HAWE Product Overview

HAWE HYDRAULIK

Content

Compact hydraulic power packs type KA und KAW

Prop. directional spool valve type PSL und PSV

Hydraulic clamps type HSE und HSA

Pressure switches type DG

Electronic accessory components type PLVC

6 Appendix 280

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Preface

HAWE Hydraulik SE was established as „Heilmeier & Weinlein, Fabrik für Oelhydraulik GmbH & Co. KG in Munich in 1949. nnovative ideas, high product quality and a lot of enthusiasm has contributed to HAWE's steady growth. We now have more than 2200 employees, a worldwide sales network with sales offices in Germany, 14 HAWE subsidiaries and more than 30 representatives international.

The product range has been widened continuously over the years, covering standard valves e.g. pressure valves etc. as well as many products tailored for special purposes such as pre-fill valves, lifting/lowering valves etc.
There are three distinguishing features that make HAWE products unique in the fluid power industry:
All HAWE products are developed based on the HAWE modular design concept. Secondly, all pressurized parts are made of steel. And finally, sustainable business takes top priority during manufacture and installation, meaning certification according to ISO 9001 (quality management), ISO 14001 (environmental management) and EN 16001 (energy management) is a given.

Production Site Freising

This Product Overview is intended to give you a summary of the general capabilities of the variety of pumps, valves, and other equipment manufactured by HAWE. This publication is supplemented with additional product specific pamphlets (listed at "Additional Information"), which contain detailed technical specifications as well as further information. The technical information contained in these pamphlets is substantial and include guarantee and warrantee relevant details. These pamphlets may be ordered from your local HAWE sales representative (see addresses on page 278) or directly from HAWE in Munich (contact: info@hawe.de).
It goes without saying that your sales partner (please see "Office addresses" attached for the addresses) and our "Technical Support" team in Munich would be glad to help with the selection, configuration and specification of the optimal HAWE products for you.

Headquarters Munich

OUR VERTICAL RANGE OF MANUFACTURE ENSURES SUPERIOR QUALITY!

Production Site
Kirchheim

Production Site
Sachsenkam

Production Site
Dorfen

Note:

All information from HAWE, our staff or our representatives provide product or system options for further investigation by users having technical expertise. Before you select or use any product or system it is important that you analyse all aspects (incl. safety regulations) of your application and review the information concerning the product or system in the current product catalogue.

All dimensions in mm, subject to change without notice!

Our vertical range of manufacture ensures superior quality!

Efficiency:

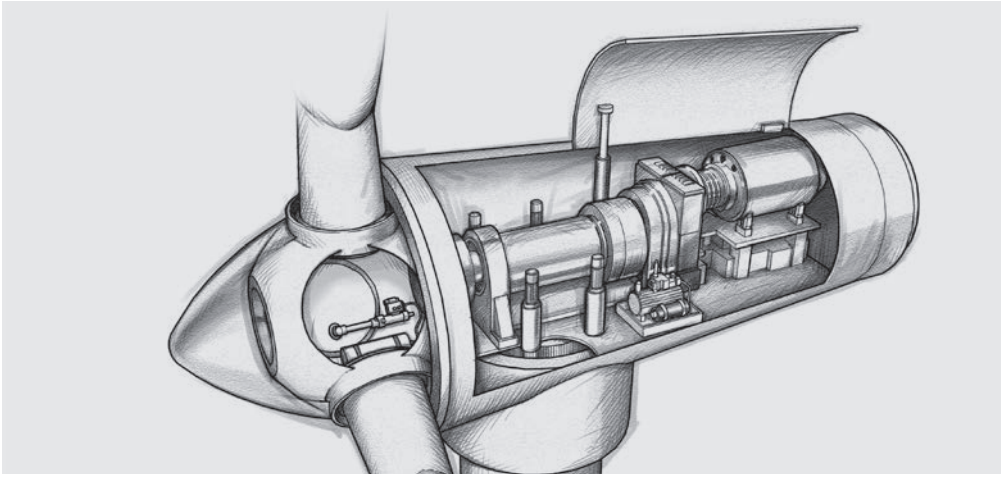
Example: Machine tools

- Compact hydraulic power packs with small tank capacity
- Zero leakage directional seated valves instead of directional spool valves
- Accumulator charged operation with idle pump circulation

Example: Truck mounted cranes

- Variable displacement axial piston pumps with clever controller technique
- Well-engineered Load-Sensing systems
- Quick response and directional spool valves with minimized leakage

HAWE Proportional directional spool valve: Sensible and powerfull fine adjustability for all mobile application with a maximum of robustness. Also in harsh environments and up to 420 b



Flexibility:

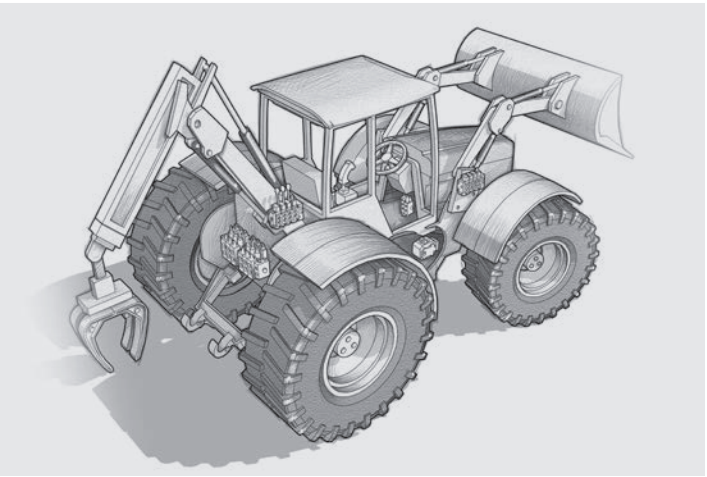
Example: Tractors for logging and agriculture

- Accurate controls that can be easily customized and extended
- One product covering all functions (boom, supports, steering etc.)
- Various sizes can be combined, additional function can be integrated

Example: Food processing

- Versatile, compact hydraulic power packs
- AC or DC-drive for low and high pressure applications
- All required functions can be implemented via directly mounted modular valve banks

We offer a wide range of various directional seated valves to ensure a safe and powerful functionality of your machine.



Reliability:

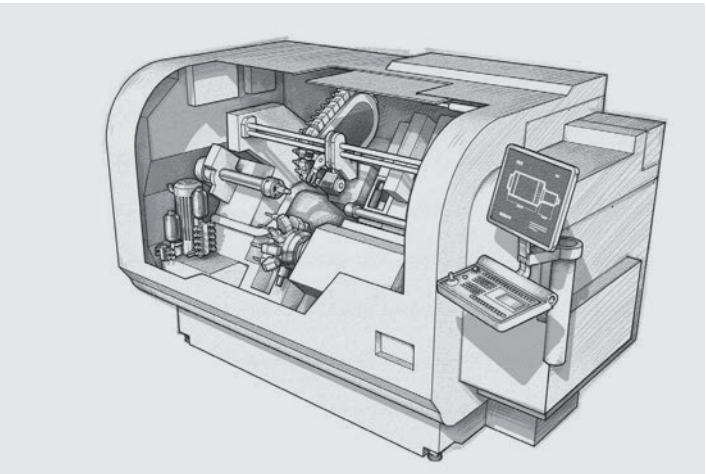
Example: Wind energy plants

- Sturdy long-lived components ensure long service life
- Modular design eases maintenance
- Hydraulic controls also for severe ambient conditions (hot, cold, moist, etc.)

Example: Construction machines

- Well proven systems consisting of pump, hydraulic controls, over-center valve and electronics
- Modular electronic controls perfectly fitting the hydraulics
- Various approved solutions for oscillation dampening

We provide with our compact hydraulic power packs energy efficient solutions for brake controls.



Technology:

Example: Tools with hydraulic drive

- High power density via compact design
- Wide range of modular high pressure components (max. 700 bar)
- Two-stage pumps efficiently generate the necessary working pressure

Example: Hydraulic presses

- Hydraulic power controlled reliable and smooth
- Decentralized hydraulic controls via compact hydraulic power packs
- Various solutions for synchronous operation

SOLUTIONS FOR A WORLD UNDER PRESSURE

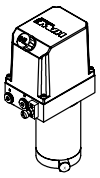
Efficiency in modules

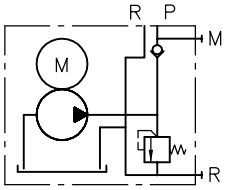
Hydraulics is based on a simple principle that allows its use in a wide variety of different applications. In order to use all of these variations, we offer a modular range of products. As a direct result of our development philosophy, the individual HAWE components supplement one another to form one complete product range. They can then be combined to form solutions and systems. Unified components and the possibility to combine them individually serve to increase efficiency at an ideal price-performance ratio.

- **individual components supplement one another to form one complete product range**
- **allows customer-specific solutions**

Compact hydraulic power packs

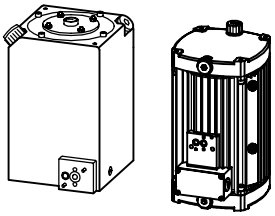
Type NPC
for miniature hydraulic systems with 5...10% ED (P_{max} = 700 bar, Q_{max} = 2.1 lpm)

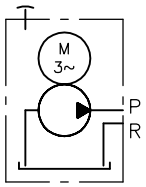




e.g. NPC 11 K/0,31

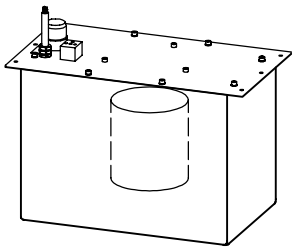
Type HC, HCW, KA, KAW
for miniature hydraulic systems with 10...30% ED (P_{max} = 700 bar, Q_{max} =20.1 lpm), available in 4 sizes, also as dual circuit pump

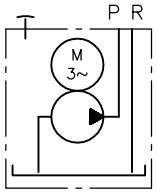




e.g. HC 14/2,0
KA 24 SKS/0,36

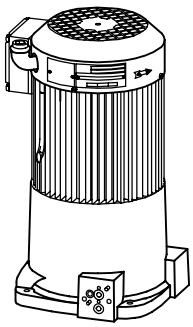
Type MP, MPN, MPW, MPNW
suitable for intermittent or load/no load operation (P_{max} = 700 bar, Q_{max} = 15 lpm) available in 5 sizes, also as dual stage pump, various tank sizes

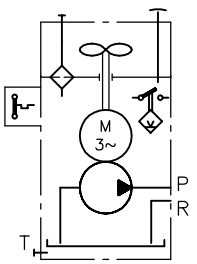




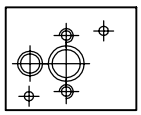
e.g. MP 24-H 1,77/B 10
MPN 44 - H 5,6 - B 25.20

Type HK, HKF, HKL
suitable for continuous operation (P_{max} = 700 bar, Q_{max} = 16 lpm), available in 3 sizes, also as double and triple circuit pump





e.g. HK 449 ST/1-H 5,0



Common connection hole pattern

Order examples

NPC 11 K/0,31 - 1/320 - R - 24
KA 44 LFK/H 2,5
MPN 44 - HZ 0,9/12,3 - B 25.20
HK 449 ST/1 - H 5,0 -
C 16 -

Compact hydraulic power packs

B31/450 - EM11 V - 13 - G 24
NE 21 - 320/25 -
AS 1 F 2/300 -
AP 34 - 43/24 -

Connection blocks

BWH 1 - NW - 33 - G 24

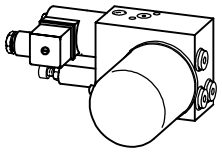
VB 21 GM - RH - 3 - G 24
BVZP 1 F 23 - G 52/22 - H 14 N 15/0 - 1 - 1 - G 24
BWN 1 F - HJ 5 - 1 - 1 - G 24

Directly mounted valve banks

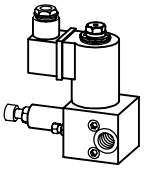
The practical modular system allows individual combinations.

Connection blocks

Type A
e.g. AS1F2/300-G24

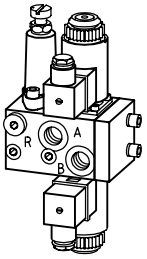


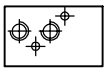
Type B
e.g. B31/450-EM11V-13-G24

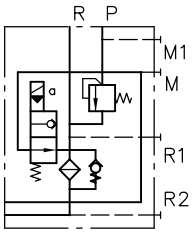


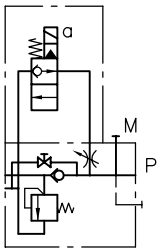
Type C
e.g. C5

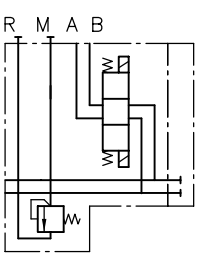
Type SKC, SWC
e.g. SWC1/150-L-1-G24





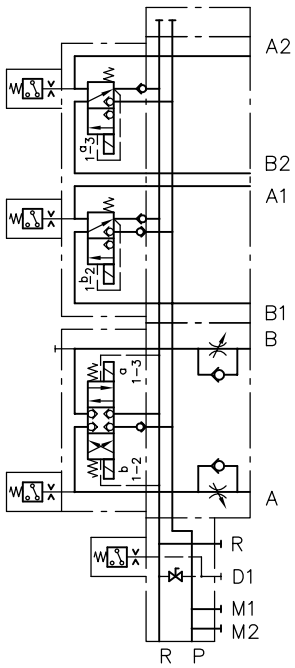






Directly mounted valve bank

Connection hole pattern for pipe connection or direct mounting of a directional valve bank
e.g. BVZP1F23-G52/22-H14N15/0-1-1G24



Pumps

1.1 Compact hydraulic power packs

Compact hydraulic power packs type KA and KAW

Compact hydraulic power packs type HK, HKF and HKL

Compact hydraulic power packs

Type	Nomenclature	Design	p_{max}	Q_{max}
NPC	**Radial piston pump** ■ With integrated electric motor ■ Direct current supply	Oil immersed compact hydraulic power pack for short period operation	750 bar	approx. 1.36 lpm
HC, HCW	**Radial piston or gear pump** ■ With integrated electric motor ■ 3-phase or 1-phase version	Oil immersed compact hydraulic power pack for intermittent operation	Radial piston pump 700 bar	approx. 4.4 lpm
			Gear pump 180 bar	approx. 3.4 lpm
KA, KAW	**Radial piston or gear pump** ■ With integrated electric motor ■ 3-phase or 1-phase version	Oil immersed compact hydraulic power pack for intermittent operation	Radial piston pump 700 bar	approx. 7 lpm
			Gear pump 180 bar	approx. 24.1 lpm
MP, MPN	**Radial piston pump and/or gear pump** ■ With integrated motor ■ Single- or dual-circuit pump	Oil immersed compact hydraulic power pack for intermittent or load/no load operation	Radial piston pump 700 bar	13.1 lpm
			Gear pump 220 bar	135 lpm
HK, HKF, HKL	**Radial piston pump and/or gear pump** ■ With integrated motor ■ 3-phase version	Oil immersed compact hydraulic power pack for continuous and intermittent operation	Radial piston pump 700 bar	approx. 13 lpm
			Gear pump 180 bar	16 lpm

Connection blocks/mounted valves

Type	Nomenclature	Design	p_{max}	Q_{max}
A, B, C	**Connection blocks** ■ For completion of hydraulic power packs	Add-on valve enabling pipe connection or mounting of valves	700 bar	approx. 20 lpm
BA	**Valve bank** ■ Directional seated valve ■ Zero leakage	Valve bank enabling pipe connection **Actuation:** solenoid, pressure-actuated or manual, mechanical	400 bar	20 lpm
BVH	**Valve bank** ■ Directional seated valve ■ Zero leakage	Valve bank enabling pipe connection	400 bar	20 lpm

Compact hydraulic power packs

1.1 Miniature hydraulic power packs type NPC

The NPC compact hydraulic power pack can be universally used in short period operation for all consumers with low oil requirements. The energy is supplied by direct current. A pressure-limiting valve is integrated into the intermediate flange. The NPC can be used on construction sites and in other mobile applications. It can be developed into a compact, complete hydraulic control by connecting valves from the VB or BWN(H) ranges.

Features and benefits:

- Very low space requirements and easy to transport
- Supplied with direct current at 12V DC or 24V DC
- Particularly suited to mobile applications
- Long service life and excellent reliability achieved by using radial piston pumps
- Environmentally sound thanks to low oil fill volumes and minimum amount of oil to be disposed of
- Low costs for hydraulic fluid
- Co-ordinated range of valves and accessories from the modular system

Intended applications:

- Rivets
- Ventilation of winch brakes
- Hydraulic jigs
- Crimping

Nomen-clature:	**Radial piston pump with integrated electric motor (version for 3-phase mains)**
Design:	**Oil immersed compact hydraulic power pack for short period operation**
p_{max}:	**750 bar**
Q_{max}:	**approx. 1.36 lpm (V_g = 0.09 - 0.76 cm³/rev)**

Design and order coding example

NPC 11 / 0,87 - 1/170 - R - G12 BWN 1 - NN - 35 - 1 - G12

Valve assembly
- BWN1, BWH1, VB01 or BVH
- can be mounted directly, without connection blocks according to D 7470 B/1, D 7302, D 7788 BV

Motor voltage 12V DC or 24V DC

Check valve With/without check valve

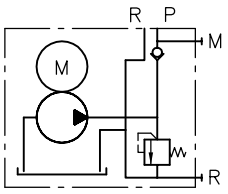
Pressure limiting valve and setting
- 1 = Tool adjustable
- 2 = Manually adjustable

Delivery flow [lpm]

Basic type, size Type NPC, size 11 and 12

Function

Symbol:



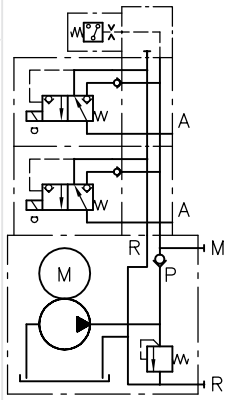
Example circuity:

NPC 11 / 0,87 - 1/170 - R - G 12

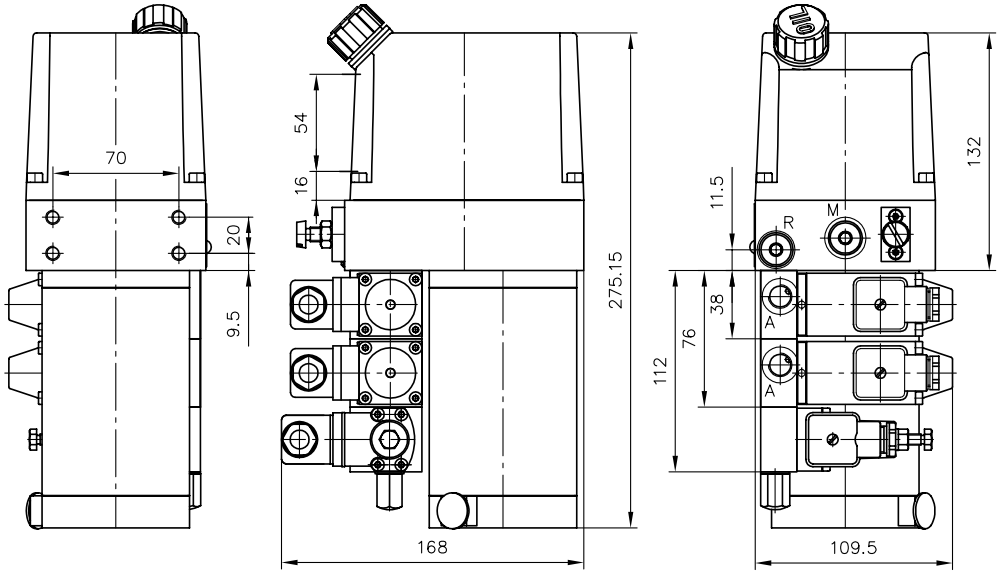
Compact hydraulic power pack type NPC, pump delivery flow approx. 0.87 lpm

BWN 1 - NN - 35 - 1 - G 12

Directly mounted valve bank type BWN with two valve sections and pressure switch for gallery P, solenoid voltage 12V DC



General parameters and dimensions



	Delivery flow						Max. pressure		
	Q_{pu} [lpm]						p_{max} [bar]	P_N [kW]	m [kg]
NPC 11 (24 V)	0.2	0.31	0.44	0.61	0.87	1.05	750	0.1/0.3	6
NPC 11 (12 V)								0.1/0.25	6
NPC 12 (24 V)	0.4	0.65	0.94	1.28	1.71	2.14	750	0.6	8
NPC 12 (12 V)								0.6	8

Associated technical data sheets:

- Compact hydraulic power pack, type NPC: D 7940

Directly mountable valve banks:

- Type VB: Page 130
- Type BVH: Page 40
- Type BWH, BWN: Page 138
- Pressure switches type DG: Page 266
- Electronic pressure transducer type DT: D 5440 T/1, D 5440 T/2

See also section "Devices for special applications"

- Hydraulics for clamping
- Devices for up to 700 bar

Compact hydraulic power packs

1.1 Compact hydraulic power packs type HC and HCW

The ready-for-connection compact hydraulic power pack can be used in applications where consumers with a low oil volume requirement have to be connected in intermittent operation (S 3), e.g. in machine tool and jig construction, or in general machine engineering. The power pack consists of the housing (tank) with integrated motor and pump. The filling gauge on HC(W) size 2, 3 and 4 types enables the fluid level to be controlled even during operation. The electrical connections are made via an integrated terminal box. Compact control systems can be created by mounting various combinations of connection blocks and valve banks. Float switches and temperature switches are optionally available for perfect monitoring.

