

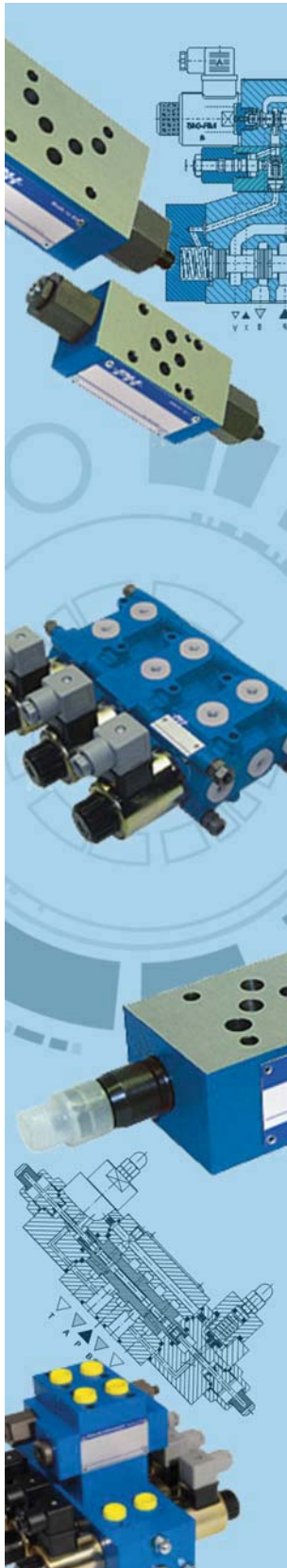
VALVES RANGE

FOR OPEN LOOPS



T E C H N I C A L C A T A L O G

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CHECK VALVES



DIRECT OPERATED VALVES

Check valve VP-NV (NG 6, 10)

7

7

Direct operated valves



PILOT OPERATED VALVES

Check valve NOV- ... -E (NG 6, 10)

Check valve NOV-6-D (NG 6)

Check valve VP-NOV (NG 6, 10)

11

11

13

15

Pilot operated valves



COUNTERBALANCE VALVES

Check-Q-meter BZV (NG 6)

Check-Q-meter modular valve VP-BZV (NG 6)

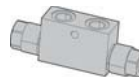
19

19

23

Counterbalance valves





CHECK VALVE VP-NV

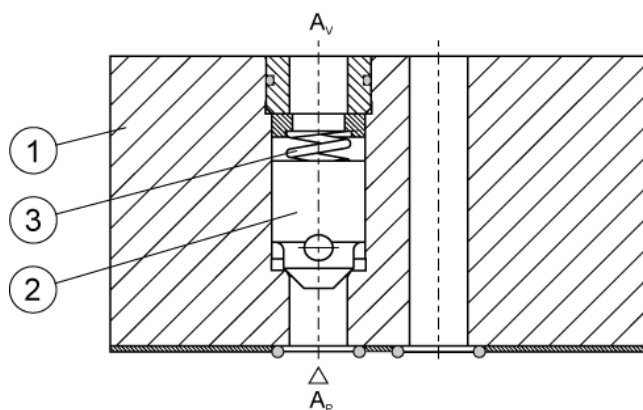
- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 100 L/min [26,4 GPM]
- Connecting dimensions to ISO 4401.
- For vertical stacking - sandwich plate design.
- Free hydraulic fluid flow in one direction.



VP-NV-6, VP-NV-10

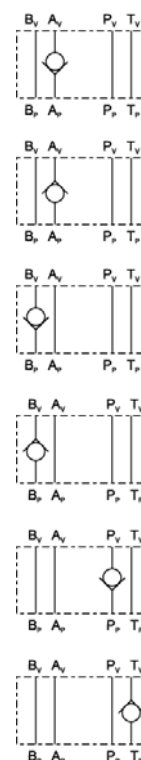
Operation

Check valves type VP-NV permit the hydraulic fluid flow in one direction, with a tight-off in the opposite direction. Sandwich plate design - for vertical stacking. These valves consist of a housing (1), poppet (2), and a spring (3). A poppet valve can be fitted into the line P, T, A or B. It serves for shutting off the hydraulic fluid flow in one direction, permitting a free flow in the opposite direction. This is made possible by the poppet (2) which provides positive seating. The hydraulic fluid flow under cracking pressure 0,4 bar [5.8 PSI] causes the poppet to lift, thus freeing the flow. In the opposite direction, the spring (3) pushes the poppet (2) against the seat, shutting the hydraulic fluid flow off.

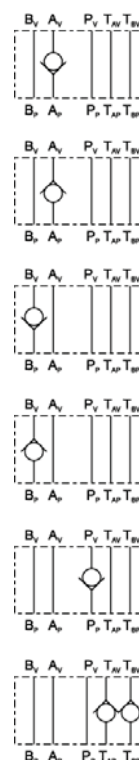


Hydraulic symbols

Size 6



Size 10



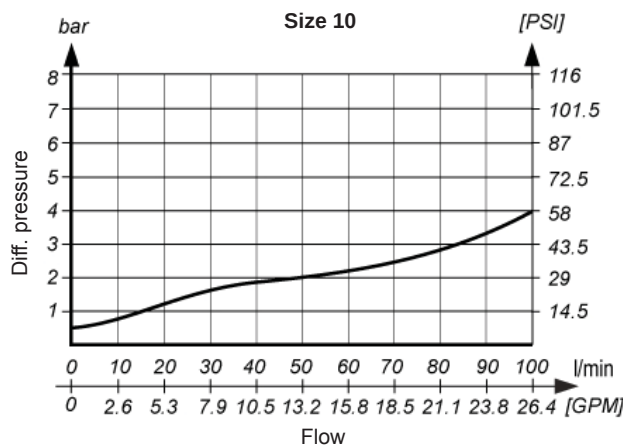
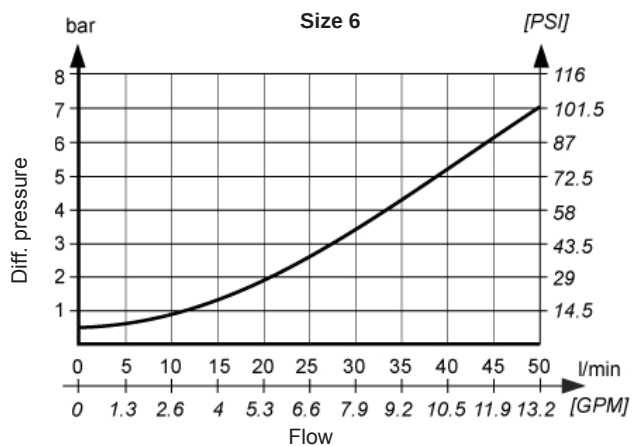
Features

Size		6	10
Flow rate	L/min [GPM]	50 [13.2]	100 [26.4]
Flow velocity	m/s	4	
Operating pressure	bar [PSI]	350 [5 076]	
Cracking pressure	bar [PSI]	0,4 [5.8]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69,5 to 1.760]	
Filtration	NAS 1638	8	
Mass	kg [lb]	0,87 [1.91]	2,77 [6.10]

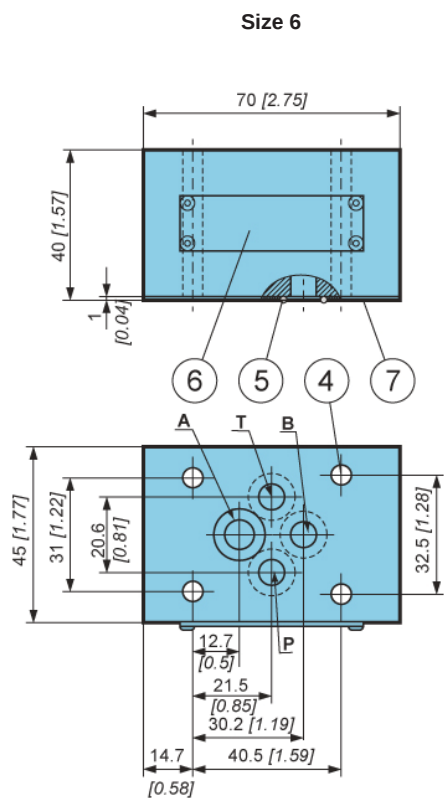


ΔP-Q Performance curves

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].

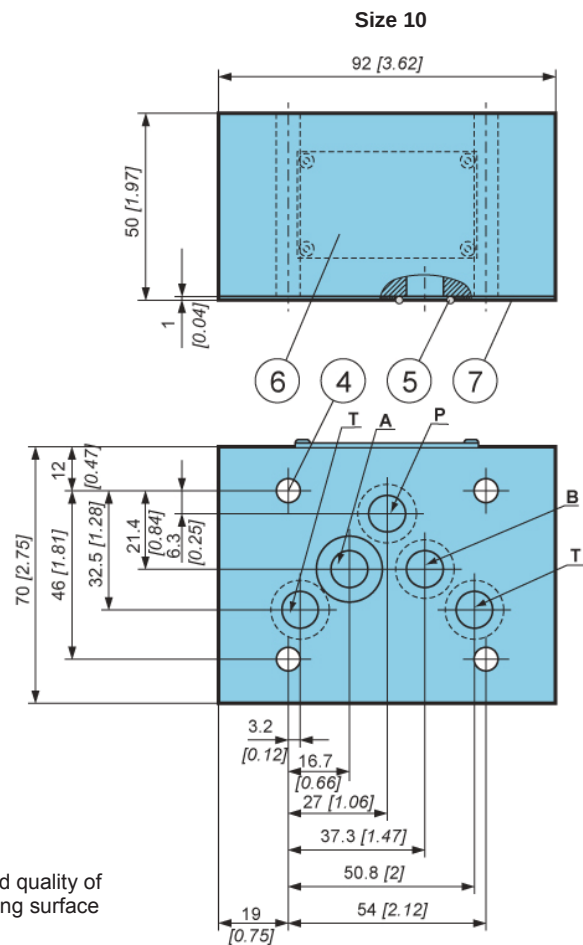
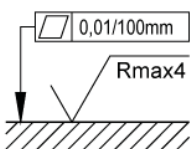


Dimensions

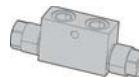


- 4. Bores for fixing screws M5
- 5. O-ring 9,25x1,78
- 6. Nameplate
- 7. O-ring plate

Required quality of the mating surface



- 4. Bores for fixing screws M6
- 5. O-ring 12,42x1,78
- 6. Nameplate
- 7. O-ring plate



Model code

V P - N V - [] - [] - [] - *	
Size	
Size 6	6
Size 10	10
To be fitted into line...Flow direction	
Size 6	Size 10
A_p-A_v 	A_p-A_v
A_v-A_p 	A_v-A_p
B_p-B_v 	B_p-B_v
B_v-B_p 	B_v-B_p
P_p-P_v 	P_p-P_v
T_v-T_p 	T_v-T_p
Seals type	
NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E
Special requirements to be briefly specified	

Direct operated valves

Pilot operated valves

Counterbalance valves





CHECK VALVE NOV- ... -E

- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 50 L/min [13.2 GPM]
- Threaded connections to ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Flow shut-off in one service line.
- Direct in-line mounting.



NOV-6-E; NOV-10-E

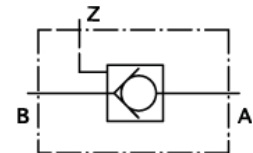
Operation

Pilot operated check valves type NOV enable the hydraulic fluid flow in the service lines to be automatically shut-off and made free, respectively.

Free flow direction is from the valve port B to port A. In the opposite direction is blocked for the hydraulic fluid flow. Free flow from port A to port B is achieved by means of pressure in port Z.

To assure zero leakage there is necessary to discharge ports B and Z towards T in the zero position of the directional valve.

Hydraulic symbol



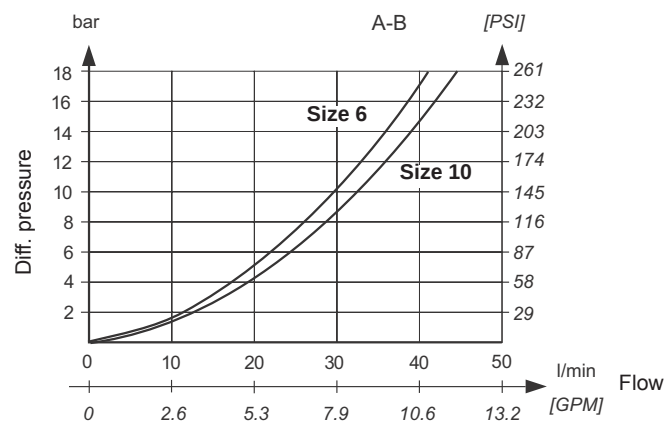
Features

Size		6	10
Flow rate	L/min [GPM]	35 [9.2]	50 [13.2]
Operating pressure	bar [PSI]	350 [5 076]	
Cracking pressure (B-A)	bar [PSI]	0.5 [7.2]	
Area ratio		1:4	
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69,5 to 1.760]	
Filtration	NAS 1638	8	
Mass	kg [lb]	0,5 [1.10]	0,65 [1.43]

ΔP-Q Performance curves

Δp - Q Performance curves of the flow in direction A → B (check valve pilot opened).

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].



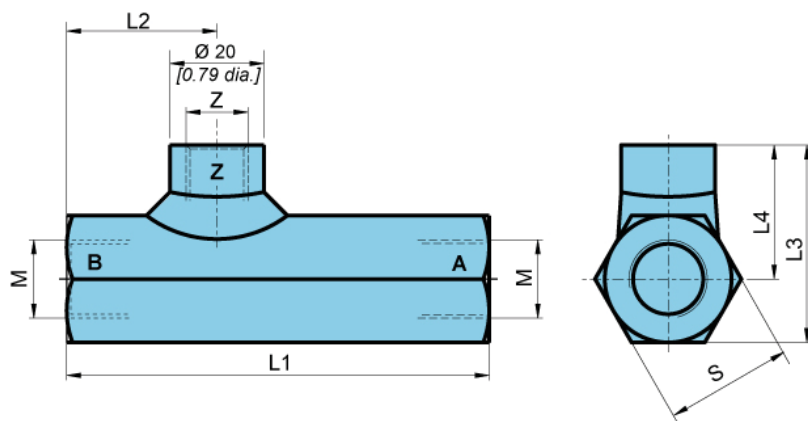
Direct operated valves

Pilot operated valves

Counterbalance valves

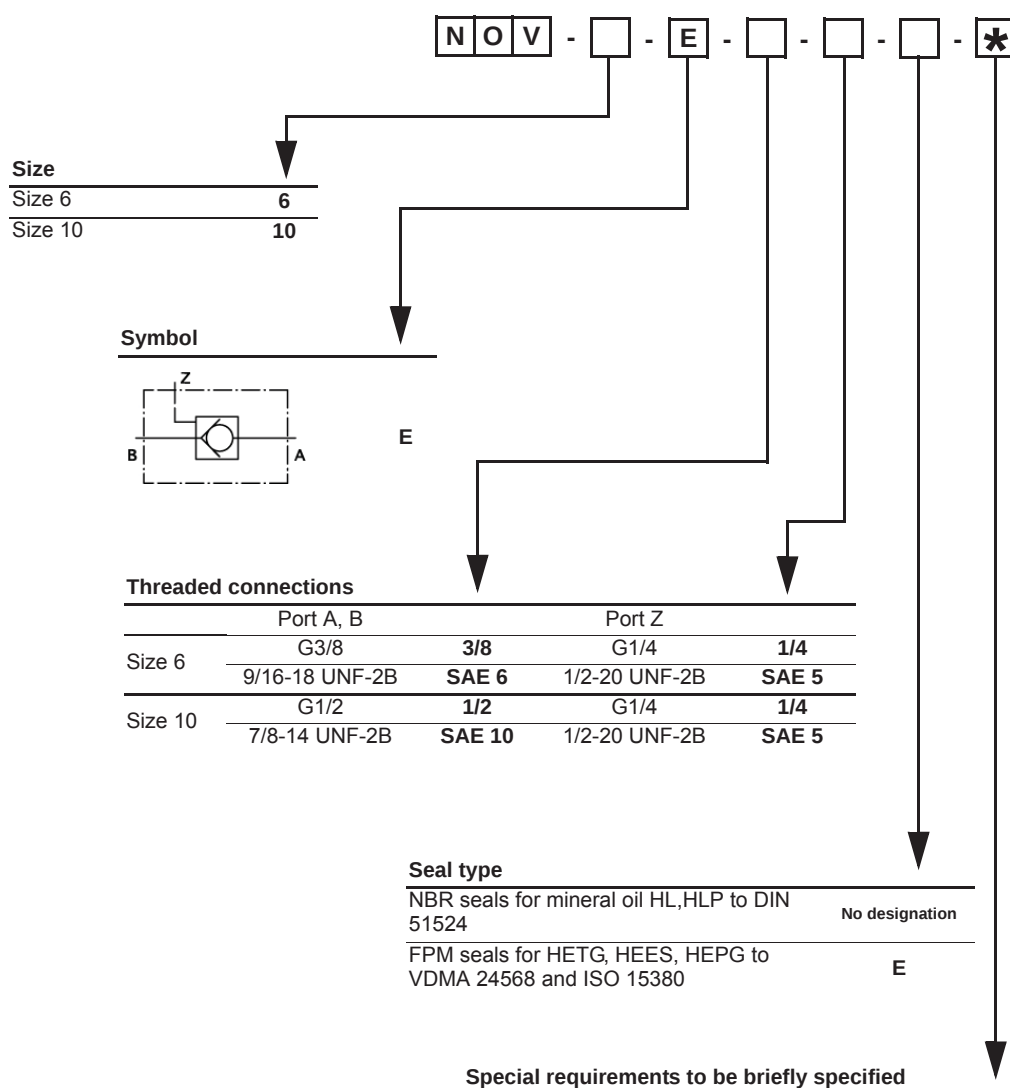


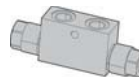
Dimensions



Size	6	10
L1	90 [3.54]	94 [3.70]
L2	32 [1.26]	34 [1.34]
L3	42 [1.65]	45 [1.77]
L4	28,5 [1.12]	30 [1.18]
S	27 [1.06]	30 [1.18]
M	G3/8	G1/2
Z	G1/4	G1/4

Model code





CHECK VALVE NOV-6-D

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 60 L/min [15.8 GPM]
- Threaded connections to ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Flow shut-off in one service line.
- Direct in-line mounting.

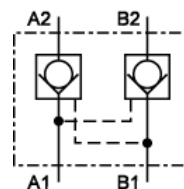


NOV-6-D

Operation

Direct operated check valves type NOV enable the hydraulic fluid flow in the service lines to be automatically shut-off and made free, respectively.
Free flow direction is always from the valve side A1, B1 to side A2, B2. In the opposite direction is the valve blocked for the hydraulic fluid flow. Free flow in port A in direction A2 to A1 is achieved by means of pressure in port B, and vice versa.
To assure zero leakage there is necessary to discharge ports A1 and B1 towards T in the zero position of the directional valve.

Hydraulic symbol



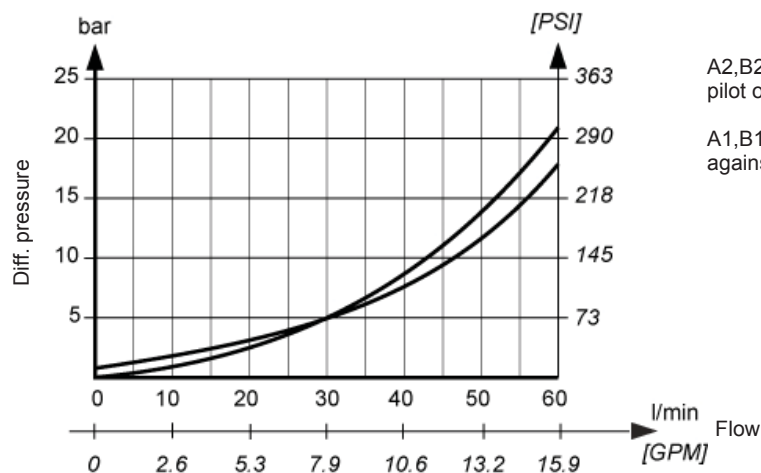
Features

Size		6
Flow rate	L/min [GPM]	60 [15.8]
Operating pressure	bar [PSI]	350 [5 076]
Cracking pressure	bar [PSI]	1 [14.5]
Area ratio		1:3,9
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [69,5 to 1.760]
Filtration	NAS 1638	8
Mass	kg [lb]	1,5 [3.30]

ΔP-Q Performance curves

Δp - Q Performance curves of the flow in direction A1, B1 → A2, B2 (through check valve) and in direction A2, B2 → A1, B1 (check valve pilot opened).

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].



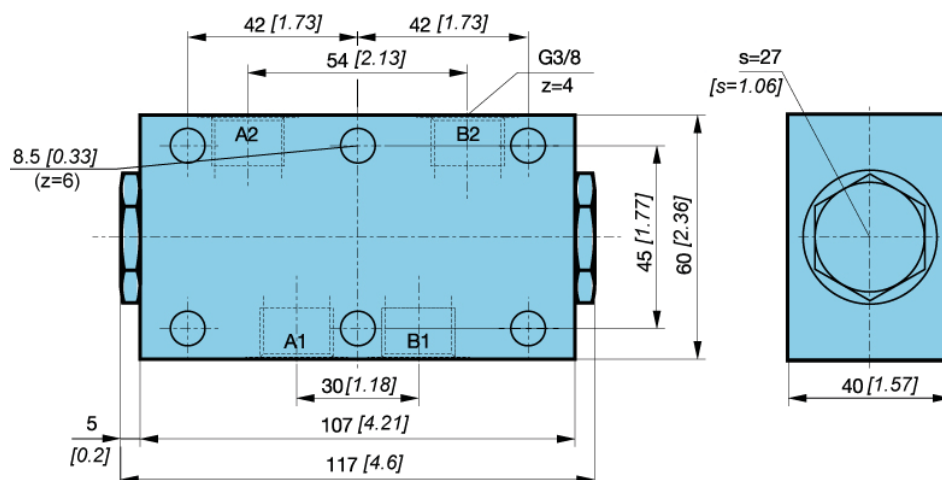
Direct operated valves

Pilot operated valves

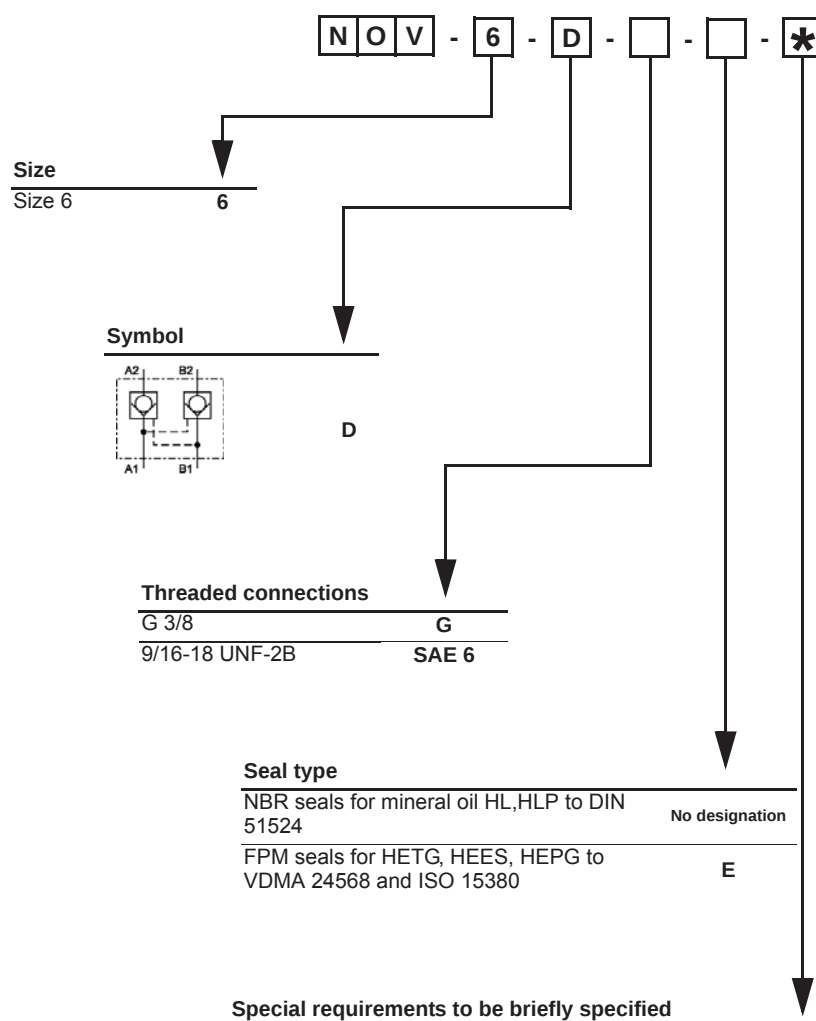
Counterbalance valves

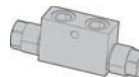


Dimensions



Model code





CHECK VALVE VP-NOV

- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 100 L/min [26,4 GPM]
- Connecting dimensions to ISO 4401.
- Flow shut-off in both or one service line.
- For vertical stacking - sandwich plate design.
- Height and width of the valves to ISO 7790 norms.



VP-NOV-10-..., VP-NOV-6-...

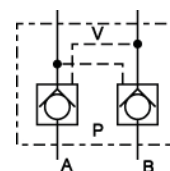
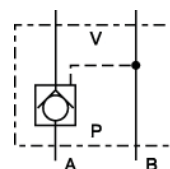
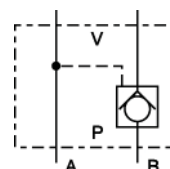
Operation

Pilot operated check valves type VP-NOV enable the hydraulic fluid flow in the service lines to be automatically shut off and made free, respectively.

Free flow direction is always from the valve side "V" to the subplate side "P". In the opposite direction is the valve blocked for the hydraulic fluid flow. Free flow in port A in direction P to V is achieved by means of pressure in port B, and vice versa.

To assure zero leakage there is necessary to discharge ports A and B towards T in the zero position of the directional valve.

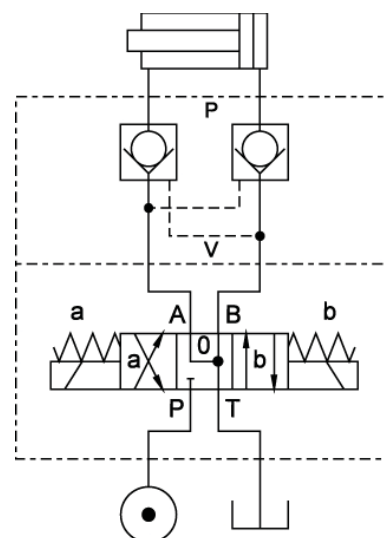
Hydraulic symbols



Features

Size		6	10
Flow rate	L/min [GPM]	60 [15.8]	100 [26.4]
Operating pressure	bar [PSI]	350 [5 076]	
Cracking pressure	bar [PSI]	1 [14.5]	0,5 [7.2]
Area ratio		1:3,9	1:3,6
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69,5 to 1.760]	
Filtration	NAS 1638	8	
Mass	kg [lb]	1,8 [3.9]	3,5 [7.7]

Mounting example



Direct operated valves

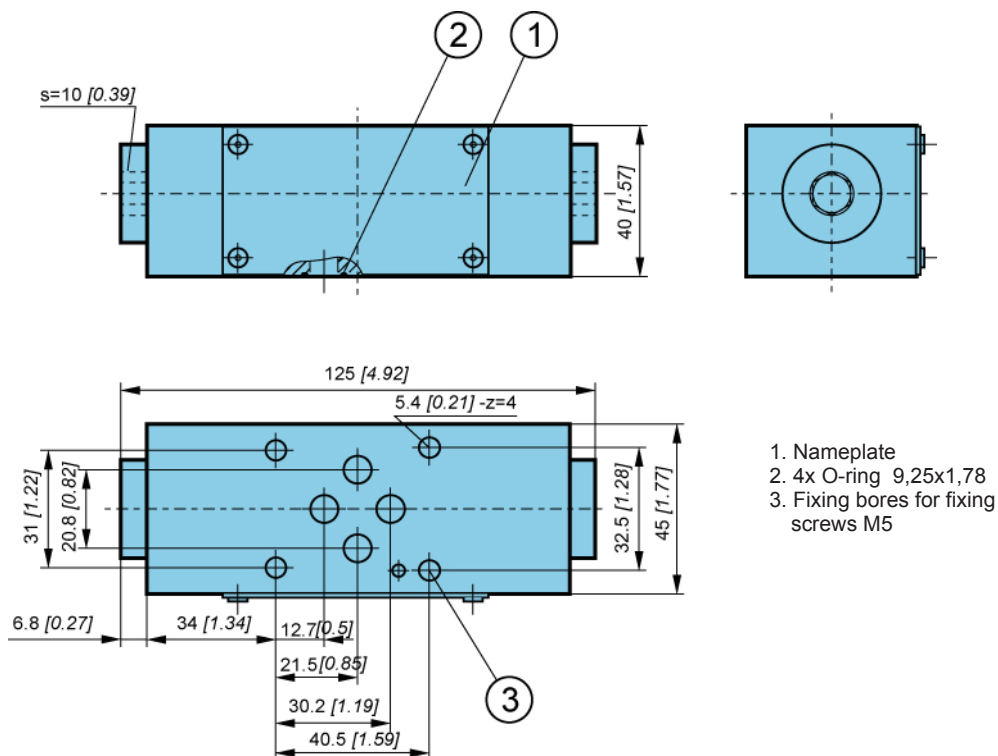
Pilot operated valves

Counterbalance valves

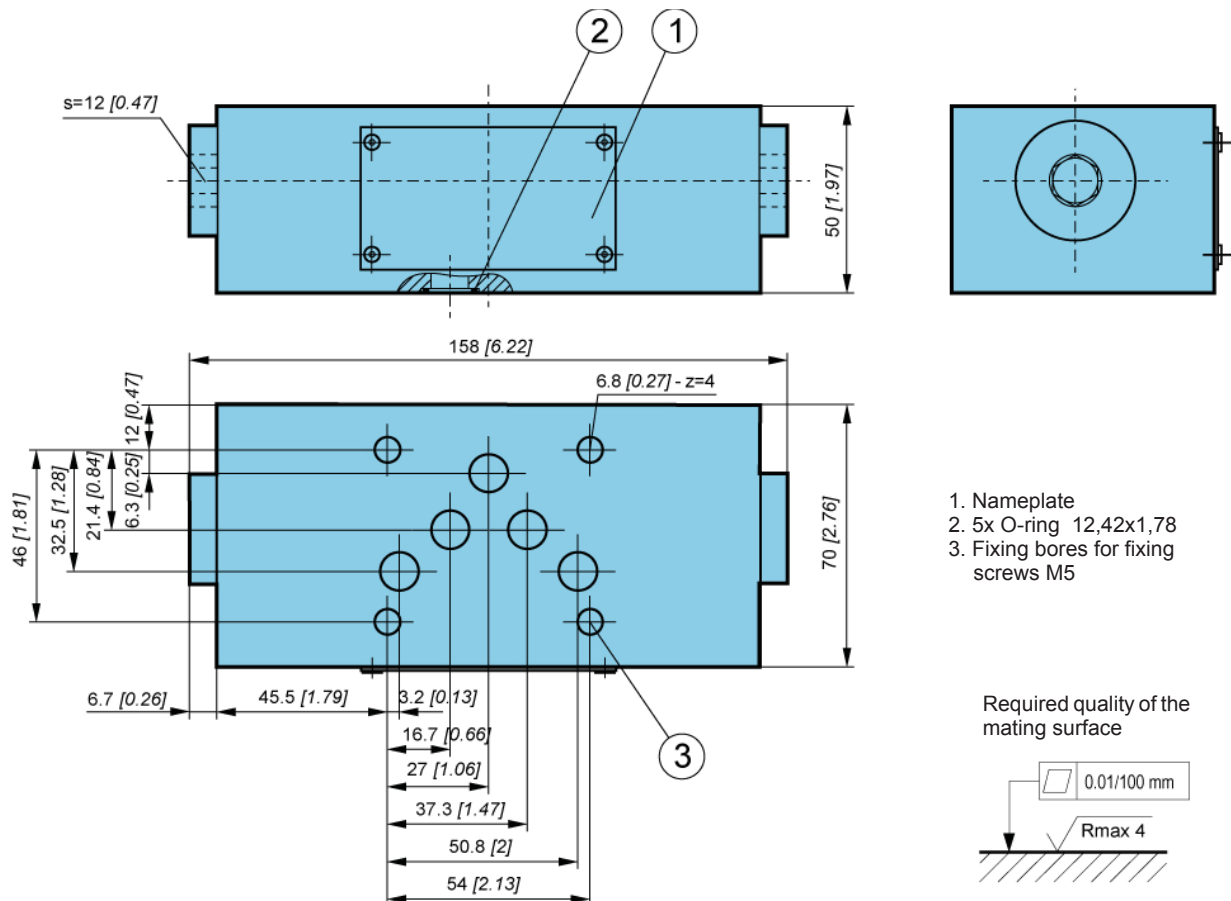


Dimensions

Size 6



Size 10

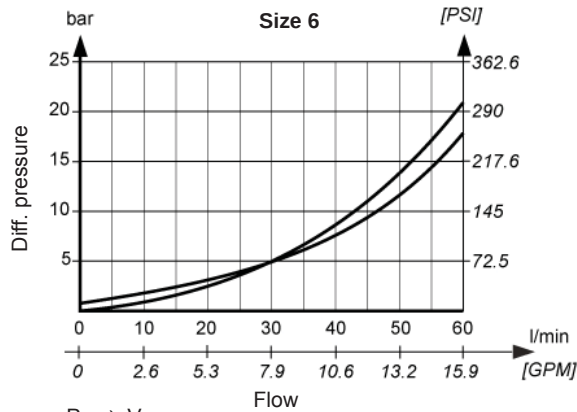




ΔP-Q Performance curves

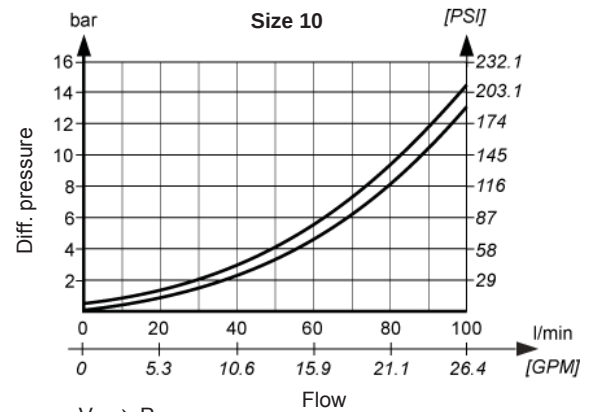
Δp - Q Performance curves of the flow in direction V to P (through check valve) and in direction P to V (check valve pilot opened with $p_x = 80$ bar).

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].



P → V
pilot opened

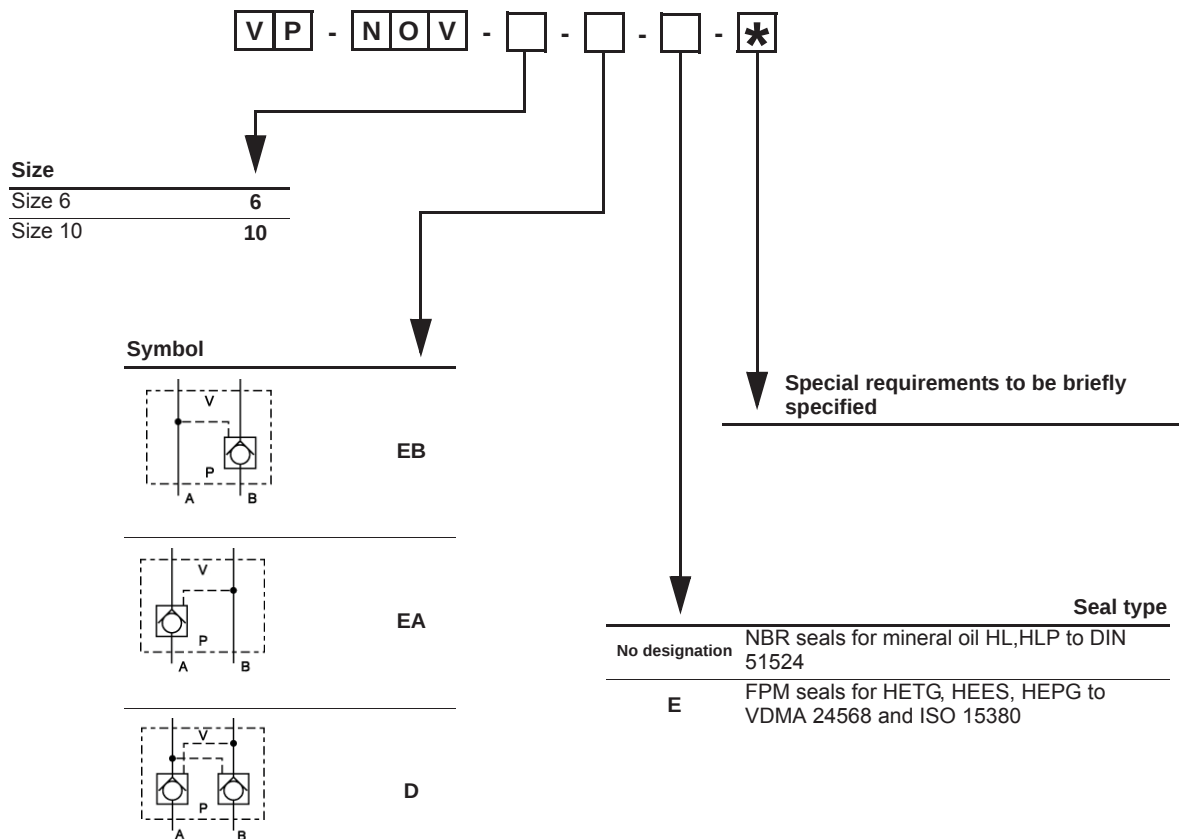
V → P
against spring force



V → P
against spring force

P → V
pilot opened

Model code

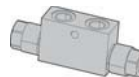


Direct operated valves

Pilot operated valves

Counterbalance valves





CHECK-Q-METER BZV

- NG 6
- Up to 270 bar [3 916 PSI]
- Up to 60 L/min [15.8 GPM]
- Hermetically sealing at closed flow path.
- Minimum pressure losses when the medium flows from port A towards port B.
- When the medium flows from port B towards port A the speed of load lowering is controlled with respect to the medium flow rate supplied to the opposite side of the hydraulic motor or cylinder. With operating cylinders the characteristic ratio of surface areas must be taken into account.
- For building into pipe-lines.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).



BZV-6-D, BZV-6-E

Operation

The check-Q-meter is used for maintaining constant speed during the lowering of loads by means of hydraulic cylinders or hydromotors in the systems where load changes with time. It prevents uncontrolled falling of load if defects occur in the pipeline between the directional control valve and the check-Q-meter or if there is no pilot pressure. When it is installed in combination with a directional control valve with negative change-over in intermediate positions, it has the function of a holding valve. If the load on hydraulic cylinders or hydromotors does not change the sign, a single check-Q-meter must be used. The check-Q-meter consists of a housing (1), main poppet (2), auxiliary spool (3), pilot poppet (4), spring (5), insert housing (7) and setting screw (8).

Lifting the load:

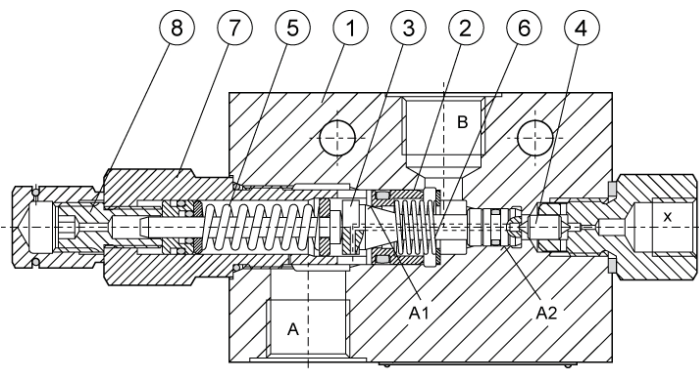
The hydraulic fluid flows from port A towards port B with minimum pressure losses, the main poppet (2) being lifted. In the case of a pressure drop and an interruption in the hydraulic fluid supply to port A, the main poppet (2) closes, holding the load in position. With the directional control valve in position (a) the hydraulic fluid flows to the annulus side of the hydraulic cylinder, which provokes a certain pilot pressure on the auxiliary spool (3). The check-Q-meter opens and thereby a free hydraulic fluid flow from port B towards port A occurs, when the main poppet (2) leans against the insert housing (7), where as the auxiliary spool (3) still performs a part of the controlled move which depends on the quantity of the hydraulic fluid supplied in a unit of time to the annulus side of the operating cylinder. In the opening direction, also the load pressure works on the circle of the predefined surface. The pilot pressure required for the opening of the check-Q-meter is:

$$\text{Required pilot pressure} = \frac{\text{safety valve setting} - \text{load pressure}}{4,25}$$

In case that the hydraulic cylinder piston starts to move faster than permitted by the hydraulic fluid supply, the pilot pressure on the port X drops and the auxiliary spool (3) under the effect of spring (5) moves in the valve closing and shutting-off direction, respectively.

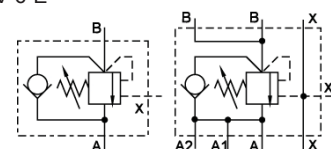
Because of the reduction in flow cross-section the resistances increase, which causes an increase in the pilot pressure and thereby a larger opening of the check-Q-meter. In this manner, the check-Q-meter is continuously balanced during lowering. The spring (5) setting force must be set at least 1.3 -times higher than the maximum force due to the operating pressure (pressure due to load):

$$\text{Max. operating pressure} = \frac{350 \text{ Bar [5076 PSI]}}{1,3} = 270 \text{ Bar [3916 PSI]}$$

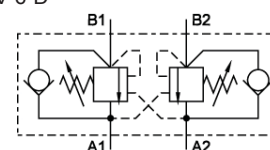


Hydraulic symbols

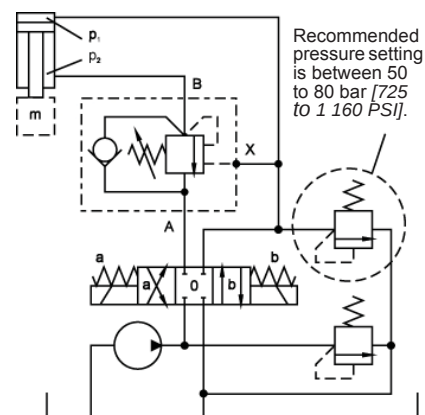
BZV-6-E



BZV-6-D



Mounting example



Because of the multiplication of pressure in hydraulic cylinder by the difference of surface areas:

$$p_2 = p_m + p_1 \times \varphi \quad \varphi = A_1/A_2 > 1$$

It is recommended to protect the circuit by means of a pressure relief valve, the cracking pressure of which is set with respect to the selected spring (5) in the BZV.

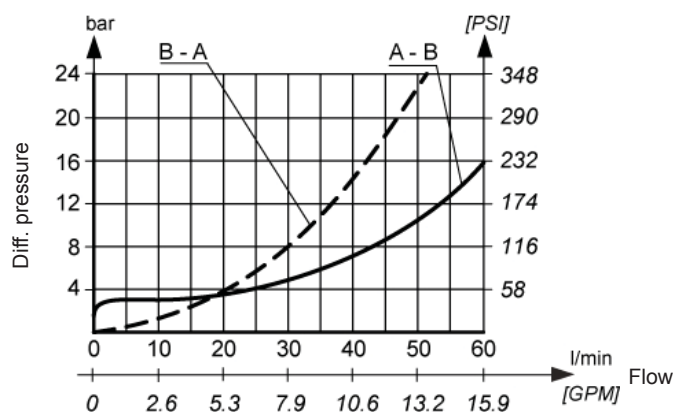


Features

Size		BZV-6-E	BZV-6-D
Flow rate	L/min [GPM]	60 [15.8]	
Operating pressure	spring 200 bar [2.900 PSI]	150 [2 175]	
	spring 350 bar [5076 PSI]	270 [3 916]	
Pilot pressure	spring 200 bar [2.900 PSI]	4 to 50 [58 to 725]	
	spring 350 bar [5076 PSI]	6 to 85 [87 to 1.232]	
Cracking pressure	bar [PSI]	2,2 [31.9]	
Pilot ratio	$R = A2/A1-A2$	4,25	
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69,5 to 1.760]	
Filtration	NAS 1638	8	
Mass	kg [lb]	1,5 [3.30]	2,4 [5.29]

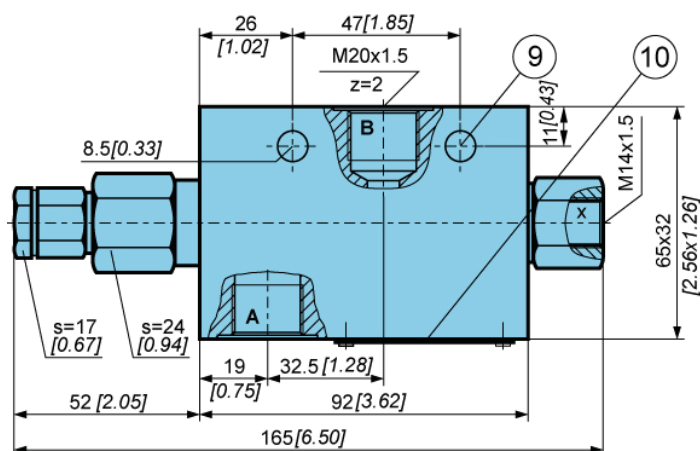
ΔP-Q Performance curves

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].



Dimensions

BZV-6-E-...-C

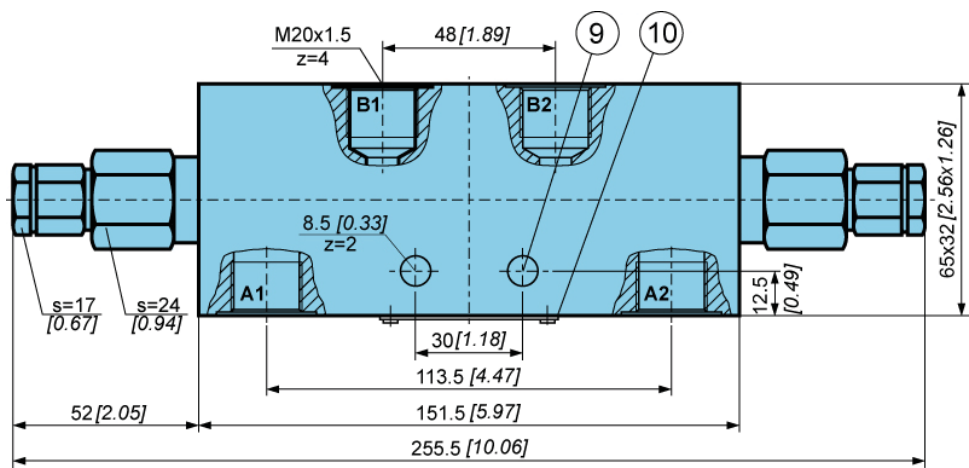


9. Fixing screw
10. Nameplate



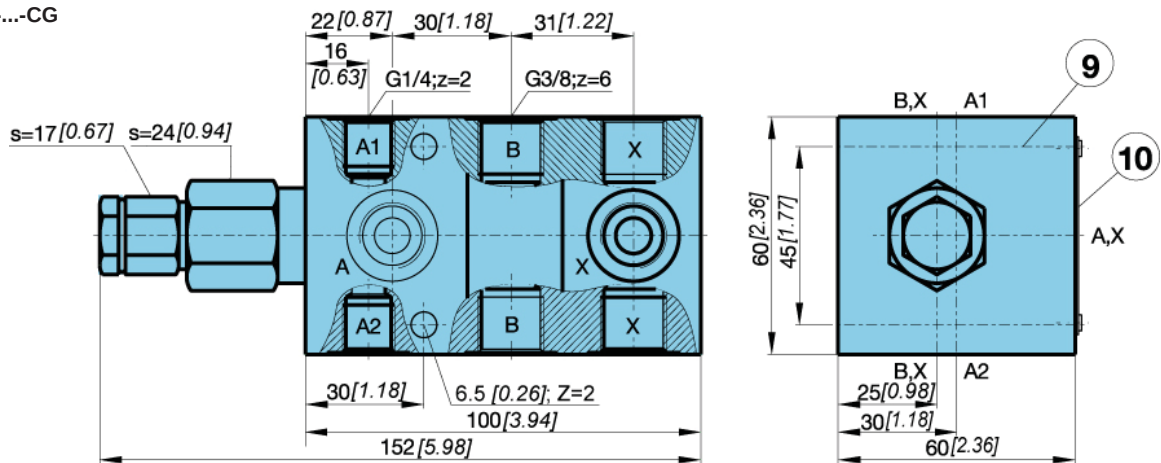
Dimensions

BZV-6-D-...-C



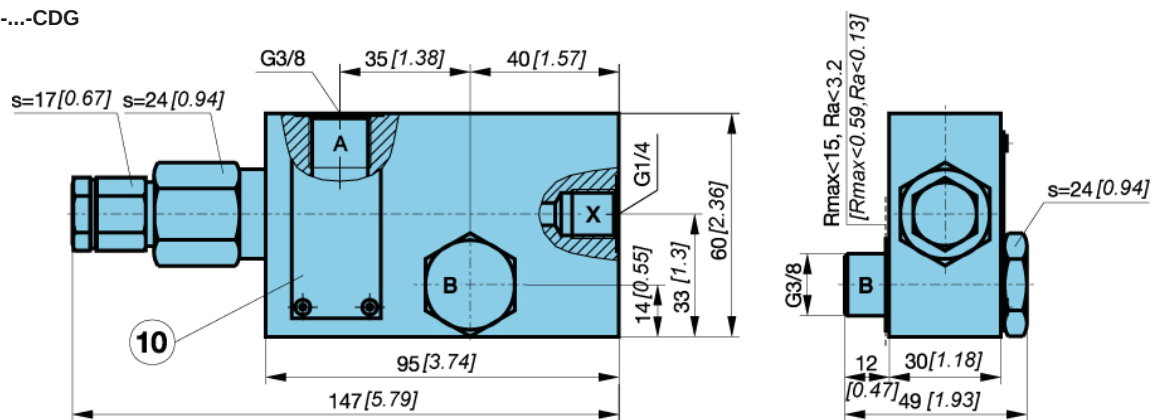
9. Fixing screw
10. Nameplate

BZV-6-E-...-CG



9. Fixing screw
10. Nameplate

BZV-6-E-...-CDG



10. Nameplate

Direct operated valves

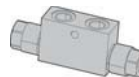
Pilot operated valves

Counterbalance valves



Model code





CHECK-Q-METER MODULAR VALVE VP-BZV

- NG 6
- Up to 270 bar [3 916 PSI]
- Up to 30 L/min [7.9 GPM]
- Connecting dimensions to ISO 4401.
- Modular plate design for vertical stacking.
- Height and width of the valve according to ISO 7790.

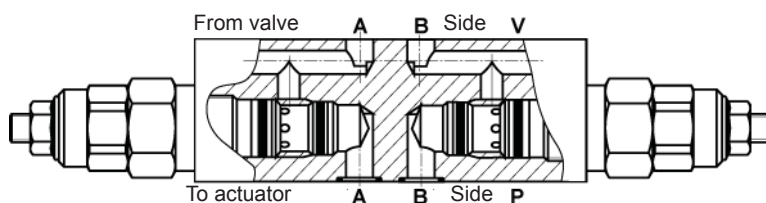


VP-BZV-6

Operation

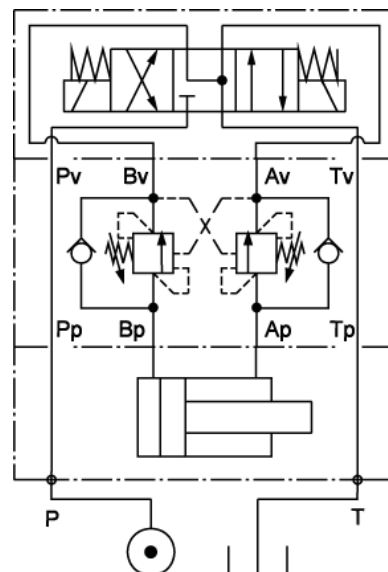
Modular check-Q-meter valve in combination with other stacking elements gives static and dynamic load control by regulating the flow into and out of hydraulic actuators. It prevents load uncontrol run away and allows thermal expansion relief of the hydraulic fluid. Flow in line B (A) from side P to V is allowed when the required pilot pressure in line A (B) is induced. For stable valve function the valve must be set (Ps) at least 1.3 - times higher than maximum expected load pressure (PL).

$$\text{Required pilot pressure (PR)} = \frac{\text{Counterbalance valve setting (Ps) - load pressure (PL)}}{\text{Pilot ratio (R)}}$$



Hydraulic symbol

Mounting example



Features

Size		6 (single valve)	6 (double valve)
Flow rate	L/min [GPM]		30 [7.9]
Operating pressure	bar [PSI]		270 [3 916]
Cracking pressure	bar [PSI]		1 [14.5]
Oil temperature range	°C [°F]		-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]		15 to 380 [69,5 to 1.760]
Filtration	NAS 1638		8
Mass	kg [lb]	1,3 [2.9]	1,8 [4.00]

Direct operated valves

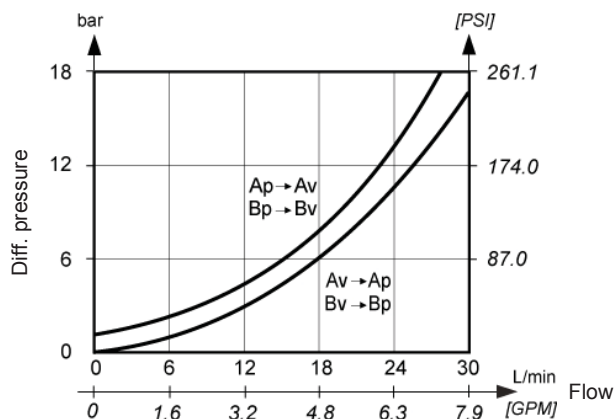
Pilot operated valves

Counterbalance valves



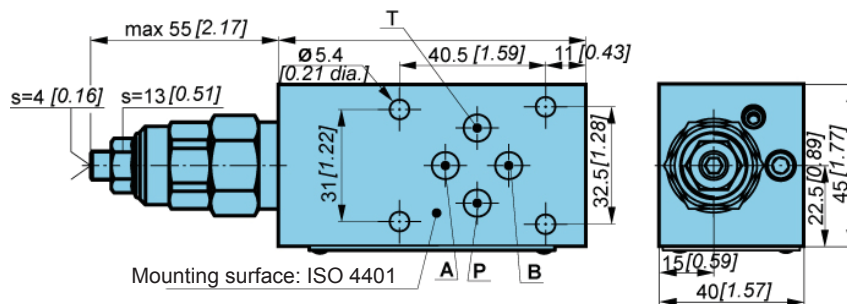
ΔP-Q Performance curves

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].

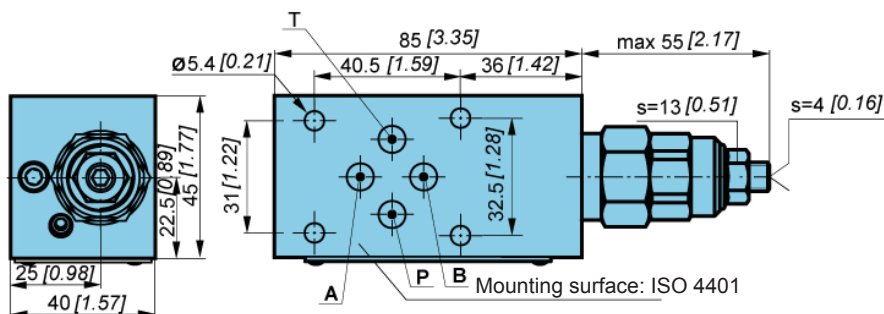


Dimensions

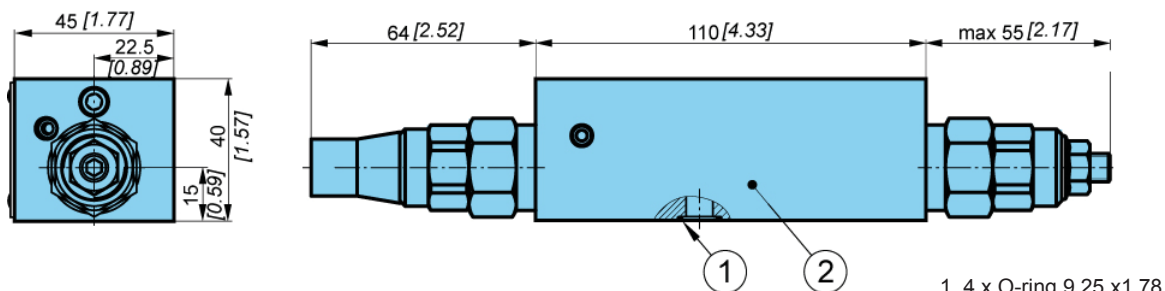
EAN, EAP, EAT



EBN, EBP, EBT

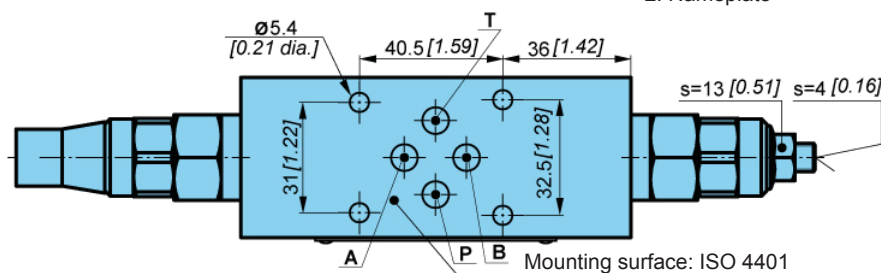
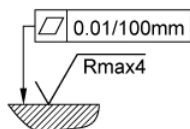


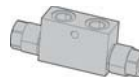
DN, DP, DT



- 1. 4 x O-ring 9.25 x 1.78
- 2. Nameplate

Required quality of the mating surface





Model code

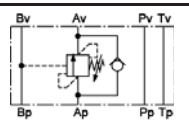
V P - B Z V - 6 - - - 04 - - - *

Size

Size 6

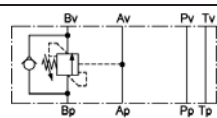
6

Symbol



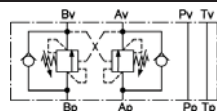
EAN

Single standard valves



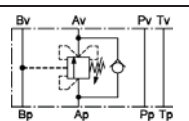
EBN

Double standard valves

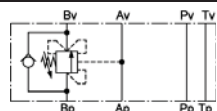


DN

Single relief compensated valves

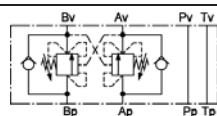


EAP



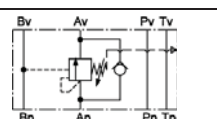
EBP

Double relief compensated valves

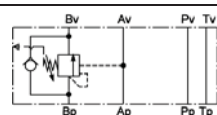


DP

Single atmospheric vented valves

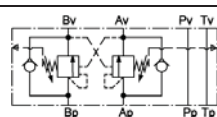


EAT



EBT

Double atmospheric vented valves



DT

Special requirements to be briefly specified

Seal type

No designation NBR seals for mineral oil HL, HLP to DIN 51524

E FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Tamperproff cap

No designation Without tamperproff cap

RC With tamperproff cap

Pilot ratio

04 4:1

Pressure setting range

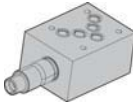
	Adjusted pressure range bar [PSI]	Pressure increase bar [PSI] /turn	Standard setting bar [PSI] (Q= 5 l/min [1,32 GPM])
20	100 to 210 [1 450 to 3 045]	109 [1 580]	200 [2 900]
35	200 to 350 [2 900 to 5 076]	137 [1 987]	350 [5 076]

Direct operated valves

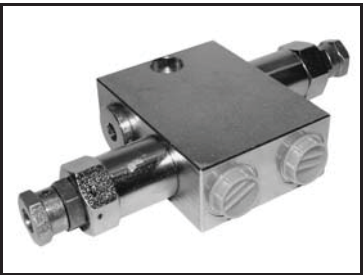
Pilot operated valves

Counterbalance valves





PRESSURE CONTROL VALVES

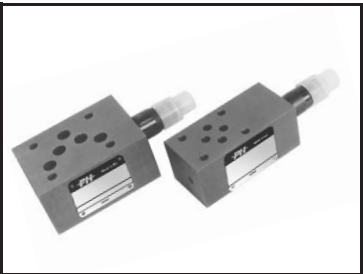


DIRECT OPERATED VALVES

- Pressure relief valve VVP (NG 6, 10)
- Pressure relief valve VVB2-10 (NG 6)

29
29
33

Direct operated valves

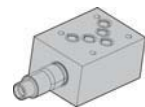


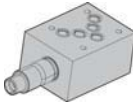
PILOT OPERATED VALVES

- Pressure relief valve RT (NG 6, 10)
- Pressure relief valve VP-RT (NG 6, 10)

37
37
41

Pilot operated valves





PRESSURE RELIEF VALVE VVP

- NG 6, 10
- Up to 400 bar [5 801 PSI]
- Up to 120 L/min [31.7 GPM]
- For fitting into a block.
- For independent mounting (when assembled with connection block P-VVP).
- Two pressure setting elements (set screw, rotary knob).



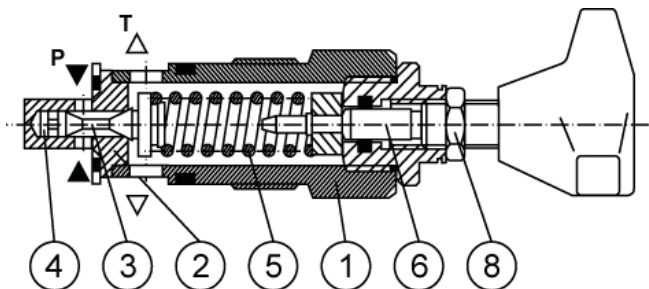
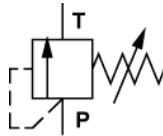
VVP-6, VVP-10

Operation

These valves consist of a housing (1), a hardened seat (2), a poppet (3), with a damping spool (4), a spring (5), and a pressure setting element (6). The P-line of this pressure relief valve is connected with the hydraulic system. The pressure of the hydraulic fluid acts on the front side of the pilot poppet (3), and the force of the spring (5) set by the pressure setting element (6) is applied to the poppet from the opposite side. When the system pressure exceeds the valve of the spring set by the pressure setting element (6) the pilot poppet moves off the seat (2), and frees the flow of the hydraulic fluid in the direction from P towards T.

The damping spool (4) prevents vibrations of the pilot poppet when opening or closing the flow way of the hydraulic flow. Loosening of the pressure setting element is prevented by a counter nut (8).

Hydraulic symbol



Direct operated pressure relief valves type VVP are used to maintain and limit the pressure in a hydraulic system.

Features

Size		6	10
Flow rate	L/min [GPM]	50 [13.2]	120 [31.7]
Pressure setting range	bar [PSI]	400 [5 801]	
Oil temperature range	°C [°F]	-30 to +70 [-22 to + 158]	
Viscosity range	mm ² /s [SUS]	2,8 to 380 [12.9 to 1760]	
Filtration	NAS 1638	8	
Mass	Execution A	0,4 [0.88]	0,5 [1.10]
	Execution B	0,5 [1.10]	0,6 [1.32]

Direct operated valves

Pilot operated valves



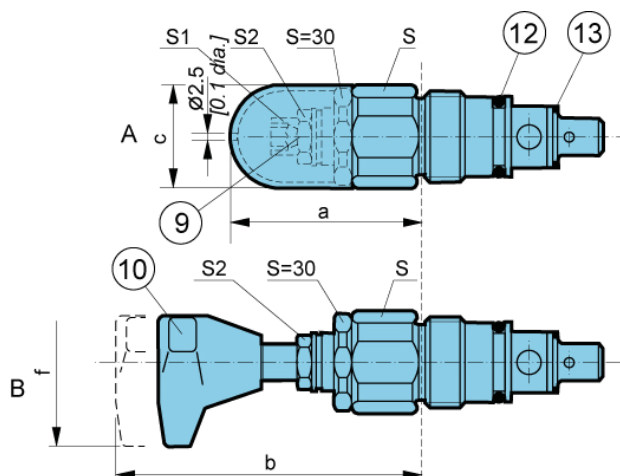
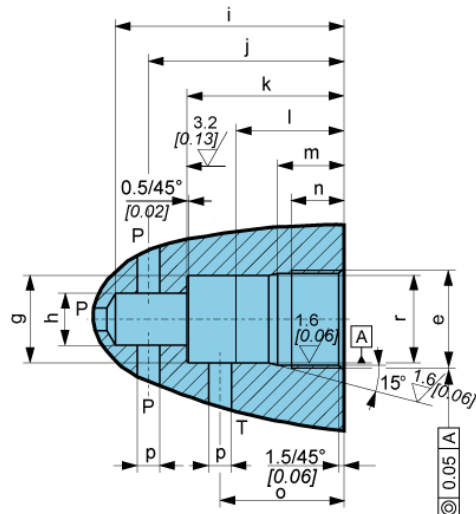
Dimensions

Tightening torque for fixing:

Nominal size 6 Md=80 Nm [708 in.lbf].

Nominal size 10 Md=140 Nm [1 239 in.lbf].

Customer specified setting can be secured by means of a stamp and a wire.



9. Pressure setting by screw and protective cap.

10. Pressure setting by rotary knob.

12. O-ring, nominal size 6, 19,2 x 3.

O-ring, nominal size 10, 26 x 3.

13. Usit ring, nominal size 6, 17,4 x 24 x 1,5.

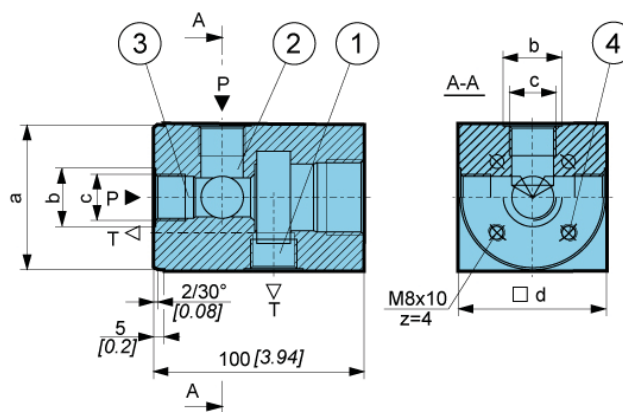
Usit ring, nominal size 10, 24,7 x 31 x 2.

