



## 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, Fab-rik 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 standard products, which 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 6,000 psi (400 bar). Our components and systems are designed for low leakage and, in some cases, are leak free 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. However, 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 component 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 system's capacity 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 Charlotte. We also follow through with after-sales support including product training, troubleshooting, and on-site service.



HAWE Hydraulik North America is based in Charlotte, 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 Charlotte 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 Charlotte office or at [HAWE.com](http://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 (400 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 P0 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

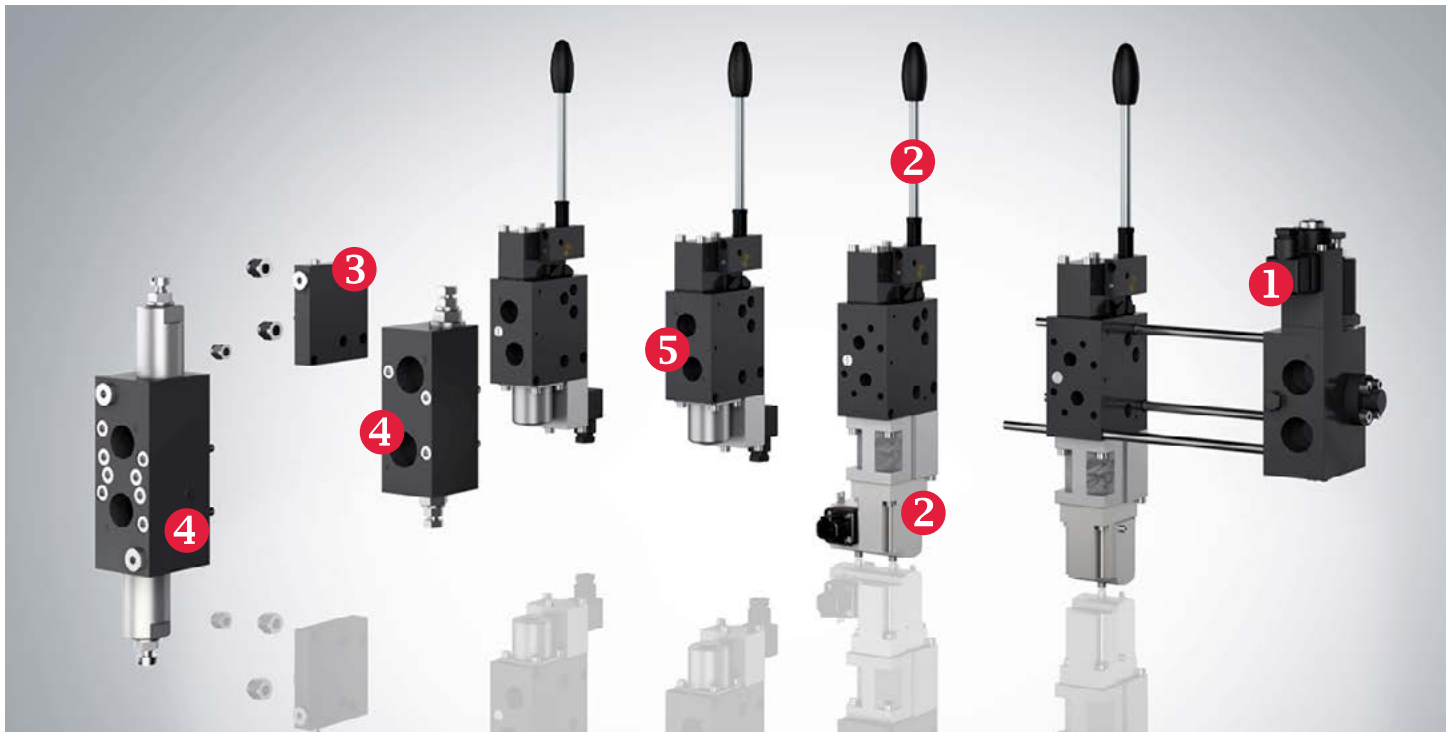
Additional functions include:

- 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 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 small volume quantities
- Compact and lightweight design
- Modular system can be directly combined with type PSL/PSV-2

### Intended applications:

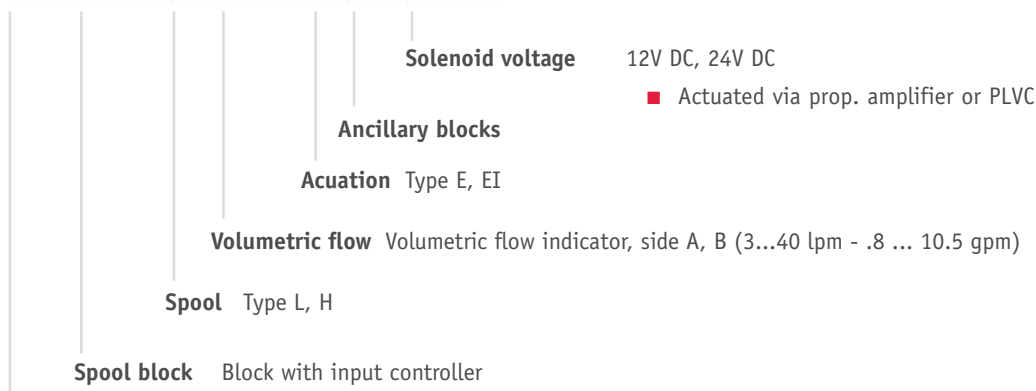
- Construction and construction materials machinery
- Cranes and lifting equipment
- Machines for forestry and agricultural purposes
- Municipal trucks



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



# 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)	15 (nom.)	Fixed/Variable
PSL UNF 3 PSV UNF 3	Size 3 1 1/16-12 UNF-2B (SAE-12)	30 (nom.)	Fixed/Variable
PSL UNF 5 PSV UNF 5	Size 5 1 5/16-12 UNF-2B (SAE-20)	60 (nom.)	Fixed/Variable

## 2 Secondary load-sensing pressure-limiting valves

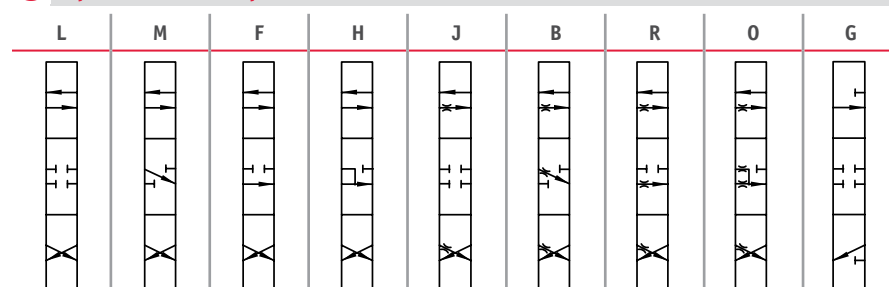
Coding	Description
No coding	Without pressure limitation
A...	Pressure limitation at A with pressure specification
B..	Pressure limitation at B with pressure specification
A...B...	Pressure limitation at A and B with pressure specification

