

## Oilfield Products Overview









HAWE Hydraulik SE was established as "Heilmeyer & 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 9001:2000 quality standards.

HAWE now has more than 2000 employees, a worldwide sales network with offices in Germany, 14 HAWE subsidiaries, and more than 30 international representatives.



HAWE has eight manufacturing facilities throughout Germany. Pictured here is the corporate headquarters and production facility in Munich.



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Solutions for a World under Pressure



# Solutions for a World under Pressure

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

## 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 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.

## Uncompromising Safety and Reliability

Because HAWE Hydraulics follows these principles, we are able to provide uncompromising safety and reliability in oilfield applications.

Working in combination with certified explosion-proof solenoids, HAWE's line of hydraulic products, a modular toolkit of parts, is used to create extremely robust, low-maintenance hydraulic systems. Low-manufacturing tolerances and rigorous quality-assurance processes ensure all parts meet the highest standards of safety, while saving time and money.



HAWE Houston brings modular components together for custom hydraulic solutions for the oil and gas industry.



HAWE Hydraulics, based in Charlotte, N.C., has a full service facility in Houston, Texas, and is an ISO 9001:2001 certified international supplier of sophisticated modular hydraulic components and systems.

HAWE Hydraulics' components have been successfully proven in many critical oilfield drilling and production operations, such as:

- BOP closing units and handling systems
- Winches, catheads, and rotary tables
- Drawworks braking systems
- Catwalk hydraulics
- Iron roughnecks
- Mast and substructure lifting systems
- Walking systems
- Top drives

## Houston Service Center: HAWE At Your Service

HAWE Hydraulics knows that time is money in the oilfield, regardless of whether it is on land or water. That's why we have a full-service facility in Houston, staffed with technical sales managers who are available to assist you with the custom design of your modular hydraulic solution.

Once your solution is designed, local inventory is available to supply your products, which are assembled, calibrated, and tested on-site. We also follow through with after-sales support including product training, troubleshooting, and field service all conducted by professional hydraulics technicians. At all phases, HAWE Hydraulics in Houston follows through with quick response from concept to completion and beyond.

## 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 Hydraulics' components for oilfield 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 your local HAWE office or at [HaweUSA.com](http://HaweUSA.com).

# HAWE Proportional Directional Spool Valves

HAWE Hydraulic 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. Many additional functions and actuation options are available for systems using manual, hydraulic piloted, or electro-hydraulic actuation. This results in a more efficient, simplified, and space-saving design for your system. Table references are for pages 4 through 7.

## 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

## Connection Block (Table 1)

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

## Actuators by Type (Table 6)

- 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

## Ancillary Block (Table 7)

Additional functions include:

- Over-center valve (Table 7, pg 5)
- Shock and suction valve
- Regenerative circuit
- Outflow controller for proportional and load independent lowering

## 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 (Table 5)
- The maximum pressure of the valve section

## Intermediate Plate

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

## End Plate

Completes the valve bank.

# 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
- Available in various sizes
- Options available for FM certified ATEX Zone 1 or Class 1, Division 1 for groups C and D
- Efficient closed-center systems
- Compact design for weight savings

**Table 1. Basic types of connection blocks and port sizes.**

Coding	Ports P and R (SAE J 514)	Rated Flow (gpm)	Pump Displacement
PSL UNF 2 PSV UNF 2	Size 2 3/4-16 UNF-2B (SAE-8)	21	Fixed Variable
PSL UNF 4 PSV UNF 44	Size 3 1-1/16-12 UN-2B (SAE-12)	53	Fixed Variable
PSL UNF 6 PSV UNF 6	Size 5 1 5/8-12 UN-2B (SAE-20)	79	Fixed Variable

**Table 3. Functional cut-off (overload protection), proportional pressure limitation.\***

Coding	Description
No coding	Without functional cut-off
FP 1, FP 2, FP 3 FPH 1, FPH 2, FPH 3	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 [G 1/8 (BSPP)] for external piping
F 1, F 2, F 3 (Sizes 3 and 5 only)	Electric functional cut-off at A, B, or A and B

\*Options available for FM certification: ATEX Zone 1 or Class 1, Division 1 for groups C and D.

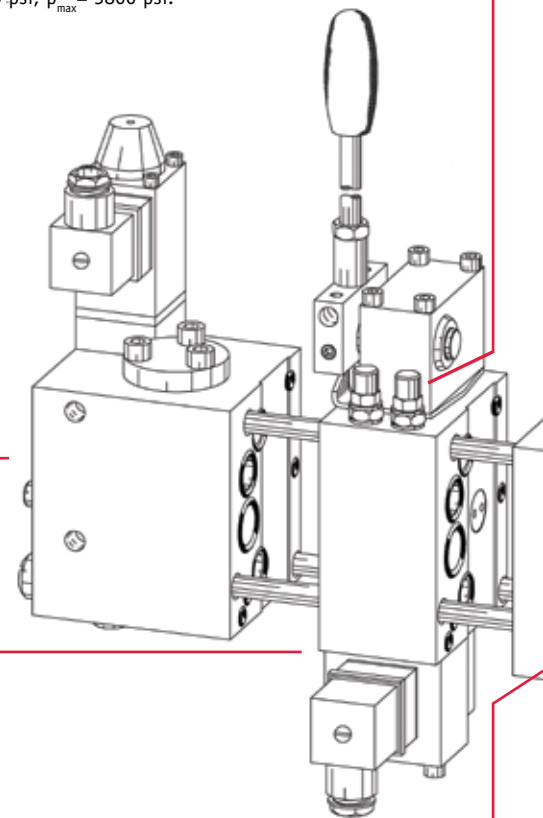
**Table 4. Maximum flow ratings of spool valves with compensator spring options.**

