2,5	41	125	170	7,3
80	**100**	**CLTB 50**	100	75	2,5	51	160	210	14,5
100	**125**	**CLTB 63**	130	85	3	61	200	265	23,1
125	**160** 6)	**CLTB 80**	160	112	3,5	81	250	325	52,3
140	**–**	**CLTB 90**	180	130	4	91	265	345	7)
160	**200** 6)	**CLTB 100**	200	145	4,5	102	295	385	7)
180	**–**	**CLTB 110**	220	160	5	112	320	410	7)

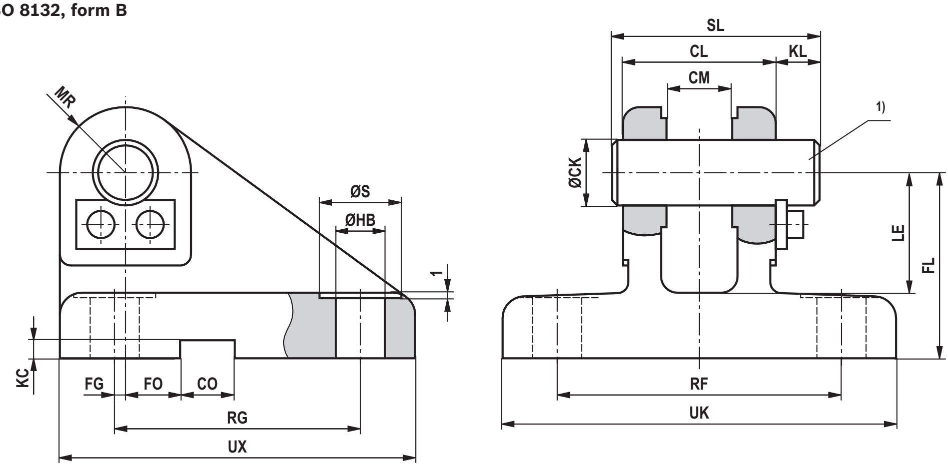
ØAL = piston Ø
1) Lubricating nipple, cone head form A according to DIN 71412
2) Contact surface trunnion (inside)
3) Bearing blocks are always supplied in pairs
4) Nominal force applies to applications in pairs
5) ***m*** = weight of trunnion bracket in kg (specified per pair)
6) Bearing blocks for piston Ø 160 and 200 mm, dimensions differ for replacement transactions (CDM1 / CGM1 / CSM1 series 1X). Please consult us.
7) Upon request

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.
The trunnion brackets are suitable for mounting type MT4.

4

Dimensions: Clevis bracket CLCA (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

ISO 8132, form B



Series					Type	Material no	Nominal force kN	ØCK H9 1)	CL h16	CM A12	CO N9	FG js14	FL js12	FO js14
CDH2 / CGH2 / CSH2		CDM1 / CGM1 / CSM1												
ØAL	ØMM	ØAL	ØAL	ØMM										
–	–	25	25	14 / 18	CLCA 12	R900542861	8	12	28	12	10	2	34	10
–	–	32	25 32	18 18 / 22	CLCA 16	R900542862	12,5	16	36	16	16	3,5	40	10
–	–	40	32 40	22 22 / 28	CLCA 20	R900542863	20	20	45	20	16	7,5	45	10
40	25 / 28	50	40 50	28 28 / 36	CLCA 25	R900542864	32	25	56	25	25	10	55	10
50	32 / 36	63	50 63	36 36 / 45	CLCA 32	R900542865	50	32	70	32	25	14,5	65	6
63	40 / 45	80	63 80	45 45 / 56	CLCA 40	R900542866	80	40	90	40	36	17,5	76	6
80	50 / 56	100	80 100	56 56 / 70	CLCA 50	R900542867	125	50	110	50	36	25	95	0
100	63 / 70	125	100 125	70 70 / 90	CLCA 63	R900542868	200	63	140	63	50	33	112	0
125	80 / 90	160	125 160	90 90 / 110	CLCA 80	R900542869	320	80	170	80	50	45	140	0
140	90 / 100	–	–	–	CLCA 90	3)	400	90	190	90	63	47,5	160	0
160	100 / 110	200	160 200	110 110 / 140	CLCA 100	3)	500	100	210	100	63	52,5	180	0
180	110 / 125	–	–	–	CLCA 110	3)	635	110	240	110	80	62,5	200	0
200	125 / 140	–	200	140	CLCA 125	3)	800	125	270	125	80	75	230	0