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

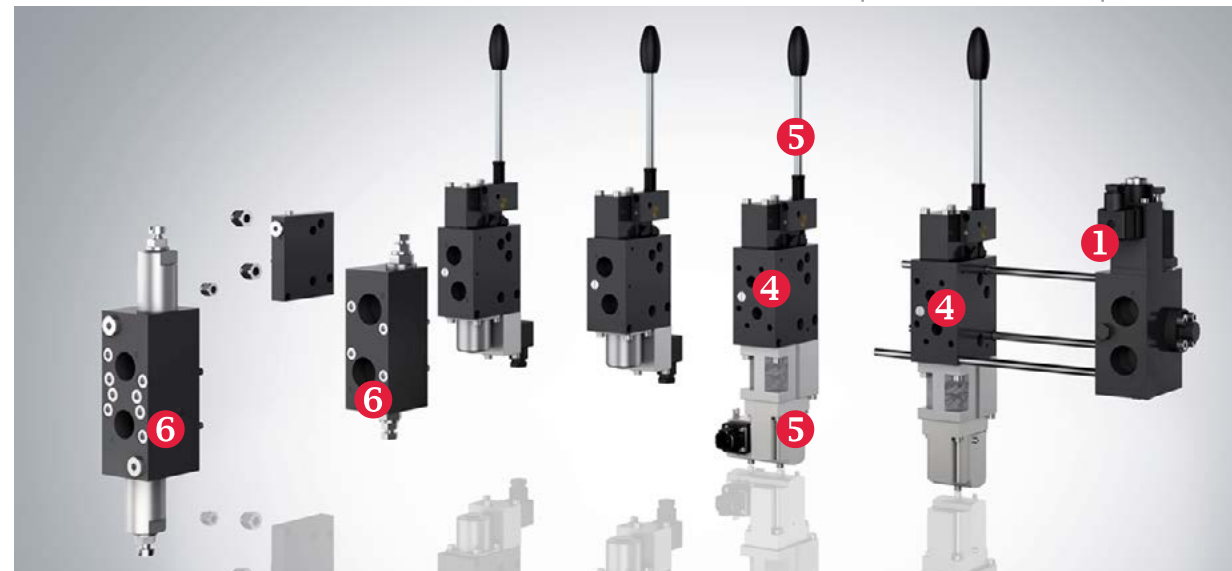
Coding	Description
No coding	Without functional cut-off
FP..., FPH...	Proportional pressure limitation for A or B. Version FPH with additional emergency actuation (no tools needed)
S, S 1	Load signal ports U and W for external piping
F 1, F 2, F 3 (Sizes 3 and 5 only)	Electric on/off functional cut-off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

## 4 Spool valve flow patterns



## 5 Actuation functions and variables

	Manual		Electro-hydraulic (EO)		Hydraulic (Hyd)			Pneumatic	Mechanical Joystick
	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
Symbols									
Manipulated variables	actuation angle: ~5° to 30°		control current 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°



## 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									
<b>Size 2 Flow Coding</b>										
	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	—	—	—	—
<b>Size 3 Flow Coding</b>										
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	—	—
<b>Size 5 Flow Coding</b>										
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 6090 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

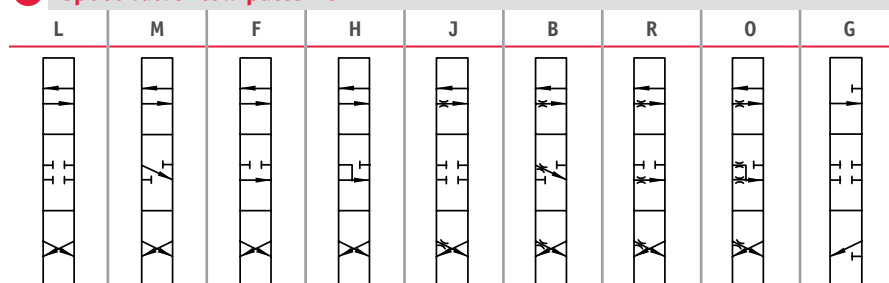
Coding	Description
No coding	Without pressure limitation
A...	Pressure limitation at A with pressure specification
B..	Pressure limitation at B with pressure specification
A...B...	Pressure limitation at A and B with pressure specification
C...	Common pressure limitation for A and B with pressure specification

Example: SLF 7-A2 H320/320 A250 B200/A.  
Pressure limitation  $p_{min}$  = 700 psi (48 bar);  $p_{max}$  = 6090 psi. (420 bar)