Nomen-clature:	**Radial piston pump with integrated electric motor (3-phase or 1-phase version)**
Design:	**Oil immersed hydraulic power pack for intermittent service (S3-service)**
p_{max}:	**Radial piston pump 700 bar Gear pump 180 bar**
Q_{max}:	**Radial piston pump approx. 4.4 lpm (V_g = 1.6 cm³/rev) Gear pump approx. 3.4 lpm (V_g = 1.3 cm³/rev)**
$V_{usable\ max}$:	**8 l**

Features and benefits:

- Wide range of application achieved with four sizes
- Direct current version for voltage supply with 12 V DC or 24 V DC
- Long service life and excellent reliability achieved by using radial piston pumps
- Low oil fill volumes make it environmentally sound thanks to the small amount of oil to be disposed of and the low costs for hydraulic fluid
- Co-ordinated range of valves and accessories from modular system
- Suitable for vertical and horizontal installation

Intended applications:

- Brake and rotor adjustment modules on wind turbines
- Tracking systems on solar panels and parabolic aerials
- Clamping systems on machine tools and jigs
- Rivets and clinching equipment
- Welding robots
- Lubrication systems

Design and order coding example

HC24 /0,6 - A1/400 - BWH1F-HH-1-1-G24 - 400V 50 Hz

Motor voltage 3 ~ 400V 50 Hz, 3 ~ 460V 60 Hz
1 ~ 230V 50 Hz, 1 ~ 110V 60 Hz (3~phase motor)

Optional directly mounted directional valve bank

Connection block

Pump version

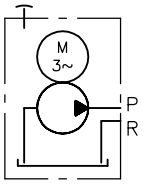
Single circuit pump
- Radial piston pump H (3-, 5- or 6-cylinders) or gear pump Z

Dual circuit pump
- Combinations:
  - Radial piston pump - gear pump
  - Radial piston pump - radial piston pump

Basic type, size Type HC (3-phase motor) and type HCW (1-phase motor, power reduction of 30 ... 50% depending on size), size 1 to 2, type HCG (direct current motor), size 1
- Horizontal version with low profile (type HC..L) or vertical version
- Usable volume V_{usable} 0.5 l to 1.1 l
- With/without fluid level gauge
- With DC-motor (Type HCG) for short time operation

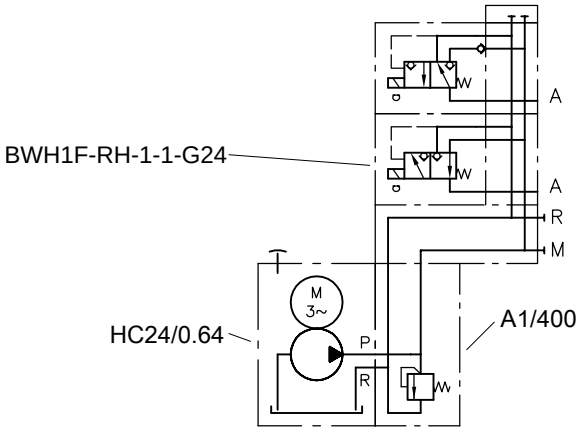
Function

Symbol:

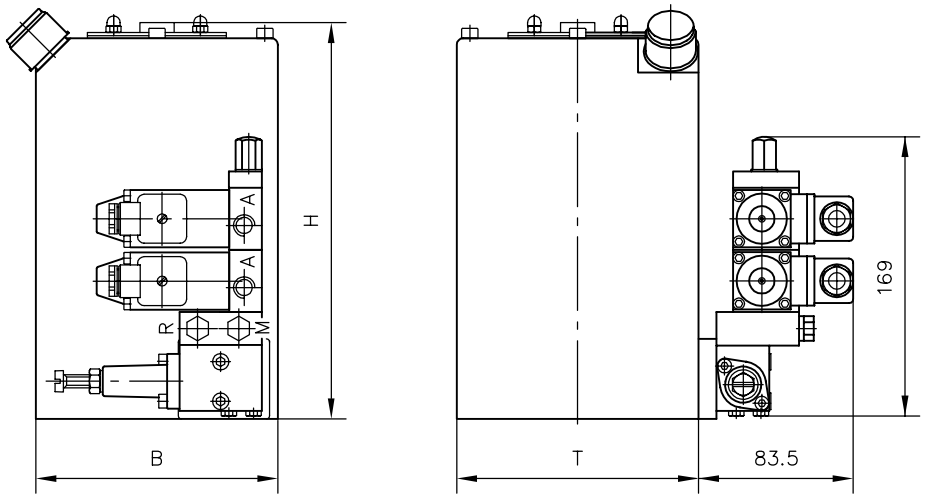


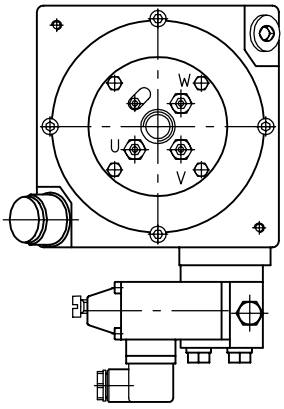
Example circuit:

HC 24/0.64 -	- A1/400	- BWH1F - RH1 - 1 - 1 - G 24
Hydraulic power pack type HC, size 24, pump delivery flow approx. 0.64 lpm	Connection block type A and pressure-limiting valve (400 bar)	Directly mounted valve bank type BWH1



General parameters and dimensions



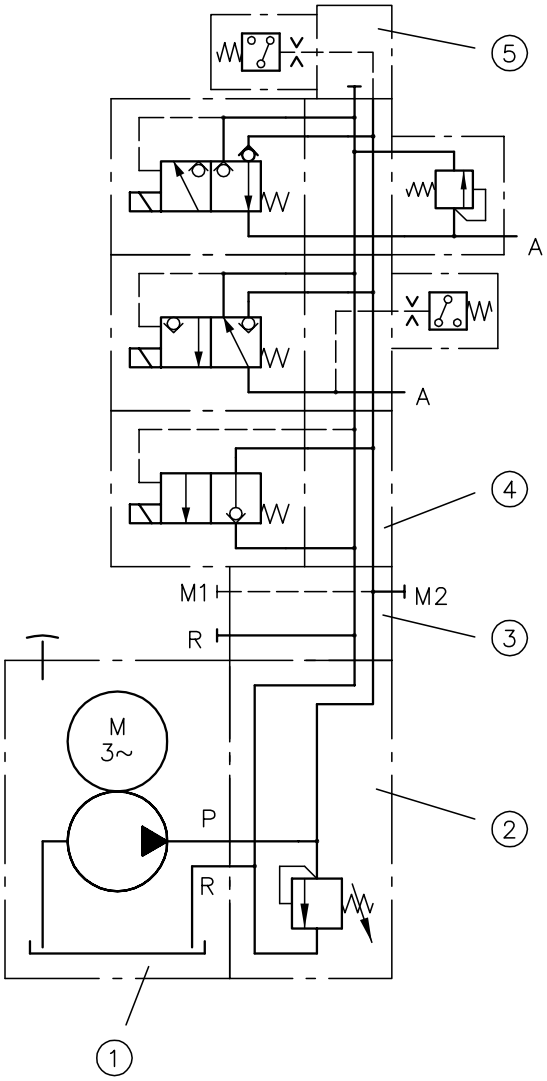


	Radial piston pump (3 cyl.)			Gear pump					Dimensions [mm]		
	Max. pressure	Delivery flow		Max. pressure	Delivery flow						
	p_{max} [bar]	Q_{pu} [lpm] 50 Hz	Q_{pu} [lpm] 60 Hz	p_{max} [bar]	Q_{pu} [lpm] 50 Hz	Q_{pu} [lpm] 60 Hz	P_N [kW][1]	m [kg][2]	H	B	T
HC 14	700 - 160	0.2 - 1.05	0.2 - 1.2	-	-	-	0.18	6.3	197	120	120
HC 12	600 - 120	0.4 - 2.15	0.5 - 2.5	-	-	-	0.25				
HC 24	700 - 185	0.27 - 2.27	0.3 - 2.7	150	0.4 - 1.6	0.5 - 1.9	0.55	10.1	243	148	148
HC 22	700 - 140	0.52 - 4.41	0.6 - 5.3	150	0.9 - 3.4	1.1 - 4	0.55				

1) The actual power input depends on the respective operation pressure and can be up to 1.5 x P_N
2) Without oil filling

Example circuit:

HC 24/0.64 - A2/400
- BWH 1 F 1-DH3 R/230-33-G24
- 3x400V 50Hz



1 Compact hydraulic power pack
2 Connection block
3 Adapter plate
4 Valve section
5 End plate

Associated technical data sheets:
- Compact hydraulic power packs type HC: D 7900
- Compact hydraulic power packs type HCG: D 7900 G

Connection blocks:
- Types A, B and C: Page 32

Directly mountable valve banks:
- Type VB: Page 130
- Type BWH, BWN: Page 138
- Type BVZP: Page 146
- Type SWR, SWS: Page 88
- Type BA: Page 34
- Type BVH: Page 40

See also section "Devices for special applications"
- Hydraulics for clamping
- Devices for up to 700 bar

Compact hydraulic power packs

1.1 Compact hydraulic power packs type KA and KAW

The ready-for-connection compact hydraulic power pack consists of a housing (tank) with integrated motor and pump. The tank volume (effective volume) can be increased by extensions. A vertical and a horizontal variant are available. A filling gauge enables visual control of the fluid level even during operation. The electrical connections are made via an integrated terminal box. Compact control systems can be created by mounting various combinations of connection blocks and valve banks. Float switches and temperature switches are optionally available for perfect monitoring.

Features and benefits:

- Additional external fan for optimum load set
- Fill/effective volumes can be flexibly extended by modular tank extensions
- Long service life and high reliability achieved by using radial piston pumps
- Low oil fill volume makes it environmentally sound thanks to the small amount of oil to be disposed of and the low costs for hydraulic fluid
- Co-ordinated range of valves and accessories from modular system
- Suitable for vertical and horizontal installation
- Optimum efficiency achieved by suboil motor cooling, direct transmission of force and cleverly designed heat dissipation

Intended applications:

- Brake and rotor adjustment modules on wind turbines
- Clamping systems on machine tools and appliances
- Torque wrenches
- Rivets and clinching equipment
- Presses
- Handling systems

Nomen-clature:	**Radial piston or gear pump with integrated motor single or dual circuit pump**
Design:	**Oil immersed hydraulic power pack for intermittent or load/no load operation (S3-service)**
p_{max}:	**Radial piston pump 700 bar Gear pump 180 bar**
Q_{max}:	**Radial piston pump approx. 7 lpm (V_g = 2.29 cm³/rev) Gear pump approx. 24.1 lpm (V_g = 7.9 cm³/rev)**
$V_{tank\ max}$:	**2 ... 10 l**

Design and order coding example

KA28	22	L1	KFTP	/HZ0,59/8,8	- ...	- 3x400V	- G1/2x300

Oil drain hose

Motor voltage 3 ~ 400V 50 Hz, 3 ~ 460V 60 Hz, 3 ~ 690V 50 Hz,
1 ~ 230V 50 Hz, 1 ~ 110V 60 Hz (1~phase motor)

Valve design

Pump version

Single circuit pump

- Radial piston pump H or gear pump Z

Dual circuit pump

- with joint connection pedestal for pressure connections P1 and P3
- Combinations: Radial piston pump - radial piston pump (HH) and radial piston pump - gear pump (HZ)

Additional function

- Oil sight glass
- Filling gauge with float switch
- Temperature switch
- Silica gel filter (instead of breather filter)
- Additional fans
- Various electrical connection variants (type KA...S)

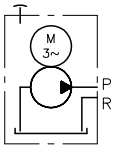
Installation position Horizontal version with low installation heights (type KA..L) or vertical version (type KA..S)

Tank size [l]

Basic type, size Type KA (3~phase motor) and KAW (1~phase motor, power reduction 30 ... 50% dep. on size), size 2 and 4

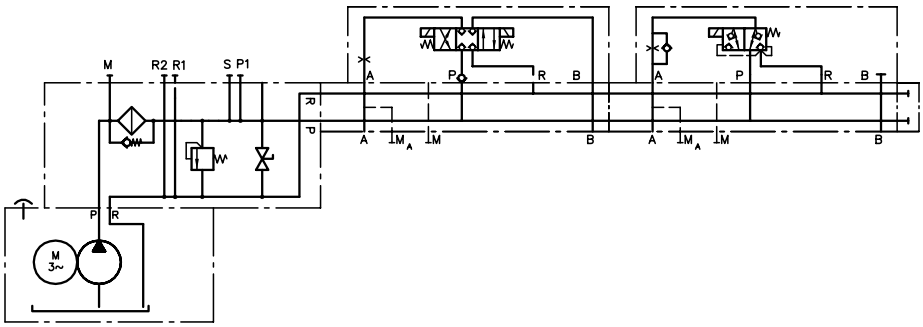
Function

Switching symbol:

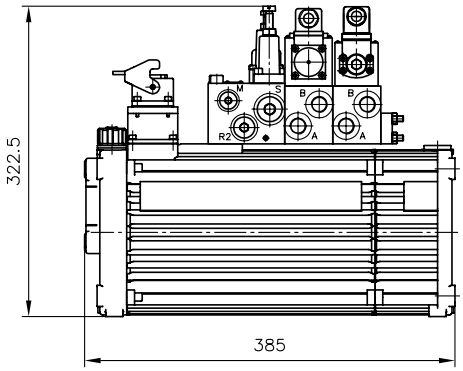


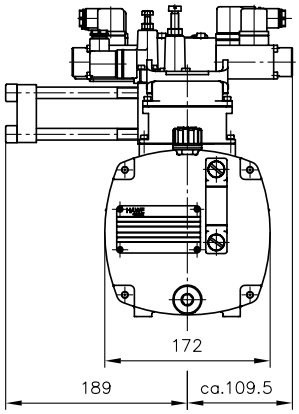
KA 231 LKP/H 0.59 - A1 D 10-B 400-3/380 - BA 2

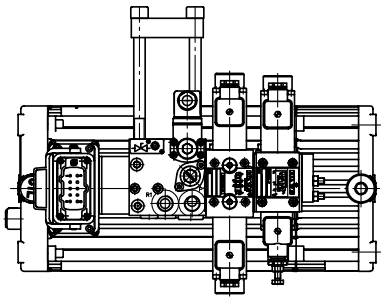
- NBVP 16 G/R/AB 2.0 - M/0
- NBVP 16 Y/ABR 1.5/4 - M/0
- 1 - G 24



General parameters and dimensions





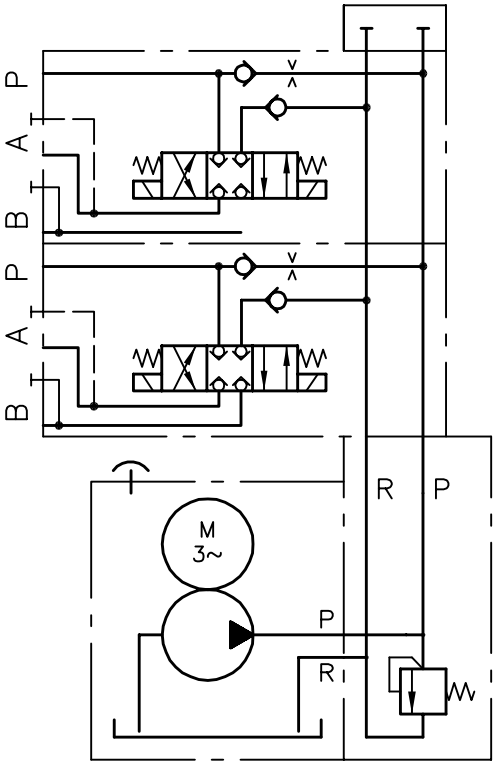


	3-cylinder radial piston pump			6-cylinder radial piston pump			Gear pump			
	p_{max} [bar]	Q_{max} [lpm] 50 Hz	Q_{max} [lpm] 60 Hz	p_{max} [bar]	Q_{max} [lpm] 50 Hz	Q_{max} [lpm] 60 Hz	p_{max} [bar]	Q_{max} [lpm] 50 Hz	Q_{max} [lpm] 60 Hz	P_N [kW]
KA 21	700 - 45	0,63 - 10,02	0,76 - 12,05	360 - 55	1,26 - 7,84	1,52 - 9,42	170 - 60	2,23 - 6,7	2,68 - 8,04	0,55
KA 22	700 - 140	0,63 - 0,02	0,76 - 12,05	700 - 180	1,26 - 7,84	1,52 - 9,42	170 - 55	2,23 - 22,04	2,68 - 26,47	1,1
KA 23	700 - 60	0,31 - 4,89	0,37 - 5,93	485 - 30	0,62 - 9,79	0,75 - 11,85	170 - 50	1,09 - 4,90	1,32 - 5,94	0,37
KA 24	700 - 160	0,31 - 4,89	0,37 - 5,93	700 - 80	0,62 - 9,79	0,75 - 11,85	170 - 65	1,09 - 10,74	1,32 - 13,04	0,75
KA 26	700 - 160	0,63 - 10,02	0,76 - 12,05	700 - 205	1,26 - 7,84	1,52 - 9,42	170 - 65	2,23 - 22,04	2,68 - 26,47	1,4
KA 28	700 - 185	0,31 - 4,89	0,37 - 5,93	700 - 90	0,62 - 9,79	0,75 -11,85	170 - 75	1,09 - 10,74	1,32 - 13,04	1,0

	3-cylinder radial piston pump			6-cylinder radial piston pump			Gear pump			
	p_{max} [bar]	Q_{max} [lpm] 50 Hz	Q_{max} [lpm] 60 Hz	p_{max} [bar]	Q_{max} [lpm] 50 Hz	Q_{max} [lpm] 60 Hz	p_{max} [bar]	Q_{max} [lpm] 50 Hz	Q_{max} [lpm] 60 Hz	P_N [kW]
KA 44	700 - 220	0,84 - 5,98	1,01 - 7,25	700 - 110	1,68 - 11,97	2,04 - 14,53	200 - 130	0,84 - 9,1	1,01 - 11,1	- 1,5 - 2,2 - 3,0

Example circuit:

KA 44 S/H 3.2
-A 1/250
-BVH 11 G/GM/R/2
-BVH 11 G/GM/R/2
-GM 24
3x400V Hz-1.5kW



Associated technical data sheets:
- Compact hydraulic power packs type KA: D 8010, D 8010-4

Similar products:
- Compact hydraulic power packs type HC and HCG: Page 14

Suitable connection blocks:
- Types A, B and C: Page 32

Directly mountable valve banks:
- Type VB: Page 130
- Type BWH, BWN: Page 138
- Type BVZP: Page 146
- Type SWR, SWS: Page 88
- Type BA: Page 34
- Type BVH: Page 40

See also section "Devices for special applications"
- Clamping hydraulics
- Geräte bis 700 bar

Compact hydraulic power packs

1.1 Hydraulic power packs type MP and MPN

These compact hydraulic power packs are designed for use in stationary applications, which work in intermittent or load/no load operation. Two different pumps can be easily mounted as an option to make this type particularly suitable for dual-stage drives such as in presses or dual-circuit systems. The tank size and drive power can be easily adjusted to the system requirements using several sizes. Compact control systems can be created by directly mounting connection blocks and valve banks.