Type	a	b	Øc	e	Øf	Øg	Øh	i	j	k	l	m	n	o	Øp	Ør	s	s1	s2
VVP-6	72 [2.83]	94 [3.70]	34 [1.34]	M28x 1,5	60 [2.36]	24,9 [0.98]	15 [0.59]	65 [2.56]	56,5 [2.22]	45 [1.77]	30 [1.18]	19 [0.75]	15 [0.59]	35 [1.38]	6 [0.24]	25H9	32 [1.26]	6 [0.24]	19 [0.75]
VVP-10	68 [2.67]	90 [3.54]	38 [1.50]	M35x 1,5	60 [2.36]	31,9 [1.25]	18,5 [0.73]	80 [3.15]	67,5 [2.66]	52 [2.05]	35 [1.38]	23 [0.90]	18 [0.71]	41 [1.61]	10 [0.39]	32H9	36 [1.42]		

Connecting dimensions / connection P-VVP-6, P-VVP-10

When fitting, the excess ports for oil supply and discharge must be closed by means of suitable screw.

1. Oil discharge when fitted independently.
2. Oil supply when fitted independently.
3. Oil supply when fitted on a tank cover.
4. Oil discharge when fitted on a tank cover.



Size	Øa	Øb	c	□d	Masse kg [lb]
6	59 d9 [2.32]	24 [0.94]	M18x1,5	60 [2.36]	2,5 [5.51]
10	69 d9 [2.72]	28 [1.10]	M22x1,5	70 [2.76]	2,9 [6.39]

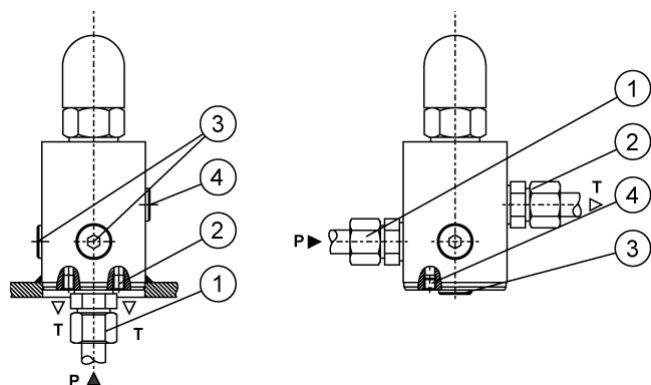
Model code

P - VVP -

Size

Size 6 **6**

Size 10 **10**

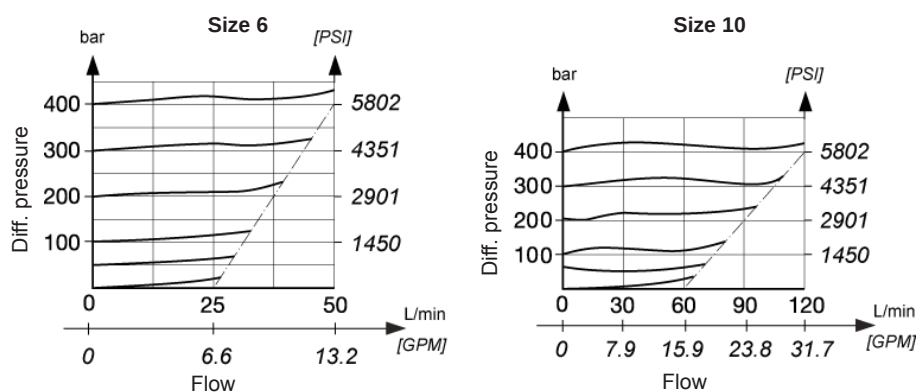


1. Port "P".
2. Return line "T".
3. Locking screws - P line.
4. Locking screws - T line.

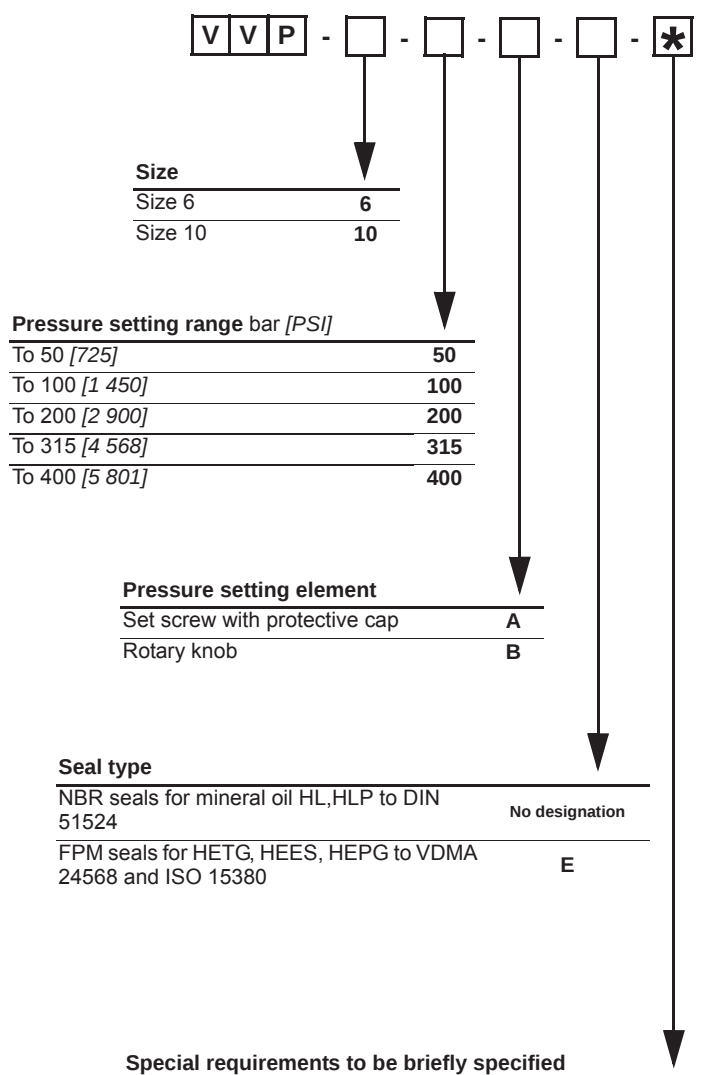


ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

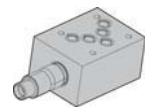


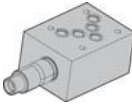
Model code



Direct operated valves

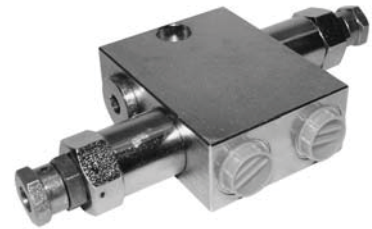
Pilot operated valves





PRESSURE RELIEF VALVE VVB2-10

- NG 6
- Up to 210 bar [3,045 PSI]
- Up to 60 L/min [15,8 GPM]
- Direct in-line mounting.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas).
- Five different pressure setting elements.

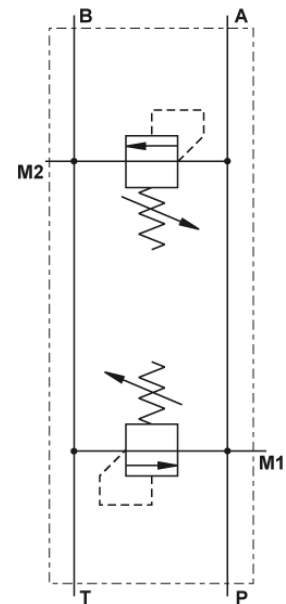


VVB2-10-...

Features

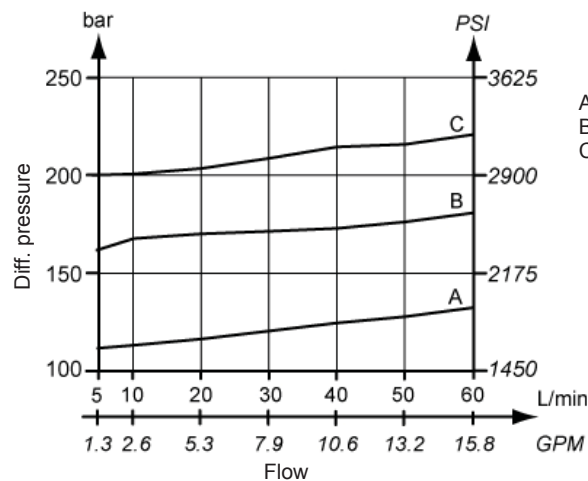
Size	10	
Operating pressure	bar [PSI]	210 [3 045]
Flow rate	L/min [GPM]	60 [15.8]
Pressure setting range	bar [PSI]	120 [1 740]; 160 [2 320]; 200 [2 900]
Oil temperature range	°C [°F]	-10 to +70 [14 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to +1,760]
Filtration	ISO 4406-1999	19/17/14
Mass	kg [lb]	1.85 [4.08]
Seal type	NBR seals for mineral oil HL, HLP, to DIN 51524	

Hydraulic symbol



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

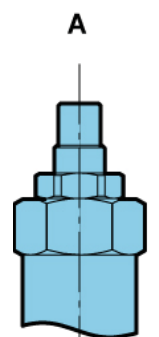
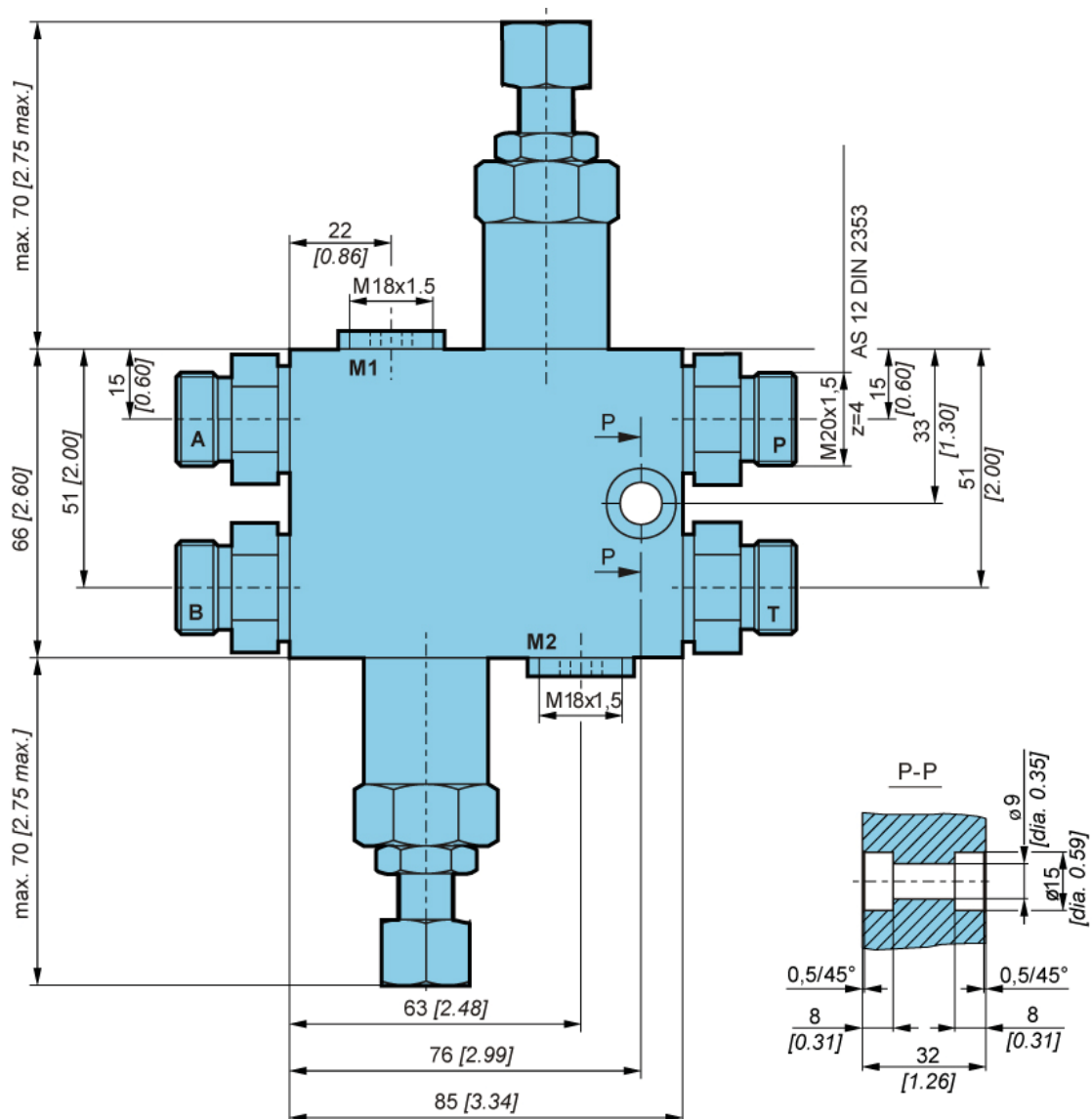


A = 120 bar [1740 PSI]
 B = 160 bar [2320 PSI]
 C = 200 bar [2900 PSI]

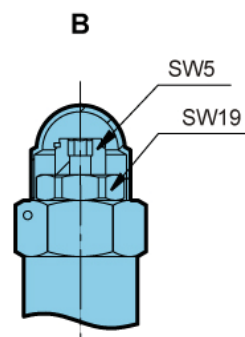
Direct operated valves

Pilot operated valves

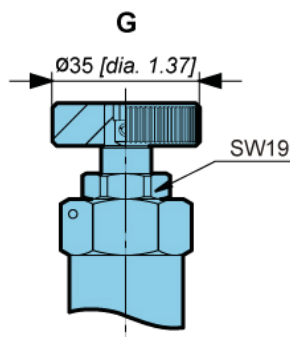
Dimensions



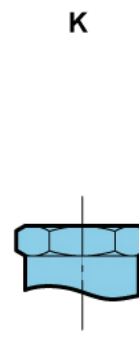
Inner hexagonal
key



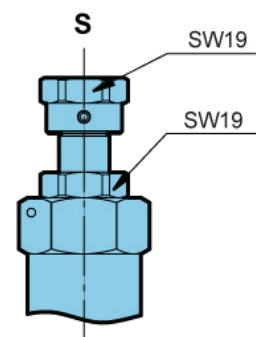
Inner hexagonal
key and
protective cap



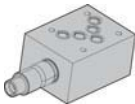
Knob



Fixed setting



Exterior key



Model code

V V B 2 - 1 0 - - - *

Pressure setting range bar [PSI]	
120 [1740]	120
160 [2 320]	160
200 [2 900]	200

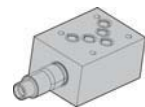
Pressure setting element	
Inner hexagonal key	A
Inner hexagonal key and protective cap	B
Knob	G
Fixed setting	K
Exterior key	S

Threaded connections	
M18 x 1,5	No designation
G 3/8	3/8

Special requirements to be briefly specified

Direct operated valves

Pilot operated valves





PRESSURE RELIEF VALVE RT

- NG 4, 6, 10
- Up to 315 bar [4 568 PSI]
- Up to 100 L/min [26.4 GPM]
- For independent fitting into a block.
- Two pressure setting ranges.



RT-4, RT-6, RT-10

Operation

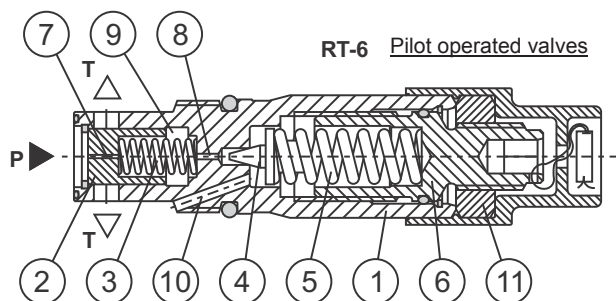
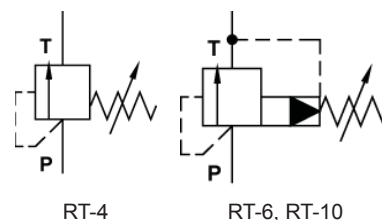
Pilot operated pressure relief valves type RT are used for maintaining and limiting the pressure in a hydraulic system.

These valves consist of a housing of cartridge design (1), main spool insert (2) with a spring (3), pilot poppet (4), spring (5) and pressure setting element (6).

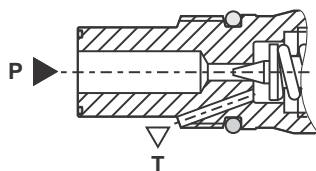
The P-line of this pressure relief valve is connected with the hydraulic system. The hydraulic medium pressure acts on the front side of the main spool insert. The bores (7,8) permit the introduction of pilot oil into the pressure chamber (9) and the application of pressure to the opposite side of the main spool insert and the front side of the pilot poppet. The pressure balance in the system and pressure chamber holds this pressure relief valve in closed position till the pressure in system exceeds this value the pilot poppet moves off the valve seat, freeing the pilot oil discharge through the bore (10). A pressure drop in the pressure chamber rises the main spool insert, thus clearing the hydraulic medium flow way in the direction from P towards port T.

Loosening of the pressure setting element (6) is prevented by a counter nut (11).

Hydraulic symbol



RT-4 Direct operated valves

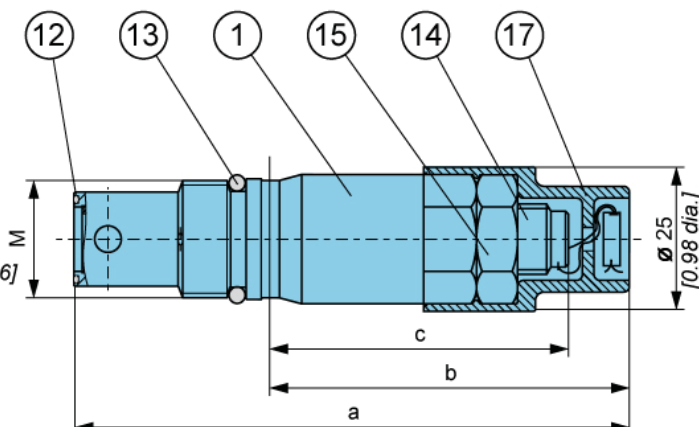
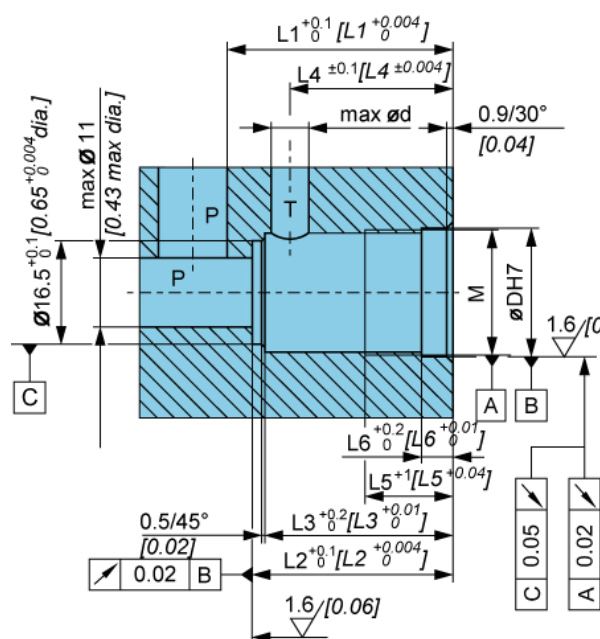


Features

Size		4	6	10
Flow rate	L/min [GPM]	4 [1.1]	60 [15.8]	100 [26.4]
Pressure setting range	bar [PSI]	315 [4 568]		
Oil temperature range	°C [°F]	-20 to +70 [-4 to + 158]		
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to + 1,760]		
Filtration	NAS 1638	8		
Mass	kg [lb]	0,15 [0.33]	0,18 [0.40]	



Dimensions



1. Housing.
12. O-ring 13x1.
13. O-ring, size 4,6 16.3x2,4.
size 10 20x2,5.
14. Pressure setting element.
15. Counternut.
17. PE cover.

Tightening torque for fixing $M_d=30 \text{ Nm}$.

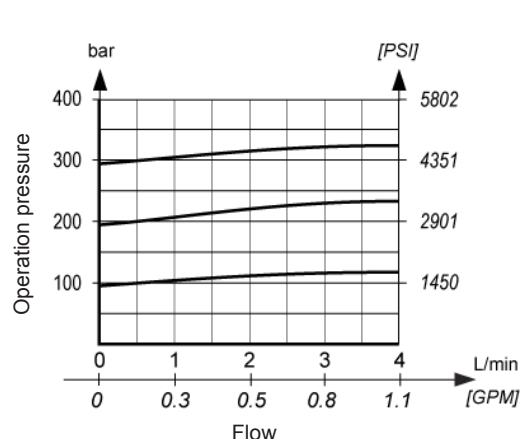
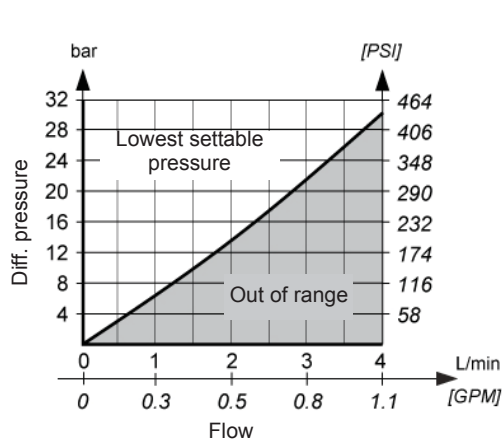
The value set on the pressure setting element is protected by means of a lead stamp $\varnothing 11$ and a wire $\varnothing 1,1 \text{ mm}$.

Note: Ports P and T can be located optionally at any place on the circumference.

Size	a	b	c	d	D	L1	L2	L3	L4	L5	L6	M
4, 6	96 [3.78]	64 [2.52]	53 [2.09]	6 [0.24]	20,5 [0.81]	36 [1.42]	32 [1.26]	30 [1.18]	26 [1.02]	14 [0.55]	4,8 [0.19]	M20x1
10	97 [3.82]	61 [2.40]	50 [1.97]	10,5 [0.41]	24,5 [0.96]	40 [1.57]	36 [1.42]	34 [1.34]	29,7 [1.17]	15 [0.59]	5,2 [0.20]	M24x1

ΔP -Q Performance curves

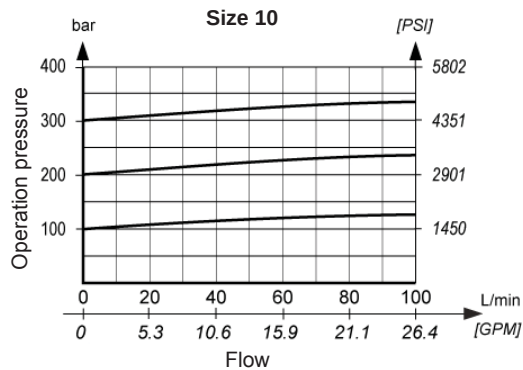
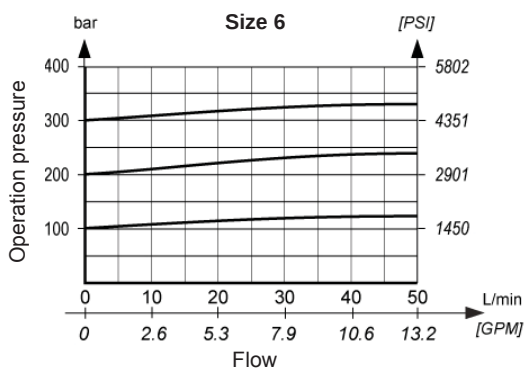
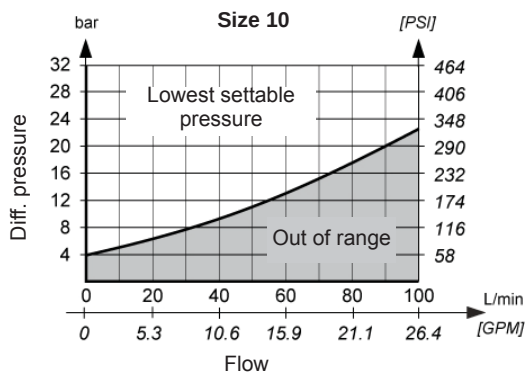
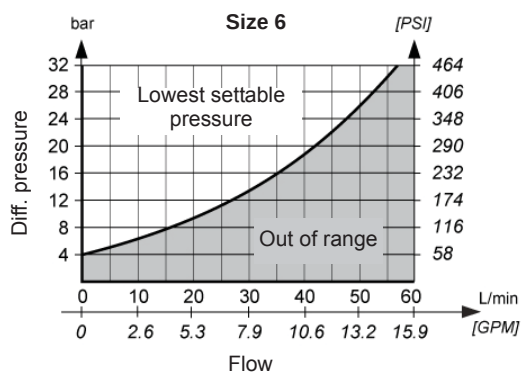
Measured at 50°C [122°F] and viscosity of $32 \text{ mm}^2/\text{s}$ [148 SUS].



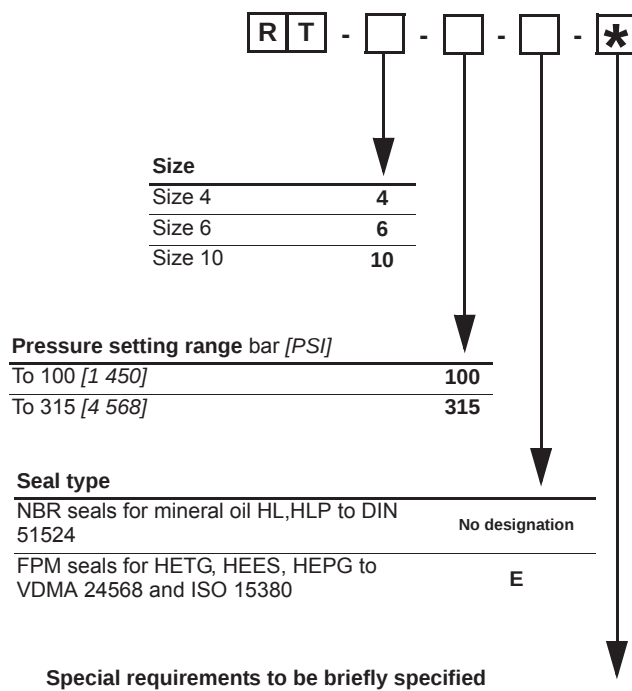


ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

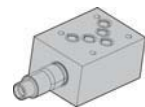


Model code



Direct operated valves

Pilot operated valves





PRESSURE RELIEF VALVE VP-RT

- NG 6, 10
- Up to 315 bar [4 568 PSI]
- Up to 100 l/min [26.4 GPM]
- Connecting dimensions to ISO 4401.
- For vertical stacking - sandwich plate design.
- Two pressure setting ranges.



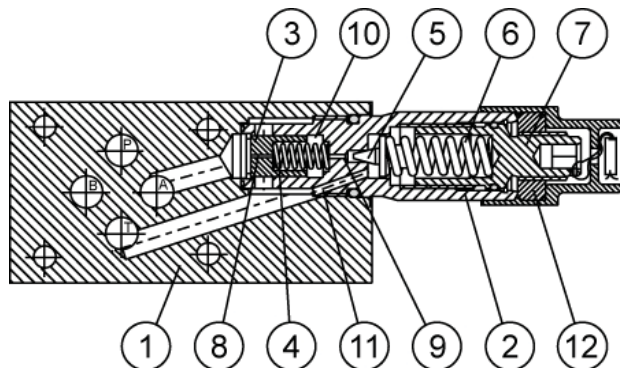
VP-RT-10, VP-RT-6

Operation

These valves consist of a stack plate (1), pressure relief valve housing (2), main spool insert (3) with a spring (4), pilot poppet (5), spring (6) and pressure setting element (7). The P-line of this pressure relief valve is connected with the hydraulic system. The hydraulic medium pressure acts on the front side of the main spool insert (3). The bores (8,9) permit the introduction of pilot oil into the pressure chamber (10) and the application of pressure to the opposite side of the main spool insert.

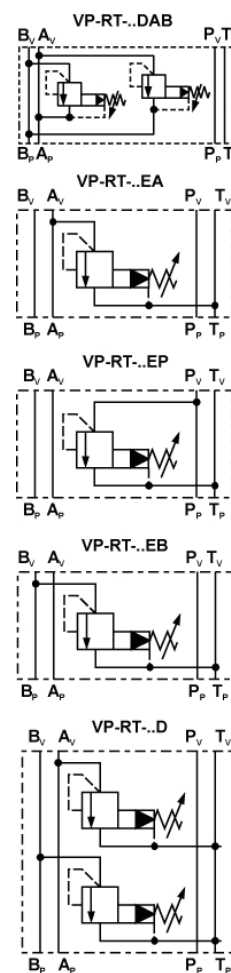
This pressure relief valve remains in closed position till the system pressure exceeds the valve set at the spring (6). A pressure rise in the system above the value set by the pressure setting element (7), provokes the movement of the pilot poppet (5) of the seat, freeing the pilot oil discharge through the bores (9) and (11). A pressure drop in the pressure chamber (10) rises the main spool insert (3), thus clearing the hydraulic medium flow in the direction from port P towards port T.

Loosening of the pressure setting element is prevented by a counternut (12).



Pilot operated pressure relief valves type VP-RT of sandwich plate design, for vertical stacking, are used for maintaining and limiting the maximum pressure in a hydraulic system.

Hydraulic symbol



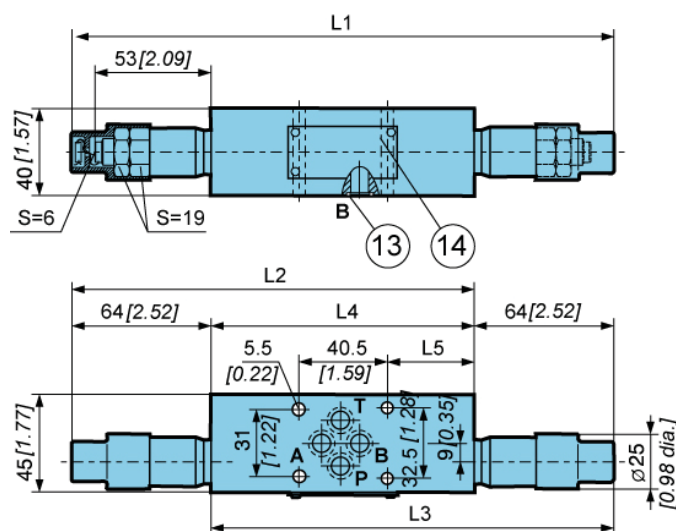
Features

Size		6	10
Flow rate	L/min [GPM]	50 [13.2]	100 [26.4]
Pressure setting range	bar [PSI]	315 [4 568]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to + 1,760]	
Filtration	NAS 1638	8	
Mass	kg [lb]	1,2 [2,64] - 1,7 [3,75] (D)	2,6 [5.73]



Dimensions

VP-RT-6

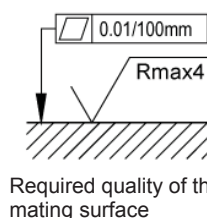


13. O-ring, Size 6: 9,25x1,78

Size 10: 12x2.

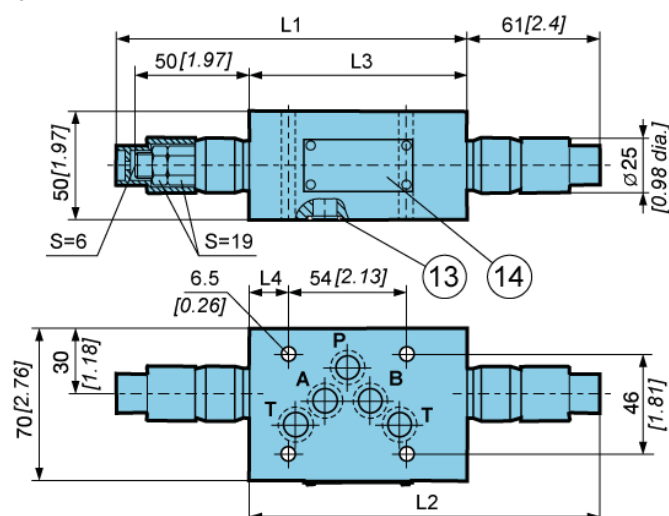
14. Nameplate

The value set on the pressure setting element is protected by means of a lead stamp Ø11 [0.43 dia.] and a wire Ø1,1 [0.04 dia.].



Required quality of the mating surface

VP-RT-10

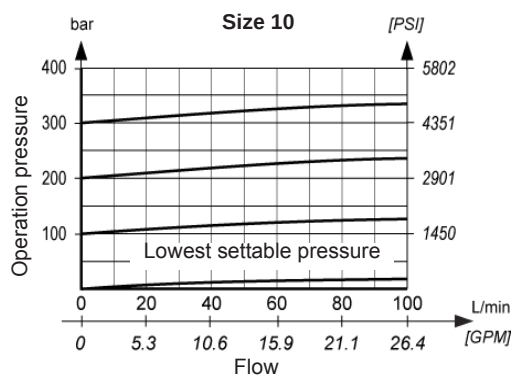
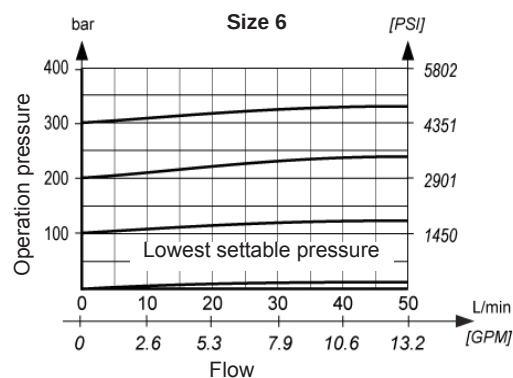
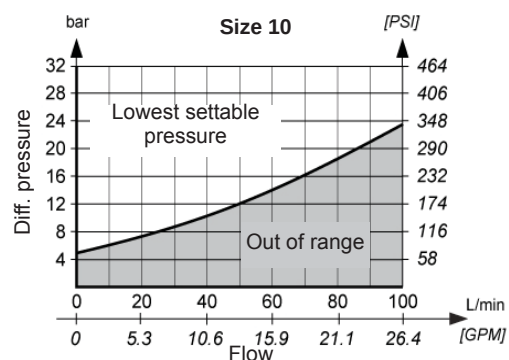
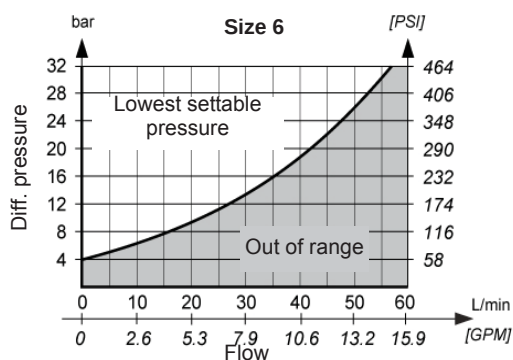


Size	L1	L2	L3	L4	L5
VP-RT-6-EA	-	154 [6.06]	-	-	9 [0.35]
VP-RT-6-EB	-	-	154 [6.06]	90 [3.54]	40,5 [1.59]
VP-RT-6-EP	-	-	-	-	-
VP-RT-6-D	249 [9.80]	-	-	121 [4.76]	40 [1.57]
VP-RT-6-DAB	245 [9.64]	-	-	116,5 [4.59]	38 [1.50]
VP-RT-10-EP	156 [6.14]	-	95,5 [3.76]	28,5 [1.12]	-
VP-RT-10-EA	161 [6.34]	-	-	-	-
VP-RT-10-EB	-	161 [6.34]	100,5 [3.96]	18 [0.71]	-



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

V P - R T - - - - *

Size

Size 6	6
Size 10	10

Relief function from → to

A → T	EA
B → T	EB
P → T	EP
A → T and B → T (only for size 6)	D
A → B and B → A (only for size 6)	DBA

Pressure setting range bar [PSI]

100 [1 450]	100
315 [4 568]	315

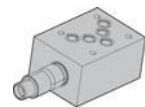
Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Direct operated valves

Pilot operated valves





FLOW CONTROL VALVES



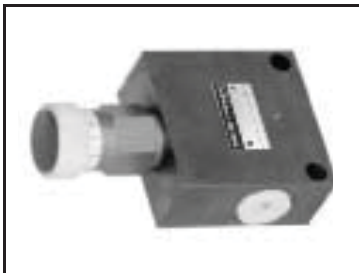
THROTTLE WITH CHECK VALVES

Throttle with check valve VP-NDV (NG 6, 10)

47

47

Throttle with Check valves



FLOW CONTROL VALVES PRESSURE COMPENSATED

Flow control valve TVTC (NG 6)

Flow control valve TVTP-...-B-... (NG 6, 10)

Flow control valve TVTP-...-P-... (NG 6, 10)

51

51

55

59

Flow control valves pressure compensated



FLOW DIVIDERS

Flow divider DTP (NG 6, 10)

63

63

Flow dividers





THROTTLE WITH CHECK VALVE VP-NDV

- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 100 L/min [26.4 GPM]
- Connecting dimensions to ISO 4401.
- For flow control in both service lines.
- For throttling in supply - and return lines.
- For vertical stacking - sandwich plate design.
- Height and width of the valves to ISO 7790 norms.



VP-NDV-10-..., VP-NDV-6-..

Operation

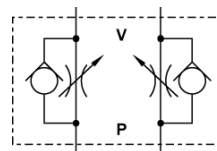
Throttle with check valves type VP-NDV are used for throttling the pilot and main flow of the hydraulic fluid in the line A and B.

These valves consist of two throttling spools with setting screws and two check valves which are built in a housing.

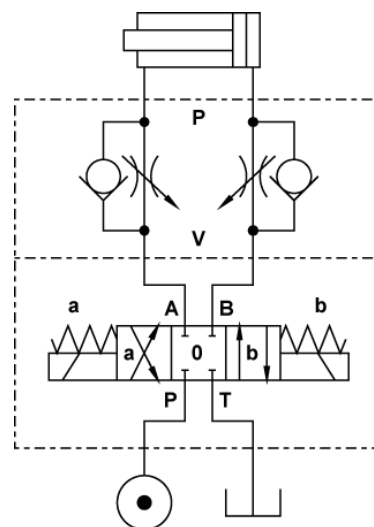
In direction V to P (see the hydraulic symbol) flows the hydraulic fluid with low pressure loss through the check valve.

In direction P to V is the hydraulic fluid flow throttled depending on adjustment of the throttling spool.

Hydraulic symbol



Mounting example



Features

Size		6	10
Flow rate	L/min [GPM]	60 [15.8]	100 [26.4]
Operating pressure	bar [PSI]	350 [5 076]	
Cracking pressure	bar [PSI]	0,4 [5.8]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]	
Filtration	NAS 1638	8	
Mass	kg [lb]	1,45 [3.20]	3,3 [7.28]

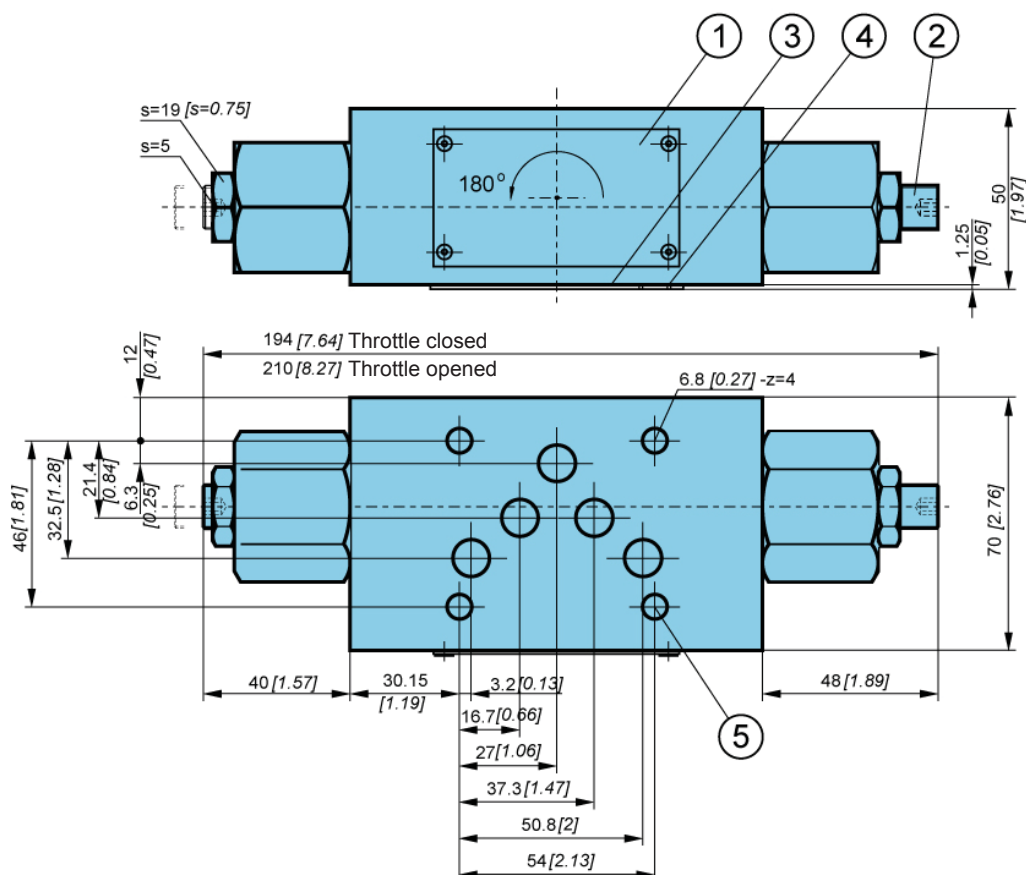
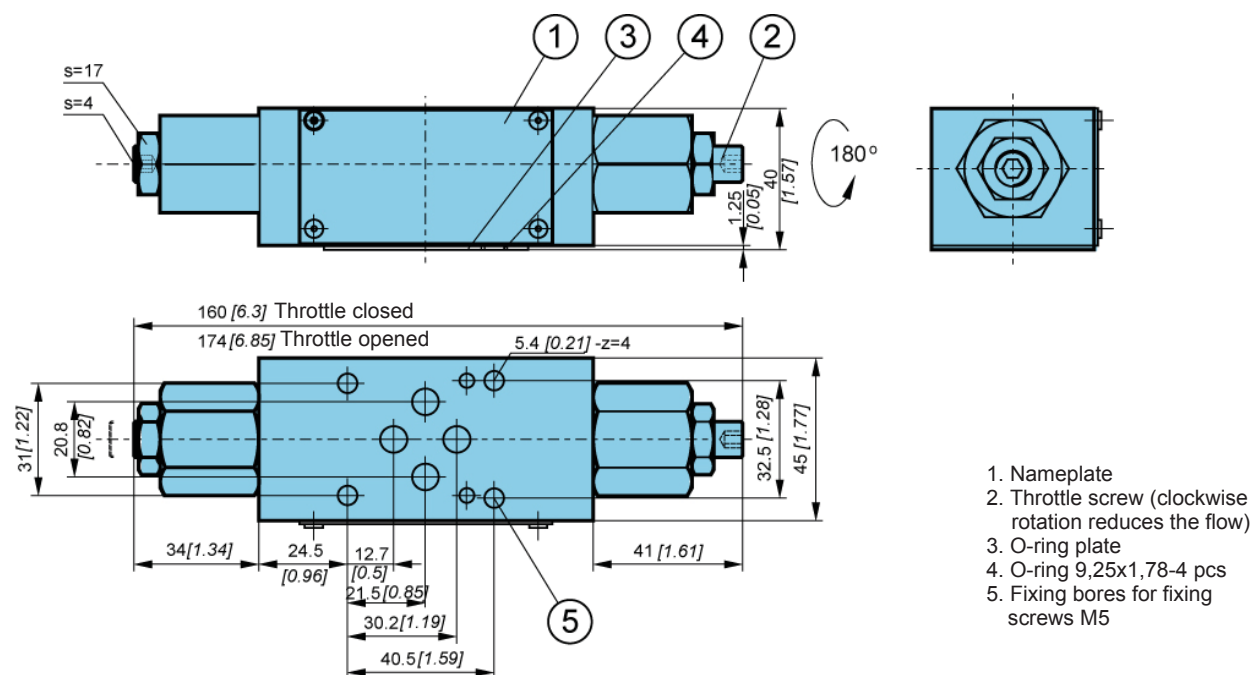
Throttle with Check valves

Flow control valves pressure compensated

Flow dividers



Dimensions

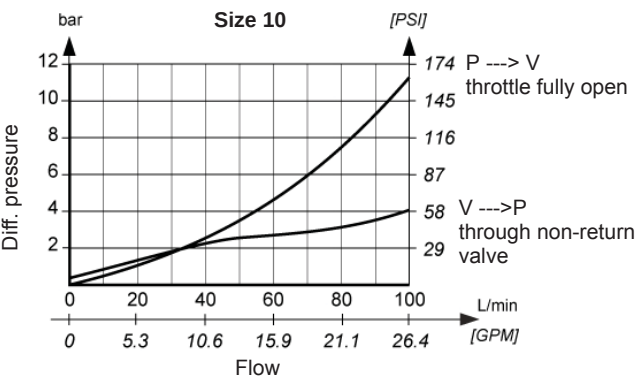
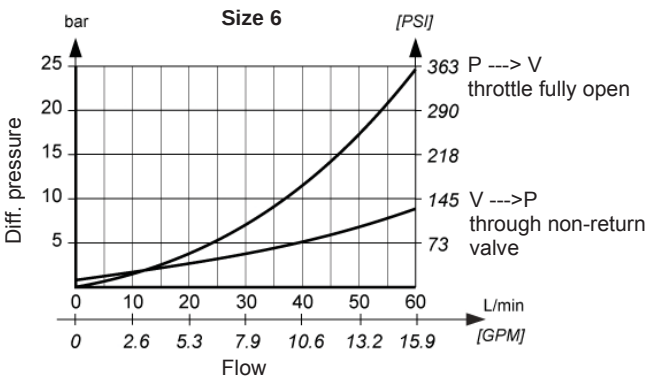


Assembly instructions

Throttle/check valves type VP-NDV are designed for vertical stacking. With these valves there can be throttling of the hydraulic fluid flow in return line or supply line achieved. Direction of throttling can be selected by turning the installation position of the valve i.e. valves size 6 turning 180° around the longitudinal axis; valves size 10 turning 180° around the lateral axis (see drawing above). The O-ring plate is always mounted on the subplate side.



ΔP-Q Performance curves



Throttle with Check valves

Model code

V P - N D V - - - *

Size

Size 6	6
Size 10	10

Seals type

NBR seals for mineral oil HL,HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Flow control valves pressure compensated

Flow dividers





FLOW CONTROL VALVE TVTC

- NG 6
- Up to 350 bar [5076 PSI]
- Up to 50 L/min [13.21 GPM]
- Three-way pressure compensator.
- Operating element: rotary knob.
- Without built - in relief valve and non return valve.
- With built - in relief valve.
- With built-in non return valve.
- Threaded connections to ISO 1179 (BSPP/Gas), ISO 11926 (UNF).



TVTC-..

Operation

3-way compensated flow control valve enables setting of constant fluid flow on port A irrespective of the pressure variations.
The excessive flow rate is discharged to port B and can be used as a secondary working port or return port to a tank.

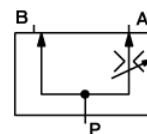
Whether the pressure in secondary circuit is higher than the regulated pressure the valve works as two-way regulator.

A pressure relief valve in valve type TVTC-...-VV limits the pressure in port A on the set valve. The excessive flow rate is discharged over port R to a tank.

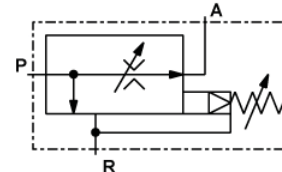
The non return valve in valve type TVTC -...-NV provides a free flow of the hydraulic fluid in the direction from A to P.

Hydraulic symbol

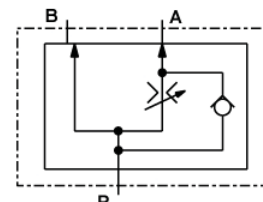
TVTC-..



TVTC-...-VV



TVTC-...-NV



Features

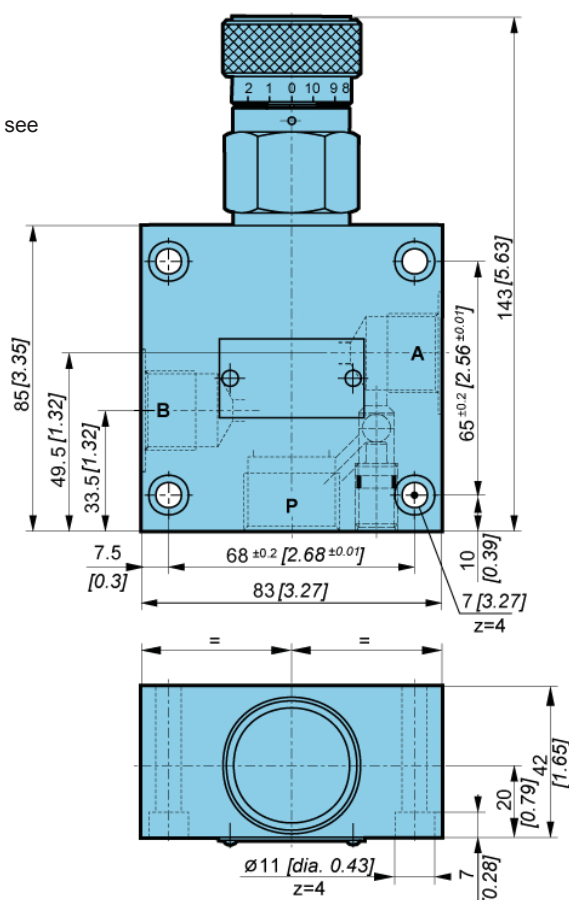
Type		TVTC-12-...	TVTC-25-...	TVTC-50-...
Flow rate A	L/min [GPM]	1 to 12 [0.26 to 13.17]	1 to 25 [0.26 to 6.60]	1 to 50 [0.26 to 13.21]
Max. flow rate A	L/min [GPM]	32 [8.45]	65 [17.17]	
Operating pressure	bar [PSI]	5 to 350 [72.52 to 5076.32]		
Differential pressure	bar [PSI]	5,5 [79.77]		
Cracking pressure for non return valve	bar [PSI]	0,5 [7.25]		
Flow stability (5 to 350 Bar)	%	±5 (Q)		
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]		
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]		
Filtration	NAS 1638	8		
Mass	kg [lb]	TVTC		
		TVTC-...-NV	2 [4.41]	
		TVTC-...-VV	3 [6.61]	



Dimensions

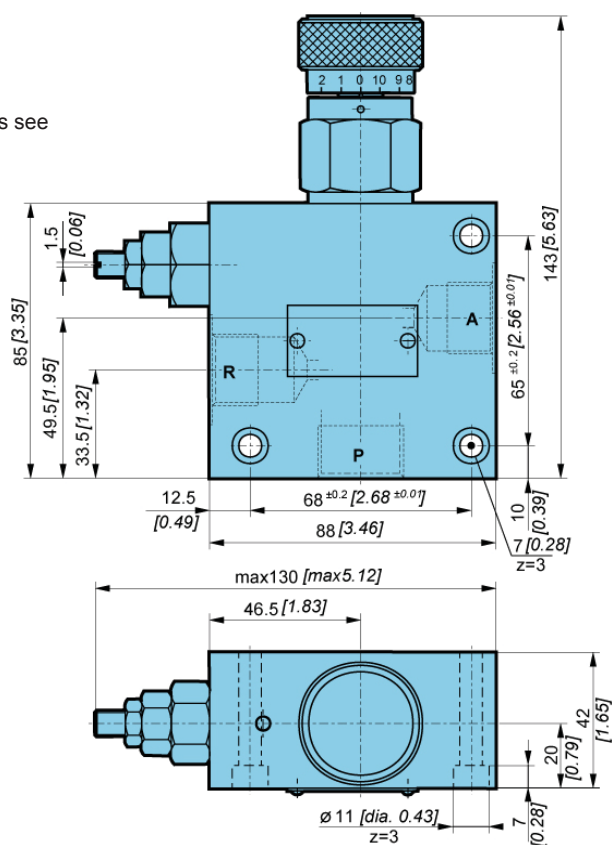
TVTC...; TVTC...-NV

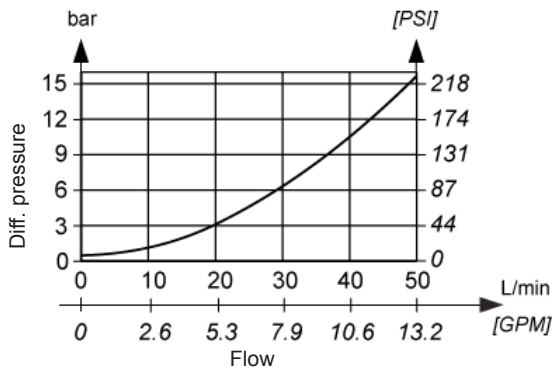
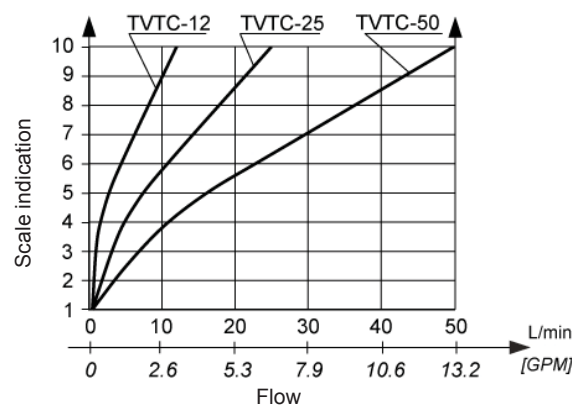
Threaded connections see
Model code



TVTC...-VV

Threaded connections see
Model code



**ΔP-Q Performance curve for non return valve****Flow rate as a function of scale indication****Model code**

T V T C - - - - - - *

Flow rate L/min [GPM]

1 to 50 [0.26 to 13.21]	50
1 to 25 [0.26 to 6.60]	25
1 to 12 [0.26 to 3.17]	12

Pressure relief valve or non return valve bar [PSI]

Without relief valve	No designation
With relief valve 4 to 175 [58 to 2538]	VV17
With relief valve 10 to 350 [145 to 5076]	VV35
With non return valve	NV

Threaded connections A, B, R

G1/2	1/2
7/8-14 UNF-2B	SAE 10

Threaded connection P

G3/4	3/4
1 1/16-12 UNF-2B	SAE 12

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Throttle with Check valves

Flow control valves pressure compensated

Flow dividers





FLOW CONTROL VALVE TVTP-...-B-...

- NG 6, 10
- Up to 350 bar [5076 PSI]
- Up to 150 L/min [39.63 GPM]
- Three-way pressure compensated.
- Operating element: rotary knob.
- For independent fitting into a block.
- For independent mounting (when assembled with connection block P-TVTP).

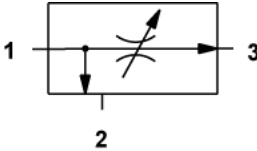


TVTP-...-B-...

Operation

TVTP three-way flow regulators are used to regulate the priority flow in outlet 3 to a maximum adjustable level largely independent of the load and pressure conditions. The surplus flow is diverted to the bypass port 2. The bypass flow may be used for a secondary circuit. Whether the pressure in secondary circuit is higher than the regulated pressure the valve works as two-way regulator.

Hydraulic symbol

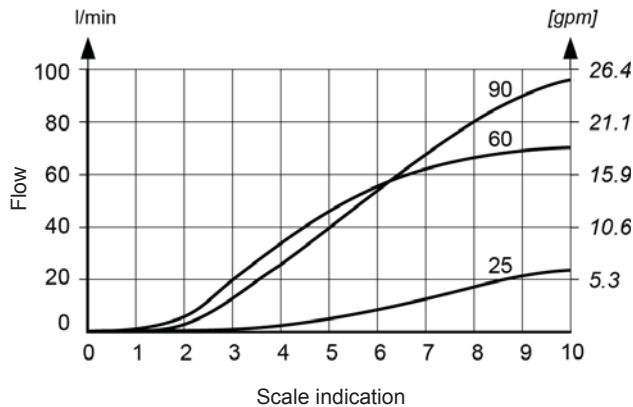


Features

Type		TVTP-25-B	TVTP-60-B	TVTP-90-B
Rated flow 3	L/min [GPM]	25 [6.60]	60 [15.85]	90 [23.78]
Flow rate 1 max.	L/min [GPM]	60 [15.85]	90 [23.78]	150 [39.63]
Operating pressure max.	bar [PSI]	350 [5076]		
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]		
Viscosity range	mm ² /s [SUS]	15 bis to 380 [69.5 to 1760]		
Filtration	NAS 1638	8		
Mass	kg [lb]	0,6 [1.32]	1 [2.20]	

Flow rate as a function of scale indication

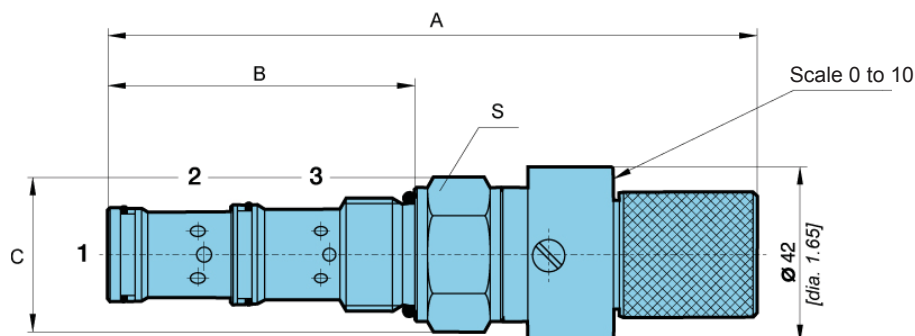
Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].





Dimensions

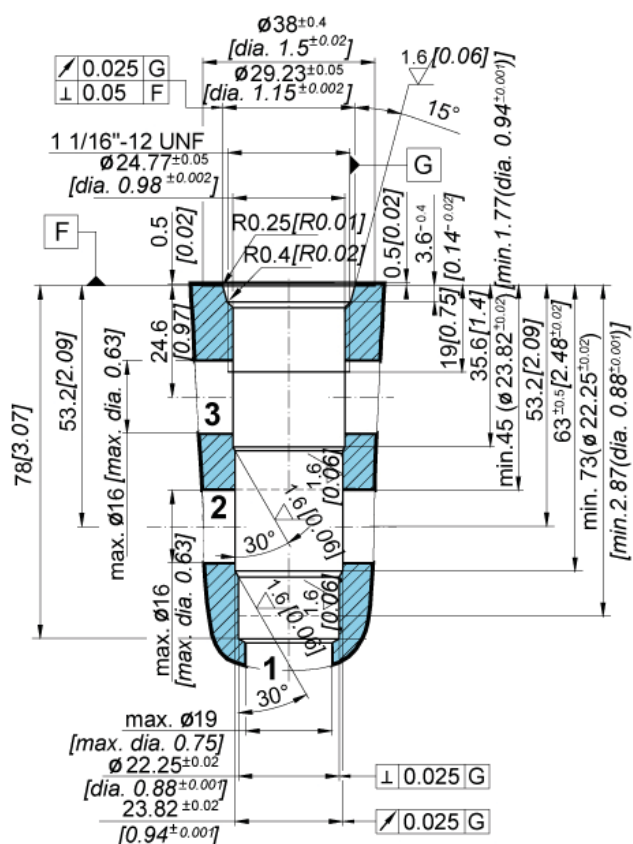
TVTP-...-B-...



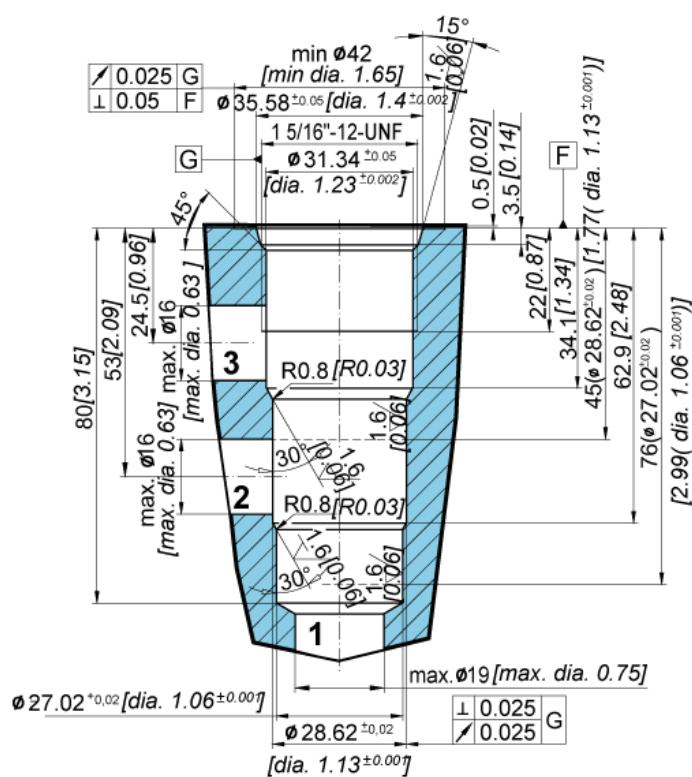
Typ	A mm [Zoll]	B mm [Zoll]	C mm [Zoll]	S	Torque into Cavity Nm [in.lbf]
TVTP-25-B	155 [6,10]	73,5 [2,83]	37 [1,46]	S32	60 - 65 [531 - 575]
TVTP-60-B	176 [6,93]	75 [2,95]	46 [1,81]	S41	70 - 75 [619 - 664]

Dimensions of cavity

TVTP-25, TVTP-60

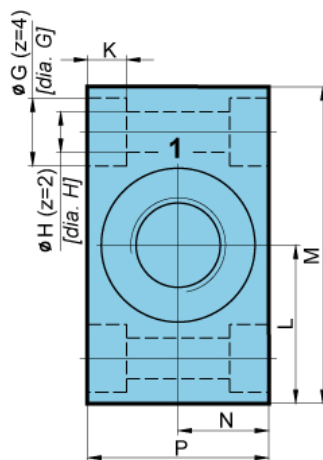
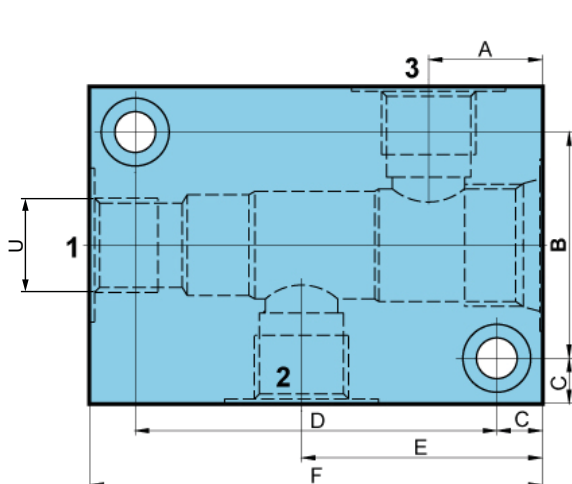


TVTP-90





Standard ported body - steel



	P-TVTP-50*	P-TVTP-90**
	mm [Zoll]	mm [Zoll]
A	25,1 [0,99]	25 [0,98]
B	50 [1,97]	65 [2,56]
C	10 [0,40]	15 [0,59]
D	80 [3,15]	80 [3,15]
E	53,2 [2,10]	53,5 [2,11]
F	100 [3,94]	110 [4,33]
G	15 [0,59]	17 [0,67]
H	9 [0,35]	11 [0,43]
K	8,6 [0,34]	10,6 [0,42]
L	35 [1,37]	47,5 [1,87]
M	70 [2,75]	95 [3,74]
N	20 [0,78]	26 [1,02]
P	40 [1,57]	52 [2,05]
U	G 1/2	G 1

Model code

P - T V T P -

Size

For TVTP-25-B; TVTP-50-B	50
For TVTP-90-B	90

Threaded connections to ISO 1179-1.

*used for TVTP-25 and TVTP-60

** used for TVTP-90

Model code

T V T P - B - *

Flow rate L/min [GPM]

25 [6.6]	25
50 [13.2]	60
90 [23.8]	90

Operating element

Rotary knob	B
Inner hexapanel key	S

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Throttle with Check valves

Flow control valves pressure compensated

Flow dividers





FLOW CONTROL VALVE TVTP-...-P-...

- NG 6, 10
- Up to 210 bar [3046 PSI]
- Up to 150 L/min [39.6 GPM]
- Three-way pressure compensated.
- Operating element: proportional solenoid.
- Control electronics: Amplifier P/N: 1659574.
- For independent fitting into a block.
- For independent mounting (when assembled with connection block P-TVTP).
- Plug-in connector for solenoids to ISO 4400.
- Protection of solenoid IP 54 to EN 60529 / IEC 60529 (IP 65 on request).



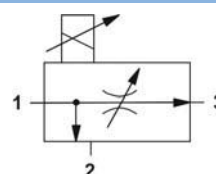
TVTP-...-P-...

Operation

TVTP three-way flow regulators are used to regulate the priority flow in outlet 3 to a maximum adjustable level largely independent of the load and pressure conditions. The surplus flow is diverted to the bypass port 2. The bypass flow may be used for a secondary circuit.

Whether the pressure in secondary circuit is higher than the regulated pressure the valve works as two-way regulator.