Dimensions: Clevis bracket CLCA (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

Series					Type	ØHB H13	KC +0,3	KL	LE min.	MR max.	RF js14	RG js14	ØS	SL	UK max.	UX max.	*m* [2] kg
CDH2 / CGH2 / CSH2		CDM1 / CGM1 / CSM1															
ØAL	ØMM	ØAL	ØAL	ØMM													
–	–	25	25	14 / 18	CLCA 12	9	3,3	8	22	12	52	45	15	38	72	65	0,45
–	–	32	25	18	CLCA 16	11	4,3	8	27	16	65	55	18	46	90	80	1
			32	18 / 22													
–	–	40	32	22	CLCA 20	11	4,3	10	30	20	75	70	18	58	100	95	1,5
			40	22 / 28													
40	25 / 28	50	40	28	CLCA 25	13,5	5,4	10	37	25	90	85	20	69	120	115	3
			50	28 / 36													
50	32 / 36	63	50	36	CLCA 32	17,5	5,4	13	43	32	110	110	26	87	145	145	5
			63	36 / 45													
63	40 / 45	80	63	45	CLCA 40	22	8,4	16	52	40	140	125	33	110	185	170	9,6
			80	45 / 56													
80	50 / 56	100	80	56	CLCA 50	26	8,4	19	65	50	165	150	40	133	215	200	15,5
			100	56 / 70													
100	63 / 70	125	100	70	CLCA 63	33	11,4	20	75	63	210	170	48	164	270	230	27,5
			125	70 / 90													
125	80 / 90	160	125	90	CLCA 80	39	11,4	26	95	80	250	210	57	202	320	280	47
			160	90 / 110													
140	90 / 100	–	–	–	CLCA 90	45	12,4	28	108	90	280	235	66	224	360	320	[3]
160	100 / 110	200	160	110	CLCA 100	52	12,4	30	120	100	315	250	76	246	405	345	[3]
			200	110 / 140													
180	110 / 125	–	–	–	CLCA 110	52	15,4	31	138	110	335	305	76	277	425	400	[3]
200	125 / 140	–	200	140	CLCA 125	52	15,4	32	170	125	365	350	76	310	455	450	[3]

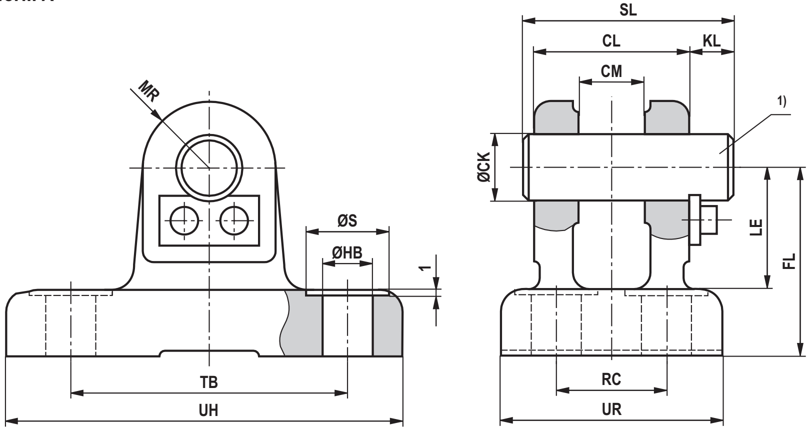
ØAL = piston Ø
ØMM = piston rod Ø
[1] Bolt Ø m6 required
(bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)
[2] *m* = weight of clevis bracket in kg
[3] Upon request

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

4

Dimensions: Clevis bracket CLCD (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