Features and benefits:

- Intermittent or load/no load operation S3 or S6
- Long service life and excellent reliability achieved by using radial piston pumps
- Low oil fill volumes make it environmentally sound thanks to small amount of oil to be disposed of and low costs for hydraulic fluid
- Two-stage valves and switch units for press controls can be directly mounted
- Co-ordinated range of valves and accessories from modular system
- Dual-circuit pumps available

Intended applications:

- Brake and rotor adjustment modules on wind turbines
- Counterbalance and provision of clamping pressure for lathe chucks, tailstocks and steady rests on large machine tools and turning centres
- Presses and other shaping machines
- Handling and clamping systems on machine tools and jigs
- Lubrication systems

Nomen-clature:	**Radial piston and/or gear pump with integrated motor single or dual circuit pump**
Design:	**Oil immersed hydraulic power pack for intermittent or load/no load operation (S2-/S3-/S6-service)**
p_{max}:	**Radial piston pump 700 bar (high pressure) Gear pump 220 bar (low pressure)**
Q_{max}:	**13.1 lpm (high pressure) (Vg = 10.7 cm^3/rev) 135 lpm (low pressure) (Vg = 60 cm^3/rev)**
$V_{t\ max}$:	**approx. 100 lpm**

Design and order coding example

MPN 44	- H 1,5	- B10.20	D	- ...	- 3 ~ 230V 50 Hz

Motor voltage 3 ~ 230/400V ΔY 50 Hz, 3 ~ 500V Y 50 Hz,
1 ~ 230V 50 Hz, 1 ~ 110V 60 Hz (1-phase motor)

Valve mounting

Additional options
- Filling gauge
- Float switch
- Temperature switch
- Various means of electrical connection

Design
- For installation in self-made oil tanks: as individual pump or cover plate version
- With tank, usable volume V_{usable} 10 l to 75 l

Pump version

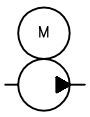
Single-circuit pump
- Radial piston pump H or gear pump Z
- Internal gear pump IZ

Dual-circuit pump
- Combinations:
  - Radial piston pump - radial piston pump (HH, only MPN)
  - Radial piston pump - gear pump (HZ)
  - Gear pump - gear pump (ZZ, only MP)

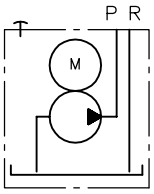
Basic type, size Type MP (3-phase motor) and MPW (1-phase motor), sizes 1 and 2
Type MPN (3-phase motor) and MPNW (1-phase motor), size 4
1-phase motor, power reduction by 30 ... 50% depending on size

Function

Single stage pump
(radial piston pump, gear pump)

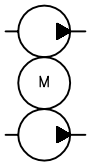


Installation pump

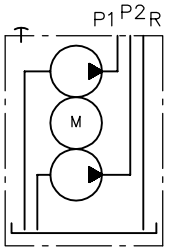


Hydraulic power pack (incl. tank)

Dual stage pump
(radial piston/gear pump,
gear pump/gear pump)

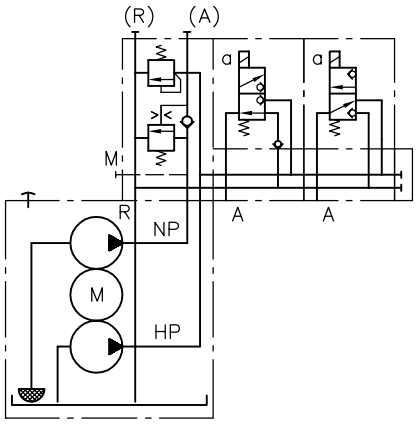


Installation pump



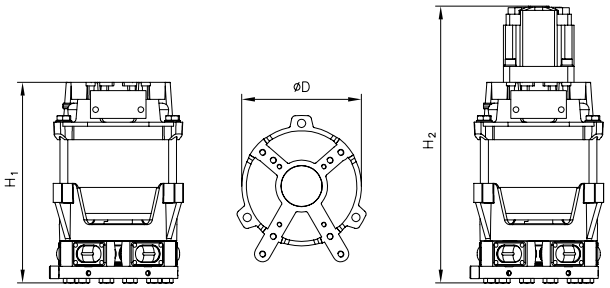
Hydraulic power pack (incl. tank)

Example circuit:

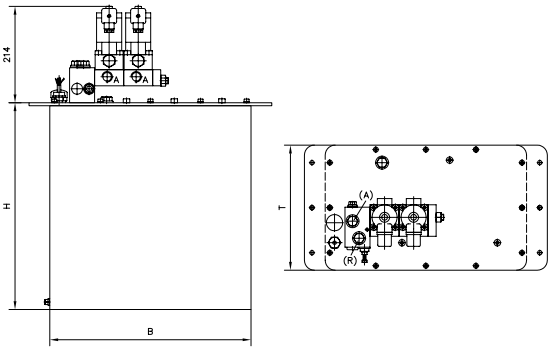


General parameters and dimensions

Single-circuit pump, dual-circuit pump
(without tank)



Compact hydraulic power pack
(tank with mounted valves)



	Radial piston pump (3 cyl.)			Gear pump					Dimensions [mm]		
	Max. pressure	Delivery flow		Max. pressure	Delivery flow						
	p_{max} [bar]	Q_{pu} [lpm] 50 Hz	Q_{pu} [lpm] 60 Hz	p_{max} [bar]	Q_{pu} [lpm] 50 Hz	Q_{pu} [lpm] 60 Hz	P_N [kW]1)	m [kg]2)	H1 2)	$H2_{max}$	∅D
MP 14	700 - 220	0,27 - 1,07	0,32 - 1,28	150 - 15	0,5 - 6,9	0,6 - 8,29	0,25	5,2/5,0	183/228	249	124
MP 12	700 - 250	0,53 - 2,1	0,64 - 2,52	150 - 60	2 - 6,9	2,4 - 8,28	0,37				
MP 24	700 - 310	0,46 - 1,73	0,55 - 2,08	150 - 35	2 - 12,3	2,4 - 14,76	0,75	9,1/7,7	195/291	322,5	140
MP 22	700 - 260	0,88 - 3,51	1,06 - 4,21	150 - 18	4 - 41,4	4,8 - 49,68	0,55				
MPN 42	700 - 250	2,39 - 7,33	2,87 - 8,8	200 - 60	8,46 - 30,02	10,2 - 36,02	2,1	12,9	251/258	431	
MPN 44	700 - 250	1,53 - 5,37	1,84 - 6,44	200 - 55	5,37 - 25,99	6,4 - 31,19	2,1				
MPN 46	700 - 250	3,16 - 11,12	3,8 - 13,34	200 - 40	12,41 - 71,73	14,89 - 86,08	3,0	18,5	274/281	454	165
MPN 48	700 - 330	2,36 - 4,06	2,83 - 4,87	220 - 60	4,16 - 34,91	4,99 - 41,89	3,0				
MPN 404	700 - 340	3,1 - 3,49	3,7 - 4,19	220 - 45	2,7 - 68,16	2,25 - 81,79	4,2	26,4	298/313	486	

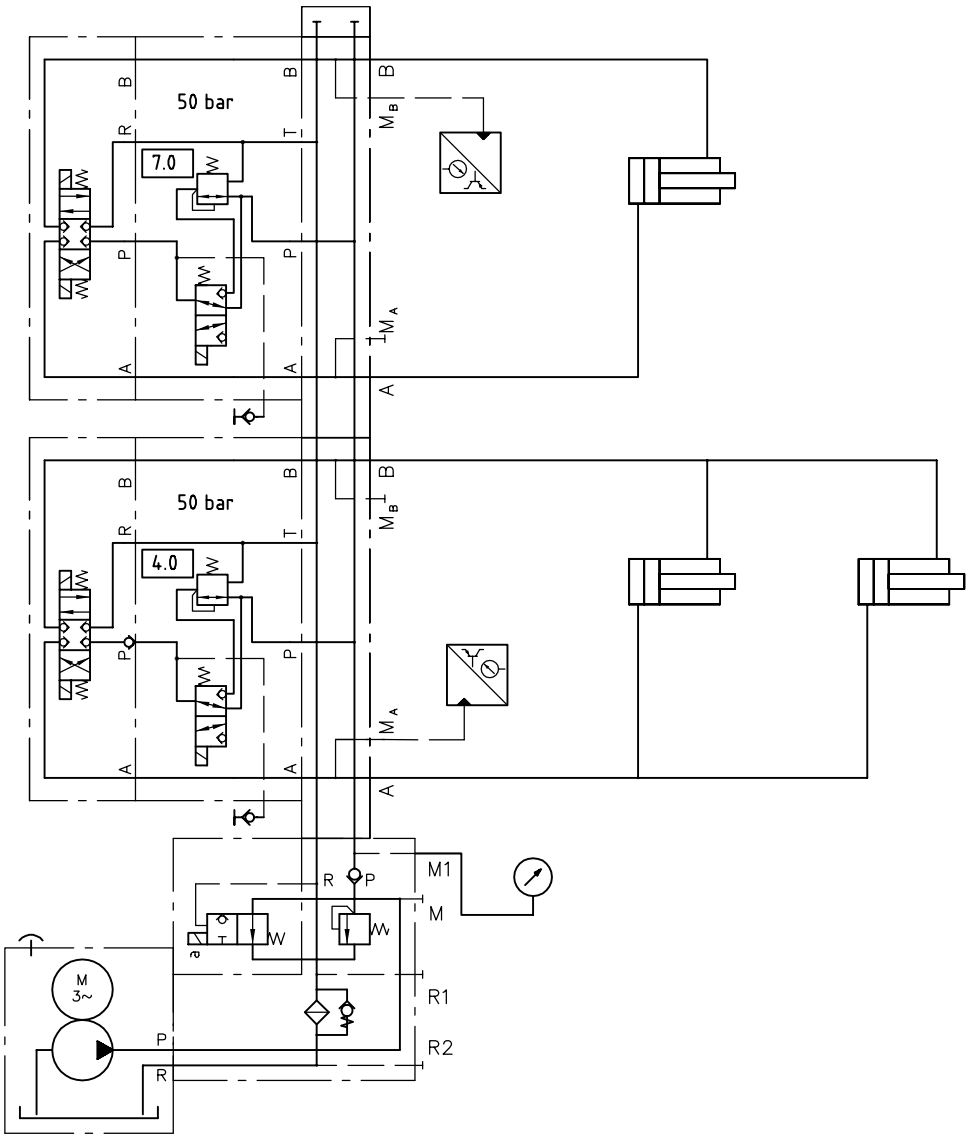
1) The actual power input is dependent on the respective operation pressure and can be up to 1.5xP_N
2) Values apply to radial piston pump/gear pump versions

Version with tank:

Size	Tank size	H [mm]	W [mm]	D [mm]
MP 1.	B 3	225	216	136
MP 1., MP 2.	B 5	265	258	160
MP 2., MPN 4.	B 10	358	324	200
MPN 4.	B 25	458	402	250
	B 55	470	560	350
	B 110	495	560	350
	B 25 L	283	623	250
	B 55 L	305	560	350

Example circuit:

MPN 44-Z 8.8-B 10 KT -AS 1 F 3/160
-BA 2
-NBVP 16 G/R-GM/NZP 16 LZY 5/50-G 8 MA/GM/3-X 84 V-DG 5E-250-1/4
-NBVP 16 G-GM/NZP 16 LZY 5/50-G 8 MA/GM/3-X 84 V-DG 62
-1-G 24
-X 84 V-9/250
-3 x 400/230 V 50 Hz



Associated technical data sheets:

- Compact hydraulic power packs type MP, MPW: D 7200, D 7200 H
- Compact hydraulic power packs type MPN, MPNW: D 7207

Connection blocks:

- Types A, B and C: Page 32

Directly mountable valve banks:

- Type VB: Page 130
- Type BWH, BWN: Page 138
- Type BVZP: Page 146
- Type SWR, SWS: Page 88
- Type BA: Page 34
- Type BVH: Page 40

See also section "Devices for special applications"

- Hydraulics for clamping
- Devices for up to 700 bar

Compact hydraulic power packs

1.1 Compact hydraulic power packs type HK, HKF, HKL

Because of the unique integrated fan configuration, the "ready for connection" hydraulic power packs are ideal for continuous operation. Another version for temperature sensitive applications features an auxiliary blower, thereby gaining improved cooling (approx. 25%). This type is available for single circuit operation (radial piston or gear pump), dual circuit operation (radial piston and/or gear pump) or triple circuit operation (radial piston pump only). Both single and dual circuit pumps are also available as a horizontal version (type HKL). Complete hydraulic control systems can be created by directly mounting various combinations of connection blocks and valve banks to the hydraulic power pack. These hydraulic power packs are used for machine tools (lathes and milling machines), jigs or general machine applications, making a commonly used external radiator superfluous.

Nomenclature:	**Radial piston pump and/or gear pump with integrated motor (version for 3-phase mains)**
Design:	**Oil immersed compact hydraulic power pack for permanent and intermittent operation (S1/S6 service)**
p_{max}:	**700 bar (radial piston pump) 180 bar (gear pump)**
Q_{max}:	**Radial piston pump (high pressure) approx. 13 lpm (V_g = 9.15 cm³/rev) Gear pump (low pressure) 24 lpm (V_g = 17.0 cm³/rev)**
$V_{usable\ max}$:	**approx. 11.1 l**

Features and benefits:

- Suited for permanent and intermittent operation (S1/S6 service)
- Additional separately driven fan for maximum utilisation of power
- 3 sizes enable wide field of application
- Radial piston pumps ensure long service life and high reliability
- Small filling volume minimize costs for fluid and fluid disposal
- Matching valve and accessories from a modular system
- Available as single to triple circuit pump

Intended applications:

- Supply of clamping pressure for lathe chucks, tail stocks, steady rests at machine tools and machining centers
- Welding machines, roboter
- Endurance test benches
- Endurance test bench construction
- Torque wrench

Design and order coding example

HK 34	8	LST	- H 3,6	3 x 400V 50Hz

Motor voltage 3 ~ 230/400V ΔY 50 Hz, 3 ~ 265/460V ΔY 60 Hz
1 ~ 230V 50 Hz, 1 ~ 115V 60 Hz (1~phase motor)

Pump version

Single circuit pump
- Radial piston pump H, gear pump Z, internal gear pump IZ

Dual circuit pump with joint connection pedestal for pressure ports P1 and P3
- Combinations:
  - Radial piston pump - radial piston pump (HH)
  - Radial piston pump - gear pump (HZ)

Dual circuit pump with separate connection pedestals
- Radial piston pump H or gear pump Z

Additional functions
- Temperature and fluid level switch
- Additional leakage port (Type HK 4.L)

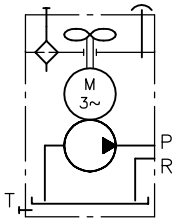
Tank size Type HK: Usable volume V_{usable} 0.85 l to15.4 l, Type HKL: Usable volume V_{usable} 1.7 l to 9.1 l
- Various filler neck designs

Basic type, size Type HK, size 2 to 4, type HKF (with auxiliary blower for increased cooling), size 4
Type HKL (3~phase motor) and HKLW (1~phase motor), size 3

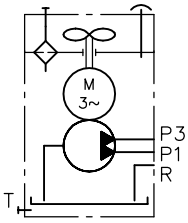
Additional versions:
- With molded motor

Function

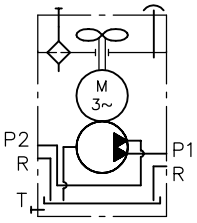
Single stage pump
(radial piston pump, or gear pump)



Dual stage pump
(radial piston/radial piston pump, or gear pump/gear pump, or radial piston pump/gear pump)

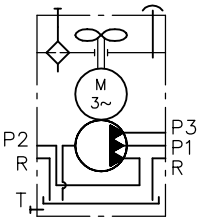


Joint pump pedestal



Separate pump pedestals

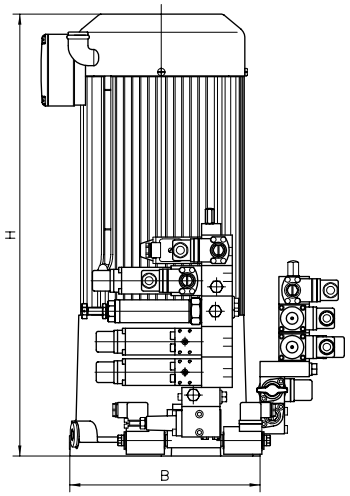
Triple circuit pump
(only radial piston pump)

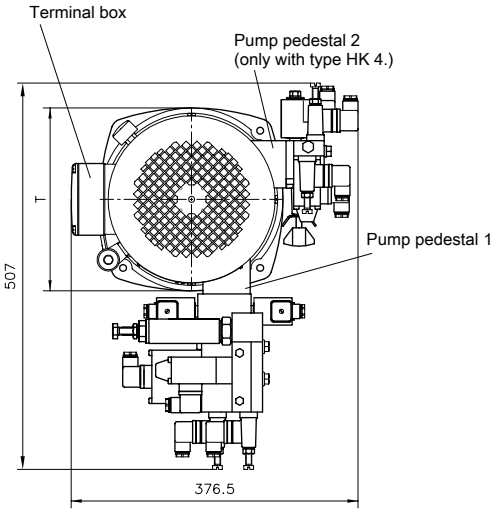


Separate pump pedestals

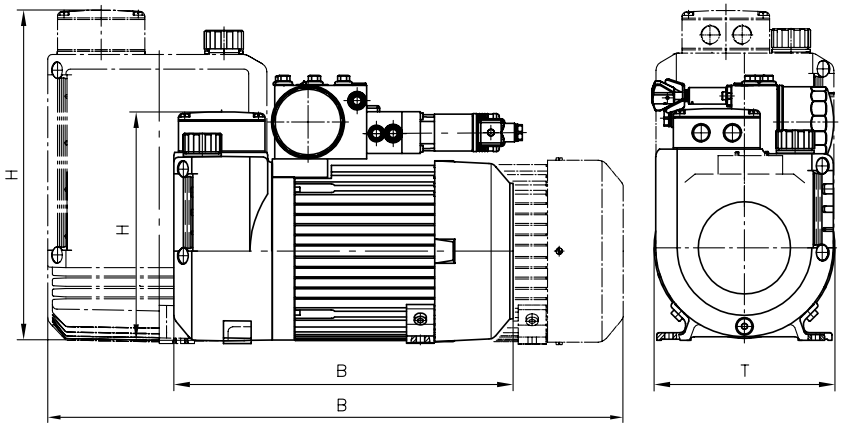
General parameters and dimensions

HK..





HKL..