Hydraulic symbol

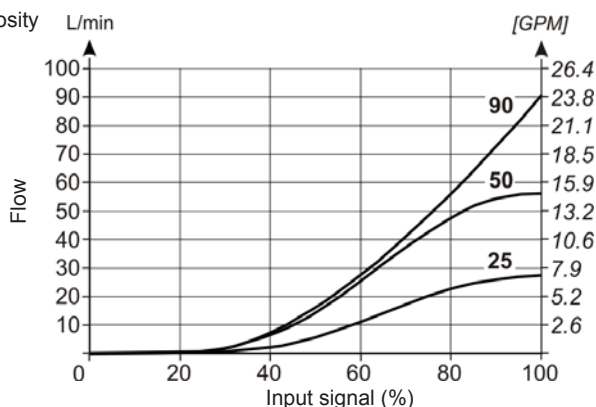


Features

Type		TVTP-25	TVTP-50	TVTP-90
Rated flow 3	L/min [GPM]	25 [6.6]	50 [13.2]	90 [23.8]
Flow rate 1 max.	L/min [GPM]	60 [15.9]	90 [23.8]	150 [39.6]
Operating pressure max.	bar [PSI]	210 [3 456]		
Hysteresis	%	<5		
Flow constant according to load pressure	%	<±2		
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]		
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 761]		
Filtration	NAS 1638	7		
Mass	kg [lb]	1 [2.2] (TVTP-...)		1,6 [3.5] (TVTP-...)
		1,2 [2.6] (TVTP-...G)		2 [4.4] (TVTP-...G)
Power	W	17,4		20,8
Voltage	V	12 and 24 DC		
Rated current at 12 V	A	1,25		1,79
Rated current at 24 V	A	0,68		0,81
Coil resistance at 12 V; 20 °C [68 °F]	Ohm	7,2		4,3
Coil resistance at 24 V; 20 °C [68 °F]	Ohm	24,6		21
Rating ED	%	100		

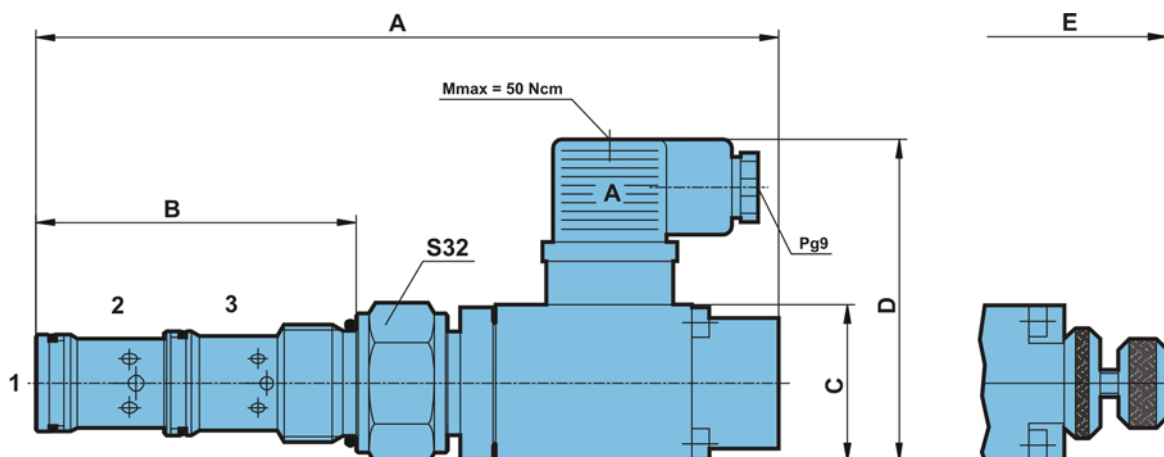
Solenoid current / flow curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].





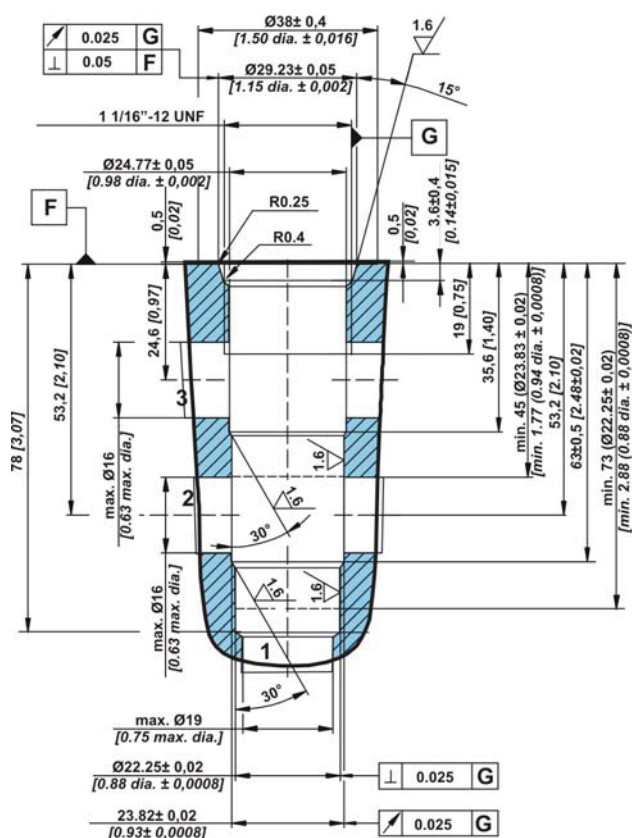
Dimensions



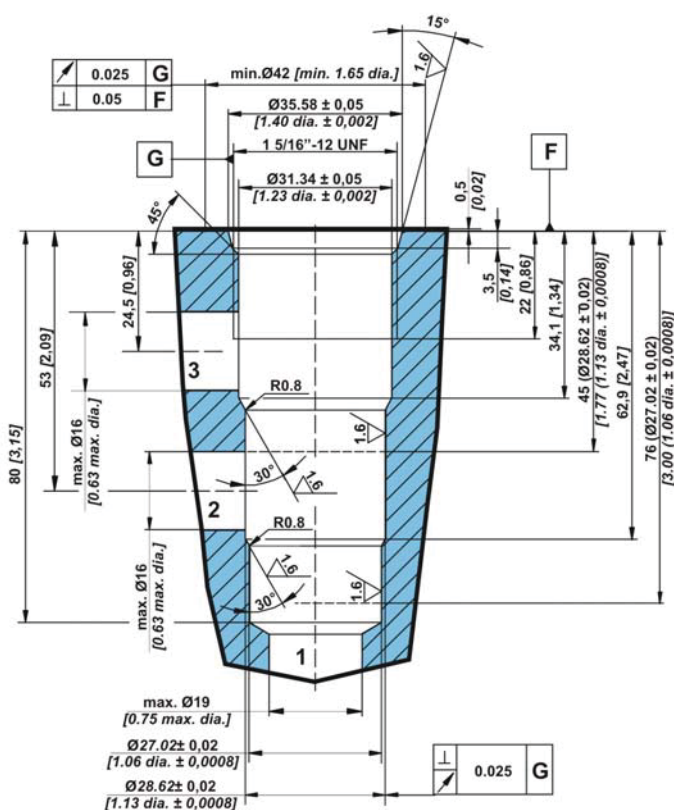
	A mm [Zoll]	B mm [Zoll]	C mm [Zoll]	D mm [Zoll]	E mm [Zoll]	S	Torque into cavity Nm [in.lbf]
TVTP-25-P	170 [6,7]	73,5 [2,9]	35 [1,4]	74 [2,9]	210 [8,3]	S32	60-65 [531-575]
TVTP-50-P	198 [7,8]	75 [3,0]	45 [1,8]	84 [3,3]	244 [9,6]	S41	70-75 [619-664]

Dimensions of cavity

TVTP-25 and 50

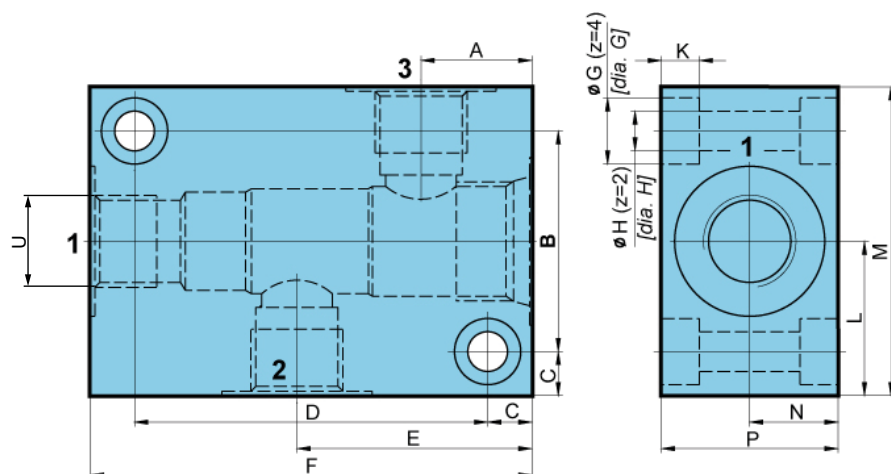


TVTP-90





Standard ported body - steel



Model code

P - **T V T P** -

Size

For TVTP-25-P; TVTP-50-P	50
For TVTP-90-P	90

	P-TVTP-50 mm [Zoll]	P-TVTP-90 mm [Zoll]
A	25,1 [0,99]	25 [0,98]
B	50 [1,97]	65 [2,56]
C	10 [0,40]	15 [0,59]
D	80 [3,15]	80 [3,15]
E	53,2 [2,10]	53,5 [2,11]
F	100 [3,94]	110 [4,33]
G	15 [0,59]	17 [0,67]
H	9 [0,35]	11 [0,43]
K	8,6 [0,34]	10,6 [0,42]
L	35 [1,37]	47,5 [1,87]
M	70 [2,75]	95 [3,74]
N	20 [0,78]	26 [1,02]
P	40 [1,57]	52 [2,05]
U	G 1/2	G 1

Threaded connections to ISO 1179-1.

Model code

T V T P - - **P** - - - - *****

Flow rate L/min [GPM]

25 [6,6]	25
50 [13,2]	50
90 [23,8]	90

Operating element

Proportional solenoid

P

Supply voltage

12 V direct voltage	12DC
24 V direct voltage	24DC

Hand operation of solenoid

Without hand operation

No designation

With hand operation

G

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524

No designation

FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

E

Special requirements to be briefly specified

Throttle with Check valves

Flow control valves pressure compensated

Flow dividers





FLOW DIVIDER DTP

- NG 6, 10
- Up to 350 bar [5.076 PSI]
- Up to 70 L/min [18,49 GPM]
- Dividing and combining of flow independent of pressure.
- Dividing and combining ratio: 50 % / 50 %
- Direct in-line mounting.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).



DTP-10, DTP-6

Operation

The flow divider DTP has two functions, dividing and combining of fluid flow. The regulator divides the fluid flow in the direction from A to B and C, and combines flows in the direction from B and C to A. The dividing / combining ratio is 50 % : 50 %, independent of pressure in respective pipeline, B or C.

The regulator consists of a housing (1), two dividing spools (2) and three weak springs (3).

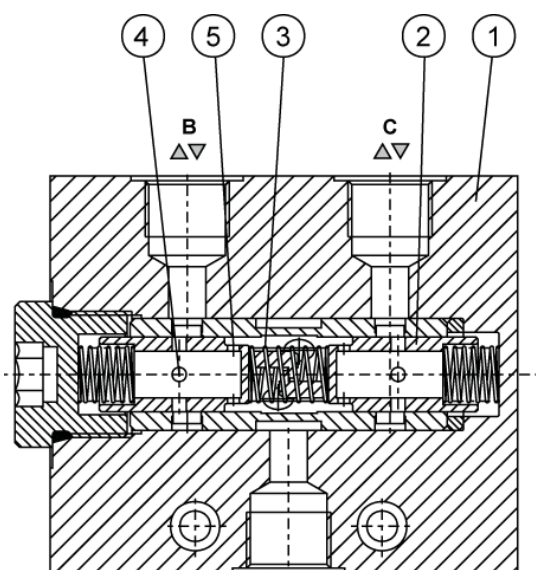
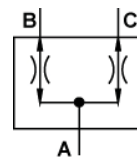
Division of flow: The fluid flow in the direction from A to B and C.

The flow in chamber A is divided and flows through the orifices (5) with constant cross-section and throttles (4) into chambers B and C. The pressure drop through the orifices (5) depends on the pressure load. The increase of flow towards one of both chambers provokes increased pressure drop through the orifices. The pressure drop generates the pressure force which shifts both spools (2). Consequently, the throttles (4) are reduced, and the pressure drop of fluid through the throttles increases. The spools keep on moving until the pressure drops through the orifices (5) are balanced. Consequently, both fluid flows are balanced, too.

Combining of flows: The oil flow in the direction from B and C to A. The operation is identical as at dividing of flow. The divider combines both flows in the ratio 50% to 50%.

The principle of operation depends on the pressure drop, which again depends on the fluid flow. For this reason the divider functions properly only within the defined flow range. Limitation of maximal flow - rate of pressure drop, limitation of minimal pressure - dividing and combining accuracy

Hydraulic symbol



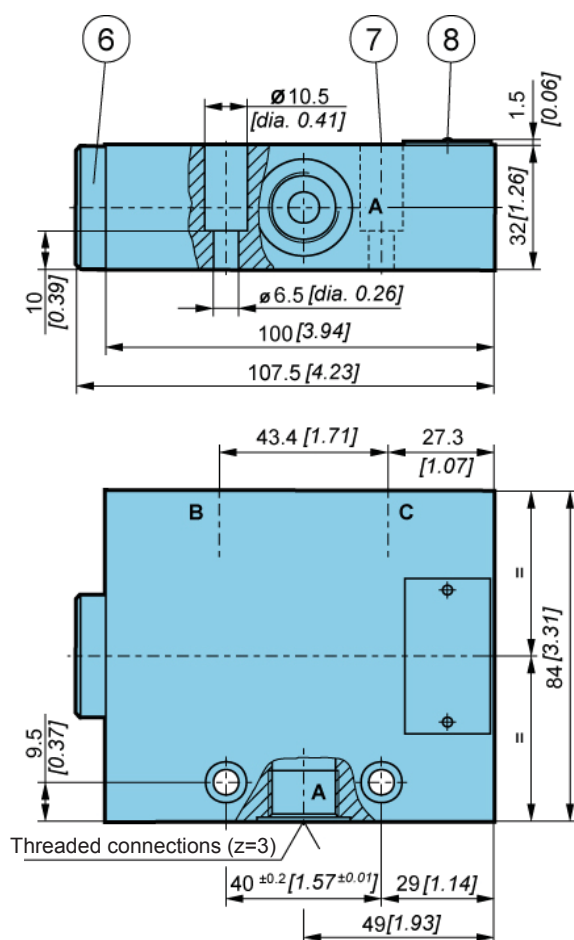


Features

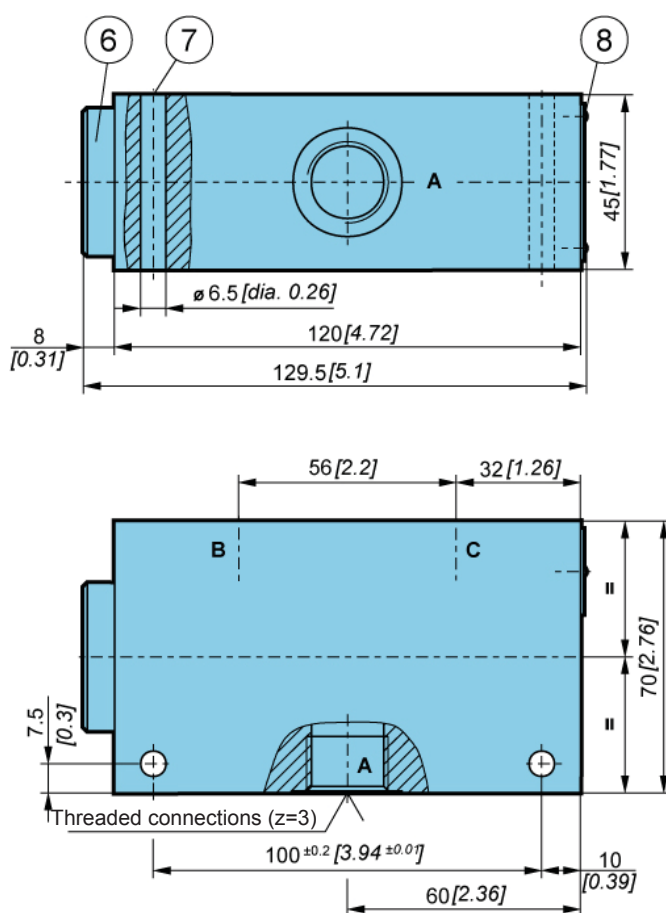
Type		DTP-6-20	DTP-6-35	DTP-6-50	DTP-10-70
Min. flow rate	L/min [GPM]	8 [2.11]	12 [3.17]	16 [4.23]	35 [9.25]
Max. flow rate	L/min [GPM]	20 [5.28]	35 [9.25]	50 [13.21]	70 [18.49]
Max. pressure range	bar [PSI]	350 [5 076]			
Dividing	%	50 : 50			
Flow dividing accuracy	%	±5			
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]			
Viscosity range	mm ² /s [SUS]	15 to 380 [59 to 716]			
Filtration	NAS 1638	8			
Mass	kg [lb]	1,7 [3.75]		2,65 [5.84]	

Dimensions

DTP-6



DTP-10

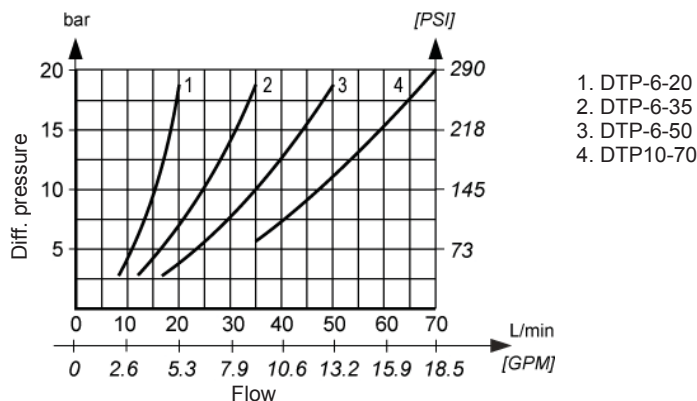


- 6. Valve cap
- 7. Two fixing holes for screws ISO 4762
DTP-6 = M6 x 20-10.9
DTP-10 = M6 x 55-10.9
Tightening torque Md = max.15 Nm
- 8. Nameplate



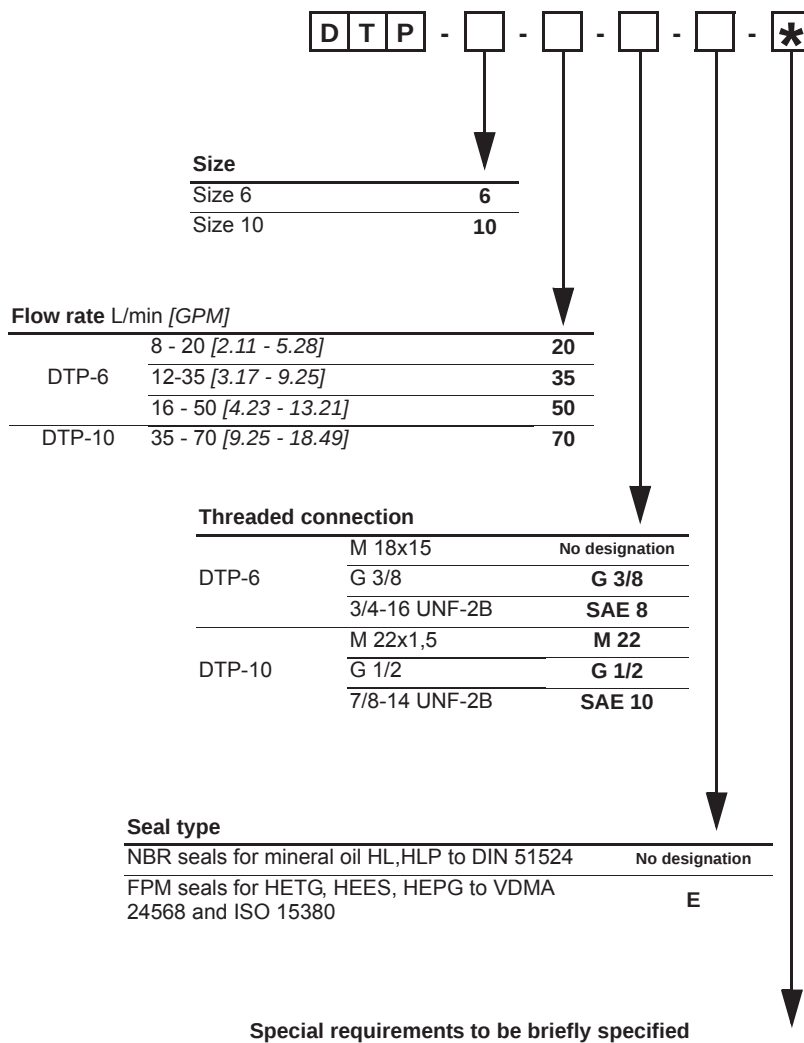
ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



1. DTP-6-20
2. DTP-6-35
3. DTP-6-50
4. DTP10-70

Model code



Throttle with Check valves

Flow control valves pressure compensated

Flow dividers





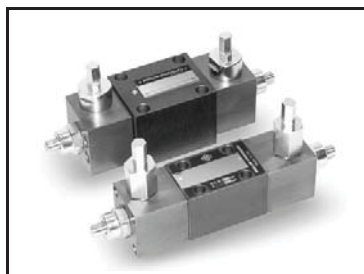
DIRECTIONAL CONTROL VALVES



MECHANICALLY OPERATED

69

2/2 way directional valves KVC (NG 6)	69
2/2 way directional valves KVC-NV (NG 6)	71
4/2, 4/3 way directional valves KV (NG 6, 10)	73
6/2 way directional valves KV (NG 6, 10)	77



HYDRAULICALLY OPERATED (AUTOMATIC)

81

4/2 way automatic directional valves PKV (NG 6, 10))	81
4/2 way automatic directional valves PKV-...-T (NG 6)	85
4/2, 4/3 way directional valves KV (NG 6, 10)	89
6/2 way diverter valves KV - High pressure (NG 16)	93



ELECTRICALLY OPERATED

97

2/2 way directional valves KV (NG 6)	97
3/2 way directional valves KVC (NG 4)	101
3/2 way directional valves KVC (NG 10)	105
4/2, 4/3 way directional valve KV-5KL (NG 6)	108
4/2, 4/3 way directional valve KV-5KO (NG 6)	114
4/2, 4/3 way directional valve KV-5KO (NG 10)	120
4/2, 4/3 way directional valves type KV (NS 16)	127
4/2, 4/3 way directional valve KV-3KO (NG 6)	133
4/2, 4/3 way directional proportional valve KVP (NG 6)	139
4/2, 4/3 way bankable directional valves KVM (NG 6)	143
4/2, 4/3 way bankable directional valves KVM (NG 6)	145
Vertical stacking for KVM valves	151
Check valve KVM-NOV-6	155
Throttle with check valve KVM-NDV-6	157
Pressure relief valve KVM-VV-6	161
Vertical stacking on valves KVM	
with standard sandwich valves to ISO 4401 (NG 6)	165
Auxiliary control lever	167
Inlet plate OB-KVM-6 (NG 6)	169
End plate ZB-KVM-6	175
Fixing elements for mounting	177
6/2 way directional valve KV (NG 6)	179
6/2 way directional valves KV (NG 10)	183
6/2 way directional valves KV (NG 16)	187
6/2 way directional valves KV-6K (NG 6)	191
6/2 way directional valves KVH (NG 6)	195
6/2 way directional valve KVH (NG 8)	198
6/2 way directional valves KVH (NG 10)	202
7/2 way directional valve KV-7/2-6 (NG 6)	206
7/3 way directional valve KV-7/3-6 (NG 6)	210
8/3 way directional valves KV (NG 6)	215

Mechanically operated

Hydraulically operated

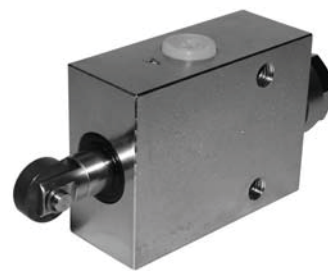
Electrically operated





2/2 way directional valves KVC

- NG 6
- Up to 250 bar [3 625 PSI]
- Up to 35 L/min [9.2 GPM]
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas)



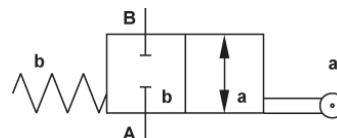
KVC-2/2-K

Mechanically operated

Features

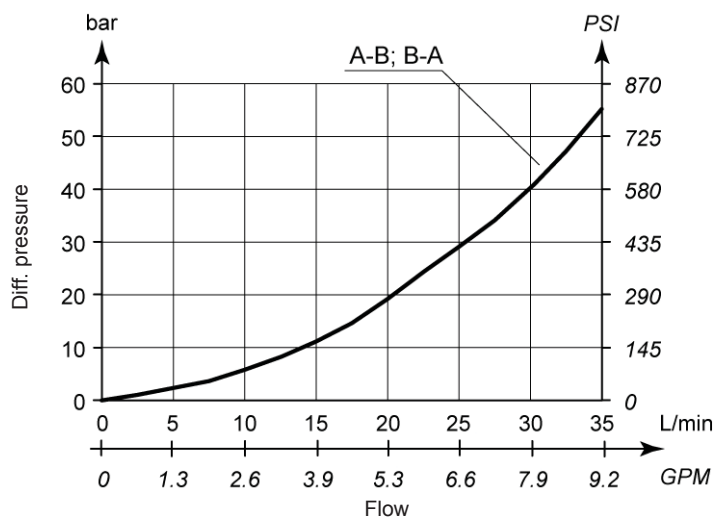
Size	6	
Flow rate	L/min [GPM]	35 [9.2]
Operating pressure	bar [PSI]	250 [3 625]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 760]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Filtration	ISO 4406-1999	19/17/14
Mass	kg [lb]	1,2 [2.6]
Seal type	NBR seals for mineral oil HL, HLP, to DIN 51524	

Hydraulic symbol



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

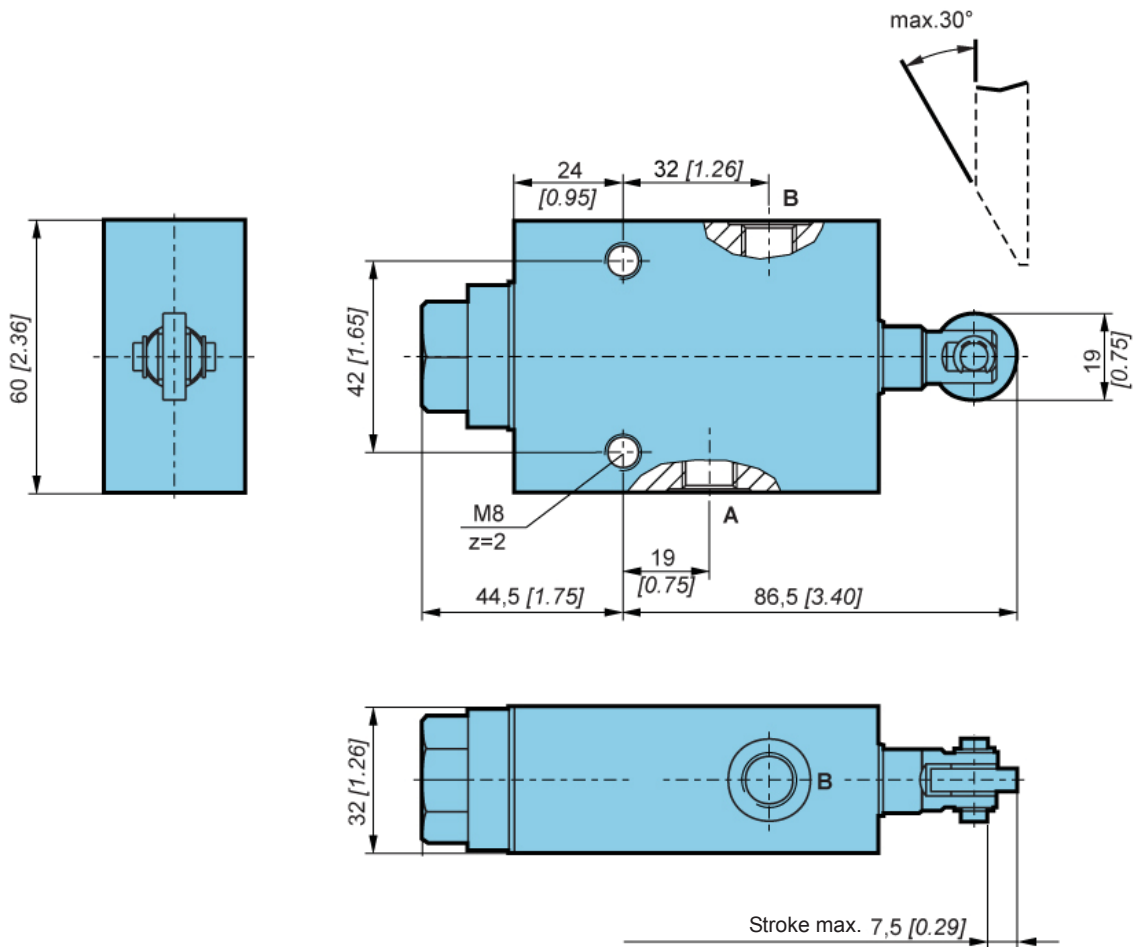


Hydraulically operated

Electrically operated



Dimensions



Model code

K V C - 2 / 2 - K - - *

Threaded connections

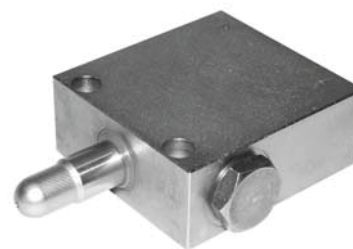
M12x1,5	No designation
G3/8	3/8

Special requirements to be briefly specified



2/2 WAY DIRECTIONAL VALVES KVC-NV

- NG 6
- Up to 210 bar [3 045 PSI]
- Up to 40 L/min [10.5 GPM]
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas)

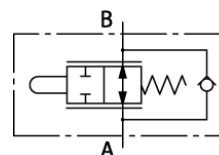


KVC-2/2-NV-T

Features

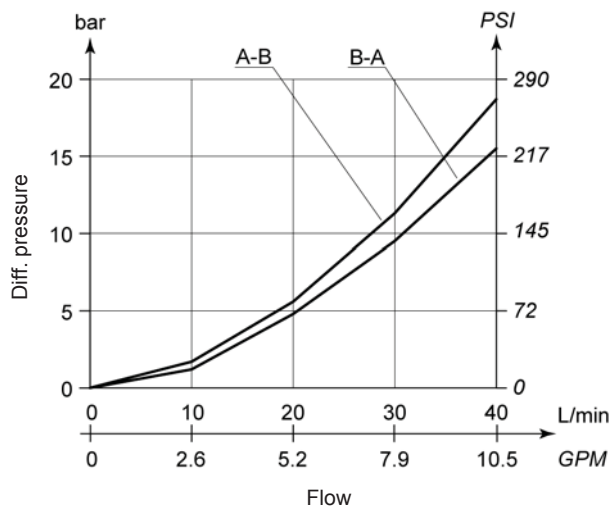
Size		6
Flow rate	L/min [GPM]	40 [10.5]
Operating pressure	bar [PSI]	210 [3 045]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 760]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Filtration	ISO 4406-1999	19/17/14
Mass	kg [lb]	1,2 [2.6]
Seal type	NBR seals for mineral oil HL, HLP, to DIN 51524	

Hydraulic symbol



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



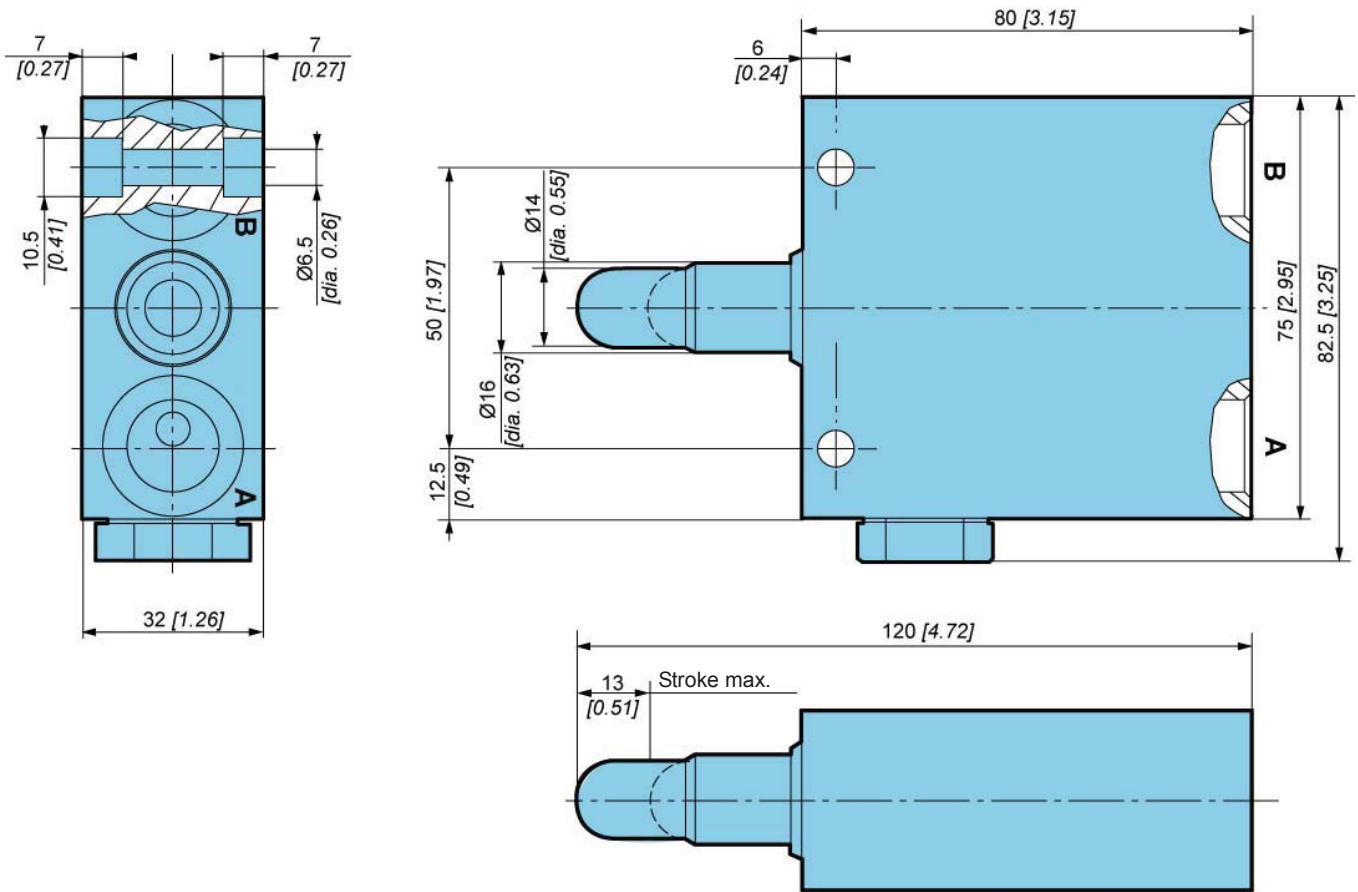
Mechanically operated

Hydraulically operated

Electrically operated



Dimensions



Model code

K V C - 2 / 2 - N V - T - - *

Threaded connections

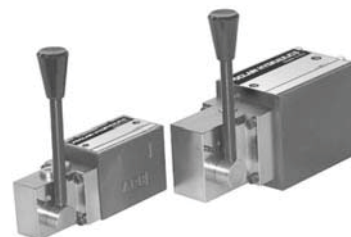
M18x1,5	No designation
G3/8	3/8

Special requirements to be briefly specified



4/2, 4/3 WAY DIRECTIONAL VALVES KV

- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 60 L/min [15.8 GPM] for NG 6
- Up to 100 L/min [26.4 GPM] for NG 10
- Connecting dimensions to ISO 4401.



KV-4/3-5KO-6-R, KV-4/3-5KO-10-R

Operation

Directional valves type KV with direct mechanical operation by means of a lever control the direction of the hydraulic fluid medium flow.

These directional valves consist of a housing (1), control spool (2), control mechanism (3), and return spring (4). In 4/3-way directional valves the centre position of the control spool is the neutral position. The change-over to one of the operating positions "a" or "b" is done by moving the operating pin lever (5) in such a manner that its acts on the control spool (2) so as to clear corresponding flow ways and establish relevant links between ports, A, B, P, and T.

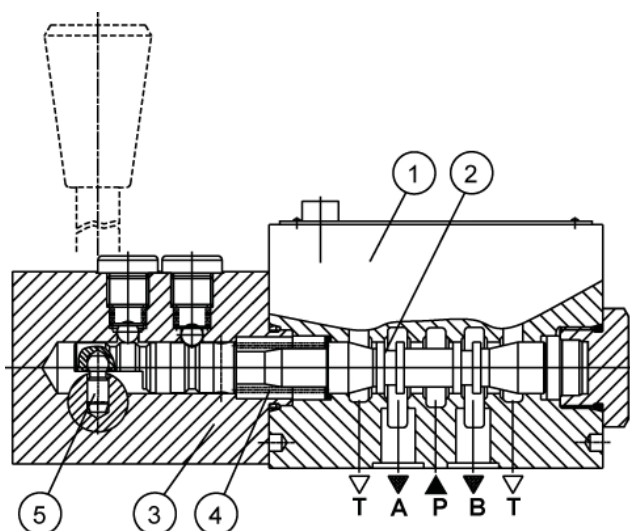
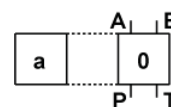
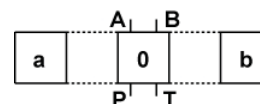
On ceasing to apply force to the control mechanism (3), the return spring (4) push the control spool into the neutral position.

There are two types of operation:

- 1/ With control spool not held in the operating position (the control spool returns to neutral position on ceasing to apply force to the control mechanism - type KV-...-R).
- 2/ With control spool held (detent) in the operating position (the control spool remains in the operating position on ceasing to apply force to the control mechanism lever - type KV-...-RA).

Hydraulic symbols

Spool types



Mechanically operated

Hydraulically operated

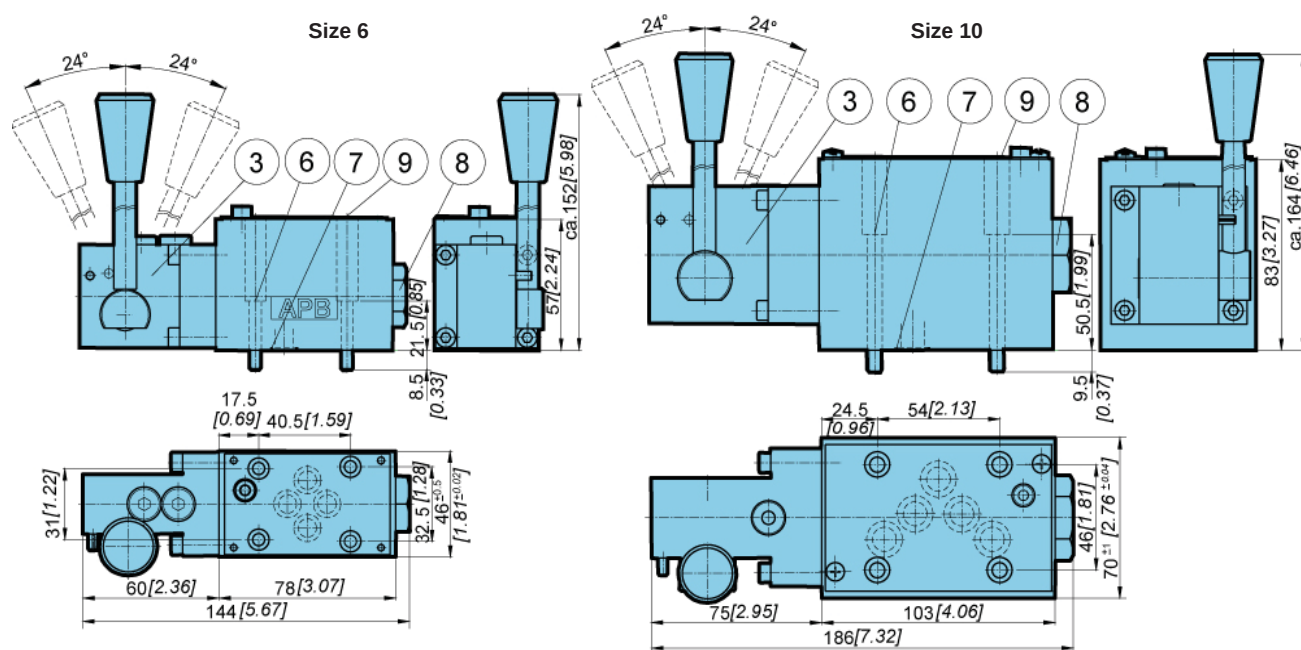
Electrically operated



Features

Size		6	10
Flow rate	L/min [GPM]	60 [15.8]	100 [26.4]
Operating pressure	P, A, B	bar [PSI]	350 [5 076]
	T	bar [PSI]	160 [2 320]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 760]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]	
Filtration	NAS 1638	8	
Mass	kg [lb]	2,05 [4.52]	5,23 [11.53]
Mounting position		Optional	

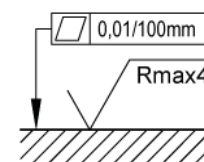
Dimensions



- 3. Control mechanism on side "a"
- 4/3 valves
- 4/2 valves, spool types 51A
- 6. Fixing screws 4 pcs M5x30 to ISO 4762-10.9 (by special order).
Required tightening torque $M_d = 9 \text{ Nm}$.
- 7. O-ring 9.25x1.78
- 8. Valve cap.
- 9. Nameplate.

- 3. Control mechanism on side "a"
- 4/3 valves
- 4/2 valves, spool types 51A
- 6. Fixing screws 4 pcs M6x60 to ISO 4762-10.9 (by special order).
Required tightening torque $M_d = 15 \text{ Nm}$.
- 7. O-ring 12.42x1.78
- 8. Valve cap.
- 9. Nameplate.

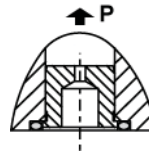
Required quality of the mating surface.





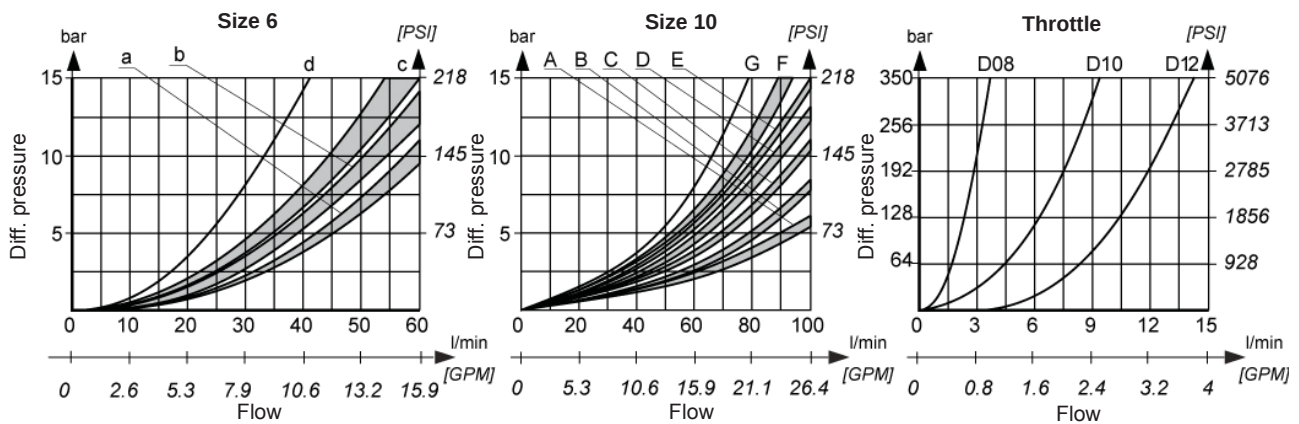
Cartridge throttle

If flow rates greater than permissible occur during change-over, a cartridge throttle must be fitted into P-line of the directional valve.



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	P-A	P-B	A-T	B-T	P-T
1	b,D	b,D	c,B	c,C	-
2	c,B	c,B	c,A	c,A	d,G
6	b,E	b,E	a,B	a,B	-
51A	c,D	b,D	c,C	a,B	-

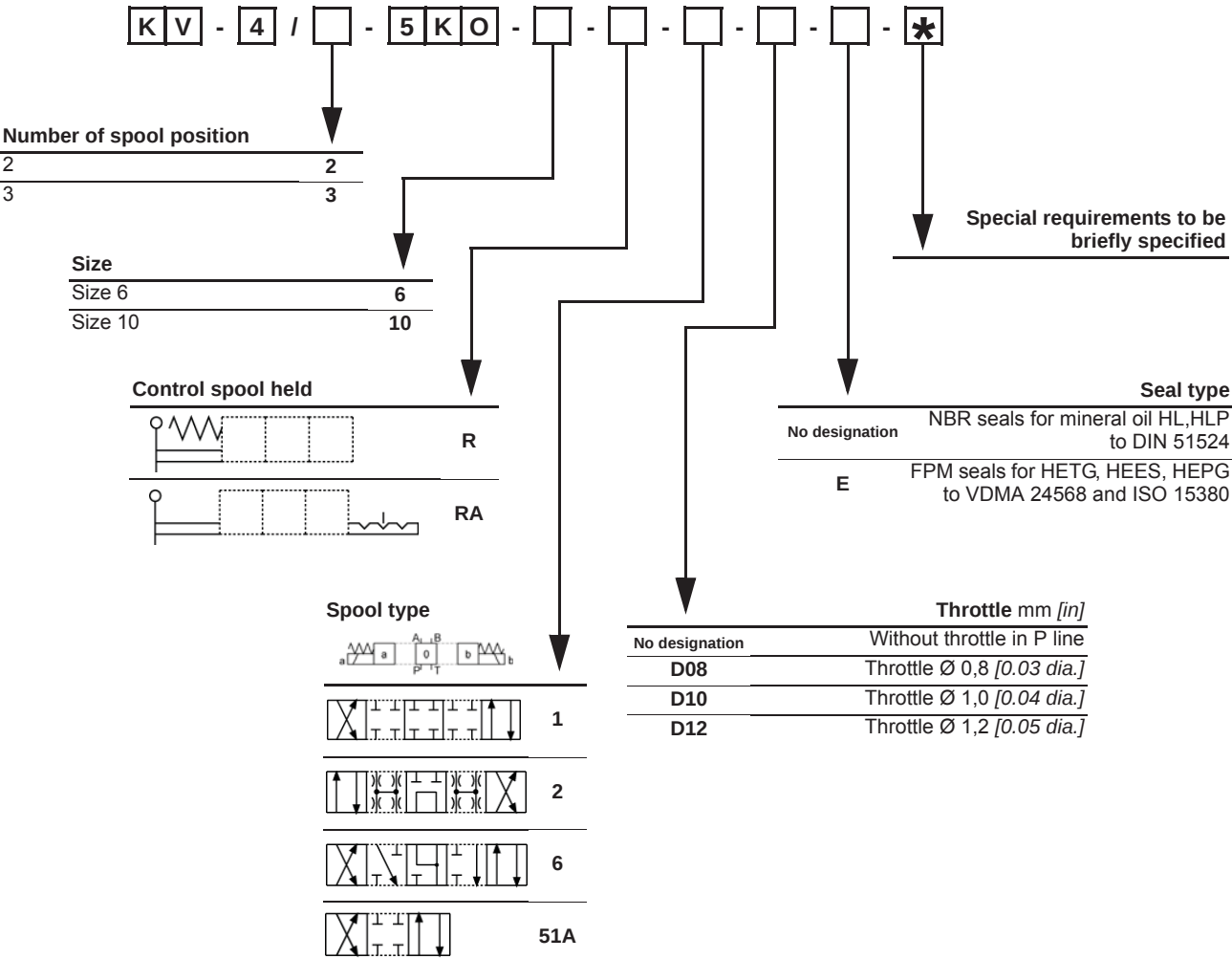
Mechanically operated

Hydraulically operated

Electrically operated



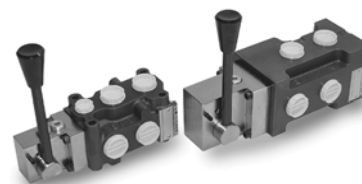
Model code





6/2 WAY DIRECTIONAL VALVES KV

- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 60 L/min [15.8 GPM] for NG 6
- Up to 120 L/min [31.7 GPM] for NG 10
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas).



KV-6/2-6-R..., KV-6/2-10-R...

Operation

Directional valves type KV with direct mechanical operation by means of a lever control the direction of the hydraulic medium flow.

They are mostly used as link between two consumers and the basic directional valve, when we want to control both consumers alternately by means of one basic directional valve.

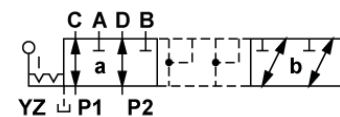
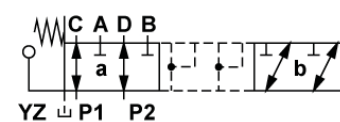
There are two types of operation:

1/ With control spool not held in the operating position (the control spool returns to position "a" on ceasing to apply force to the mechanism - type KV-...-R).

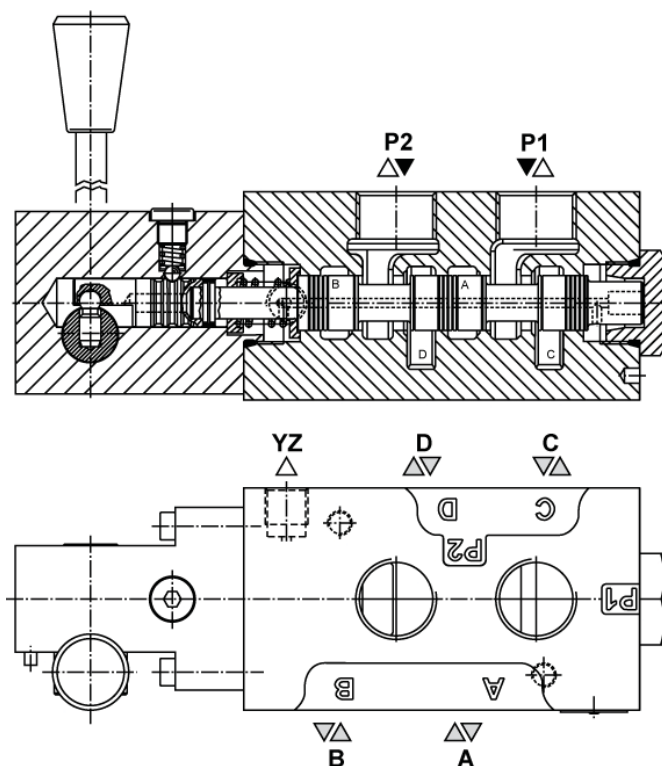
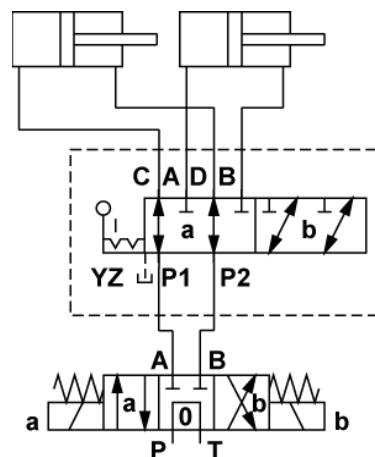
2/ With control spool held (detent) in the operating position (the control spool remains in the operating position on ceasing to apply force to the control mechanism lever - type KV-...-RA).

Hydraulic symbols

Spool types



Mounting example



Mechanically operated

Hydraulically operated

Electrically operated



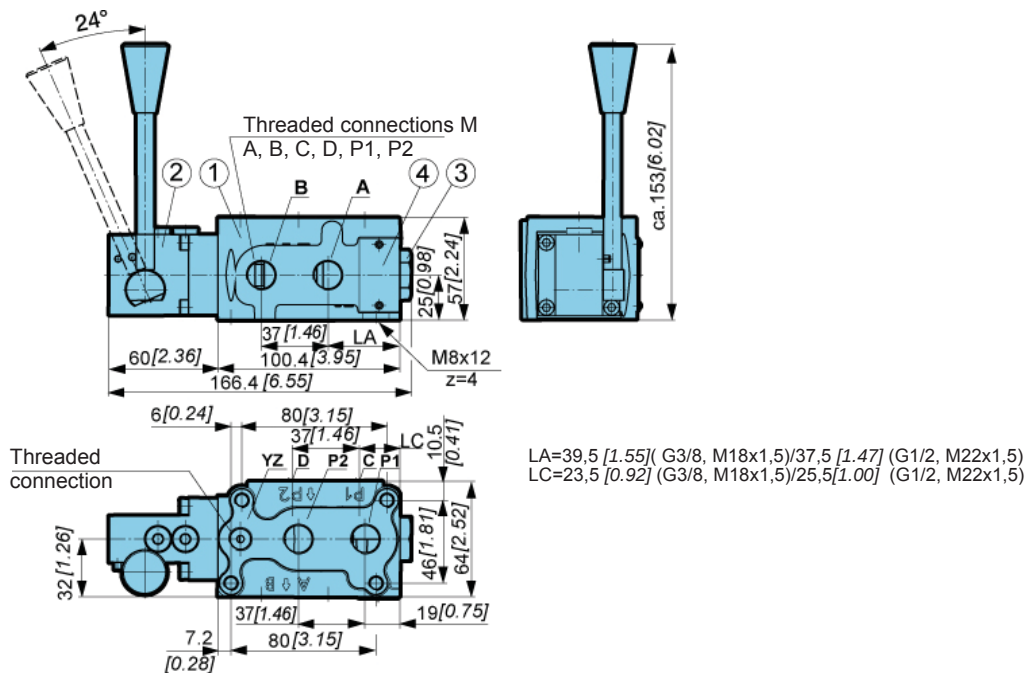
Features

Size			6	10
Flow rate		L/min [GPM]	60 [15.8]	120 [31.7]
Operating pressure	With YZ	bar [PSI]	350 [5 076]	
	Without YZ	bar [PSI]	160 [2 320]	
Viscosity range		mm ² /s [SUS]	15 to 380 [69,5 to 1 760]	
Oil temperature range		°C [°F]	-20 to +70 [-4 to 158]	
Filtration		NAS 1638	8	
Mass		kg [lb]	2,4 [5.3]	5,3 [11.7]
Mounting position			Optional	

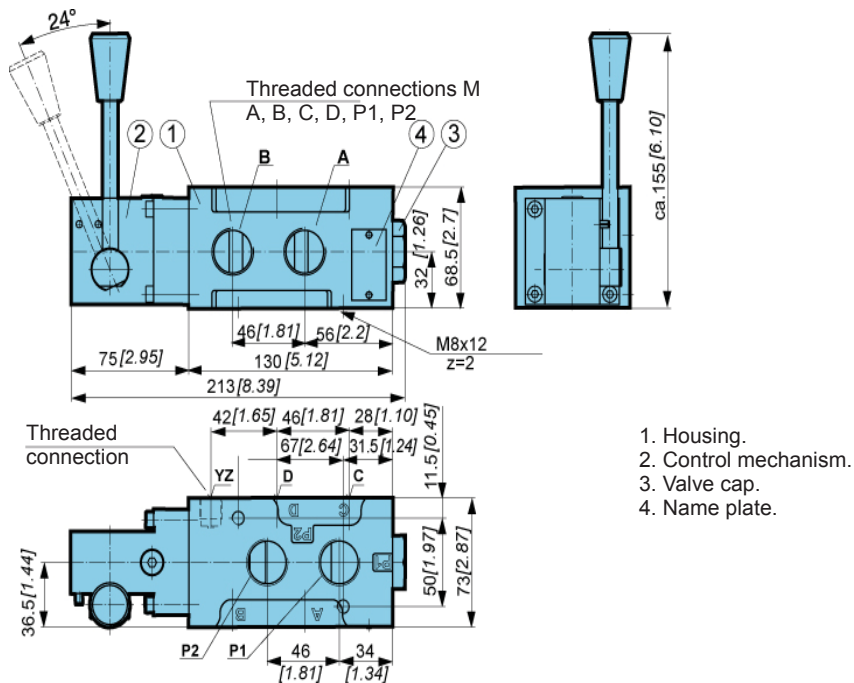


Dimensions

Size 6



Size 10



Mechanically operated

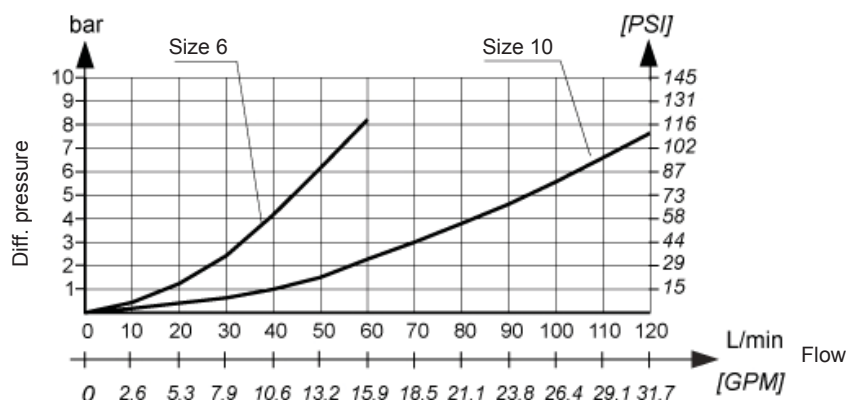
Hydraulically operated

Electrically operated



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

Model Code Structure: K V - 6 / 2 - - - - - - *

Size

Size 6	6
Size 10	10

Control spool held

	R
	RA

Threaded connections (M ; YZ)

Size	Threaded connections (M ; YZ)	Designation
Size 6	M18x1,5; M14x1,5	No designation
	M22x1,5; M14x1,5	M22
	G3/8; G1/4	G3/8
	G1/2; G1/4	G1/2
	3/4-16 UNF-2B; 9/16-18 UNF-2B	SAE 8
Size 10	M22x1,5; M14x1,5	No designation
	M27x1,5; M14x1,5	M27
	G1/2; G1/4	G1/2
	G3/4; G1/4	G3/4
	7/8-14 UNF-2B; 9/16-18 UNF-2B	SAE 10

Drainage

Without YZ	No designation
With YZ	YZ

Seal type

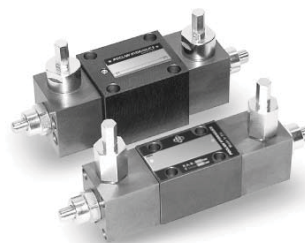
NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified



4/2 WAY AUTOMATIC DIRECTIONAL VALVES PKV

- NG 6, 10
- Up to 210 bar [3 045 PSI]
- Up to 60 L/min [15.8 GPM]
- Indirect hydraulic operation.
- Connecting dimensions to ISO 4401.
- Provision of pressure setting for change - over.
- Automatic change - over from the other operating position.

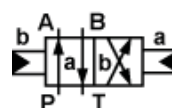


PKV-6, PKV-10

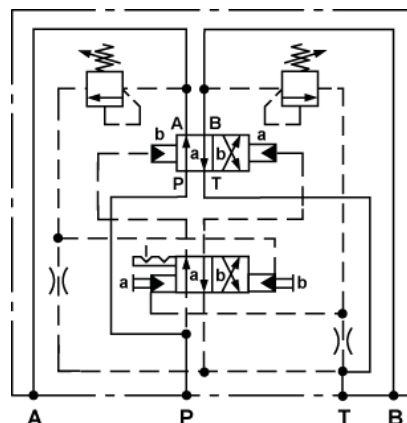
Operation

Indirectly, hydraulic - operated directional valves type PKV are used to control the hydraulic fluid flow direction by an automatic change - over.

Hydraulic symbol



Detailed schematics of the valve



Features

Size		6	10
Flow rate min/max	L/min [GPM]	1/25 [0.3/6.6]	1/60 [0.3/15.8]
Operating pressure	P, A, B	bar [PSI] To 210 [3 045]	
	T	bar [PSI] To 40 [580]	
Min. press. req. for autom. change over	bar [PSI]	50 [725]	
Change over pressure	bar [PSI]	50 to 210 [725 to 3 045]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 760]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]	
Filtration	NAS 1638	8	
Mass	kg [lb]	2,6 [5.7]	3,2 [7.0]

Mechanically operated

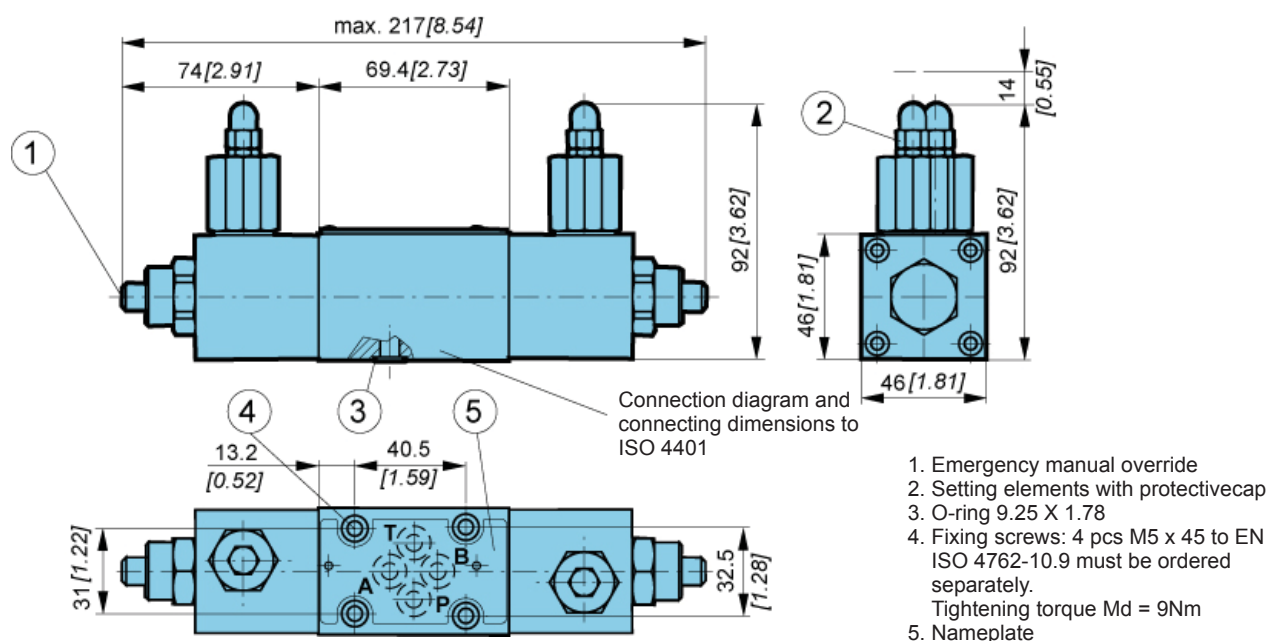
Hydraulically operated

Electrically operated

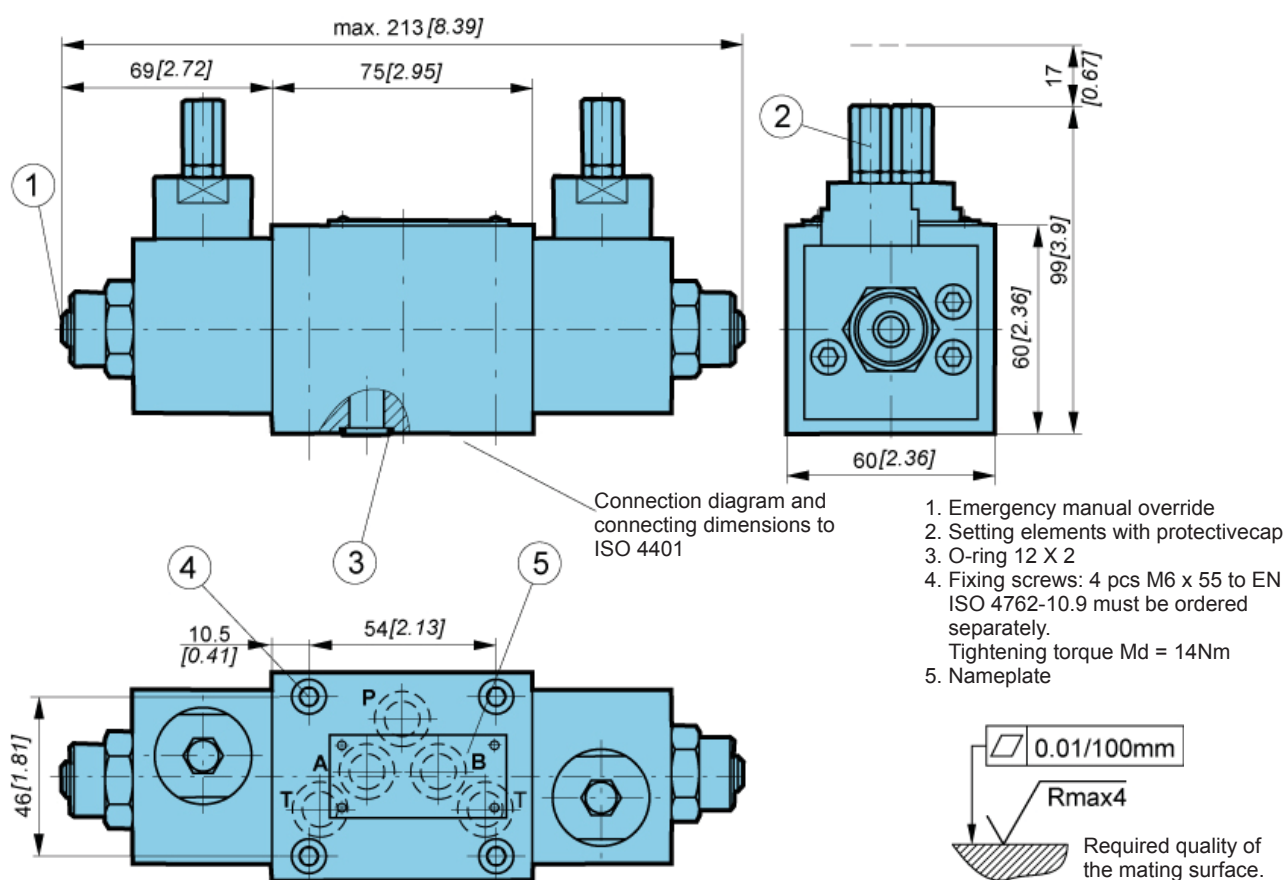


Dimensions

Size 6

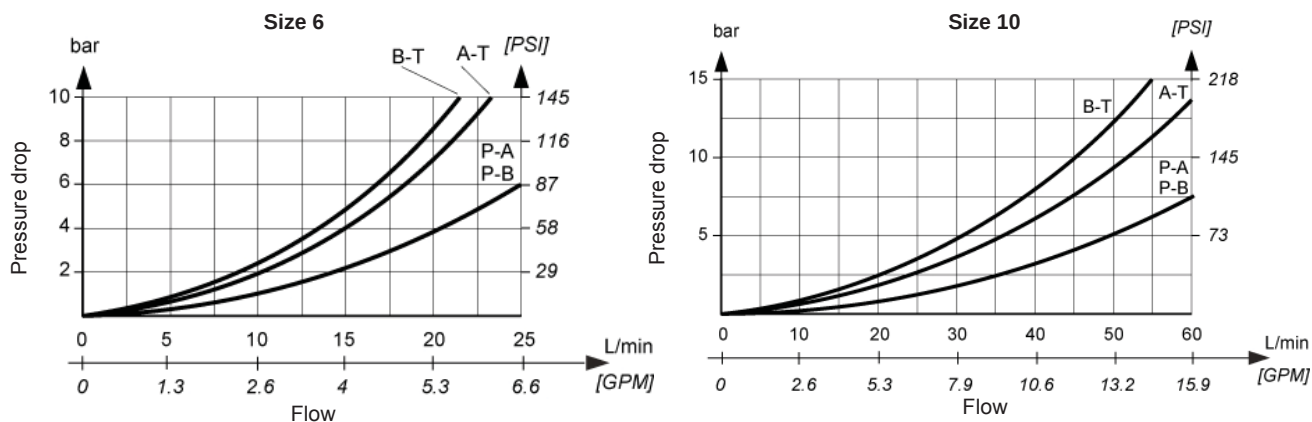


Size 10



**ΔP-Q Performance curves**

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

**Model code**

P K V - - - *

Size

Size 6	6
Size 10	10

Seal type

NBR seals for mineral oil HL, HLP, to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

Electrically operated





4/2 WAY AUTOMATIC DIRECTIONAL VALVES PKV-...-T

- NG 6
- Up to 210 bar [3 045 PSI]
- Up to 30 L /min [7.9 GPM]
- Connecting dimensions to ISO 4401.
- Automatic, load - independent reversal.
- Predefined actuator direction at start - up.



