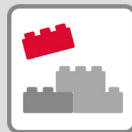


Mobile Products Overview

Product range and technical information



Solutions for a World under Pressure

HAWE
HYDRAULIK

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HAWE Hydraulik SE was established as "Heilmeier & Weinlein, Fabrik für Oelhydraulik GmbH & Co. KG" in Munich in 1949. Innovative ideas, high quality products, and a lot of enthusiasm has contributed to HAWE's steady growth.

The product range has been widened continuously over the years, covering standard valves as well as many products tailored for special purposes such as pre-fill valves and lifting and lowering valves. All products are produced by German craftsmen to ISO 9001:2015 quality standards.

HAWE now has more than 2000 employees, a worldwide sales network with offices in Germany, 16 HAWE subsidiaries, and more than 30 international representatives.



HAWE has multiple manufacturing facilities throughout Germany. Pictured here is HAWE's production facility in Kaufbeuren.

Solutions for a World under Pressure

In 1997, North America was introduced to HAWE Hydraulik through its American subsidiary. Today, many of America's most rugged industries rely on over 60 years of HAWE's dependable German engineering and experience to help them build equipment with extremely robust hydraulic systems.

When you see construction and fire trucks, lifting platforms, cranes, and drilling rigs to name only a few, you could be watching HAWE in action as more and more equipment manufacturers are finding out about the benefits of our hydraulic systems.

Tough as Steel

Because all HAWE pressurized components are made of steel, they are more compact when compared with competitors' products, and this saves space in smaller or more complicated designs. Hydraulic components made of steel also have greater durability in intermediate pressure applications, but are designed to handle pressures up to 6000 psi (420 bar). Our components and systems are designed for low leakage and, in some cases, zero leakage for a more reliable and efficient use of the energy it takes to operate the machinery.

Turn-Key Modular Solutions

HAWE has a unique approach to hydraulics, which may at first glance appear complicated. It's a simple concept based on three principles:

1. the manufacture of all pressurized parts from steel for smaller, more durable, and reliable components in applications with extreme repeatability;
2. to provide varieties of standard and exclusive components for unparalleled flexibility; and
3. to design all components to work as a seamlessly integrated modular design for precision system solutions as individual as your application.

HAWE's broad and varied product line is designed with a modular approach, where components can be combined to create any number of systems and solutions. An essential element of our flexibility is in the development of our own state-of-the-art electronics. These devices increase the number of applications and expand the systems' capacities, with many as easy as plug-and-play.

At Your Service

HAWE Hydraulik knows the value of the machinery you build. That's why we add value to each purchase through our customer service. Our sales and application engineers are available to assist you with the custom design of your modular hydraulic solution. Once that is decided, we have local inventory to supply your products, which are assembled, calibrated, and tested on-site in Bethlehem. We also follow through with after-sales support including product training, troubleshooting, and on-site service.



HAWE Hydraulik North America is based in Huntersville, North Carolina, and is an ISO 9001:2015 certified international supplier of sophisticated modular hydraulic components and systems.



Components are assembled, calibrated, and tested at the Bethlehem facility.

About This Catalog

This product overview is intended to provide you with a summary of the general capabilities and technical information for a variety of HAWE Hydraulik components for mobile applications. It is supplemented with additional product-specific pamphlets containing detailed technical specifications and information on how to order these products. These additional documents are available upon request from our Huntersville office or at HAWE.com.

HAWE Proportional Directional Spool Valves

Proportional directional spool valves are a type of directional valve. They control the direction of movement and the velocity of individual or multiple hydraulic consumers actuated simultaneously. Control is independent of the load and continuous. HAWE Hydraulik spool valves are made of steel on all pressurized components, allowing us to manufacture valves with a very small footprint while withstanding pressures up to 6000 psi (420 bar). Many additional functions and actuation options are available for systems using manual, piloted, or electrohydraulic actuation. This results in a more efficient, simplified, and space-saving design for your system.

Examples of Additional Functions:

- Secondary pressure limitation (Table 2)
- Pressure limitation
- Integrated over-center valves
- Functional cut-off (Table 3)
- Zero-leak PO checks
- Float function

1 Connection Block

The connection block is chosen to accommodate the pump type, flow, and a variety of features including:

- Dampening
- Arbitrary idle pump circulation of all consumers

2 Actuators by Type

- Manual (also emergency)
- Electro-hydraulic
- Hydraulic
- Pneumatic
- Mechanical joystick
- Direct CAN-Bus interface

Additional Actuation Features

- Mechanical micro switch to monitor the spool's position
- Integrated displacement transducer (Hall sensor) with analog signal output
- Combinations of several actuation options are possible

Intermediate plates and Functional cut-off (overload protection), proportional pressure limitation is available

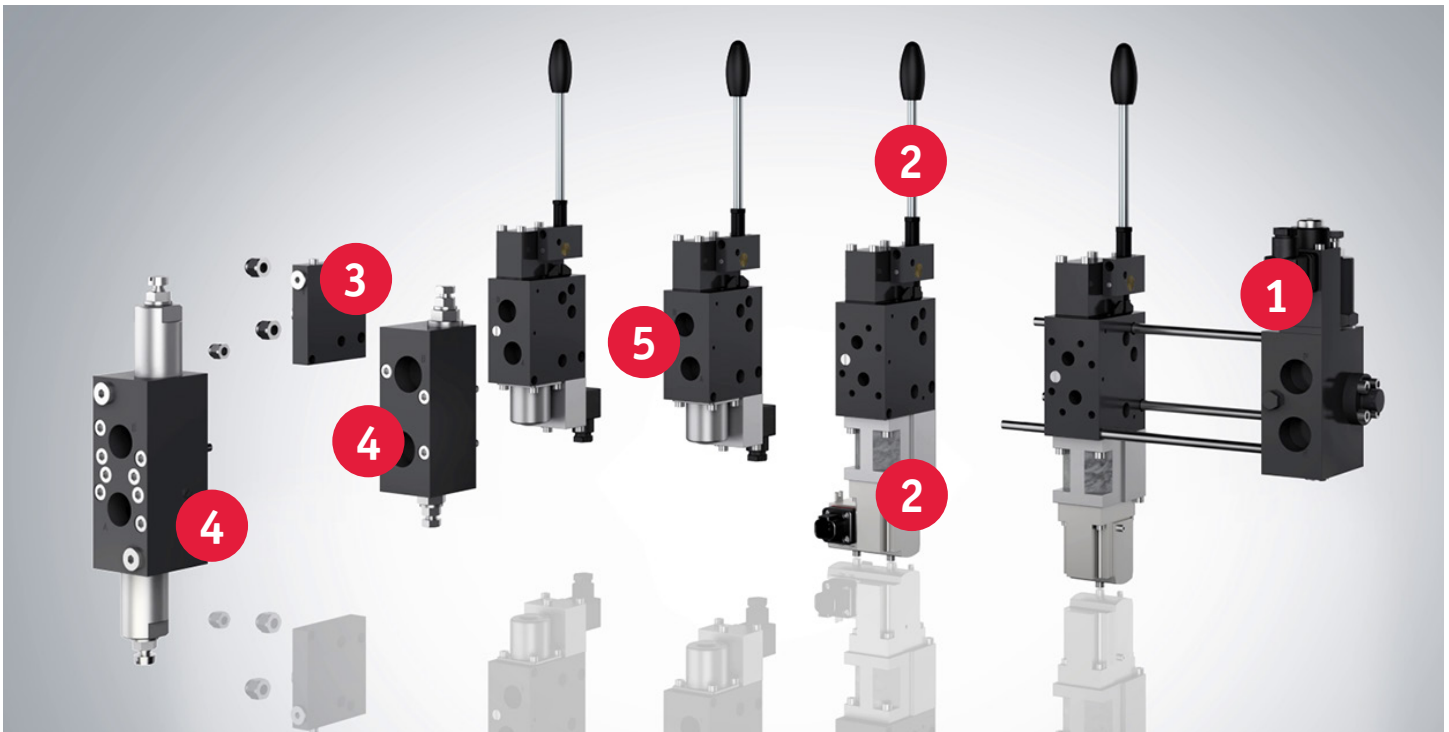
Additional functions include:

- Additional P port for a second pump circuit
- Priority flow divider
- Blocks the pump gallery for all subsequent consumers
- Limits operation pressure or arbitrary flow (velocity) for all subsequent valve sections

3 End Plate

Completes the valve bank.

- E 1, E 2, E 17, E 17 UNF, E 18 & E 18 UNF offer external T-port for external control oil return to the tank
- E 4, E 5, E 19, E 19 UNF, E 20, & E 20 UNF offer additional P port for internal control oil return gallery
- Refer to data sheet D 7700-... for information on ports and descriptions



4 Ancillary Block

Additional functions include:

- Over-center valve (Table 6)
- Shock and suction valve
- Regenerative circuit
- Outflow controller for proportional and load independent lowering

5 Add-On Spool Valve

For controlling the individual function, the add-on spool valve is determined by:

- The maximum flow rating (Table 4)
- The flow pattern symbol (See Table on page 6)
- The maximum pressure of the valve section

Proportional Direction Spool Valve: MICK

The proportional directional spool valve type MICK® is a combination of the proportional directional spool valve type PSL and specially designed 8/3-way diverter valves which are flanged-mounted on the PSL sections.

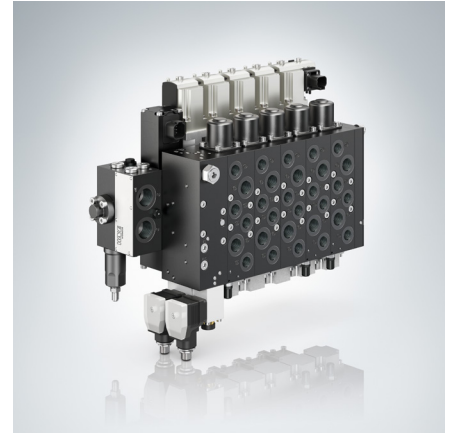
The PSL sections proportionally control the flow rate and the downstream diverter valves distribute it to the individual consumers. Up to three dual-acting consumers can thus be supplied with one valve section.

Features and benefits:

- Space, weight and cost savings compared to a conventional solution
- Smart system solution to also control secondary functions with CAN bus valves
- Integrated safety functions such as P-line shut-off, LS relief and meander circuit
- Extensive modular system with many variants and combination options
- High energy efficiency thanks to low Δp and energy-saving solutions

Intended applications:

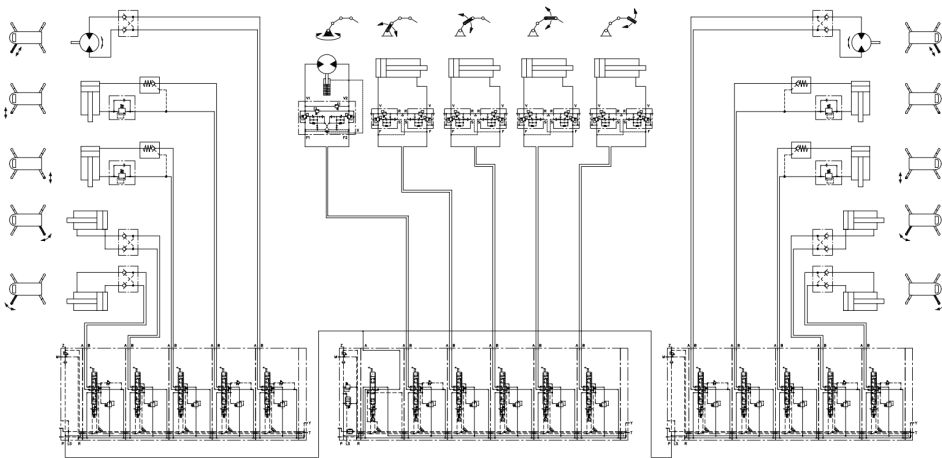
- Concrete line pumps
- Aerial Lift Platforms