## 3 Functional cut-off, proportional pressure limitation

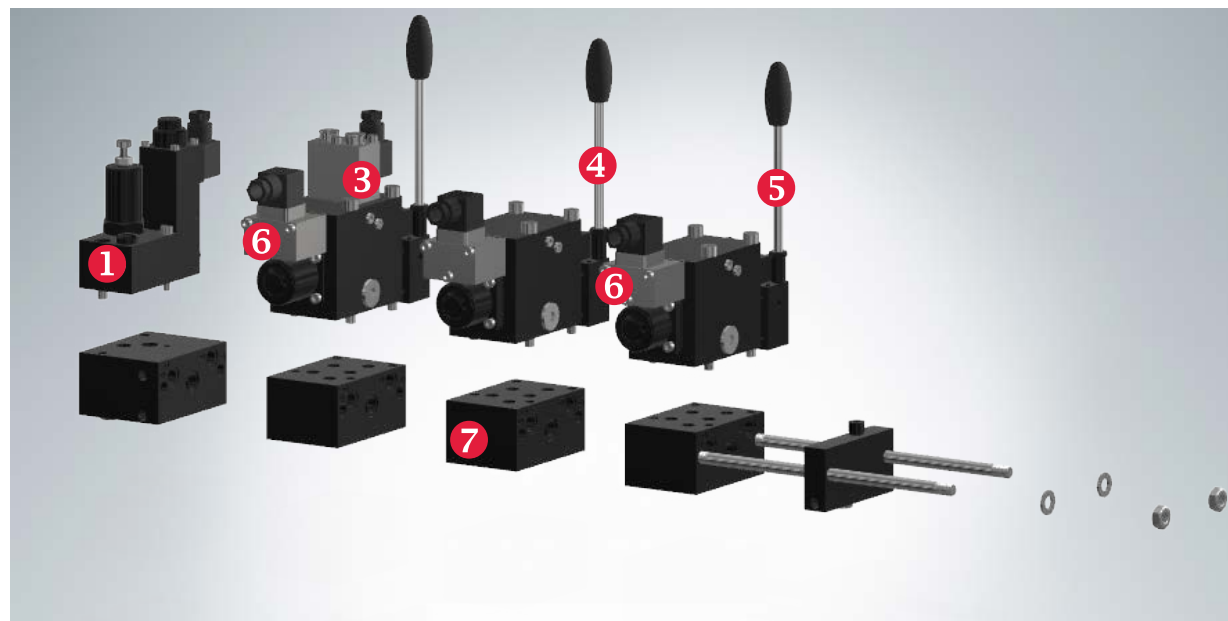
Coding	Description
No coding	Without functional cut-off
F 1, F 2	Electric functional cut-off at A or B
F 3	Electric functional cut-off at A and B
FP..., FPH...	Proportional pressure limitation for A or B, or A and B. No additional emergency actuation (no tool required).
S (size 5)	Flange-sided load signal 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 $I/I_N$ : ~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 Pressure Reducing Valve, Hydraulic Joystick: KFB



The KFB proportional pressure reducing valve bank is used for a stepless remote control of hydraulic actuators, which respond proportionally to variations of the control pressure. Two directly actuated pressure reducing valves, one for each switching direction, are combined in one housing and supply control pressure at one of the two outlet ports. That port is then dependent on the movement direction and is proportional to the position of the hand lever, but is independent of the inlet pressure. While one of the outlet ports is pressurized, the other port is depressurized to the tank.

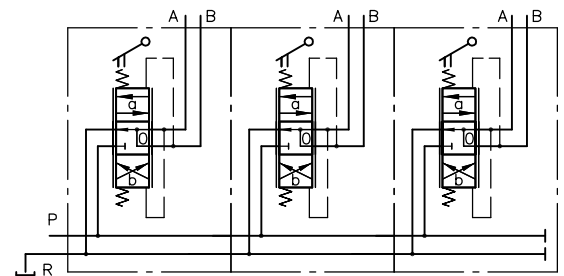
### Features and Benefits:

- Available in a single or bankable design
- Many pressure ranges available
- A perfect match for PSL/PSV valves
- Made of steel for durability

### Valve bank port coding and descriptions

Coding	Description
A/...	First section: with ports P, R, A, and B
M/...	Center sections: maximum 8 sections, ports A and B
E/ ...	End section: concludes the valve bank, ports A and B

Pressure range of the proportional pressure reducing valve



### Basic type coding, individual valve

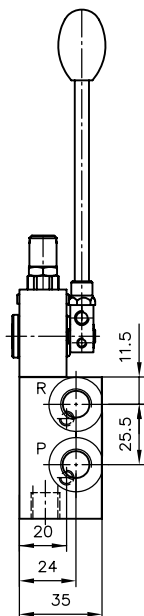
KFB 01	Ports G 1/4 (BSPP)
KFB 01 UNF	Ports 7/16-20 UNF-2B (SAE-4)

### Valve Section and Valve Bank Ports

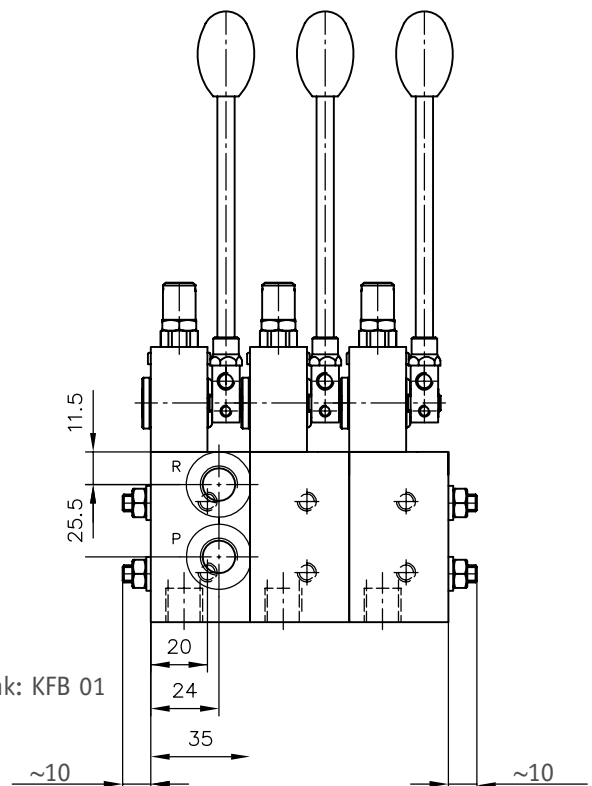
P, R, A, B = G 1/4 [ISO 228/1 (BSPP)]  
= 7/16-20 UNF-2B (SAE-4)

All dimensions are in mm and are subject to change without notice.

Individual valve section: FB 01



Valve bank: KFB 01





# 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.

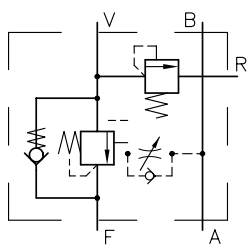
### Features and Benefits:

- 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 6090 psi (420 bar)

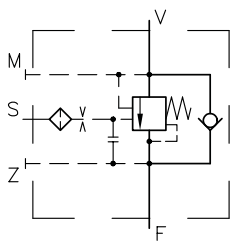
Basic Type	LHK 2	LHK 3	LHK 4	LHT 2	LHT 3	LHT 5	LHDV 33
Operating Pressure (psi)	5800	5200	5000	5800	5800	5800	6100
Flow (gpm)	4	13	22	6	22	55	18