PKV-6-T, PKV-6-T-G

Operation

These valves reverse the movement of an actuator every time the flow through the valve stops. Preferential starting is P → B and A → T position. The spool is moved by two springs and locked by unbalanced pressure inside valve. When no more flow is crossing the valve, the spool changes the position inverting the direction of the actuator. These valves are mostly used to control the movement compactors or system where it is not possible to use electrical device.

About the spindle for the PKV-6-T-G valves:

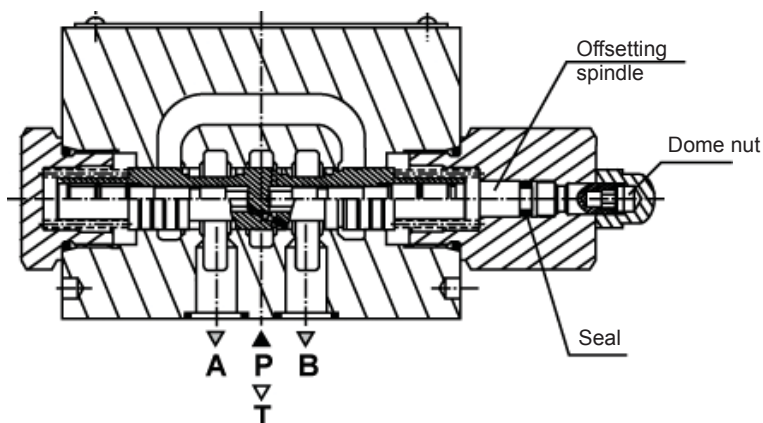
The spindle for the PKV-6-T-G valves is used just to set the system pressure limiter. To set the maximum pressure you have to block the self-reversing function.

Procedure to set a pressure on the system pressure limiter:

- 1/ Switch off the pump or reduce pressure to minimum (10 bar max).
- 2/ To set the system pressure limiter first block the automatic reversal of the valve.
Remove the dome nut and turn the offsetting spindle clockwise until it hits its inner end spool. The spool is now clamped P to B and A to T.
- 3/ Start the pump and set the required pressure.
- 4/ After that stop again the pump.
- 5/ Turn the offsetting spindle anticlockwise until it hits its outer end stop then put the dome nut back.



Never turn the offsetting spindle when the valve is pressurized over 10 bar [145 PSI]. This can cause seal damage. If necessary switch off the pump.



Hydraulic symbol

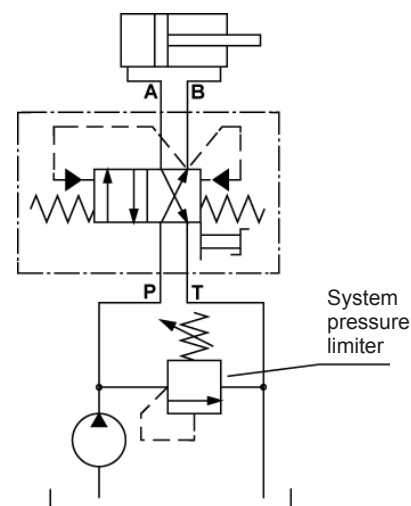
PKV-6-T



PKV-6-T-G



Detailed schematics of the valve



Mechanically operated

Hydraulically operated

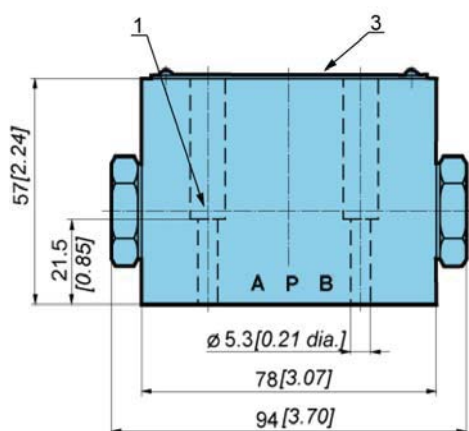
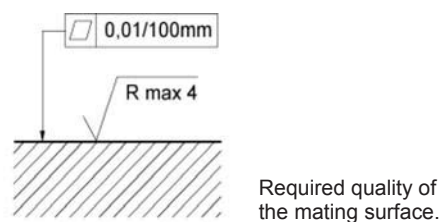
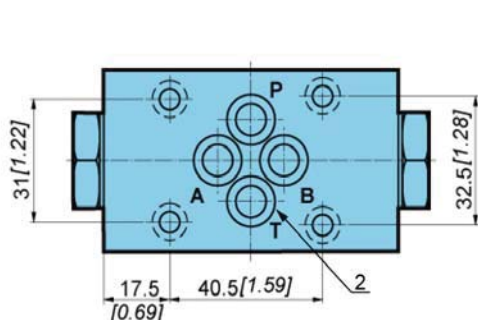
Electrically operated



Features

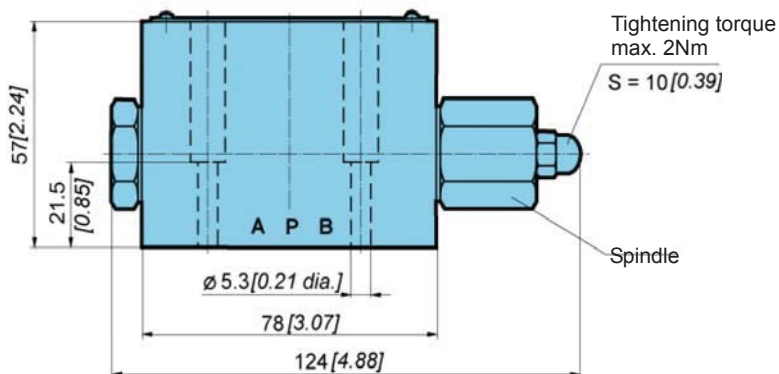
Size	6	
Flow rate min/max	L/min [GPM]	3/30 [0.8/7.9]
Operating pressure P, A, B	bar [PSI]	50 to 210 [725 to 3 045]
Max. pressure T	bar [PSI]	40 [580]
Viscosity range	mm ² /s [SUS]	20 to 200 [92.7 to 926.8]
Oil temperature range	°C [°F]	-20 to +60 [-4 to 140]
Filtration	NAS 1638	8
Mass	PKV-6-T	1,3 [2.8]
	PKV-6-T-G	1,4 [3.1]

Dimensions



PKV-6-T

Connection diagram and connecting dimensions to ISO



PKV-6-T-G

1. 4 x fixing screws M5x30 to DIN EN ISO 4762-10.9 must be ordered separately.
Required tightening torque $M_d = 9 \text{ Nm}$ [79.65 in.lbf].

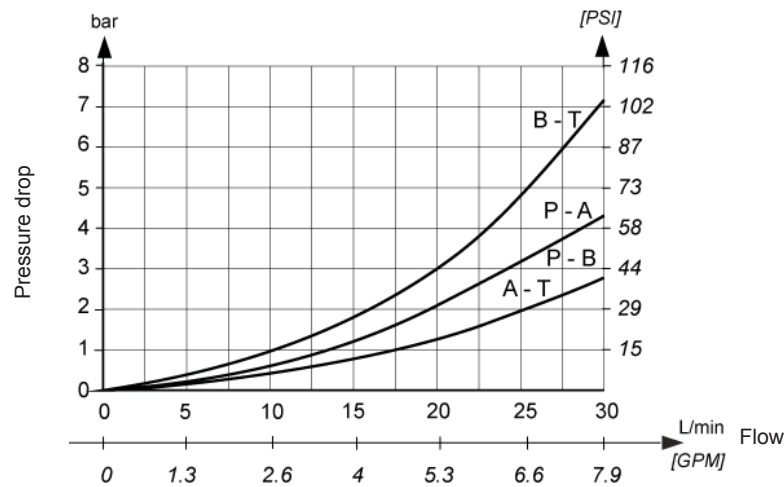
2. O-ring 9,25 x 1,78

3. Nameplate



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

P K V - 6 - T - - *

Offsetting spindle

Without offsetting spindle No designation
With offsetting spindle G

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524 No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380 E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

Electrically operated





4/2, 4/3 WAY DIRECTIONAL VALVES KV

- NG 6, 10
- Up to 350 bar [5 076 PSI]
- Up to 80 L/min [21.1 GPM]
- Up to 130 L/min [34.3 GPM]
- Direct hydraulic operation.
- Connecting dimensions to ISO 4401.
- Threaded connections to ISO 1179.

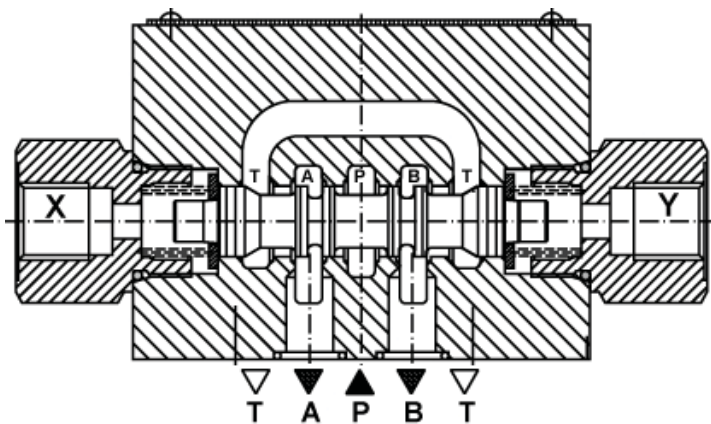


KV-4/3-5KO-6-H, KV-4/3-5KO-10-H

Operation

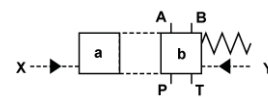
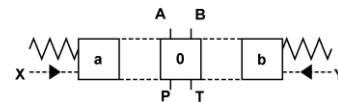
The KV-...-H is a hydraulically controlled 4/3 or 4/2 way directional control valve. The valve is operated by the pilots ports X and Y via the connection of an external pilot pipe direct on the valve body.

The minimum pilot pressure must be ensured for all operating conditions of the directional valve.



Hydraulic symbols

Spool types



Features

Size		6	10
Flow rate	L/min [GPM]	80 [21.1]	130 [34.3]
Operating pressure	Ports A, B, P	bar [PSI]	350 [5 076]
	Ports X, Y, T	bar [PSI]	210 [3 045]
Pilot supply pressure min.	bar [PSI]	10 [145]	
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 760]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]	
Filtration	NAS 1638	8	
Mass	kg [lb]	1,4 [3.1]	4,0 [8.8]
Mounting position		Optional	

Mechanically operated

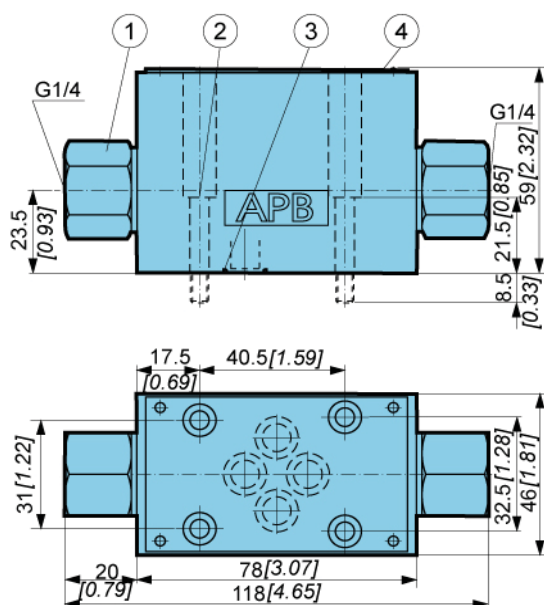
Hydraulically operated

Electrically operated



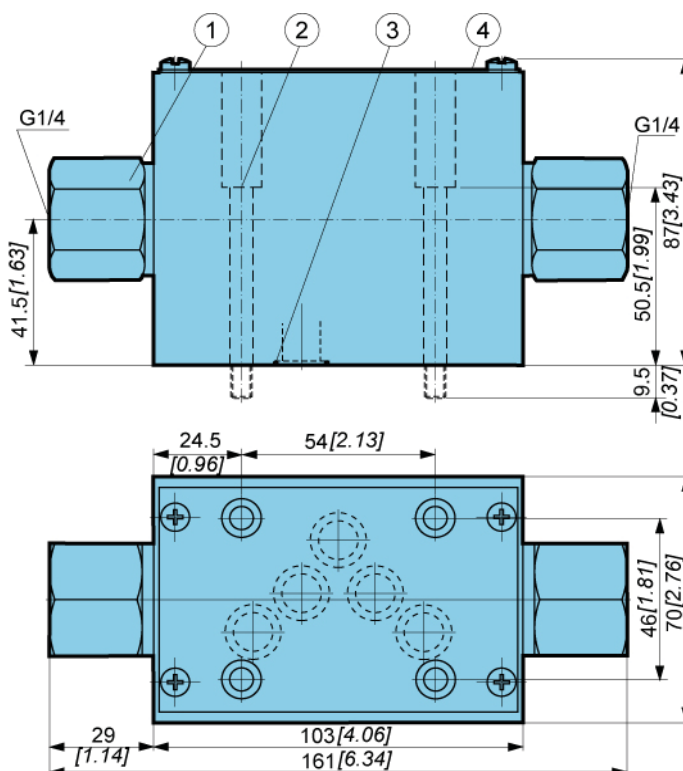
Dimensions

Size 6



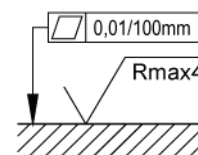
1. Threaded connection X (Y) - G1/4
2. Fixing screws 4 pcs M5x30 to ISO 4762-10.9 (by special order) Required tightening torque $M_d = 9\text{Nm}$
3. O-ring 9.25 x 1.78
4. Nameplate.

Size 10



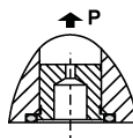
1. Threaded connection X (Y) - G1/4
2. Fixing screws 4 pcs M6x60 to ISO 4762-10.9 (by special order) Required tightening torque $M_d = 15\text{Nm}$
3. O-ring 12.42 x 1.78
4. Nameplate.

Required quality of the mating surface.



Cartridge throttle

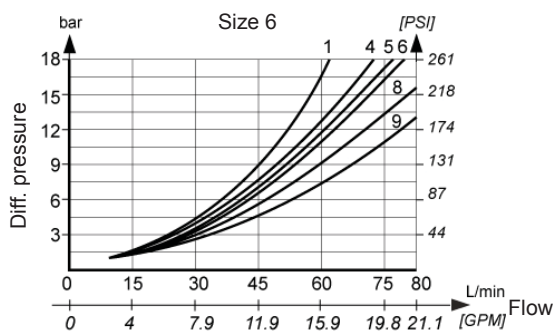
If flow rates greater than permissible occur during change-over, a cartridge throttle must be fitted into P-line of the directional valve.



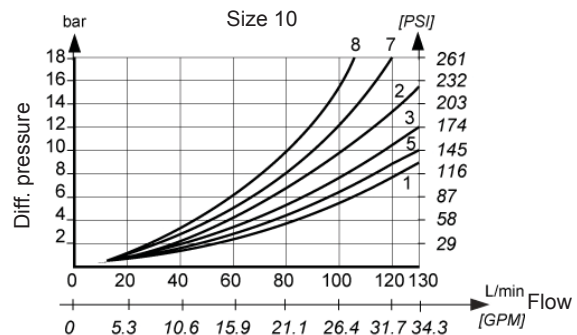


ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	P-A	P-B	A-T	B-T	P-T
1	8	8	6	6	-
2	5	5	4	4	1
6	5	5	9	9	-
51A	5	5	1	1	-



Spool	P-A	P-B	A-T	B-T	P-T
1	1	1	5	5	-
2	3	3	2	7	8
6	1	1	2	2	-
51A	1	1	3	3	-

Model code

K V - 4 / - 5 K O - - H - - - *

Number of control spool position

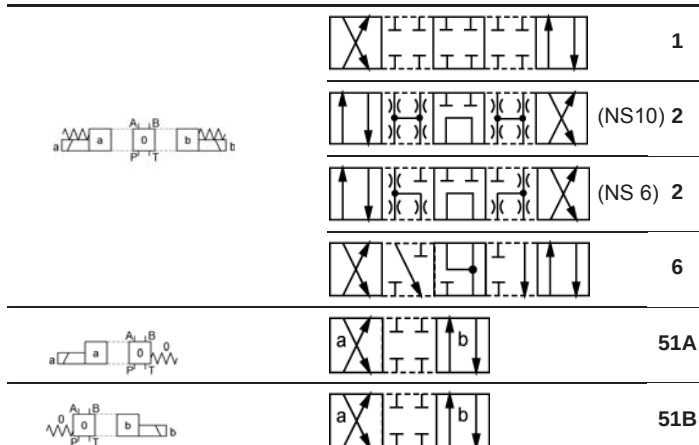
Two positions	2
Three positions	3

Size

Size 6	6
Size 10	10

Hydraulically operated

Spool types



Special requirements to be briefly specified

Seal type

No designation	NBR seals for mineral oil HL, HLP to DIN 51524
E	FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Throttle mm [in]

No designation	Without throttle in P line
D08	Throttle Ø 0,8 [0.03 dia.]
D10	Throttle Ø 1,0 [0.04 dia.]
D12	Throttle Ø 1,2 [0.05 dia.]

Mechanically operated

Hydraulically operated

Electrically operated





6/2 WAY DIVERTER VALVES KV - HIGH PRESSURE

- NG 16
- Up to 450 bar [6 527 PSI]
- Up to 300 L/min [79.25 GPM]
- Hydraulically operated

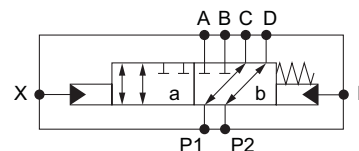


KV-6/2-16-H

Operation

6/2 directional valves are normally used for selection between two consumers or two hydraulic circuits which are not operated simultaneously. Control spool is operated by pilot pressure acting on port X. Return of the spool to the initial position is assured by the return spring.

Hydraulic symbol



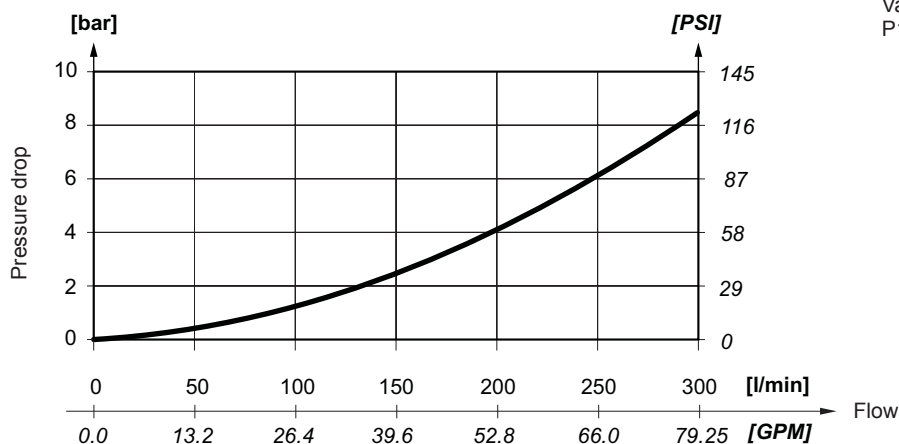
Features

Max pressure	bar [PSI]	450 [6 527]
Minimal pilot pressure X for spool shift*	bar [PSI]	36 [522]
Max pressure on port X and L	bar [PSI]	210 [3 045]
Max flow range	L/min [GPM]	300 [79.25]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]
Fluid contamination	ISO 4406: 1999	19/17/14
Mass	kg [lb]	16,8 [37.04]

* Valid for operation at flow 250 L/min [66.0 GPM] and pressure 450 bar [6 527 PSI]. At lower p-Q load the pilot pressure can be also lower.

ΔP-Q Performance curves

Measured at 50 °C [122 °F] and viscosity 32 mm²/s [148 SUS].



Valid for flow directions:
P1-C, D-P2, P1-A, B-P2

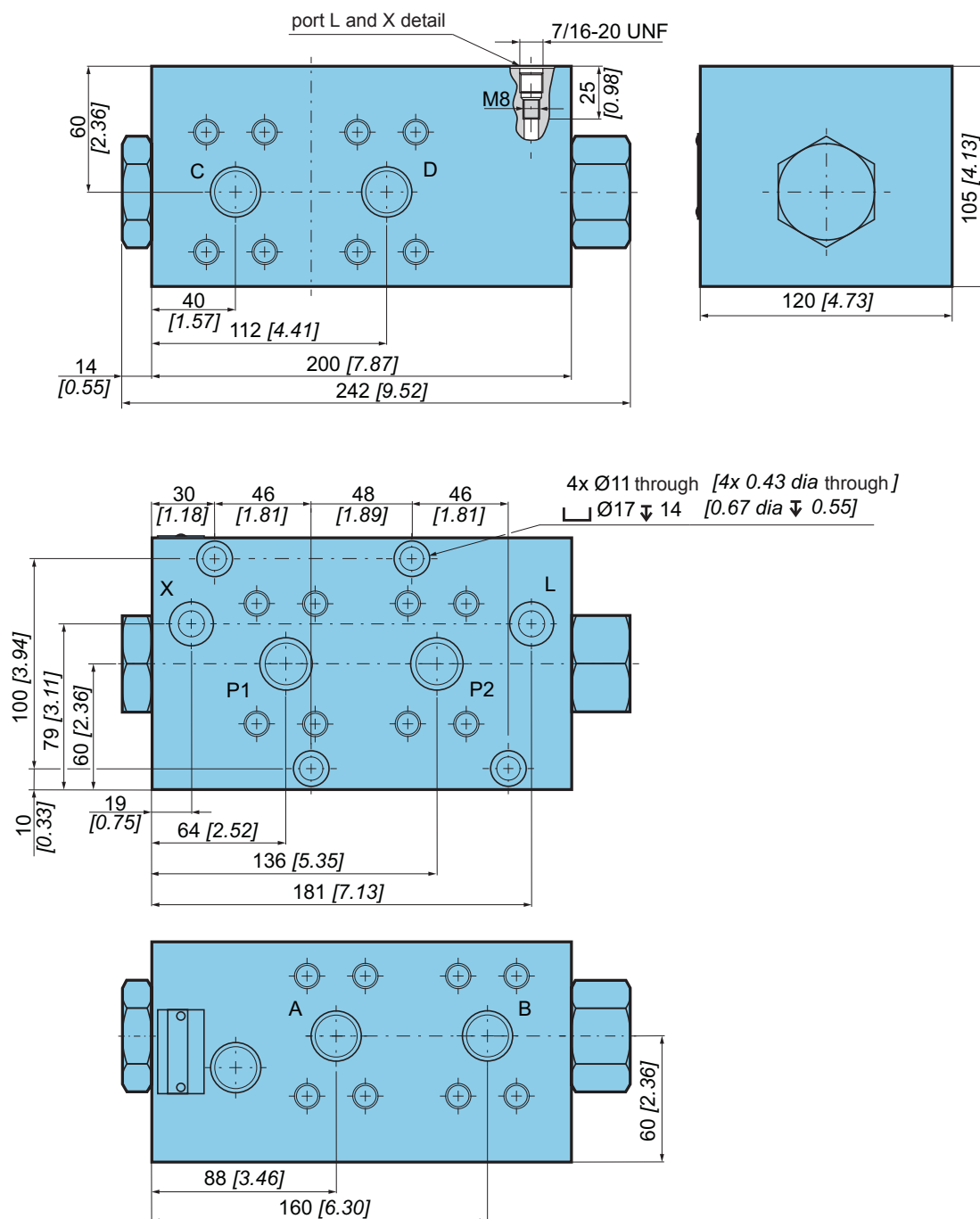
Mechanically operated

Hydraulically operated

Electrically operated



Dimensions



Installation

Mounting position: Indifferent

	Class	 (*)
	8.8	N.m [lb.ft]
4xM10		49 [36]

(*) As per standard DIN 912



Model code

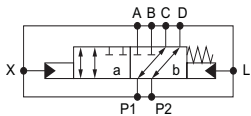
K V - 6 / 2 - 16 - H - - S A E 1 - 4 5 0 - - R A L - *

Operation

Hydraulically operated

H

Spool type



No designation

Ports

P1, P2, A, B, C, D - SAE, 6000 PSI
X, L - 7/16-20 UNF

SAE1

Max working pressure bar [PSI]

450 [6 527]
350 [5 076]

450

No designation

Special requirements

To be briefly specified

Surface protection

No designation	Phosphated
RAL	Painted RAL 9005
ZN	Zinc coated

Seal type

No designation	NBR seals for mineral oil HL, HLP
E	FMM seals for HETG, HEES, HEPG

Mechanically operated

Hydraulically operated

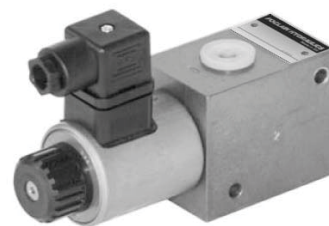
Electrically operated





2/2 WAY DIRECTIONAL VALVES KV

- NG 6
- Up to 210 bar [3045 PSI]
- Up to 30 L/min [7.9 GPM]
- Direct in-line mounting.
- Threaded connections to ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Hermetically sealing at closed flow path.
- No STICK-SLIP effect even after a prolonged dwell time under pressure.
- Plug-in solenoid connector to ISO 4400.
- Protection of solenoid IP65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-2/2-6-S-..

Operation

Directly-operated directional seat valves KV are used for the control of direction of hydraulic fluid.

KV-2/2-6-S-A-...

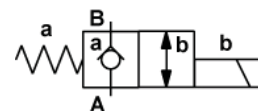
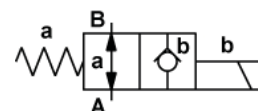
In the start control position a, the return spring (4) holds the ball (2) in its open position, thus freeing the flow path between ports A and B. The change-over into the control position b is accomplished by energizing the solenoid (3), whereby the ball (2) is pushed against the seat (1). The hydraulic fluid on port A is under pressure.

KV-2/2-6-S-B-...

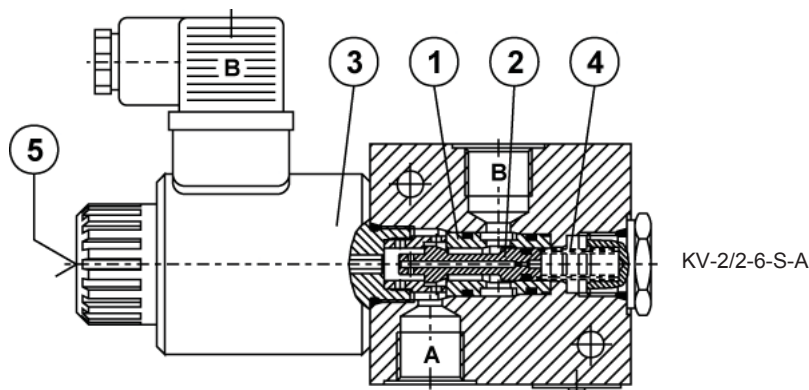
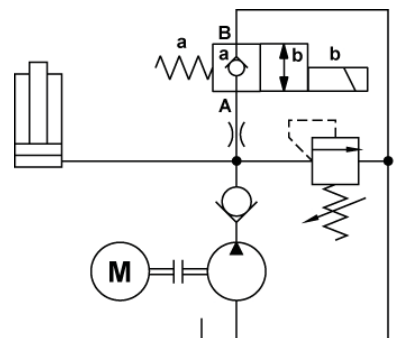
The hydraulic fluid on port A in the start control position a is under pressure. The return spring (4) pushes the ball (2) against its seat (1). The change-over to the control position b is performed by energizing the solenoid (3), thus freeing the flow path between ports A and B.

The change-over can also be done manually by pressing the emergency manual override (5).

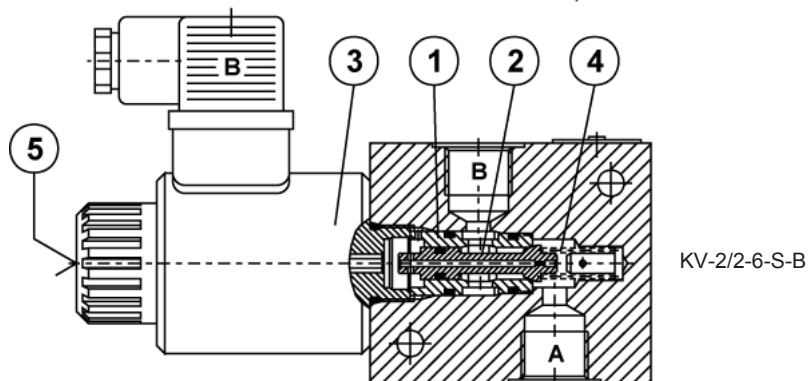
Hydraulic symbols



Mounting example



KV-2/2-6-S-A



KV-2/2-6-S-B

Mechanically operated

Hydraulically operated

Electrically operated



Features

Hydraulic

Size		6
Flow rate	L/min [GPM]	30 [7,93]
Operating pressure	bar [PSI]	210 [3045.79]
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [3.24 to 82]
Filtration	NAS 1638	8
Mass	kg [lb]	2,2 [4.85]

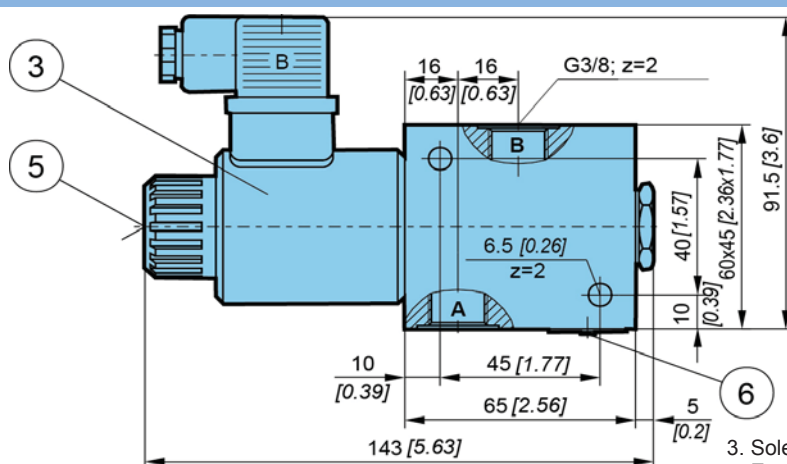
Electrical

Supply voltage	V	12, 24, 48, 110, 230 DC or AC
Power	W	29 *
Intermittence		continuous
Ambient temperature	°C [°F]	To +50 [To +122]
Coil temperature	°C [°F]	To +180 [To +356]
Duty cycle	min ⁻¹	250

* 12V supply voltage - 36W

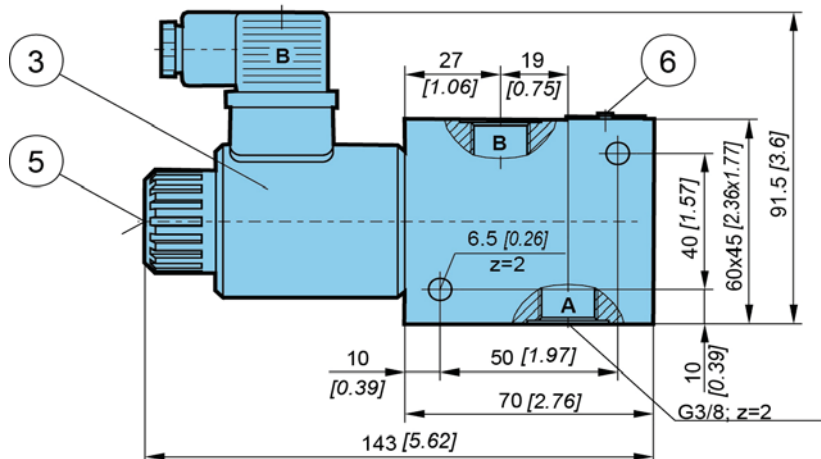
Dimensions

KV-2/2-6-S-A-



- 3. Solenoid "b" MR-045.
- 5. Emergency manual override.
- 6. Nameplate.

KV-2/2-6-S-B-

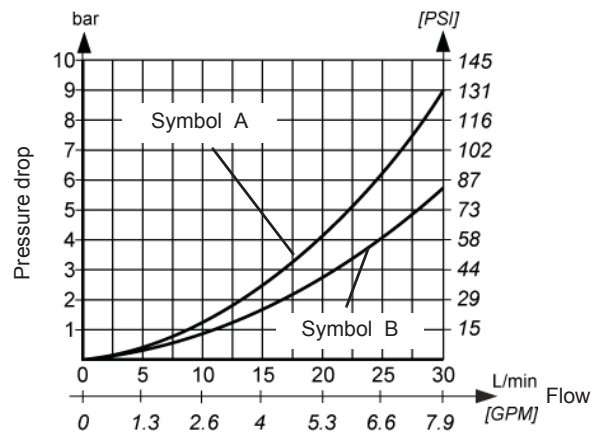




ΔP -Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

Valid for flow direction A to B.



Model code

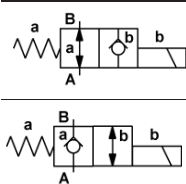


Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

**Special requirements to be
briefly specified**

Spool type



A

B

Seal type

No designation	NBR seals for mineral oil HL, HLP, to DIN 51524
E	FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Supply voltage

	Direct voltage	Alternating voltage
12 V	12 DC	12 AC
24 V	No designation	24 AC
48 V	48 DC	48 AC
110 V	110 DC	110 AC
220 V	220 DC	-
230 V	-	230 AC*

- Alternating voltage solenoids are fitted with a bridge rectifier
- With solenoids of over 48 V an earthing clamp to ISO 4400 must be connected.
To fulfil EMC (89/336/EEC) a capacitor must be built in.

Threaded connections

No designation	G 3/8
SAE 8	3/4-16 UNF-2B

Overvoltage protection

No designation	Without overvoltage protection
T	With overvoltage protection

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
EN 175301-803 without connector	K
AMP junior timer without connector	M
Deutsch	V

Mechanically operated

Hydraulically operated

Electrically operated





3/2 WAY DIRECTIONAL VALVES KVC

- NG 4
- Up to 160 bar [2 320 PSI]
- Up to 16 L/min [4.2 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Optimized flow paths for low losses of pressure.
- Wet pin solenoid with interchangeable coil.
- Manual emergency control.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF)



KVC2-3/2-4-47B, KVC-3/2-4-47B

Features

Hydraulic

Size		4
Flow rate	L/min [GPM]	16 [4.2]
Operating pressure	bar [PSI]	160 [2 320]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Filtration	ISO 4406-1999	19/17/14
Mass	KVC-3/2-4	1,6 [3.5]
	KVC2-3/2-4	3,5 [7.7]

Electrical

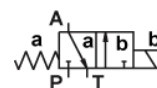
Supply voltage	V	12, 24
Power	W	29 *
Switch-on time**	ms	50 to 80
Switch-off time**	ms	30 to 55
Switching frequency	1/h	15 000
Ambient temperature	°C [°F]	to 50 [122]
Coil temperature	°C [°F]	to 180 [356]
Duty cycle		Continuous

* 12 V supply voltage - 36 W.

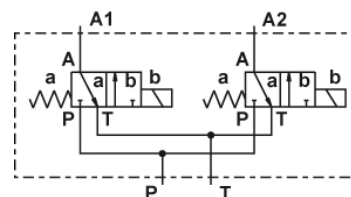
** The switching-on and off times apply to 24 V DC solenoids

Hydraulic symbol

Single: KVC-3/2-4-47B



Double: KVC2-3/2-4-47B



Mechanically operated

Hydraulically operated

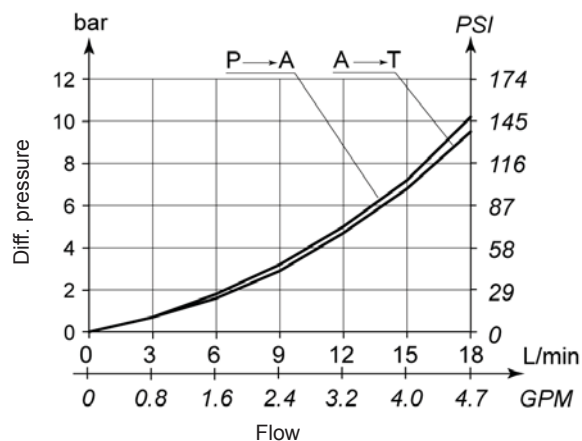
Electrically operated



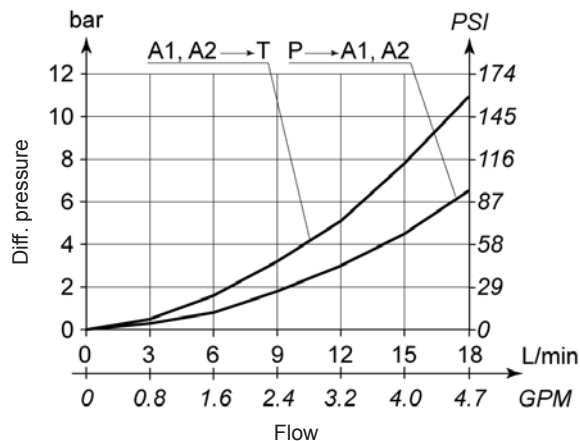
ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

KVC-3/2-4

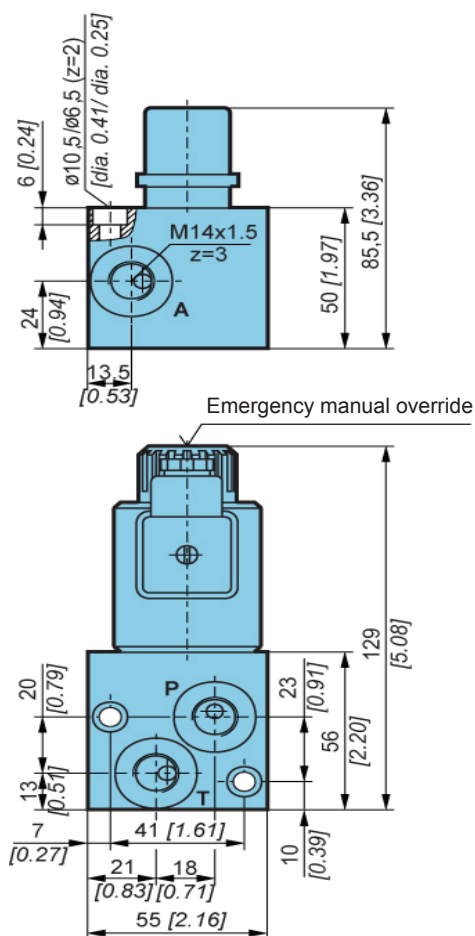


KVC2-3/2-4

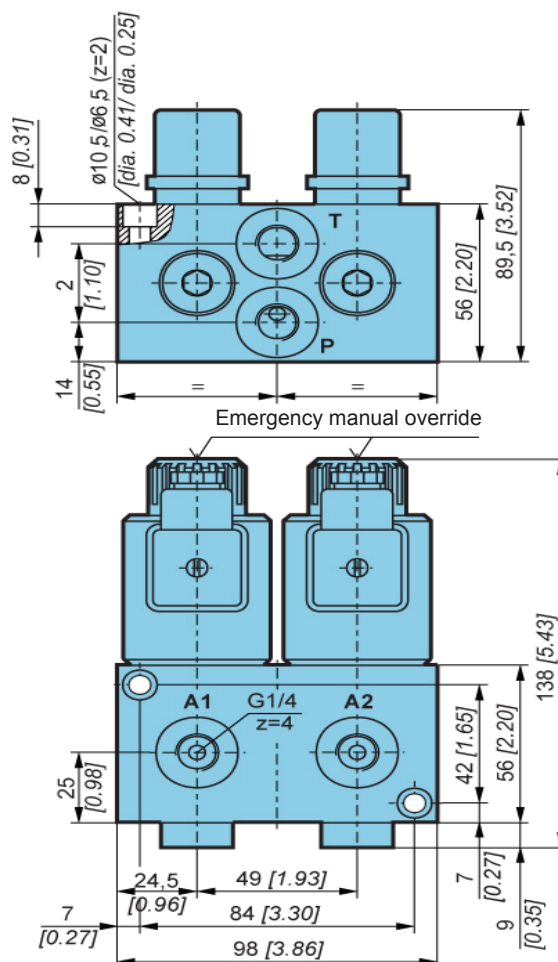


Dimensions

KVC-3/2-4-47B

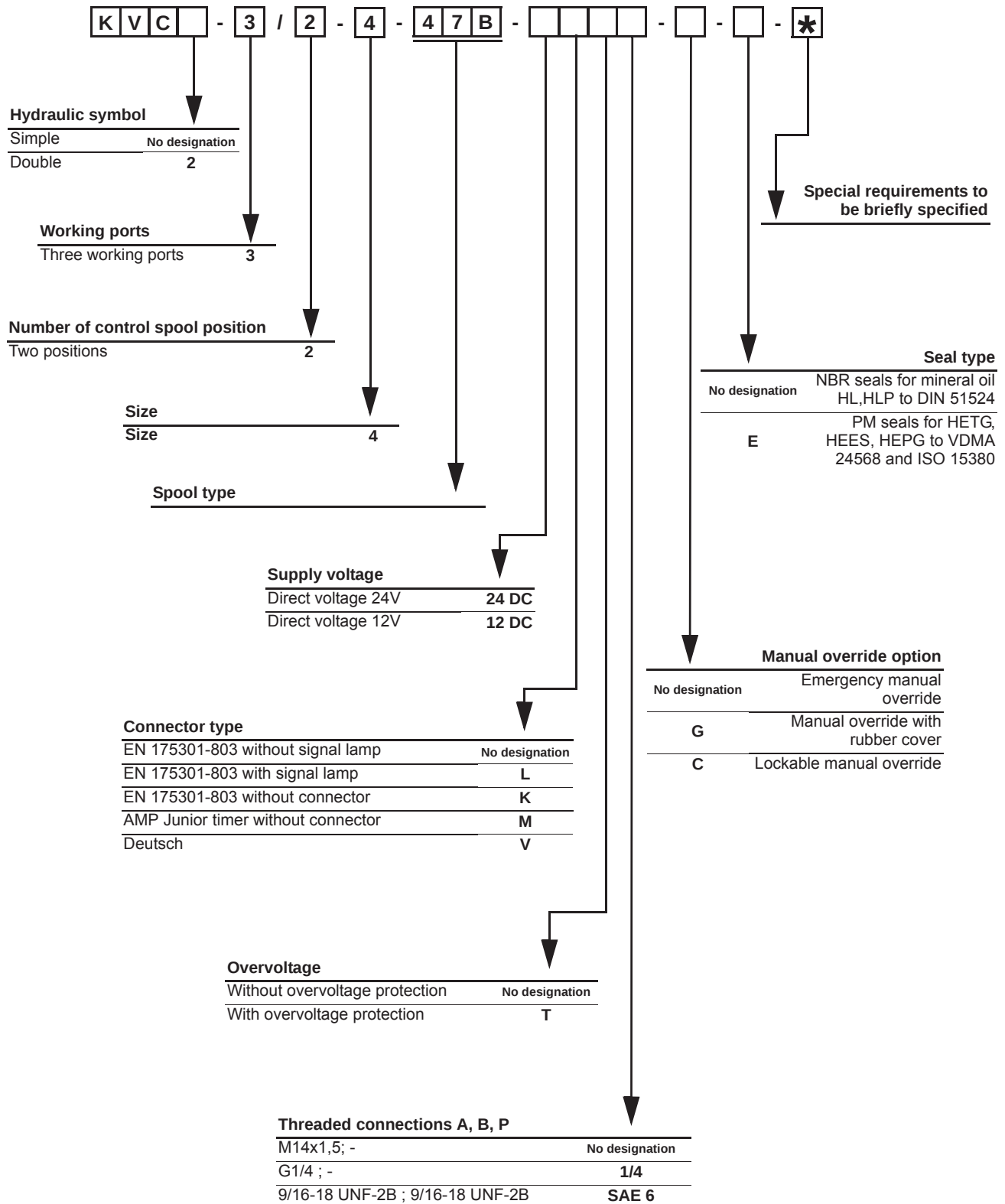


KVC2-3/2-4-47B





Model code







3/2 WAY DIRECTIONAL VALVES KVC

- NG 10
- Up to 350 bar [5 076 PSI]
- Up to 100 L/min [26.4 GPM]
- Direct in-line mounting.
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP65 to EN 50529 / IEC 60529.



KVC-3/2-10

Operation

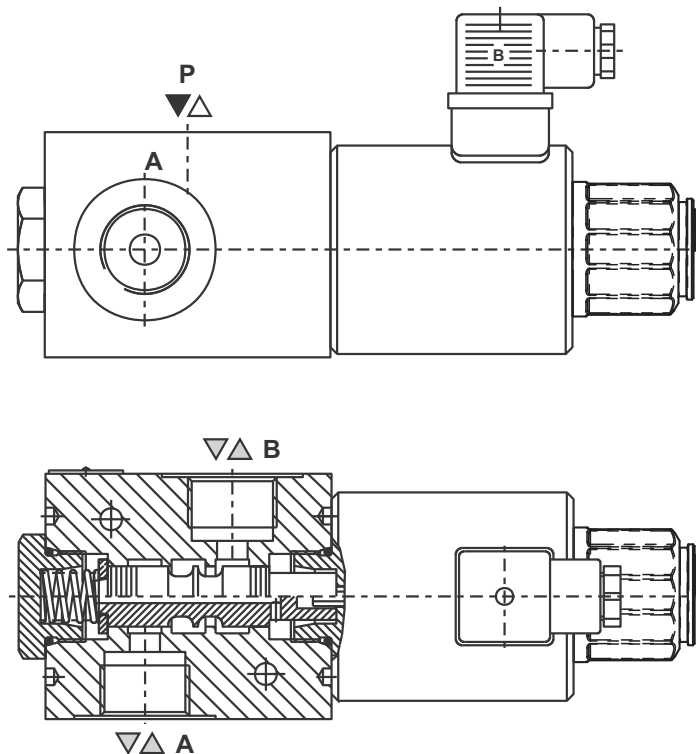
Directional valves type KVC-3/2-10 with direct solenoid operation are used to control the direction of hydraulic fluid flow.

Type KVC-3/2-10 is a reduced version of type KV-6/2. It is used for alternate control of two one-pipe working units (e.g. Plunger) with common, main directional valve.

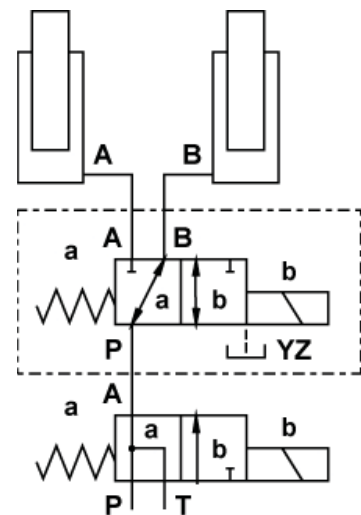
It is also very proper as bypass valve.

The change-over can also be done manually by pressing the emergency manual override.

Hydraulic symbol



Mounting example



Mechanically operated

Hydraulically operated

Electrically operated



Features

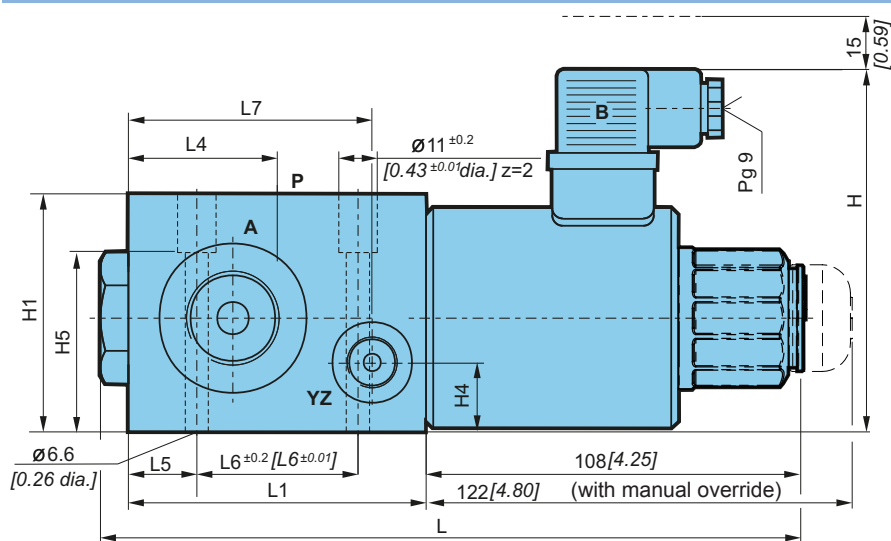
Hydraulic

Size		10
Flow rate	Without drainage	L/min [GPM]
	With drainage	60 [15.8]
Operating pressure	Without drainage	bar [PSI]
	With drainage	250 [3 625]
Oil temperature range	Without drainage	°C [°F]
	With drainage	-20 to +70 [-4 to +158]
Viscosity range		mm ² /s [SUS]
		15 to 380 [3.24 to 82]
Mounting position		Optional
Mass	Without drainage	kg [lb]
	With drainage	5,6 [12.34]
Filtration		NAS 1638
		8

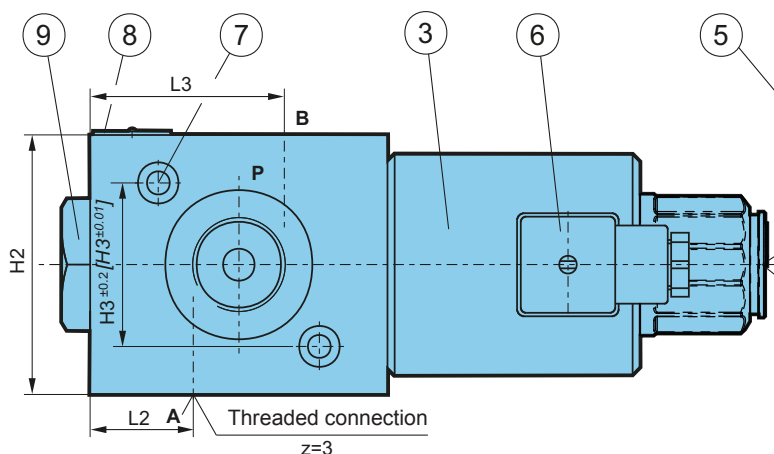
Electrical

Supply voltage	V	12, 24 DC
Power	W	45
Switching frequency	1/h	15000
Ambient temperature	°C [°F]	to +50 [to + 122]
Coil temperature	°C [°F]	to +180 [to + 356]
Duty cycle		Continuous

Dimensions



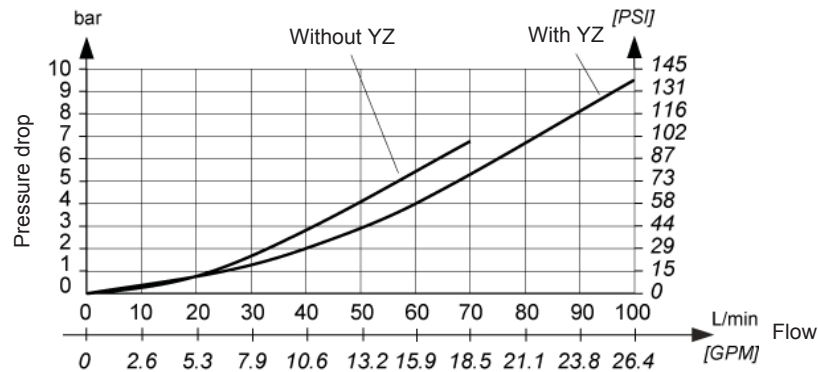
Dimensions	Without YZ	With YZ
L	201 [7.91]	210 [8.27]
L1	85 [3.34]	94 [3.70]
L2	29,5 [1.16]	31,5 [1.24]
L3	55,5 [2.18]	62,5 [2.46]
L4	42,5 [1.67]	47 [1.85]
L5	19,5 [0.76]	18 [0.71]
L6	46 [1.81]	40 [1.57]
L7	-	79,5 [3.13]
H	104 [4.09]	105 [4.13]
H1	67 [2.63]	74 [2.91]
H2	73 [2.87]	90 [3.54]
H3	46 [1.81]	66 [2.60]
H4	-	33 [1.30]
H5	50,5 [1.98]	31 [1.22]



- 3. Solenoid "b" MR-060
- 5. Emergency manual override
- 6. Plug-in connector "b" -black
- 7. Fixing screws:
-without YZ: 2 x M6x60 to ISO 4762-10.9
-with YZ: - 2 x M6x40 to ISO 4762-10.9
- 8. Nameplate
- 9. Valve cap

**ΔP-Q Performance curves**

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

**Model code**

K V C - **3** / **2** - **10** - **41B** - **1** - **1** - **1** - *****

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Spool type**41B****Supply voltage**

Direct voltage 24V	No designation
Direct voltage 12V	12 DC

Connector type

175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
EN 175301-803 without connector	K
AMP Junior timer without connector	M
Deutsch	V

Overvoltage

Without overvoltage protection	No designation
With overvoltage protection	T

Special requirements to be briefly specified**Seal type**

No designation	NBR seals for mineral oil HL, HLP to DIN 51524
E	FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Drainage

No designation		Without YZ
YZ		With YZ
YZP		With YZ plugged

Threaded connections A,B,P ; YZ

No designation	M18x1,5 ; -
M22	M22x1,5 ; -
M20	M20x1,5 ; -
3/8	G3/8 ; -
1/2	G1/2 ; -
3/4	G3/4 ; -
3/4	G3/4 ; G1/4
SAE 12	1 1/16-12 UNF-2B; 9/16-18 UNF-2B
SAE 10	7/8-14 UNF-2B; 9/16-18 UNF-2B

Mechanically operated

Hydraulically operated

Electrically operated



4/2, 4/3 WAY DIRECTIONAL VALVE KV-5KL

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 80 L/min [21 GPM]
- Connection diagram and connecting dimensions ISO 4401
- 5-chamber model with good spool guidance
- Optimized flow paths for low losses of pressure
- Low internal leakage
- Wet pin solenoid with interchangeable coil
- Manual emergency control
- Fulfil EMC (89/336/EEC)
- Packaging in carton box



KV-4/3-5KL-6

Operation

Directional valves type KV with direct solenoid operation control the direction of the hydraulic medium flow.

A valve basically consists of a housing (1), one or two solenoids (2a, 2b), control spool (3) and return spring (4).

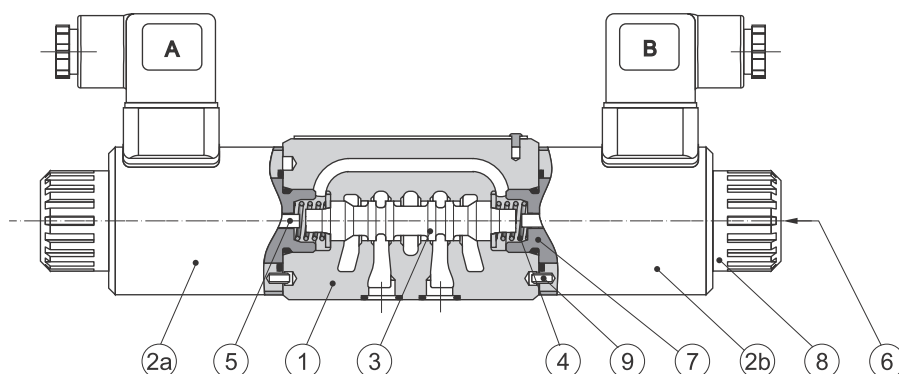
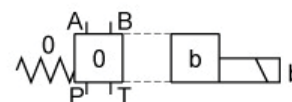
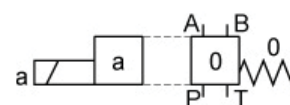
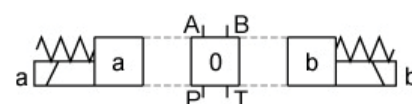
In 4/3 way directional valves the centre position of the spool is defined by 4 return springs which hold the spool in the neutral position. The change over to the operating position (a) or (b) is done by energizing the solenoids (2a/ 2b) respectively, whereby the solenoid plunger acts on the control spool (3) via the operating pin (5), thus clearing the corresponding flow ways and establishing relevant links between ports P, A, B and T. When the solenoid (2a/ 2b) is deenergized, the control spool (3) is returned to neutral position by the return spring (4). In 4/2 way directional valves the centre position of the spool is defined by return spring on the opposite side of the solenoid (2a or 2b).

Change-over of the control spool (3) can be done manually by pressing the pin (6) for emergency manual override in the solenoid core.

Solenoid coil is fastened to the solenoid core (7) by retaining nut (8). Position of the coil (orientation of the connector) is pre-defined by the positioning hole on the valve housing and by the fixation pin (9) on the coil.

Hydraulic symbols

Spool types





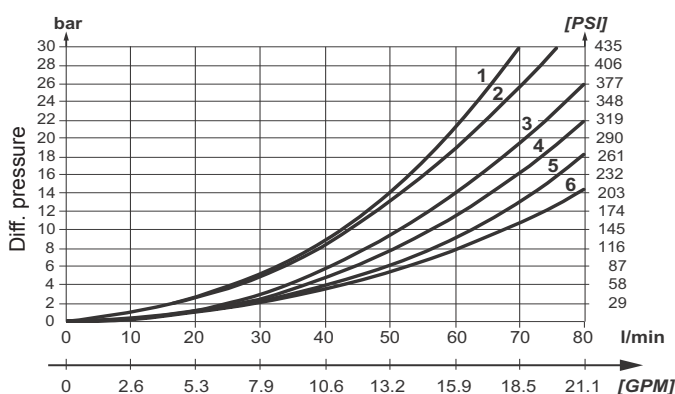
Features

Hydraulic			
Size	6		
Flow rate		L/min [GPM]	see ΔP-Q curves
Operating pressure	Ports A, B, P	bar [PSI]	350 [5 076]
	Port T	bar [PSI]	250 [3 625]
Viscosity range		mm ² /s [SUS]	15 to 380 [69.5 to 1 760]
Oil temperature range		°C [°F]	-20 to +70[-4 to 158]
Filtration		ISO 4406:1999	19/17/14
Mass	4/2	kg [lb]	1,6 [3.6]
	4/3		2,2 [4.9]
Mounting position	Optional		
Electrical			
Supply voltage	Direct	V	12, 24, 48
	Alternating		110, 230
Max. allowable voltage variation	+/- 10 %		
Power	W		31
Switch-on time*	ms		200 to 260
Switch-off time*	ms		100 to 120
Switching frequency	1/h		15 000
Ambient temperature	°C [°F]		to 50 [122]
Coil temperature	°C [°F]		to180 [356]
Duty cycle	Continuous		
Protection class to EN 50529 / IEC 60529			
	- Connector EN 175301	- IP65	
	- Connector AMP	- IP65	
	- Connector Deutsch	- IP69K	

* Measured on unloaded valve

ΔP -Q Performance curves

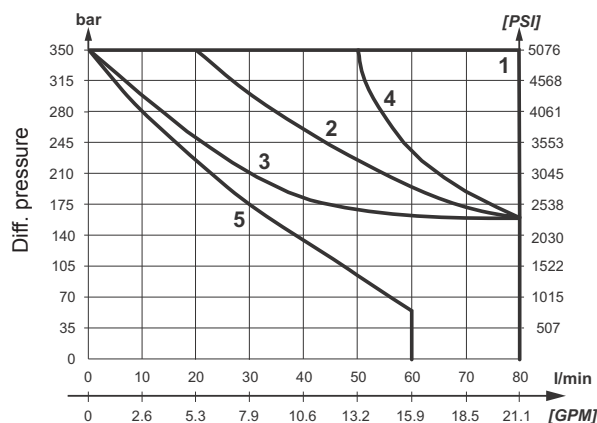
Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	Flow path				
	P-A	P-B	A-T	B-T	P-T
1	5	5	4	4	-
2	3	3	1	1	1
3	6	6	3	3	3
6	3	3	4	4	-
51A, 51B	4	4	2	2	-
41A, 41B	4	4	-	-	-

ΔP -Q Operating limits

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



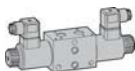
Spool	Curve
1	1
2	2
3	3
6	4
51A, 51B	1
41A, 41B	5

The operating limits of the valve are determined at a voltage 10% below the nominal rating. The curves refer to application with symmetrical flow throw the valve (P-A and B-T). In the case of asymmetric flow (e.g. one part not used) reduced values may result.

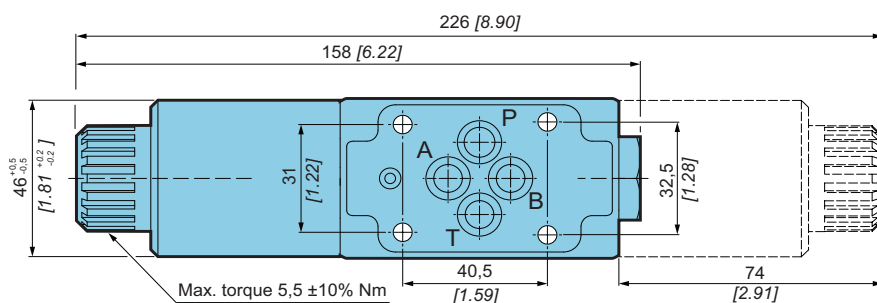
Mechanically operated

Hydraulically operated

Electrically operated

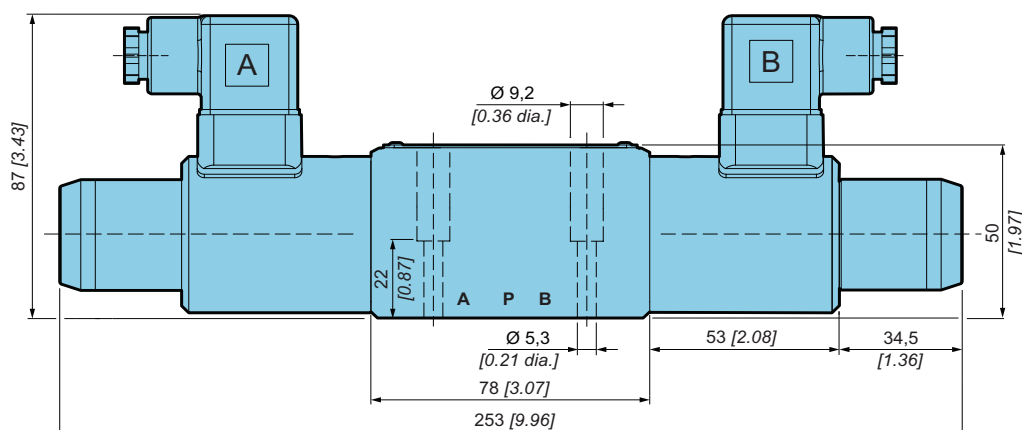


Dimensions



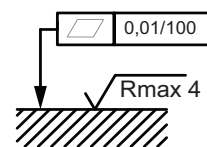
KV-4/2-5KL-6

Connection diagram and connecting dimensions to ISO 4401.

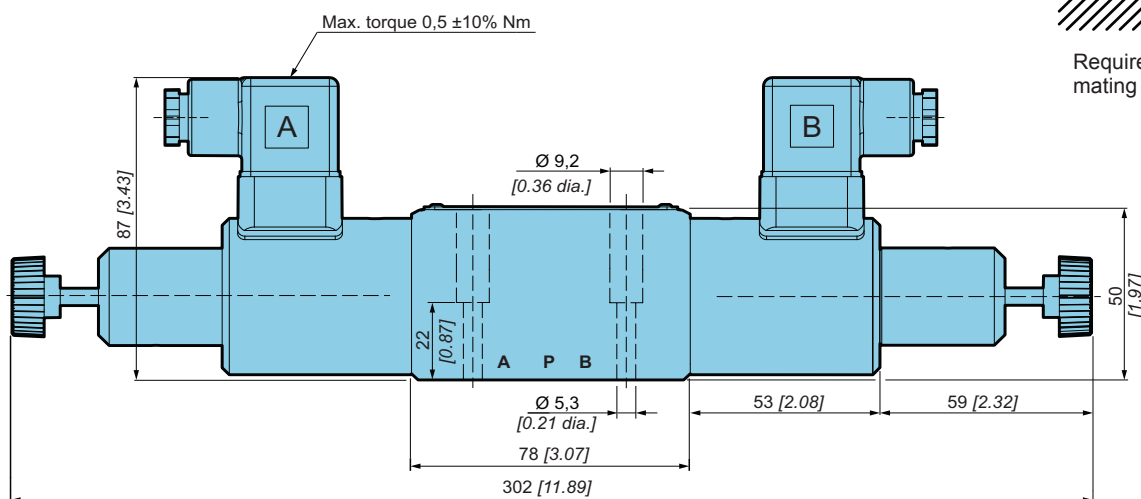


KV-4/3-5KL-6-G...

Manual override with rubber cover



Required quality of the mating surface.

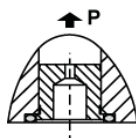


KV-4/3-5KL-6-C...