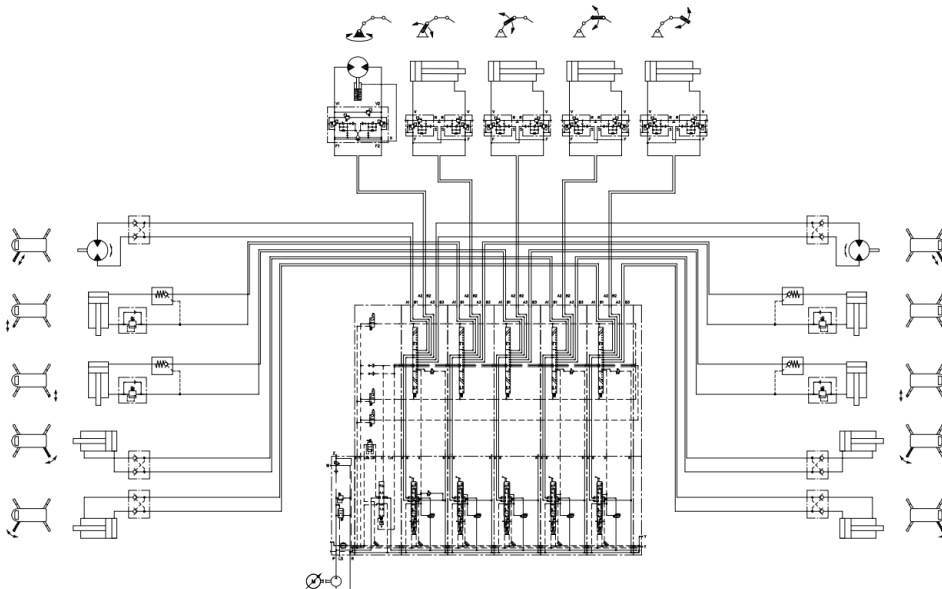
Nomenclature:	Proportional directional spool valve
Pmax:	6000 psi (420 bar)
Flow rate (pump) Qmax:	200 lpm (52.8 gpm)
Flow rate (consumer) Qmax:	120 lpm (31.7 gpm)

System schematic for a concrete line pump

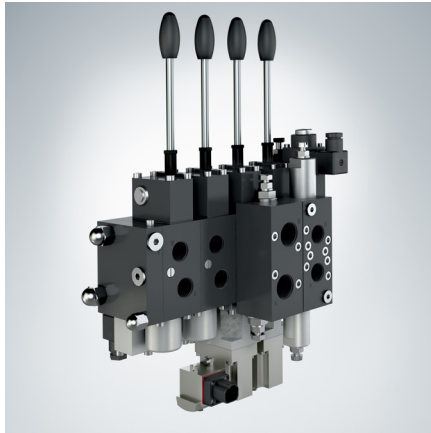
Example of a conventional system



Example of a MICK system



Proportional Directional Spool Valve: PSL/PSV



Designed for mobile hydraulics applications, the PSL works with continuous delivery pump systems, while the PSV works with variable displacement systems. These valve banks can be customized for applications requiring unequal flows at ports A and B, as well as additional functions such as secondary pressure limitation, and functional cut-off, which can be incorporated into the basic valve, optional intermediate plates, or the ancillary block.

Features and Benefits:

- Suited for demanding controls
- Efficient closed-center systems
- Available in various sizes
- Compact design for weight savings

1 Basic types of connection blocks and ports sizes

Coding	Ports P and R (SAE J 514)	Rate Flow (gpm)	Pump Displacement
PSL UNF 2 PSV UNF 2	Size 2 3/4-16 UNF-2B (SAE-8)	21	Fixed/Variable
PSL UNF 3 PSV UNF 3	Size 3 1 1/16-12 UNF-2B (SAE-12)	53	Fixed/Variable
PSL UNF 5 PSV UNF 5	Size 5 1 5/16-12 UNF-2B (SAE-20)	79	Fixed/Variable

2 Secondary load-sensing pressure-limiting valves

Coding	Description
No coding	Without pressure limitation
A...	Pressure limitation at A with pressure specification
B..	Pressure limitation at B with pressure specification
A...B...	Pressure limitation at A and B with pressure specification

Example: SL 3-32 H 63/40 A 50 B 420/A.
Pressure limitation $p_{min} = 725$ psi (50 bar); $p_{max} = 6090$ psi. (420 bar)

3 Functional cut-off (overload protection), proportional pressure limitation

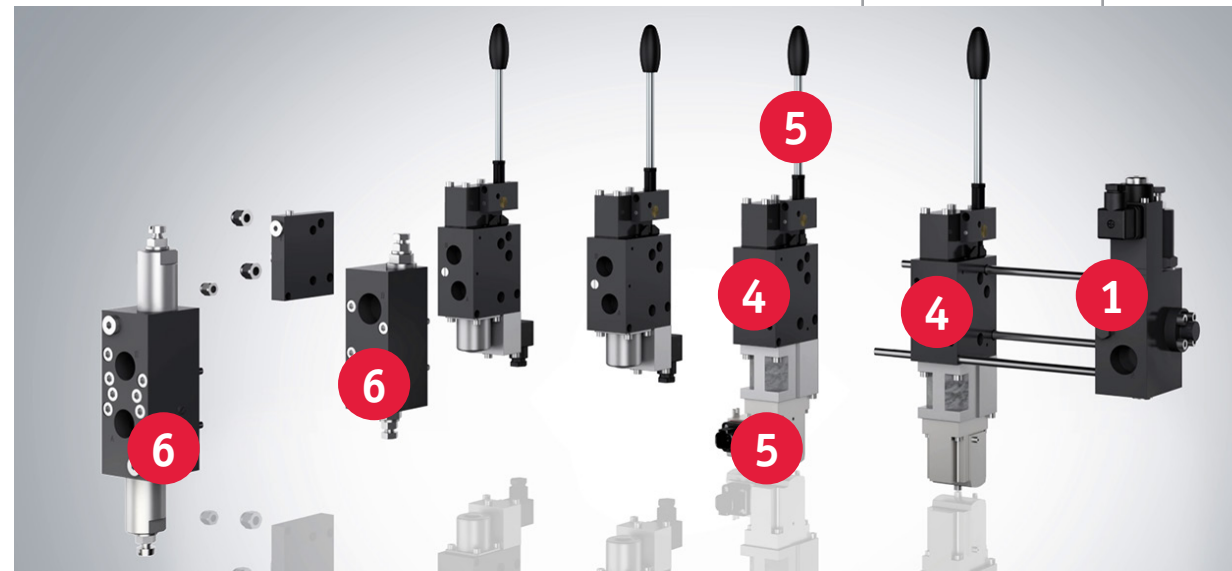
Coding	Description
No coding	Without functional cut-off
FP..., FPH...	Proportional pressure limitation for A or B. Version FPH with additional emergency actuation (no tools needed)
S, S 1	Load signal ports U and W for external piping
F 1, F 2, F 3 (Sizes 3 and 5 only)	Electric on/off functional cut-off at A, B, or A and B

4 Spool valve flow patterns

L	M	F	H	J	B	R	O	G

5 Actuation functions and variables

	Manual		Electro-hydraulic (EO)		Hydraulic (Hyd)			Pneumatic	Mechanical Joystick	CAN actuation
	Spring return	Detent	EO only	EO and manual	Hyd only	Hyd and manual	Hyd, solenoid and manual			
Coding	A EOA	C EOC AR EOAR	E EC	EA EAR	H H UNF F F UNF	HA HA UNF FA F UNF	HEA HEA UNF FEA FEA UNF (HE, FE)	P PA	K KE K 12	E CAN(L) E I CAN(L) E A CAN(L) E M A CAN(L) E H A CAN
Symbols										
Manipulated variables	actuation angle: ~5° to 30°		control current ratio I/I : ~0.2 to 1		control pressure: minimum: 72.5 psi (5 bar) maximum: 261 psi (18 bar) maximum permissible 725 psi (50 bar)			control pressure: ~36 to 101.5 psi (7 bar)	actuation angle: ~5° to 19°	Protocol supported J1939 and CAN open



4 Maximum flow ratings of spool valves with compensator spring options

Spool Valve Compensator Spring Option Coding	Flow Coding $Q_{A,B}$ (gpm): Consumer Port A and B									
Size 2 Flow Coding										
	3	6	10	16	25	40	63	80	120	160
2	0.8	1.6	2.6	4.2	6.6	10.6	—	—	—	—
5	1.1	2.4	3.7	5.8	9.0	14.3	—	—	—	—
7	1.3	2.6	4.0	6.3	10.0	15.9	—	—	—	—
Size 3 Flow Coding										
2, 2S	0.8	1.6	2.6	4.2	6.6	10.6	16.6	21.1	—	—
5, 5S	1.1	2.4	3.7	5.8	9.0	14.3	22.5	28.3	—	—
7	1.3	2.6	4.0	6.3	10.0	15.9	25.1	31.2	—	—
Size 5 Flow Coding										
2	—	—	—	4.2	6.6	10.6	16.6	21.1	31.7	42.3
5	—	—	—	5.3	8.5	13.5	21.1	29.1	39.6	55.5
7	—	—	—	6.3	10.0	15.9	25.1	31.2	46.2	63.4

6 Ancillary block examples

Coding	Description	Symbol*
/2AL...BL...	With over-center valves at A and B	Size 2
/2AL...BL...	With over-center valves at A and B	Size 3
/UNF 2=3/4-16 UNF-2B (SAE-8) /UNF 3=7/8-14 UNF-2B (SAE-10) /UNF 5=1-5/16 UNF-2B (SAE-16)	Without additional function	
/UNF 2 AS...BS... /UNF 3 AN...BN... /UNF 5 AS... BS...	With shock valves at A and B (routed to the opposing side), with pressure	
/UNF 2 AN...BN... /UNF 3 AN...BN... /UNF 5 AN... BN...	With shock and suction valves at A and B, with pressure specification (bar)	
/UNF 2 DRH /UNF 3 DRH /UNF 5 DRH	Size 2: with double check valve, opening pressure: .04 $p_{A,B} + 43$ psi (3 bar) Size 3, 5: releaseable check valves in A and B (release ratio: 1:2:5)	

*Gauge ports optional on size 2.

Proportional Directional Spool Valve: PSLF/PSVF



Available for both fixed (PSLF) and variable (PSVF) displacement systems, these directional spool valves are attached to adjoining manifold blocks. They control the direction and speed of the hydraulic consumers, which may operate simultaneously and independently of each other. These valve banks can be tailored to a specific application that require unequal maximum consumer flows at ports A and B, and can include additional functions such as functional cut-off.