Spool Valve Compensator Spring Option Coding	Coding for consumer flow Q <sub>A,B</sub> (gpm)									
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, 26	0.8	1.6	2.6	4.2	6.6	10.6	16.6	21.1	—	—
5, 56	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

**Table 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 400/A.  
Pressure limitation  $p_{min} = 725$  psi;  $p_{max} = 5800$  psi.



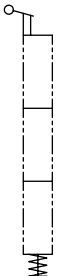
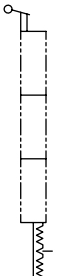
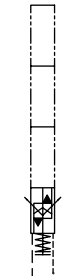
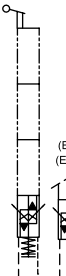
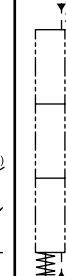
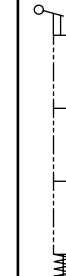

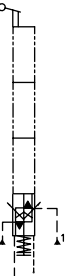

**Functional cut-off (Table 3)**

**Table 5. Spool valve flow patterns.**

L	M	F	H	J	B	R

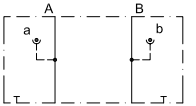
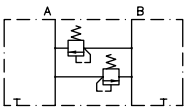
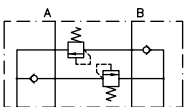
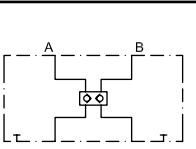


**Table 6. Actuation functions and variables.\***

	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 ratio I/I <sub>N</sub> : ~0.2 to 1		control pressure: minimum: 72.5 psi maximum: 261 psi maximum permanent: 725 psi			control pressure: ~36 to 101.5 psi	actuation angle: ~5° to 19°

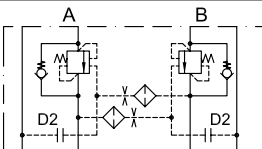
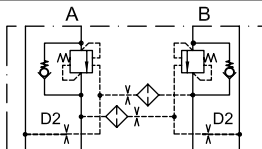
\*Options available for FM certification: ATEX Zone 1 or Class 1, Division 1 for groups C and D.

**Table 7. Ancillary block examples.**

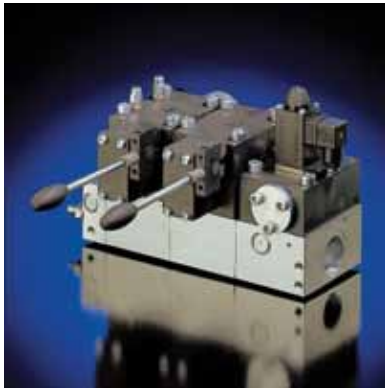
Coding	Brief Description	Symbol*
/UNF 2=3/4-16 UNF-2B (SAE-8) /UNF 3=7/8-14 UNF-2B (SAE-10) /UNF 5=1-5/16 UNF-2B (SAE-16)	Without additional function	
/UNF 2 AS...BS... /UNF 3 AN...BN... /UNF 5 AS... BS...	With shock valves at A and B (routed to the opposing side), with pressure	
/UNF 2 AN...BN... /UNF 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 <sub>A,B</sub> + 3 bar  Size 3, 5: releaseable check valves in A and B (release ratio: 1:2:5)	

\*Gauge ports optional on size 2.

**Table 8. Ancillary blocks with over-center valves, sizes 2 and 3.**

Coding	Description	Size 2 Symbol	Size 3 Symbol
/2AL...BL... /ZAL...BL...	With over-center valves at A and B		

# 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 106 gpm (400 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)
- Options available for FM certified ATEX Zone 1 or Class 1, Division 1 for groups C and D

**Table 1. Basic types of connection blocks and port sizes.**

Code and Size		Rated Flow (gpm)	Description
PSLF A ..-3 PSVF A ..-3	Inlet Section	~30	Fixed Variable
PSLF A ..-5 PSVF A ..-5		~90	Fixed Variable
PSLF A ..-7		~270	Variable

**Table 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.

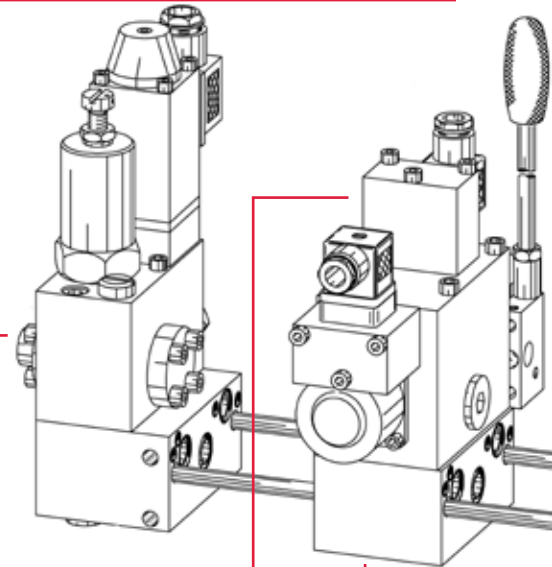
Example: SLF 7-A2 H320/320 A250 B200/A.