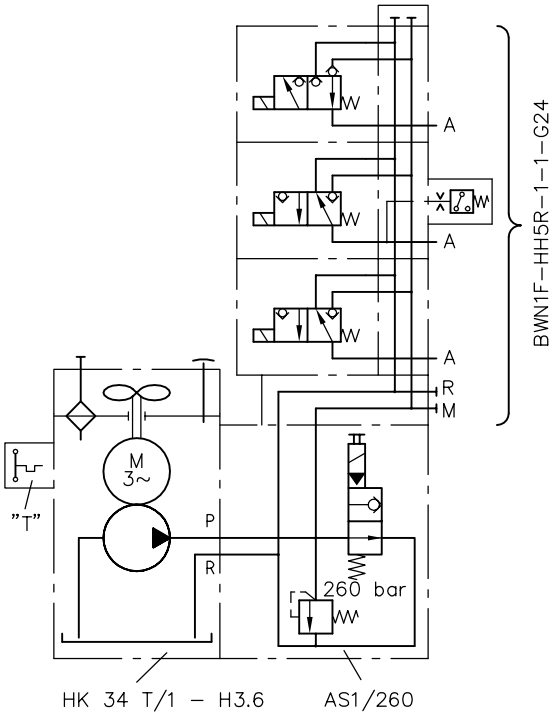
	Radial piston pump			Gear pump				Dimensions [mm]			
	Max. pressure	Delivery flow		Max. pressure	Delivery flow						
	p_{max} [bar]	Q_{pu} [lpm] 50 Hz	Q_{pu} [lpm] 60 Hz	p_{max} [bar]	Q_{pu} [lpm] 50 Hz	Q_{pu} [lpm] 60 Hz	P_N [kW][1)]	H_{max}	B	T	m [kg]
HK 24	700 - 220	0.46 - 1.77	0.55 - 2.12	-	-	-	0.55	340	196	196	13
HK 33	560 - 100	1.25 - 6.5	1.5 - 7.8	170 - 100	2.7 - 6.9	3.24 - 8.28	0.8	405	212	212	20.5
HK 34	700 - 170	1.25 - 6.5	1.5 - 7.8	170 - 160	2.7 - 6.9	3.24 - 8.28	1.1	405	212	212	20.5
HK(F) 43	610 - 90	2.08 - 13.1	3.36 - 15.72	170 - 80	4.5 - 16	3.29 - 19.2	1.5	460	240	240	29
HK(F) 44	700 - 130	2.08 - 13.1	2.5 - 15.72	170 - 110	4.5 - 24	3.29 - 28.8	2.2	460	240	240	29
HK(F) 48							3	833	240	240	40
HKL(W) 32	700 - 220	1.65 - 8.7	1.98 - 10.44	170 - 130	2.7 - 11.3	3.24 - 13.56	1.8	358	617	196	19.2
HKL(W) 34											
HKL 38	700 - 220	1.65 - 8.7	1.98 - 10.44	170 - 130	2.7 - 11.3	3.24 - 13.56	2.2	358	617	196	22.2

1) The actual power input is depends on the respective operation pressure and can be up to 1.5 x P_N

Example circuits:

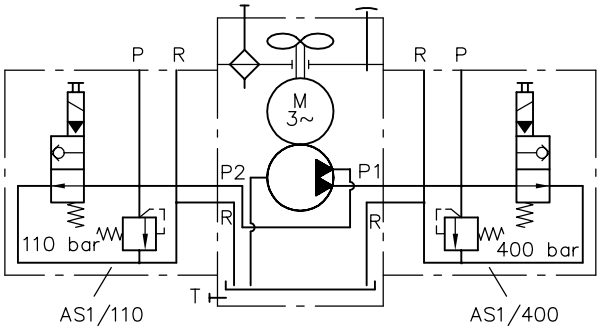
HK34T/1-H 3.6-AS1/260-BWN1F-H H5 R-1-1-G24

Compact hydraulic power pack type HK 34 with temperature switch (coding T), radial piston pump H 3.6, connection block (type AS 1/260) with pressure-limiting valve (260 bar) and idle circulation valve as well as directly mounted valve bank type BWN 1



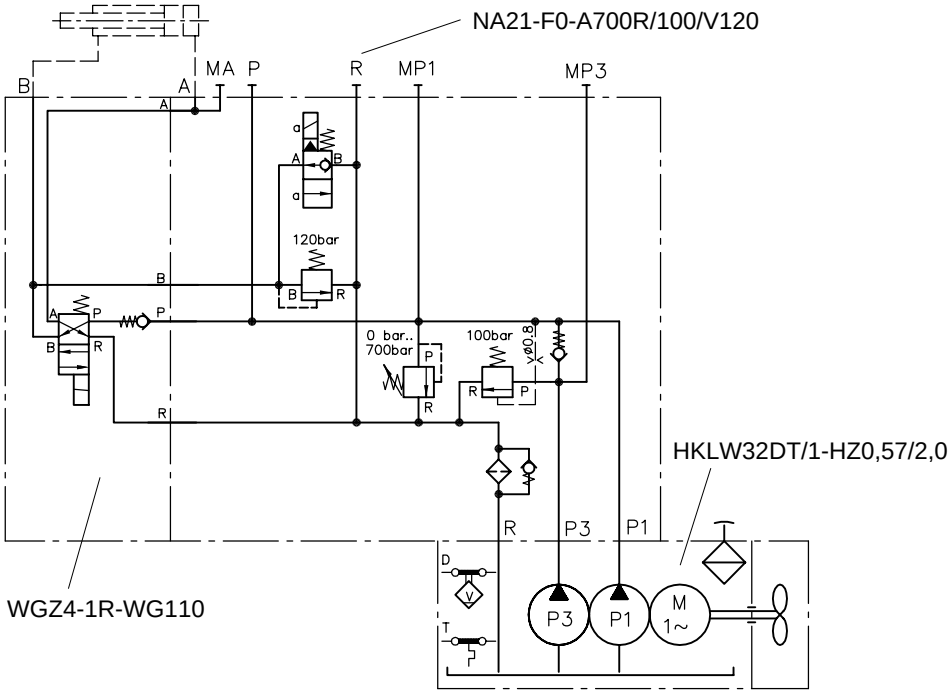
HK44 /1-H 2.5-Z 6.9-AS1/400-AS1/110-G24

Compact hydraulic power pack type HK 44 with radial piston pump H 2.5 and gear pump Z 6.9 on separate pump pedestals, each with connection block (type AS1/..) with pressure-limiting valve
(400 bar and 110 bar) and idle circulation valve (connection of valve banks possible)



Example circuit:

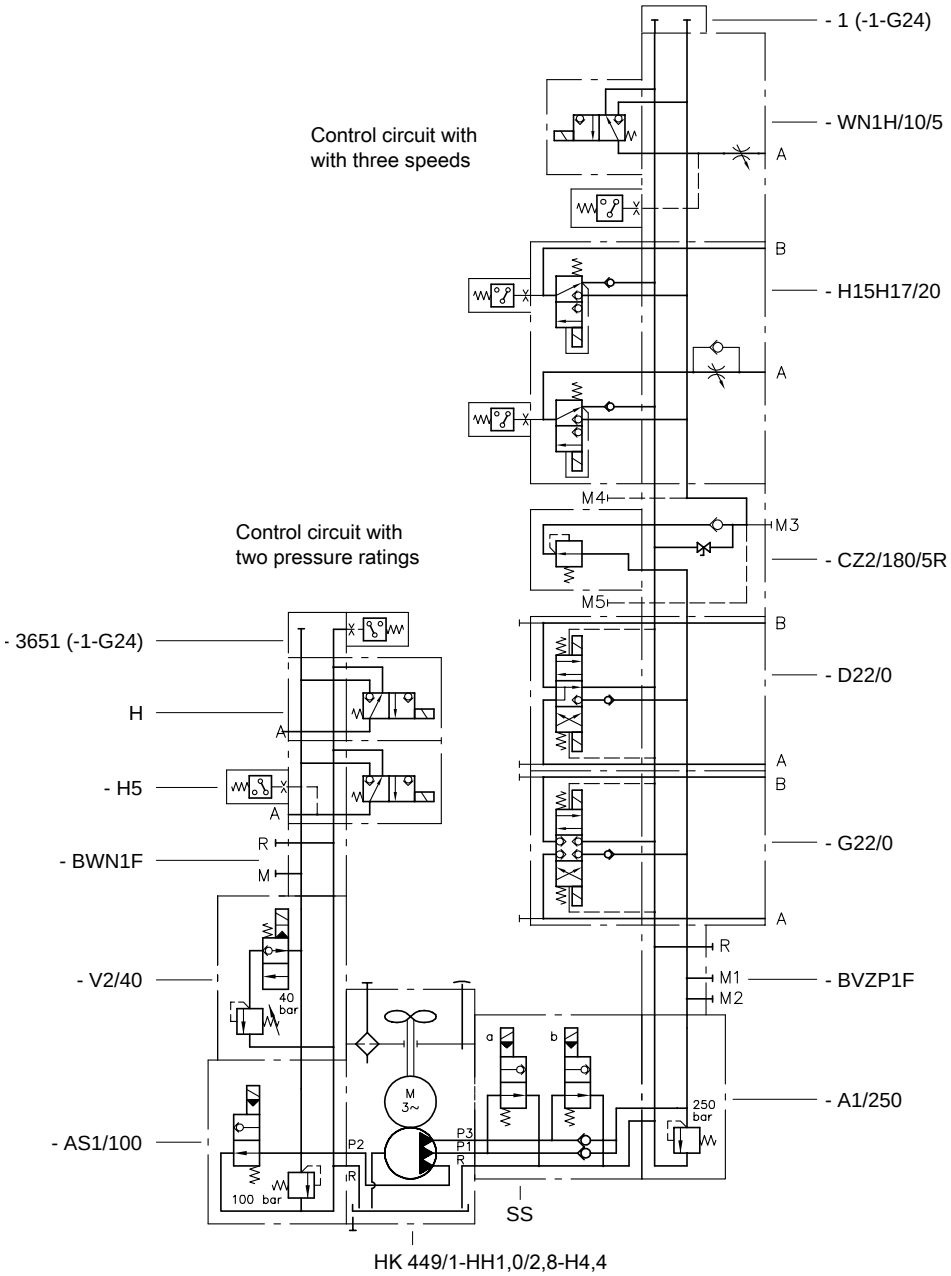
HKLW32DT/1-HZ0.57/2.0 **- NA21F0-A700R/100/V120**
- WGZ4-1R-WG110
1 ~ 110V 60 Hz



Example circuit:

HK449/1-HH1.0/2.8-H4.4 -SS
- **A1/250**
- **BVZP1F -G22/0 -D22/0 -CZ2/180/5R**
- **H15H17/20 -WN1H/10/5 -1-1**
- **AS1/100 -V2/40**
- **BWN1F-H5H-3651-1-G24**

3 ~ 400/230V ⅄Δ 50 Hz



Associated technical data sheets:
- Compact hydraulic power packs type HK 4, HKF 4: D 7600-4
- Type HK 3: D 7600-3
- Type HK 2: D 7600-2
- Type HKL 3, HKLW 3: D 7600-3L

Connection blocks:
- Type A, B and C: Page 32

Directly mountable valve banks:
- Type VB: Page 130
- Type BWH, BWN: Page 138, Type BVZP 1: Page 146
- Type SWR, SWS: Page 88
- Type BA: Page 34
- Type BVH: Page 40

See also section "Devices for special applications"
– Hydraulics for clamping, devices for up to 700 bar

Compact hydraulic power packs

1.1 Connection blocks type A, B, and C

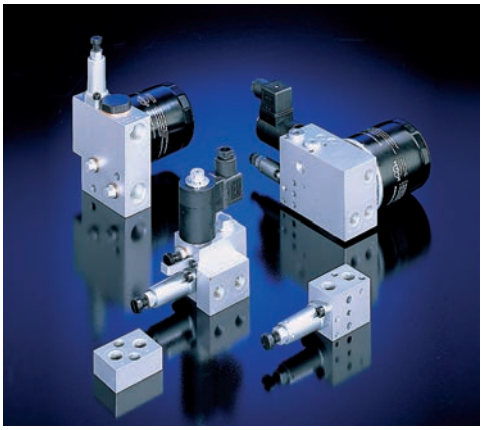
Connection blocks are used to develop types HC, KA, MP, MPN, HK, HKF and HKL compact hydraulic power packs into a ready-for-connection solution. Compact control systems can be created by directly mounting valve banks to the connection blocks on type A (see “complete solutions in modular system”).

Features and benefits:

- Enables compact and sturdy direct mounting of ongoing components at the compact power packs of HAWE Hydraulik
- Intermediate plates enable versatile addition of other components
- Efficient and space saving solution for mounting individual valves or valve banks to single and dual circuit pumps
- Pressure and return filter, pressure limiting valves, switches etc. can be integrated

Intended applications:

- Lifting devices
- Machine tools
- Modules for braking or rotor blade adjustment at wind power systems
- Tracking systems for solar panels and parabolic antennas



Nomen-clature:	Connection blocks to the completion of hydraulic power packs
Design:	Add-on valve enabling pipe connection or direct mounting of valve banks
p_{max}:	700 bar
Q_{max}:	approx. 20 lpm

Design and order coding example

AS3F2 /420 - G24

- **Solenoid voltage** 12V DC, 24V DC, 230V AC
- **Pressure setting (bar)**
- **Basic type** **Type A, B, C** see table

Options, type A, B, C

Type A with pressure-limiting valve (pre-set or manually adjustable, also with unit approval)

- For direct pipe connection
- To attach valve banks

Options:

- Check valve in P gallery
- Prop. pressure-limiting valve
- Return filter, Pressure filter
- Idle circulation valve (solenoid-actuated)
- Shut-off valve, accumulator charging valve

Type B with pressure-limiting valve to actuate single- and double-acting cylinders

- For direct pipe connection

Options:

- Check valve in P gallery
- Throttle for regulating the drain speed
- Idle circulation valve open or closed in neutral position
- Pressure switch in P gallery
- Automatic clamping and releasing via the pressure switch (type B..DW)

Type C without additional elements

- For direct pipe connection

Options:

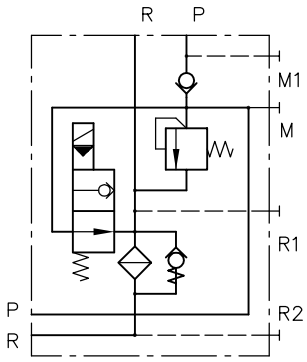
- For pipe connection (pump side) of all type A, B connection blocks
  (Type C15, C16 - connection block with hole pattern of the pump, type C36)

Additional versions

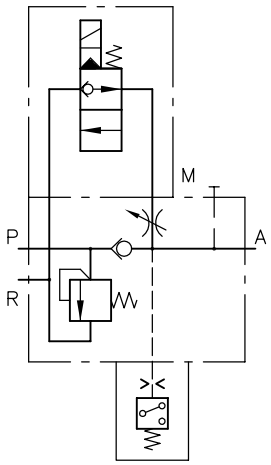
- Connection blocks for dual-stage pumps
- Intermediate blocks for dual-stage pumps type S, V, C30
- Spacer plates for single and dual-circuit pumps type U.
- Additional intermediate block for second pressure stage type V, S

Function

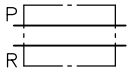
A



B



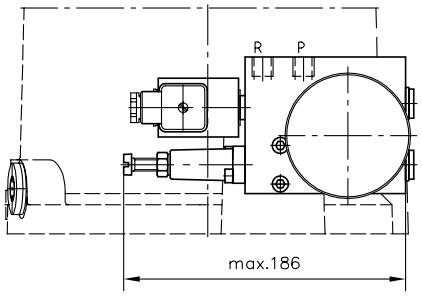
C



General parameters and dimensions

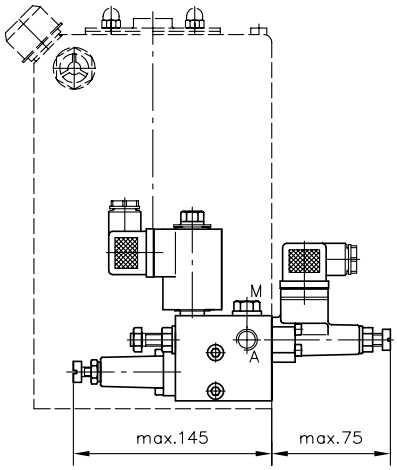
AS ..

Example: HK 44/1 - H 2.08 **- AS 3 F2/400 - G 24**



B..

Example: HC 14/1.95 **- B 31/180 - EM 11V - 13/3 - G 24**



Associated technical data sheets:

- Type A etc.: D 6905 A/1
- Type AX: D 6905 TÜV
- Type B: D 6905 B
- Type C: D 6905 C

Suitable compact hydraulic power packs:

- See section Compact hydraulic power packs

Products with shared connection diagram:

- Two-stage valves type NE 21: Page 206
- Switch units type CR: Page 164
- Directional spool valves type SKC: SKP, SKH
- Type SWC: Page 88

Suited valve banks for combination:

- Type VB: Page 130
- Type BWH, BWN: Page 138
- Type BVZP: Page 146
- Type SWR, SWP, SWS: Page 88
- Type BA: Page 34
- Type BVH: Page 40

Compact hydraulic power packs

1.1 Valve bank type BA

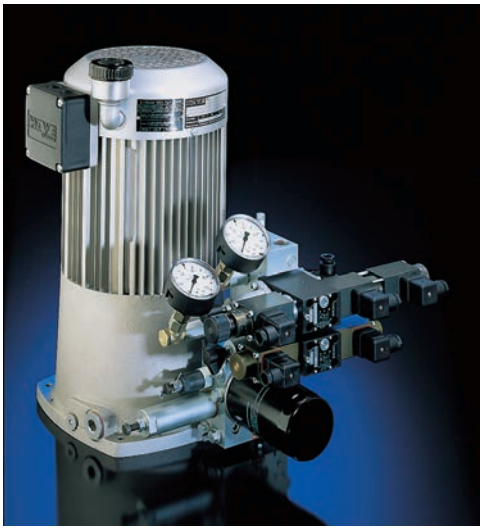
Thanks to the identical flange pattern of type BA sub-plates, they can be combined very flexibly with type A.. connection blocks. On the pump side, this enables direct mounting (without intermediate plate) to the connection blocks of the compact hydraulic power packs. Directional seated valve banks and directional spool valve banks (e.g. type BWN, BWH, BVH, VB, BVZP, SWR, SWP and SWS) can be flanged to the valve section side. Valves and intermediate plates with standard connection patterns (type NSMD2, NSWP2, NBVP16, NBMD16, NG..-1, NZP16) can be mounted individually. Additional functions for the pump or consumer side (e.g. throttle and throttle check valve, pressure-reducing valve or pressure switch) enable flexible adaptation to changing operating conditions. Hydraulic clamping systems (e.g. in machine tools) with the associated wide range of requirements are the typical application areas.

Features and benefits:

- Sub-plates for flexible combination with directional valve types with NG6 (CETOP) standard connection pattern
- Valve bank can be flanged directly to the connection block of a compact hydraulic power pack or connected as a separately arranged valve bank for pipe connection
- Pressure switches and/or any other monitoring elements can be connected directly
- Additional elements, such as orifices, throttles and check valves for P, R, A and B connections can be integrated
- Diaphragm accumulator can be mounted directly

Intended applications:

- Clamping systems on machine tools and equipment
- Process control on deforming machine tools
- Brake and rotor adjustment modules on wind turbines



Nomencla-ture:	**Sub-plates/directional seated valve, zero leakage**
Version:	**Valve section with sub-plates for pipe connection**
Actuation:	**Solenoid** **Pressure-operated** ■ **Hydraulic** ■ **Pneumatic** **Manual** **Mechanical** ■ **Pin** ■ **Roller**
p_{max}:	**400 bar**
Q_{max}:	**20 lpm**

Design and order coding example

BA2 A5									
	NBVP16 NBVP16 NSWP2	S G G	0 B0,8 R B0,6 R	/ABR2,0/BBR1,5 /ABR1,0/BBR1,5	/A3B9/400 /50	/S /S	/0	- 1	- G24

Solenoid voltage 12V DC, 24V DC, 230V AC, 110V AC

End plate
- Drain valve with/without pressure switches
- with one or two accumulator ports with/without release valve and/or with/without drain valve

Sub-plate
- Check valves with release
- Throttle
- Additional pressure gauge connections

Additional elements in R Return pressure stop

Pressure switch/pressure gauge in A and/or B

Additional elements in A, B Throttle check valve in A and/or B
Throttle valve in A and/or B

Additional elements in P Check valve
Orifice

Switching symbol of the directional valve

Valve sections

Directional valves
- Type NSMD2, NSWP2, NBVP16, NBMD16, NG..-1, NZP16

Intermediate plates for series connection
- Type CZ: with pressure-reducing valve in P gallery

Intermediate plates for parallel connection type NZP
- with throttle and/or throttle check valves
- with pressure-reducing valves
- with short-circuit and by-pass valves
- for random switching of a 2nd speed

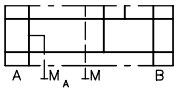
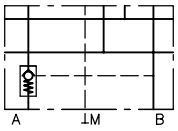
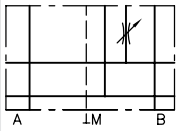
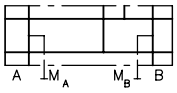
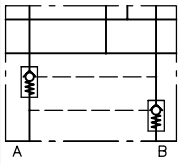
Connection block
- Direct mounting onto type A, AF etc. connection blocks (for type KA, MP, MPN, HC, HK(F), HKL compact hydraulic power packs)
- Variant for pipe connection with/without pressure-limiting valve (A5)

Function

Connection blocks/adapter plates:

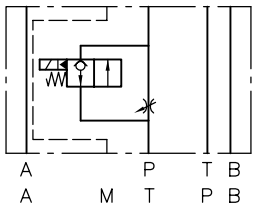
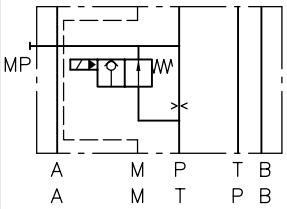
BA2 ..	BA2 A5	BA2 A8
Direct mounting onto type A, AF etc. connection blocks at type KA, MP, MPN, HC, HK(F), HKL compact hydraulic power packs	Version for pipe connection without pressure-limiting valve 	Like version BA2 A5 but with check valve in R 

Sub-plates for plate assembly valve

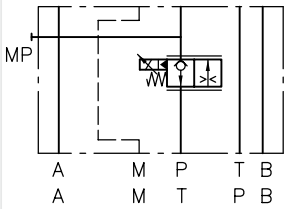
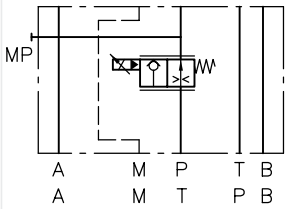
BA2.../0	BA2../1	BA2../2	BA2../3	BA2../5
				

Additional options for the valve sections:

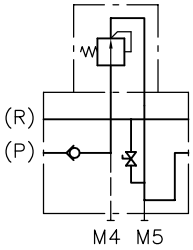
Intermediate plates for 2nd speed with orifice/throttle in P and T gallery

/NZP16(T)V/P(T)Q20...	/NZP16(T)S/P(T)B...
	