Features and Benefits:

- Maximum flow of 124 gpm (469 lpm) at 6000 psi (420 bar)
- Excellent accessibility to the valve due to rear-sided hydraulic ports
- Manifold mounted: various sizes can be combined and easy valve replacement
- Simultaneous full-speed operation of several functions
- Manifold design (via subplates) offers easy maintenance (Table 7)

1 Basic types of connection blocks

Coding and Size	Inlet Section	Rate Flow (gpm)	Description
PSLF A ...-3 PSVF A ...-3		~113 lpm (30 gpm)	Fixed / Variable
PSLF A ...-5 PSVF A ...-5		~340 lpm (90 gpm)	Fixed / Variable
PSVF A ...-7		~1022 lpm (270 gpm)	Variable

2 Secondary load-sensing pressure-limiting valves

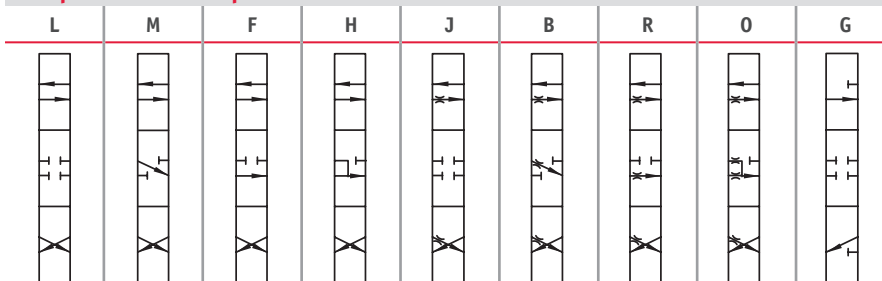
Coding	Description
No coding	Without pressure limitation
A...	Pressure limitation at A with pressure specification
B..	Pressure limitation at B with pressure specification
A...B...	Pressure limitation at A and B with pressure specification
C...	Common pressure limitation for A and B with pressure specification

Example: SLF 7-A2 H320/320 A250 B200/A.
Pressure limitation $p_{min} = 700$ psi (48 bar); $p_{max} = 6000$ psi. (420 bar)

3 Functional cut-off, proportional pressure limitation

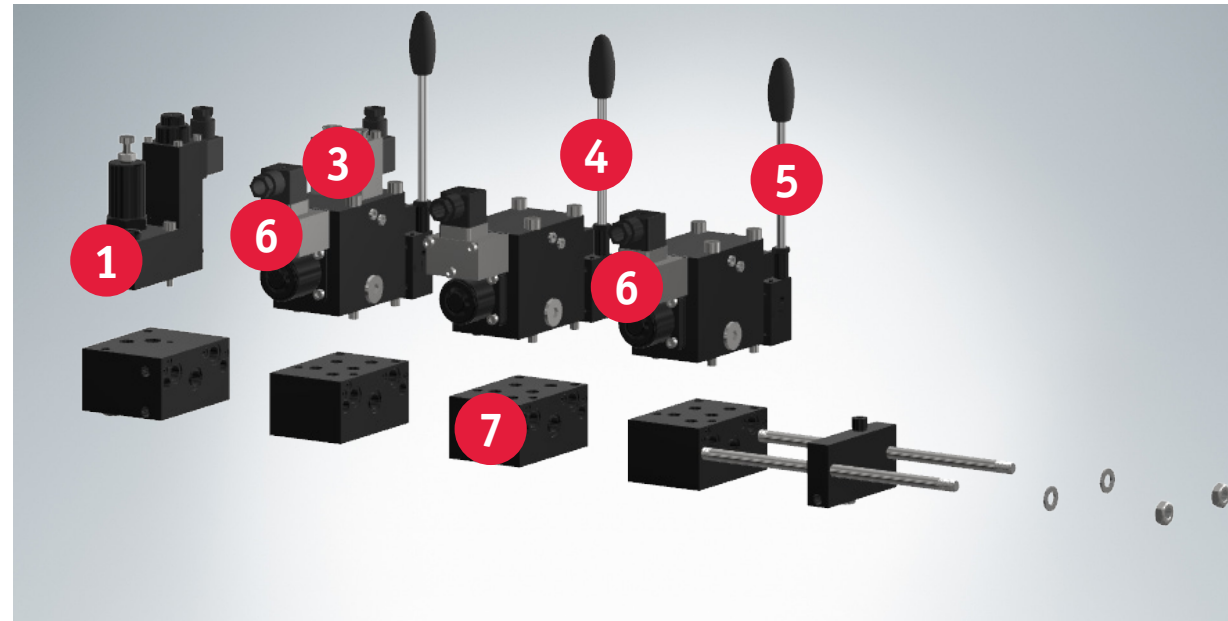
Coding	Description
No coding	Without functional cut-off
F 1, F 2	Electric functional cut-off at A or B
F 3	Electric functional cut-off at A and B
FP..., FPH...	Proportional pressure limitation for A or B, or A and B. No additional emergency actuation (no tool required).
S (size 5)	Flange-sided load signal ports U and W (G 1/8) for external piping. For example, in combination with sub-plate /5 S.
S 1	Load signal ports U and W for external piping; tapped port block at valve section.

4 Spool valve flow patterns



6 Actuation functions and variables

	Manual		Electro-Hydraulic (EO)		Hydraulic (Hyd)			Pneumatic
	Spring return	Detent	EO only	EO and manual	Hyd only	Hyd and manual	Hyd, solenoid and manual	
Coding	A EOA	C EOC AR EOAR	E ER	EA EAR	H H UNF	HA HA UNF	HEA HEA UNF (HE, HE UNF)	P PA
Symbols								
Manipulated variables	actuation angle: ~5° to 30°		control current ratio I/I_1 : ~0.2 to 1		control pressure: minimum: 72.5 psi (5 bar) maximum: 261 psi (18 bar) maximum permanent: 725 psi (50 bar)			control pressure: ~36 to 101.5 psi (~2 to 7 bar)



5 Maximum flow ratings of spool valves with compensator spring options

Compensator Spring Option	Flow Coding $Q_{A,B}$ (gpm): Consumer Port A and B	Flow Coding $Q_{A,B}$ (gpm): Consumer Port A and B													
		Coding	Size	3	6	10	16	25	40	63	80	120	160	250	320
A 2	3	0.8	1.6	2.6	4.2	6.6	10.6	16.6	21.1	—	—	—	—	—	—
	5	—	—	—	4.2	6.6	10.6	16.6	21.1	31.7	42.3	—	—	—	
	7	—	—	—	—	—	—	—	—	31.7	42.3	66	85	106	
A 5	3	1.0	2.4	3.7	5.8	9.0	14.3	22.5	28.3	—	—	—	—	—	
	5	—	—	—	5.3	8.5	13.5	21.1	29	39.6	55	—	—	—	
	7	—	—	—	—	—	—	—	—	40	55	82	100	124	
A 7	3	1.1	2.2	3.1	6	10	16	25	31	—	—	—	—	—	
	5	—	—	—	6	10	16	25	31	46	63	—	—	—	

7 Sub-plate descriptions

Coding	Port Size for A and B		Size	Description
	ISO 228/1 (BSPP)	SAE J 514		
/3, /UNF 3	G 1/2	7/8-14 UNF-2B	3	Standard
/4, /UNF 4	G 3/4	7/8-14 UNF-2B	3	Standard
/5	G 1	—	5	Standard
/UNF 3 AN... BN... /UNF 3 AN... /UNF 3 BN...	G 1/2	7/8-14 UNF-2B	3	Shock and suction valves at A and B, or A or B. (Request pressure in bar.)
/534, /UNF 534	G 3/4	7/8-14 UNF-2B	5	Sub-plate for valve section size 3, in a valve bank size 5 (saving an intermediate plate).
/3 X, /UNF 3 X /UNF 4 W	G 1/2	7/8-14 UNF-2B (1 1/16-12 UNF-2B)	3	Joint-load signal pick-up port X for external circuitry.
/5 X, /UNF 5 X	G 1	1 5/16-12UNF-2B	5	
/5 SAE, /5 SAE S /5 SAE 8	SAE 1 (6090 psi - 420 bar)		5	Sub-plate with SAE-flange, analogue /5, /5 S, and /58.
/6D SAE	SAE 1 1/4 (6090 psi - 420 bar)		5	Sub-plate with SAE-flange for combination of two valve sections, to achieve a load compensated consumer flow, maximum 106 gpm.
/U 3	—	—	3	Sub-plate for mounting ancillary blocks with additional functions according to Table 21a (size 3) and Table 21b (size 5).
/U 5	—	—	5	
/U 53	—	—	5	Like /533, but prepared for mounting and ancillary blocks with additional functions, according to Table 21a (size 3).

Proportional Directional Spool Valve: EDL

The directional spool valve type EDL with series connection is actuated directly. The flows for the individual consumers can be individually adjusted. By means of additional functions in the intermediate plates (longitudinal and sandwich valve combination) and ancillary blocks, the proportional directional spool valve can be flexibly adapted to different control tasks.

The directional spool valve type EDL can be combined directly with the proportional directional spool valve type PSL and PSV in size 2. It is used in mobile hydraulics, in particular in civil engineering and agricultural engineering.

Features and benefits:

- One product for various control functions and lower flow requirements
- Compact and lightweight design
- Modular system can be directly combined with type PSL/PSV-2

Intended applications:

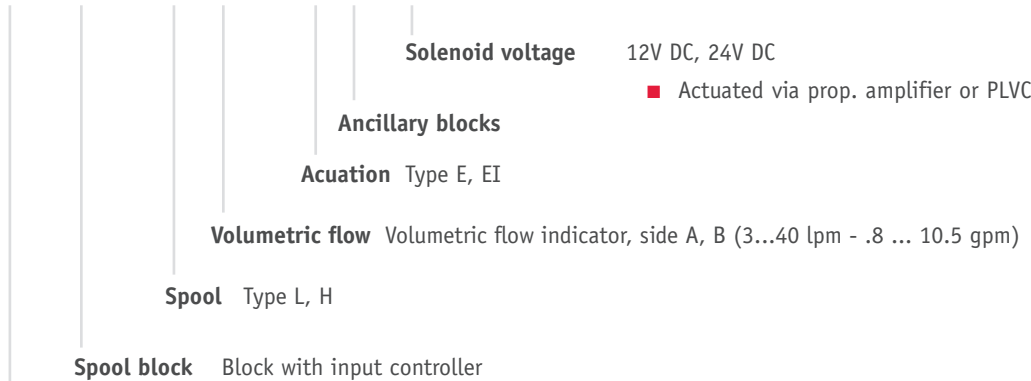
- Construction and construction materials machinery
- Cranes and lifting equipment
- Machines for forestry and agricultural purposes
- Municipal trucks



Nomenclature:	Directly actuated directional spool valves as per load-sensing principle
Version:	Valve bank in parallel connection
Actuation:	Solenoid-actuated
Pmax:	4600 psi (320 bar)
Qmax. consumer:	3 ... 40 lpm (.8 ... 10.5 gpm)
Qpu max:	Approx. 80 lpm (21 gpm)

Design and order coding example

EDL - DA2 L 40/25 E /2 - G24



Basic type Type EDL directly actuated proportional directional spool valve

Directional spool valve banks type CWS

The directional spool valve bank type CWS is actuated directly. The consumers can be controlled with on/off or proportional actuation. A range of connection blocks and mounted blocks offer a wide range of applications.

The valve bank CWS can be used in mobile or stationary hydraulic systems. Combining a compact form factor with competitive pricing, these products offer a smart, high-value alternative to conventional D03/NG6 valves and custom manifolds.

Features and Benefits:

- One valve for different control functions
- Compact and robust design

Intended applications:

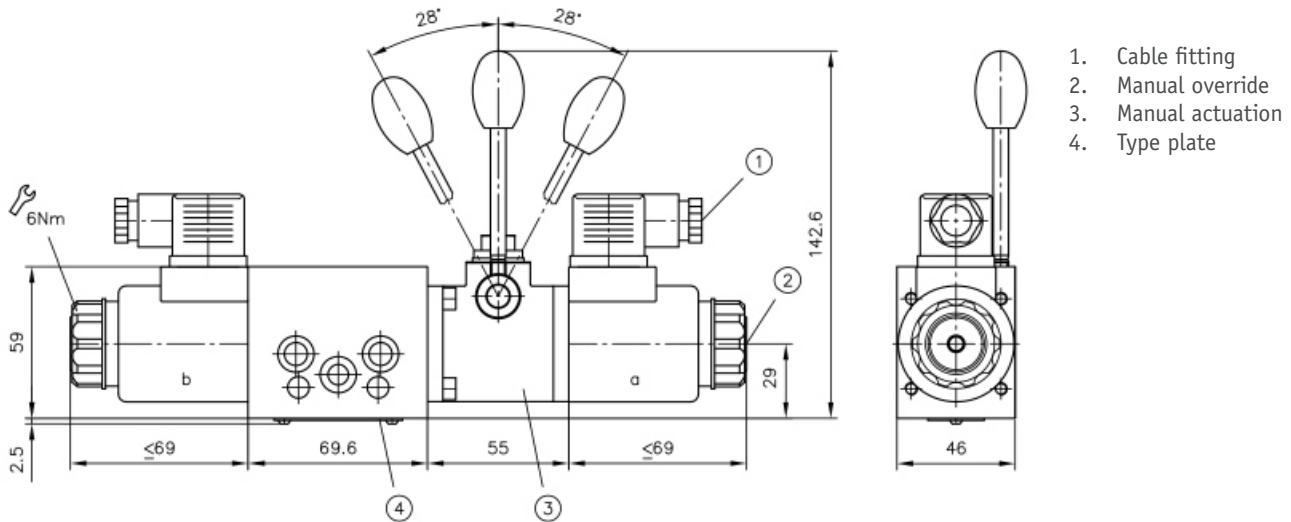
- Construction machines and construction material machines
- Cranes and lifting equipment
- Agricultural machinery and machines for forestry purposes
- Municipal trucks