Lockable manual override

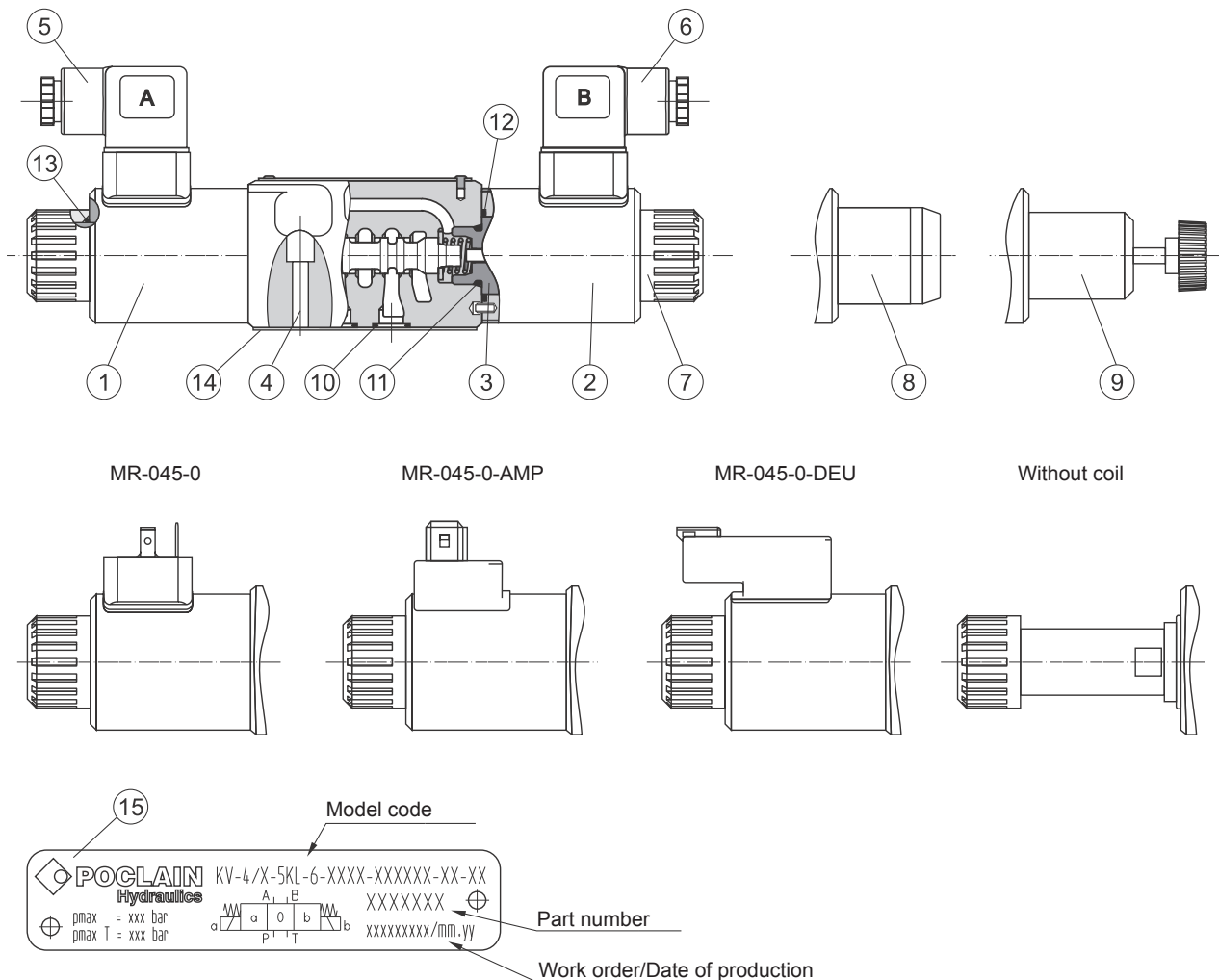
Cartridge throttle

If flow rates greater than permissible occur during change-over, a cartridge throttle must be fitted into P-line of the directional valve. (option D08/D10/D12 in the model code)





Valve assembly- spare parts



1. Solenoid coil "a" - Type **MR-045-O**
2. Solenoid coil "b" - Type **MR-045-O**
3. Solenoid core - Type **MR-045-O**
4. Fixing screws 4 pcs **M5x30 to ISO 476210.9**, not supplied with the valve; must be ordered separately
Required tightening torque: 9^{+/-} 10% Nm - steel tapped holes, 7^{+/-} 10% Nm - aluminium tapped holes
5. Plug-in connector EN 175301-803 "a" - grey - Type **MR-K-A**
6. Plug-in connector EN 175301-803 "b" - black - Type **MR-K-B**
7. Retaining nut - Type **MR-045-M**
8. Retaining nut for manual override with rubber cover - Type **MR-045-M-G**
9. Retaining nut for lockable manual override - Type **MR-045-M-C**
10. O-ring FI 9,25x1,78
11. O-ring FI 17x2
12. O-ring FI 26x2
13. O-ring FI 22x1,5
14. Protection plate
15. Nameplate

Detail technical data regarding the solenoids and Model codes for ordering are available in catalogue chapter SOLENOIDS.

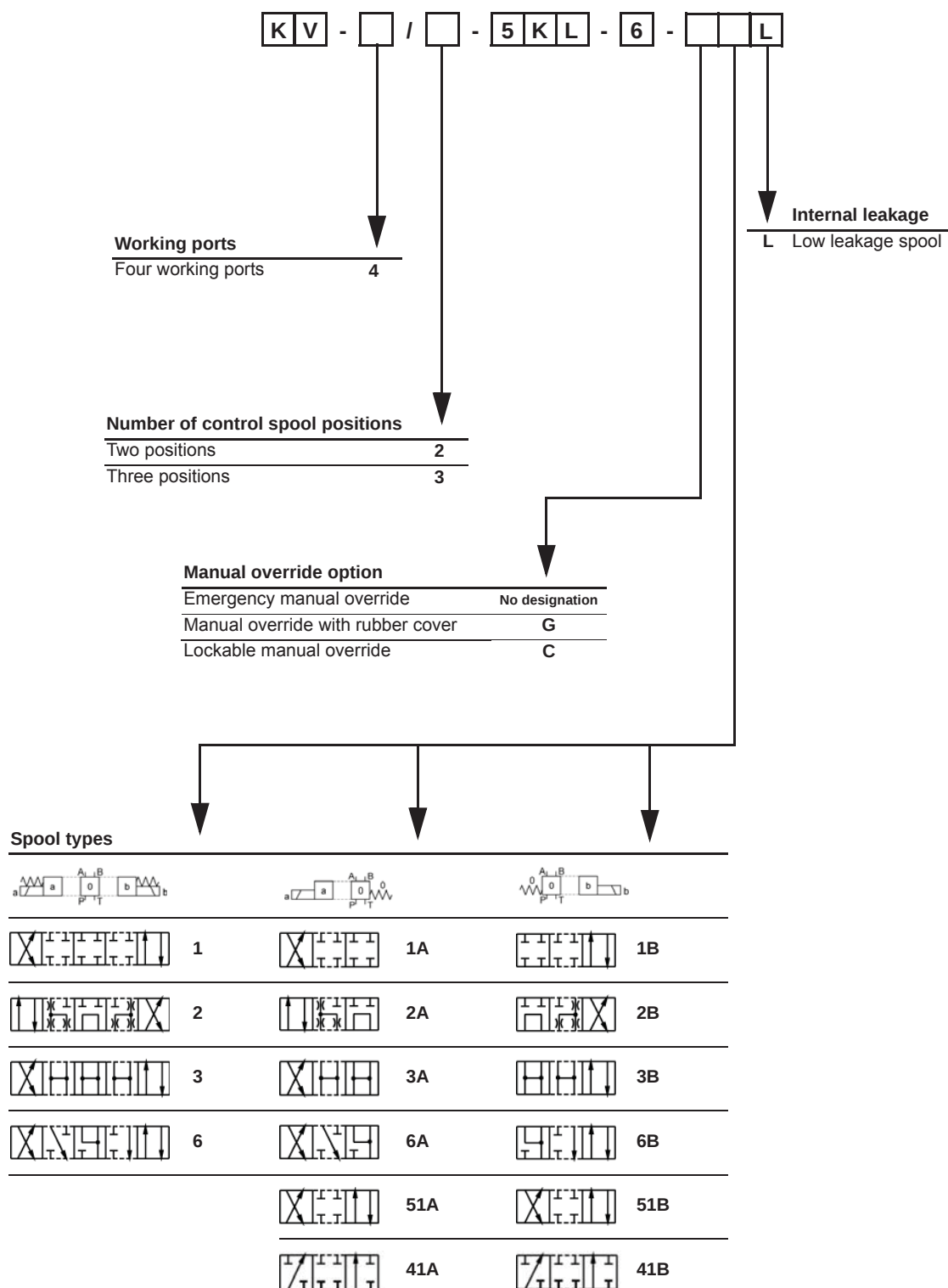
Mechanically operated

Hydraulically operated

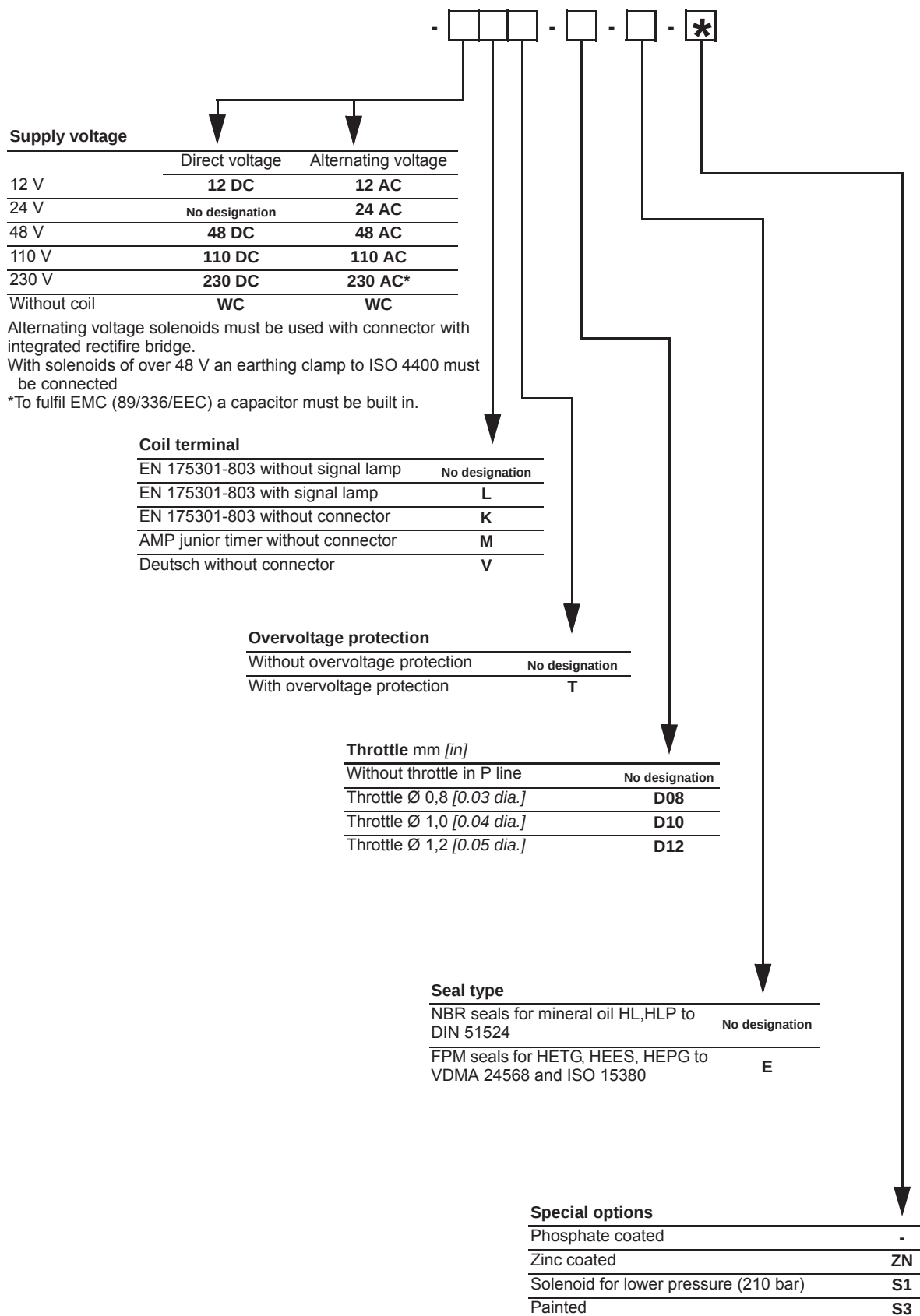
Electrically operated

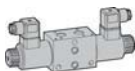


Model code



Port T in the valves with spool type 41A and 41B must be used as leakage line when working pressure is over 250 bar [3 625 PSI].





4/2, 4/3 WAY DIRECTIONAL VALVE KV-5KO

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 75 L/min [19.8 GPM]
- Connection diagram and connecting dimensions to ISO 4401.
- Plug-in connector for solenoids to ISO 4400.
- 5-chamber model with good spool guidance.
- Optimized flow paths for low losses of pressure.
- Adjustment of the switching time.
- Wet pin solenoid with interchangeable coil.
- Manual emergency control.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-4/3-5KO-6

Operation

Directional valves type KV with direct solenoid operation control the direction of the hydraulic medium flow.

These directional valves consist of a housing (1), a control spool (3), and one solenoid (2) with two return springs (4) in 4/2-way directional valves, and two solenoids (2) with two return springs (4) in 4/3-way directional valves. In 4/3-way directional valves the centre position of the control spool is the neutral position. The change-over to the operating position (a) and (b) is done by energizing the solenoids (2) "a" and "b" respectively, whereby the solenoid plunger acts on the control spool (3) via the operating pin (5), thus clearing the corresponding flow ways and establishing relevant links between ports A, B, P, and T.

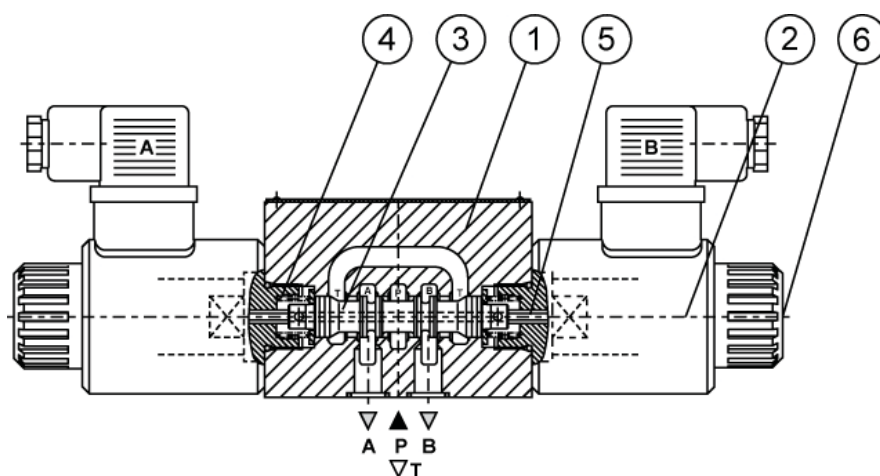
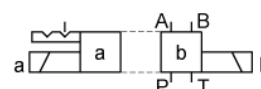
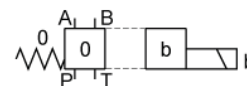
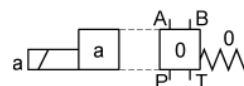
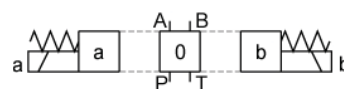
When the solenoid (2) is de-energized, the control spool (3) is returned to its neutral position by the return spring (4). The change-over can be done manually by pressing the emergency manual override (6).

KV-4/2-5KO-6-81

Directional valve with two operating position, two solenoids without springs allow the control spool to be held in the operating position (detent). The control spool remains in the operation position also when the solenoids are de-energized.

Hydraulic symbols

Spool types





Features

Hydraulic		
Size	6	
Flow rate	L/min [GPM]	see ΔP -Q curves
Operating pressure	Ports A, B, P	bar [PSI]
	Port T	bar [PSI]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1 760]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Filtration	NAS 1638	8
Mass	4/2	kg [lb]
	4/3	kg [lb]
Mounting position	Optional	

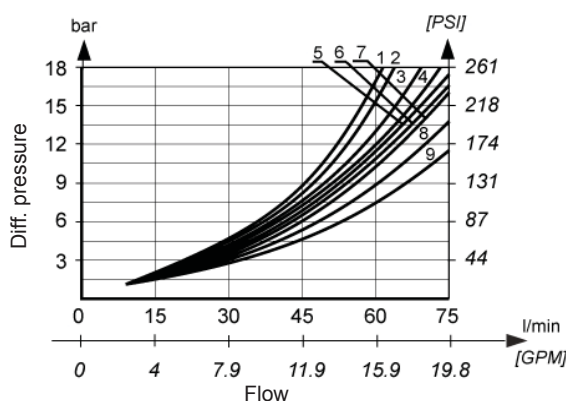
Electrical		
Supply voltage	Direct	V
	Alternating	V
Power	W	29 *
Switch-on time**	ms	50 to 80
Switch-off time**	ms	30 to 55
Switching frequency	1/h	15 000
Ambient temperature	°C [°F]	to 50 [122]
Coil temperature	°C [°F]	to 180 [356]
Duty cycle	Continuous	

* 12 V supply voltage - 36 W.

** The switching-on and off times apply to 24 V DC solenoids.

ΔP -Q Performance curves

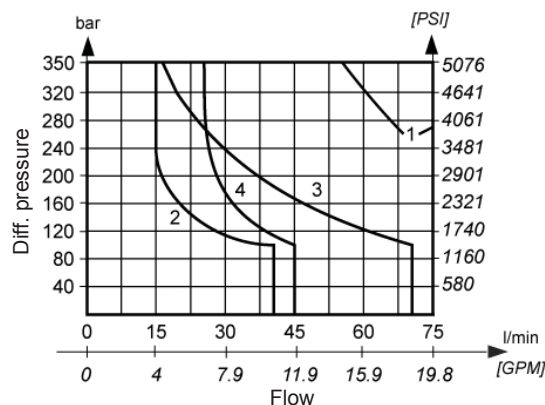
Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	Flow path				
	P-A	P-B	A-T	B-T	P-T
1	8	8	6	6	-
2	5	5	4	4	1
3	8	8	7	7	2
6	5	5	9	9	-
81	5	5	1	1	-
51A, 51B	5	5	1	1	-
41A, 41B	7	7	-	-	-

ΔP -Q Operating limits

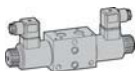
Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



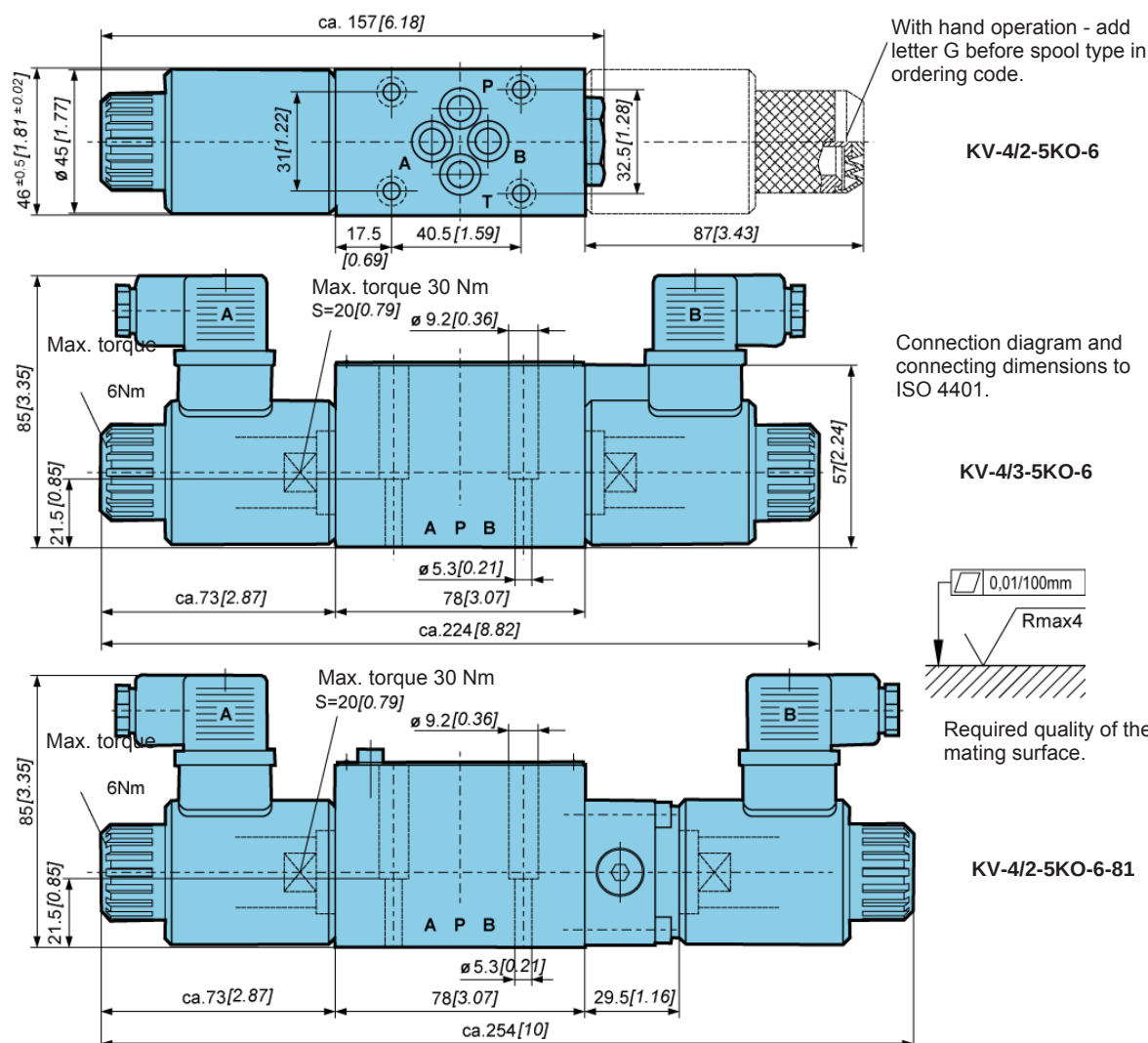
Spool	Curve
1	1
2	4
3	3
6	3
81	1
51A, 51B	1
41A, 41B	2

The operating limits of the valve are determined at a voltage 10% below the nominal rating. The curves refer to application with symmetrical flow throw the valve (P-A and B-T). In the case of asymmetric flow (e.g. one part not used) reduced values may result.

Note: For valves with adjustment of the switching time reduced values of the operating limits may result.

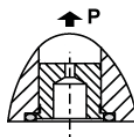


Dimensions



Cartridge throttle

If flow rates greater than permissible occur during change-over, a cartridge throttle must be fitted into P-line of the directional valve.



Installation-important for option with restrictor-type ... "UD"

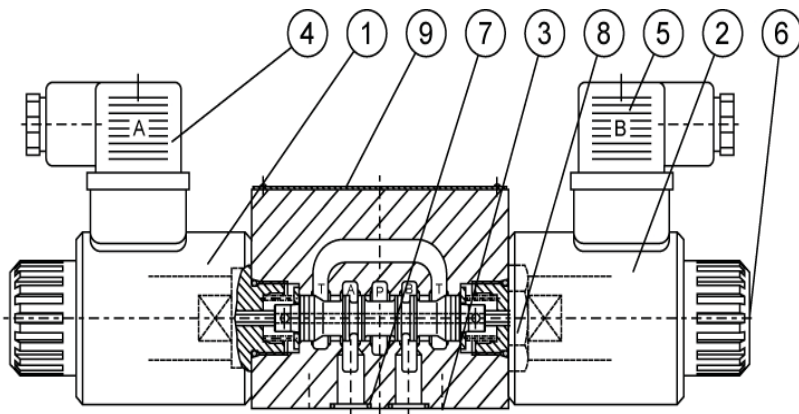
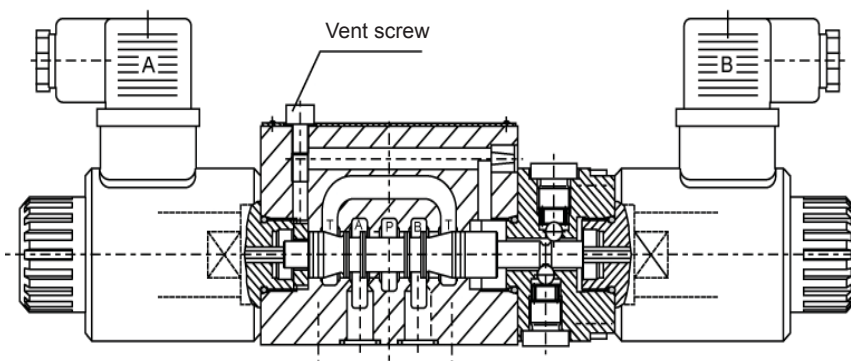
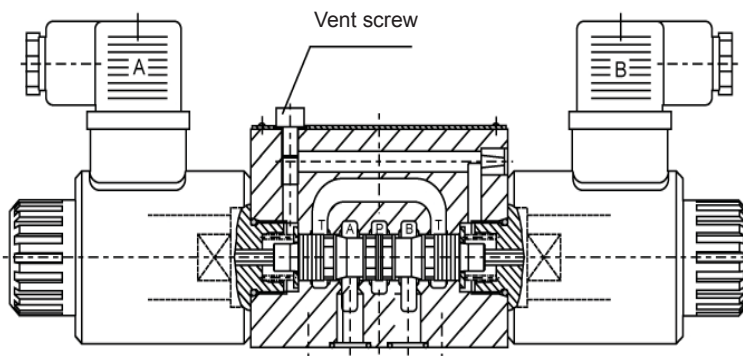
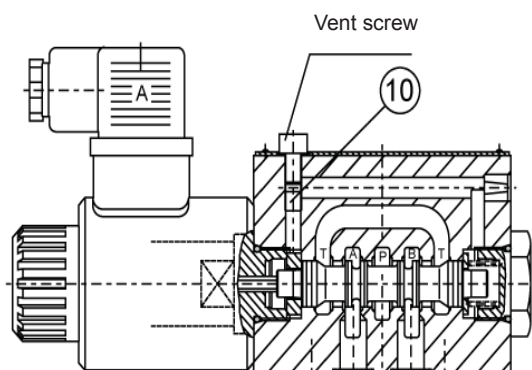
The directional control valve must be installed horizontally (Nameplate on top). If this is not the case, the valve must be removed for venting. Unscrew the vent screw. Move the spool alternately to the switching positions a and b until no more bubbles appear at the screw hole. The oil must be visible at the screw hole. Missing oil should be refilled with an oilcan, drop by drop. Screw in the vent screw. A constant or short time static oil pressure of at least > 4 bar must prevail at connection T of the directional control valve to maintain the oil pressure in the spring chambers. If this is not the case, the preloaded oil volume of the restricted valve would leak into the T channel through the leakage section of the control spool shoulders. The dampening constancy also depends on the constancy of the oil viscosity. For this reason the dampening effect should always be adjusted with the system at operational temperature.

**Function drawing**

Mechanically operated

Hydraulically operated

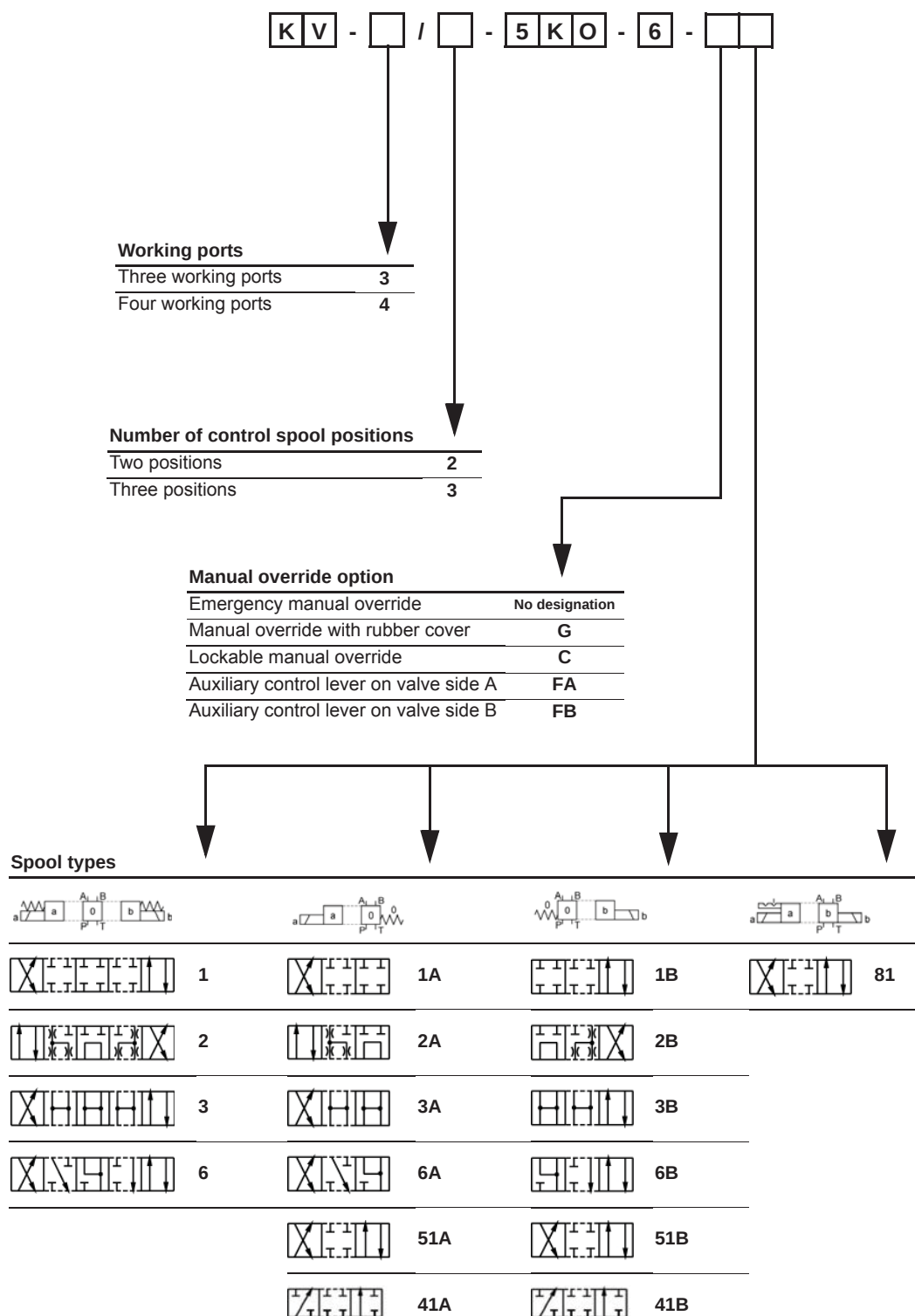
Electrically operated

**KV-4/3-5KO-6**
(KV-4/2-5KO-6)**KV-4/2-5KO-6-81****KV-4/3-5KO-6-2****KV-4/2-5KO-6-UD**

1. Solenoid "a" - MR-045
2. Solenoid "b" - MR-045
3. Fixing screws 4 pcs M5 x 30 to ISO 4762
-10.9 must be ordered separately.
Required tightening torque $M_d = 9 \text{ Nm}$
4. Plug-in connector "a" - grey
5. Plug-in connector "b" - black
6. Emergency manual override
7. O-ring 9,25 x 1,78
8. Valve cap
9. Nameplate
10. Constant action restrictor



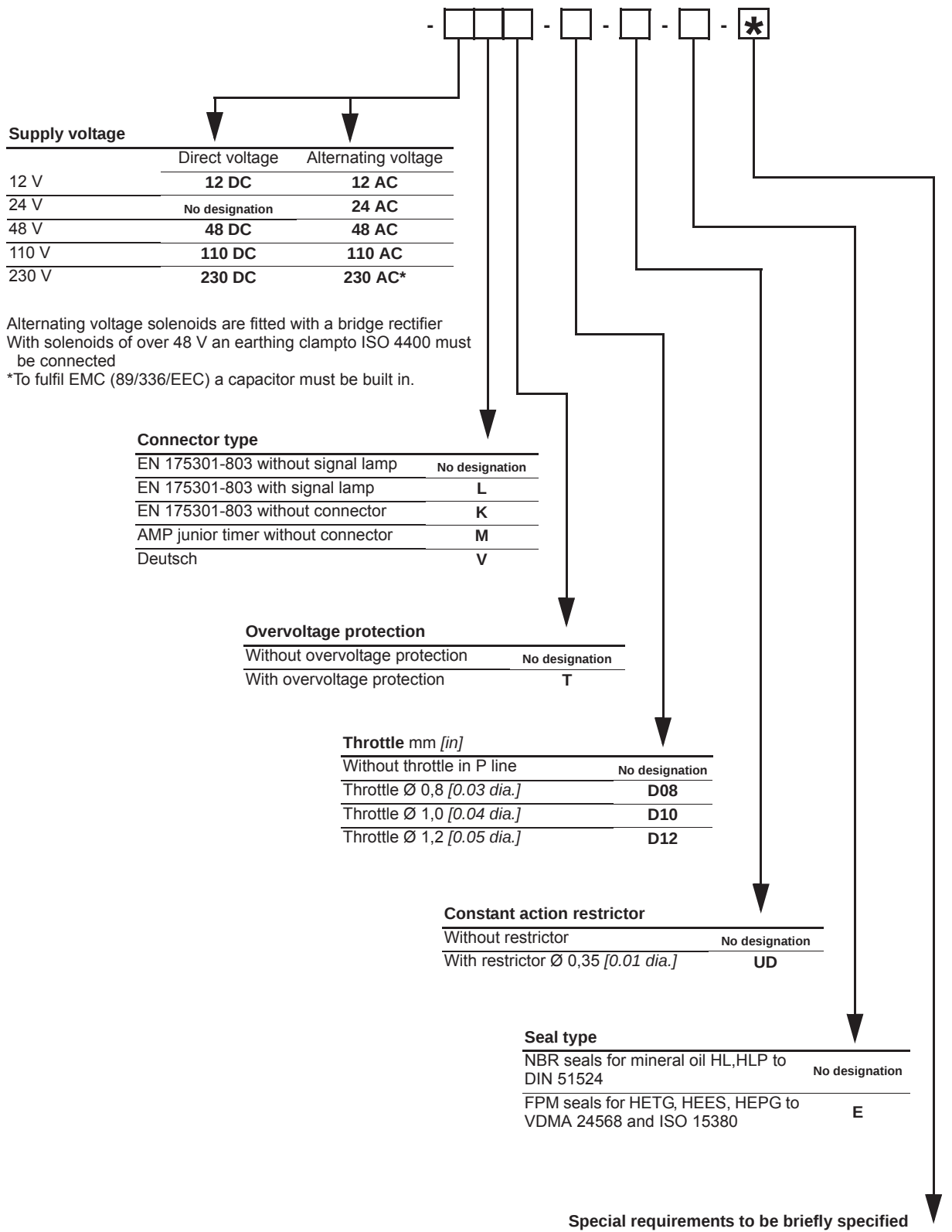
Model code



Port T in the valves with spool type 41A and 41B to be used as leakage line.



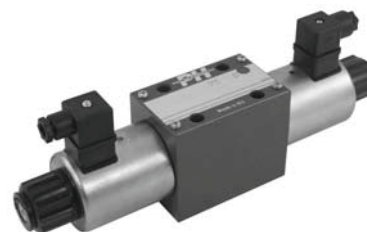
Valves with adjustment of the switching time - a constant or short - time static oil pressure of at least ≥ 4 bar [58 PSI] must prevail at connection T of the directional control valve to maintain the pressure in the spring chambers.





4/2, 4/3 WAY DIRECTIONAL VALVE KV-5KO

- NG 10
- Up to 350 bar [5 076 PSI].
- Up to 120 L/min [31.7 GPM].
- Connection diagram and connecting dimensions to ISO 4401.
- Plug-in connector for solenoids to ISO 4400.5-chamber model with good spool guidance.
- Optimized flow paths for low losses of pressure.
- Adjustment of the switching time.
- Wet pin solenoid with interchangeable coil.
- Manual emergency control.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.



KV-4/3-5KO-10

Operation

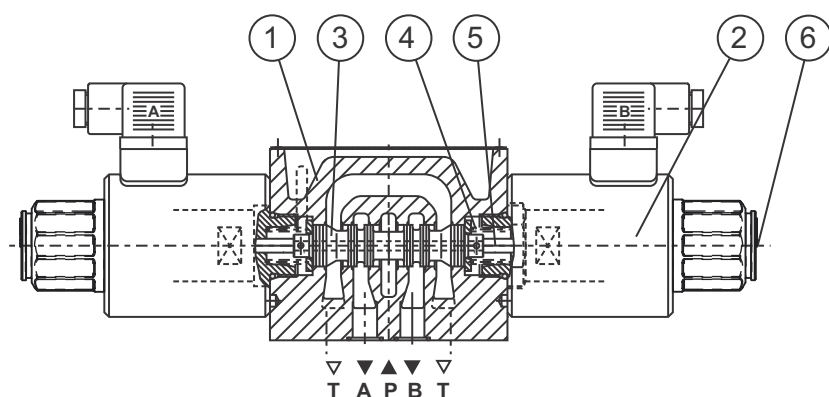
Directional valves type KV with direct solenoid operation control the direction of the hydraulic medium flow.

These directional valves consist of a housing (1), a control spool (3), and one solenoid (2) with two return springs (4) in 4/2-way directional valves, and two solenoids (2) with two return springs (4) in 4/3-way directional valves. In 4/3-way directional valves the centre position of the control spool is the neutral position. The change-over to the operating position (a) and (b) is done by energizing the solenoids (2) "a" and "b" respectively, whereby the solenoid plunger acts on the control spool (3) via the operating pin (5), thus clearing the corresponding flow ways and establishing relevant links between ports A, B, P, and T.

When the solenoid (2) is de-energized, the control spool (3) is returned to its neutral position by the return spring (4). The change-over can be done manually by pressing the emergency manual override (6).

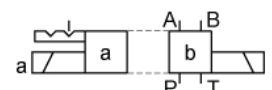
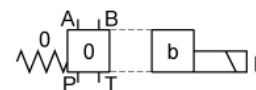
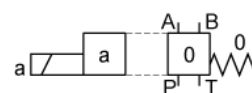
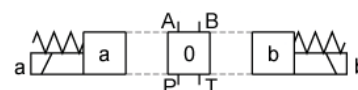
KV-4/2-5KO-10-81

Directional valve with two operating position, two solenoids without springs allows the control spool to be held in the operating position (detent). The control spool remains in the operation position also when the solenoids are de-energised.



Hydraulic symbol

Spool types





Features

Hydraulic Size		10	
Flow rate		L/min [GPM]	see ΔP-Q curves
Operating pressure	Ports A, B, P	bar [PSI]	350 [5 076]
	Port T	bar [PSI]	250 [3 625]
Viscosity range		mm ² /s [SUS]	15 to 380 [69.5 to 1 760]
Oil temperature range		°C [°F]	-20 to +70 [-4 to 158]
Filtration		NAS 1638	8
Mass	4/2	kg [lb]	6,5 [14.3]
	4/3		7,3 [16.1]
Mounting position	Optional		

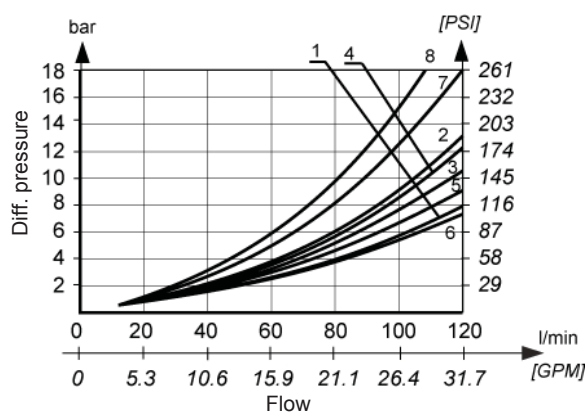
Electrical

Supply voltage	Direct	V	12, 24, 48
	Alternating		110, 230
Power		W	45
Switch-on time*		ms	70 to 95
Switch-off time*		ms	40 to 80
Switching frequency		1/h	15 000
Ambient temperature		°C [°F]	to 50 [122]
Coil temperature		°C [°F]	to 180 [356]
Duty cycle	Continuous		

* The switching-on and off times apply to 24 V DC solenoids.

ΔP -Q Performance curves

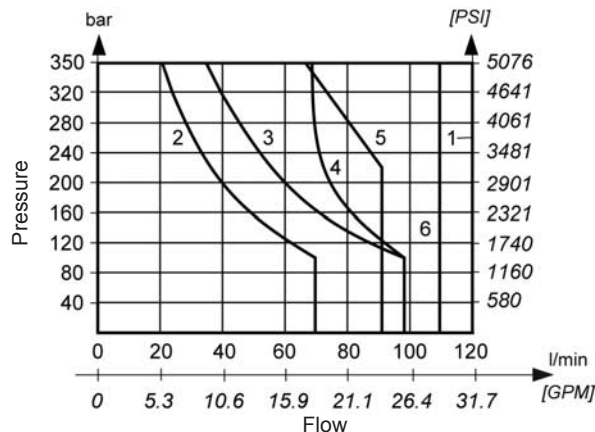
Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	Flow path				
	P-A	P-B	A-T	B-T	P-T
1	1	1	5	5	-
2	3	3	2	7	8
3	6	6	3	4	7
6	1	1	2	2	-
9	6	6	2	2	-
81	1	1	3	3	-
51A, 51B	1	1	3	3	-
41A, 41B	6	6	-	-	-

ΔP -Q Operating limits

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	Curve	The operating limits of the valve are determined at a voltage 10% below the nominal rating. The curves refer to application with symmetrical flow throw the valve (P-A and B-T). In the case of asymmetric flow (e.g. one part not used) reduced values may result.
Spool	Curve	
1	1	Note: For valves with adjustment of the switching time reduced values of the operating limits may result.
2	4	
3	5	
6	3	
9	6	
81	1	
51A, 51B	1	
41A, 41B	2	

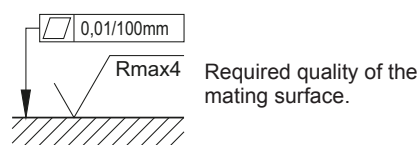
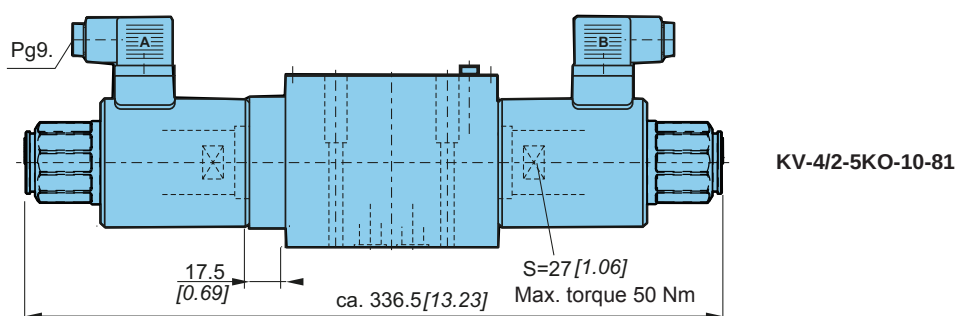
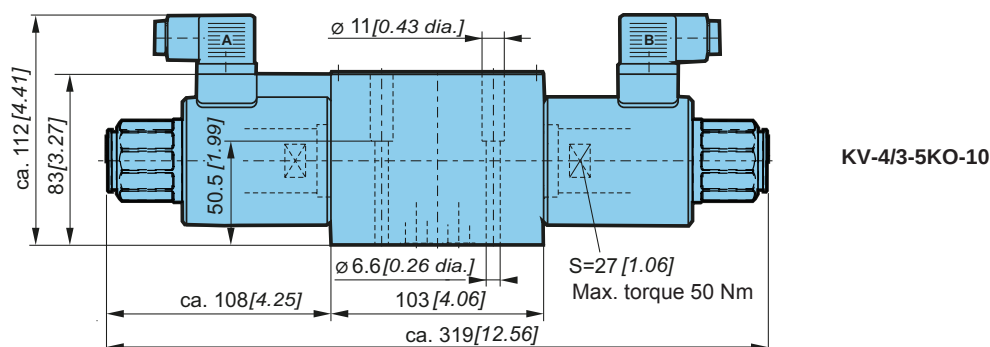
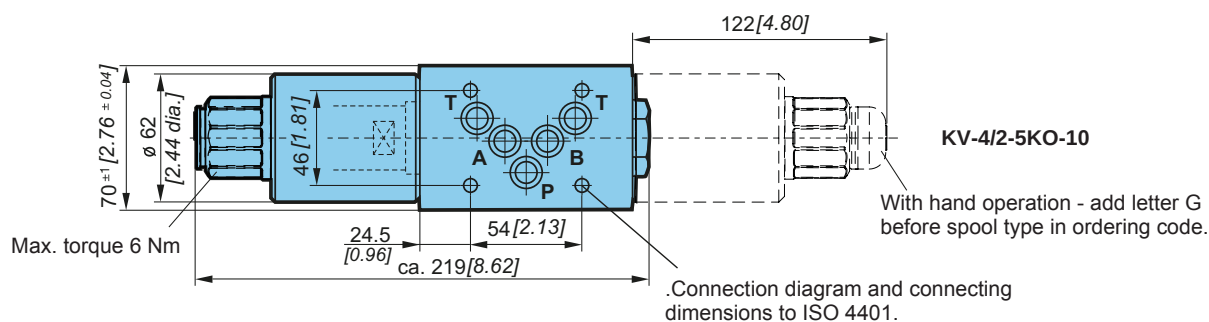
Mechanically operated

Hydraulically operated

Electrically operated

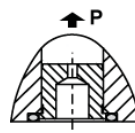


Dimensions



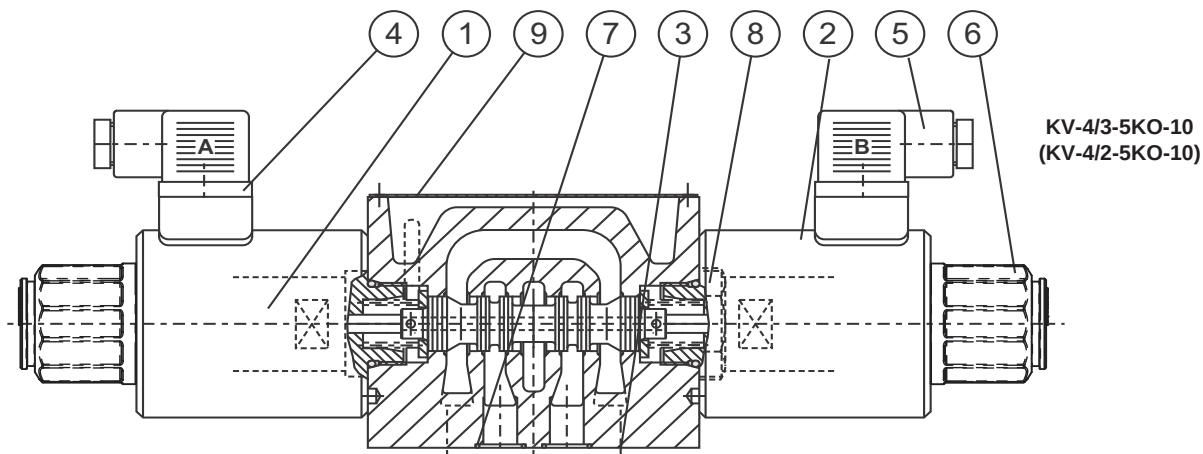
Cartridge throttle

If flow rates greater than permissible occur during change-over, a cartridge throttle must be fitted into P-line of the directional valve.



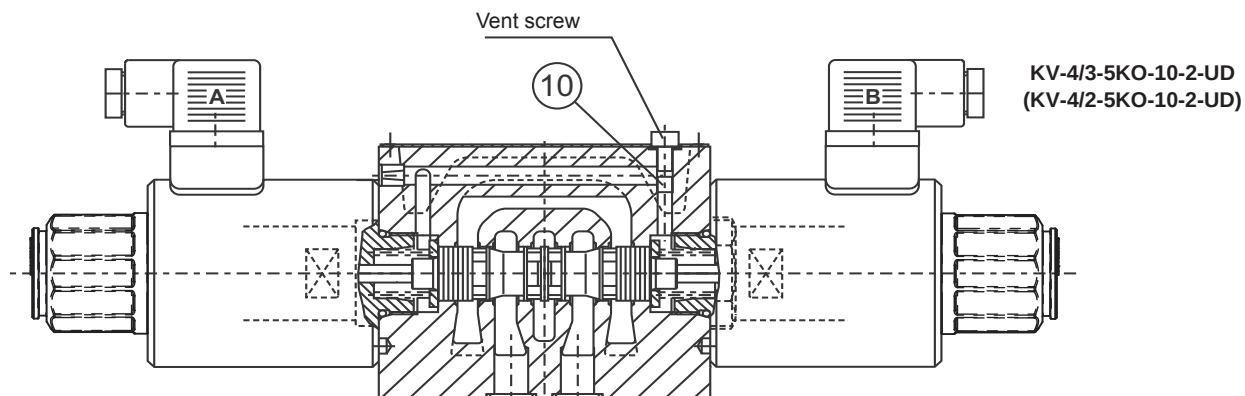
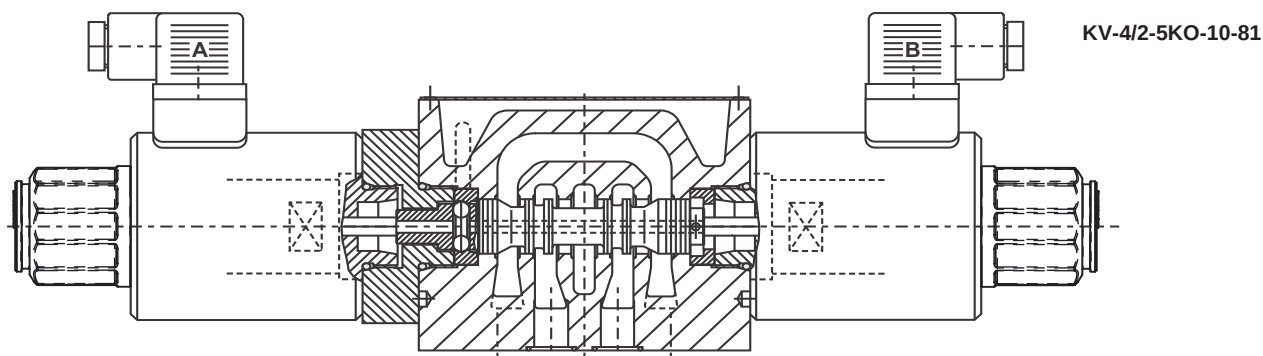
Installation-important for option with restrictor-type... "UD"

The directional control valve must be installed horizontally (Nameplate on top). If this is not the case, the valve must be removed for venting. Unscrew the vent screw. Move the spool alternately to the switching positions a and b until no more bubbles appear at the screw hole. The oil must be visible at the screw hole. Missing oil should be refilled with an oilcan, drop by drop. Screw in the vent screw. A constant or short time static oil pressure of at least > 4 bar must prevail at connection T of the directional control valve to maintain the oil pressure in the spring chambers. If this is not the case, the preloaded oil volume of the restricted valve would leak into the T channel through the leakage section of the control spool shoulders. The dampening constancy also depends on the constancy of the oil viscosity. For this reason the dampening effect should always be adjusted with the system at operational temperature.

**Function drawing**

1. Solenoid "a" - MR-060
2. Solenoid "b" - MR-060
3. Fixing screws 4 pcs M6 x 60 to ISO 4762 -10.9 must be ordered separately. Required tightening torque Md = 15 Nm

4. Plug-in connector "a" - grey
5. Plug-in connector "b" - black
6. Emergency manual override
7. O-ring 12,42 x 1,87
8. Valve cap
9. Nameplate
10. Constant action restrictor



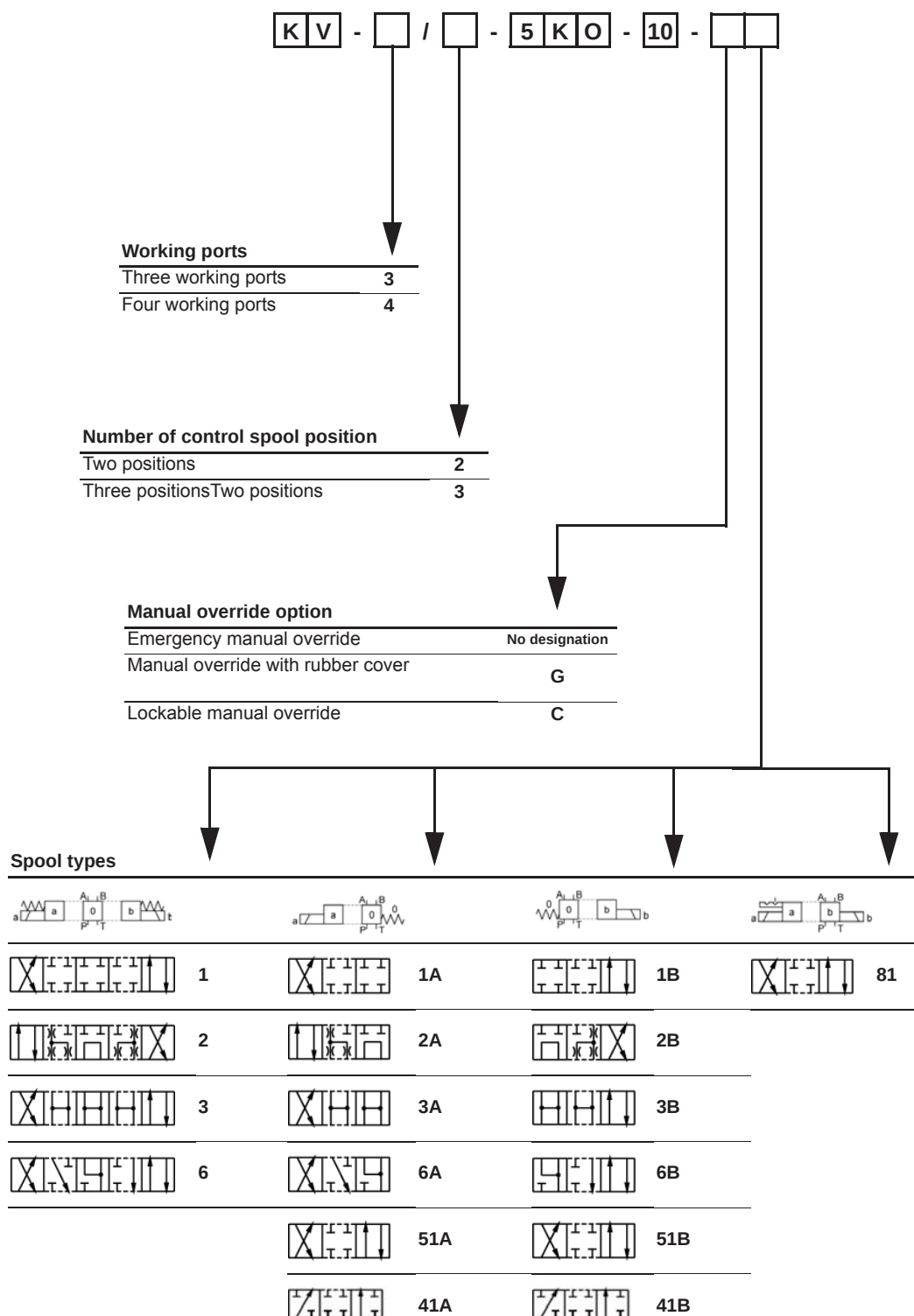
Mechanically operated

Hydraulically operated

Electrically operated



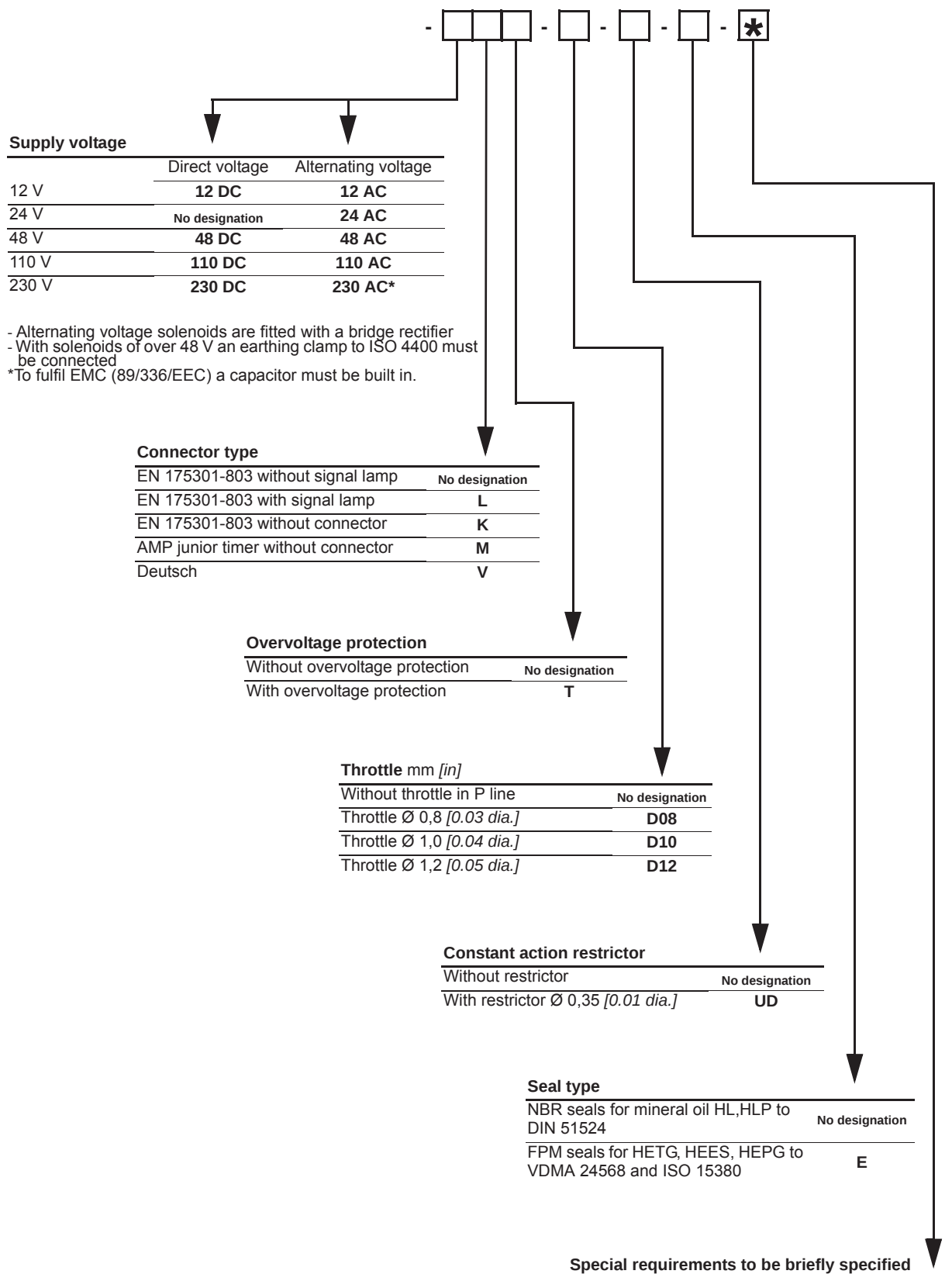
Model code



Port T in the valves with spool type 41A and 41B to be used as leakage line.



Valves with adjustment of the switching time - a constant or short - time static oil pressure of at least > 4 bar [58 PSI] must prevail at connection T of the directional control valve to maintain the pressure in the spring chambers.







4/2, 4/3 WAY DIRECTIONAL VALVES TYPE KV

- NG 16
- To 350 bar [5 076 PSI]
- To 300 L/min [79 GPM]

- Indirect, solenoid, and mechanical (by lever) operation.
- Connection diagram and connecting dimensions to ISO 4401.
- Plug-in solenoid connector to ISO 4400.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-4/3-16-

Operation

Directional valves type KV with indirect, solenoid-hydraulic operation control the hydraulic fluid flow direction.

These valves consist of the main valve (1), a control spool (2), two return springs (3) in 4/3-way valves and none in 4/2-way valves, a double throttle check/valve (4) and a pilot valve (5).

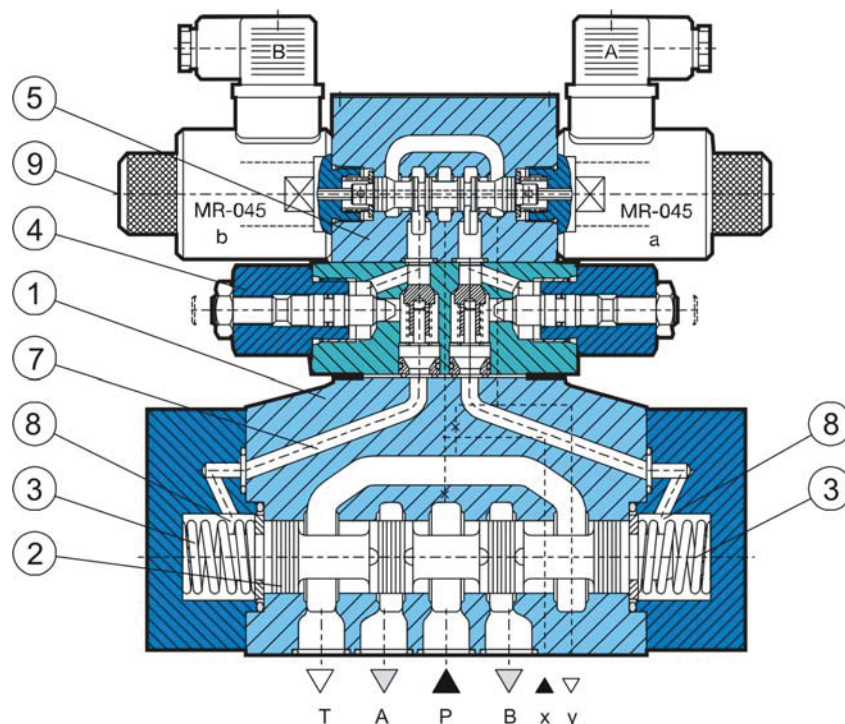
The pilot valve (5) is connected with the pressure chambers (8) via the pilot line (7). Feeding of the pilot valve oil is either or external (via the port "x"). Change-over of the control spool to one of the operating position is activated by the introduction of oil via the pilot valve (5) into one of the pressure chambers (8). A pressure rise in chambers provokes the movement of the control spool (2). Suitable links between ports A,B,P,T according to spool types are established as set forth in the table.

When the solenoid of the pilot valve (5) are de-energized a link between the pressure chamber (8) and the return line "y" for the pilot oil discharge is established. A pressure drop in the chamber actuates the main valve return spring (3) which automatically return the control spool to the neutral position.

Discharge of the return pilot oil from the pressure chambers is either internal or external (via the port "y").

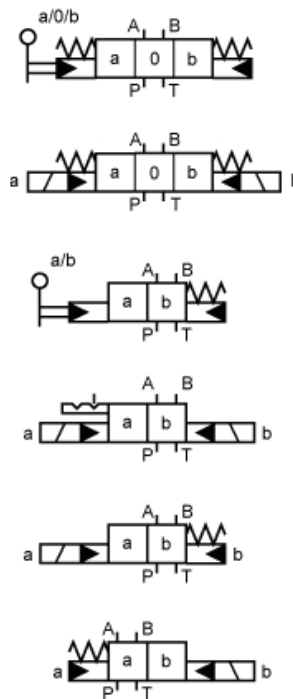
Manual change-over of the main valve is also possible by pressing the emergency manual override (9).

Indirect directional valves can also be provided with a manual pilot valve. These valves are manually operated by moving the operating lever.



Hydraulic symbols

Spool types



Mechanically operated

Hydraulically operated

Electrically operated



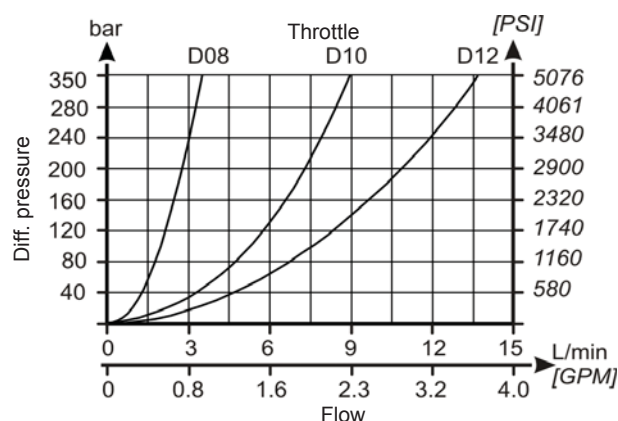
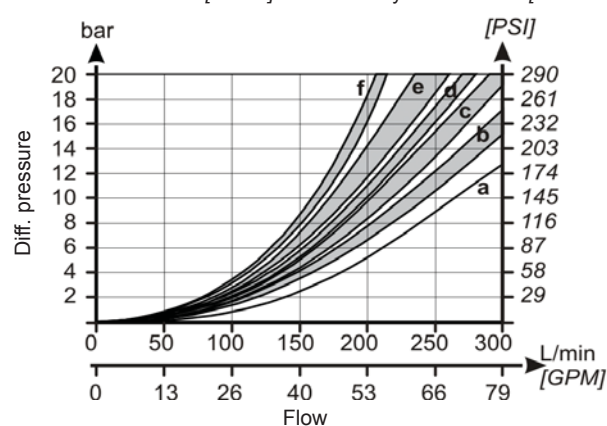
Features

Flow rate	L/min [GPM]	300 [79.2]	
Operating pressure	bar [PSI]	Ports A, B, P	350 [5076.3]
		Port T	250 [3625.9]
Pilot oil pressure (x-external)	bar [PSI]	50-250 [725.2-3625.9]	
Pilot oil pressure (x-internal) Pre-load valve is fitted into P-port of the main valve Without Pre-load valve in the P-port of the main valve		In valve types with internal pilot oil supply (x) the spool types 2, 3, and 4 are possible only when the oil flow in the direction from P towards T achieves the flow rate Q = 150 L/min [39.6 GPM], with the control spool in the centre position.	
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]	
Viscosity range	mm ² /s	15 to 380	
Required pilot oil volume	cm ³ [cu.in]	2 positions valve	7,8 [0.47]
		3 positions valve	3,9 [0.24]
		Main valve	8 [17.6]
		4/3 pilot valve	2,5 [5.5]
		4/2 pilot valve	2,2 [4.8]
		Throttle/check valve	1,45 [3.2]
Mass	kg [lb]	Pressure reducing valve	1,70 [3.7]
Mounting position		Optional, horizontal for spool types 4/2	
Switch-on time	(ms)	3 positions valve	60
Solenoid change-over from the operating to the centre position	(ms)	2 positions valve	85
Switch-off time	(ms)	3 positions valve	45
Solenoid change-over from the operating to the centre position	(ms)	2 positions valve	50
Filtration	NAS 1638	8	
Ambient temperature range	°C [°F]	+50 [122]	
Coil temperature range	°C [°F]	+180 [356]	
Power	W	29 (12V supply voltage - 36W)	
Voltage	V	12, 24, 48, 110, 230	

The switch-on and switch-off times apply to 24 V DC solenoids.

ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



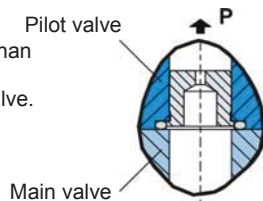
Spool type	P-A	P-B	A-T	B-T	P-T
1, R1, 51B, 51A, F51, R51	e	e	e	f	-
2, R2	a	b	c	e	f
3, R3	b	b	c	d	-
4, R4	b	c	c	e	-
5, R5	b	c	c	e	-
6, R6	b	c	d	e	-

See Model Code for spool type choice.



Cartridge throttle

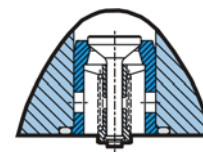
If the pilot oil supply rate (x) is greater than permissible a cartridge throttle shall be fitted into the P line of the directional valve.