### Examples of Symbols

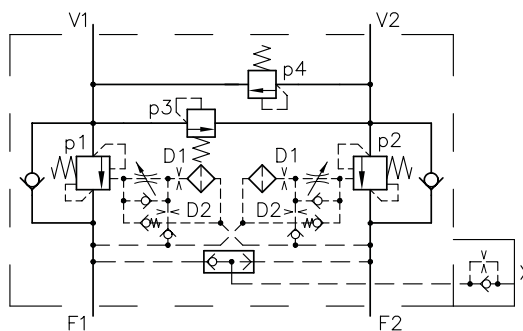
LHK



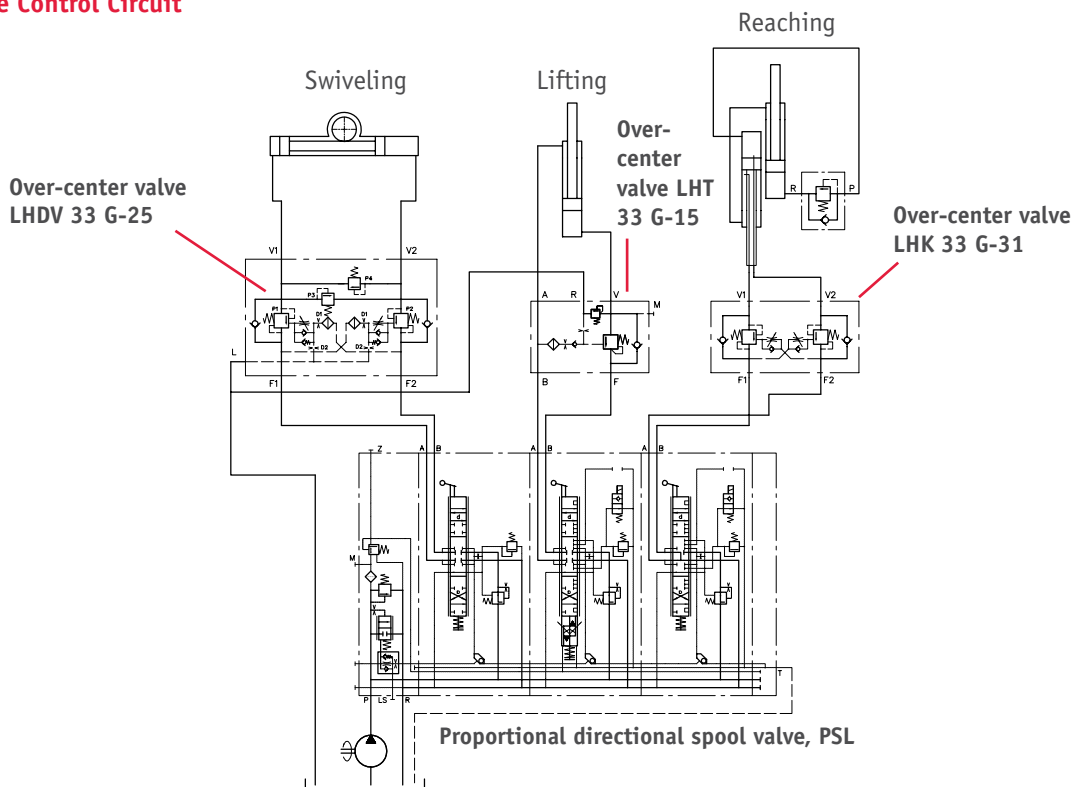
LHT



LHDV



### Example Crane Control Circuit



# Variable Displacement Axial Piston Pump: V30E



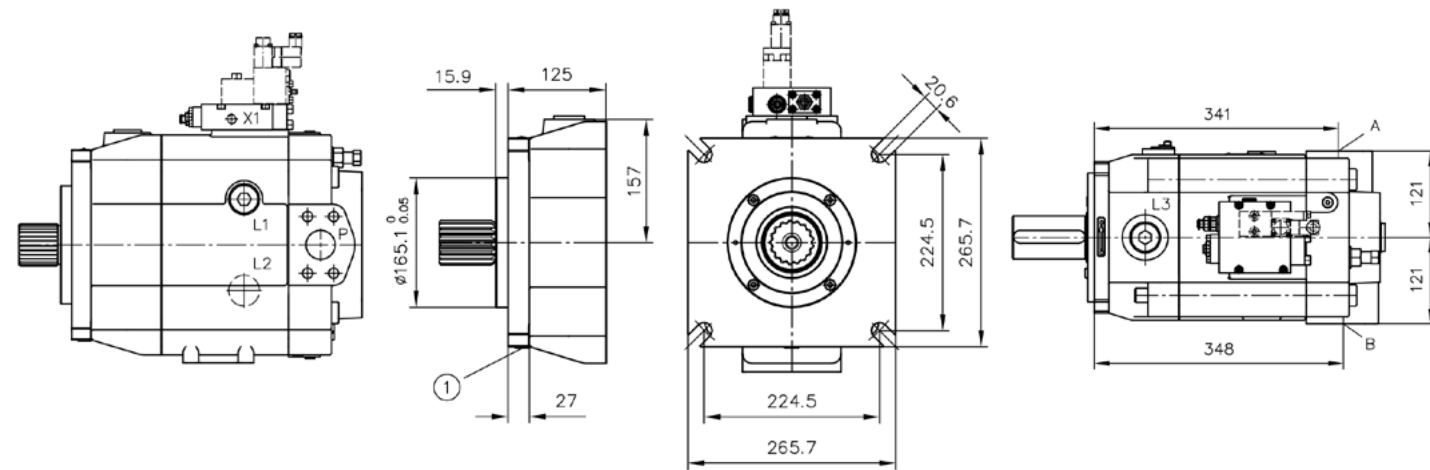
The V30E works according to the swash plate principle and is intended for open circuit operation mobile hydraulics. There is also an option for a thru-shaft for flange mounting additional variable and fixed displacement pumps. The V30E is fast, quiet, lighter in weight, has minimal pulsation and is extremely 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 in<sup>3</sup>/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 5,100 psi (350 bar) with a maximum of 6,090 psi (420 bar)

### Technical data

	V30E -095	V30E -160	V30E -270
Geometric displacement (in <sup>3</sup> /rev)	5.98	9.76	16.47
Nominal delivery: at 1750 rpm (gpm)	45	74	125
Nominal pressure, p <sub>nom</sub> (psi)	5100	5100	5100
Maximum pressure, p <sub>max</sub> (psi)	6090	6090	6090
Maximum revolution rating, self priming (rpm)	2500	2100	1800
Weight, including pump controller (lb)	125	196	353



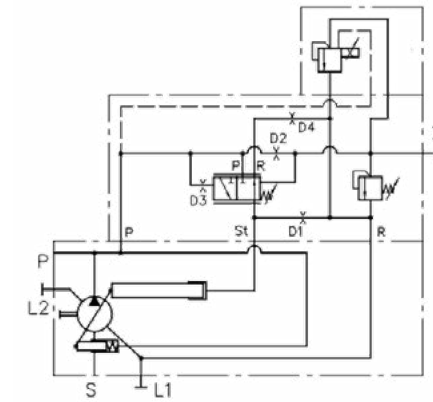
### Basic Dimensions: All dimensions are in mm\*

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.