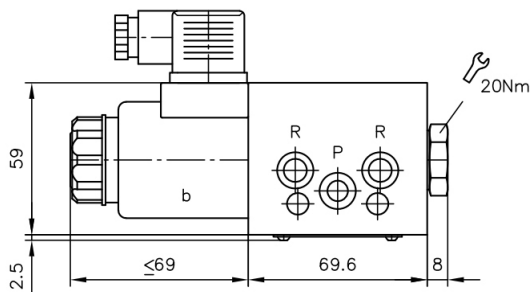
Nomenclature:	Directional spool valve bank type CWS
Actuation:	solenoid-actuated
Operating pressure Pmax:	4500 psi (315 bar)
Flow rate Qmax:	80 lpm (21.13 gpm)

Spool block

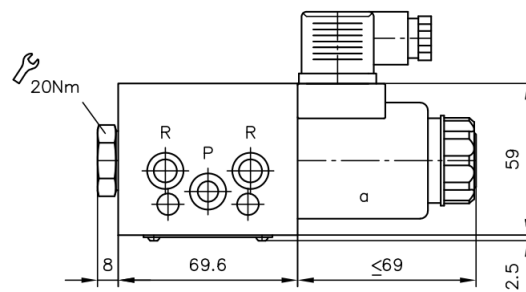
4/3-way directional valve with circuit symbol G, D, H, L, X



4/2-way directional valve with circuit symbol W, HB, GB (function in switching position 0 and b)



4/2-way directional valve with circuit symbol B, HW, GW (function in switching position 0 and a)



Directional spool valve banks type CWL

The CWL directional valve bank combines load-sensing technology with direct on-off or proportional control. Its integral LS output and modular connection and ancillary blocks provide a highly adaptable solution for diverse applications.

Features and Benefits:

- Low-cost load-sensing valve without any individual pressure compensators
- Modular system with many variants and combination options
- One valve for a range of different control functions and small flow quantities
- Compact and robust design
- Robust long-life design

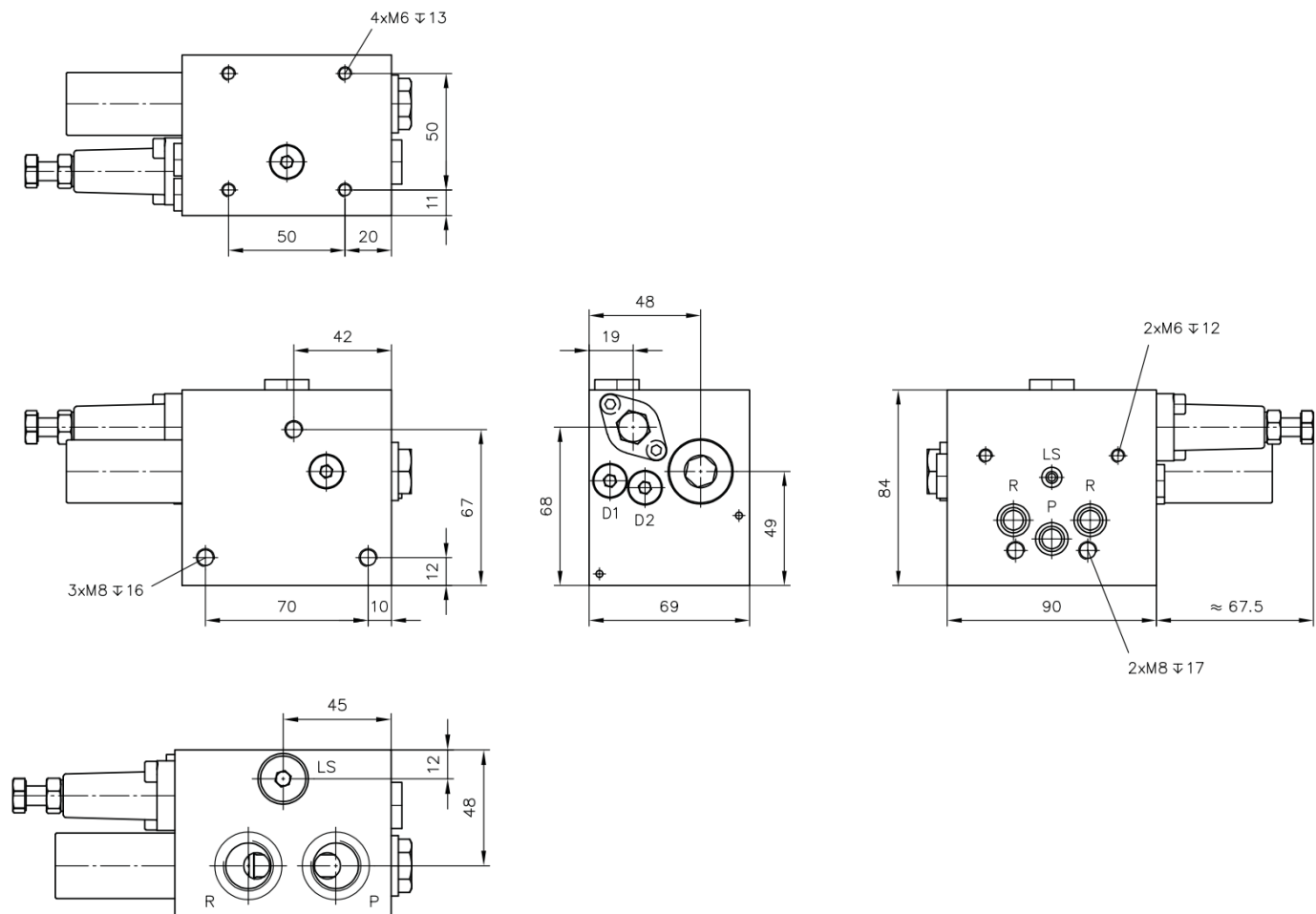
Intended applications:

- Municipal trucks
- Machines for forestry and agricultural purposes
- Lifting platforms
- Construction machines



Nomenclature:	Directional spool valve bank type CWS
Actuation:	solenoid-actuated
Operating pressure Pmax:	4500 psi (315 bar)
Flow rate Qmax:	60 lpm (15.85 gpm)

CWL 2..CL6



Directional spool valve banks type CWD

The CWD directional spool valve is a 6/2 or 6/3 diverter valve that connects an upstream directional valve with two downstream hydraulic consumers. If necessary, two or three sections can be combined to form a valve bank and connected in series in order to supply up to four double-acting hydraulic consumers. The CWD is directly actuated and controlled with on/off.

Features and Benefits:

- Ease of switching between multiple consumers used sequentially
- Efficient, cost-effective solution providing multiple functions with a single proportional valve
- Modular system with different circuit symbols and actuation, connection and seal variants
- Flexible expansion capability to form a valve bank with 2 or 3 sections connected in series

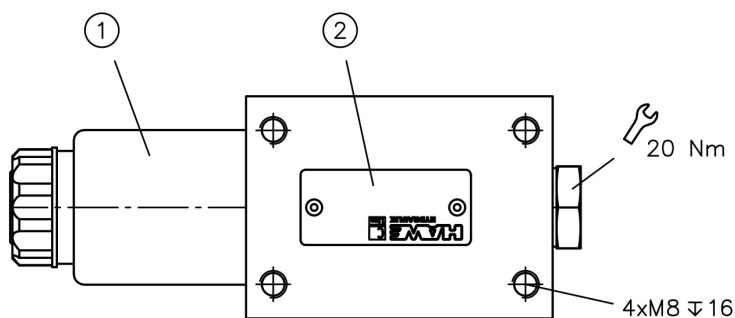
Intended applications:

- Lifting platforms
- Telehandlers
- Industrial vehicles
- Machines for forestry and agricultural purposes
- Municipal trucks
- Construction machines

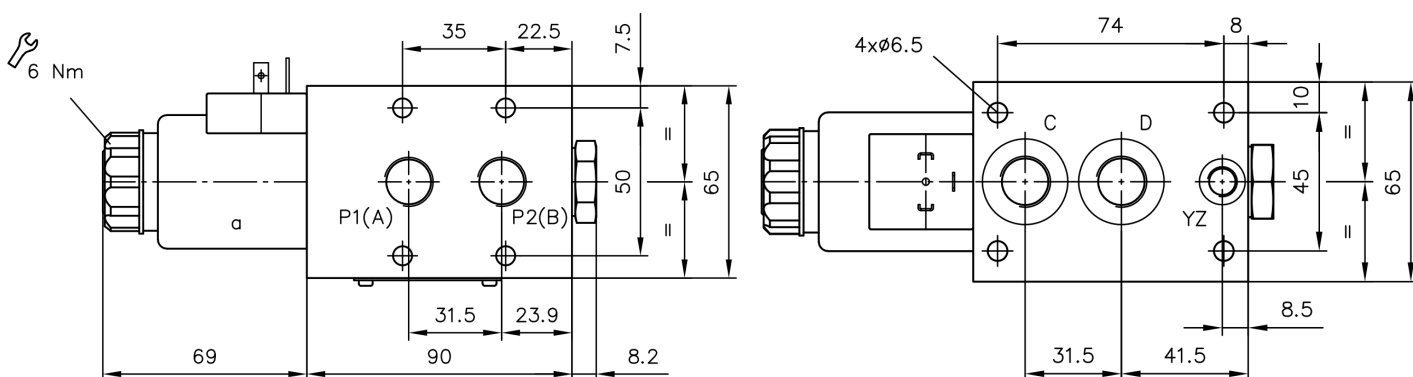


Nomenclature:	Directional spool valve bank type CWS
Actuation:	solenoid-actuated
Operating pressure Pmax:	5000 psi (350 bar)
Flow rate Qmax:	50 lpm (13.2 gpm)

Single valve



1. Actuation
2. Type plate



Directional spool valve type CWPN

The CWPN directional spool valve is a directly actuated, 4 way / 3 position or 4 way / 2 position valve featuring a standard NG 6 (CETOP 03) interface.

Designed for flexibility, the CWPN valve integrates seamlessly with standard HAWE BA and BNG type NG6 modular subplate systems, industry common single subplates, series and parallel ported bar manifold systems, and even on customer-specific custom manifolds or subplates.

Features and Benefits:

- Universally usable thanks to standard connection pattern NG 6 (CETOP 3)
- according to ISO 4401-03 or DIN 24 340-A6
- Modular system with various circuit symbols and actuation variants
- Optionally also available with additional valves in port P

Intended applications:

- Machine tools
- Wind turbines
- Solar power plants
- Industrial hydraulics



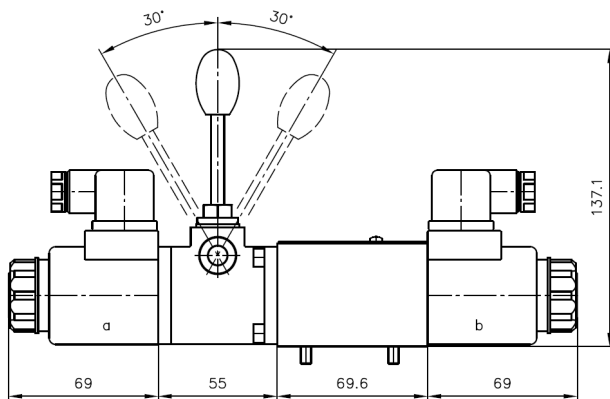
Nomenclature:	Directional spool valve type CWPN
Operating pressure P_{max}:	5000 psi (350 bar)
Flow rate Q_{max}:	80 lpm (21.13 gpm)

Coding	X 12 G 12 L 12 AMP 12 DT 12	x 24 G 24 L 24 AMP 24 DT 24	WG 110	WG 230
Nominal voltage	12 v DC	24 v DC	110 v AC	230 v AC
Permissible voltage	10%			
Nominal current I _N	2.50 A	1.25 A	0.28 A	0.15 A
Nominal power P _x	30 W	30 W	27.5 W	29.5 W
Duty cycle	51 (100%)			
Switching times	Circuit symbol G: on = approx. 50 ms and off = approx. 80 ms			
Switching frequency	approx. 15,000 switches/h			
Insulation material class	H			
Contact temperature	max. 100°C at 20°C ambient temperature			

Standard version without manual actuation

4/3-way directional valve

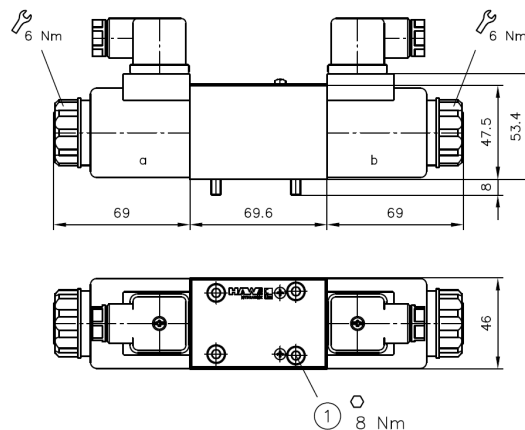
Circuit symbol G, D, H, L, X, C, E, O, K



Version with manual actuation

4/3-way directional valve

Circuit symbol G, D, H, L, X, C, E, O with HA actuation



Load-holding Valve Type OSCA



The type OSCA-D load-holding valve is especially suitable for applications that are either particularly susceptible to vibration or that work with very high load pressures.