Example: .../NZP16TV/TB1.0/... Type B1.0 orifice and type EM21V by-pass valve in T gallery	

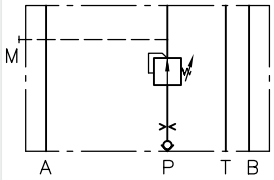
Intermediate plate for variable speed adaptation via proportional throttle in P and T gallery

/NZP16(T)VP	/NZP16(T)SP
	
Example: .../NZP16VP/... Type EMP21V proportional throttle valve in P gallery	

Intermediate plate (series connection) with pressure-reducing valve for pressure reduction of the subsequent P gallery

.../CZ...

Example: BAZ-CZ2/180/5R Type CDK3 pressure-reducing valve set to 180 bar with check valve

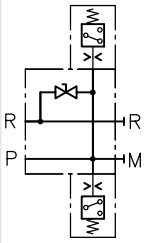
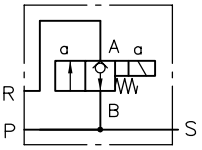
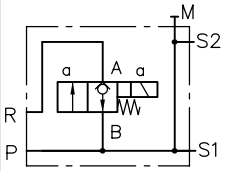
Intermediate plates (parallel connection) with pressure-reducing valve in P gallery

.../NZP16(26)CZ...

Example: .../NZP16CZ08/350/B0.8R/... Type CDK0.8 pressure-reducing valve set to 350 bar with orifice and check valve in P gallery

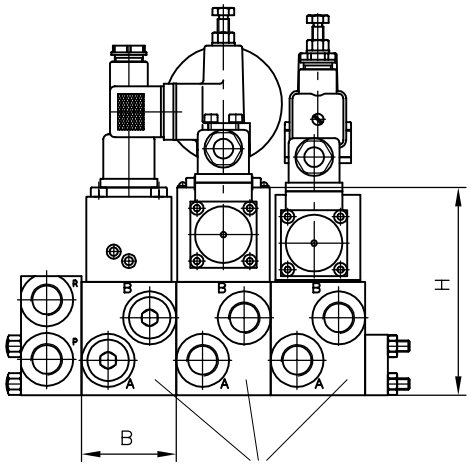
Actuations:

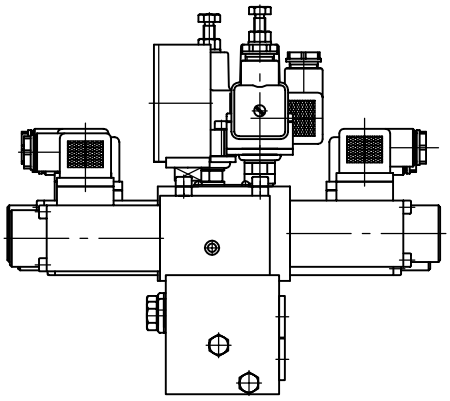
M:	Solenoid actuation (p_{max}= 400 bar)	P:	Pneumatic
GM:	Solenoid actuation (p_{max}= 250 bar)	A:	Manual actuation
H:	Hydraulic actuation	T:	Pin
		K:	Roller

End plates

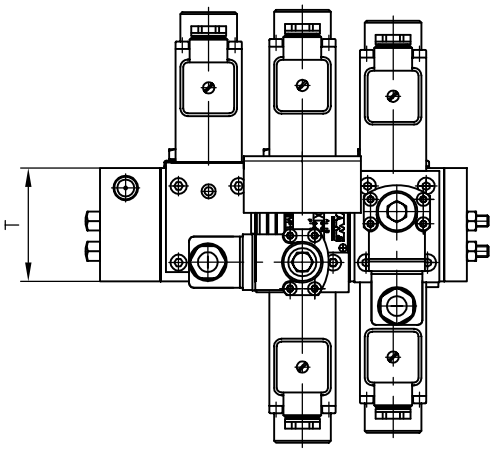
-1	-6	-422	-8	-80/-8W	-880(88W)/...
Series	with drain valve	with drain valve and pressure switches	with accumulator port and drain valve	with accumulator port and release valve	with two accumulator ports and release valve
					

BA





Unterplatten Typ BA2



	Q_{max} [lpm]	p_{max} [bar]	Ports (BSPP)	Dimensions [mm]			m [kg]
			A, B, P, R, M	H	B	T	Valve section
BA2	20	400	G 1/4, G 3/8	139	50	60	0,8

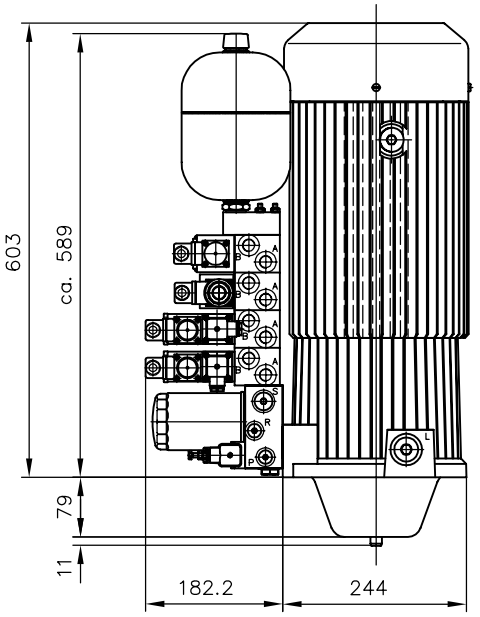
Example circuit:
HK 449 LDT/1 - Z16
- AL21R F2 - F/50/60 - 7/45
- BA2
- NSMD2W/GRK/B2.0/0
- NSMD2W/GRK/B2.0/0
- NSWP2D/B2.0/20/1
- NBVP16G/0
- 8 - AC2001/35 - L24

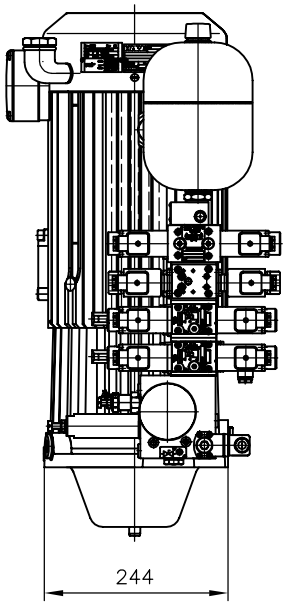
Type HK compact hydraulic power pack size 4;
connection block with accumulator charging valve, setting: 50 bar,
pressure-limiting valve,
setting: 60 bar,
filter and pressure switch,
setting: 45 bar

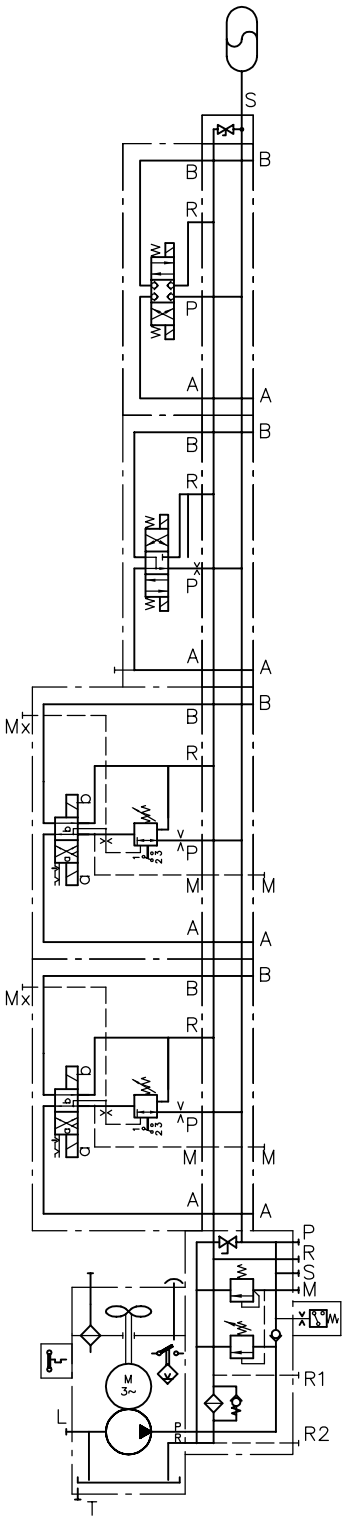
Type BA2 valve bank with four industrial standard valves mounted on sub-plates, two clamping functions for work piece clamping with combined option to adjust pressure and pressure switches, two additional functions for indexing and tool clamping

Parameters of the example circuit:

- Q_{Pu} = 16 lpm (at 1450 rpm)
- $p_{max\ Pu}$ = 110 bar
- p_{System} = 60 bar
  (pressure-limiting valve setting)
- $p_{switch\text{-}off\ feature}$ = 50 bar
- V_{load} = approximately 5 l







Associated technical data sheets:

- Type BA directional control valve banks: D 7788
- Type NZP intermediate plates: D 7788 Z

Suitable compact hydraulic power packs:

- see compact hydraulic power pack section

Suitable connection block:

- Type A: Page 32

Suited products for combination:

- Type NSMD clamping modules: D 7787
- Type NSWP directional spool valves: Page 84
- Type NBVP directional seated valves: Page 156

Suitable accessories:

- Type DG pressure switches: Page 266
- Type AC diaphragm accumulators: Page 268

Suitable plugs:

- with LEDs or to support the EMC or with features including economy circuit: D 7163

Compact hydraulic power packs

1.1 Valve bank type BVH

Type BVH valve banks can be very flexibly combined with type A connection blocks. Segments are mounted using a hollow screw in the P gallery. In addition to the seated valve functions, the additional functions in the P and R gallery (e.g. check valve, orifice in P gallery, filter, pressure switch in A gallery) have been integrated into the valve segment. The benefits of this technical design are the flexible bearing and the expansion options that can be easily adapted to the corresponding application at the end user. The main areas of application are hydraulic clamping systems and the machine tool industry.

Features and benefits:

- Very flexible expansion options and maintenance of valve banks at end user
- Compact and lighter design

Intended applications:

- Clamping systems on machine tools and equipment
- Clamping systems on deforming machine tools
- Brake and rotor adjustment modules on wind turbines

Nomen-clature:	**Valve sections Directional seated valve Zero leakage**
Version:	**Valve sections for pipe connection**
Actuation:	**Solenoid**
p_{max}:	**400 bar**
Q_{max}:	**20 lpm**

Design and order coding example

BVH 11 | M/CZ/35/M/R/2 | - 8 | - G24

Solenoid voltage 12V DC, 24V DC, 110V AC, 230V AC

End plate
- With tapped plugs at P, R
- With accumulator port and drain valve

Valve sections
- With individual pressure reduction (parallel connection)
- Additional elements:
  - Pressure-reducing valves
  - Orifice and/or check valve in P gallery
  - Orifice or restrictor check valve for A
  - Return pressure block in R gallery
  - Pressure switches for A

Basic type Type BVH 11 for direct mounting onto type A etc. connection blocks (for type KA, MP, MPN, HC, HK, HKF, HKL compact hydraulic power packs)

Function

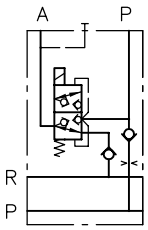
Connection blocks/adapter plates:

BVH

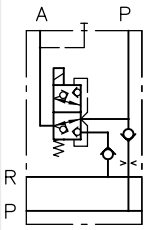
Direct mounting onto type A etc. connection blocks
for type KA, MP, MPN, HC, HK, HKF, HKL compact hydraulic power packs

Valve sections:

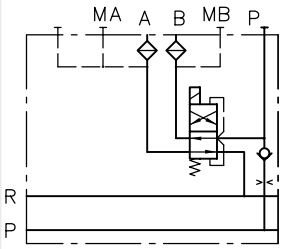
H



M



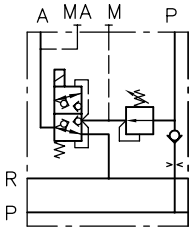
W



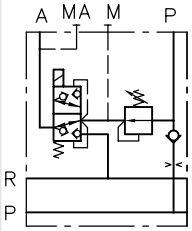
Additional options for the valve sections:

Individual pressure reduction (parallel connection)

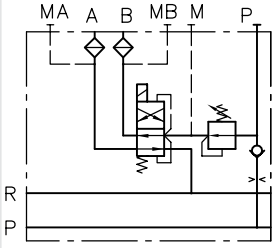
BVH 11 H/CZ...



BVH 11 M/CZ...



BVH 11 W/CZ...



Actuations:

M:	Solenoid actuation (p_{max}= 400 bar)
GM:	Solenoid actuation (p_{max}= 250 bar)

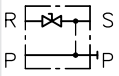
End plates:

without

Tapped plug at P, R

-8

with accumulator port and drain valve



General parameters and dimensions

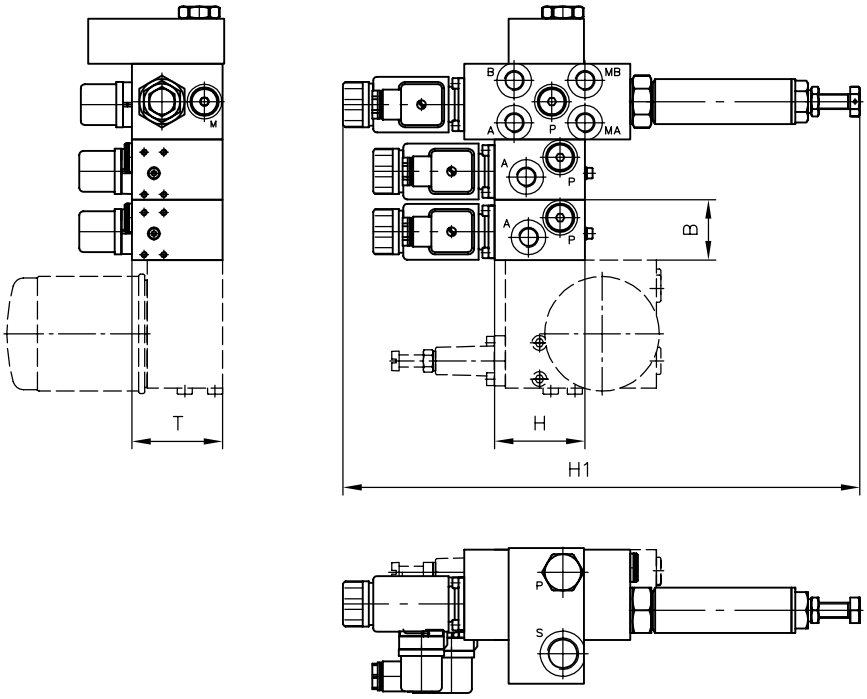
(A1F1/310)

- BVH 11 H/M/R/2
- BVH 11 M/M/R B2.5/3
- BVH 11 W/CZ 5/35/M/R/22 - 8 - G 24

Type BVH valve bank for direct mounting at type A connection block

Valve section 1 with 3/2-way function switching symbol H, P check valve (coding R), no pressure switch (coding 2)
Valve section 2 with 3/2-way function switching symbol M, check valve and orifice in P gallery (coding R, B, 2, 5) and pressure switch for A (coding 3)
Valve section 3 with 4/2-way function switching symbol W, individual pressure-reducing valve set to 35 bar (coding CZ5/35) and check valve in P gallery (coding R), no pressure switch
End plate for accumulator port (coding 8) and 24V DC solenoid voltage

BVH



	Q_{max} [lpm]	p_{max} [bar]	Ports (BSPP)	Dimensions [mm]				m [kg]
			A, B, P, R, M	H	H1	B	T	Valve section
BVH	20	400	G 1/4	60	343	40/50	60	0,8

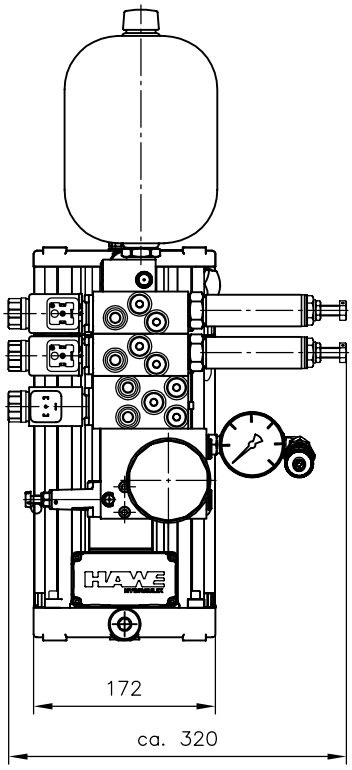
Example circuit:

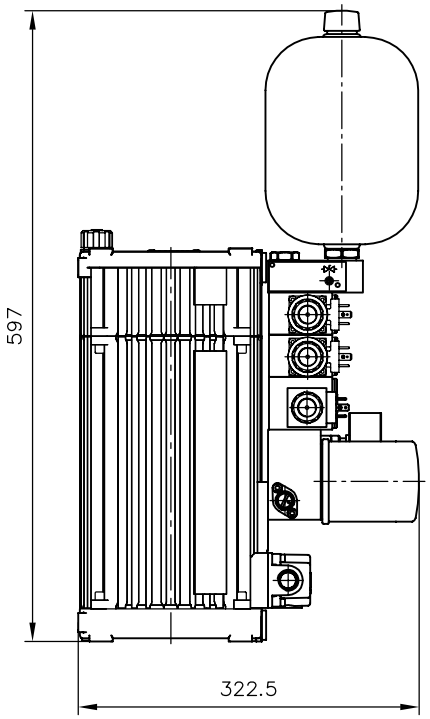
KA 281 SKT/Z 9.8

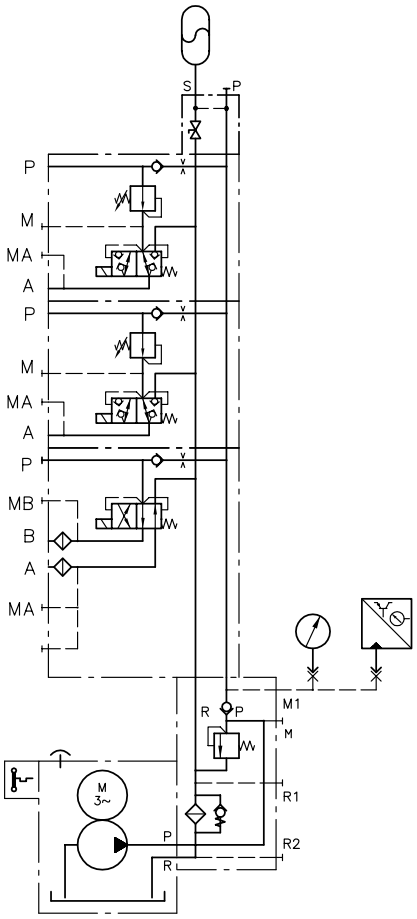
- **AX 3 F 1 E/120**
- **BVH 11 W/M/RH/2**
- **BVH 11 M/CZ5/35/M/RHB 2.5**
- **BVH 11 M/CZ5/35/M/RHB 2.5**
- **8-X 24 - AC 2001/60/3/A 3x400V 50 Hz**