Table 1. Size designation specifications

Coding	095	160	270
Displacement (in <sup>3</sup> /rev)	5.98	9.76	16.47
Flow at 1800 rpm (gpm)	46.5	76.0	128
Maximum continuous pressure (psi)	5100	5100	5100
Maximum peak pressure (psi)	6090	6090	6090
Maximum housing pressure (psi)	1.0	1.0	1.0



D1 = dampening throttle  
D2 = piloting throttle  
L1, L2 = drain ports  
P = pressure port  
S = suction port  
X1 = remote control port

Controller P

Table 2. Controller specifications

Type	Description
P - ...	Pressure controller, adjustable directly at the pump. Also used as a port for an external pilot valve.
LSP - ...	Load-sensing controller with pressure limitation. Stand-by pressure, adjustable between 217... 507 psi (15...35 bar); HAWE pre-set: 362.5 psi + 72.5 (25 bar +5).
-PMVPS 4- 41 /G 12 42 /G 24 43	Pressure range: (72.5) ...2611 psi (72.5) ...4206 psi (72.5) ...6382 psi Additional directly mounted proportional pressure limiting valve as reference setting for the pressure controller.
	Solenoid voltage
EM.CH	Electro-hydraulic displacement and pressure control
L	Power controller, torque limitation

## Variable Displacement Axial Piston Pump: V60N



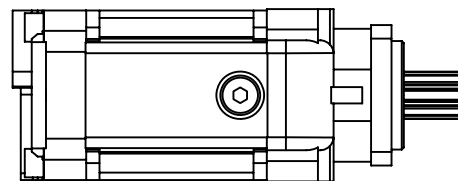
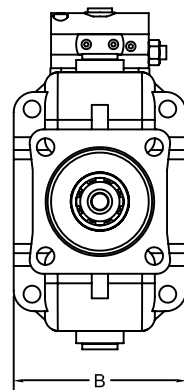
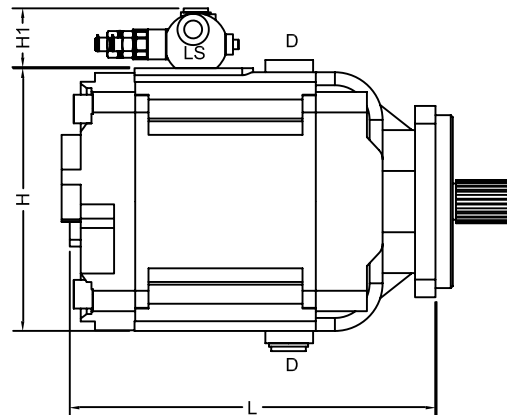
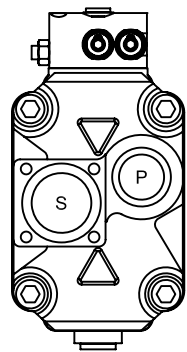
Intended for open-circuit operation in mobile hydraulics, the V60N works according to the swash plate principle, usually driven via the ancillary drive. An optional thru-shaft enables direct mounting of additional variable displacement pumps or a fixed displacement pump. These pumps are suited for a 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 in<sup>3</sup>/rev
- Continuous operating pressure ratings up to 5,100 psi (350 bar) with a maximum of 5,800 psi (400 bar)

### Technical data

	V60N-060	V60N-090	V60N-110	V60N-130
Geometric displacement (in <sup>3</sup> /rev)	3.7	5.5	6.7	7.9
Nominal delivery: at 1750 rpm (gpm)	19	29	36	60
Nominal pressure, p <sub>nom</sub> (psi)	5000	5000	5000	5800
Maximum pressure, p <sub>max</sub> (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 <sub>1</sub>
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).
/L Standard-130	Product "pressure x displacement" = constant. 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.

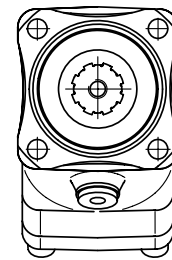
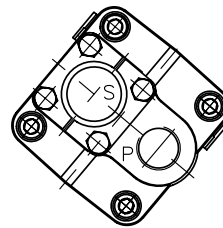
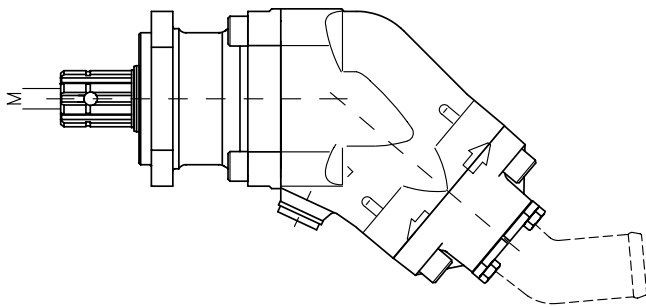
## Axial Piston Pump: K60N



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 in<sup>3</sup>/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 <sup>2</sup>	108 9108 <sup>2</sup>
Geometric Displacement (in <sup>3</sup> /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 <sup>1</sup> n <sub>max</sub> (rpm)	3000	3000	3000	3000	2500	2500	2000/2200	2000/2300
Continuous n <sub>nom</sub> (rpm)	2300	2300	2300	2300	1900	1900	1500/1600	1500/1900
Operating pressure (p <sub>max</sub> ) (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

<sup>1</sup> Intermittent operation, duty cycle = maximum 10 sec. per minute.

<sup>2</sup> K60N-984 and 9108 are high-speed versions: cannot be reversed.