The valve is designed as a screw-in cartridge and is easy to install and remove. A variety of connection blocks is offered and form tools for machining your own blocks are also available.

Features and Benefits:

- Pressure settings up to 7250 psi (500 bar)
- High stability to resist vibration
- Zero leakage holding
- Pressure adjustment is simple
- Zinc-nickel corrosion protection as standard

Intended Applications:

- Cranes and lifting equipment
- Construction machines
- Municipal trucks

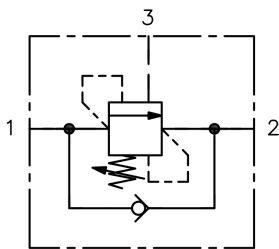
General Data

- Pressure settings: 7250 psi (500 bar)
- Load pressure: 6000 psi (420 bar)
- Flow rate: 10.6 gpm (40 lpm)

Screw-in Valve

OSCA-D 20 020

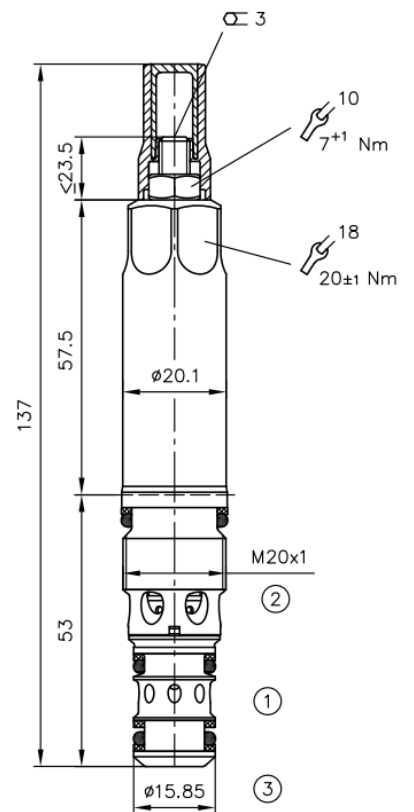
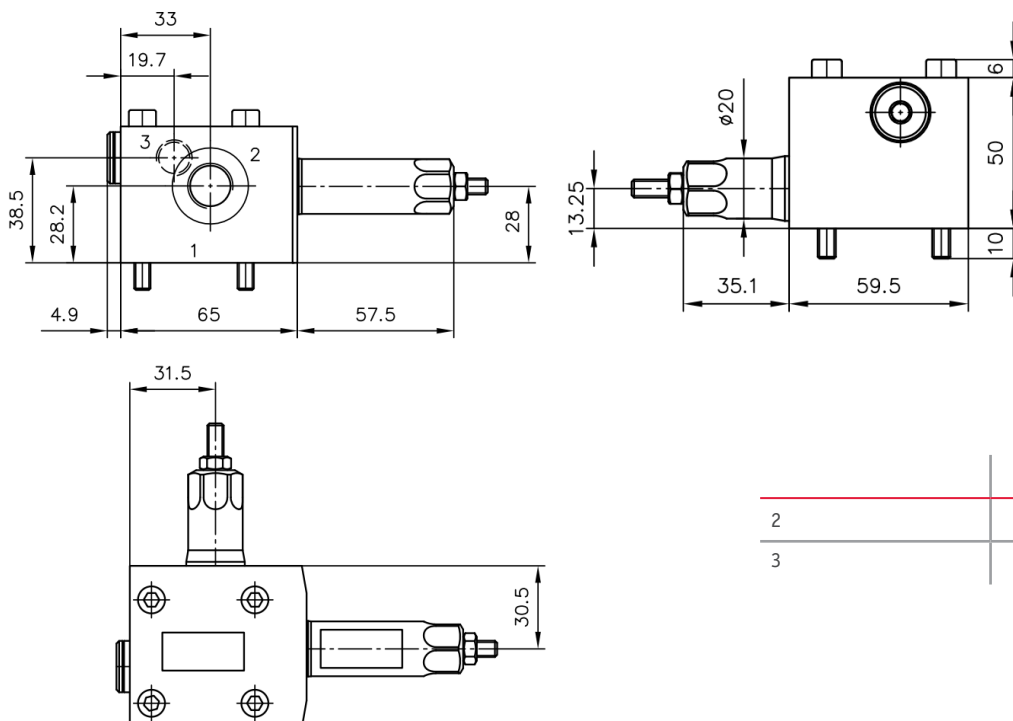
Circuit Symbol



- 1 Consumer port
- 2 Directional valve/pump port
- 3 Pilot pressure port

Manifold mounting with shock valve

2 P-16



Connections per ISO 228-1

Port	Connection
2	G 3/8
3	G 1/4

Over-Center Valves: LHK, LHT, and LHDV



LHK, LHT and LHDV are load-holding valves (or over-center valves); pressure valves that operate at the return side of double acting consumers, building the necessary load-holding pressure toward reverse-acting loads to prevent the uncontrolled speed of the cylinder.

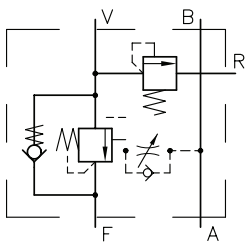
Features and Benefits:

- Good dampening characteristics
- Optional shock valves available
- Versions for consumers with load direction (pipe connection or manifold mounted valve) and consumers with alternating load direction (twin valve for pipe connection) one-sided.
- Compact design
- Pressure and flow adapts to operating conditions
- Maximum flow of 66 gpm (250 lpm) at 6000 psi (420 bar)

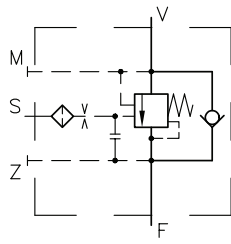
Basic Type	LHK 2	LHK 3	LHK 4	LHT 2	LHT 3	LHT 5	LHDV 33
Operating Pressure (psi)	6000	5200	5000	6000	6500	6500	6000
Flow (gpm)	4	13	22	6	22	55	18

Examples of Symbols

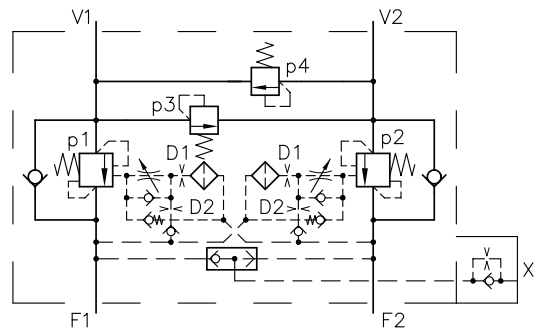
LHK



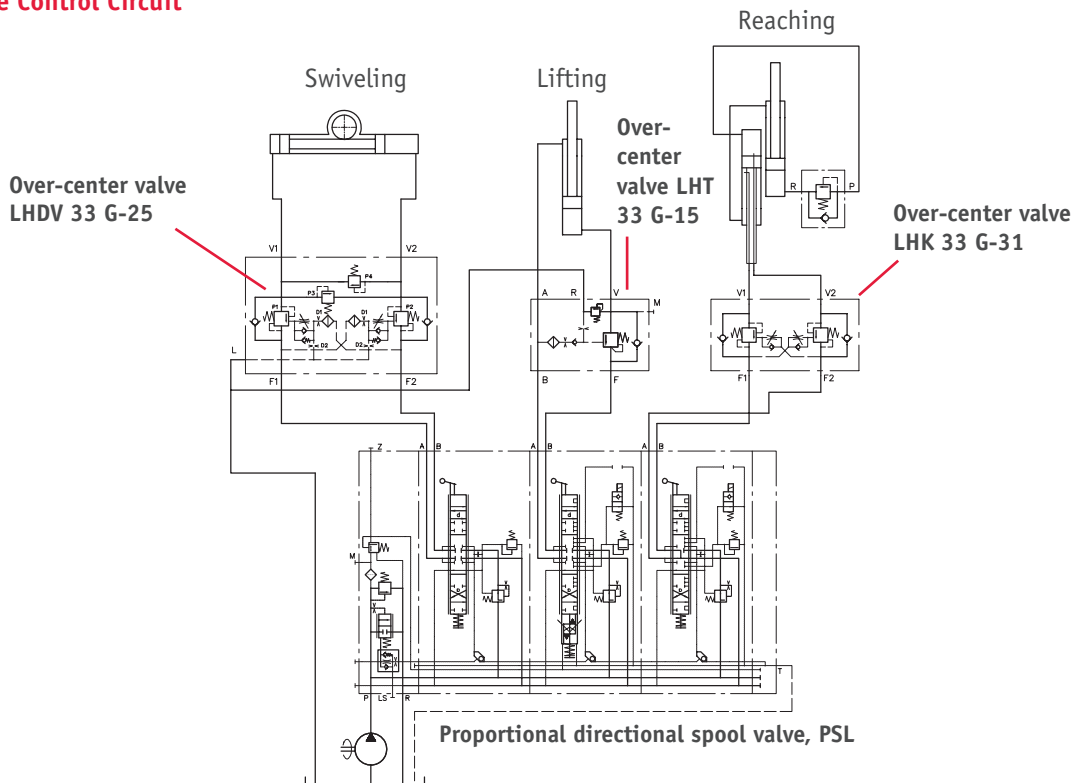
LHT



LHDV



Example Crane Control Circuit



Load-holding valve type CLHV, CLHV-PIB & CLHV-C

Load-holding valves are a type of pressure control valve. They prevent loads on cylinders or motors dropping in an uncontrolled manner. For this purpose they are pre-loaded with a pressure setting that is higher than the largest possible load. A hydraulic piston controls the opening of the valve to achieve the required lowering velocity.

The load-holding valve type CLHV is suitable for applications with low and medium tendencies to oscillate and is used especially in connection with proportional directional spool valves, e.g. types PSL and PSV.

Type CLHV-PIB and type CLHV-C (screw-in valve) can either be installed directly at the cylinder, in the manifold or hydraulic motor. It is also available with return pressure compensation and spring chamber relief.