Pre-load valve

In valves with a low pressure bypass and internal pilot oil feed, minimum pilot pressure is obtained by installing a pre-load valve in the P-port of the main valve.

The cracking pressure is approx. 4,5 to 6 bar [65 to 87 PSI].



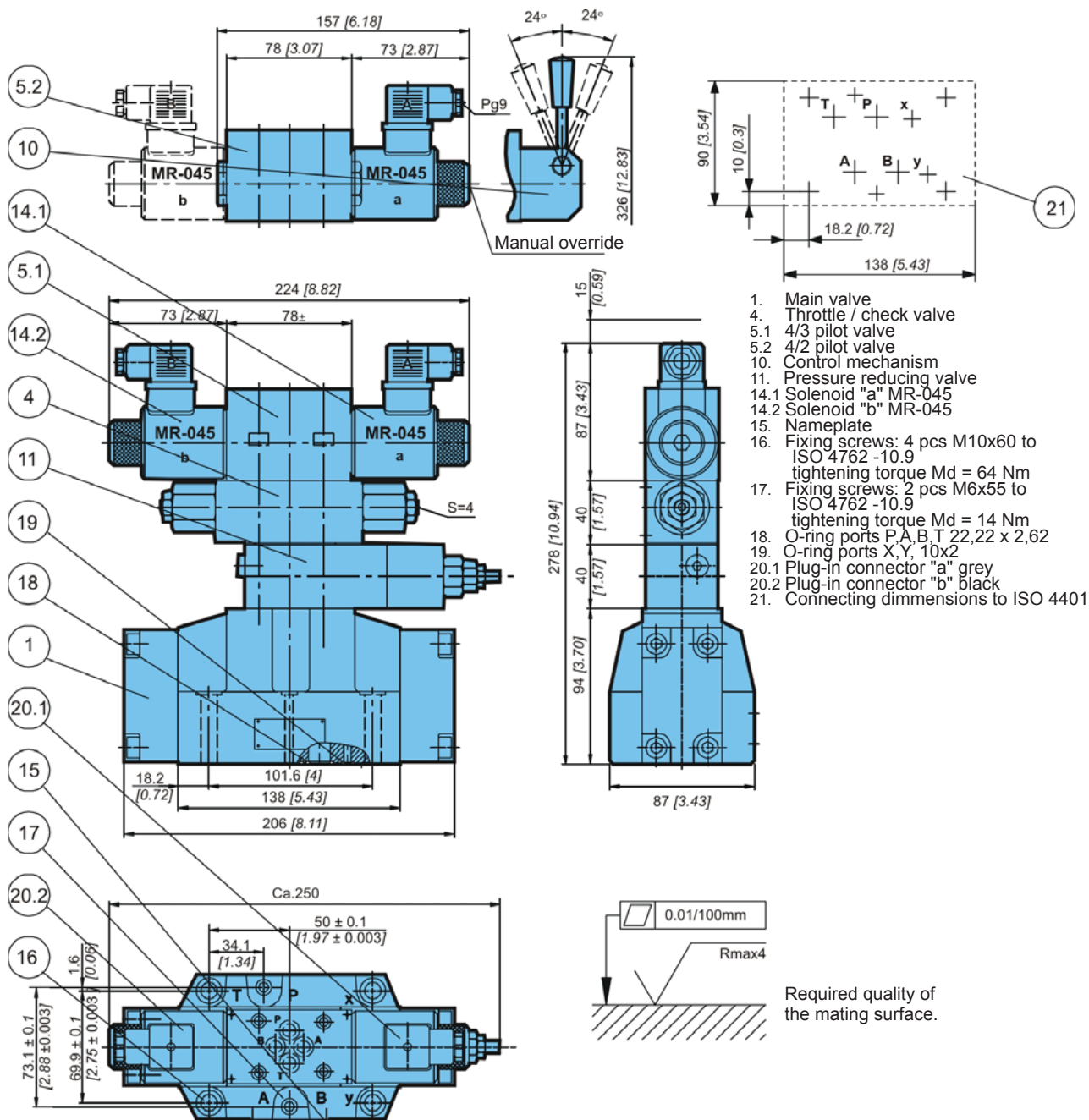
Pressure reducing valve

The pressure reducing valve used when the pilot oil "X" pressure exceeds the permissible limit $p = 250$ bar [3 626 PSI].

Throttle check valve

The throttle check valve used for setting the supply flow rate of the pilot oil to the pressure chambers. Simultaneously, the change-over speed of the main control spool is adjusted. In this way a smoother change-over, without hydraulic shocks is provided.

Dimensions



Mechanically operated

Hydraulically operated

Electrically operated



Model code

K V - 4 / 1 6 - - -

Number of control spool positions

Two positions	2
Three positions	3

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

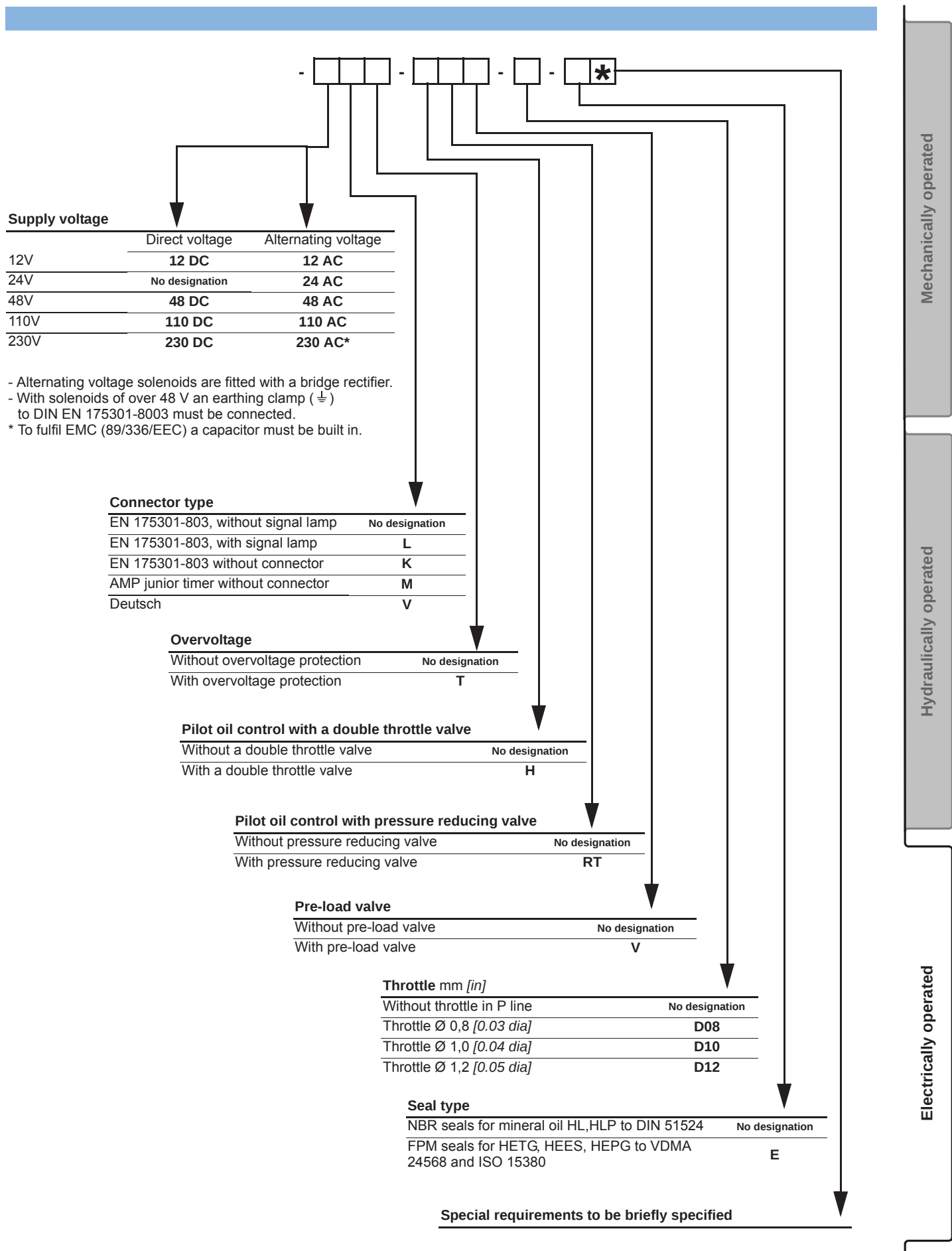
Spool types

	1
	2
	3
	4
	5
	6
	R1
	R2
	R3
	R4
	R5
	R6
	R51
	F51
	51A
	51B

Pilot oil supply and discharge

Three positions	Two positions
Internal x, y	Internal x, y
Internal y, external x	Internal y, external x
Internal x, external y	Internal x, external y
External x, y	External x, y

For supply and discharge with spool type 2 and 3, refer to the features table.



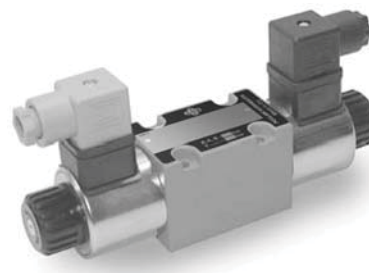




4/2, 4/3 WAY DIRECTIONAL VALVE KV-3KO

- NG 6
- Up to 250 bar [3 625 PSI]
- Up to 40 L/min [10.6 GPM]

- Connection diagram and connecting dimensions to ISO 4401.
- Different types of plug-in connectors.
- 3-chamber model.
- Optimized flow paths for low losses of pressure.
- Wet pin solenoid with interchangeable coil.
- Manual emergency control.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-4/3-3KO-6

Operation

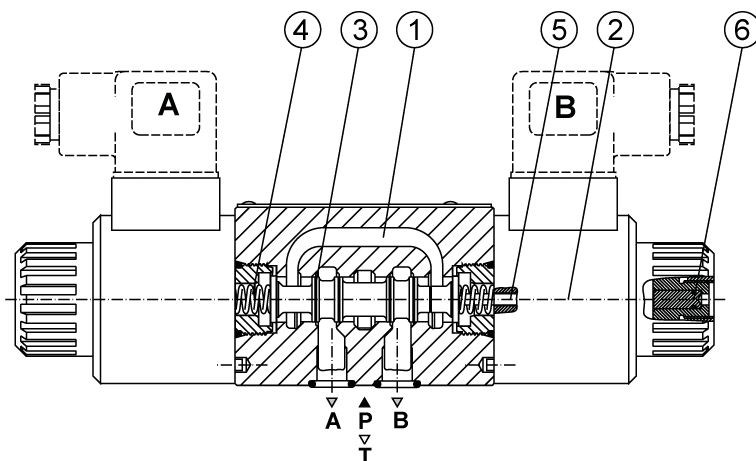
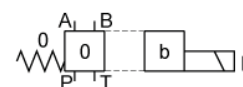
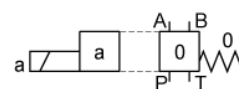
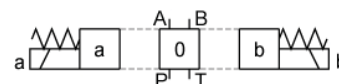
Directional valves type KV-3KO with direct solenoid operation control the direction of the hydraulic medium flow.

These directional valves consist of a housing (1), a control spool (3), and one solenoid (2) with two return springs (4) in 4/2-way directional valves, and two solenoids (2) with two return springs (4) in 4/3-way directional valves. In 4/3-way directional valves the centre position of the control spool is the neutral position. The change-over to the operating position (a) and (b) is done by energizing the solenoids (2) "a" and "b" respectively, whereby the solenoid plunger acts on the control spool (3) via the operating pin (5), thus clearing the corresponding flow ways and establishing relevant links between ports A, B, P, and T.

When the solenoid (2) is de-energized, the control spool (3) is returned to its neutral position by the return spring (4). The change-over can be done manually by pressing the emergency manual override (6).

Hydraulic symbols

Spool types



Mechanically operated

Hydraulically operated

Electrically operated



Features

Hydraulic

Size	6		
Flow rate	L/min [GPM]		see ΔP-Q curves
Operating pressure	Ports A, B, P	bar [PSI]	250 [3 625]
	PortT	bar [PSI]	
Viscosity range	mm²/s [SUS]		15 to 380 [69.5 to 1 760]
Oil temperature range	°C [°F]		-20 to +70[-4 to 158]
Filtration	NAS 1638		8
Mass	4/2	kg [lb]	1,3 [2.9]
	4/3		1,8 [3.9]
Mounting position	Optional		

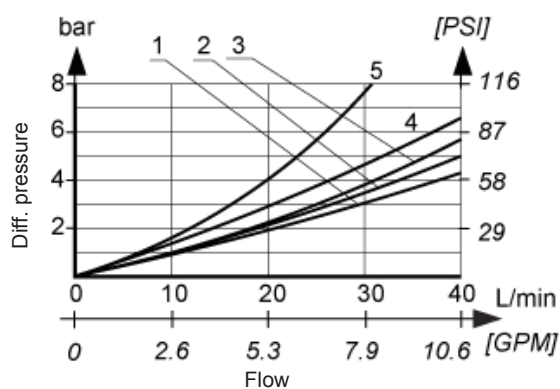
Electrical

Supply voltage	Direct	V	12, 24, 48
	Alternating		110, 230
Power		W	26
Switch-on time*		ms	50 to 80
Switch-off time*		ms	30 to 55
Switching frequency		1/h	15 000
Ambient temperature		°C [°F]	to50 [122]
Coil temperature		°C [°F]	to180 [356]
Duty cycle			Continuous

* The switching-on and off times apply to 24 V DC solenoids.

ΔP -Q Performance curves

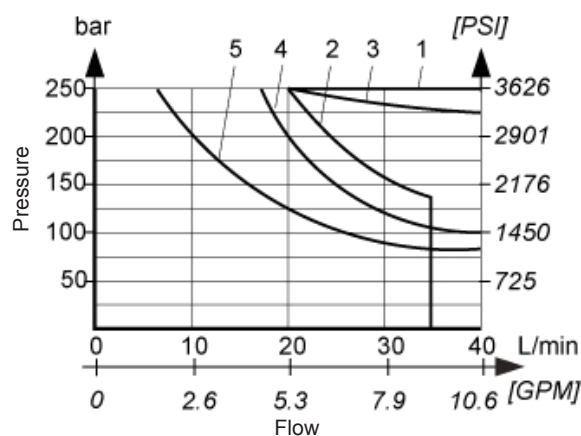
Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Spool	Flow path				
	P-A	P-B	A-T	B-T	P-T
1	1	1	2	2	-
2	3	3	3	3	5
3	1	1	4	4	-
6	1	1	1	1	-
51A, 51B	1	1	3	3	-
41A, 41B	3	3	-	-	-

ΔP -Q Operating limits

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

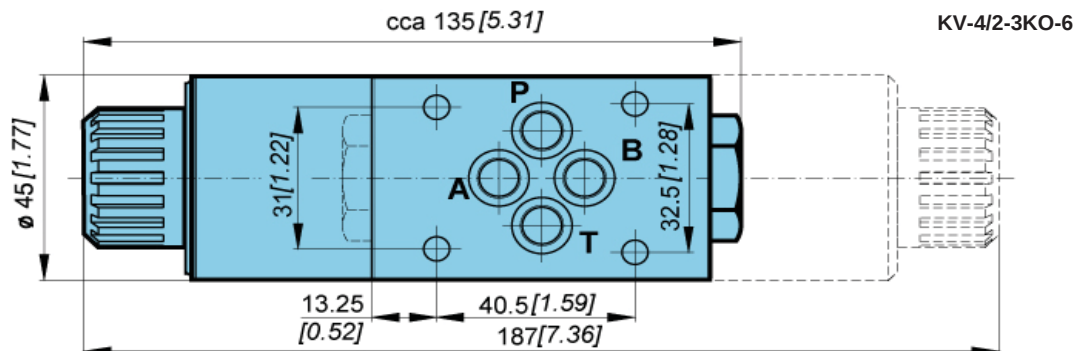


Spool	curve
1	1
2	2
3	3
6	4
51A, 51B	1
41A, 41B	5



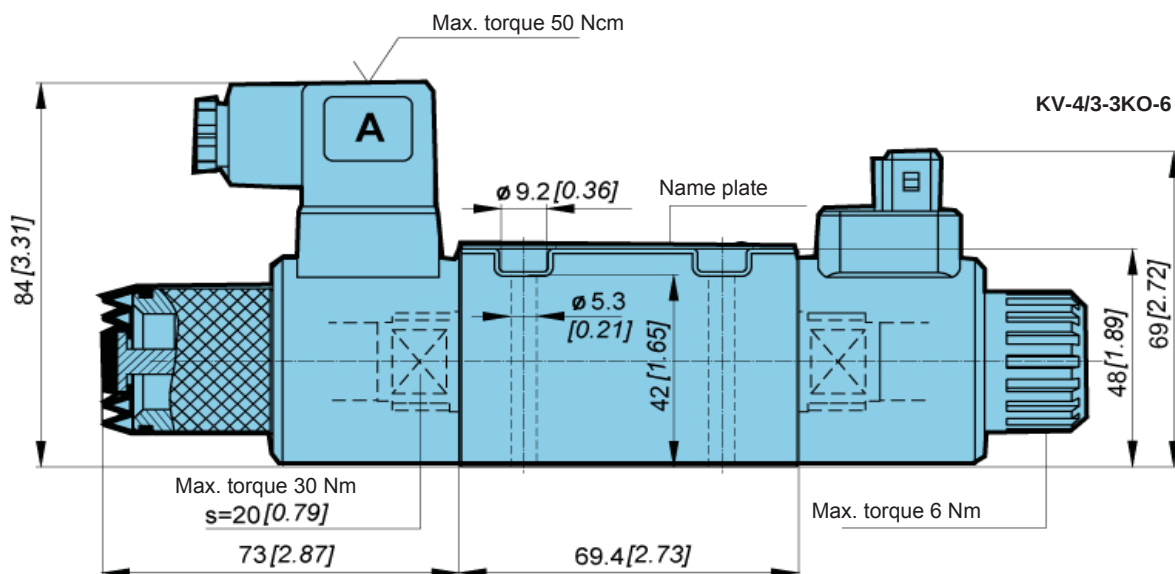
Dimensions

Connection diagram and connecting dimensions to ISO 4401.



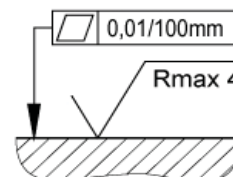
Option: Plug-in connector to ISO 4400

Option: AMP JUNIOR connector



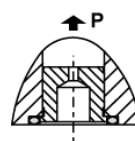
4 x Fixing screws M5x50 to ISO 4762- 10.9 must be ordered separately.
Required tightening torque $M_d = 7\text{Nm}$.

Required quality of the mating surface.



Cartridge throttle

If flow rates greater than permissible occur during change-over, a cartridge throttle must be fitted into P-line of the directional valve.



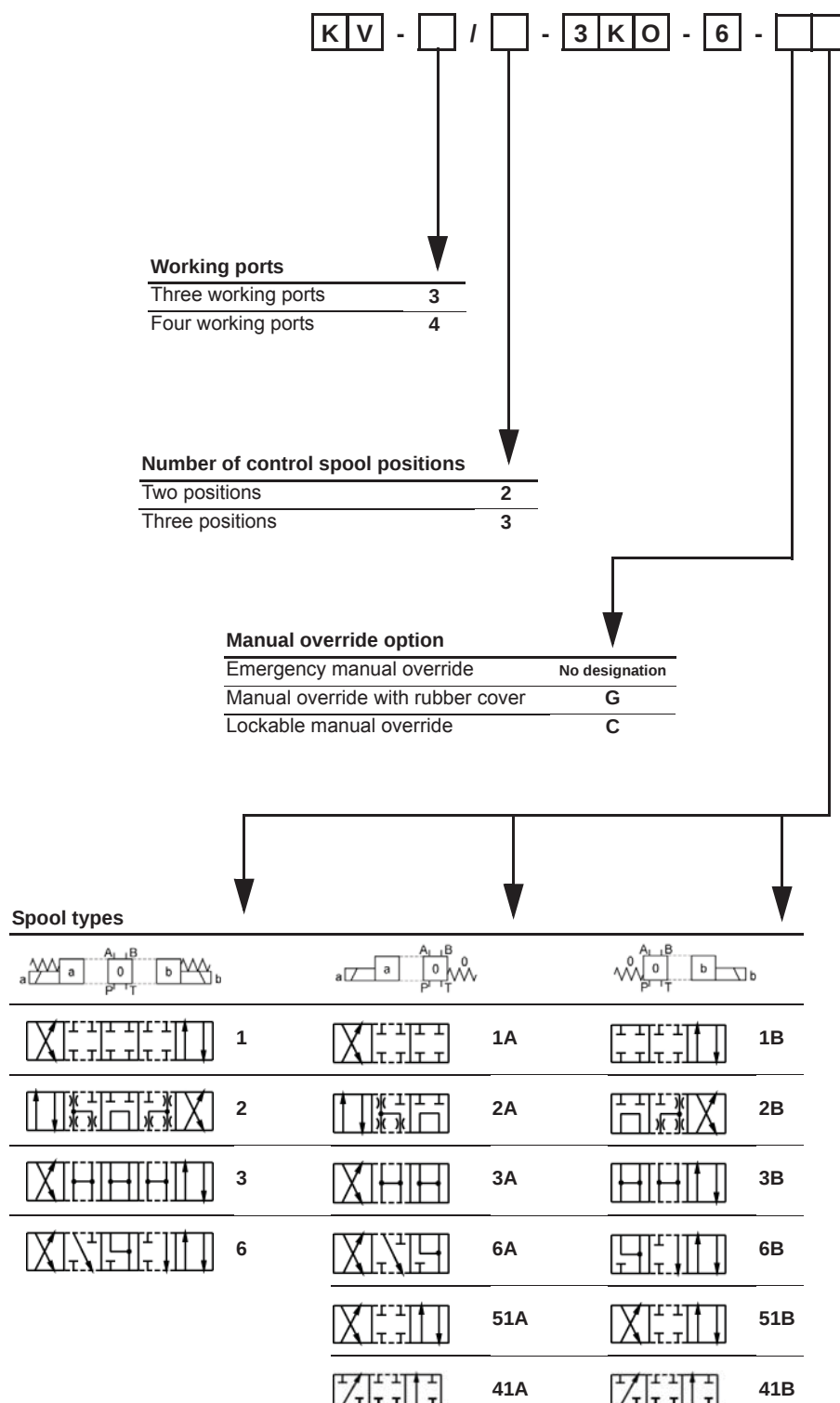
Mechanically operated

Hydraulically operated

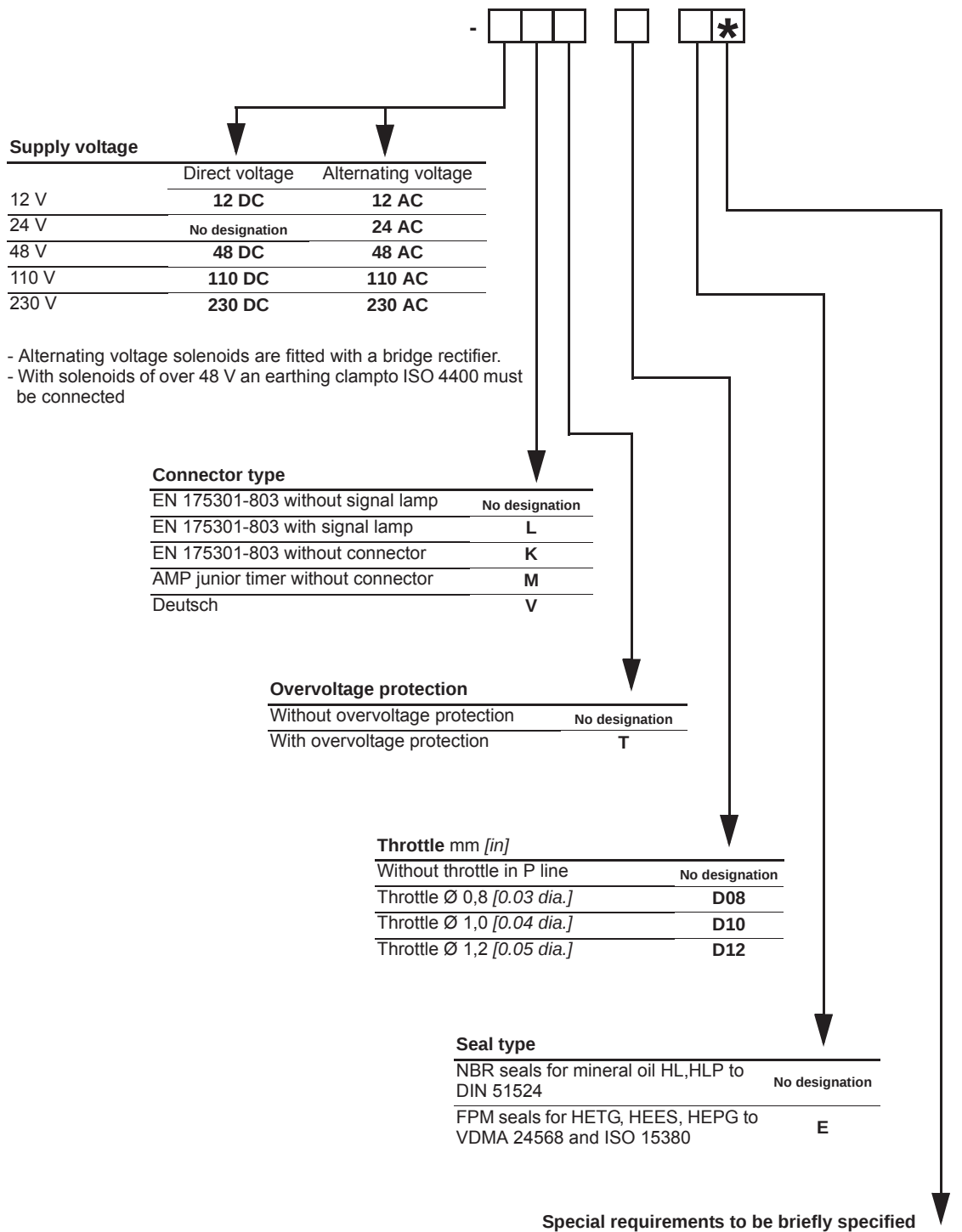
Electrically operated



Model code



Port T in the valves with spool type 41A and 41B to be used as leakage line when working pressure is higher than 210 bar [3 045 PSI].



Mechanically operated

Hydraulically operated

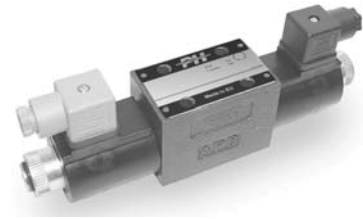
Electrically operated





4/2, 4/3 WAY DIRECTIONAL PROPORTIONAL VALVE KVP

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 30 L/min [7.9 GPM]
- Plug-in connector for solenoids to ISO 4400. Connection diagram and connection dimensions to ISO 4401.
- 5 chamber models with good spool guidance. Optional control electronics: Amplifier P/N: 1659574.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).

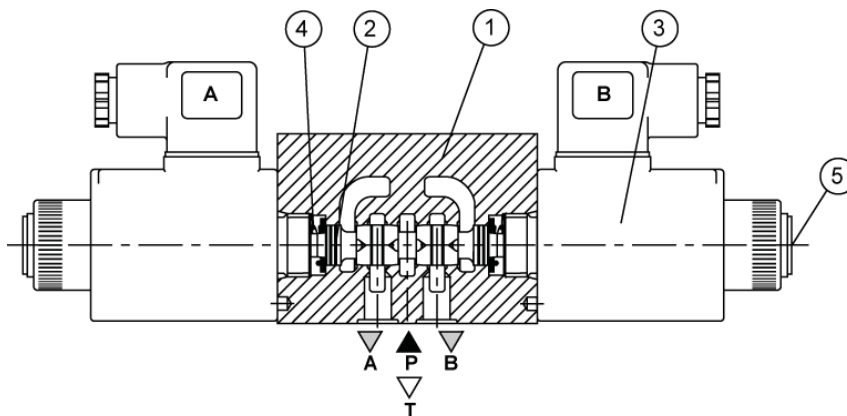


KVP-4/3-5KO-6

Operation

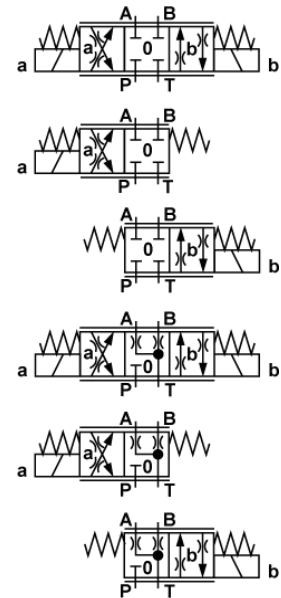
The KVP directional control valve is a proportional valve providing variable flow rates. This valve is used with control electronics. Typical applications are soft switching via adjustable ramps for the reduction of hydraulic and mechanical shocks, and electrically adjustable flow rates - speeds for automating machine functions.

This directional valves consist of a housing (1), a control spool (2), one or two proportional solenoids (3) and two return springs (4). The change-over can be done manually by pressing the emergency manual override (5).



Hydraulic symbols

Spool type



Mechanically operated

Hydraulically operated

Electrically operated



Features

Hydraulic

Size	6		
Flow rate		L/min [GPM]	10, 20, 30 [2.6 - 5.2 - 7.9]
Operating pressure	A, B, P	bar [PSI]	350 [5 076]
	T		250 [3 625]
Oil temperature range		°C [°F]	-20 to +70 [-4 to +158]
Viscosity range		mm ² /s [SUS]	15 to 380 [3.24 to 82]
Mounting position	Optional		
Mass	4/2	kg [lb]	1,65 [3.63]
	4/3		2,2 [4.85]
Filtration		NAS 1638	7

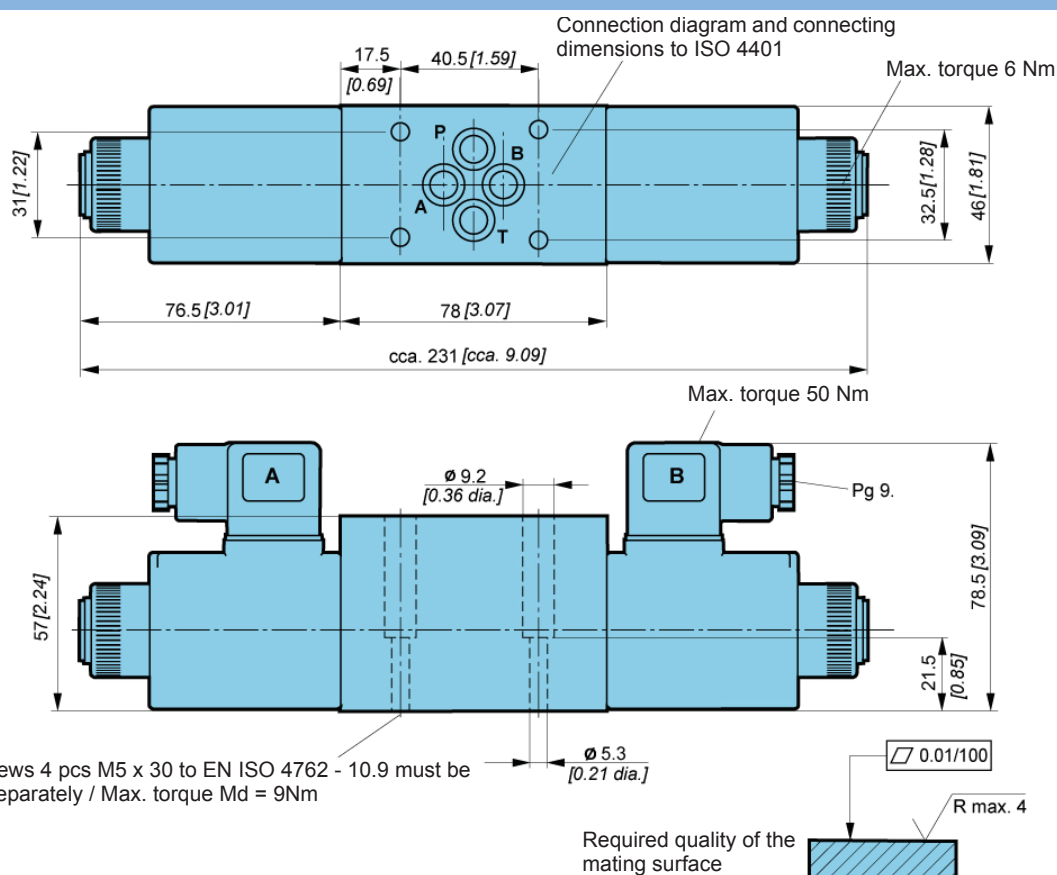
Proportional

Hysteresis	5% of max. flow rate		
Nominal current	12 DC	A	2
	24 DC		1

Electrical

Supply voltage	V	12, 24 DC
Power	W	36
Ambiant temperature	°C [°F]	to +50 [to +122]
Coil temperature	°C [°F]	to +180 [to +356]
Duty cycle	Continuous	

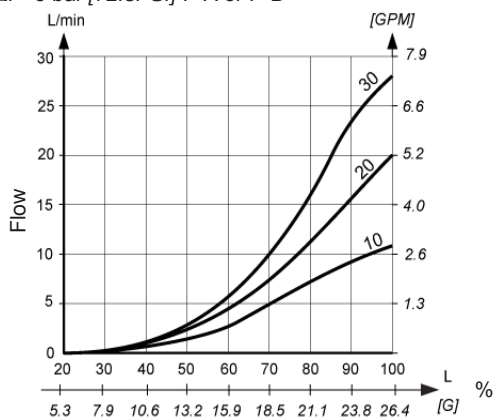
Dimensions





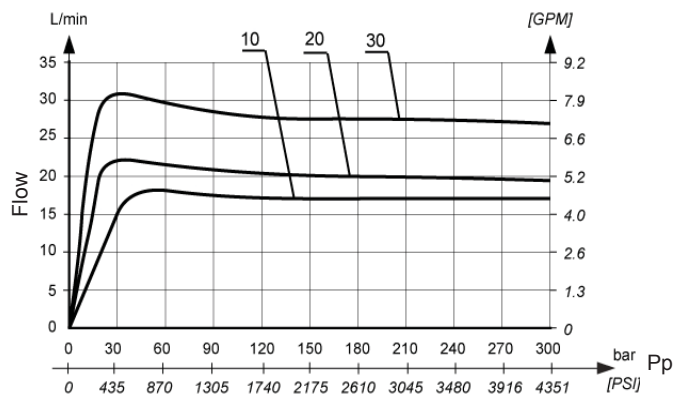
Input signal curves / Flow rate

Measured at 40°C [104°F] and viscosity of 32 mm²/s.
 $\Delta P=5$ bar [72.5 PSI] P-A or P-B



Power limits transmitted

Measured at 40°C [104°F] and viscosity of 32 mm²/s.



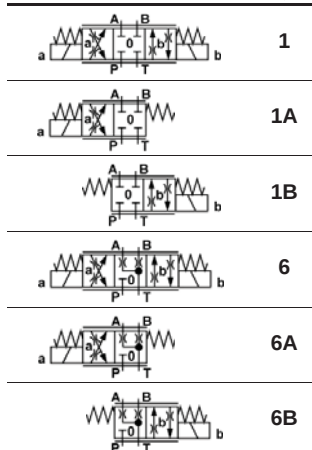
Model code

K V P - 4 / - 5 K O - 6 - - - - *

Number of spool positions

Two positions	2
Three positions	3

Spool types

Regulated flow rate
 $(\Delta P=5$ bar [72.1 PSI] / P-A or P-B)

0-10 L/min [0-2.6 GPM]	10
0-20 L/min [0-5.2 GPM]	20
0-30 L/min [0-7.9 GPM]	30

Supply voltage

Direct voltage 24V	No designation
Direct voltage 12V	12 DC

Special requirements to be briefly specified

FA	Auxiliary control lever on valve side A
FB	Auxiliary control lever on valve side B

Seal type

No designation	NBR seals for mineral oil HL, HLP, to DIN 51524
E	FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Connector type

No designation	EN 175301-803 without signal lamp
L	EN 175301-803 with signal lamp
K	EN 175301-803 without connector
V	Deutsch

Mechanically operated

Hydraulically operated

Electrically operated





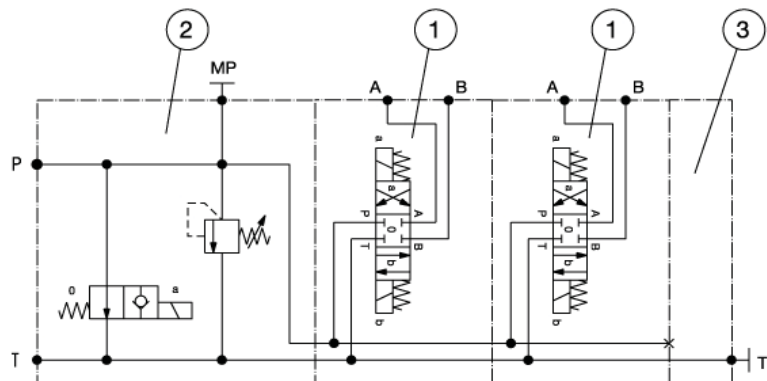
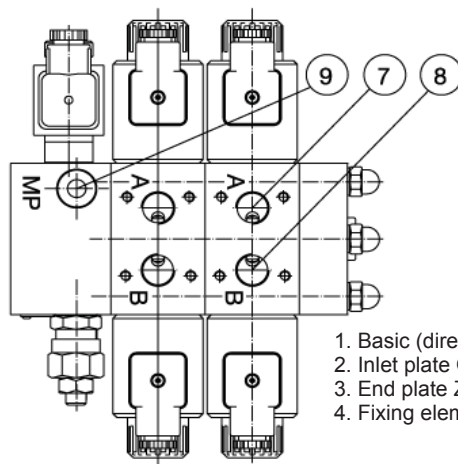
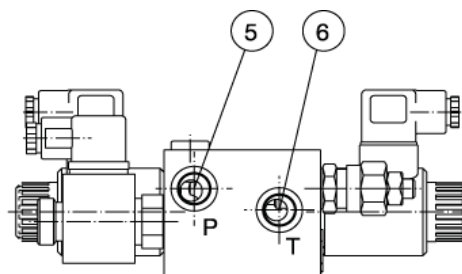
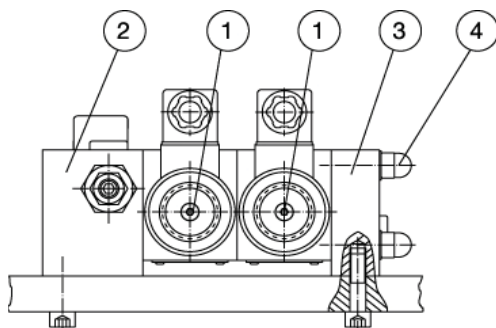
4/2, 4/3 WAY BANKABLE DIRECTIONAL VALVES KVM

- NG 6
- Up to 350 bar [5 076PSI]
- Up to 40 L/min [10.6 GPM]
- Threaded connection to ISO 9974 (Metric), ISO1179 (BSPP/Gas).
- Series or parallel connections.
- Inlet plate possibility with pressure relief valve, pump unloading valve or flow control valve.
- Possibility to use standard components for vertical stacking.



KVM-6-...-VV-KV-N4

Basic concept

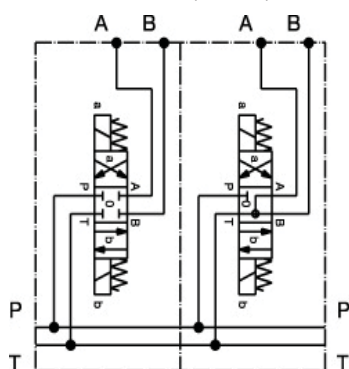


1. Basic (directional control) valves KVM-6
2. Inlet plate OB-KVM-6
3. End plate ZB-KVM-6
4. Fixing elements for mounting SET-KVM-6

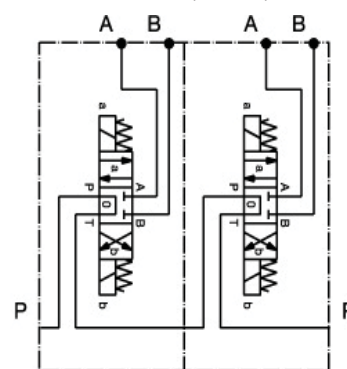
5. Threaded connection P
6. Threaded connection T
7. Threaded connection A
8. Threaded connection B
9. Threaded connection MP (closed)

Type of connection

Parallel (KVM-P)



Series (KVM-S)



Mechanically operated

Hydraulically operated

Electrically operated





4/2, 4/3 WAY BANKABLE DIRECTIONAL VALVES KVM

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 40 L/min [10.6 GPM]
- Parallel or series connection.
- Plug-in connection for solenoids to ISO 4400.
- 5-chamber model with good spool guidance.
- Wet pin solenoid with interchangeable coil.
- Manual emergency control.
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).



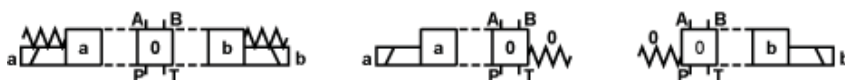
KVM-P-4/3-6-1-1-12DC-3/8

Hydraulic symbol

Spool types - Parallel connection (KVM-P)



Spool types - Series connection (KVM-S)



Features

Hydraulic				
			KVM-P	KVM-S
Size			6	6
Flow rate		L/min [GPM]	40 [10.6]	30 [7.9]
Operating pressure	A, B, P	bar [PSI]	350 [4 568]	250 [3 626]
	T		250 [3 626]	
Oil temperature range		°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range		mm ² /s [SUS]	15 to 380 [3.24 to 82]	
Mass	4/2	kg [lb]	1,85 [4.08]	
	4/3		2,4 [5.29]	
Filtration		NAS 1638	8	
Electrical				
Supply voltage		V	12, 24 DC	
Power		W	29	
	(12 V DC supply voltage)		36	
Switching frequency		1/h	15 000	
Ambiant temperature		°C [°F]	to +50 [to +122]	
Coil temperature		°C [°F]	to +180 [to +356]	
Duty cycle			Continuous	

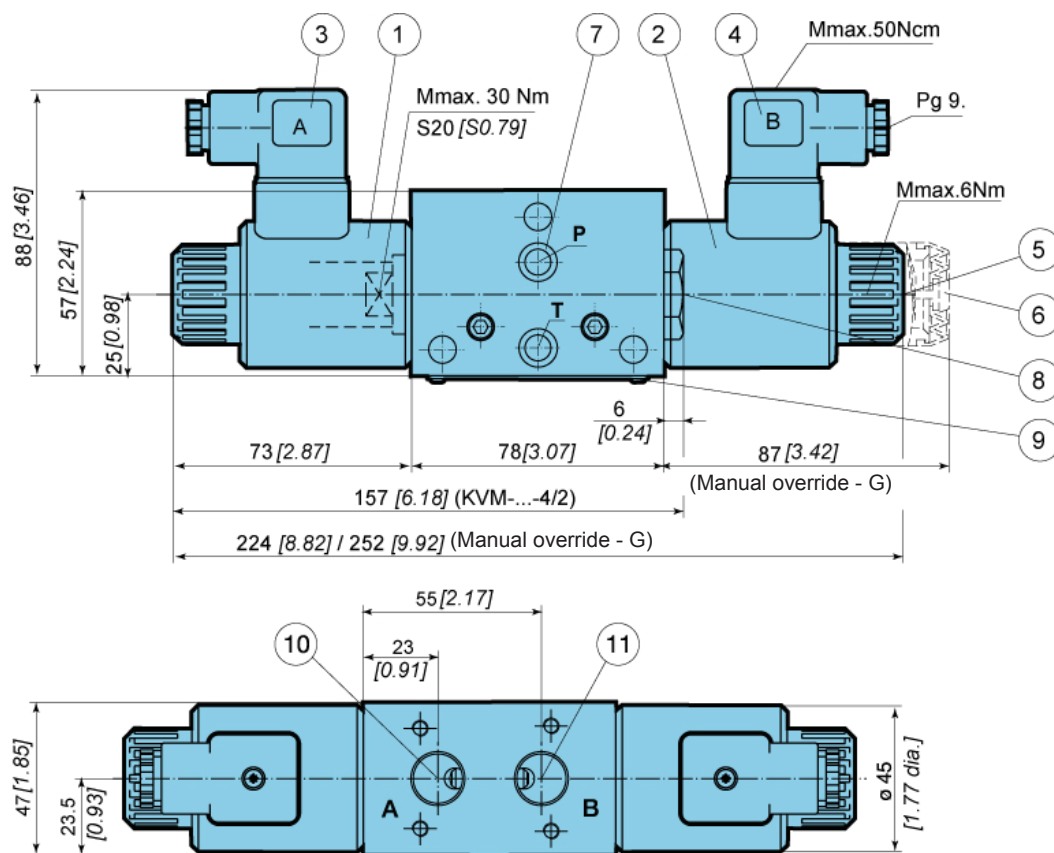
Mechanically operated

Hydraulically operated

Electrically operated

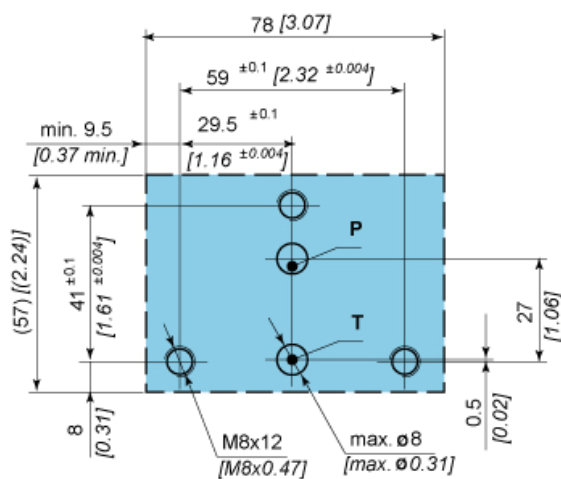


Dimensions

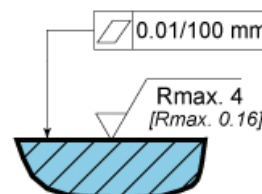


1. Solenoid "a" / MR-045-O
2. Solenoid "b" / MR-045-O
3. Plug-in connector «a» -grey
4. Plug-in connector «b» -black
5. Emergency manual override
6. Manual override with rubber (G)
7. O-ring 9,25 x 1,78
8. Valve cap (KVM-...-4/2)
9. Nameplate
10. Threaded connection A-M torque = max. 100 Nm
11. Threaded connection B-M torque = max. 100 Nm

Connection dimensions for KVM-6



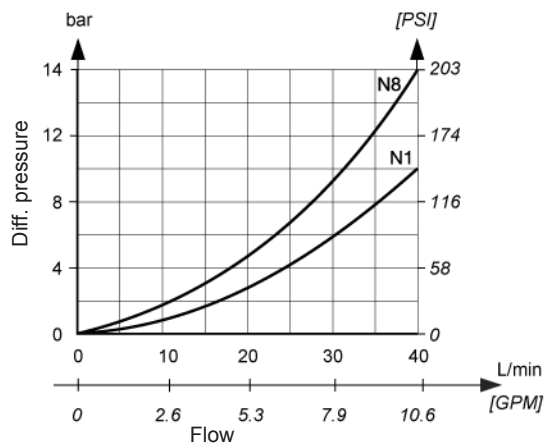
Required quality of the mating surface



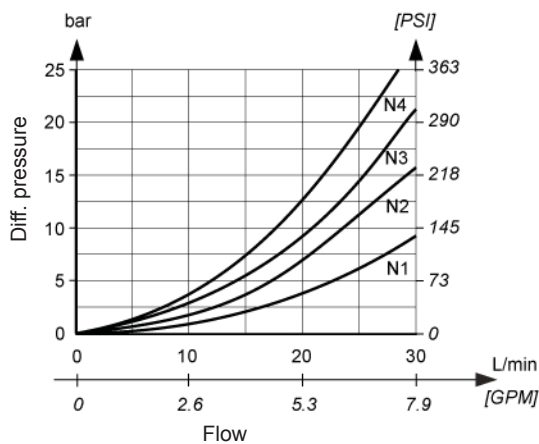
**ΔP-Q Performance curves**

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

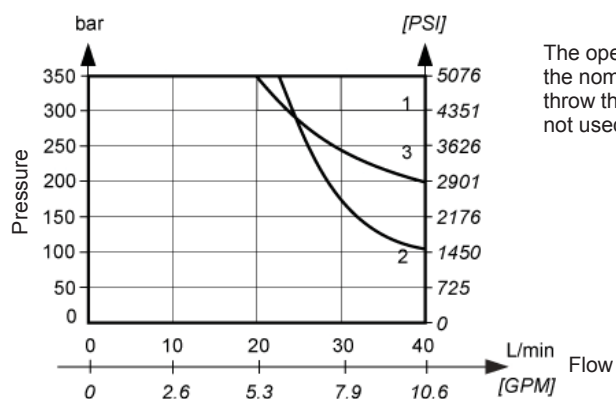
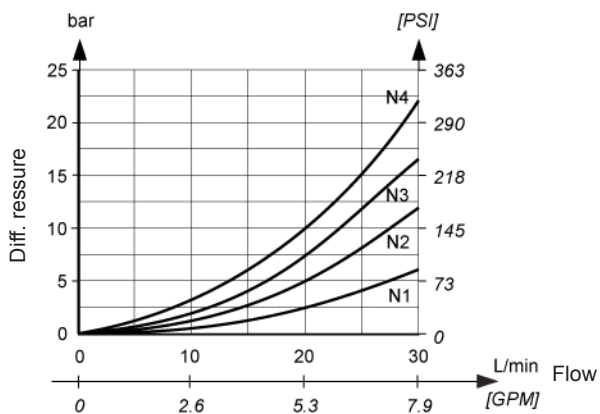
Parallel connection -KVM-P (N1 to N8)



Series connection -KVM-S (P to T).



Series connection -KVM-S (P to A(B)).



The operating limits of the valve shall be determined at a voltage 10% below the nominal rating. The curves refer to application with symmetrical flow through the valve (P-A and B-T). In the case of asymmetrical flow (e.g. one part not used) reduced values may result.

Spool type	Curve
1	1
2	2
3,6	3

Mechanically operated

Hydraulically operated

Electrically operated



Model code

K V M - - **4** / - **6** -

Type of connection

Series connection	S
Parallel connection	P

Number of control spool positions

Two positions	2
Three positions	3

Manual override option

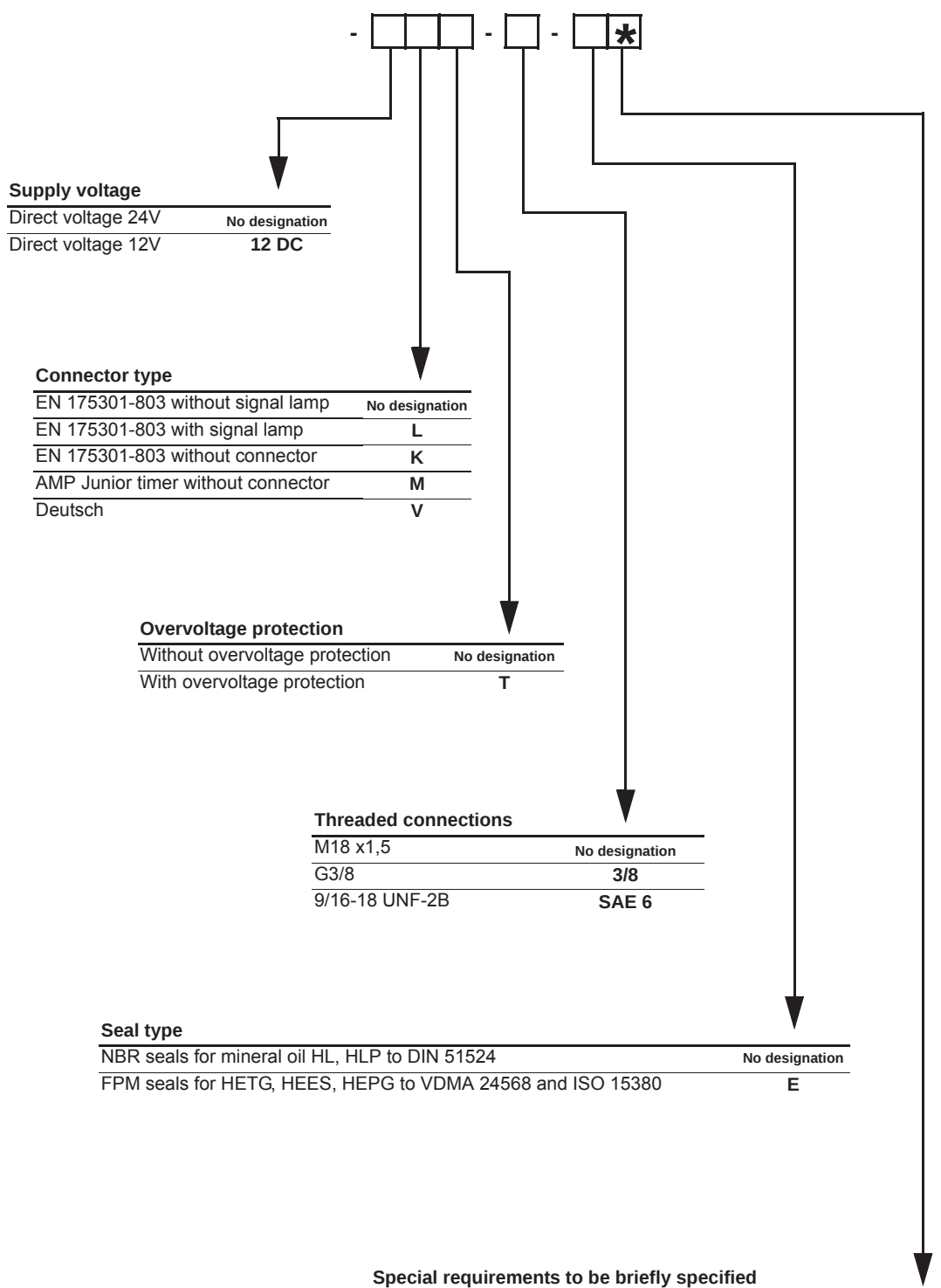
Emergency manual override	No designation
Manual override with rubber	G
Lockable manual override	C
Auxiliary control lever on valve side A	FA
Auxiliary control lever on valve side B	FB

Spool type

		1
		3
		6
		1A
		3A
		6A
		51A
		1B
		3B
		6B
		51B
		81
		2
		2A
		2B

Parallel connection
(KVM-P)

Series connection
(KVM-S)

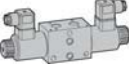


Mechanically operated

Hydraulically operated

Electrically operated





VERTICAL STACKING FOR KVM VALVES

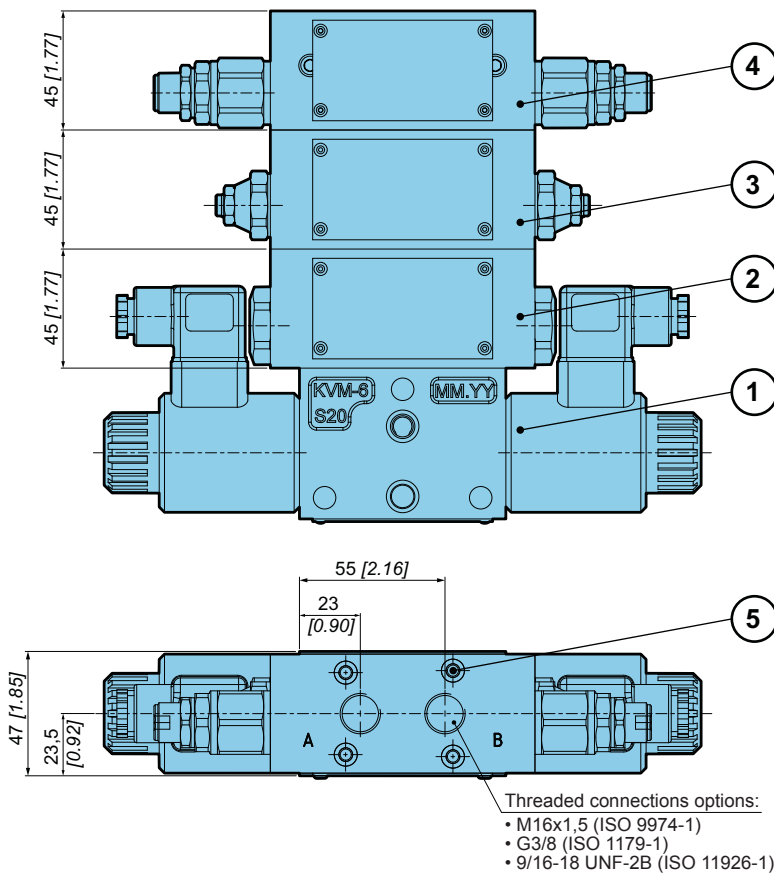
- NG 6
- Up to 350 bar [5076 PSI]
- Up to 40 l/min [10.56 GPM]
- Threaded connections to ISO 9974, ISO 1179 or ISO 11926.
- Possibility of stacking one, two or three vertical stacking components.



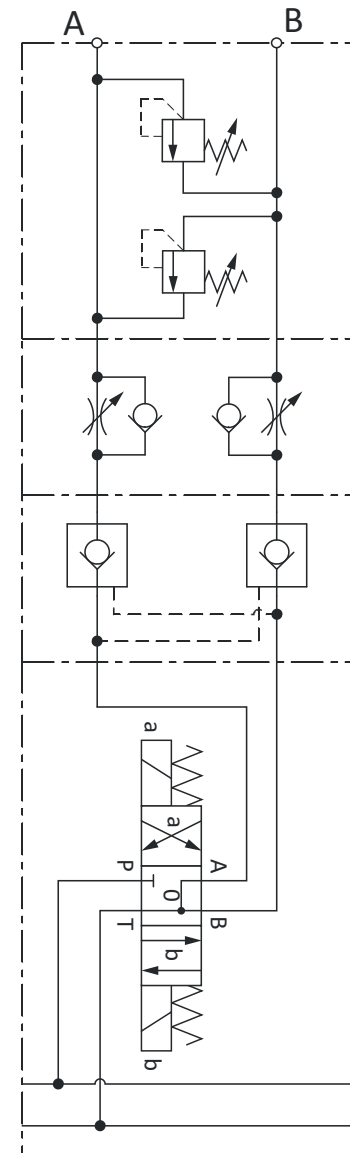
Mounting example

1. Bankable directional valve KVM-6
2. First stacking component (KVM-NOV-6)
3. Second stacking component (KVM-NDV-6)
4. Third stacking component (KVM-VV-6)
5. Mounting screws for vertical stacking components:
 - M5x55, ISO 4762-10.9 (for one stacking component) - ordering code: 1114573
 - M5x95, ISO 4762-10.9 (for two stacking components) - ordering code: 1253603
 - M5x135, ISO 4762-10.9 (for three stacking components) - ordering code: 1668356

Mounting screws tightening torque: max. 9 Nm [79.6 in.lbf]



Hydraulic symbol



Mechanically operated

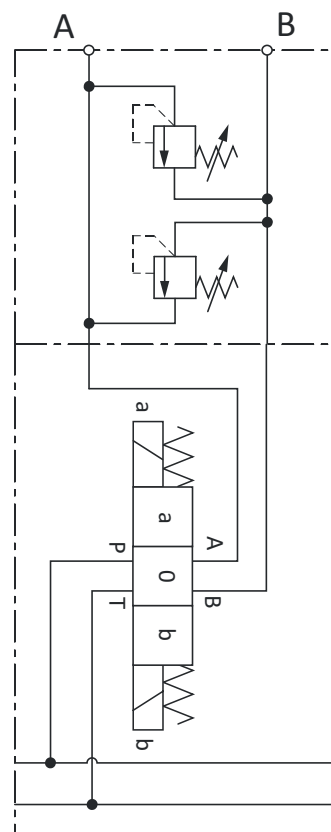
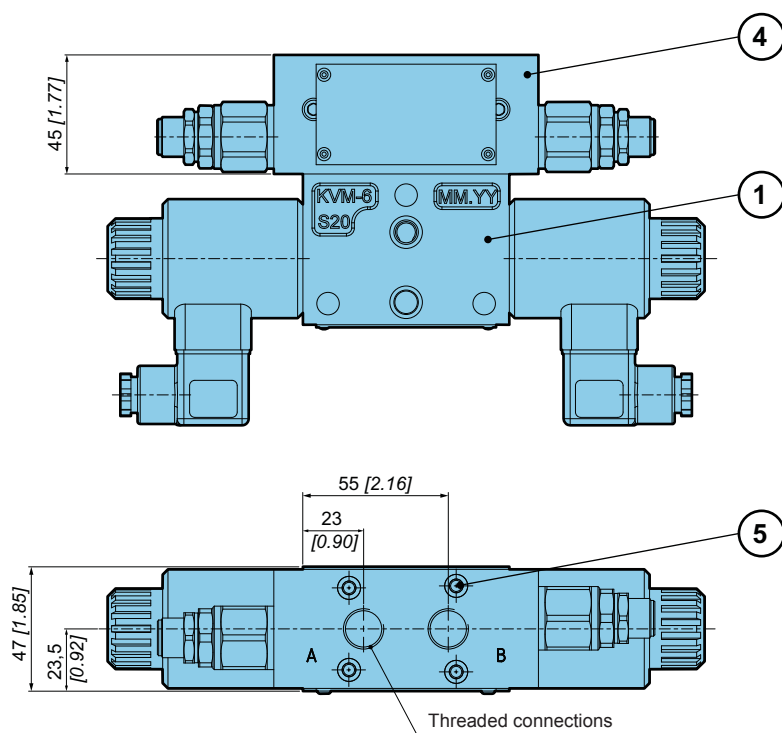
Hydraulically operated

Electrically operated



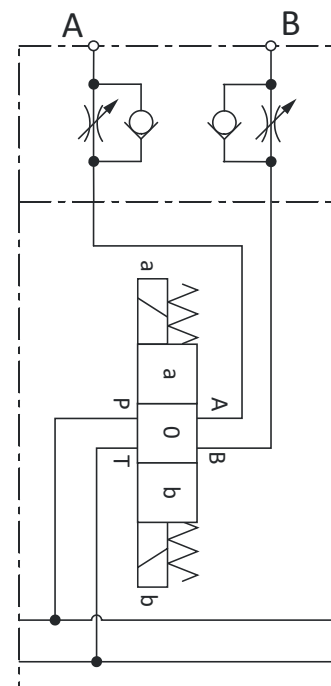
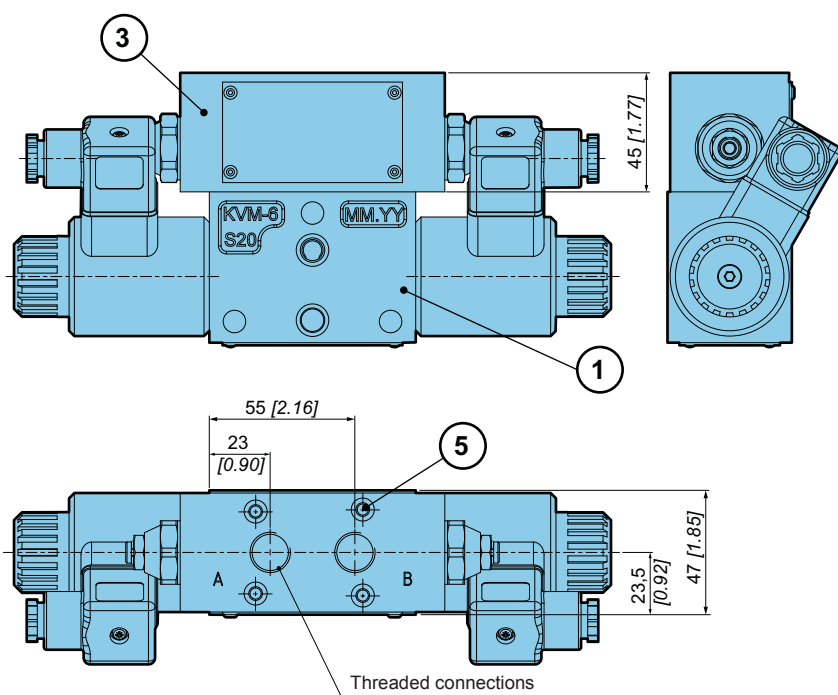
Directional valve KVM and KVM-VV-6 relief valve mounting example

Hydraulic symbol



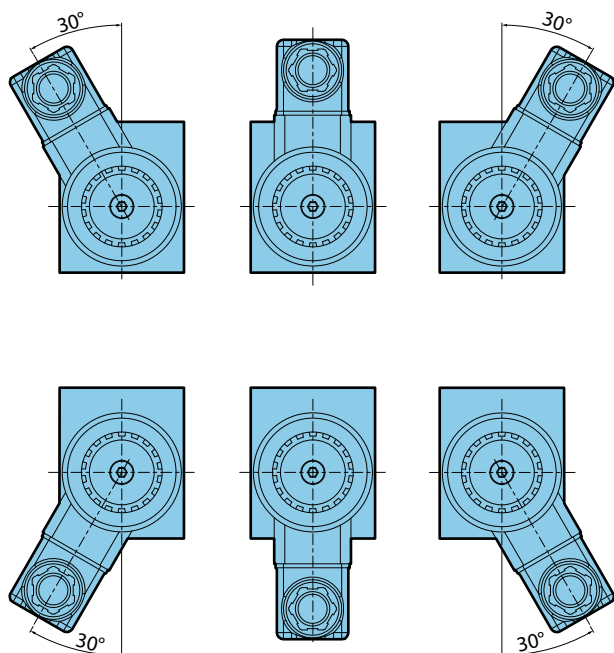
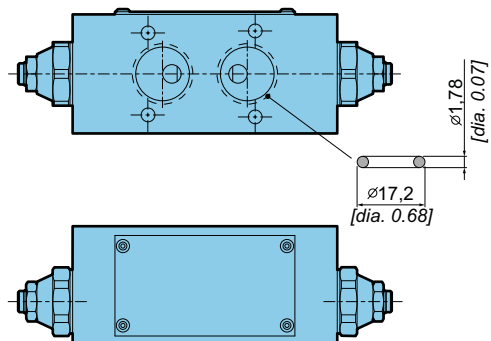
Directional valve KVM and KVM-NDV-6 throttle valve mounting example

Hydraulic symbol



**Solenoid orientation options**

Six different orientation options:

**Sealing between stacking elements**

Mechanically operated

Hydraulically operated

Electrically operated





CHECK VALVE KVM-NOV-6

- Up to 350 bar [5 076 PSI]
- Up to 40 l/min [10.6 GPM]
- Flow shut-off in both or one service line.
- For vertical stacking on KVM directional valves.