Pressure limitation  $p_{min}$  = 700 psi;  $p_{max}$  = 6000 psi.

**Table 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 1, FP 2, FP 3, FPH 1, FPH 2, FPH 3	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 (G 1/8) for external piping; tapped port block at valve section.

\*Options available for FM certification: ATEX Zone 1 or Class 1, Division 1 for groups C and D.



**Table 7. Subplate descriptions.**

Coding	Port Size for A and B ISO 228/1 (BSPP) SAE J 514		Size	
/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 in bar.)
/534, /UNF 534	G 3/4	7/8-14 UNF-2B	5	Sub-plate for val intermediate pla
/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
/5 X, /UNF 5 X	G 1	1 5/16-12UNF-2B	5	
/5 SAE, /5 SAE S /5 SAE 8	SAE 1 (6000 psi)		5	Sub-plate with S
/6D SAE	SAE 1 1/4 (6000 psi)		5	Sub-plate with S achieve a load co
/U 3	—	—	3	Sub-plate for mo according to Tab
/U 5	—	—	5	
/U 53	—	—	5	Like /533, but p additional functi



**Table 4. Maximum flow ratings of spool valves with compensator spring options.**

Valve-Spool Coding		Flow Coding Q <sub>A,B</sub> (gpm): Consumer Port A and B												
Coding	Size	3	6	10	16	25	40	63	80	120	160	250	320	400
A 2	3	0.7	1.3	2.2	3.5	5.5	8.8	16.6	21.1	—	—	—	—	—
	5	—	—	—	3.5	5.5	8.8	16.6	21.1	31.7	42	—	—	—
	7	—	—	—	—	—	—	—	—	31.7	42	66	85	106
A 1, A 8	3	0.8	2	3.1	4.8	7.5	12	19	28.3	—	—	—	—	—
	5	—	—	—	4.4	7	11	16	28.3	39.6	55	—	—	—
A 5	3	0.8	2	3.1	4.8	7.5	12	22.5	28.3	—	—	—	—	—
	5	—	—	—	4.4	7	11	22.5	28.3	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	—	—	—

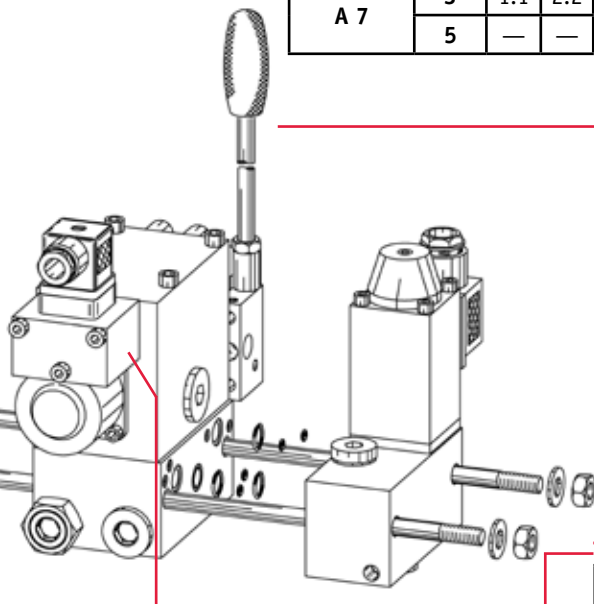
**Table 5. Spool valve flow patterns.**

L	M	F	H	J	B	R	O	G

**Table 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 <sub>N</sub> : ~0.2 to 1		control pressure: minimum: 72.5 psi maximum: 261 psi maximum permanent: 725 psi			control pressure: ~36 to 101.5 psi

\*Options available for FM certification: ATEX Zone 1 or Class 1, Division 1 for groups C and D.



Description
on valves at A and B, or A or B. (Request pressure
ve section size 3, in a valve bank size 5 (saving an
te).
pick-up port X for external circuitry.
AE-flange, analogue /5, /5 S, and /58.
AE-flange for combination of two valve sections, to
compensated consumer flow, maximum 106 gpm.
ounting ancillary blocks with additional functions
le 21a (size 3) and Table 21b (size 5).
prepared for mounting and ancillary blocks with
ons, 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 level 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
- A perfect match for PSL/PSV valves
- Many pressure ranges available
- Made of steel for durability

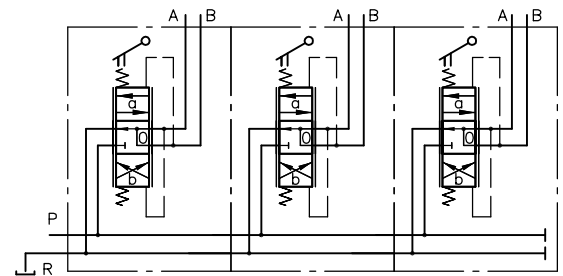
## Order Example

**KFB 01 - A/ 19/F - M/ 19/ F - E/ 19/F**

Manual actuation

Valve bank (see Table 1)