Type KA compact hydraulic power pack
1 kW motor output;
Connection block with return filter
and TÜV-approved safety valve
set to 120 bar

Type BVH valve bank with three valve segments,
two clamping functions with individually adjustable
clamping pressure







Parameters of the example circuit:

- Q_{Pu} = 9.8 lpm (at 1450 rpm)
- $p_{max\ Pu}$ = 170 bar
- p_{System} = 120 bar
- $p_{switch\text{-}off\ feature}$ = 50 bar
- V_{load} = approximately 3 l

Associated technical data sheets:

- Type BVH directional valve banks: D 7788 BV

Compact hydraulic power packs:

- See section "Compact hydraulic power packs"

Connection blocks:

- Type A: Page 32

Combinable products:

- Directional seated valves type NBVP: Page 156
- Pressure-reducing valves type CDK, DK: Page 196

Accessories:

- Type DG pressure switches: Page 266
- Type AC diaphragm accumulators: Page 268

Plug:

- with LEDs including: D 7163

1.2 Standard pumps and power packs

Radial piston pumps type R and RG

Variable displacement axial piston pumps type V60N

Standard pumps and power packs

Type	Nomenclature/version	p_{max}	Q_{max}	V_{max}
R, RG	**Radial piston pump** ■ Individual pump ■ Motor pump ■ Hydraulic power pack	700 bar	91.2 lpm (1450 rpm)	V_g = 64.18 cm³/rev
V30D, V30E	**Variable displacement axial piston pump** ■ Individual pump ■ Pump combination	Continuous: 350 bar Peak: 420 bar	65 ... 392 lpm (1450 rpm)	$V_{g\ max}$: 45 ... 270 cm³/rev
V60N	**Variable displacement axial piston pump** ■ Individual pump ■ Pump combination	Continuous: 350 bar Peak: 420 bar	85 ... 185 lpm (1450 rpm)	$V_{g\ max}$: 60 ... 130 cm³/rev
V40M	**Variable displacement axial piston pump** ■ Individual pump ■ Pump combination	Continuous: 380 bar Peak: 400 bar	65 lpm (1450 rpm)	$V_{g\ max}$: 45 cm³/rev

1.2 Radial piston pumps type R and RG

The radial piston pumps consist of valve-controlled pump cylinders that are arranged radially. Higher volumetric flows can be achieved by arranging up to 6 radials in parallel. The pump is usually driven by an electric motor, which is connected to the pump via a flange and coupling. The closed pump housing allows for installation in a tank (hydraulic power pack) as well as installation outside a tank (motor pump). The possibility of a radial piston pump with several pressure outlets (several equal or different volumetric flows) is particularly innovative. Type RG with slide bearings is used in extreme operating conditions to increase the service life of the bearings. Compact control systems can be created by mounting various connection blocks and valve banks onto the cover plate of the hydraulic power packs.

Features and benefits:

- High level of efficiency
- Compact design
- Max. 14 separate pressure outlets
- Available from the modular product range as a hydraulic power pack with valve banks

Intended applications:

- Press construction
- Jig construction
- Testing and laboratory devices
- Lubricating systems

Nomen-clature:	**Radial piston pump**
Design:	**Individual pump Pump complete with motor Hydraulic power pack**
p_{max}:	**700 bar**
Q_{max}:	**91.2 lpm (V_g = 64.18 cm³/rev)**
$V_{tank\ max}$:	**approx. 470 l**

Design and order coding example

R 11,6 / M 7,5 K

Options
- Fluid level gauge
- Temperature switch
- Float switch

Function, drive

Motor pump
- With/without industrial standard motor (output P_N in kW)

Hydraulic power packs
- Version with tank, with/without industrial standard motor
  Consumable volume $V_{cons.}$ 6 l to 450 l
- Cover plate version (for installation on customer furnished tanks), with/without industrial standard motor
- Combination motor + pump (for installation on customer furnished cover plates and tanks)
- With direct current drive (design 6011)

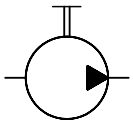
Basic type, delivery flow [lpm]

Type R (version with roller bearing) and type RG (version with slide bearing)

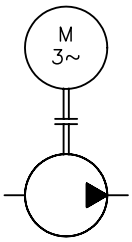
Additional versions:
- With several pressure ports
- With separate ports for the flow of one or two pump elements (Q_{max} = 4,4 lpm)
  e.g. as control oil supply
- Integrated switch-off valve at two pressure ports

Function

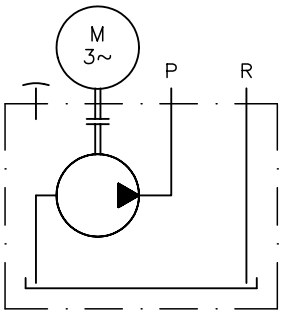
Individual pump



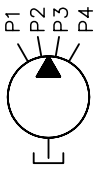
Pump complete with motor



Hydraulic power pack

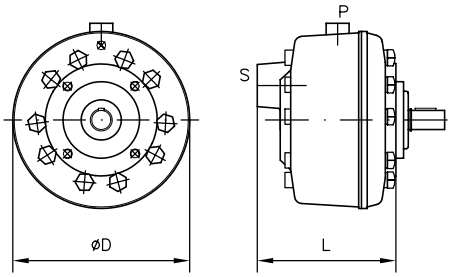


Pump with several pressure outlets (example for an individual pump)

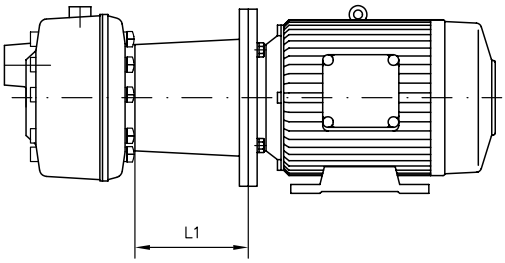


General parameters and dimensions

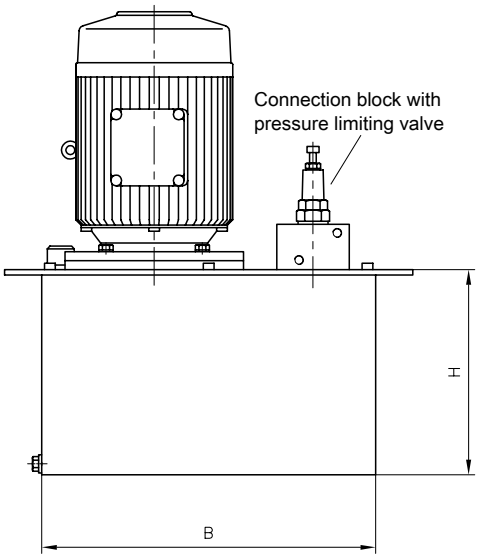
Individual pump

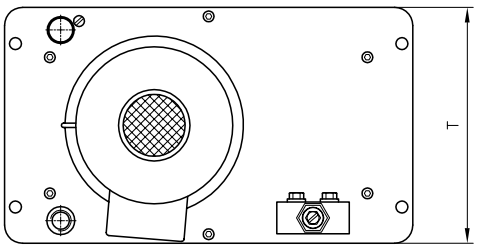


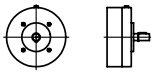
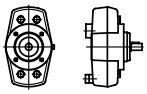
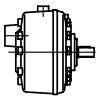
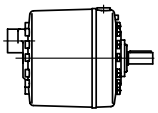
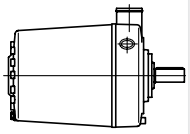
Pump complete with motor



Hydraulic power pack





Design		Number of cylinders	Delivery flow Q_{pu} (lpm) (approximate reference value at 1450 rpm) and max. pressure p_{max} (bar)						Tank sizes	Dimensions [mm]			
			700 bar	550 bar	450 bar	250 bar	160 bar	P_N [kW]	$V_{use.}$ [l]	D	L	$L1_{max}$	m [kg][2]
7631		2	0.18	0.28	0.43	0.92	-	0.25...0.55	6...45	130	53	109	3.2
		3	0.27	0.42	0.64	1.35	-						
		5	0.46	0.7	1.08	2.27	-						
6010		1	0.3	0.5	0.8	1.7	2.2	0.25...3	6...80	174	82.5	113	3.1
		2	0.6	1.0	1.6	3.3	4.4						
		3	0.9	1.5	2.5	5.1	6.5						
6011		5	1.4	2.6	4.2	8.3	10.9	0.55...5.5	6...160	185	86	155	5.8
		7	2.1	3.7	5.8	11.8	15.3						
6012		10	2.7	5.3	8.2	16.8	21.7	2.2...11	20...160	185	146	188	10.5
		14	4.0	7.4	11.6	23.5	30.4						
6014		20	6.1	11.0	17.4	35.0	43.4	5.5...22	80...450	218	250	188	24.2
		28	8.0	15.0	23.0	47.0	60.8						
6016		42	12.7	22.0	34.5	70.0	91.2	11...30	120...450	238	311	212	39.1

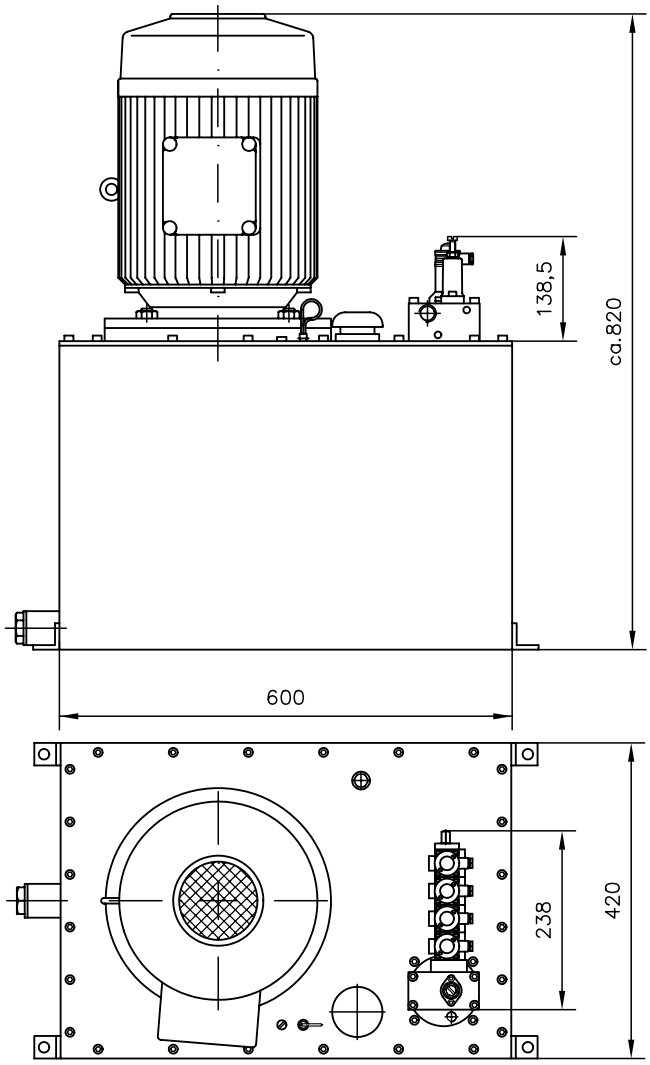
- The parameters listed here represent only a choice from avariety of possibilities.
1) Standard motor, design IM B 35 for pumps complete with motor or IM B 5 for hydraulic power packs.
2) Mass of the individual pump

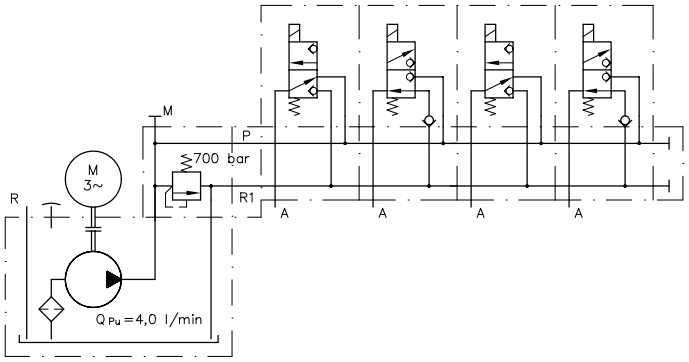
Hydraulic power pack:

Tank size	H [mm]	B [mm]	T [mm]	V_{max} tank [l]
B 6	230	253	315	9.3
B 13	230	368	260	17
B 20	320	368	260	25
B 30	320	448	320	39
B 40	320	448	440	55
B 50	403	600	420	85
B 75	478	600	420	107
B 100	536	650	500	152
B 160	666	650	500	193
B 250	575	1000	600	309
B 400	825	1000	600	469

Circuit example:

R 4,0/B 50 A 700 - VB 11 DM - HRHR - 1 - G 24 - V 5,5





Associated technical data sheets:

- Radial piston pumps type R, RG: D 6010
- Motor pumps, hydraulic power packs type R, RG: D 6010 H
- Radial piston pumps with several pressure ports type R, RG: D 6010 D, D 6010 DB
- Radial piston pumps with control oil port type R: D 6010 S
- Hydraulic power packs with gear pump type Z: D 6820

Directly mountable valve banks:

- Type VB: Page 130
- Type BWH(N): Page 138
- Type SWR: Page 88
- Type SKP:D 7230

See also section "Devices for special applications"

- Press controls
- Devices for up to 700 bar

1.2 Variable displacement axial piston pumps type V30D and V30E

The variable displacement axial piston pumps type and V30E are designed for open circuits in industrial and mobile hydraulics and operate according to the swash plate principle. A thru-shaft is optionally available to enable the connection of additional variable displacement pumps or an auxiliary pump. In this context, type V30E represents a design according to the most recent findings in pump design. Above all this concerns the optimised self-suction speed, reduced noise emissions and pulsation, increased service life and significantly reduced weight. A wide range of controllers (modular principle) offers the user a wide range of application possibilities.Individual pumps or multiple pumps may be used for hydraulic circuits with several volumetric flows. Robust design, low performance/weight ratio, long service life (large bearing dimensions) and a swash plate angle indicator are amongst the additional benefits.

Features and benefits:

- Low noise emissions
- Wide range of controllers
- Full torque available at the second pump in tandem pump applications

Intended applications:

- Machines for forestry and agricultural purposes
- Cranes and lifting equipment
- Presses
- Municipal trucks

Nomen-clature:	**Variable displacement axial piston pump**
Design:	**Individual pump Pump combination**
p_{max}:	**350 bar (continuous) 420 bar (peak)**
$V_{g\ max}$:	**45 ... 270 cm^3/rev**

Design and order coding example

V30D - 095	R	SF	N	- 1	- 1	- XX	/LN	-2	/120	- 200

Pressure specification [bar]

Torque setting [Nm] Alternatively specification for power [kW] and speed [rpm]

Additional versions
- Conversion with L power controller
- Max. stroke limitation

Controllers see "Controller types"

Release

Pivoting angle indicator With/without indicator or with pivoting angle pick-up

Shaft version With/without thru-shaft

Seal material
- NBR (N)
- EPDM (E)
- FKM (V)

Shaft journal/flange
- Spline shaft (DIN 5480) (D)
- SAE spline shaft and flange (S)
- Parallel key (K)
- DIN (W)
- SAE (F)

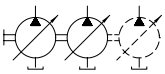
Rotation direction Anti-clockwise (L), clockwise (R)

Basic type, nominal size
- Individual pumps
- Dual and multiple pumps (tandem pumps)

Function

Individual pump

Multiple pump



Controller types:

Power controller:
- To restrict the drive torque (L)
- With option to reduce the geom. delivery flow (Lf1)

Load-sensing controller:
- For proportional directional spool valve (LS)
- with pressure limitation (LSN)

Pressure controller:
- For constant pressure systems (N)
- With remote-control port (P)
- With remote-control port for systems that are very sensitive to vibration (Pb)

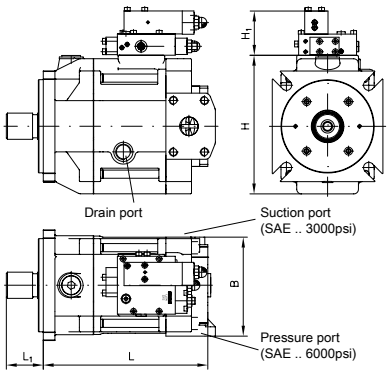
Flow controller:
- For maintaining a constant flow (Q)
- For maintaining a constant level at higher speeds (Qb)

Electro-hydraulic proportional control of the pump:
- For continuous delivery flow control using an electronic control card (V)

Controller:
- With hydraulic proportional control of the delivery flow (VH)

General parameters and dimensions

V30



(connection locations for clockwise operation)

	Geom. delivery volume	Nom. pressure	Self-suction speed	Dimensions [mm] approx.					m [kg]
	V_g [cm³/rev]	p_{nom} (p_{max}) [bar]	n [rpm]	L	L1	H	H1	B	(with controller)
V30E - 095	95	350 (420)	2600	300	63	190	50	190	59
V30E - 160	160		2100	330	65	210	50	210	92
V30E - 270	270		1800	399	79	326	50	242	126
V30D - 045	45	350 (420)	2600	268	68	150	82	160	40 (46)
V30D - 075	75		2400	310	80	170	86	178	60 (66)
V30D - 095	95		2200	341	93	196	87	196	70 (76)
V30D - 115	115	250 (300)[1)]	2000	341	93	196	87	196	70 (76)
V30D - 140	140	350 (420)	2200	363	90	212	85	212	85 (91)
V30D - 160	160	250 (300)[1)]	1900	363	90	212	85	212	85 (91)
V30D - 250	265	350 (420)	1800	432	115	224	97	272	130 (136)

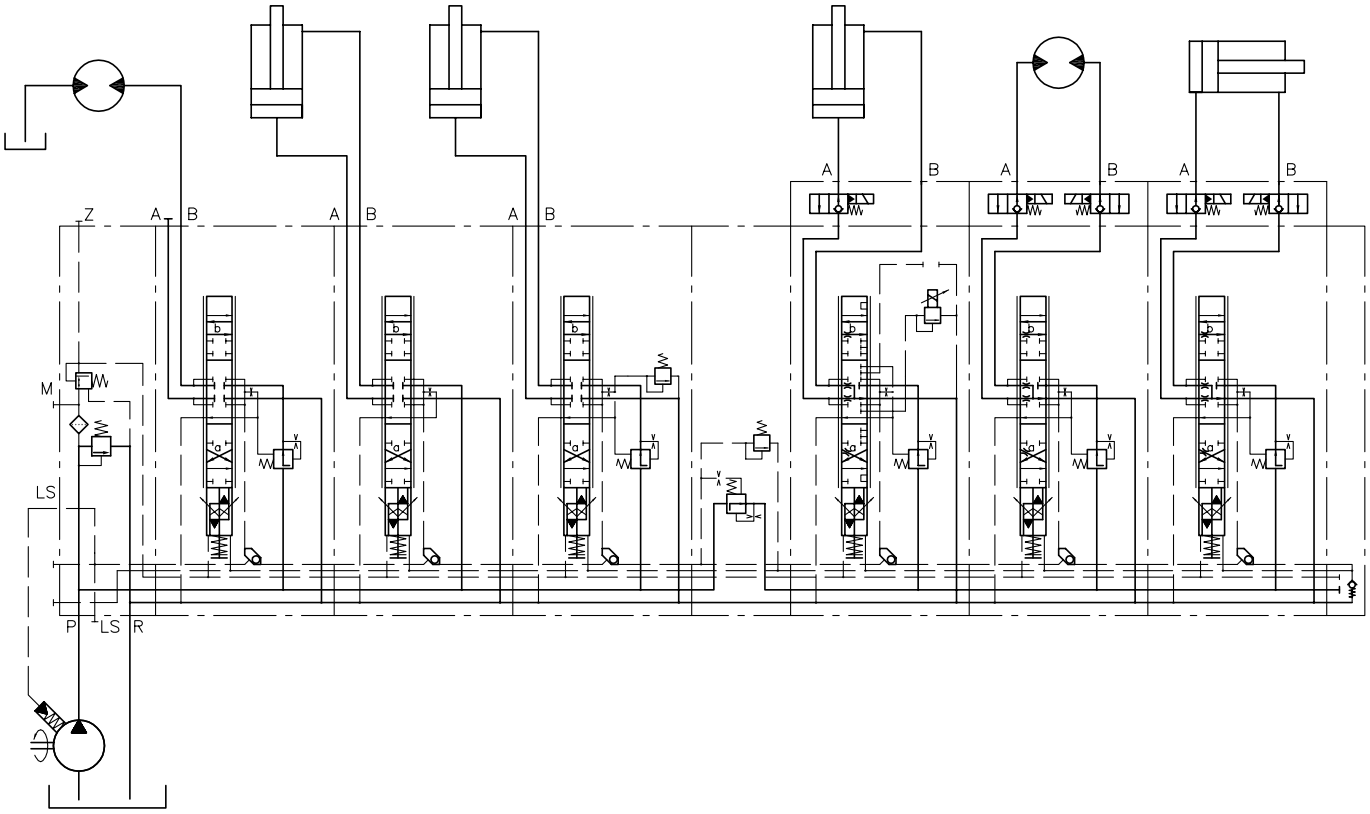
1) Higher pressure is possible with reduced geom. delivery flow