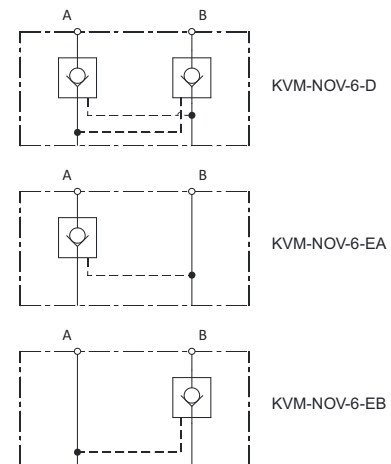
Operation

Pilot operated check valves type KVM-NOV-6 enables the hydraulic fluid flow in the service lines to be automatically shut off and made free, respectively.

Free flow direction is always from the valve side to the ports side. In the opposite direction is the valve blocked for the hydraulic fluid flow. Free flow in port A in direction from ports to valve side is achieved by means of pressure in port B and vice versa.

To assure zero leakage there is necessary to discharge ports A and B towards port T in the zero position of the directional valve.

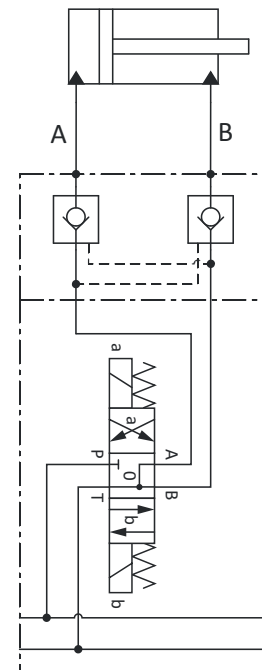
Hydraulic symbols



Features

Size		6
Flow rate	l/min [GPM]	40 [10.5]
Operating pressure	bar [PSI]	350 [5 076]
Cracking pressure	bar [PSI]	1 [14.5]
Area ratio		1:3,9
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]
Filtration	ISO 4406: 1999	19/17/14
Mass	kg [lbs]	1,4 [3.0]

Mounting example



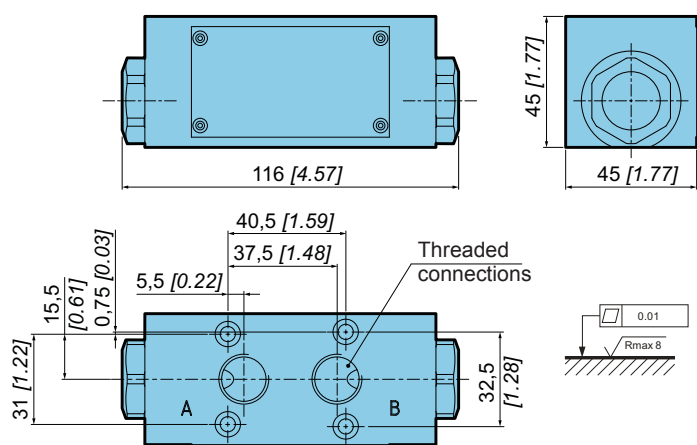
Mechanically operated

Hydraulically operated

Electrically operated

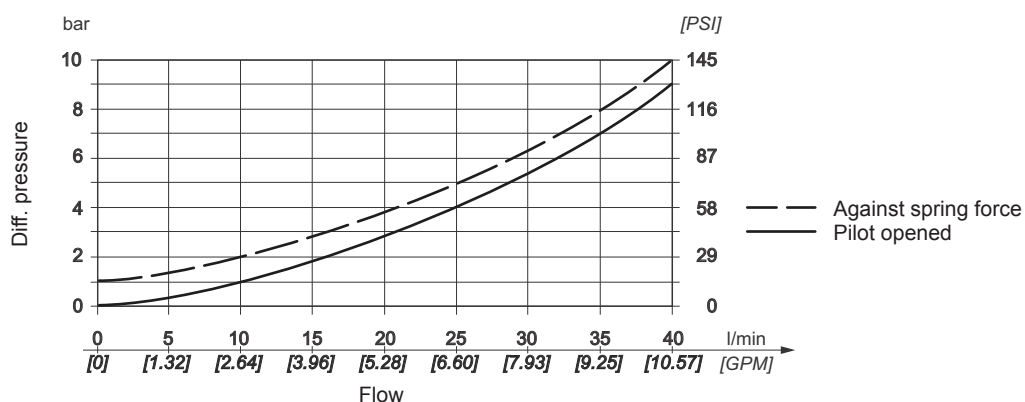


Dimensions

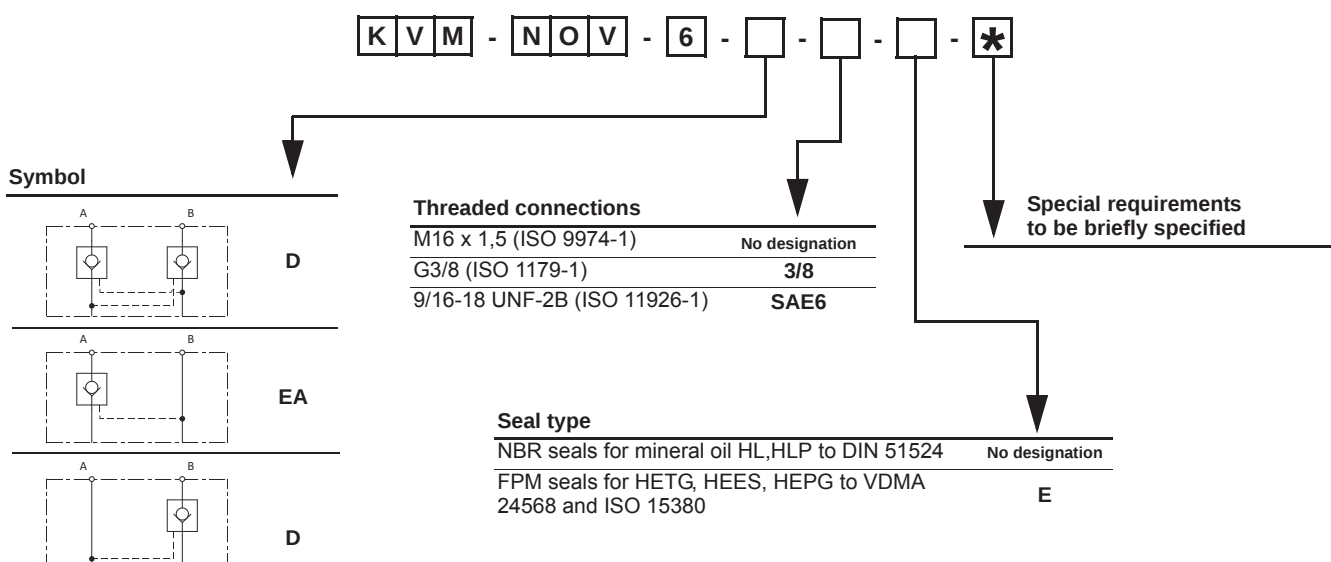


ΔP-Q Performance curves

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].



Model code





THROTTLE WITH CHECK VALVE KVM-NDV-6

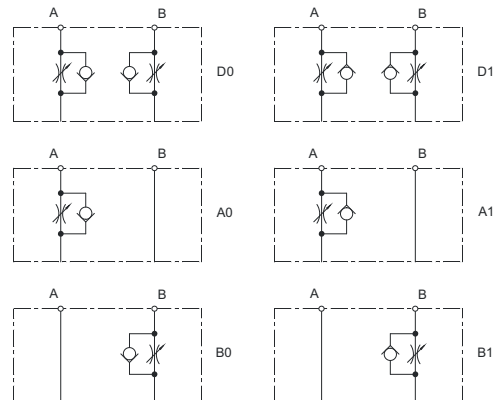
- Up to 350 bar [5 076 PSI]
- Up to 40 l/min [10.6 GPM]
- Flow control in both or one service line.
- For flow throttling in supply and/or return lines.
- For vertical stacking on KVM directional valves.



Operation

Throttle with check valves type KVM-NDV-6 are used for throttling flow of the hydraulic fluid in lines A and/or B. The KVM-NDV-6 valves are allowing free flow in one direction through check valve and throttled flow in reversed direction. Hydraulic fluid flow is throttled depending on adjustment of the throttling screw.

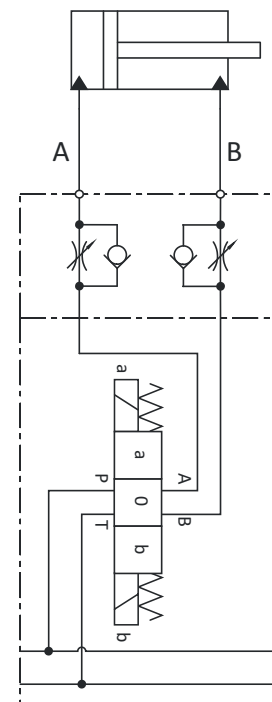
Hydraulic symbols



Features

Size	6	
Flow rate	l/min [GPM]	40 [10.6]
Operating pressure	bar [PSI]	350 [5 076]
Cracking pressure	bar [PSI]	0,5 [7.2]
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]
Filtration	ISO 4406: 1999	19/17/14
Mass	kg [lbs]	1,5 [3.3]

Mounting example



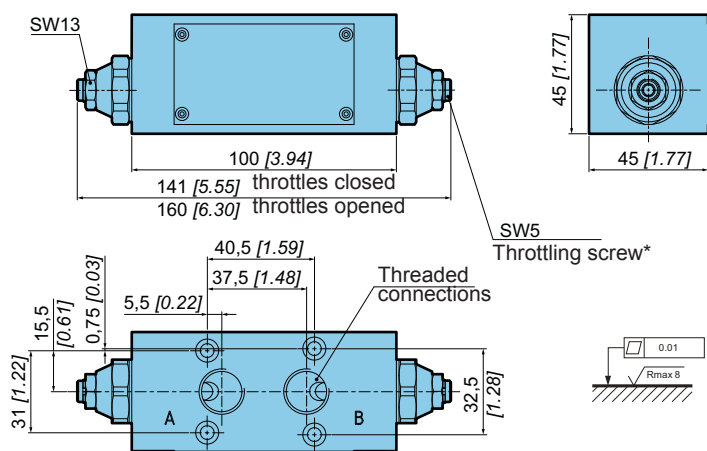
Mechanically operated

Hydraulically operated

Electrically operated



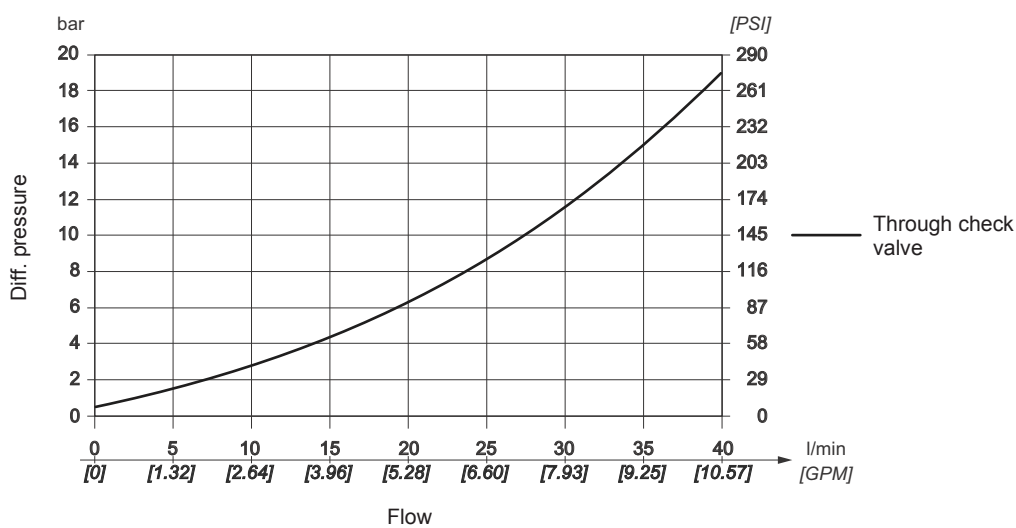
Dimensions



* Clockwise rotation reduces the hydraulic fluid flow. It is recommended that the valve is set at zero pressure in setting line.

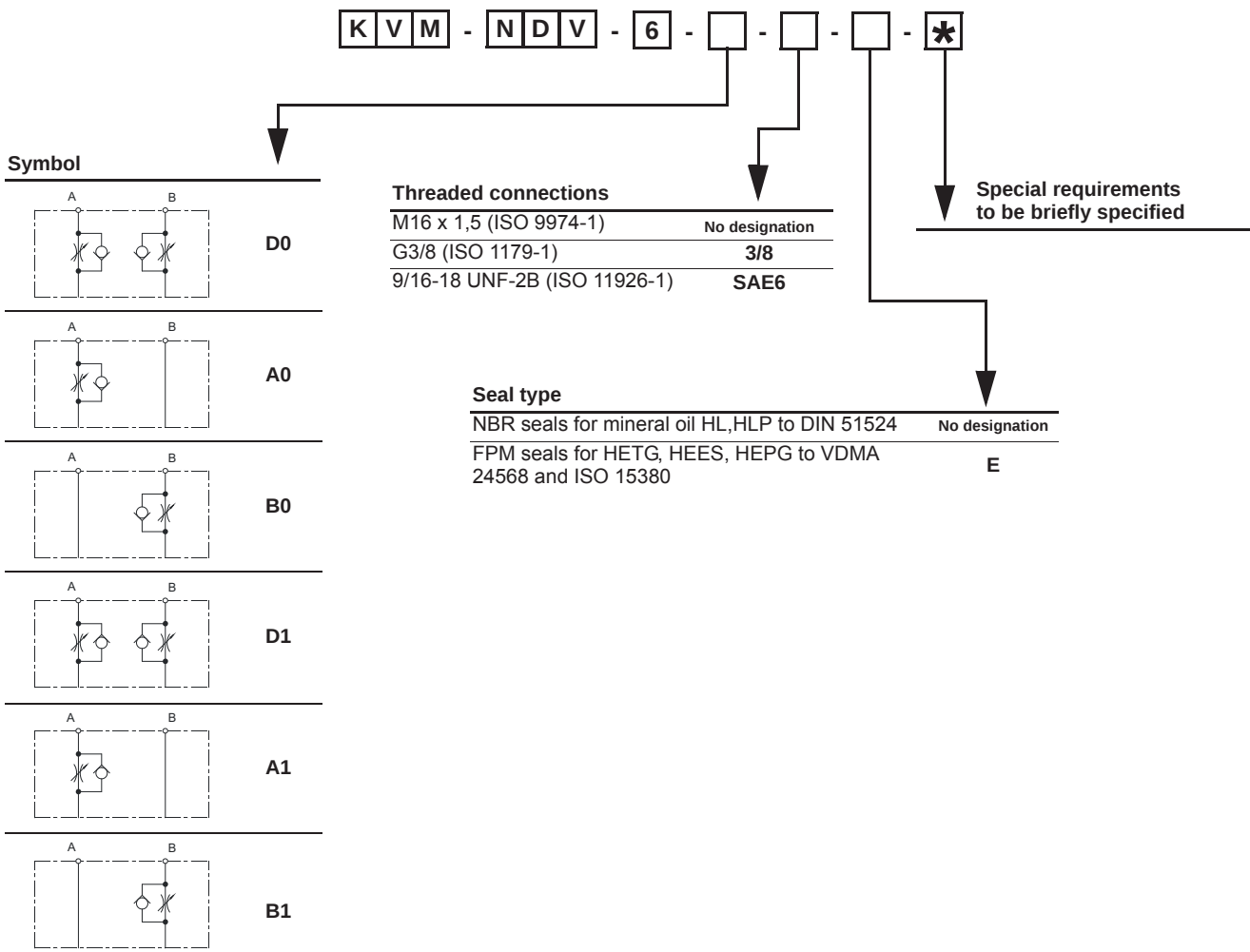
ΔP-Q Performance curve

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].





Model code







PRESSURE RELIEF VALVE KVM-VV-6

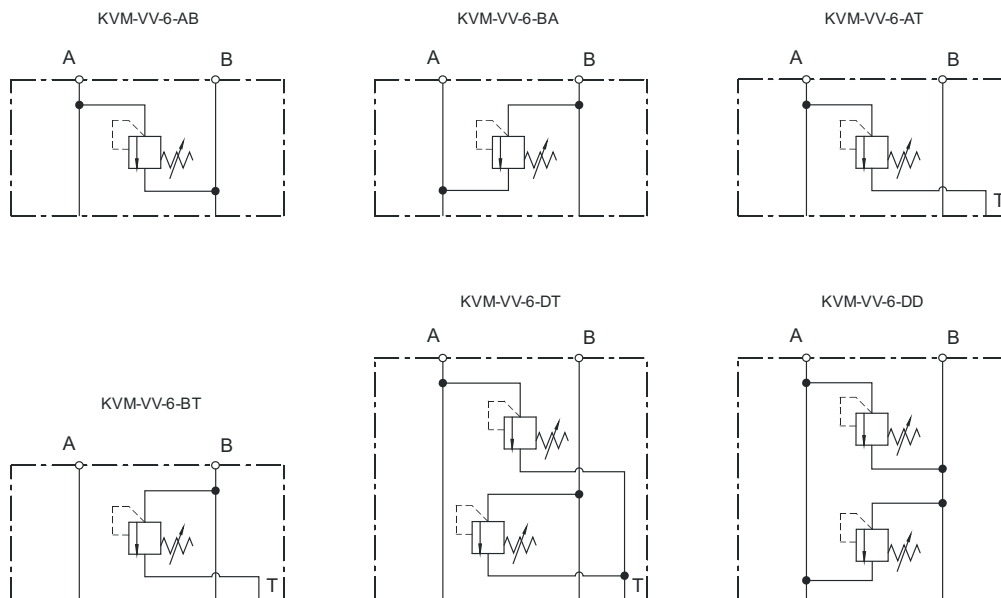
- Up to 350 bar [5 076 PSI]
- Up to 40 l/min [10.6 GPM]
- Direct operated.
- For vertical stacking on KVM directional valves.
- Multiple pressure setting ranges.
- Various hydraulic symbols.



Operation

Throttle with check valves type KVM-NDV-6 are used for throttling flow of the hydraulic fluid in lines A and/or B. The KVM-NDV-6 valves are allowing free flow in one direction through check valve and throttled flow in reversed direction. Hydraulic fluid flow is throttled depending on adjustment of the throttling screw.

Hydraulic symbols



Features

Size	6	
Flow rate	l/min [GPM]	40 [10.6]
Pressure setting range	bar [PSI]	15 - 350 [270 - 5 076]
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [69.5 to 1760]
Filtration	ISO 4406: 1999	19/17/14
Mass	kg [lbs]	1,1 - 1,8 [2.4 - 4.0]

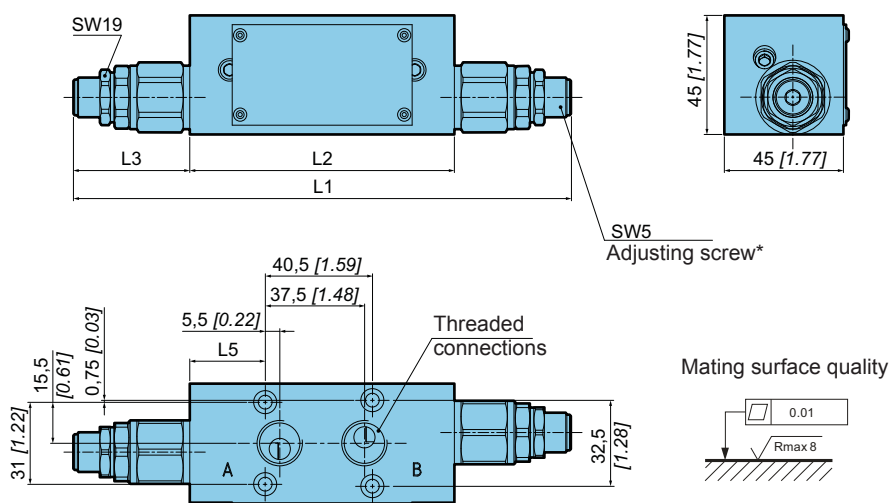
Mechanically operated

Hydraulically operated

Electrically operated



Dimensions

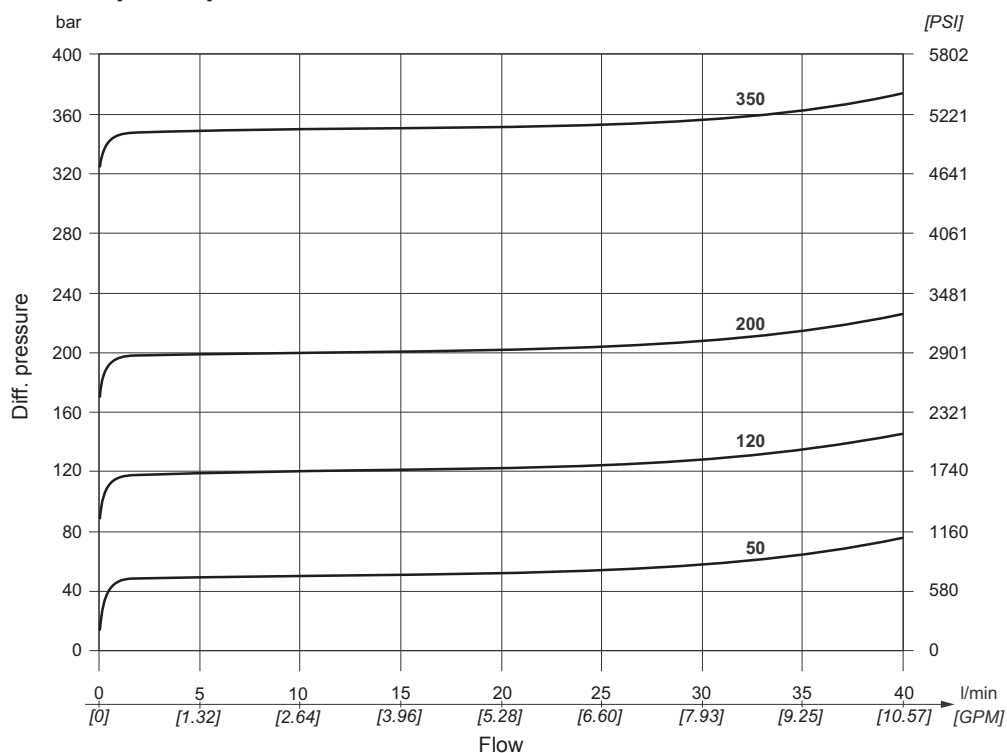


* Clockwise rotation increases pressure rise at the inlet port of pressure relief valve.

Option	L1 mm [inch]	L2 mm [inch]	L3 mm [inch]	L4 mm [inch]	L5 mm [inch]	Mass kg [lbs]
KVM-VV-6-AB	109 [4.29]	70 [2.76]	0	39 [1.53]	13,5 [0.53]	1,1 [2.42]
KVM-VV-6-BA	109 [4.29]	70 [2.76]	39 [1.53]	0	13,5 [0.53]	1,1 [2.42]
KVM-VV-6-AT	144 [5.67]	100 [3.94]	44 [1.73]	0	29 [1.14]	1,6 [3.53]
KVM-VV-6-BT	121,5 [4.78]	80 [3.15]	0	41,5 [1.63]	8,5 [0.33]	1,3 [2.87]
KVM-VV-6-DT	188 [7.40]	100 [3.94]	44 [1.73]	44 [1.73]	28,5 [1.12]	1,8 [3.97]
KVM-VV-6-DD	188 [7.40]	100 [3.94]	44 [1.73]	44 [1.73]	28,5 [1.12]	1,8 [3.97]

ΔP-Q Performance curves

Measured at 50°C [122°F]
and viscosity of 32 mm²/s [148 SUS].

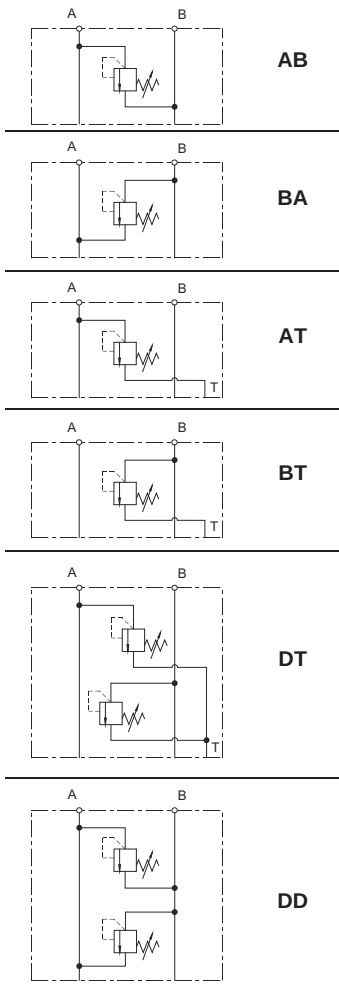




Model code

K V M - **V V** - **6** - - - - *****

Symbol



Threaded connections

M16 x 1,5 (ISO 9974-1)	No designation
G3/8 (ISO 1179-1)	3/8
9/16-18 UNF-2B (ISO 11926-1)	SAE6

Pressure setting range
bar [PSI]

15 - 50 [217 - 725]	50
51 - 120 [740 - 1740]	120
121 - 200 [1755 - 2900]	200
201 - 350 [2915 - 5076]	350

Special requirements
to be briefly specified

Mechanically operated

Hydraulically operated

Electrically operated





VERTICAL STACKING ON VALVES KVM WITH STANDARD SANDWICH VALVES TO ISO 4401

- NG 6
- Up to 350 bar [5076 PSI]
- Up to 40l/min [10.57 GPM]

- Use standard components for vertical stacking.
- Threaded connections to ISO 9974 or ISO 1179.
- Possibility of stacking one or two standard components.



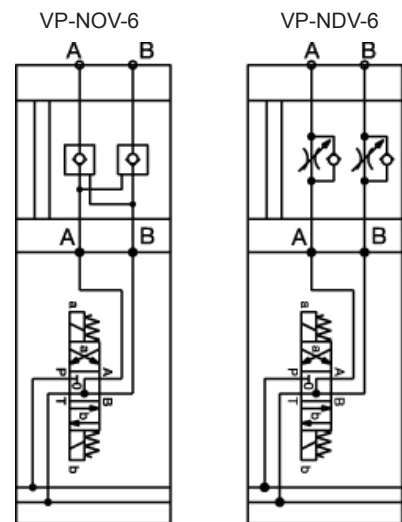
KVM-P-4/3-5KO-6 and VP-NOV-6 for stacking

Description

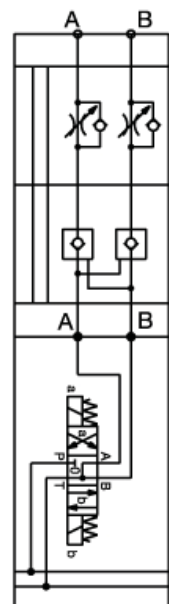
1. Bankable directional valve KVM-6
2. STACK-KVM-6 consist of:
 - 2.1 Adapter plate and two O-rings 18,77 x 1,78
 - 2.2 End plate and two O-rings 9,25 x 1,78
 - 2.3 Fixing screws M5x100 ISO 4762-10.9 (for one stacking component) or M5x140 ISO 4762-10.9 (for two stacking components)
3. First stacking component (standard VP-NOV-6 or VP-NDV-6)
4. Second stacking component (standard VP-NDV-6)

Hydraulic symbol

One standard component



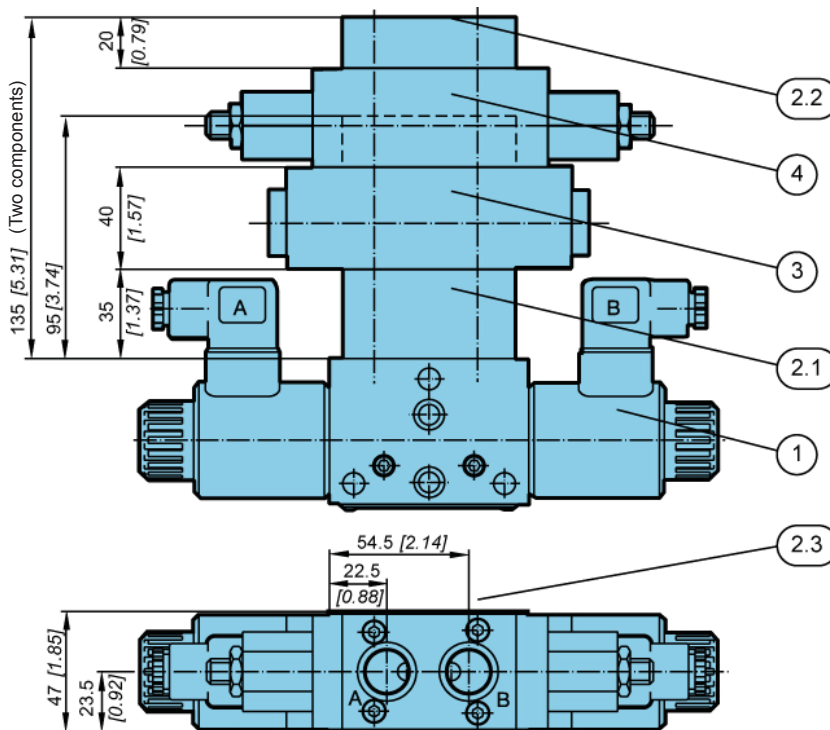
Two standard components



Mechanically operated

Hydraulically operated

Electrically operated



Mtorque = max. 9Nm [79.6 in.lbf]



Model code

S T A C K - **K V M** - **6** - - - - *

Number of stacking components

One standard component

N1

Two standard components

N2**Threaded connections**

G3/8 (ISO 1179)

3/8

M18 x 1,5 (ISO 9974)

No designation

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524

No designation

FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

E**Special requirements to be briefly specified**



AUXILIARY CONTROL LEVER

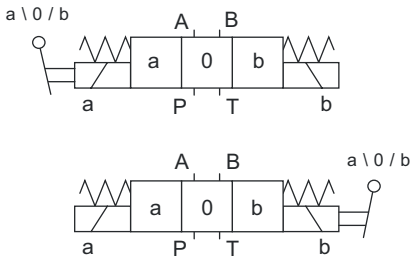
- Compatible with KV-5KO-6, KVM-6 and KVP-5KO-6 directional valves
- Without impact on valve's performance.
- Up to 250 bar [3 625 PSI] on T port.



Description

The optional auxiliary control lever module offers solenoid or manual operation of directional valves. Control lever provides mechanical connection with main control spool without significant impact on valve's performance. Auxiliary control lever module is mounted between the valve housing and solenoid. During solenoid operation, hand lever remains in neutral position. Modular and robust design of auxiliary control lever enables installation on A or B side of various types of directional valves and operating pressure range up to 250 bar [3 625 PSI] on T port.

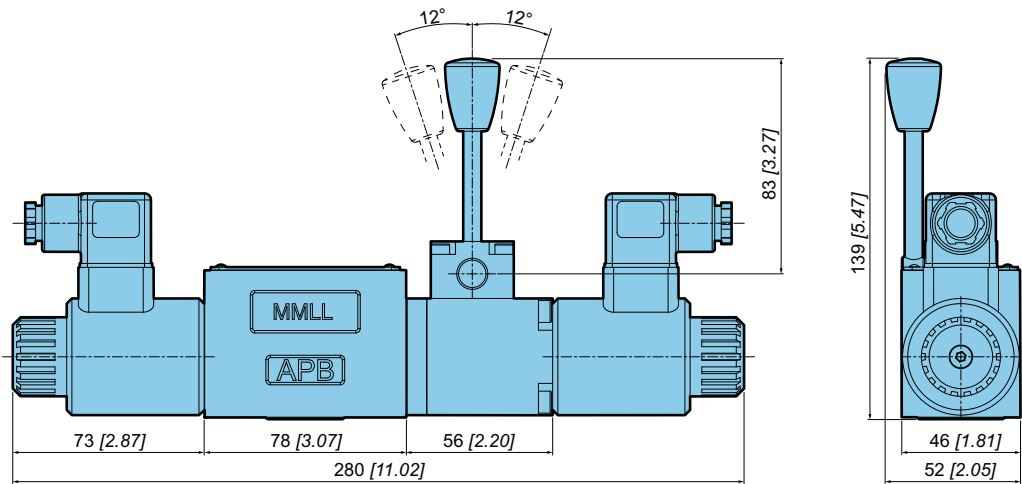
Hydraulic symbols



Features

Size	6		
Operating pressure	Ports A, B, P	bar [PSI]	350 [5 076]
	Port T	bar [PSI]	250 [3 626]
Oil temperature range		°C [°F]	-20 to +70 [-4 to +158]
Viscosity range		mm ² /s [SUS]	15 to 380 [69.5 to 1760]
Filtration		ISO 4406: 1999	19/17/14
Lever actuating force (end stroke)		N [lbf]	40 [9.0]
Mass (ACL module)		kg [lb]	0,9 [1.98]

Dimensions



Mechanically operated

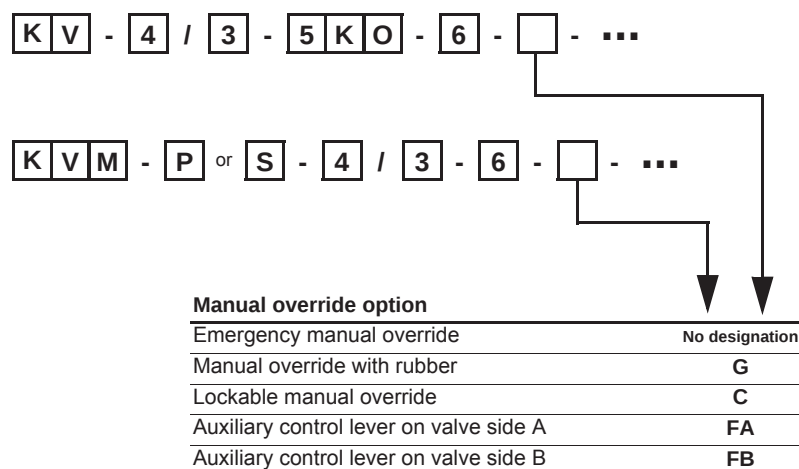
Hydraulically operated

Electrically operated



Model code

The auxiliary control lever on valves KV-5KO-6 and KVM-6 is defined by the designation in the manual override option field.



The auxiliary control lever on valves KVP-6 is defined by the designation FA or FB in the special requirements field.



INLET PLATE OB-KVM-6

- NG 6
- Up to 350 bar [5076 PSI]
- Up to 40 L/min [10.6 GPM]

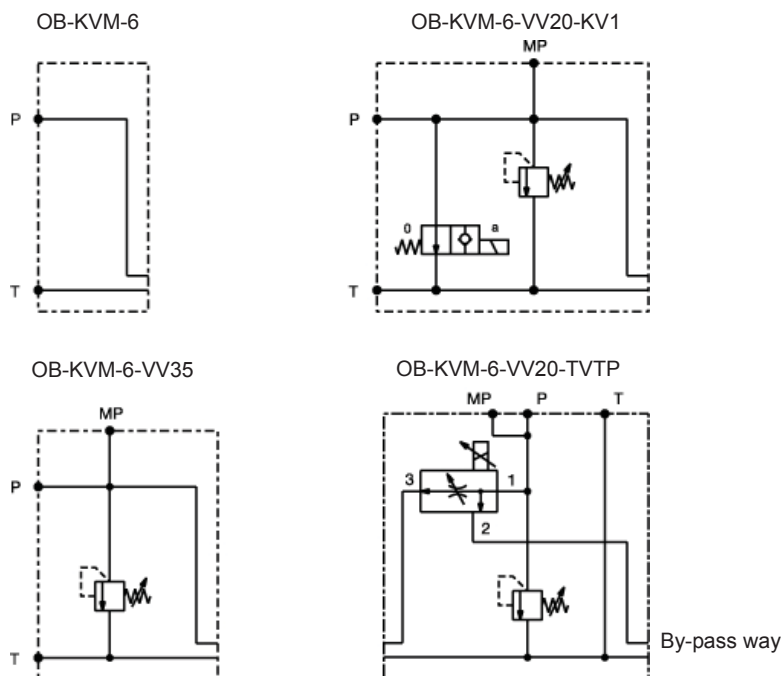
- Provide pressure relief valve.
- Provide pump unloading valve.
- Provide flow control valve.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).



OB-KVM-6-VV20-KVO

OB-KVM-6-VV20-TVTPG

Hydraulic symbol



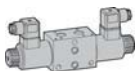
Features

		OB-KVM-6	OB-KVM-6-VV	OB-KVM-VV-KV	OB-KVM-VV-TVTP
Oil temperature range	°C [°F]		-20 to +70 [-4 to +158]		
Viscosity range	mm ² /s [SUS]		15 to 380 [3.24 to 82]		
Filtration	NAS 1638		8		
Mass	kg [lb]	1,25 [2.76]	1,35 [2.98]	2,2 [4.85]	4,5 [9.92]
Flow rate	L/min [GPM]	/	40 [10.6]		
Press Setting	bar [PSI]	/	50-210 [13-55]		
		/	100-350 [26-92]		
Adjustments		/	allen key		
Max. pressure	bar [PSI]	/	/	350 [5 076]	210 [3 045]
Supply voltage	V DC	/	/	12, 24	/
Power	W	/	/	17	/
Flow - inlet	L/min [GPM]	/	/	/	max. 50 [max. 13,21]
Flow - priority way	L/min [GPM]	/	/	/	0 - 25 [0 - 6.6]
Flow - bypass	L/min [GPM]	/	/	/	max. 40 [max. 10,6]

Mechanically operated

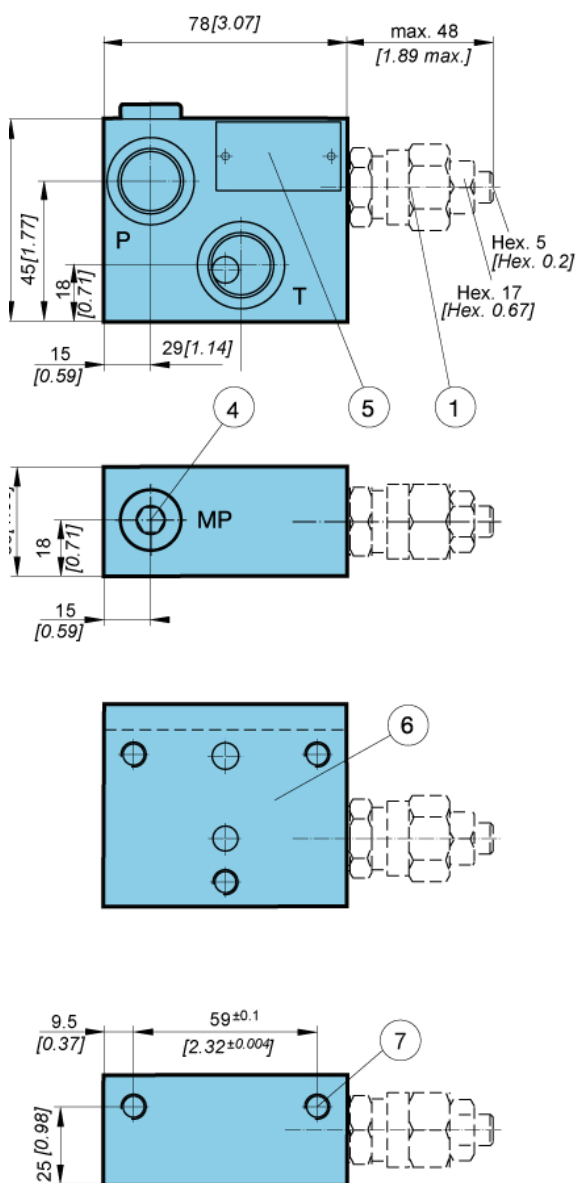
Hydraulically operated

Electrically operated

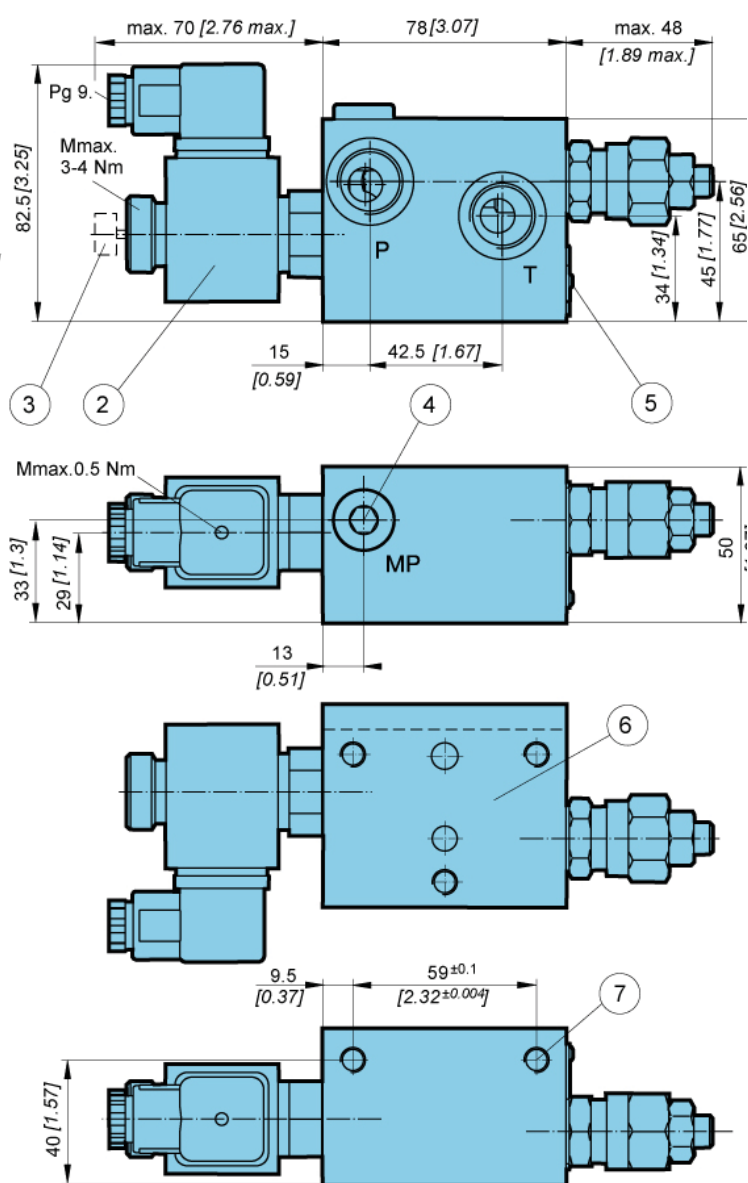


Dimensions

OB-KVM-6
OB-KVM-6-VV



OB-KVM-6-VV...-KV...

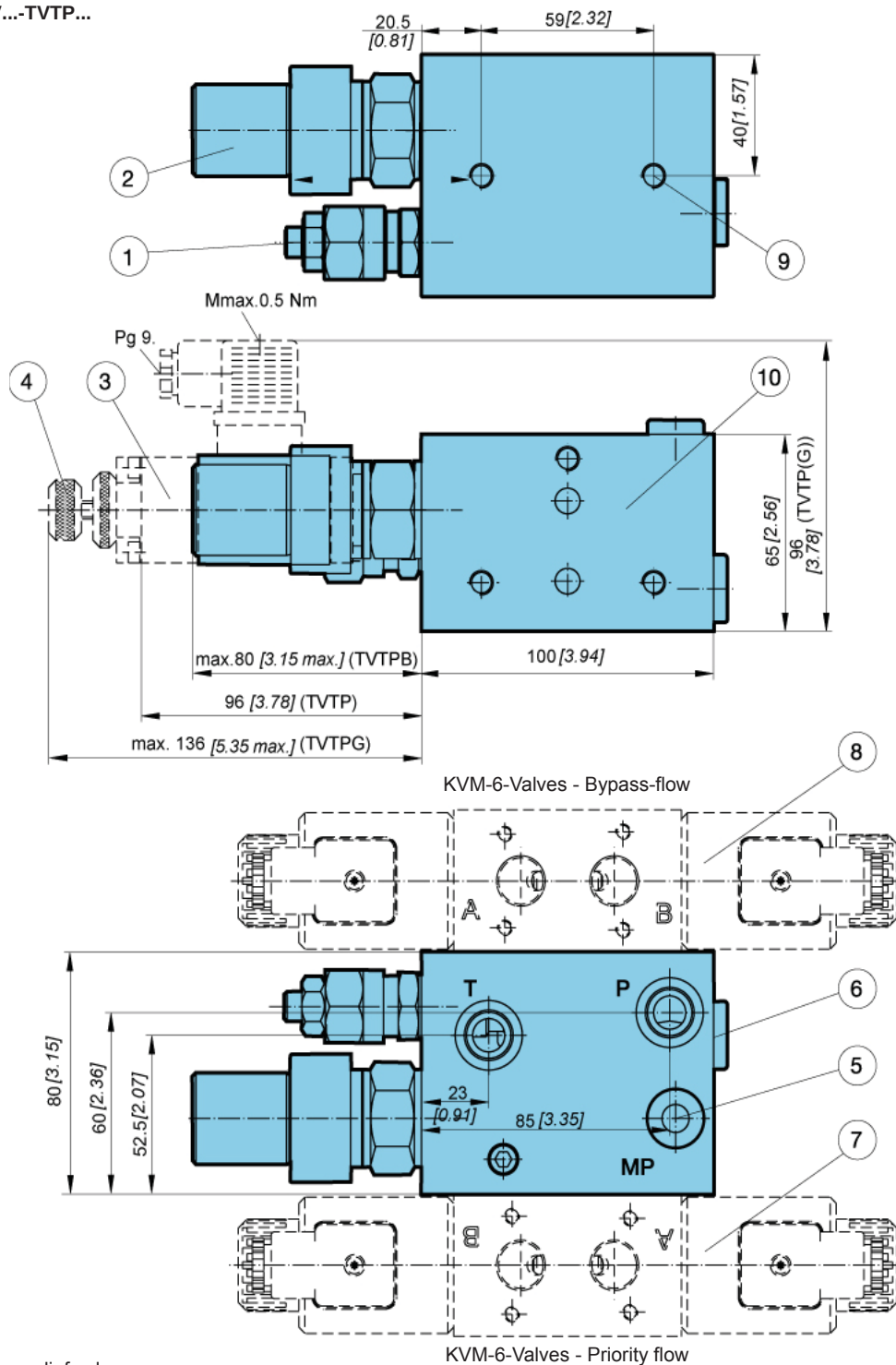


1. Pressure relief valve
2. Pump unloading valve
3. Manual override with knob
4. Threaded connection MP - G1/4 (closed)
6. Connection dimensions for KVM-6
7. Fixing hole (M8 X 12) for mounting assembly



Dimensions

OB-KVM-6-VV....TVTP...



1. Pressure relief valve
2. Flow control valve - rotary knob -TVTPB
3. Flow control valve - proportional solenoid - TVTP
4. Flow control valve - proportional solenoid with manual override - TVTPG
5. Threaded connection MP - G1/4 (closed)
6. Nameplate
7. Bankable directional valves KVM-6 Priority flow
8. Bankable directional valves KVM-6 Bypass flow
9. Fixing hole (M8 x 12) for mounting assembly
10. Connection dimensions for KVM-6 (see page 12.11.3)

Mechanically operated

Hydraulically operated

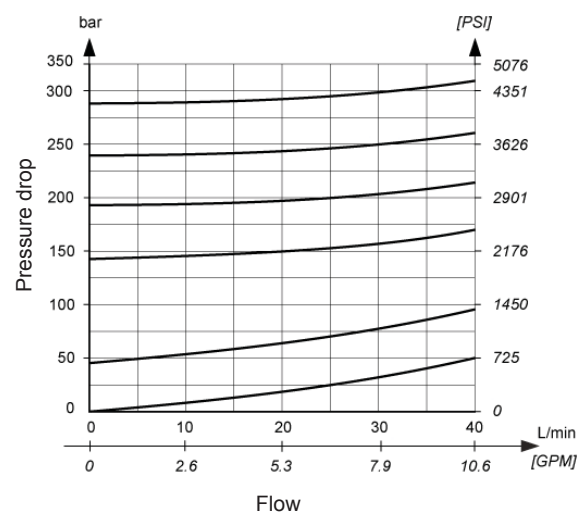
Electrically operated



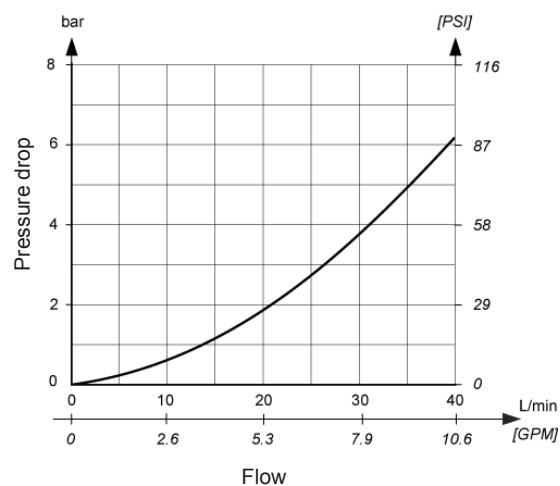
ΔP -Q Performance curves

Measured at 50°C [122°F] and viscosity of 28 mm²/s [148 SUS].

.OB-KVM-6-VV (pressure relief valve- flow P to T.



OB-KVM-6-KV (pump unloading valve- flow P to T.





Model code



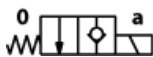
Pressure relief valve

Without pressure relief valve	No designation
Pressure relief valve range 50-210 bar [725-3045 PSI]	VV20
Pressure relief valve range 100-350 bar [1450-5076 PSI]	VV35

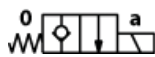
Pump unloading valve

Without pump unloading valve	No designation
Pump unloading valve - normally closed	KV0
Pump unloading valve - with manual override - knob	KVG0
Pump unloading valve - normally open	KV1
Pump unloading valve - with manual override - knob	KVG1

Normally open



Normally closed



Flow control valve

Without flow control valve	No designation
Flow control valve - rotary knob - TVTP-25-B	TVTPB
Flow control valve - prop. solenoid - TVTP-25-P	TVTP
Flow control valve - with manual override - knob	TVTPG

supply voltage

Direct voltage 24 V	No designation
Direct voltage 12 V	12

Threaded connections

M18 x 1,5 (ISO 9974)	No designation
M22 x 1,5 (ISO 9974)	M22
G1/2 (ISO 1179)	1/2
G3/8 (ISO 1179)	3/8
3/4-16 UNF-2B	SAE 8

Plug-in connector

Without signal lamp	No designation
With signal lamp	L
Deutsch	V

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

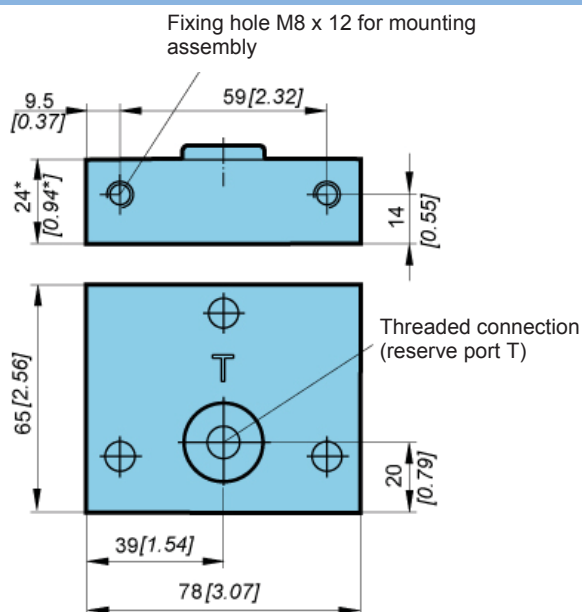
Electrically operated





END PLATE ZB-KVM-6

Dimensions



ZB-KVM-6

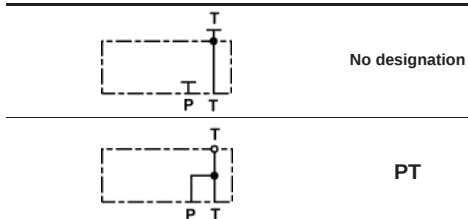
* ZB-KVM-6-PT-1/2(M22) = 27

Mass = 0,8 kg

Model code

Z B - K V M - 6 - [] - [] - [] - *

Symbol



((It is necessary to use this end plate by series connections KVM-S))

Threaded connections

M18 x 1,5 (ISO 9974)	No designation
M22 x 1,5 (ISO 9974)	M22
G1/2 (ISO 1179)	1/2
G3/8 (ISO 1179)	3/8
3/4-16 UNF-2B	3/4-16UNF

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

Electrically operated





FIXING ELEMENTS FOR MOUNTING

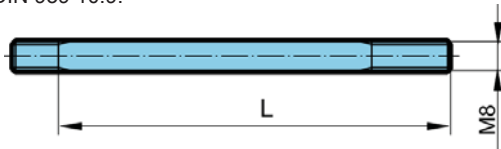
- SET-KVM-6 consists of:
 - a) Nuts: 3 x M8 DIN 1587
 - b) Washers: 3 x A8 DIN 6798-J
 - c) Screws: 3 x M8 DIN 939 10.9



SET-KVM-6-N3

Description	Model code
-------------	------------

Screw M8 DIN 939 10.9:



	L mm [in]
N1	80 [3,15]
N2	127 [4,99]
N3	174 [6,85]
N4	221[8,70]
N5	268 [10,55]
N6	315 [12,40]
N7	362 [14,25]
N8	409 [16,10]

:Max. number of bankable valves KVM:

a) parallel connection (KVM-P) = eight valves (max. N8).

SET - KVM - 6 -

Number of bankable directional valves KVM-6

One valves KVM-6	N1
Two valves KVM-6	N2
Three valves KVM-6	N3
Four valves KVM-6	N4
Five valves KVM-6	N5
Six valves KVM-6	N6
Seven valves KVM-6	N7
Eight valves KVM-6	N8

Mechanically operated

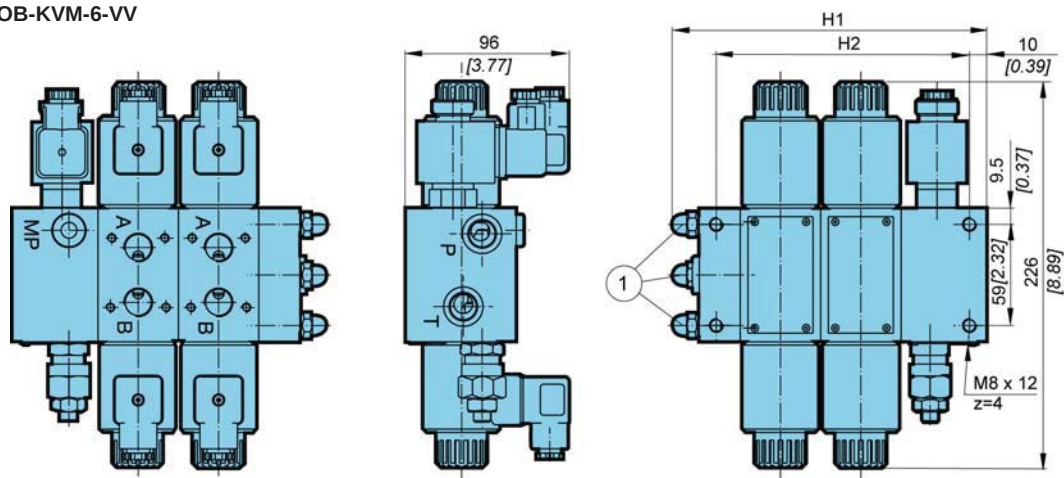
Hydraulically operated

Electrically operated



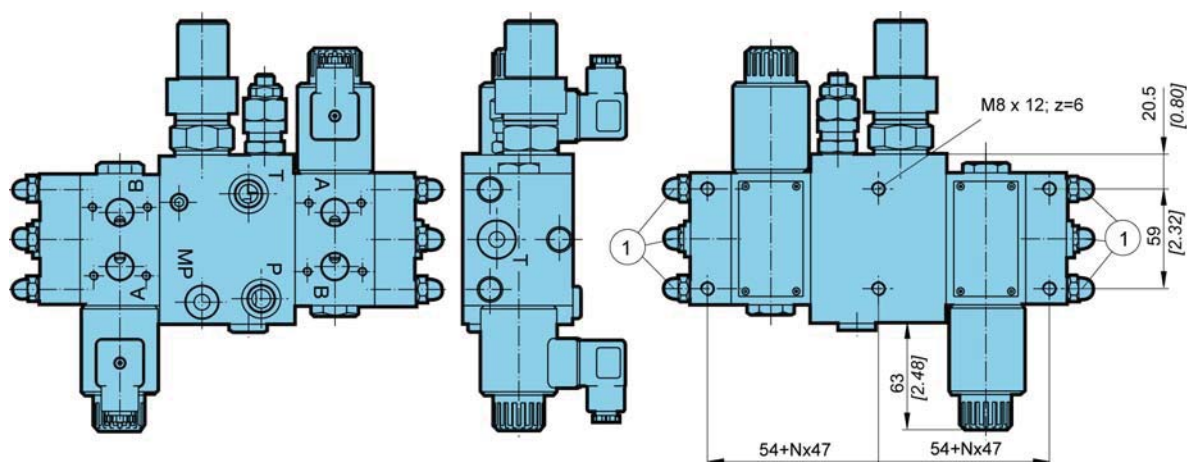
Dimensions

OB-KVM-6, OB-KVM-6-VV



	H1	H2
OB-KVM-6 or OB-KVM-6-VV...	75+Nx47 (N = 1 to 8)	39+Nx47 (N = 1 to 8)
OB-KVM-6-VV...-KV...	90+Nx47 (N = 1 to 8)	54+Nx47 (N = 1 to 8)

OB-KVM-6-VV...-TVTPB...



1. [141 in.lbf]Mtorque / Parallel connection (KVM-P) - max. 20Nm [177 in.lbf] / Series connection (KVM-S) - max. 16 Nm



6/2 WAY DIRECTIONAL VALVE KV

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 50 L/min [13.2 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-6/2-6-S50

Operation

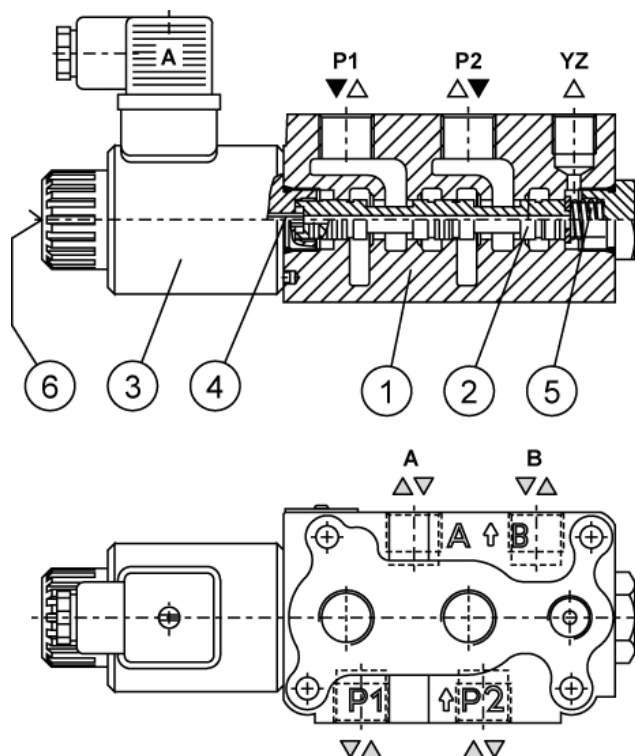
Directional valves type KV with direct solenoid operation control the direction of the hydraulic medium flow. They are mostly used as link between two consumers and the basic directional valve, when we want to control both consumers alternately by means of one basic directional valve.

The KV type directional valves consist of a housing (1), a control spool (2), a solenoid (3) and a return spring (5).

Change-over to the operating position is done by energizing the solenoid (3), whereby the solenoid plunger acts on the control spool (2) via the operating pin (4), thus clearing the corresponding flow ways and establishing respective links between the ports P1, A, B and P2.

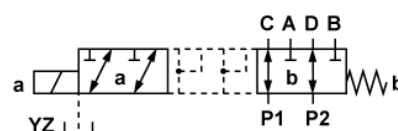
When the solenoid (3) is de-energized, the control spool (2) is returned to its neutral position by the return spring (5), thus establishing again the links between ports P1, C, D and P2.

The change-over can also be done manually by pressing the emergency manual override (6).

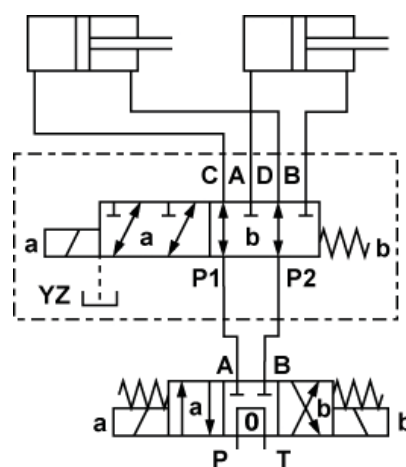


Hydraulic symbol

Spool type



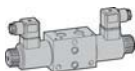
Mounting example



Mechanically operated

Hydraulically operated

Electrically operated



Features

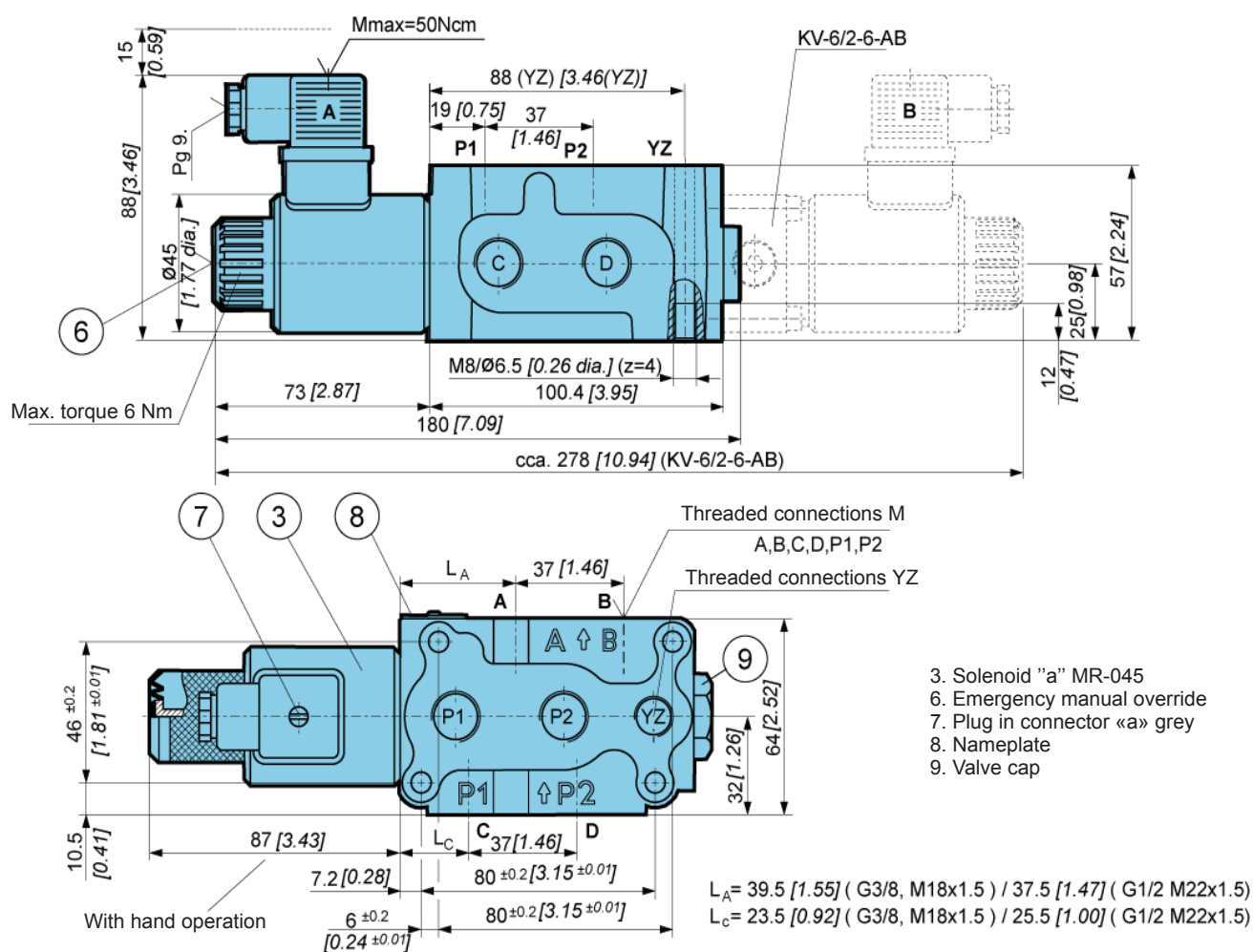
Hydraulic

Size	6		
Flow rate	L/min [GPM]		50 [13.2]
Operating pressure	With YZ	bar [PSI]	350 [5 076]
	Without YZ		250 [3 625]
Oil temperature range	°C [°F]		-20 to +70 [-4 to+158]
Viscosity range	mm ² /s [SUS]		15 to 380 [3.24 to 82]
Mounting position	Optional		
Mass	kg [lb]		2,5 [5.51]
Filtration	NAS 1638		8

Electrical

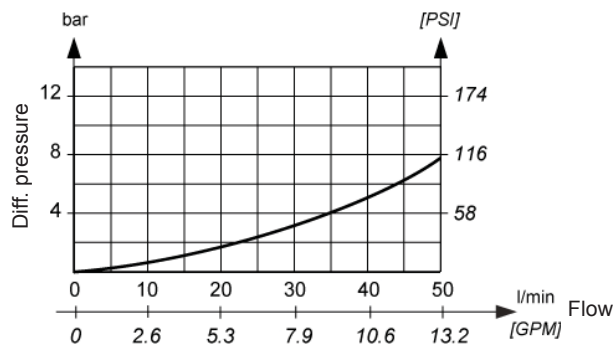
Supply voltage	V	12, 24 DC
Power	W	31
Switching frequency	1/h	15 000
Ambiant temperature	°C [°F]	to +50 [to +122]
Coil temperature	°C [°F]	to +180 [to +356]
Duty cycle	Continuous	

Dimensions

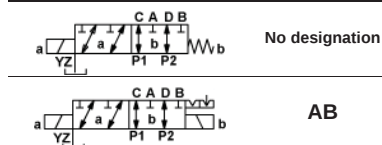


**ΔP-Q Performance curve**

Measured at 40°C [104°F] and viscosity of 32 mm²/s [148 SUS].