Basic type coding for the individual valve (see Table 2)



**Table 1. 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

**Table 2. Basic type coding, individual valve.**

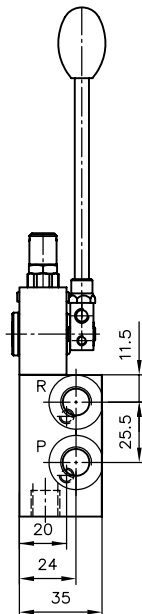
<b>KFB 01</b>	Ports G 1/4 (BSPP)
<b>KFB 01 UNF</b>	Ports 7/16-20 UNF-2B (SAE-4)

## Valve Section and Valve Bank Ports

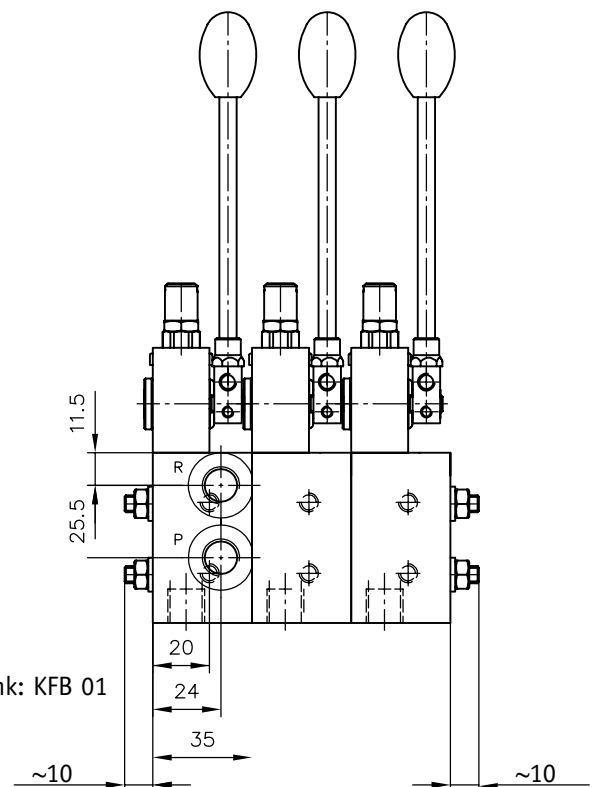
P, R, A, B = G 1/4 [ISO 228/1 (BSPP)]  
= 7/16-20 UNF-2B (SAE-4)

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

Individual valve section: FB 01



Valve bank: KFB 01





# Proportional Pressure Reducing Valve: PMZ



For controlling oil supply in piloting circuits, pressure reducing valves PMZ allows pressure on the secondary side (port A) to be proportionally adjusted independently from the pressure on the primary side, according to an electrical signal. The reduced pressure at port A changes proportional to alternation of the electrical input signal. This pressure reducing valve also features an override compensation that acts like a pressure-limiting valve if the pressure on the secondary side exceeds the set pressure due to external forces.

## Features and Benefits

- Steel construction
- Compact design
- Multiple configurations
- Options available for FM certified ATEX Zone 1 or Class 1, Division 1 for groups C and D

## Order Example

**PMZ 1 - 30 - 30 - G 24 - 1/4**

Basic type (Table 1)

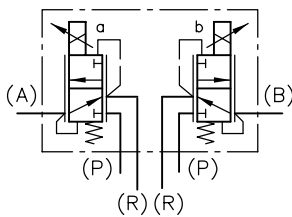
Proportionally adjustable  
nominal pressure difference (Table 2)

Individual connection block, port G 1/4  
(BSPP) (for PMZ 1 only)

Solenoid voltage (Table 3)

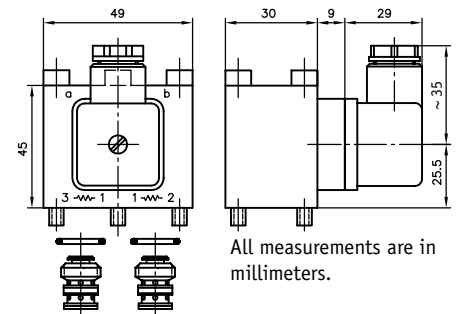
**Table 1. Basic type.**

Coding	Version	
PMZ 1	Assembly kit	Twin valve
PMZ 01		Twin valve (small solenoid)



**Table 2. Proportionally adjustable nominal pressure difference**

Coding	$\Delta p_A = p_A - p_R$ (psi)
30	435
19	275
14	203
11	167
9	130
7	109
5.5	80
4	65