ISO 8132, form A



Series					Type	Material no.	Nominal force	ØCK	CL	CM	FL	ØHB	KL
CDH2 / CGH2 / CSH2		CDM1 / CGM1 / CSM1					kN	H9 1)	h16	A13	js12	H13	
ØAL	ØMM	ØAL	ØAL	ØMM									
–	–	25	25	14 / 18	CLCD 12	R900542879	8	12	28	12	34	9	8
–	–	32	25	18	CLCD 16	R900542880	12,5	16	36	16	40	11	8
			32	18 / 22									
–	–	40	32	22	CLCD 20	R900542881	20	20	45	20	45	11	10
			40	22 / 28									
40	25 / 28	50	40	28	CLCD 25	R900542882	32	25	56	25	55	13,5	10
			50	28 / 36									
50	32 / 36	63	50	36	CLCD 32	R900542883	50	32	70	32	65	17,5	13
			63	36 / 45									
63	40 / 45	80	63	45	CLCD 40	R900542884	80	40	90	40	76	22	16
			80	45 / 56									
80	50 / 56	100	80	56	CLCD 50	R900542885	125	50	110	50	95	26	19
			100	56 / 70									
100	63 / 70	125	100	70	CLCD 63	R900542886	200	63	140	63	112	33	20
			125	70 / 90									
125	80 / 90	160	125	90	CLCD 80	R900542887	320	80	170	80	140	39	26
			160	90 / 110									
140	90 / 100	–	–	–	CLCD 90	3)	400	90	190	90	160	45	28
160	100 / 110	200	160	110	CLCD 100	3)	500	100	210	100	180	45	30
			200	110 / 140									
180	110 / 125	–	–	–	CLCD 110	3)	635	110	240	110	200	52	31
200	125 / 140	–	200	140	CLCD 125	3)	800	125	270	125	230	52	32

Dimensions: Clevis bracket CLCD (clampable) for series CDH2/CGH2/CSH2 and CDM1/CGM1/CSM1 (dimensions in mm)

Series					Type	LE	MR	RC	ØS	SL	TB	UR	UH	*m* [2]
CDH2 / CGH2 / CSH2		CDM1 / CGM1 / CSM1				min.	max.	js14			js14	max.	max.	kg
ØAL	**ØMM**	**ØAL**	**ØAL**	**ØMM**										
–	**–**	**25**	**25**	**14 / 18**	**CLCD 12**	22	12	20	15	38	50	40	70	0,35
–	**–**	**32**	**25**	**18**	**CLCD 16**	27	16	26	18	46	65	50	90	0,7
			32	**18 / 22**										
–	**–**	**40**	**32**	**22**	**CLCD 20**	30	20	32	18	58	75	58	98	0,95
			40	**22 / 28**										
40	**25 / 28**	**50**	**40**	**28**	**CLCD 25**	37	25	40	20	69	85	70	113	1,9
			50	**28 / 36**										
50	**32 / 36**	**63**	**50**	**36**	**CLCD 32**	43	32	50	26	87	110	85	143	3
			63	**36 / 45**										
63	**40 / 45**	**80**	**63**	**45**	**CLCD 40**	52	40	65	33	110	130	108	170	5,5
			80	**45 / 56**										
80	**50 / 56**	**100**	**80**	**56**	**CLCD 50**	65	50	80	40	133	170	130	220	10,6
			100	**56 / 70**										
100	**63 / 70**	**125**	**100**	**70**	**CLCD 63**	75	63	100	48	164	210	160	270	17
			125	**70 / 90**										
125	**80 / 90**	**160**	**125**	**90**	**CLCD 80**	95	80	125	57	202	250	210	320	32
			160	**90 / 110**										
140	**90 / 100**	**–**	**–**	**–**	**CLCD 90**	108	90	140	66	224	290	230	370	[3]
160	**100 / 110**	**200**	**160**	**110**	**CLCD 100**	120	100	160	66	246	315	260	400	[3]
			200	**110 / 140**										
180	**110 / 125**	**–**	**–**	**–**	**CLCD 110**	138	110	180	76	277	350	290	445	[3]
200	**125 / 140**	**–**	**200**	**140**	**CLCD 125**	170	125	200	76	310	385	320	470	[3]

ØAL = piston Ø
ØMM = piston rod Ø
[1] Bolt Ø m6 required
(bolt and bolt lock are included in the scope of delivery and are not mounted upon delivery)
[2] ***m*** = weight of clevis bracket in kg
[3] Upon request

☞ **Notice!**
Geometry and dimensions may differ depending on the manufacturer. In case of combination with other mounting elements, check the suitability.

Notes

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