Ports:

	Drain port	Auxiliary port	Suction port	Pressure port
V30E - 095	G 3/4	-	2 1/2"	1 1/4"
V30E - 160	G 3/4	-	2 1/2"	1 1/4"
V30E - 270	G 1	-	3"	1 1/2"
V30D - 045	G 1/2	G 1/4	1 1/2 "	3/4"
V30D - 075	G 3/4	G 1/4	2"	1"
V30D - 095	G 3/4	G 1/4	2"	1 1/4"
V30D - 115	G 3/4	G 1/4	2"	1 1/4"
V30D - 140	G 3/4	G 1/4	2 1/2 "	1 1/4"
V30D - 160	G 3/4	G 1/4	2 1/2 "	1 1/4"
V30D - 250	M 33x 2	Pipe ∅ 8	3"	1 1/2"

Example circuit:

V30E-270-LSF N-2-1/03-LSN-320



Associated technical data sheets:

- Type V30D variable displacement axial piston pumps: D 7960, Type V30E: D 7960 E

Similar products:

- Type V40M variable displacement axial piston pump: Page 58
- Variable displacement axial piston pump type V60N: Page 54
- Type K60N fixed displacement axial piston pump: D 7960 K
- Type M60N axial piston motor: D 7960 M

Suitable prop. directional spool valves:

- Type PSL/PSV sizes 2, 3 and 5: Page 104
- Type PSLF/PSVF sizes 3, 5 and 7: Page 110

Suitable accessories:

- Prop. amplifier type EV1M2: Page 276
- Programmable logic valve control type PLVC: Page 278

See also chapter "Equipment for special applications":

– Mobile hydraulics

Standard pumps

1.2 Variable displacement axial piston pump type V60N

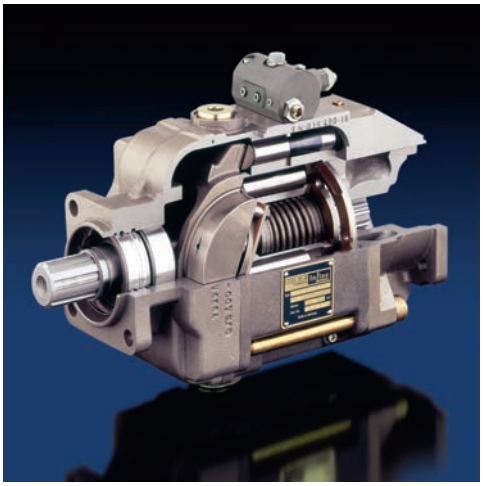
Thanks to its sturdy construction, the variable displacement axial piston pump is designed for direct flange mounting to the power take-off on commercial vehicle gearboxes, or for standard connection using an SAE flange. The benchmark figures for this product are 130 cm^3/rev and 450 bar end pressure, allowing for a wide range of applications. These are supported by a high self-suction speed rating and low noise level. Variations with thru-shaft for flange mounting additional variable displacement axial piston pumps and auxiliary pumps are also available. Several different controllers offer the user a wide range of application possibilities. Particular advantages with regard to the mutual coordination arise from a combined application of variable displacement axial piston pumps with proportional directional spool valves type PSV and possibly required load-holding valves type LHT and LHDV.

Features and benefits:

- Good performance/weight ratio
- High self-suction speed
- Different shaft and flange versions

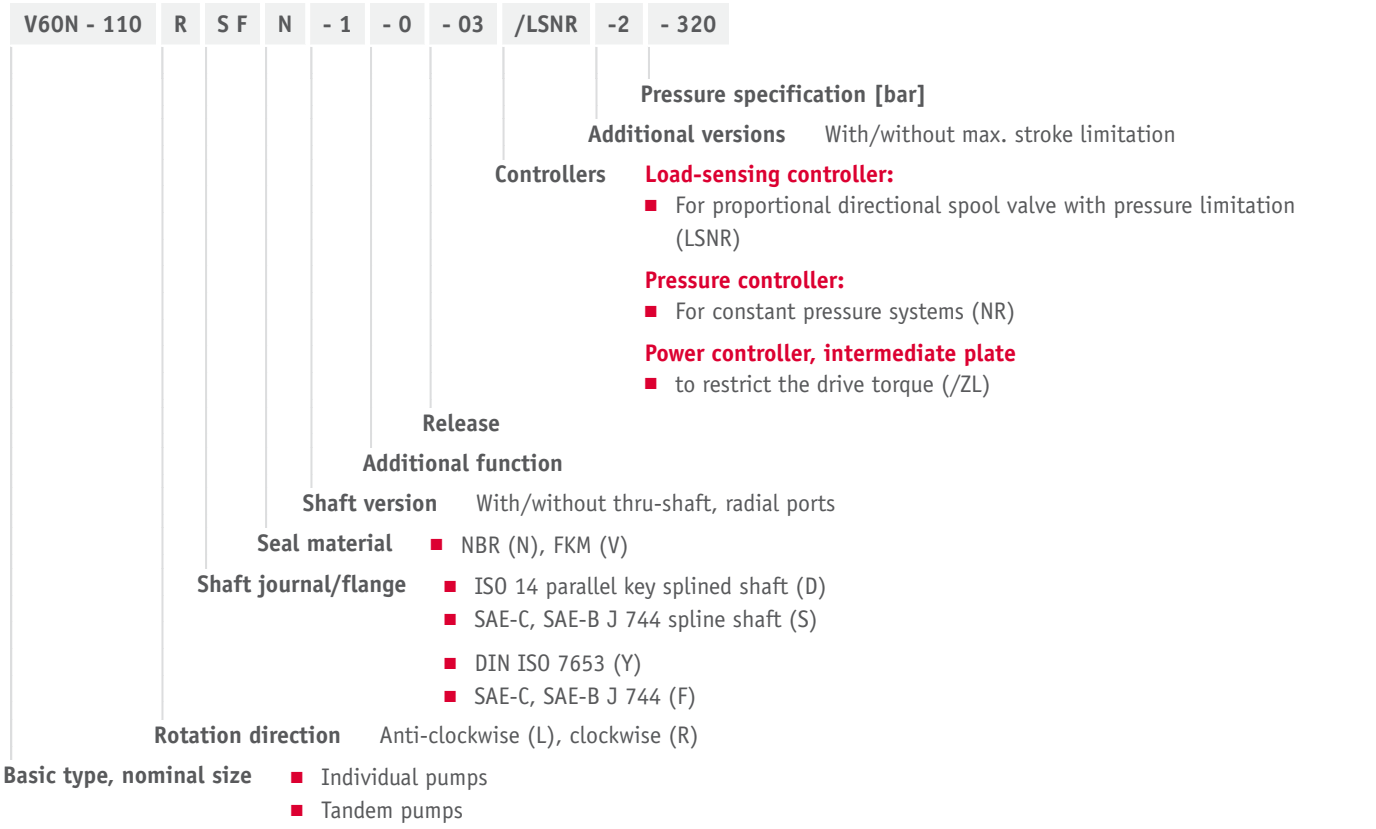
Intended applications:

- Machines for forestry and agricultural purposes
- Cranes and lifting equipment
- Truck-mounted concrete pumps
- Municipal trucks



Nomen-clature:	**Variable displacement axial piston pump**
Design:	**Individual pump Pump combination**
p_{max}:	**400 bar (continuous), 450 bar (peak)**
$V_{g\ max}$:	**60 ... 130 cm^3/rev**

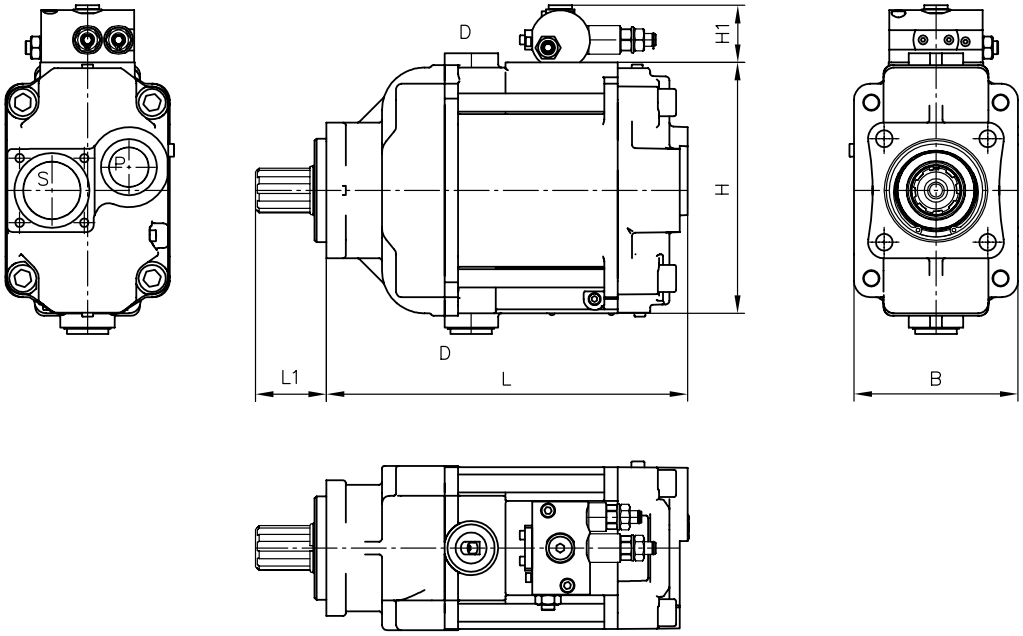
Design and order coding example



Function

General parameters and dimensions

V60N



Characteristic values

	Geom. delivery volume	Nom. pressure	Self-suction speed	Dimensions [mm]					m [kg]
	V_g [cm³/rev]	p_{nom} (p_{max}) [bar]	n [rpm]	L	L1	H	H1	B	
V60N - 060	60	350 (400)	2500	254	55	181	44	115	23
V60N - 090	90		2300	277	55	189	44	120	26,7
V60N - 110	110		2200	279	55	191	44	125	29
V60N - 130	130	400 (450)	2100	269,5	55	210	45,1	130	30,8

Ports:

	Drain port D	LS signal port	Suction port S	Pressure port P
V60N - 060	G 3/4	G 1/4	Flange ∅ 1 1/2	G 1
V60N - 090				
V60N - 110				
V60N - 130				

Example circuit

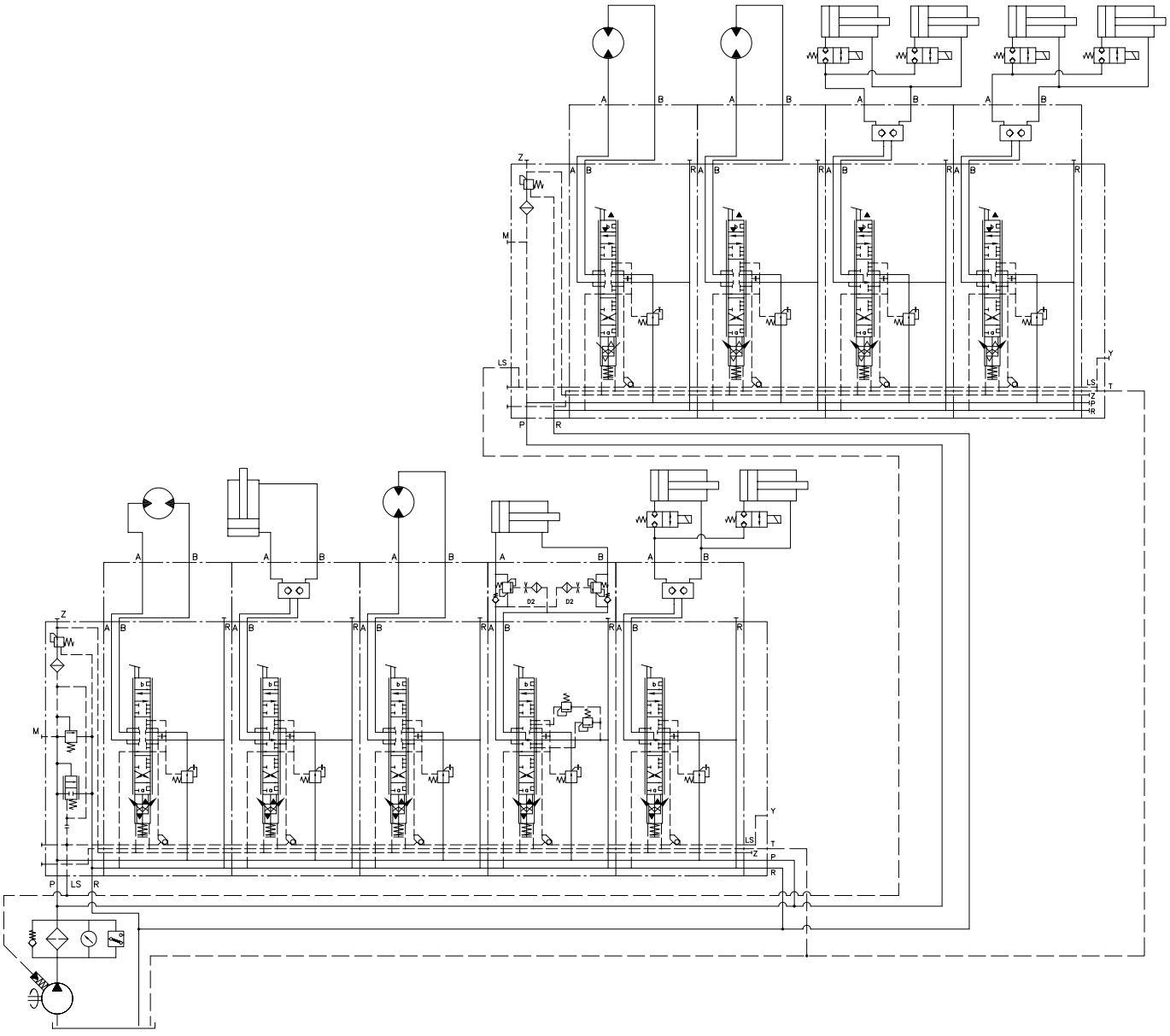
V60N-130 RSFN-1-0-0.00/LSNR-2-250

PSV 31/D280-2

- A 2 L 25/25/EA1/2
- A 2 H 40/40/EA1/2 DRH
- A 2 L 25/25/EA1/2
- A 2 H 3/3 A 100 B 100/EA1/2 AL-0-D 4/120-BL-0-D 4/120
- A 2 H 3/3/EA1/2 DRH
- E 18-G 24

PSV 31-1

- A2 L 25/25/EA1/2
- A2 L 25/25/EA1/2
- A2 H 3/3/EA1/2 DRH
- A2 H 3/3/EA1/2 DRH
- E 1 - G24



Associated technical data sheets:

- Type V60N variable displacement axial piston pump: D 7960 N

Similar products:

- Variable displacement axial piston pumps type V40M: Page 58
- Type V30D and V30E variable displacement axial piston pumps: Page 50
- Type K60N fixed displacement axial piston pump: D 7960 K
- Type M60N axial piston motors: D 7960 M

Suitable prop. directional spool valves:

- Type PSL/PSV sizes 2, 3 and 5: Page 104
- Type PSLF/PSVF sizes 3, 5 and 7: Page 110

Suitable load-holding valves:

- Type LHK, LHDV, LHT: Page 212

See also chapter "Equipment for special applications":

- Mobile hydraulics

1.2 Variable displacement axial piston pump type V40M

Thanks to its sturdy construction, the variable displacement axial piston pump is designed for a standard connection using an SAE flange. The benchmark figures for this product are 45 cm³/rev and 400 bar end pressure, allowing for a wide range of applications. These are supported by a high self-suction speed rating and low noise level.

Variations with thru-shaft for flange mounting additional variable displacement axial piston pumps and auxiliary pumps are also available. Several different controllers offer the user a wide range of application possibilities. Particular advantages with regard to the mutual coordination arise from a combined application of variable displacement axial piston pumps with proportional directional spool valves type PSV and possibly required load-holding valves type LHT and LHDV.

Nomenclature:	Variable displacement axial piston pump
Version:	Individual pump Pump combination
p_{max}:	380 bar (continuous), 400 bar (peak)
$V_{g\ max}$:	45 cm³/rev

Features and benefits:

- Good performance/weight ratio
- High self-suction speed
- Different shaft and flange versions

Intended applications:

- Machines for forestry and agricultural purposes
- Cranes and lifting equipment
- Truck-mounted concrete pumps
- Municipal trucks

Design and order coding example

V40M	- 045	R	T	X	V	- 2	- 0	- 00	/LS-DA	- C 01

Thru-shaft version

Controllers

Load-sensing controller:
- for proportional directional spool valve with pressure limitation (LS-DA)

Pressure controller:
- can be controlled electrically, with falling characteristic curve (P1R1)

Release

Additional function

Shaft version With/without thru-shaft, radial ports

Seal material FKM (V)

Flange Flange version (input side) SAE-B-2-Hole J744 (X)

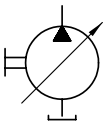
Shaft journal Spline shaft SAE-B J 744 (H)
Spline shaft SAE-B-B J 744 (T)

Rotation direction Anti-clockwise (L), clockwise (R)

Nominal size
- 045: Medium pressure version (250 bar)
- 045 H: High pressure version (380 bar)

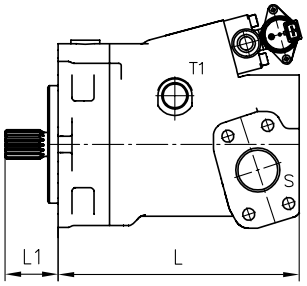
Basic type Individual pumps
Tandem pumps

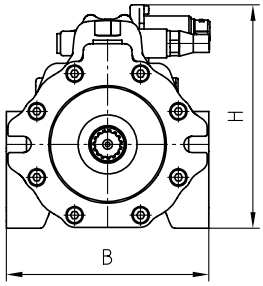
Function

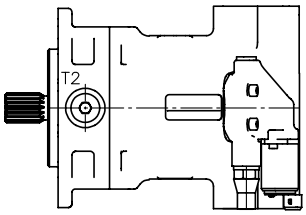


General parameters and dimensions

V40M







	Geom. displacement	Nom. pressure	Self-suction speed	Dimensions [mm]				m [kg]
	V_g [cm³/rev]	p_{nom} (p_{max}) [bar]	n [rpm]	L	L1	H	B	
V40M - 045	46,5	250 (320)	2900	208,5	45,9	186	175	20,9

Connections:

	Drain port T	LS-signal port	Suction port	Pressure port P
V40M - 045	7/8-14 UNF-2B	M12 x 1.5	SAE 1 1/2" 500 psi	SAE 1" 6000 psi

Associated technical data sheets:

- Variable displacement axial piston pump type V40M: D 7961

Similar products:

- Variable displacement axial piston pumps type V60N: Page 54
- Variable displacement axial piston pumps type V30: Page 50
- Fixed displacement axial piston pump type K60N: D 7960 K
- Axial piston motors type M60N: D 7960 M

Prop. directional spool valve:

- Type PSL/PSV sizes 2, 3 and 5: Page 104
- Type PSLF/PSVF size 3, 5 and 7: Page 110

Load holding valves:

- Type LHK, LHDV, LHT: Page 212

See also chapter "Equipment for special applications":

– Mobile hydraulics

1.3 Dual stage pump

Dual stage pump type RZ

Dual-stage pumps

Type	Nomenclature/Design	p_{max}	Q_{max}	V_{max}
RZ	**Dual-stage pump** ■ Radial piston pump and gear pump ■ Individual pump ■ Motor pump ■ Hydraulic power pack	Radial piston pump 700 bar	91.2 lpm	$V_{tank\ max}$: approx. 470 l
		Gear pump 150 bar	135 lpm	

Dual stage pump

1.3 Dual stage pumps type RZ

Dual-stage pumps consist of a high-pressure section (radial piston pump, HP) and a directly coupled low-pressure section (gear pump, LP). The pump is usually driven by one single electric motor, which is connected with the dual-stage pump by means of a flange and a coupling. Compact control systems (e.g. for presses) can be created by mounting two-stage valves and valve banks onto the cover plate of hydraulic power packs.