**Table 3. Solenoid options.**

Coding		Nominal Voltage	Description	PMZ 1	PMZ 01
G 12 G 12 T(H)	X 12 X 12 T(H)	12 V DC	Standard version with connection EN 175 301-803 with (G) or without (X) plug. T versions with manual emergency actuation, TH with additional push button.	•	•
G 24 B 24 T(H)	X 24 X24 T(H)	24 V DC			
G 24 H 4	X 24 H 4	24 V DC	Same as G 24 (X 24), but with solenoid for 4-pin electrical actuation.	•	
G 24 C 4	X 24 C 4	24 V DC	With connection EN 175 301-803, 4 pin with (G) or without (X) plug.	•	
AMP 24 H4		24 V DC	With connection via AMP Junior Timer and 4-pin electrical actuation.	•	•
DT 12 DT 24		12 V DC 24 V DC	Connection via DEUTSCH DT 04-4P, suited for socket DT 06-4S.	•	•
S 12, S 12 T		12 V DC	With quarter turn type plug (Bayonet PA 5, Co. Schlemmer D-85586 Poing, suited for taper with bayonet 10 SL), S(T) version comes with additional manual emergency actuation. Plug is not included.	•	•
S 24, S 24 T		24 V DC			
G 24 EX G 24 EX-10 m		24 V DC	For use in areas with explosive conditions. Suited for Category 2 and 3, Zones 1, 21, 2, 22. Protection class EEx m II 120° (T4), with cable length of 3 m (standard) or 10 m.	•	
G 24 MSHA G 24 MSHA-10 m		24 V DC	For use in mines and their on-surface systems, where MSHA approval is mandatory. Protection Class I M2 EX d I (flame proof, intrinsically safe), with cable lengths of 5 m (standard) or 10 m.	•	

## Variable Displacement Axial Piston Pump: V30E



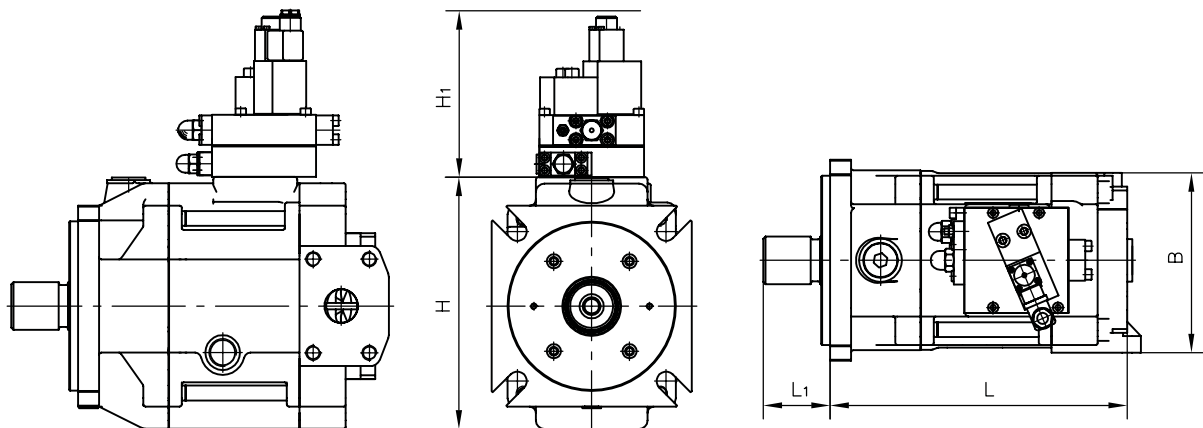
The V30E works according to the swash plate principle and is intended for open circuit operation mobile hydraulics. There is also an option for a thru-shaft for flange mounting additional variable and fixed displacement pumps. The V30E is fast, quiet, lighter in weight, has minimal pulsation and is extremely 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 5,075 psi with a maximum of 6,090-psi.

### 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, $p_{nom}$ (psi)	5100	5100	5100
Maximum pressure, $p_{max}$ (psi)	6100	6100	6100
Maximum revolution rating, self priming (rpm)	2500	2100	1800
Weight, including pump controller (lb)	125	196	353



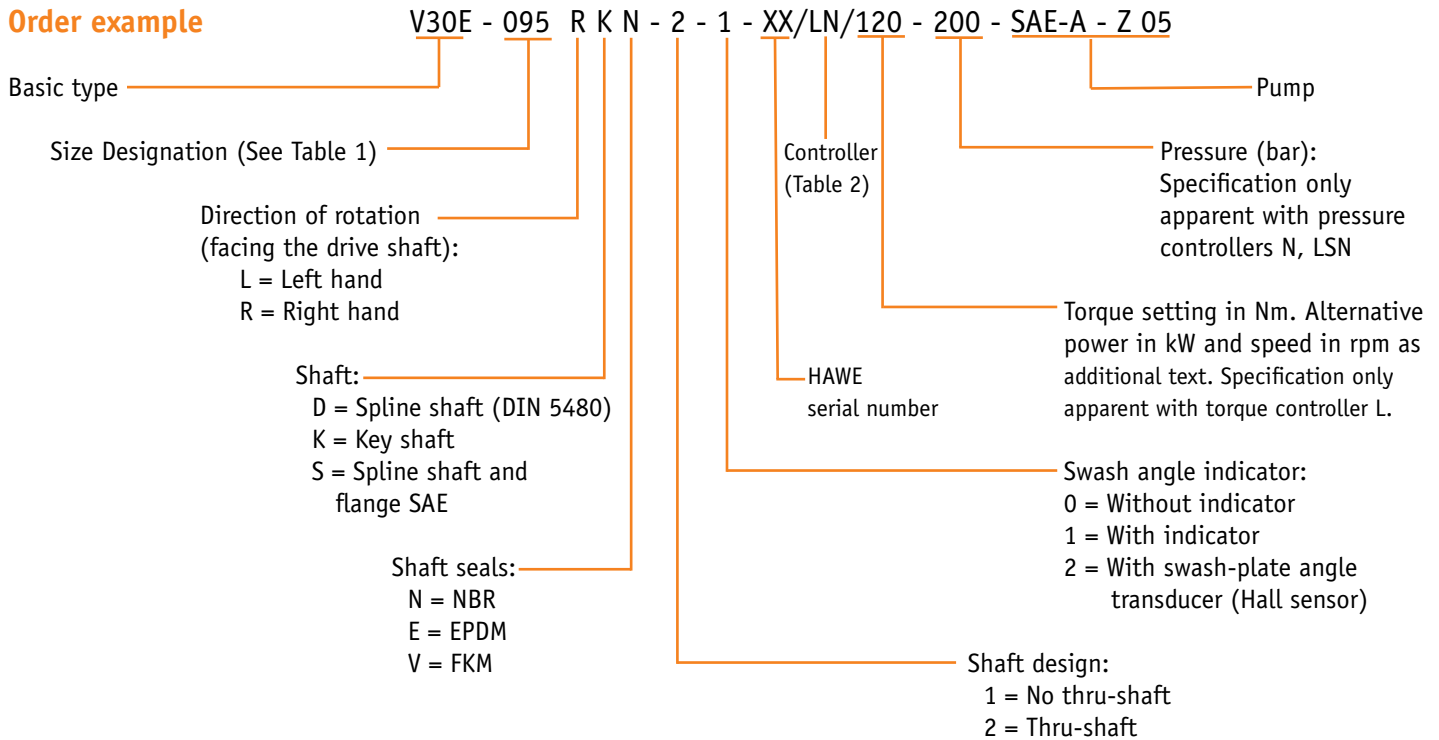
**Basic Dimensions: All dimensions are in inches.\***