Features and Benefits:

- Pressure settings up to 350 bar
- 4 sizes from 4 to max. 350 lpm
- Various adjustment options
- Various types of relief
- Various models

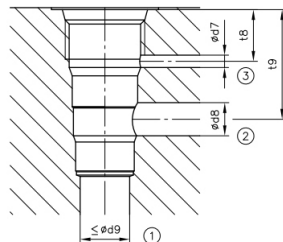
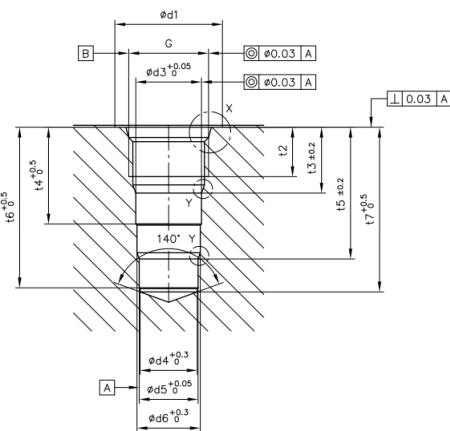
Intended applications:

- Cranes
- Construction machines
- Lifting devices
- Agricultural machinery

Basic type and size

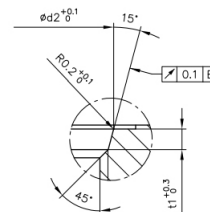
Basic type and size	Bore hole	Description		Flow rate Q _{max} gpm (lpm)	Pressure setting p _{max} psi (bar)
CLHV 2	2UNF	SAE 08	3/4-16 UNF-2B	7.925 (30)	5,000 (350)
CLHV 3	3UNF	SAE 10	7/8-14 UNF-2B	15.850 (60)	5,000 (350)
	T11A	T11A	M20 x 1.5	19.812 (75)	5,000 (350)
CLHV 5	4UNF	SAE 12	1-1/16-12 UN-2B	31.700 (120)	5,000 (350)
	T2A	T2A	1"-14 UNS-2B	39.625 (150)	5,000 (350)
CLHV 7	6UNF	SAE 20	1-5/8-12 UN-2B	84.535 (320)	5,000 (350)

2UNF, 3UNF, 4UNF, 6UNF



1. Consumer port
2. Directional valve port
3. Control oil pressure port

View X



View Y



Additional cavity configurations are available.

Coding	$\phi d1$	$\phi d2$	$\phi d2$	$\phi d2$	$\phi d2$	$\phi d2$	$\phi d2$	$\phi d2$	$\phi d2$	$\phi d2$	G
2UNF	26	20.6	15.87	15.3	13.8	14.27	3	8	12		3/4-16 UNF-2B
3UNF	30	23.9	19.05	18.6	17	17.47	8	8	14		7/8-14 UNF-2B
4UNF	35	29.2	23.8	23.3	21.7	22.22	5	14	19		1-1/16-12 UN-2B
6UNF	48	43.5	36.52	36	32.8	33.35	7	28	31		1-5/8-12 UN-2B
	t1	t2	t3	t4	t5	t6	t7	t8	t9		
2UNF	2.5	12	16	23.5	32	39	40	12.5	26.5		
3UNF	2.6	13	18	27	40	47	49	18	34		
4UNF	3.3	21	26.5	37	49.5	58	60	22.5	40.5		
6UNF	3.3	20	25.5	38	65.5	75.5	78	20	50		

Cartridge Valves



These valves are designed according to the company's key principles of compressive strength, compactness, ruggedness, leak-tightness, and long service life. They fit into the most popular cavities in the world, the T-***A cavities and the SAE Common Cavity. These are certainly hallmarks of HAWE Hydraulik, which is known for producing high-quality hydraulic components.

Including a specific part number and QR code on the packaging provides clear identification and traceability, which can be very useful for customers when seeking technical support, ordering replacement parts, or verifying authenticity.

Features and Benefits:

- Cartridges are active system elements.
- Highly engineered components.
- Perform same pressure, flow, and directional control functions as conventional hydraulic valves.
- Highly reliable.
- High degree of interchangeability.
- Offer cost competitive solutions.
- Stocked locally in Bethlehem, PA.

General Function	Specific Function	Cavity			Max Flow gpm (lpm)	Max Pressure psi (bar)
		SAE Common	HAWE	T-***A		
Pressure Control	Counterbalance	x	x	x	30 (120)	7250 (500)
	Relief & Bi-Directional Relief	x	x	x	200 (760)	10150 (700)
	Reducing	x	x	x	80 (320)	7250 (500)
	Bypass & Restrictive Compensator			x	60 (240)	5000 (350)
	Sequence			x	15 (60)	5000 (350)
Flow Control	Pressure Compensated	x		x	25 (95)	5000 (350)
	Needle	x		x	20 (80)	5000 (350)
	Flow Divider/Combiner	x		x	40 (165)	5000 (350)
	Priority Flow Control	x		x	15 (57)	3480 (240)
	Hand Pump			x	10.6 (cc/stroke)	3000 (210)
Directional Control & Check	Check	x	x	x	165 (640)	10150 (700)
	PO Check	x		x	60 (240)	5000 (350)
	Shuttle	x		x	5 (20)	5000 (350)
	Logic			x	50 (200)	5000 (350)
	Air Bleed			x	50 (200)	5000 (350)
Solenoid Directional Control & Check	Proportional Reducing		x	x	10 (40)	5000 (350)
	Proportional Relief	x	x	x	25 (95)	6000 (420)
	Proportional Throttle	x		x	20 (80)	5800 (400)
	Poppet Solenoid	x	x	x	125 (480)	7250 (500)
	Spool Solenoid	x		x	90 (350)	5000 (350)

Cartridge Valves

Loose Cartridges

HAWE Hydraulik – Offers Complete Solution for Hydraulic Control

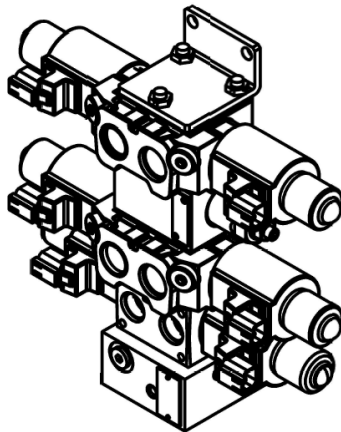
Whether you're looking for slip-in or screw-in valves, directional control, electro-proportional valves, flow control, or pressure control – HAWE has it all. From high-pressure to low-pressure, solenoid-operated to load-holding valves, we offer the components you need to keep your operations running smoothly.



And with our commitment to quality and efficiency, HAWE ensures fast lead times and the quantity you need – all delivered with precision and reliability.

Cartridges Integrated into Modular Sectional Blocks

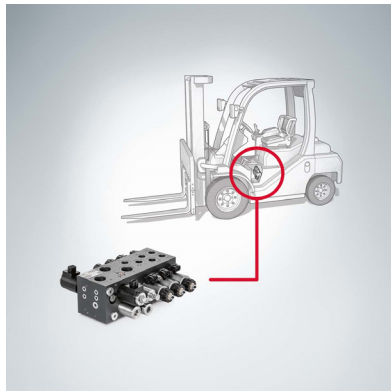
HAWE cartridge valves are a great option for optimizing hydraulic systems, especially when space is a concern. They are designed to be integrated into modular valve blocks, which can significantly reduce installation space while still meeting system performance requirements. This modular approach allows for a more compact and efficient design, offering flexibility in system configuration.



Cartridge Valves Incorporated in a HIC Solution

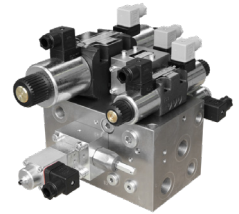
Still not finding the right solution?

Let us help you create the perfect setup by combining our high-performance cartridge valves with a custom-designed manifold block. This tailored approach ensures the ideal configuration for your unique application needs.



Custom Manifolds - S-Line

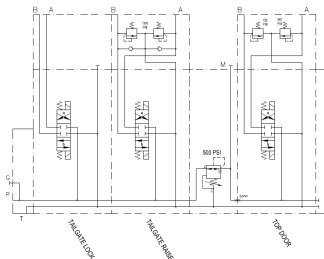
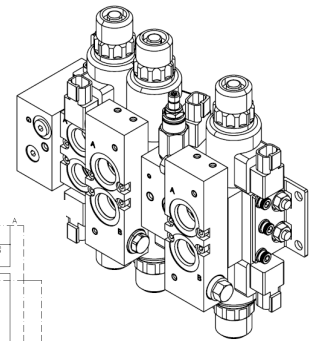
HAWE Hydraulik offers a comprehensive range of hydraulic solutions with a strong focus on custom design and manufacturing. If you're looking for hydraulic manifolds, cartridge valves, or full systems, our team of CNC machining experts in Bethlehem is well-equipped to handle specific requirements and deliver tailored solutions.



Their ability to collaborate on design and provide timely delivery could be especially beneficial for applications requiring precision and reliability, which is crucial in hydraulic systems. Whether it's for industrial machinery, mobile equipment, or other specialized uses, HAWE is a solid partner for both individual components and complete hydraulic system solutions.

Expanded CWx Functionality

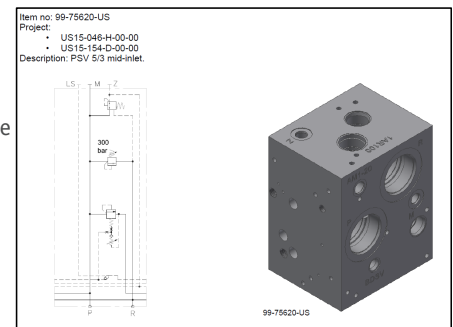
Integrating cartridge valves into hydraulic systems such as pumps, Like HAWE's V60N, and motors, or even HAWE's CWx valve, is a highly effective way to enhance system functionality while keeping costs down and avoiding major redesigns.



Expanded PSL Functionality

HAWE's PSL Valve with Cartridge Valves: Unmatched Flexibility and Reliability

HAWE's PSL valve offers exceptional flexibility and functionality, especially when enhanced with our high-performance cartridge valves. This combination gives you the ability to tailor your hydraulic system to meet the most specific and demanding requirements.



Hand pump type CH

Hand pumps are a type of hydraulic pump. They generate a flow rate manually.

The hand pump type CH is single acting. It draws oil in when the hand lever is moved in one direction and discharges it when the hand lever is moved in the opposite direction.

The hand pump type CH is available for pipe connection and manifold mounting.

Features and benefits:

- Sturdy design
- Corrosion resistance
- Safety valve and drain valve
- Zero-leakage pressure connection

Intended applications:

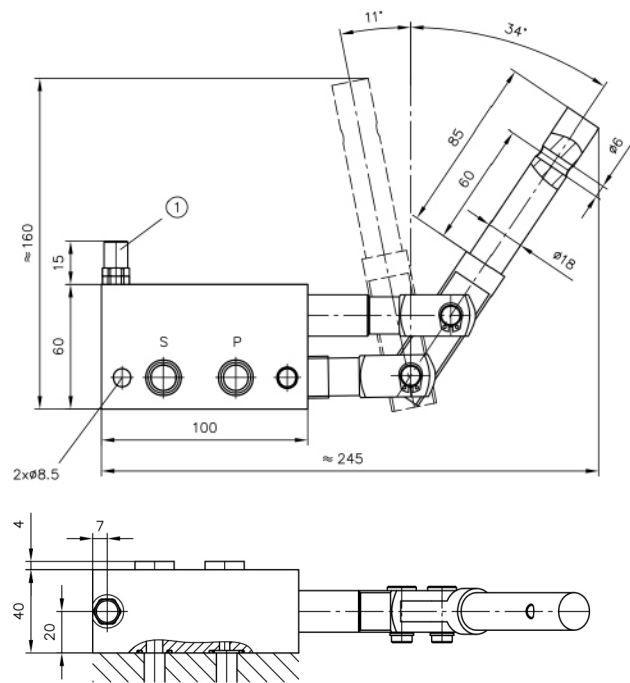
- Shipbuilding
- Mining machinery
- Wind power plants
- Fixture construction
- Test facilities and laboratory facilities
- Emergency pump



Nomenclature:	Hand pump type CH
Operating pressure P _{max} :	4350 psi (300 bar)
Displacement volume V _{max} stroke:	8.3 cm ³ /stroke

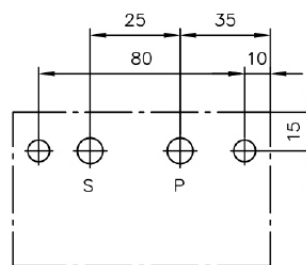
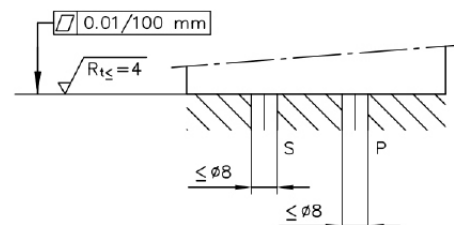
Dimensions

All dimension in mm, subject to change.