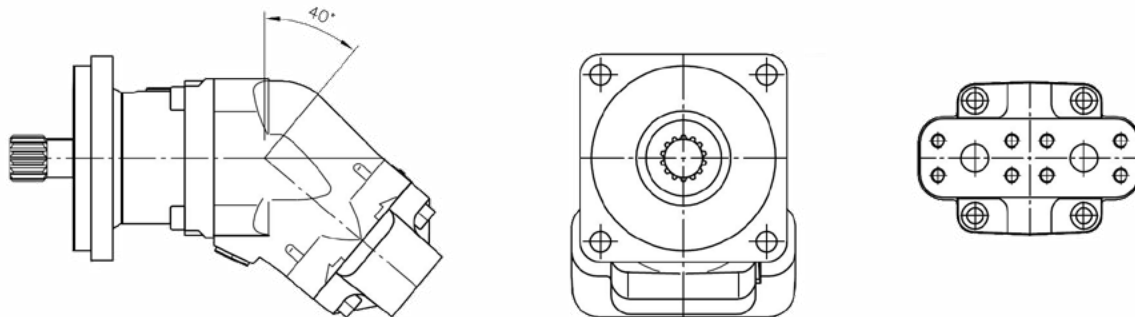
## Axial Piston Motor: M60N



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 <sup>3</sup> /rev)	0.76	1.03	1.55	2.08	2.87	3.87	5.09	6.59
Pressure (psi):								
Intermittent <sup>1</sup> p <sub>max</sub> (rpm)	5800	5800	5800	5800	5800	5800	5800	5800
Continuous p <sub>nom</sub> (rpm)	5075	5075	5075	5075	5075	5075	5075	5075
Speed								
Intermittent <sup>1</sup> n <sub>max</sub> (rpm)	5400	5400	5400	5400	4700	4700	3800/3200 <sup>2</sup>	3800/3200 <sup>2</sup>
Continuous n <sub>nom</sub> (rpm)	4800	4800	4800	4800	4000	4000	3400/3200 <sup>2</sup>	3400/3200 <sup>2</sup>
Minimal n <sub>min</sub> (rpm)	300	300	300	300	300	300	300	300
Power (kW)								
Intermittent <sup>1</sup> p <sub>max</sub>	21	28	42	59	74	84	115	140
Continuous p <sub>nom</sub>	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 <sup>-3</sup> × kg m <sup>2</sup> )	0.9	0.9	1.1	1.1	2.6	2.6	6.3/7.4 <sup>2</sup>	6.3/7.4 <sup>2</sup>
Mass (weight in lbs)	20	20	20	20	33	33	40/77 <sup>2</sup>	40/77 <sup>2</sup>
Mounting flange	SAE-B	SAE-B	SAE-B	SAE-B	SAE-C	SAE-C	SAE-C/ SAE-D <sup>2</sup>	SAE-C/ SAE-D <sup>2</sup>

<sup>1</sup> Intermittent operation, duty cycle = maximum 10 sec. per minute.

<sup>2</sup> 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
<b>Inputs/outputs</b>					
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	0...100%	50 Hz...1kHz	Fuse	2 × 10 A, 1 × 1 A
4 IPWM output	1800 mA	0...100%	50 Hz...1kHz with current control <sup>1</sup>	Dimensions	60×60×30 mm 2.36×2.36×1.18 in

<sup>1</sup> 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.

## Electronic amplifier type EV2S-CAN/EV2S-BT



Proportional amplifiers actuate proportional solenoid valves by converting an input signal into a corresponding control current. The EV2S-CAN proportional amplifier is available for direct mounting onto a solenoid valve as a plug amplifier. It is suitable for controlling proportional single-acting and twin solenoids. The influences of temperature and power supply are compensated for by the feedback measurement at the valve outputs, enabling consistent accuracy. Important parameters (e.g. input signal, minimum current, maximum current, dither, ramp times etc.) can either be set with push-buttons and an integrated display or via CAN bus via software on the computer.

### Features and Benefits

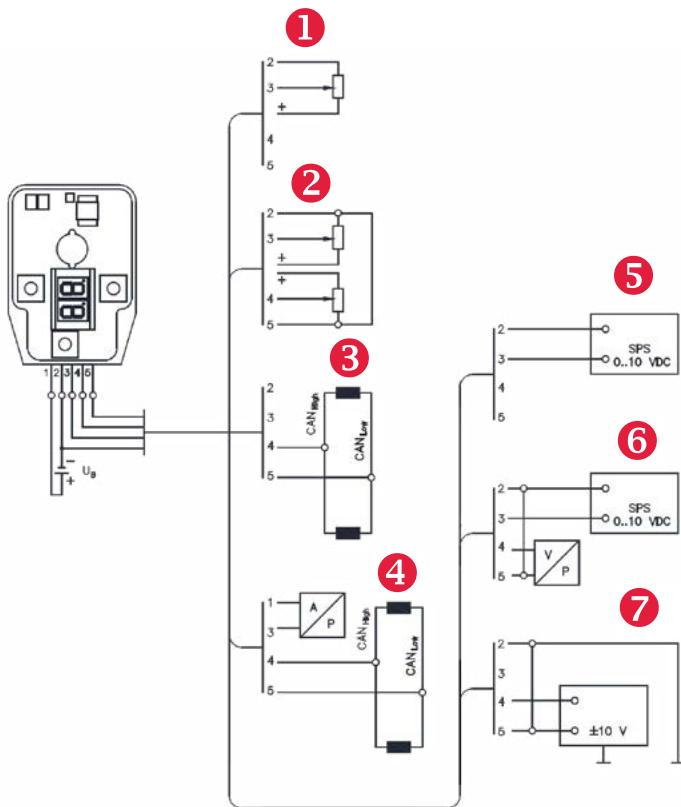
- Direct assembly onto the solenoid valves
- Easy commissioning
- Up to two analogue inputs for target value signals
- Control of twin and single valves
- CAN bus interface
- Functions and settings tailored to HAWE products

If the valve is difficult to reach in the installation location, such as decentralized control on a crane boom or just hidden in the machine housing, not to worry. The electronic amplifier plug type EV2S-BT with integrated Bluetooth interface communicates wirelessly with a range of several meters.

Connect the amplifier plug with your smartphone via Bluetooth. Nominal value, output current and device temperature are displayed in real time. Configuration is optimized with a swipe. Save the setting of your application, send them via e-mail or duplicate them onto another EV2S-BT amplifier, too. Avoid unauthorized access by setting a password. Download the appropriate HAWE eControl App from the App Store or the Google Play store for free.