Features and benefits:

- Two-stage circuits
- Hydraulic power packs with direct valve mounting

Intended applications:

- Presses
- Construction and construction materials machinery

Nomen-clature:	Dual stage pump (radial piston and gear pump)
Design:	Individual pump Pump complete with motor Hydraulic power pack
p_{max}:	700 bar (radial piston pump) 150 bar (gear pump)
Q_{max}:	Radial piston pump, 91.2 lpm (high pressure) (V_g = 64.18 cm³/rev) Gear pump,135 lpm (low pressure) (V_g = 89.6 cm³/rev)
$V_{tank\ max}$:	approx. 470 l

Design and order coding example

RZ 0,9 | /2 - 16 | W 7,5

Function, drive [kW]

Motor pump
- With /without industrial standard motor

Hydraulic power packs
- Version with tank,
  Consumable volume V_{nom} 6 l to 450 l
- Cover plate version (for installation on customer furnished tanks), with/without industrial standard motor
- With built-in two-stage valves type NE or switch units type CR

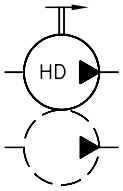
Hydraulic power packs for direct pipe connection
- With tank, consumable volume V_{nom} 12 l to 400 l
- With/without industrial standard motor

Gear pump, delivery flow low pressure section [lpm] Gear pump size 1 to 3

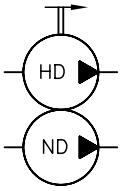
Basic type, delivery flow high pressure section [lpm] Type RZ (radial piston pump/gear pump),
Type RGZ (version with slide bearing for increased service life),
Type RF (version where the high pressure section features a 2-hole SAE-flange)
- Individual pump (high and low pressure section or only high pressure section alone)
- Motor pump
- Hydraulic power pack

Function

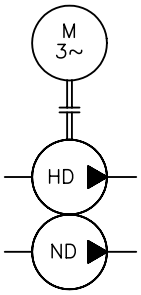
Individual pump
Only high pressure section, low pressure section is customer furnished



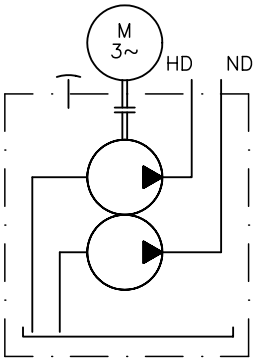
Individual pump
High pressure section and low pressure section



Pump complete with motor

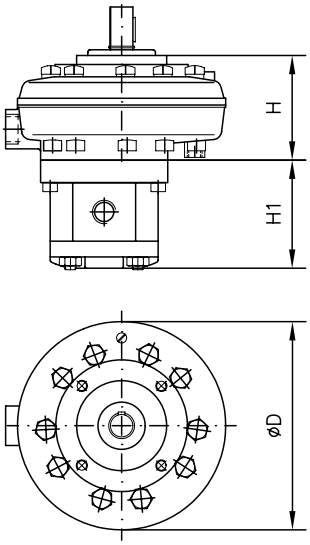


Hydraulic power pack

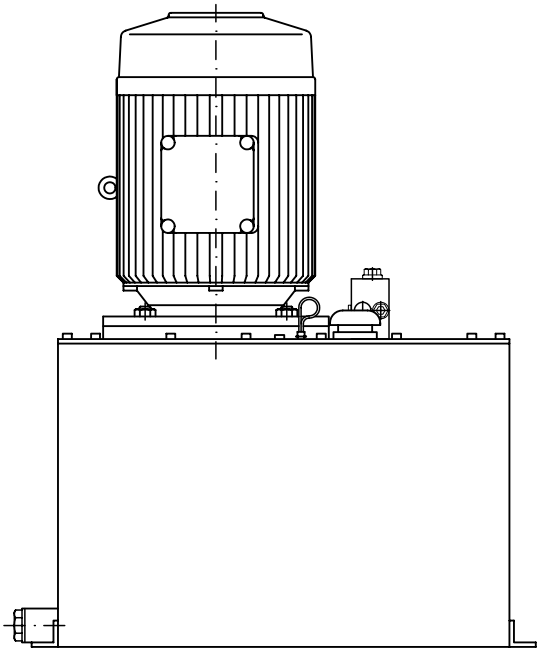


General parameters and dimensions

Individual pump



Hydraulic power pack



For dimensions of motor pumps and hydraulic power packs, see Page 46

High-pressure section (like radial piston pump type R)

Design	Delivery flow Q_{pu} [lpm] and max. pressure p_{max} [bar] (approx. reference value at 1450 rpm)			Max. permissible drive power[1]	Combination with gear pumps	Tank sizes [2] (selectable)	Dimensions [mm]		m [kg]
	700 bar	450 bar	250 bar	P_N [kW]	Size	V_{usable} [l]	H	D	
7631	RZ 0,18...	RZ 0,64...	RZ 2,27...	1.5	1	13 ... 42	58	130	3.1
6910	RZ 0,9...	RZ 2,5...	RZ 5,1...	3	2	22 ... 80	85.5	175	3.1
6911	RZ 1,4...	RZ 5,8...	RZ 11,8...	11	2 and 3	32 ... 400	85	185	6.3
6912	RZ 2,7...	RZ 8,2...	RZ 16,8...	11		60 ... 400	125	185	10.5
6914	RZ 8,0...	RZ 23,0...	RZ 47,0...	22		100 ... 400	221	218	23.9
6916	RZ 12,7...	RZ 34,5...	RZ 70,0...	30		100 ... 400	320	238	39.1

1) Industry standard motor shape IM B 35 for motor pumps or IM B 5 for hydraulic power packs
2) Minimum size determined by overall height of the pump

Low-pressure section (gear pump)

Size	Delivery flow Q_{pu} [lpm] and max. pressure p_{max} [bar]			Dimensions [mm]	m [kg]
	120 bar	80 bar	40... 60 bar	H1	
/1	5.2	8.8	11.3	70 ... 86	1.2
/2	12.3	16	37	96 ... 132	3.1
/3	24	110	135	140 ... 178	8.4

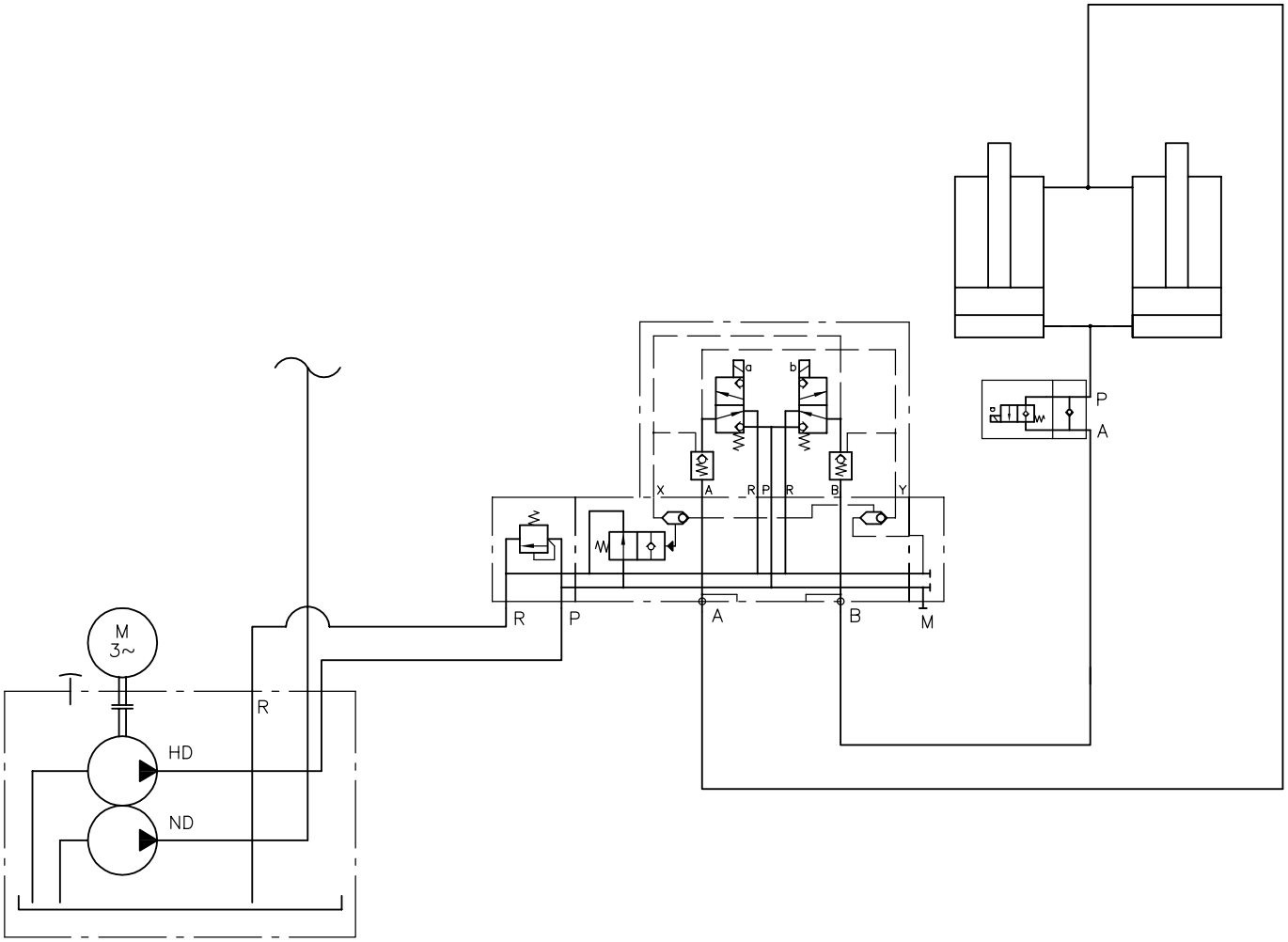
- The data listed represent only a selection of the various differing versions

Example circuit:

RZ 4,0/2-12,3-B 75-V 5,5
- 3 x 690/400V 50 H

VB 22 AM 1/500
- G 49/U 22
- 8 E-2-G 24

GR 2-1-1-3/8 C-G 24



Associated technical data sheets:

- Dual-stage pumps type RZ: D 6910
- Motorpumps and hydraulic power packs type RZ: D 6910 H
- Dual stage pump type RF: D 7410

Similar products:

- Radial piston pumps and hydraulic power packs type R and RG: Page 46

Valves:

- Two-stage valves type NE: Page 206
- Switching valves type CR: Page 164

See also section "Devices for special applications":

- Press controls
- Devices for up to 700 bar

1.4 Air driven hydraulic pumps

Air driven hydraulic pump type LP

Air-driven hydraulic pumps

Type	Nomenclature/Design	$p_{air\ max}$	$p_{hydr\ max}$	Q_{max}
LP	**Air-driven hydraulic pump** ■ Individual pump ■ Hydraulic power pack	10 bar	160... 1500 bar	0.9... 12 lpm

Air driven hydraulic pumps

1.4 Air driven hydraulic pumps type LP

The hydraulic pumps type LP are reciprocating, valve-controlled plunger pumps that are available in three sizes. They are basically oscillating pneumatic/hydraulic pressure intensifiers. Stroke reversal is controlled automatically. The stroke frequency is dependent on the air pressure set and the current hydraulic counter pressure, and comes to a complete stop when the pressure limit is reached. As an air-driven hydraulic power pack, the tank version of this type of pump can be combined with directional seated valves for use in different applications. This type of pump is used in laboratory presses, jig construction and lubrication technology, for example. Since they are supplied with energy by means of compressed air, they can be used in potentially explosive atmospheres.

Features and benefits:

- High operating pressures
- Suitable for explosion-proof systems and equipment
  No electrical energy
- Hydraulic power packs with direct valve mounting

Intended applications:

- Construction and construction materials machinery
- Jig construction
- Testing and laboratory equipment

Nomenclature:	**Air driven hydraulic pumps**
Design:	**Individual pump Hydraulic power pack**
$p_{hydraulicmax}$:	**160...1500 bar**
p_{airmax}:	**10 bar**
Q_{max}:	**0.9...12 lpm**

Design and order coding example

LP 125 - 16 E /S 81

Additional elements
- Suction parts for hydraulic pumps
- Tanks for hydraulic pumps

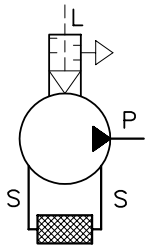
Design

Hydraulic pump
- Ready-to-connect version
- Individual version for self-installation

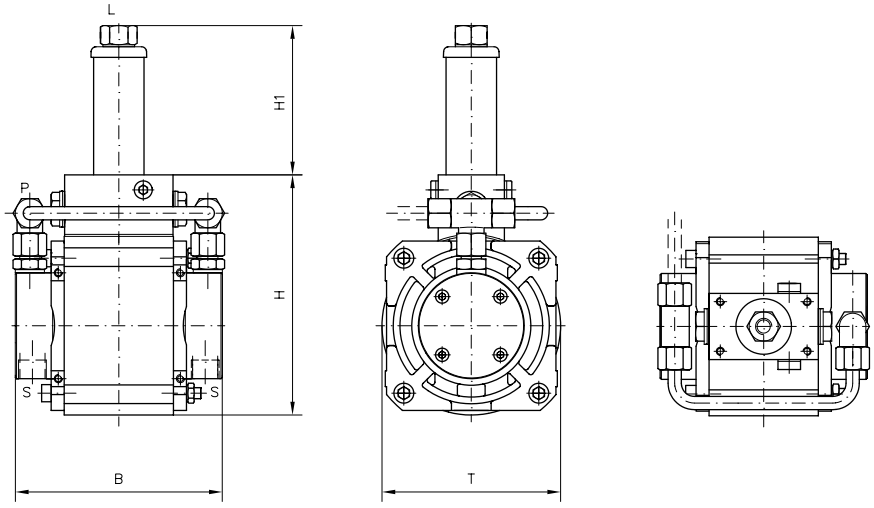
Hydraulic power pack (with type VB, BWH, BWN valve banks)
- Tank version, usable volume V_{usable} 5 l to 28 l
- Cover plate version (for installation in self-manufactured oil tanks)

Basic type, size Type LP, size 80, 125, 160

Function



LP

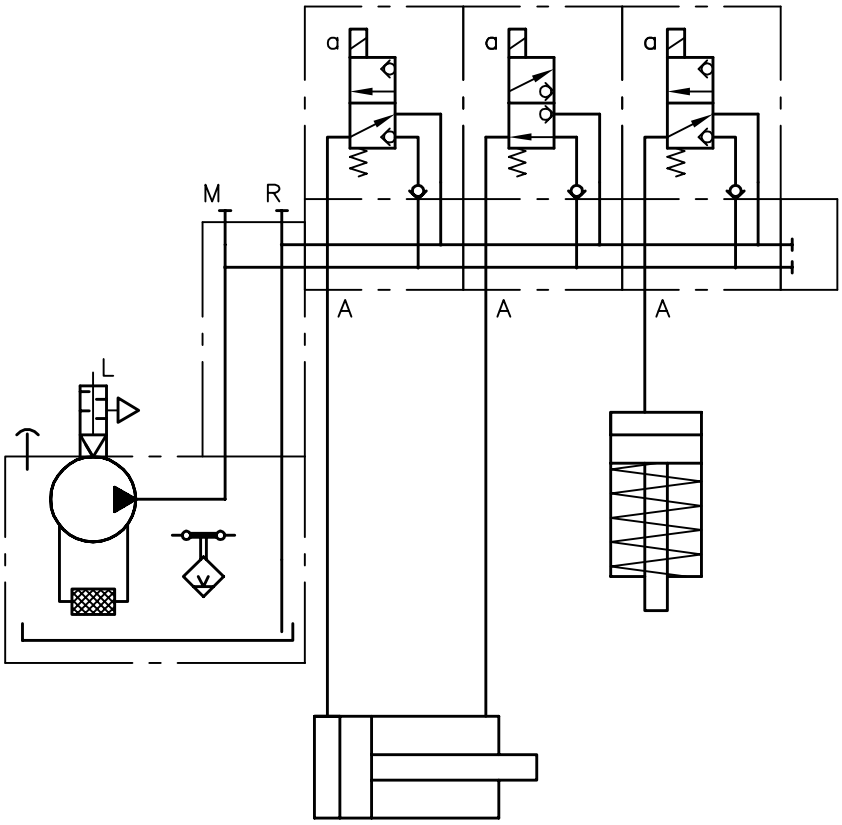


No piping for type LP...-..

Basic type and size		p_{max} [bar]	Pressure ratio	Geom. volume per double stroke V_{hydr} [cm³]	Tapped port (air) Pipe diameter for pressure connection (hydr)	Dimensions [mm]				m [kg]
						H	H1	B	T	
LP80-	**8**	700	1 : 200	1.5	G 1/4 ∅6 mm	119	94	121	85	5
	10	630	1 : 63	2.3						
	12	430	1 : 43	3.4						
	16	240	1 : 24	6						
LP125-	**8**	1500	1 : 243	2	G 3/8 ∅8 mm, ∅10 mm	159	114	156	135	8.5
	10	1500	1 : 155	3.1						
	12	700	1 : 108	4.5						
	16	600	1 : 60	8						
	18	470	1 : 47	10.2						
	20	380	1 : 38	12.6						
	25	240	1 : 24	19.6						
	30	160	1 : 16	28.3						
LP160-	**8**	1500	1 : 400	2	G 1/2 ∅8 mm, ∅10 mm	228	136	156	175	11.5
	10	1500	1 : 255	3.1						
	12	700	1 : 177	4.5						
	16	700	1 : 100	8						
	18	700	1 : 78	10.2						
	20	620	1 : 63	12.6						
	25	390	1 : 40	19.6						
	30	265	1 : 24	28.3						

Example circuit:

LP 125-10/B 10 D
-VB 11 LM-NRN-1-G 24



Associated technical data sheets:

- Hydraulic pumps type LP: D 7280
- Hydraulic power packs type LP: D 7280 H

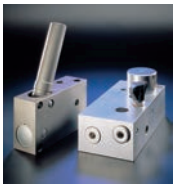
Valve banks :

- Type VB: Page 130
- Type BWH(N): Page 138

See also section "Devices for special applications":

- Press controls
- Devices for explosion hazardous areas (conforming ATEX)
- Devices for up to 700 bar

1.5 Hand pumps



Hand pumps type H, HE, HD, and DH

Hand pumps

Type	Nomenclature/Design	Actuation	p_{max}	Q_{max}
H, HE, HD, DH	**Piston pump** ■ Single acting ■ Double acting	Hand pump	80 ... 800 bar	4 ... 64 cm^3/stroke