Basic type	L	L <sub>1</sub>	B	H	H <sub>1</sub>
V30E -095	12	2.5	7.5	7.5	2
V30E -160	13	2.5	8.25	8.25	2
V30E -270	16	3	9.5	13	2

**\*Subject to change without notice.**

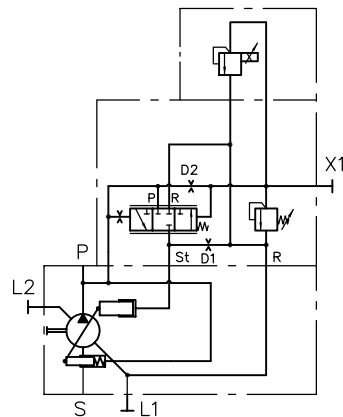


## Order example



**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)	6100	6100	6100
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 N**

**Table 2. Controller specifications.**

Type	Description
N - ...	Pressure controller, adjustable directly at the pump. Also used as a port for an external pilot valve.
LSN - ...	Load-sensing controller with pressure limitation. Stand-by pressure, adjustable between 15...35 bar; HAWC pre-set: 362.5 psi + 72.5 (25 bar +5).
-PMVP 4- 41 /G 12 42 /G 24 43	Pressure range: (72.5) ...2611 psi (72.5) ...4206 psi (72.5) ...6382 psi  Solenoid voltage
EM.CH	Electrohydraulics displacement and pressure control
L	Power controller, torque limitation

# Variable Displacement Axial Piston Pump: V60N



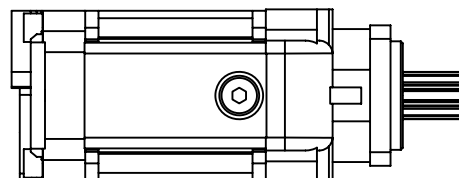
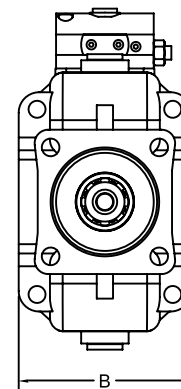
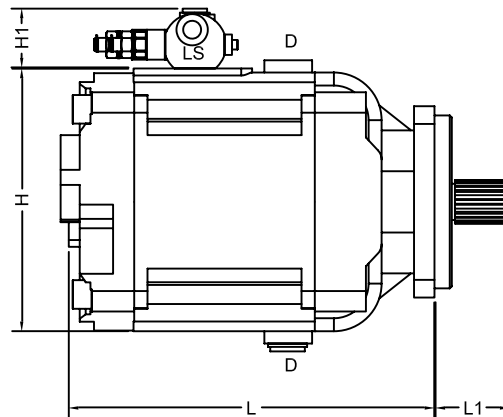
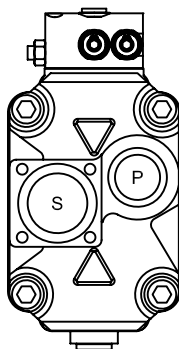
Intended for open-circuit operation in mobile hydraulics, the V60N works according to the swash plate principle, usually driven via the ancillary drive. An optional thrushaft enables direct mounting of additional variable displacement pumps or a fixed displacement pump. These pumps are suited for a wide 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
- Three displacements are available from 4–7 in<sup>3</sup>/rev
- Continuous operating pressure ratings up to 5,075 psi with a maximum of 5,800 psi

## 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, $p_{nom}$ (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



Basic Dimensions: All dimensions are in inches.\*

Basic type	L	L <sub>1</sub>	B	H	H <sub>1</sub>
V60N-060	10	2	4.5	7	4
V60N-090	11	2	5	7.5	4
V60N-110	11	2	5	7.5	4
V60N-130	11	2	5	8	2

\*Subject to change without notice.