### Benefits:

- Initial operation at remote locations
- Remote diagnostics and condition monitoring of proportional valves
- Troubleshooting in electro-hydraulic systems
- Adjustment and optimization of your configuration in real time
- Duplicating configurations without computer or bus links



### Plug types

Marking	EV2S-CAN	EV2S-BT	Description
G	•	•	Connector for single-action and twin solenoids with socket according to DIN EN 175 301-803 A
DG	•	—	2 x connectors for 2 single-action solenoids with socket according to DIN EN 175 301-803 A

### Interface option

Marking	EV2S-CAN	EV2S-BT	Description
L3K	•	—	3 m (9.8 ft) cable with open line ends 5 x 0.5 mm <sup>2</sup> (.2 x.02 in <sup>2</sup> )
M	•	•	M12 plug, 5-pole, only possible with plug type G

### Typical circuits

- Example 1** Operation with an external target value potentiometer at analogue input 1
- Example 2** Operation with two external target value potentiometers at analogue input 1 and 2
- Example 3** Operation in the CAN bus network
- Example 4** Operation in the CAN bus network and reading of a sensor
- Example 5** Operation with an external target value source from PLC, CNC or computer
- Example 6** Operation with external target value source from PLC, CNC or computer and control using analogue sensor
- Example 7** Operation with external target value source PLC, CNC or computer analogue II

## C-Line - the new standard for standard



HAWE has a unique, excellent position in the market:  
We are the premium manufacturer of premium products for demanding technology customers.

But we also observe that growth opportunities in the premium segment are limited, if not exhausted. At the same time, the “mid-segment” is becoming increasingly important: products and solutions that are perfect for a specific purpose, a specific application - nothing more, nothing less. They are the economical, price-aggressive alternative to higher-priced premium products.

With the C-Line, we are conquering this fast-growing segment. This opens up new customers, new applications and new market shares. Thus securing HAWE’s leading position in the world market.

### C-Line – a promise of success

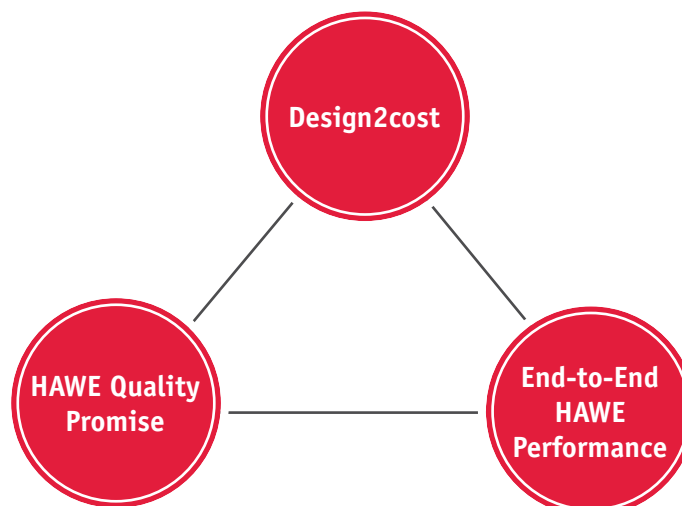
The “C” stands for “Competitive”.

It could stand for “China” as well. Because some C-Line products are developed and manufactured in our HAWE factory in Shanghai. With State-of-the-Art production technology, highly motivated and well trained employees and an excellent network of suppliers, HAWE produces results with high quality as well as high quantities.

However, the “C” also stands for “Cost efficient”: the development of cost-efficient components by cooperation partners according to specifications and requirements of HAWE.

### The new standard for standard

In the communication focus: C-Line is consistently developed and produced for the requirements in the mid-segment. Uncompromising in price and performance.



#### Mid-Segment

C-Line gives the HAWE quality promise: 100% quality, 100% application- designed, 0% error in practical operation.

#### HAWE Customer Experience

In the communication focus: C-Line is more than the pure product. C-Line contains all HAWE know-how - from technical support to logistics and service.

## Directional spool valve banks type CWS

The directional spool valve bank type CWS is actuated directly. The consumers are black/white controlled. A range of connection blocks and mounted blocks offer a wide range of applications.

The valve bank CWS is used mainly in mobile hydraulics and in stationary hydraulics, the direct mounting on the compact hydraulic power pack results in an extremely compact system solution.

### Features and Benefits:

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

### Intended applications:

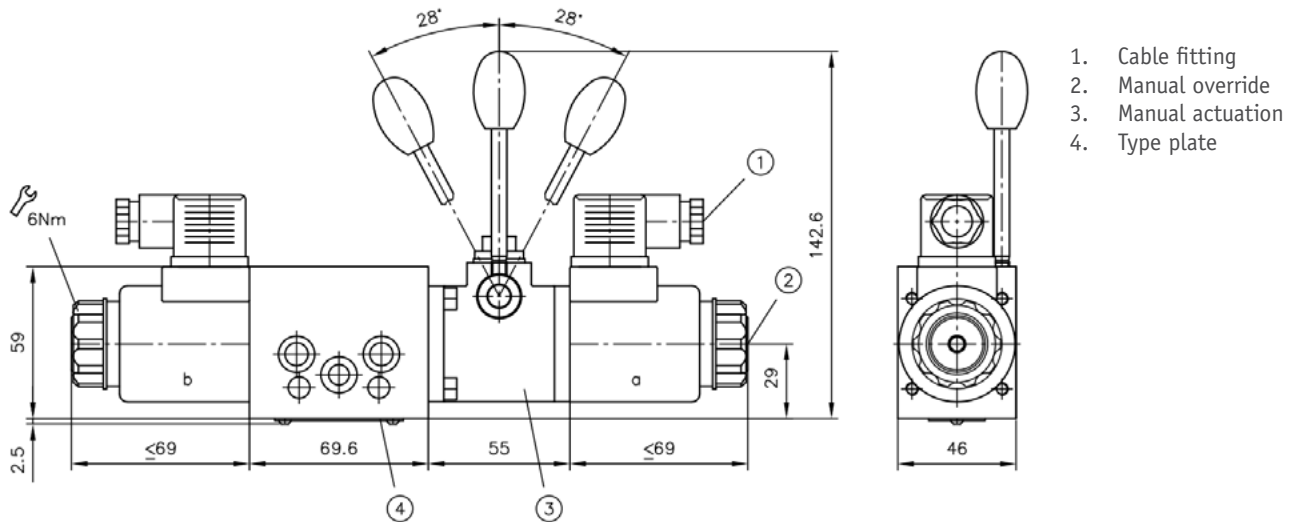
- Construction machines and construction material machines
- Cranes and lifting equipment
- Agricultural machinery and machines for forestry purposes
- Municipal trucks



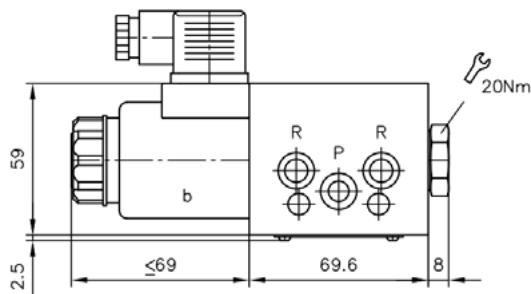
<b>Nomenclature:</b>	Directional spool valve bank type CWS
<b>Actuation:</b>	solenoid-actuated
<b>Operating pressure Pmax:</b>	4500 psi (310 bar)
<b>Flow rate Qmax:</b>	80 lpm (21.13 gpm)