1 Pressure-limiting valve, only for type CH 08 P-S

Base plate hole pattern

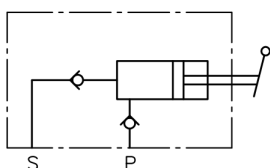


Sealing of the ports:

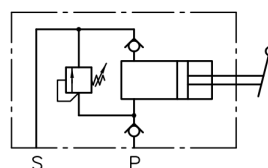
	O-ring
P,S	14x1.6

Circuit symbol:

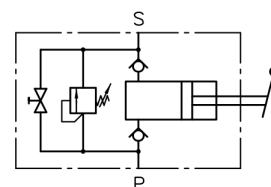
CH 08 P



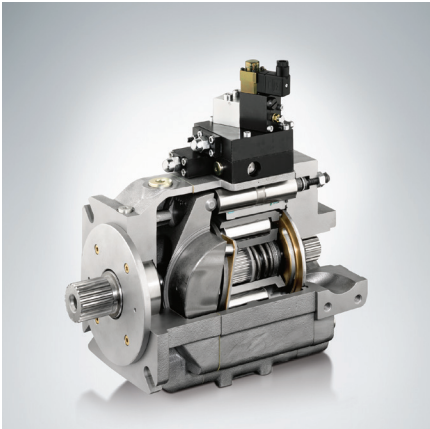
CH 08 P-S



CH 08 G-AS



Variable Displacement Axial Piston Pump: V30E



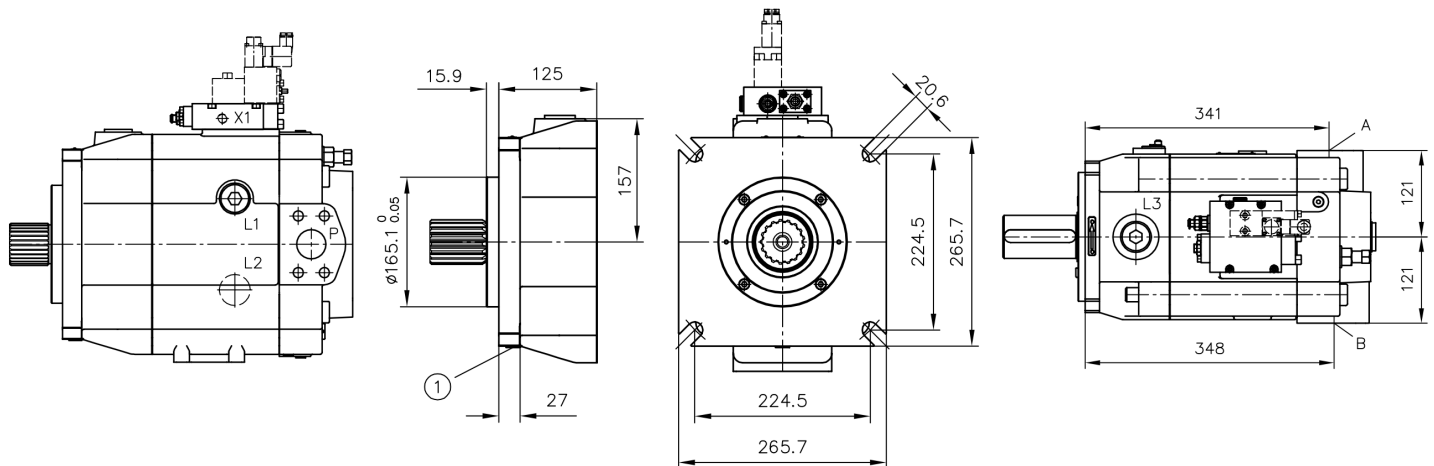
The V30E works according to the swash plate principle and is intended for open circuit operation mobile hydraulics. There is also an option for a thru-shaft for flange mounting additional variable and fixed displacement pumps. The V30E is fast, quiet, lighter in weight, has minimal pulsation and is extremely durable. Where several outlet flows are required, hydraulic circuits can be fed either by one individual pump or multiple pumps.

Features and Benefits:

- Quiet operation
- Good performance-to-weight ratio
- Available with three displacements from 6–16 in³/rev
- Quick and responsive flow and pressure adjustment
- Long service life due to oversized bearings and swash-plate angle indicator
- Continuous operating pressure ratings up to 5000 psi (350 bar) with a maximum of 6000 psi (420 bar)

Technical data

	V30E -095	V30E -160	V30E -270
Geometric displacement (in ³ /rev)	5.98	9.76	16.47
Nominal delivery: at 1750 rpm (gpm)	45	74	125
Nominal pressure, p _{nom} (psi)	5000	5000	5000
Maximum pressure, p _{max} (psi)	6000	6000	6000
Maximum revolution rating, self priming (rpm)	2500	2100	1800
Weight, including pump controller (lb)	125	196	353

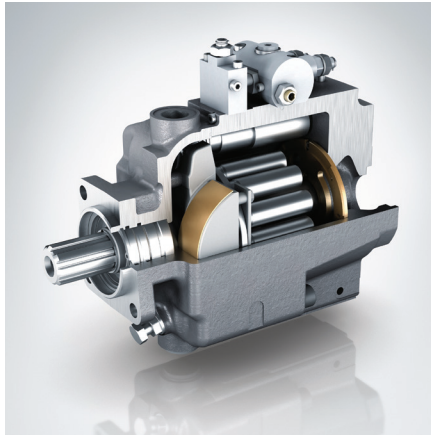


Basic Dimensions: All dimensions are in mm*

Type V30E	Without controller (kg)	With controller (kg)			
		LSP, LSPb, P, Pb	PMVPS 4	L, Lf, Lf1, Lfe	EM...
095	54	+3.2	+1.1	+2.7	+6.1
160	74	+3.2	+1.1	+2.7	+6.1
270	126	+3.2	+1.1	+2.7	+6.1

*Subject to change without notice.

Variable Displacement Axial Piston Pump: V60N



Intended for open-circuit operation in mobile hydraulics, the V60N works according to the swash plate principle, usually driven via the ancillary drive. An optional thru-shaft enables direct mounting of additional variable displacement pumps or a fixed displacement pump. These pumps are suited for a wide range of applications due to their quiet operation and variety of pump controllers. The V60N can be mounted directly at the gear box either via an SAE-flange or a flange conforming to ISO 7653. The flange area at the suction port enables an optimal hose connection with little back pressure.

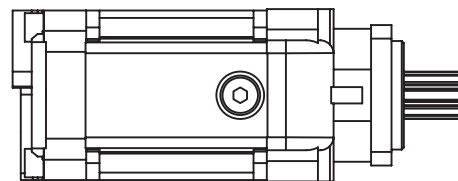
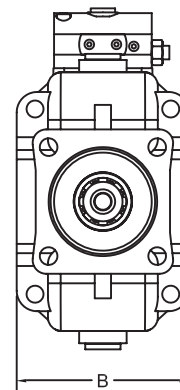
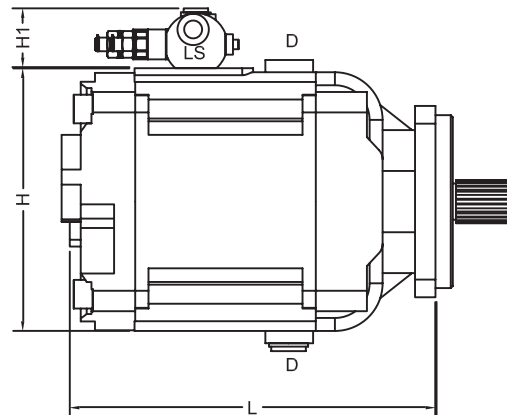
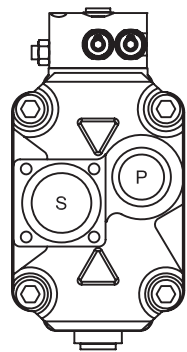
Features and Benefits:

- Quiet operation
- Various shaft and flange versions
- Good performance-to-weight ratio
- Four displacements are available from 4–7 in³/rev
- Continuous operating pressure ratings up to 5100 psi (350 bar) with a maximum of 5800 psi (400 bar)



Technical data

	V60N-060	V60N-090	V60N-110	V60N-130
Geometric displacement (in ³ /rev)	3.7	5.5	6.7	7.9
Nominal delivery: at 1750 rpm (gpm)	19	29	36	60
Nominal pressure, p _{nom} (psi)	5000	5000	5000	5800
Maximum pressure, p _{max} (psi)	5800	5800	5800	6500
Maximum revolution rating, self priming (rpm)	2500	2300	2200	2100
Weight, including pump controller (lb)	48	57	62	68



Ports:

- P = Pressure outlet G 1
- S = Flange suction port
- D = Case drain G 3/4
- LS = Load-sensing port G 1/4

Coding UNF, ports conforming to SAE J 514:

- P = SAE-16
- S = Flange suction port
- LS = G 1/4 [ISO 228/1 (BSPP)]
- D = Case drain SAE-12

Basic Dimensions: All dimensions are in inches*

Basic type	L	B	H	H ₁
V60N -060	10	4.5	7	2
V60N -090	11	5	7.5	2
V60N -110	11	5	7.5	2
V60N -130	11	5	8	2

*Subject to change without notice.

Table 2. Pump controller and intermediate plate specifications

Coding	Description
LSNR	Load-sensing controller with integrated pressure limitation
NR	Pressure controller, adjustable directly at the pump. The pressure controller automatically maintains a constant system pressure independent of the required flow. Therefore, it is suited for constant pressure systems, where differing flows are required or at the efficient pressure limitation of the hydraulic system.
Intermediate plates	Intermediate plates are used only in combination with controllers LSNR, LSNRT, QNR, ZV, ZV1, V, NR, NR2, NR3, PR, P1R, ZL, or L.
/ZL	Intermediate plate with power controller (torque limitation). Product "pressure x displacement" = constant.
/L Standard-130	Adjustment range: 25...100% of maximum drive torque.
/ZW	Angled intermediate plate (at 45°) is mandatory for mounting controllers at pumps with housing design -2 and -3.

*See D 7960N Pages 8, 9, 10 for other controllers.

Axial Piston Pump: K60N



The fixed displacement axial piston pump K60N (bent axis design) is especially suited for demanding, high-duty service. The pump has a displacement range up to 6.5 in³/rev. The pump has been designed for high-flow performance, high pressures with high efficiency, and very small dimensions. The pump is available both to DIN and SAE standards, and can be mounted either directly at the gear box or via a drive shaft. If necessary it can also be augmented with a by-pass valve.

Features and Benefits:

- High speed rating
- Quiet operation
- Smooth running and long bearing life
- External fluid leaks are eliminated by using O-rings at all sealing surfaces
- Optional by-pass valve

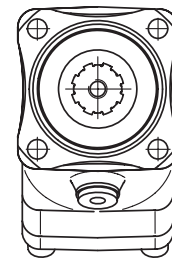
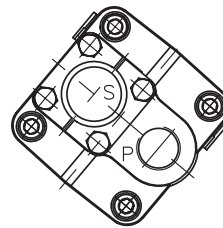
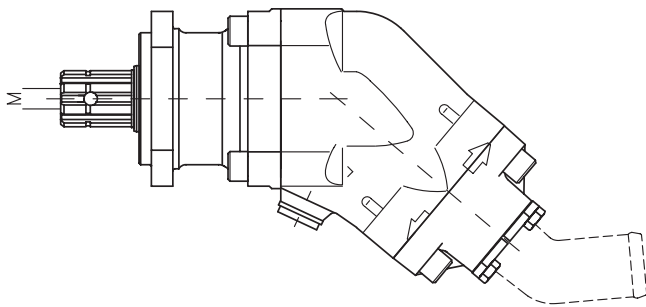


Table 1. Size designation specifications.