## Ports:

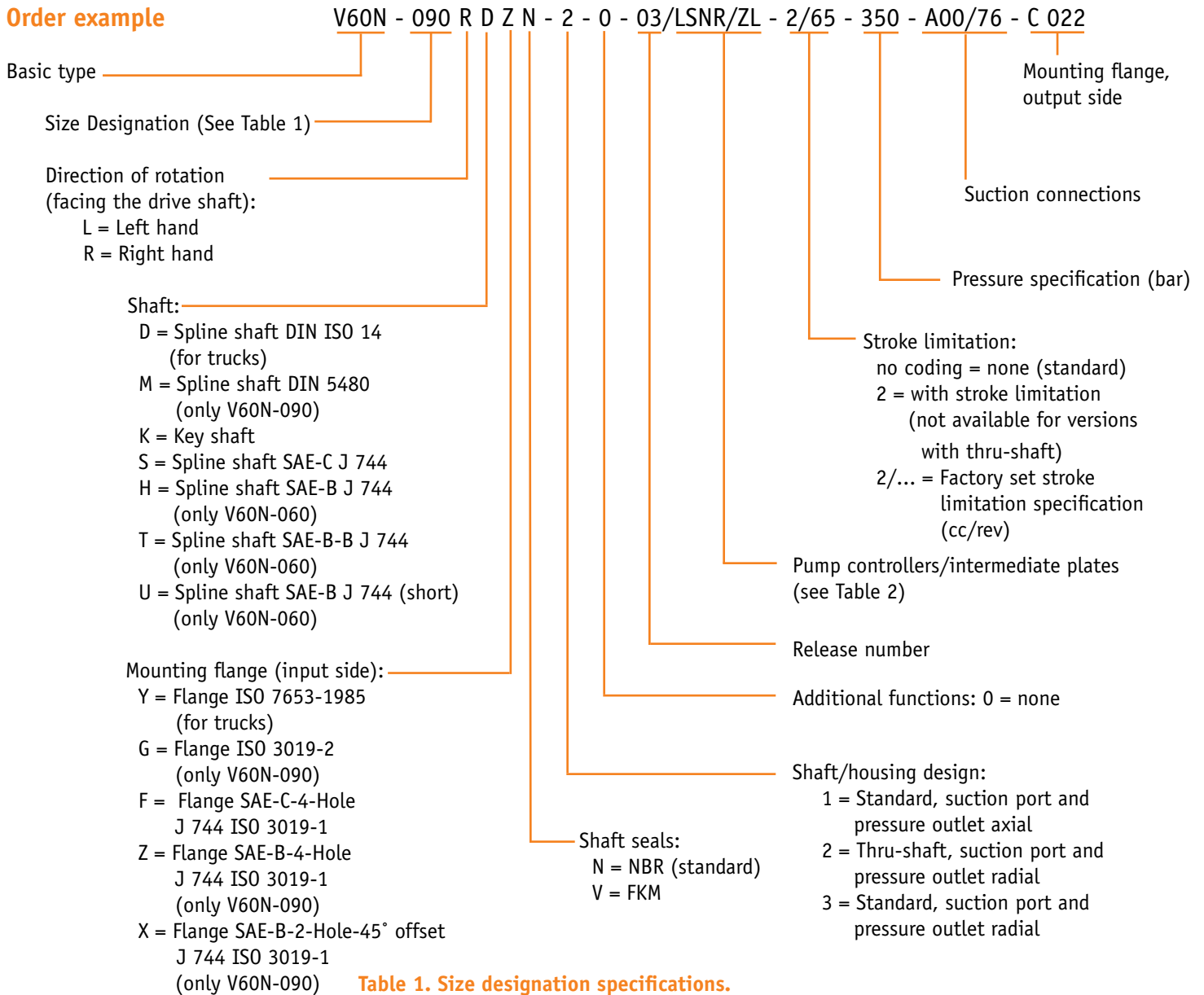
- P = Pressure outlet G 1
- S = Flange suction port
- D = Case drain G 3/4
- L = Load-sensing port G 1/4

## Coding UNF, ports conforming to SAE J 514:

- P = 1 5/16-12 UN-2B
- S = 1/8-8-12 UN-2B
- LS = G 1/4 [ISO 228/1 (BSPP)]



## Order example



**Table 1. Size designation specifications.**

Coding	060	090	110	130
<b>Geometric displacement (in<sup>3</sup>/rev)</b>	3.7	5.5	6.7	7.9
<b>Nominal Pressure p<sub>nom</sub> (psi)</b>	5075	5075	5075	5800
<b>Pressure p<sub>max</sub> (psi)</b>	5800	5800	5800	6500

**Table 2. Pump controller and intermediate plate specifications.**

Coding	Description
<b>LSNR</b>	Load-sensing controller with integrated pressure limitation
<b>NR</b>	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.
<b>Intermediate plates</b>	Intermediate plates are used only in combination with controllers LSNR or NR.
<b>/ZL</b>	Intermediate plate with power controller (torque limitation). Product "pressure x displacement" = constant. Adjustment range: 25...100% of maximum drive torque.
<b>/ZW</b>	Angled intermediate plate (at 45°) is mandatory for mounting controllers at pumps with housing design -2 and -3.