### Spool block

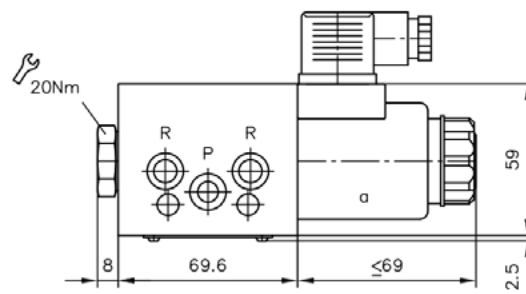
4/3-way directional valve with circuit symbol G, D, H, L, X



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)



# 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:

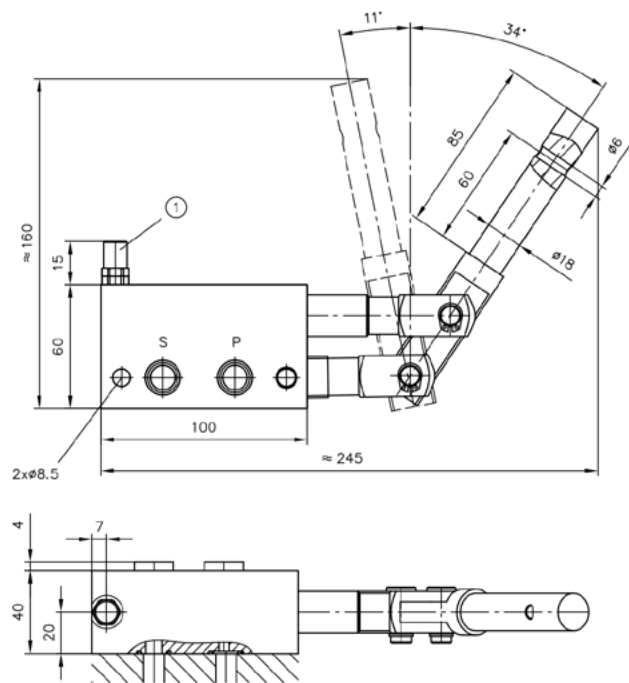
- Shipbuilding
- Mining machinery
- Wind power plants
- Fixture construction
- Test facilities and laboratory facilities
- Emergency pump



Nomenclature:	Hand pump type CH
Operating pressure Pmax:	4500 psi (300 bar)
Displacement volume Vmax stroke:	8.3 cm <sup>3</sup> /stroke

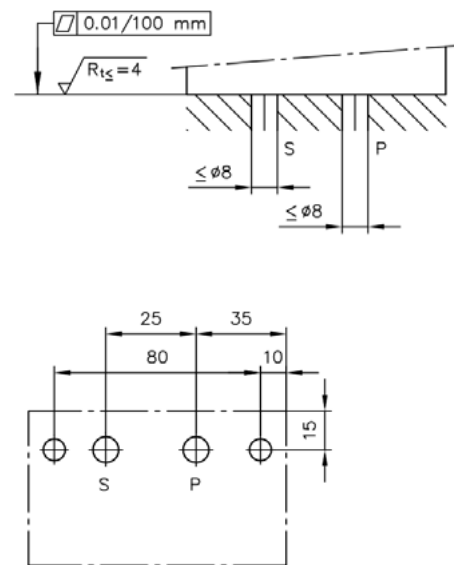
### Dimensions

All dimension in mm, subject to change.



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

### Base plate hole pattern

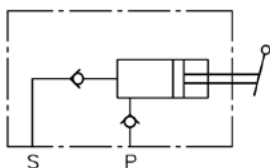


Sealing of the ports:

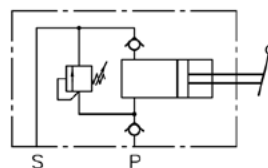
	O-ring
P,S	14x1.6

### Circuit symbol:

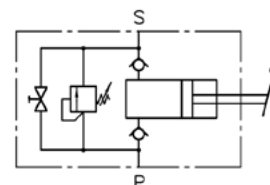
#### CH 08 P



#### CH 08 P-S



#### CH 08 G-AS





# 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

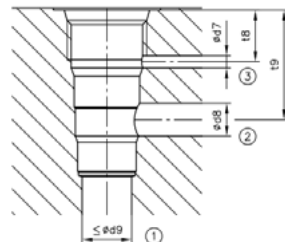
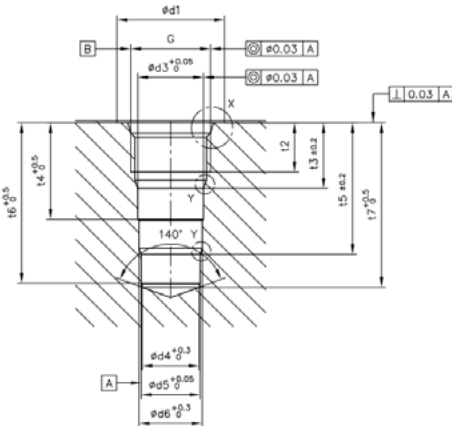
### Intended applications:

- Cranes
- Construction machines
- Lifting devices
- Agricultural machinery

### Basic type and size

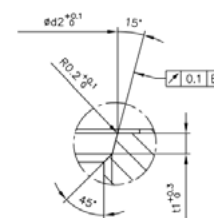
Basic type and size	Bore hole	Description		Flow rate Q <sub>max</sub> gpm (lpm)	Pressure setting p <sub>max</sub> psi (bar)
CLHV 2	2UNF	SAE 08	3/4-16 UNF-2B	7.925 (30)	5,076 (350)
CLHV 3	3UNF	SAE 10	7/8-14 UNF-2B	15.850 (60)	5,076 (350)
	T11A	T11A	M20 x 1.5	19.812 (75)	5,076 (350)
CLHV 5	4UNF	SAE 12	1-1/16-12 UN-2B	31.700 (120)	5,076 (350)
	T2A	T2A	1"-14 UNS-2B	39.625 (150)	5,076 (350)
CLHV 7	6UNF	SAE 20	1-5/8-12 UN-2B	84.535 (320)	5,076 (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	Ød1	Ød2	Ød2	Ød2	Ød2	Ød2	Ød2	Ød2	Ød2	Ød2	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		



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