Coding	012	017	025	034	047	064	084 984 ²	108 9108 ²
Geometric Displacement (in ³ /rev)	0.76	1.03	1.55	2.08	2.87	3.87	5.09	6.59
Flow (gpm) at:								
500 rpm	1.5	2	3.3	4.5	6.2	8.3	11	14.2
1000 rpm	3.2	4.3	6.6	8.9	12.4	16.8	22	28.5
1500 rpm	4.8	6.5	10	13.5	18.6	25.2	33	42.8
Speed								
Intermittent ¹ n _{max} (rpm)	3000	3000	3000	3000	2500	2500	2000/2200	2000/2300
Continuous n _{nom} (rpm)	2300	2300	2300	2300	1900	1900	1500/1600	1500/1900
Operating pressure (p _{max}) (psi)	5800	5800	5800	5800	5800	5800	5800	5800
Mass (weight in lbs)	18	18	18	18	26	26	37.5	37.5
Tare-weight torque (Nm)	6.9	6.9	7.4	7.4	13	13	21	21

¹ Intermittent operation, duty cycle = maximum 10 sec. per minute.

² K60N-984 and 9108 are high-speed versions: cannot be reversed.

Axial Piston Motor: M60N



These axial piston motors with fixed displacement are designed as bent-axes motors. Spherical pistons arranged at 40° make the M60N an efficient motor with high starting torque. High reliability and small dimensions make it especially suited for truck hydraulics.

Features and Benefits:

- Flange and shaft meet SAE-standards
- Tapered roller bearings for high radial load tolerance
- Optimized connection cover for optimal performance and durability
- Spherical pistons eliminate pulsation and ensure high start torque, high pressure, and high speed.
- Few moving parts, low bearing loads, high reliability and high overall efficiency.

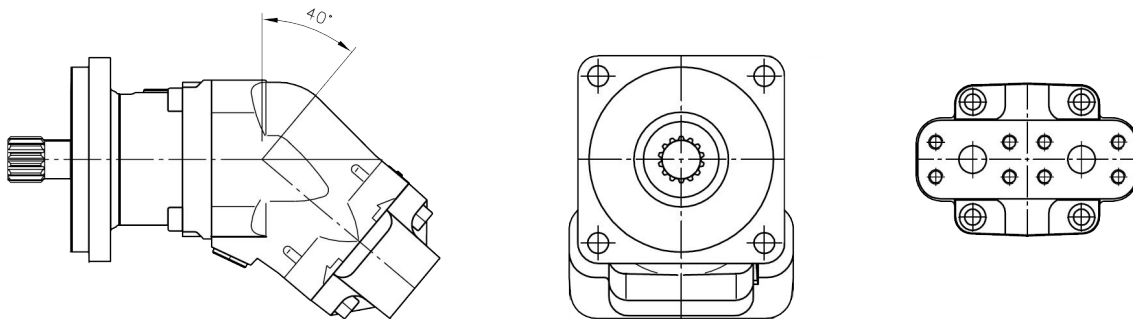


Table 1. Size designation specifications.

Coding	012	017	025	034	047	064	084	108
Geometric Displacement (in ³ /rev)	0.76	1.03	1.55	2.08	2.87	3.87	5.09	6.59
Pressure (psi):								
Intermittent ¹ p _{max} (psi)	5800	5800	5800	5800	5800	5800	5800	5800
Continuous p _{nom} (psi)	5000	5000	5000	5000	5000	5000	5000	5000
Speed								
Intermittent ¹ n _{max} (rpm)	5400	5400	5400	5400	4700	4700	3800/3200 ²	3800/3200 ²
Continuous n _{nom} (rpm)	4800	4800	4800	4800	4000	4000	3400/3200 ²	3400/3200 ²
Minimal n _{min} (rpm)	300	300	300	300	300	300	300	300
Power (kW)								
Intermittent ¹ p _{max}	21	28	42	59	74	84	115	140
Continuous p _{nom}	15	20	30	42	53	60	80	100
Starting torque (theoretical figure) (Nm/bar)	0.2	0.27	0.4	0.54	0.75	1.0	1.33	1.71
Inertia moment (10 ⁻³ × kg m ²)	0.9	0.9	1.1	1.1	2.6	2.6	6.3/7.4 ²	6.3/7.4 ²
Mass (weight in lbs)	20	20	20	20	33	33	40/77 ²	40/77 ²
Mounting flange	SAE-B	SAE-B	SAE-B	SAE-B	SAE-C	SAE-C	SAE-C/ SAE-D ²	SAE-C/ SAE-D ²

¹ Intermittent operation, duty cycle = maximum 10 sec. per minute.

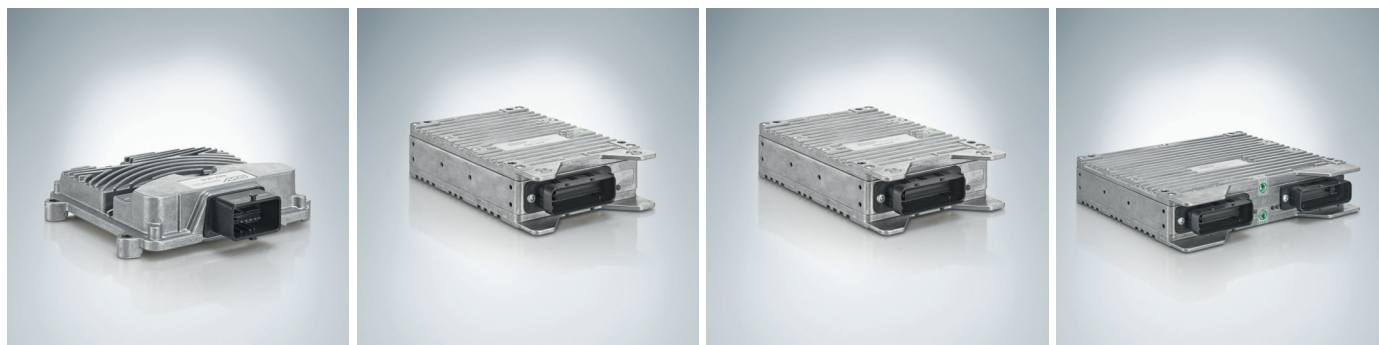
² Values valid for flange SAE-C/SAE-D

Mobile controllers

In the ESX mobile controllers product range, you will find everything you need to control and regulate your mobile machine. These compact models are intended for use in small machines or as slaves for decentralized controlled functions in complex systems. The expandable larger models, equipped with high-performance computers, can be used as master control in construction machinery, cranes and forestry vehicles.

Features and Benefits:

- Scalable solutions for flexible adaptation to the complexity of the control system
- Certified for functionally safe applications according to ISO 13849 (PLd) and ISO 61508 (SIL2)
- Perfect integration into your automation concept through freely programmable interfaces
- HAWE-specific function blocks available easy programming
- Control individually adaptable at any time through PLC programming with structured text



Mobile Controllers

	ESX-3CS	ESX-3CM	ESX-3XM	ESX-3XL
Flash memory	4MB	4MB	6MB	6MB
Number of inputs	16 (SENT support)	28 (SENT support)	15	28
Number of outputs	14	28	8	24
Notes			Extendable up to 65 I/O's	Extendable up to 136 I/O's

CAN-Bus CAN-IO 14



CAN-Bus CAN-IO 14 is a very compact and versatile controller for hydraulic applications. It can be used as a CAN-Bus slave in combination with a ESX, CAN-PSL or it can stand-alone with a user programmed C-program.

Features and Benefits:

- 10–30 vDC
- IP67 rated
- CAN-Bus interface
- RS 232 interface, for setting and diagnostics
- Compact dimensions: 60×60×30mm (2.36×2.36×1.18 in)
- All outputs can also be used as analog inputs

General Data

Programming	CAN-Bus, C program or used as configurable slave drive			Temperature	-40° F –185° F
Bus	ISO 11898-2 CAN2.0A+B			Connector	Sicma 211 PL249S0005
Inputs/outputs					
1 digital	switching level 4.5V	Input resistance 12 kΩ		EEPROM	2 KB
6 analog input	12-bit resolution	0...11 V	12.6 kΩ/235 Ω/10 kΩ pull-up	CAN-Bus	PCAN-USB dongle
4 PWM output	2000 mA	50 Hz...1kHz		Fuse	2 × 10 A, 1 × 1 A
4 IPWM output	1800 mA	0...100%	50 Hz...1kHz with current control ¹	Dimensions	60×60×30 mm 2.36×2.36×1.18 in

¹ In heavy-duty applications and high ambient temperatures, 1kHz PWM is not supported. There is a 100-Hz limit and not on all 4 transistors simultaneously.

Proportional amplifier type EMMA



The proportional amplifier type EMMA has been developed for direct mounting onto a solenoid valve as a line connector.

It is suitable for controlling proportional single-action and twin solenoids. The integrated magnetic measuring technology allows the neutral position/spool position of directly operated solenoid valves to be monitored.

Important parameters (e.g. input signal, minimum current, maximum current, dither, ramp times, etc.) can be set via a wireless interface using a smartphone or PC.

Features and Benefits

- Direct assembly onto the solenoid valves
- Easy commissioning
- Integrated spool position measurement (proportional and digital)
- Control of single, double and twin solenoid valves
- CAN bus interface
- Wi-Fi interface
- Simple diagnostics and status monitoring
- Functions and settings tailored to HAWE products
- CAN bus interface
- Functions and settings tailored to HAWE products

Benefits:

- For controlling proportional valves in the industry sector
- Neutral position monitoring of a directly operated solenoid valve
- Connection of analogue proportional valves in CAN bus networks
- Closed storage control

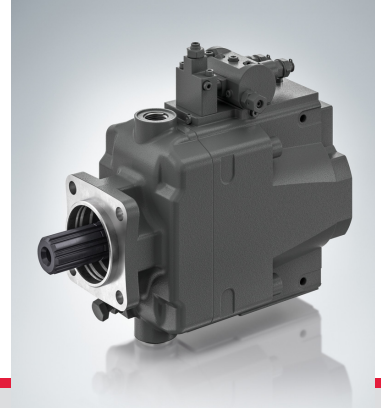
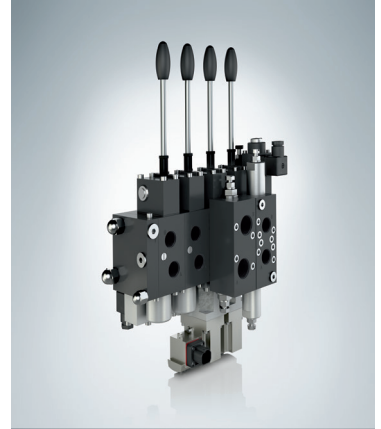
General Data	
Operating Temperature	-25 to +80°C
Storage Temperature	-40 to +80°C

Technical Data	
Supply voltage U_B :	10 to 30 V DC
Output current $I_{A \text{ MAX}}$:	3 A

Weight	
EMMA-G	= approx. 70 g
EMMA-DG	= approx. 130 g

Electrical Data	
Supply voltage U_B	10 to 30 V DC, protected against reverse polarity
Output voltage U_A	$U_B - 2 \text{ V}$
Output current $I_{A \text{ controlled}}$	IPWM output up to 2.5 A
Output current $I_{A \text{ On/Off}}$	to 3 A
Possible analogue input 1	12-bit resolution <ul style="list-style-type: none"> ■ 0 to 5 V DC, RE = 10 kΩ ■ 0 to 10 V DC, RE = 10 kΩ ■ 4 to 20 mA, RE = 300 Ω ■ 0 to UB, RE = 10 kΩ ■ +/- 10 V DC, RE = 10 kΩ ■ PWM, RE = 10 kΩ
Digital input	1x digital input, short-circuit-proof, max. 24 V DC, RE = 10 k Ω Switching point 4.5 V DC All analogue inputs can also be used as a digital input
PWM frequency	100 to 2500 Hz
Dither amplitude l	0 to 100%, default 0%
Dither frequency f	50 to 400 Hz, default: 100 Hz
Ramp time t_r	0 to 300 s, increase and decrease time can be adjusted separately
Interfaces	<ul style="list-style-type: none"> ■ CAN bus (ISO 11898-2 CAN 2.0 A & B) ■ Wireless interface





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