## 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

### Order example

**K60N - 064 L SC N**

**K60N - 108 R D N - S-F12 - A45/76**

Basic type

Size designation (See Table 1)

Direction of rotation:

L = Left hand

R = Right hand

Suction connections

By-pass valve:

S-F12 = NO-type, solenoid  
voltage 12V DC

S-F24 = NO-type, solenoid  
voltage 24V DC

Shaft seals:

N = NBR (standard)

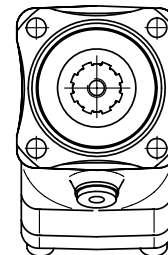
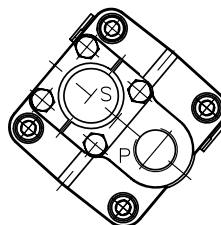
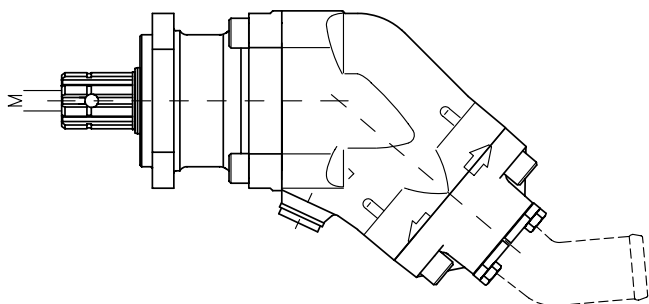
V = FKM

Shaft design and mounting flange:

D = Splined shaft (DIN ISO 14), with flange ISO 7653-1985

SB = Splined shaft with flange SAE-B

SC = Splined shaft with flange SAE-C (sizes 047 and up)



**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 specially 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.

## Order example

**M60N - 034 B S B N / 4**

Basic type

Size designation (See Table 1)

Direction of rotation:

B = any

Shaft design:

S = Spline shaft (SAE)

K = Key shaft

Connections:

4 = Tapped ports G 3/4 (BSPP)

4 UNF = Tapped ports 1 1/16-12 UN (SAE-12)

SAE 4 = SAE flange (sizes 047, 064)

SAE 5 = SAE flange (sizes 084, 108)

Shaft seals:

N = NBR (standard)

V = FKM

Mounting flange:

B = SAE-B for sizes 012-034

C = SAE-C for sizes 047-108

D = SAE-D for sizes 084 and 108

**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

# Programmable Logic Valve Control: PLVC



The programmable logic valve control PLVC offers the functionality required for your hydraulic system and are fully compatible with our valves and pumps. The two smaller versions with fewer inputs and outputs are available to handle small and mid-sized applications. These PLVC controls were developed and tested in demanding mobile and stationary applications. Their range of use is widened by Profi-Bus and CAN-Bus interfaces.

## Features and Benefits

- High flexibility due to our modular concept
- RS 232, CAN-Bus, Profi-Bus interfaces available
- Flexible programming (IEC 61131-3)
- Software as function modules (PLC-programs)
- Remote diagnosis via modem, mobile phone
- Simple and free parameter settings of all inputs and outputs via HAWE software
- Combination options for several valves
- CAN-Bus control for complex systems
- Matched to the HAWE product range

## Basic PLVC types and main parameters.

	PLVC 41	PLVC 21	PLVC 8 × 2
<b>Number of inputs</b>			
Digital	27	13	17
Analog	28	12	23
Frequency	3	3	3
Emergency stop	x	x	x
<b>Number of outputs</b>			
Digital	16	16	13
Analog (PWM)	16	4	16
Analog (0...10V)	1	—	—
Relay	8	4	—
Auxilliary voltage	1	—	—
<b>Interfaces</b>			
RS 232	x	x	x
CAN-Bus	x	x	x
Profi-Bus	—	x	—
Power supply (10...30V DC)	5A	5A	5A

## Examples of software function packs.

- Position indication
- CAN-Bus communication
- Position and flow control
- Malfunction indication
- Closed-loop control
- Simultaneous movement
- Anti-saturation control
- Overload detection
- Load-sensing control
- Pressure control

The PLC programming via the structured text (ST) enables easy and quick customization.

## 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 PLVC, 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 × 30 mm
- All outputs can also be used as analog inputs

## General Data

Programming		CAN-Bus, C program or used as configurable slave device	
Bus		ISO 11898-2 CAN2.0A+B	
Inputs/outputs			
1 digital	switching level 4.5V	Input resistance 12 kΩ	
6 analog input	12-bit resolution	0...11 V	12.6 kΩ/235 Ω/10 k Ω pull-up
4 PWM output	2000 mA	0...100%	50 Hz...1kHz
4 IPWM output	1800 mA	0...100%	50 Hz...1kHz with current control <sup>1</sup>

<b>Temperature</b>	-40° F –185° F
<b>Connector</b>	Sicma 211 PL249S0005
<b>EEPROM</b>	2 KB
<b>CAN-Bus</b>	PCAN-USB dongle
<b>Fuse</b>	2 × 10 A, 1 × 1 A
<b>Dimensions</b>	60 × 60 × 30 mm

<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 four transistors simultaneously.









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