**Model code**

K V - 6 / 2 - 6 - - - - - - - - - - - - - - - S 5 0 - *

Spool type**Overlap****Manual override option**

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

Direct voltage 24V	No designation
Direct voltage 12V	12 DC

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
EN 175301-803 without connector	K
AMP Junior timer without connector	M
Deutsch	V

Overvoltage protection

Without protection	No designation
With protection	T

Special requirements to be briefly specified

Seal type

No designation	NBR seals for mineral oil HL, HLP to DIN 51524
E	FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Drainage

No designation	Without YZ
YZ	With YZ

Threaded connections M ; YZ

No designation	M18x1,5 ; M14x1,5
M22	M22x1,5 ; M14x1,5
3/8	G3/8 ; G1/4
1/2	G1/2 ; G1/4
SAE 8	3/4-16 UNF-2B ; 9/16-18 UNF-2B

Mechanically operated

Hydraulically operated

Electrically operated





6/2 WAY DIRECTIONAL VALVES KV

- NG 10
- Up to 350 bar [5 076 PSI]
- Up to 120 L/min [31.7 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP65 to EN 50529 / IEC 60529.



KV-6/2-10

Operation

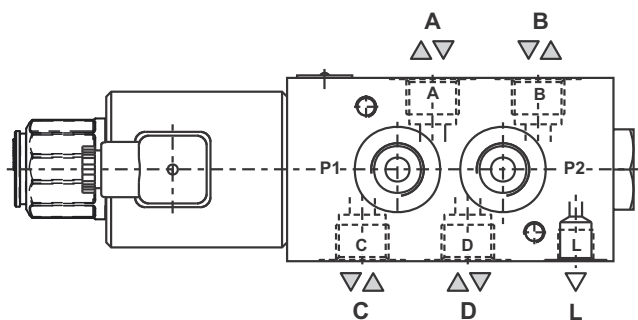
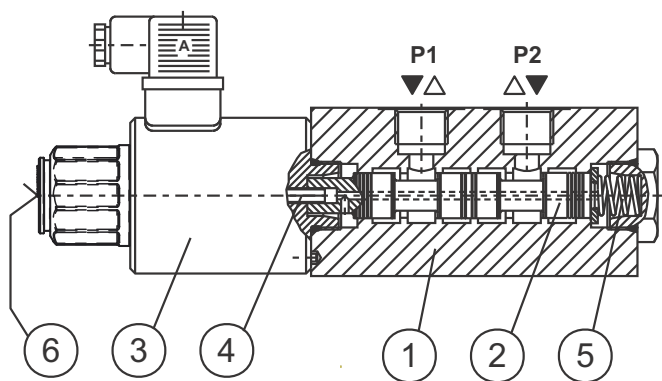
Directional valves type KV with direct solenoid operation control the direction of the hydraulic medium flow. They are mostly used as link between two consumers and the basic directional valve, when we want to control both consumers alternately by means of one basic directional valve.

The KV type directional valves consist of a housing (1), a control spool (2), a solenoid (3) and a return spring (5).

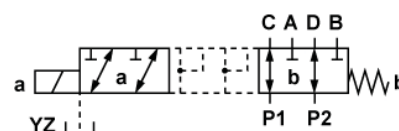
Change-over to the operating position is done by energizing the solenoid (3), whereby the solenoid plunger acts on the control spool (2) via the operating pin (4), thus clearing the corresponding flow ways and establishing respective links between the ports P1, A, B and P2.

When the solenoid (3) is de-energized, the control spool (2) is returned to its neutral position by the return spring (5), thus establishing again the links between ports P1, C, D and P2.

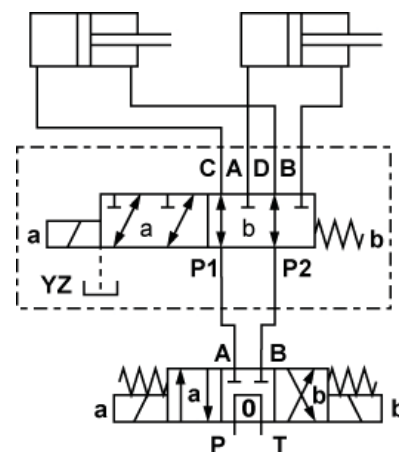
The change-over can also be done manually by pressing the emergency manual override (6).



Hydraulic symbol



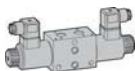
Mounting example



Mechanically operated

Hydraulically operated

Electrically operated

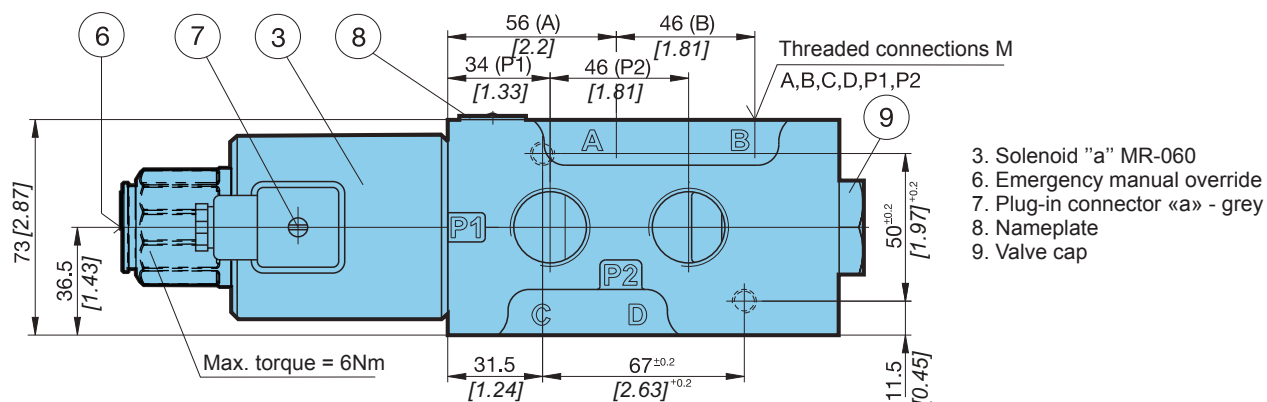
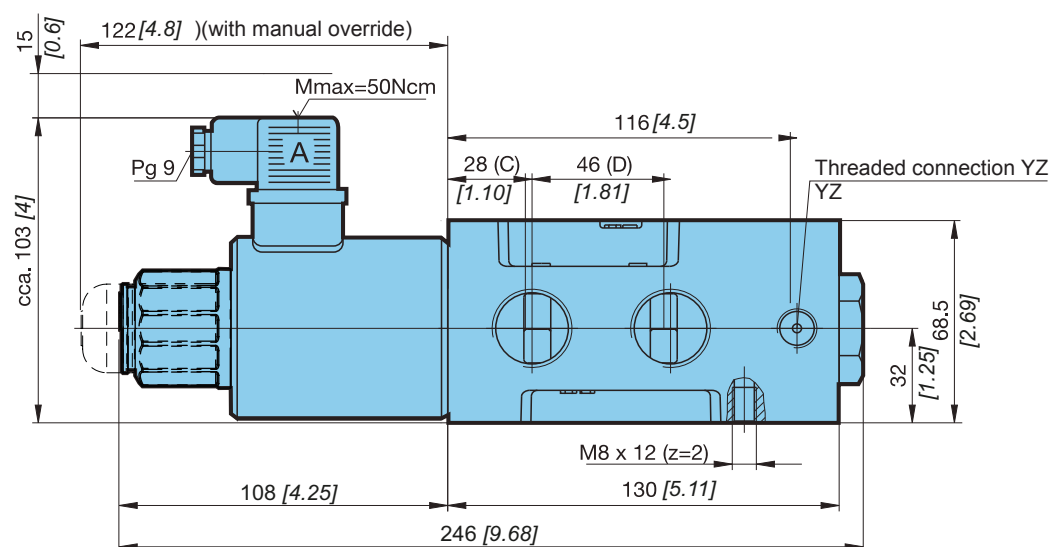


Features

Hydraulic		
Size		10
Flow rate	L/min [GPM]	120 [31.7]
Operating pressure	With YZ	350 [5 076]
	Without YZ	250 [3 625]
Oil temperature range	°C [°F]	-20 to+70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [3.24 to 82]
Mounting position		Optional
Mass	kg [lb]	5,5 [12.12]
Filtration	NAS 1638	8

Electrica		
Supply voltage	V	12, 24 DC
Power	W	45
Switching frequency	1/h	15000
Ambient temperature	°C [°F]	to+50 [to +122]
Coil temperature	°C [°F]	to+180 [to +356]
Duty cycle		Continuous

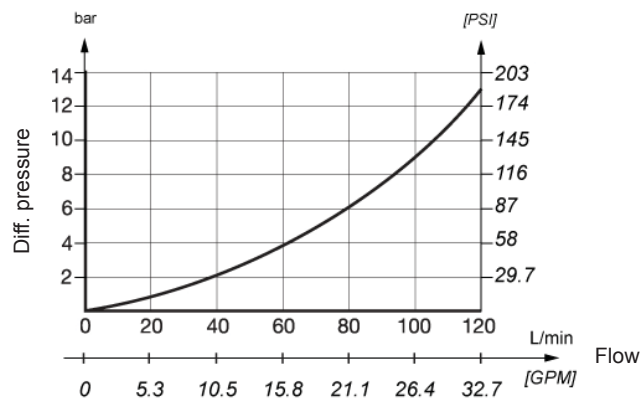
Dimensions





ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

K V - **6** / **2** - **10** - **□** - **□** - **□** - **□** - **□** - **□** - **□** - *****

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

Direct voltage 24V	No designation
Direct voltage 12V	12 DC

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
EN 175301-803 without connector	K
AMP Junior timer without connector	M
Deutsch	V

Overvoltage

Without overvoltage protection	No designation
With overvoltage protection	T

Threaded connections M ; YZ

M22x1,5; M14x1,5	M22
M27x2; M14x1,5	M27
G1/2; G1/4	1/2
G3/4; G1/4	3/4
7/8-14 UNF-2B; 9/16-18 UNF-2B	SAE 10

Drainage

Without YZ	No designation
With YZ	YZ

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

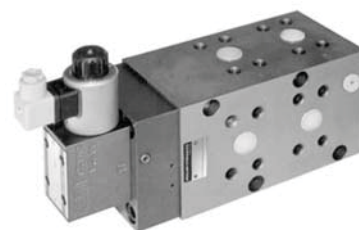
Electrically operated





6/2 WAY DIRECTIONAL VALVES KV

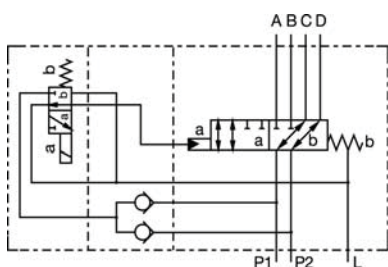
- NG 16
- Up to 350 bar [5 076 PSI]
- Up to 250 L/min [66.04 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Flange ports to ISO 6162-2.
- Fulfil EMC (89 / 336 / EEC).
- Protection of solenoid IP 65 to EN 60529 / IEC 60529.



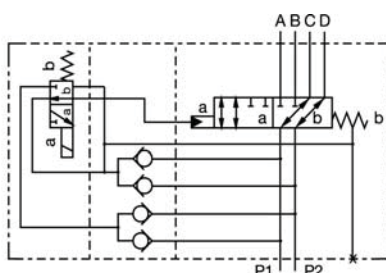
KV-6/2-16-XN

Hydraulic symbol

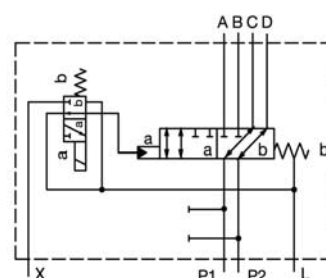
KV-6/2-16-...-XN



KV-6/2-16-...-N



KV-6/2-16-...-Z



Features

Hydraulic

Size		16
Flow rate	L/min [GPM]	250 [66]
Operating pressure	bar [PSI]	15 to 350 [217.56 to 5076.32]
(in port L or in return way)	bar [PSI]	250 [3625.94]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Viscosity range	mm ² /s [SUS]	15 to 380 [3.24 to 82]
Mounting position		Optional
Mass	kg [lb]	22 [48.50]
Filtration	NAS 1638	8

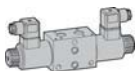
Electrical

Supply voltage	V	12, 24 DC
Power	W	29
(12 V DC supply voltage)		36
Switching frequency	1/h	15 000
Ambiant temperature	°C [°F]	to +50 [to +122]
Coil temperature	°C [°F]	to +180 [to +356]
Duty cycle		Continuous

Mechanically operated

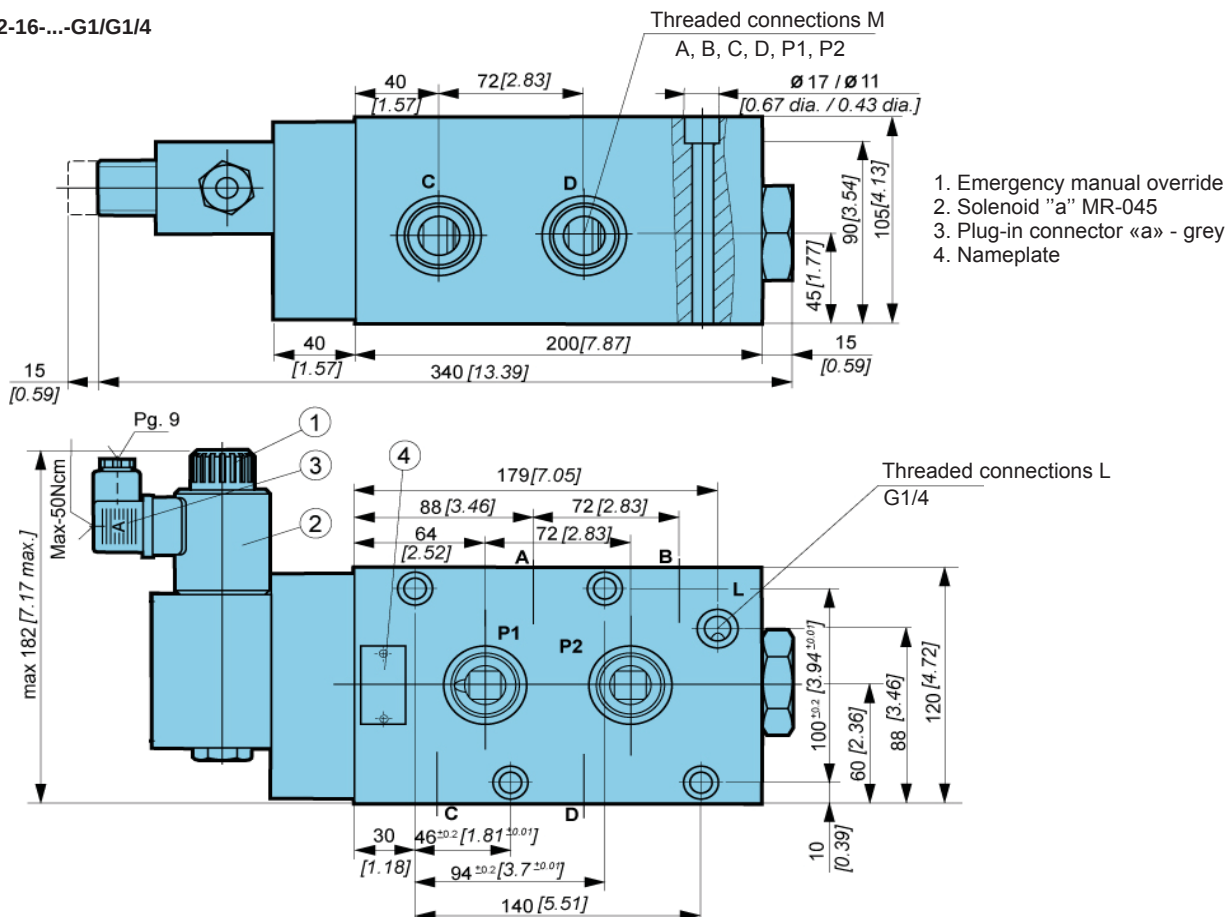
Hydraulically operated

Electrically operated



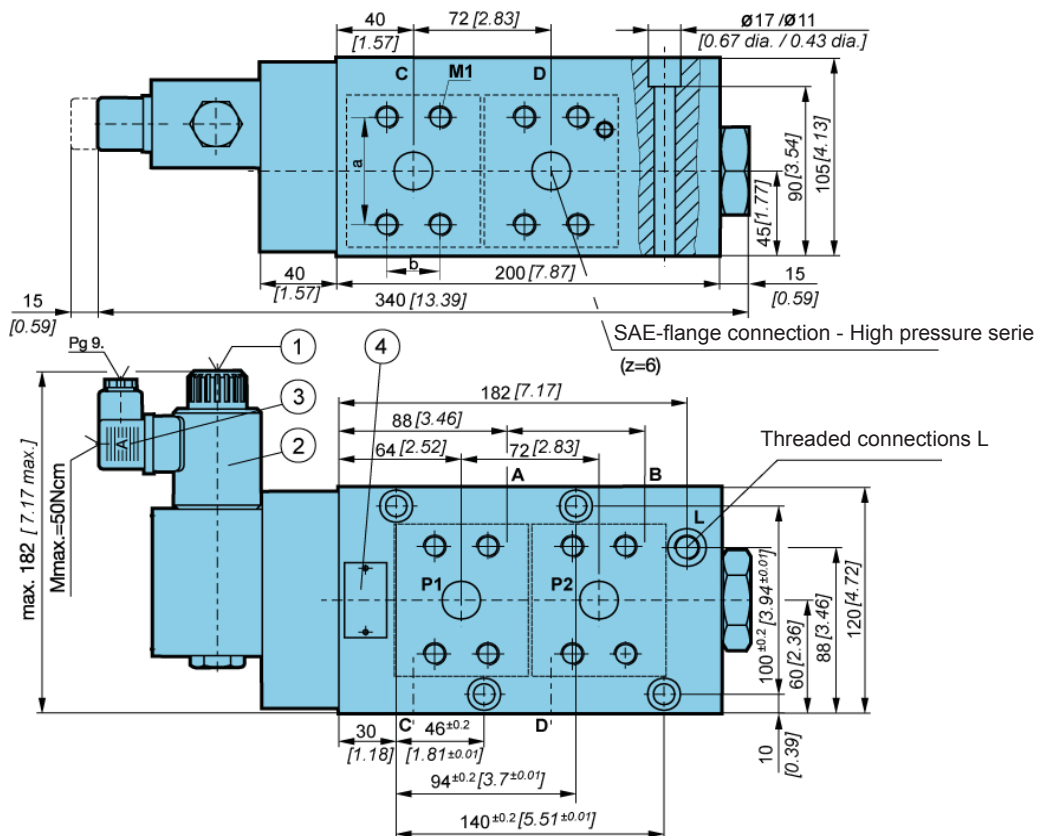
Dimensions

KV-6/2-16-...-G1/4



KV-6/2-16-...-SAE...

	Size	
	SAE 3/4	SAE 1
a	50.8 [2]	57.2 [2.25]
b	23.8 [0.94]	27.8 [1.09]
M1	M10	M12

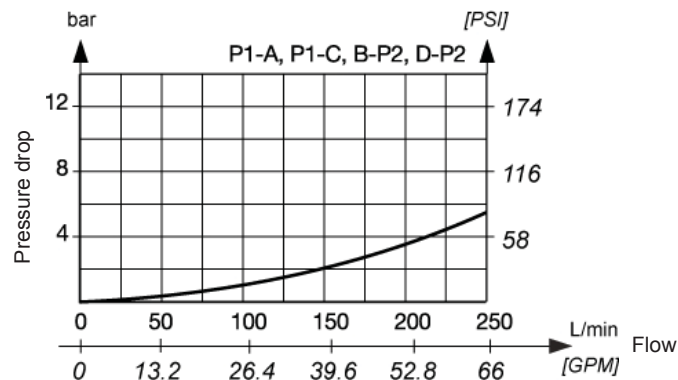


1. Emergency manual override
2. Solenoid "a" MR-045
3. Plug-in connector «a» - grey
4. Nameplate



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

K V - **6** / **2** - **16** - **□** - **□** - **□** - **□** - **□** - **□** - **□** - *****

Pilot oil supply and discharge

Internal x, y	N
Internal, external y (port L)	XN
external, external	Z

Connections

G1 ; G1/4	G1/G1/4
1 5/16-12 UNF-2B ; 9/16-18 UNF-2B	SAE 16
SAE-Flange connections 3/4 - high pressure series	SAE3/4
SAE-Flange connections 1 - high pressure series	SAE1

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

supply voltage

direct voltage 24 V	No designation
direct voltage 12 V	12 DC

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
G1/2 (YZ=G1/4) without connector	K
AMP junior timer without connector	M
Deutsch	V

Overvoltage protection

without overvoltage protection	No designation
with overvoltage protection	T

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

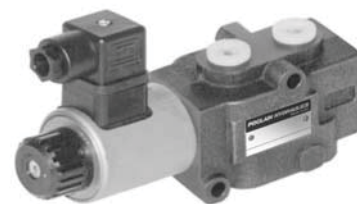
Electrically operated





6/2 WAY DIRECTIONAL VALVES KV-6K

- NG 6
- Up to 250 bar [3 625 PSI]
- Up to 50 L/min [13.2 GPM]
- Direct in-line mounting.
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP65 to EN 60529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-6K/2-6

Operation

Directional valves type KV-6K/2-6 with direct solenoid operation control the direction of the hydraulic medium flow.

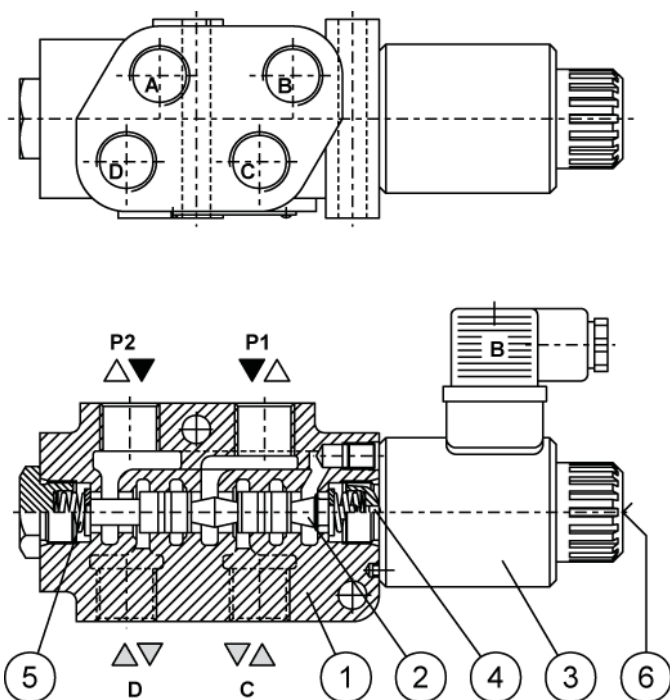
They are mostly used as link between two consumers and the basic directional valve, when we want to control both consumers alternately by means of one basic directional valve.

The KV-6K/2-6 type directional valves consist of a housing (1), a control spool (2), and a solenoid (3) with return spring (5).

Change-over to the operating position is done by energizing the solenoid (3), whereby the solenoid plunger acts on the control spool (2) via the operating pin (4), thus clearing the corresponding flow ways and establishing respective links between the ports P1, A,B and P2.

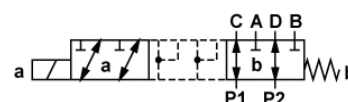
When the solenoid (3) is de-energized, the control spool (2) is returned to its neutral position by the return spring (5), thus establishing again the links between ports P1, C,D and P2.

The change-over can also be done manually by pressing the emergency manual override (6).

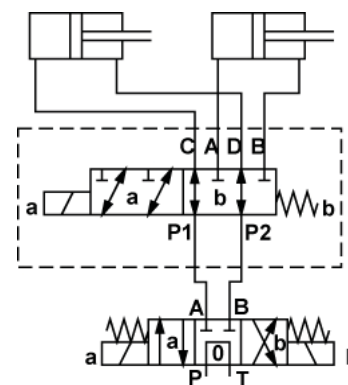


Hydraulic symbol

Spool type



Mounting example



Mechanically operated

Hydraulically operated

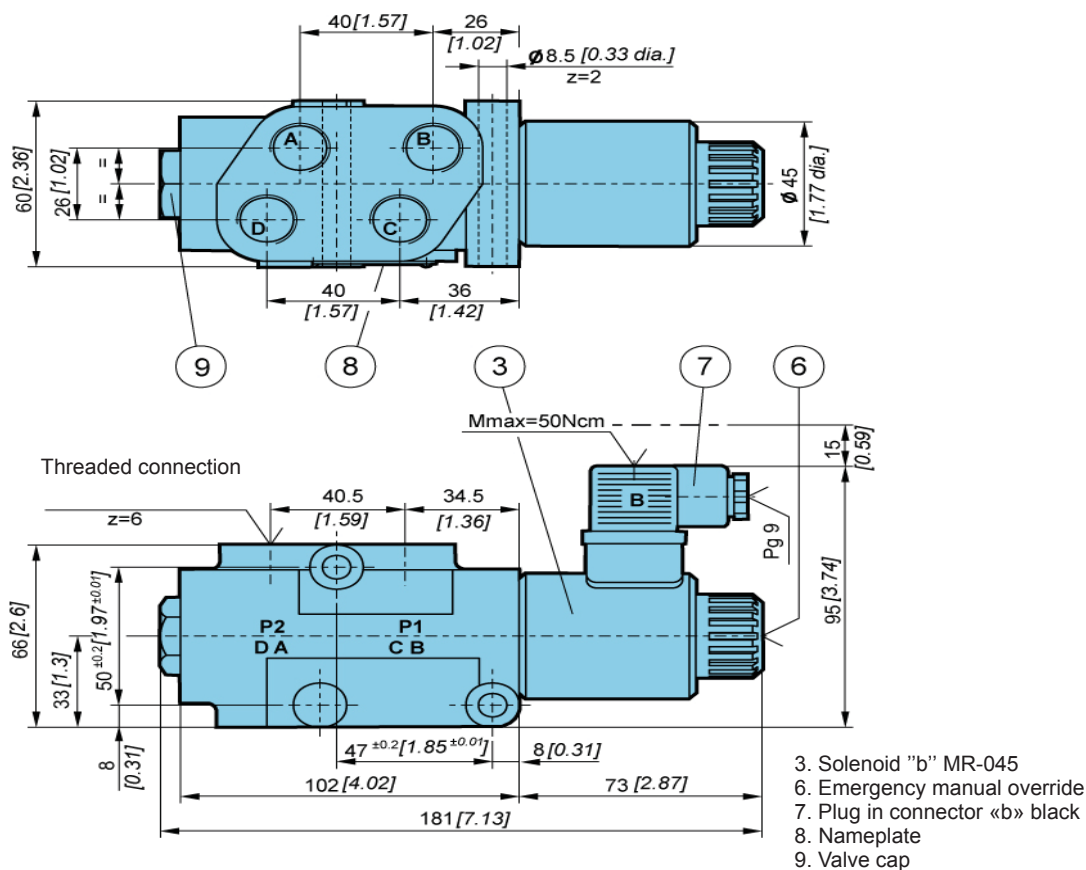
Electrically operated



Hydraulic		
Size	6	
Flow rate	L/min [GPM]	50 [13.2]
Operating pressure	bar [PSI]	250 [3 625]
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [3,24 to 82]
Mounting position	Optional	
Mass	kg [lb]	2,5 [5.51]
Filtration	NAS 1638	8

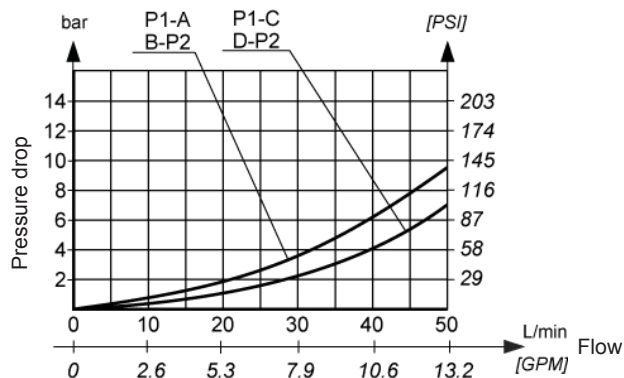
Electrical		
Supply voltage	V	12, 24 DC
Power	W	29
(12 V DC supply voltage)	W	36
Switching frequency	1/h	15000
Ambient temperature	°C [°F]	to +50 [to +122]
Coil temperature	°C [°F]	to +180 [to +356]
Duty cycle		Continuous

Dimensions



**ΔP-Q Performance curves**

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].

**Model code**

K V - **6 K** / **2** - **6** - **□** - **□** - **□** - **□** - **□** - *****

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

Direct voltage 24V	No designation
VDirect voltage 12V	12 DC

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
EN 175301-803 without connector	K
AMP Junior timer without connector	M
Deutsch	V

Overvoltage

Without overvoltage protection	No designation
With overvoltage protection	T

Threaded connections

M18x1,5	No designation
G 3/8	3/8
9/16-18 UNF-2B	SAE 6

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

Electrically operated





6/2 WAY DIRECTIONAL VALVES KVH

- NG 6
- Up to 315 bar [4 568 PSI]
- Up to 50 L/min [13.2 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP65 to EN 50529 / IEC 60529.
- Fulfil EMC (89/336/EEC).
- For stacking (1-5 units).



KVH-6/2-6-S50-N3

Operation

Directional valves type KVH with direct solenoid operation control the direction of the hydraulic medium flow.

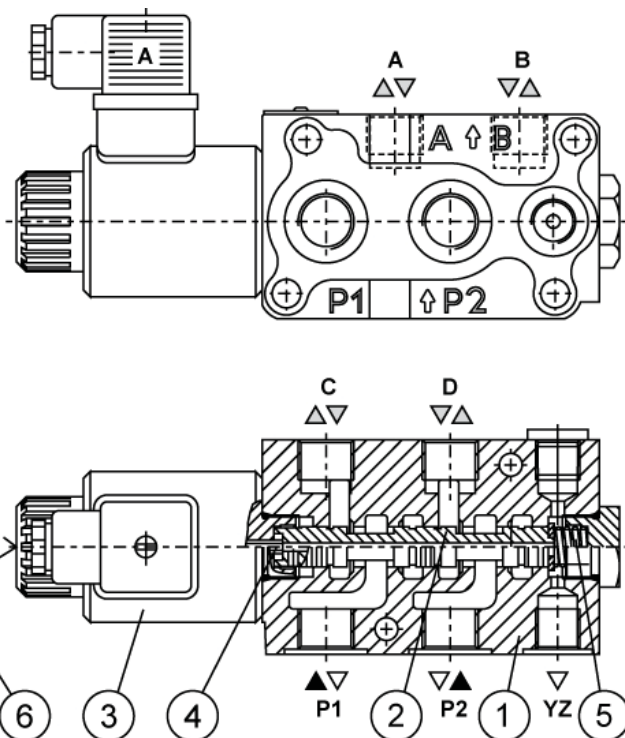
They are mostly used as link between two consumers and the basic directional valve, when we want to control both consumers alternately by means of one basic directional valve.

The KVH type directional valves consist of a housing (1), a control spool (2), and a solenoid (3) with return spring (5).

Change-over to the operating position is done by energizing the solenoid (3), whereby the solenoid plunger acts on the control spool (2) via the operating pin (4), thus clearing the corresponding flow ways and establishing respective links between the ports P1, A, B and P2.

When the solenoid (3) is de-energized, the control spool (2) is returned to its neutral position by the return spring (5), thus establishing again the links between ports P1, C, D and P2.

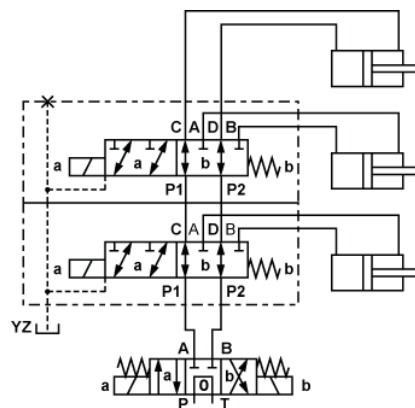
The change-over can also be done manually by pressing the emergency manual override (6).



Hydraulic symbol



Mounting example



Mechanically operated

Hydraulically operated

Electrically operated



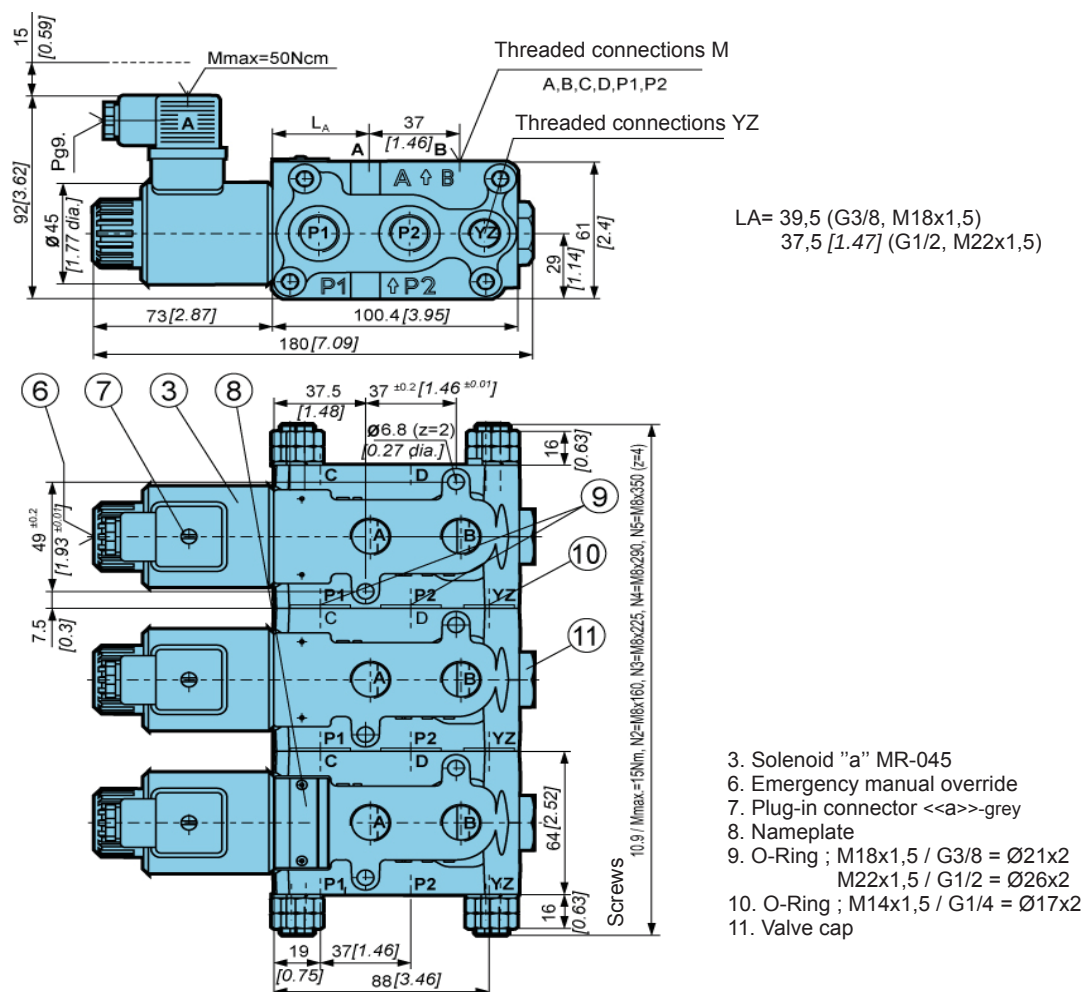
Features

Hydraulic		
Size		6
Flow rate	L/min [GPM]	50 [13.21]
Operating pressure	With YZ	315 [4 568]
	Without YZ	250 [551]
Oil temperature range	°C [°F]	-20 to +70 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [3.24 to 82]
Mounting position		Optional
Mass	kg [lb]	2,7 [5.95] (N1)
Filtration	NAS 1638	8

Electrical

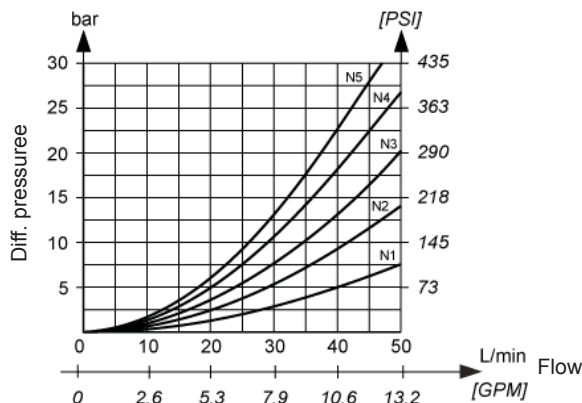
Supply voltage	V	12, 24 DC
Power	W	29
		(12 V DC supply voltage) 36
Switching frequency	1/h	15 000
Ambient temperature	°C [°F]	to +50 [to+122]
Coil temperature	°C [°F]	to +180 [to +356]
Duty cycle		Continuous

Dimensions



**ΔP-Q Performance curves**

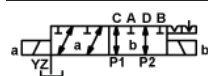
.Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].]

**Model code**

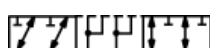
K V H - **6** / **2** - **6** - **□** - **□** - **□** - **□** - **□** - **□** - **□** - **□** - **S 5 0** - **□** - **□** - *****

symbol

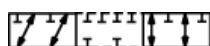
No designation



AB

Overlap

No designation



P

Manual override option

Emergency manual override

No designation

Manual override with rubber cover

G

Lockable manual override

C

Supply voltage

Direct voltage 24V

No designation

Direct voltage 12V

12 DC

Connector type

EN 175301-803 without signal lamp

No designation

EN 175301-803 with signal lamp

L

EN 175301-803 without connector

K

AMP Junior timer without connector

M

Deutsch

V

Overvoltage protection

Without overvoltage protection

No designation

With overvoltage protection

T

Special requirements to be briefly specified

Number of units

N1	One
N2	Two
N3	Three
N4	Four
N5	Five

Seal type

No designation	NBR seals for mineral oil HL, HLP to DIN 51524
E	FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

Drainage

No designation	Without YZ
YZ	With YZ

Threaded connections M ; YZ

No designation	M18x1,5; M14x1,5
M22	M22x1,5; M14x1,5
3/8	G3/8; G1/4
1/2	G1/2; G1/4
SAE 8	3/4-16 UNF-2b; 9/16-18 UNF-2B

Mechanically operated

Hydraulically operated

Electrically operated



6/2 WAY DIRECTIONAL VALVE KVH

- NG 8
- Up to 350 bar [5 076 PSI]
- Up to 90 L/min [23.8 GPM]
- Threaded connections to ISO 9947 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF)
- Fulfil EMC (89/336/EEC)
- Plug-in connector for solenoids to ISO 4400/AMP/Deutch
- With internal or external drain release
- For single use or series assembly of 2 to 6 sections



KVH-6/2-8

Operation

Directional valves type KVH with direct solenoid operation control the direction of the hydraulic medium flow. They are mostly used as circuit selector valve between two (or more) consumers when we want to control two (or more) consumers by means of one basic directional control valve.

A valve basically consists of a housing (1), a control spool (2), a solenoid (3) and a return spring (5).

Change-over to the operating position is done by energizing the solenoid (3), whereby the solenoid plunger acts on the control spool (2) via operating pin (4), thus clearing the corresponding flow ways and establishing respective links between the ports P1-A and P2-B.

When the solenoid (3) is de-energized, the control spool (2) is returned to its neutral position by the return spring (5), thus establishing again the links between ports P1-C and P2-D.

The change-over can also be done manually by pressing the pin for emergency manual override on the solenoid core (6).

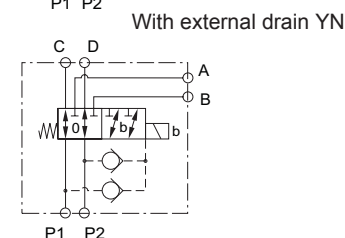
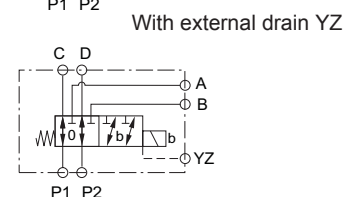
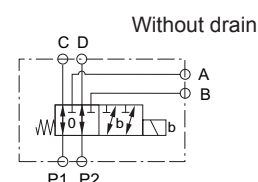
Solenoid coil is fastened to the core by retaining nut (7).

Position of the coil is pre-defined by a pin on the coil (8) and fixation hole on the valve housing.

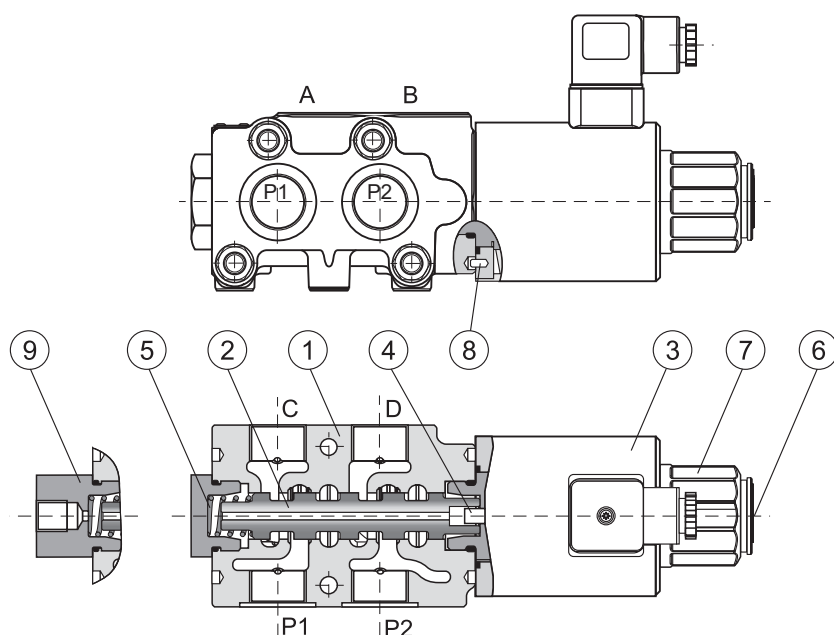
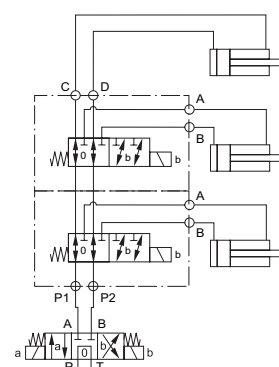
Wet pin tube of the solenoid core is loaded by working pressure.

When the valve is used at pressure over 250 bar the pressure in the tube must be released by external drain port (9) to tank (option YZ), or internally over the check valves to the lower pressure port - alternatively P1/P2 (option YN).

Hydraulic symbols



Mounting example





Features

Hydraulic

Size	8		
Flow rate		L/min [GPM]	90 [24]
Operating pressure	with YN or YZ	bar [PSI]	350 [5 076]
	without drain release	bar [PSI]	250 [3 625]
Viscosity range		mm ² /s [SUS]	15 to 380 [69.5 to 1 760]
Oil temperature range		°C [°F]	-20 to +70 [-4 to +158]
Filtration		ISO 4406:1999	19/17/14
Mass		kg [lb]	3,8 [7.71]
Mounting position	Optional		

Electrical

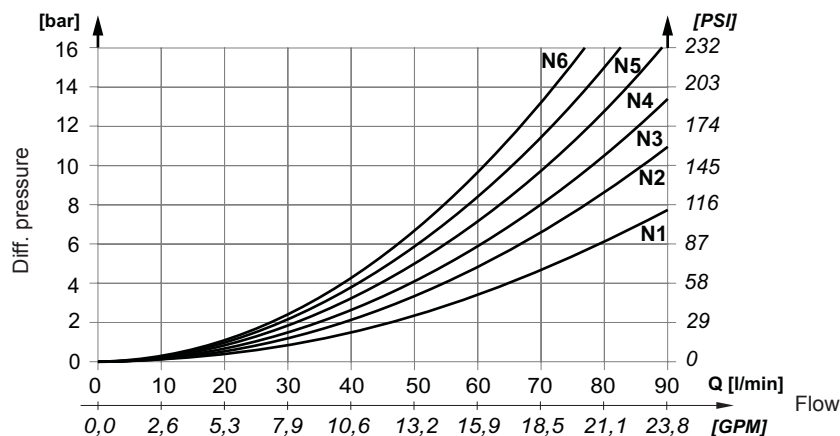
Supply voltage	V	12 DC, 24 DC
Max. allowable voltage variation		+/- 10 %
Power	W	45
Ambient temperature	°C [°F]	to 50 [122]
Coil temperature	°C [°F]	to 180 [356]
Duty cycle	Continuous	

Protection class to EN 50529 / IEC 60529

- Connector ISO 4400
- Connector AMP
- Connector Deutsch

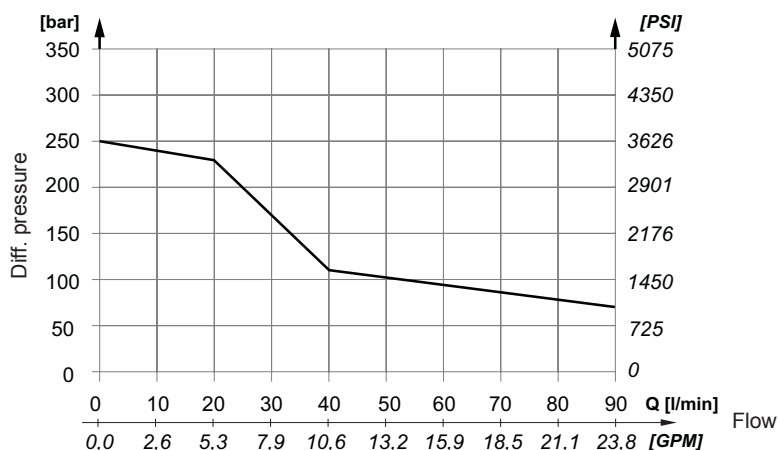
- IP65
- IP65
- IP69K

ΔP-Q Performance curves



Pressure drop curves for flow in one direction, measured on the valves with ports M22x1,5 and spool with negative overlapping.

P-Q Operating limits



Change-over of the spool is assured in the p-Q range below the operating limit curve. However, stability of the spool in position "0" or "b" is assured in the whole p-Q range up to 350 bar and up to 90 l/min [23.8 GPM].

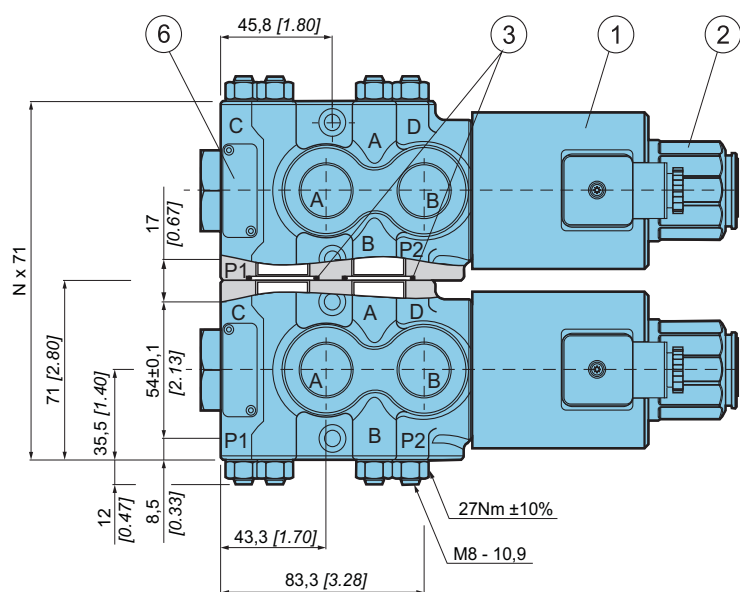
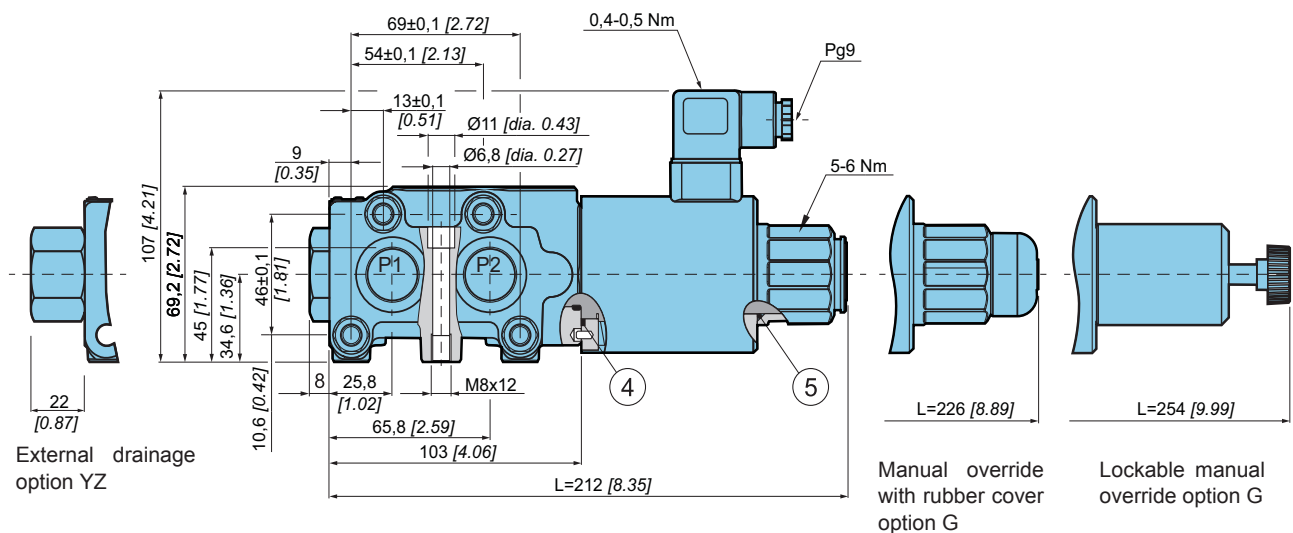
Mechanically operated

Hydraulically operated

Electrically operated



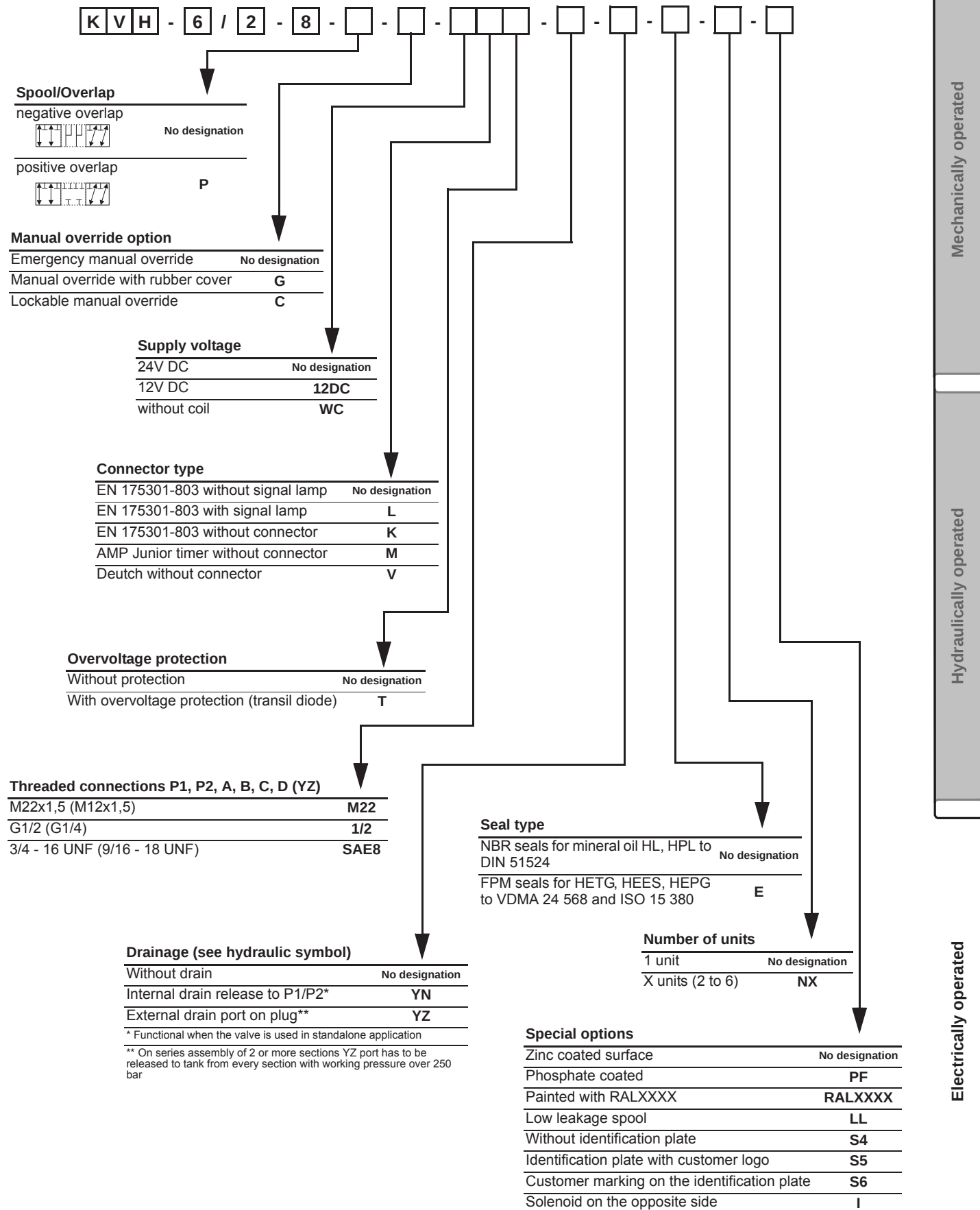
Dimensions



1. Solenoid coil - MR-060-O...
2. Retaining nut - MR-060-M...
3. O-ring FI 26x2
4. O-ring FI 35x2
5. O-ring FI 31x2
6. Nameplate



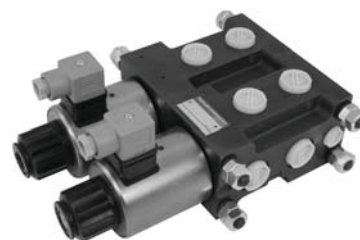
Model code





6/2 WAY DIRECTIONAL VALVES KVH

- NG 10
- Up to 315 bar [4 568 PSI]
- Up to 120 L/min [31.70 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP 65 to EN 50529 / IEC 60529.



KVH-6/2-10-N2

Operation

Directional valves type KVH with direct solenoid operation control the direction of the hydraulic medium flow. They are mostly used as link between two consumers and the basic directional valve, when we want to control both consumers alternately by means of one basic directional valve.

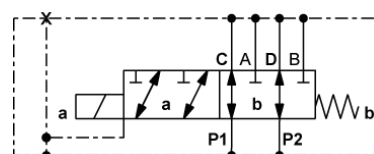
The KVH type directional valves consist of a housing (1), a control spool (2), and a solenoid (3) with return spring (5).

Change-over to the operating position is done by energizing the solenoid (3), whereby the solenoid plunger acts on the control spool (2) via the operating pin (4), thus clearing the corresponding flow ways and establishing respective links between the ports P1, A, B and P2.

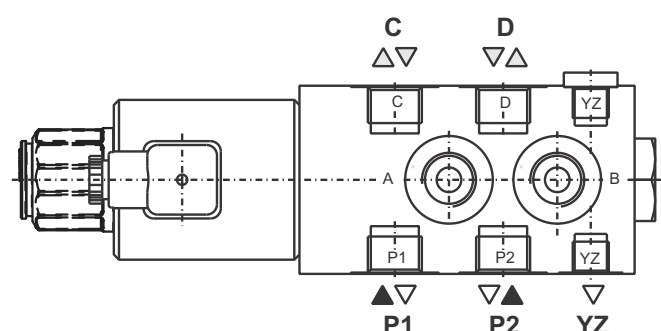
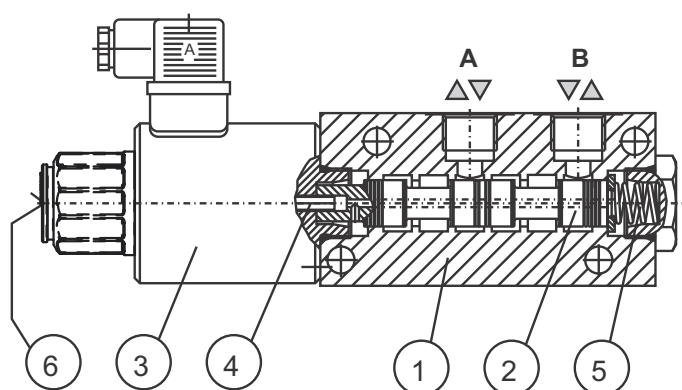
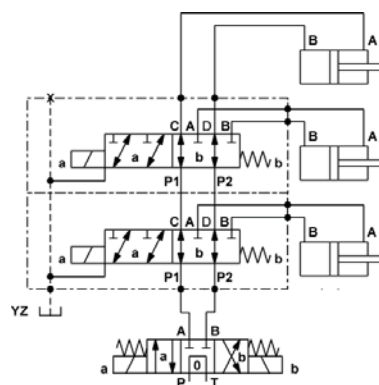
When the solenoid (3) is de-energized, the control spool (2) is returned to its neutral position by the return spring (5), thus establishing again the links between ports P1, C, D and P2.

The change-over can also be done manually by pressing the emergency manual override (6).

Hydraulic symbol



Mounting example

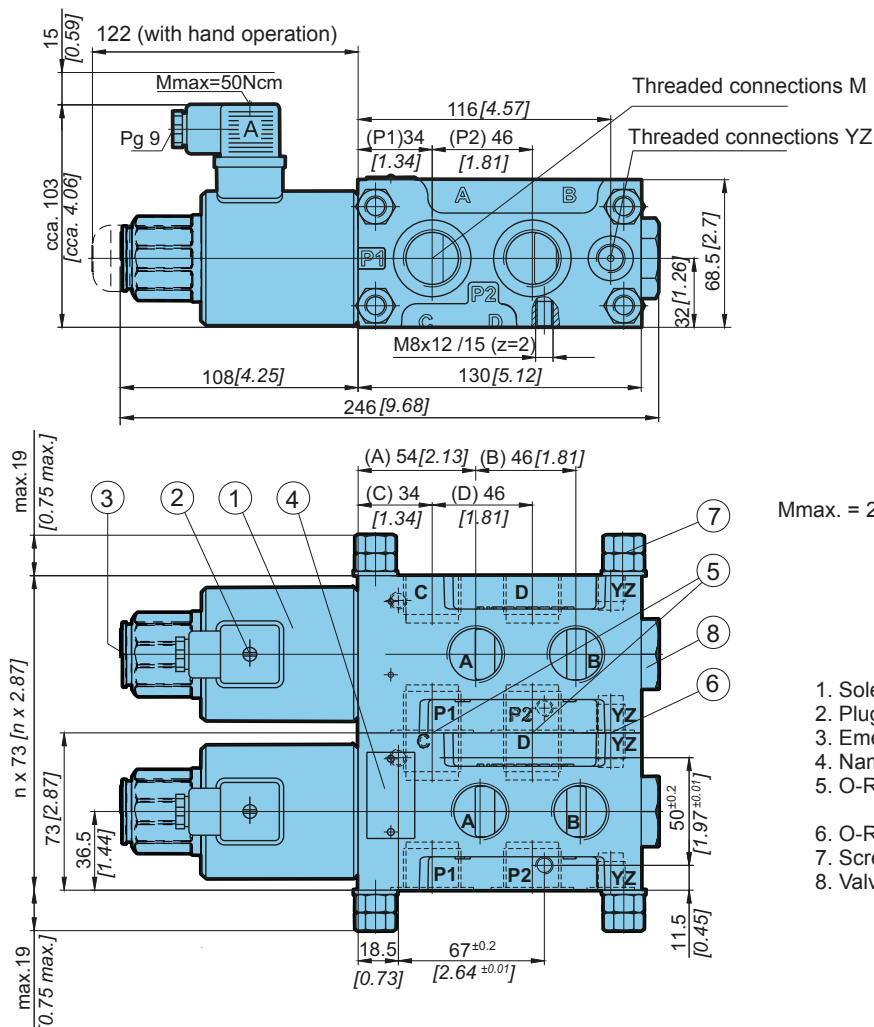




Features

Hydraulic			
Size			10
Flow rate		L/min [GPM]	120 [31.70]
Operating pressure	With YZ	bar [PSI]	315 [4 568]
	Without YZ		250 [551]
Oil temperature range		°C [°F]	-20 to +70 [-4 to +158]
Viscosity range		mm ² /s [SUS]	15 to 380 [3.24 to 82]
Mounting position			Optional
Mass		kg [lb]	5,5 [12.12]
Filtration		NAS 1638	8
Electrical			
Supply voltage		V	12, 24 DC
Power		W	45
Switching frequency		1/h	15 000
Ambient temperature		°C [°F]	to +50 [to +122]
Coil temperature		°C [°F]	to +180 [to +356]
Duty cycle			Continuous

Dimensions



Mmax. = 20Nm

1. Solenoid "a" MR-060
2. Plug-in connector «a» - grey
3. Emergency manual override
4. Nameplate
5. O-Ring ; 26x2 = KVH-6/2-10-G1/2 (M22)
31x2 = KVH-6/2-10-G3/4 (M27)
6. O-Ring 17x2
7. Screws M10 - 10.9 (z=4)
8. Valve cap

Mechanically operated

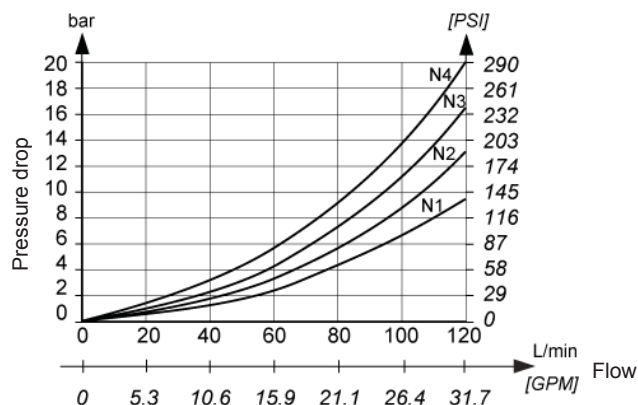
Hydraulically operated

Electrically operated



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

K V H - **6** / **2** - **10** - **□** - **□** - **□** - **□** - **S 4 0** - **□** - **□** - *****

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

Direct voltage 24V	No designation
Direct voltage 12V	12 DC

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
175301-803 without connector	K
AMP Junior timer without connector	M
Deutsch	V

Overvoltage protection

Without overvoltage protection	No designation
With overvoltage protection	T

Threaded connections M; YZ

M22x1,5; M14x1,5	M22
M27x2; M14x1,5	M27
G1/2; G1/4	G1/2
G3/4; G1/4	G3/4
7/8-14 UNF-2B; 9/16-18 UNF-2B	SAE 10

Drainage

Without YZ	No designation
With YZ	YZ

Seal type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Number of units

N1	One
N2	Two
N3	Three
N4	Four
N5	Five



Mechanically operated

Hydraulically operated

Electrically operated



7/2 WAY DIRECTIONAL VALVE KV-7/2-6

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 50 L/min [13.2 GPM]
- Threaded connections to ISO 1179-1-N (BSPP/Gas) / ISO 9974 (metric) / ISO 11926 (SAE)
- Protection of solenoid:
IP 65 to EN 60529 / IEC 60529 - ISO and AMP Junior timer connector
IP 69 to EN 60529 / IEC 60529 - Deutsch connector
- Fulfill EMC (89/336/EEC)
- Zinc coated



KV-7/2-6

Operation

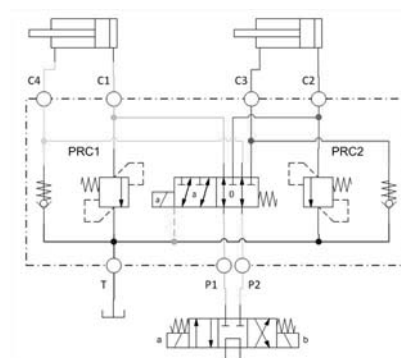
Valves KV-7/2-6 are used as diverter between two hydraulic cylinders which are not operated simultaneously. Two hydraulic cylinders can be controlled by one directional control valve.

Integrated pressure relief valves prevent hydraulic system against pressure peaks on working ports C1 and C2.

The valve is ideal solution for all applications where pressure peaks appear because of mechanical shocks acting on hydraulic cylinder(s).

The oil from pressure relief valves can be released over T port to tank or to accumulator assembled on T port.

Hydraulic symbol



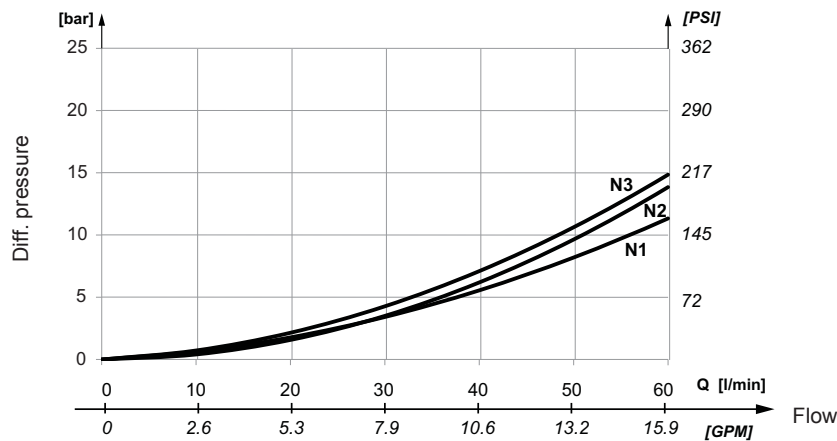
Features

Hydraulic

Size		6
Flow rate		L/min [GPM] 50 [13.2]
Operating pressure	Ports P1, P2, C1, C2, C3, C4	bar [PSI] 350 [5 076]
	port T	bar [PSI] 250 [3 626]
Oil temperature range		°C [°F] -20 to +70 [-4 to 158]
Viscosity range		mm ² /s [SUS] 15 to 380 [75 to 1 760]
Fluid contamination		ISO 4406:1999 19/17/14
Mass		kg [lb] 3,6 [7.94]

Electrical

Supply voltage	V	12 DC, 24 DC, 48 DC
Power	W	31
Coil temperature	°C [°F]	to 180 [to 356]
Duty cycle	Continuous	

**Δ P- Q performance curves**Measured at 50 °C [122 °F] and viscosity 32 mm²/s [148 SUS]

N1: P1-C2 and P2-C4

N2: P1-C2

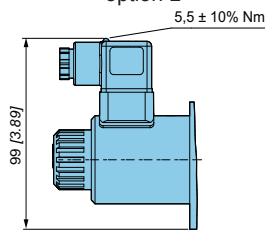
N3: P2-C3

p/Q operating limitsMeasured at 50 °C [122 °F] and viscosity 32 mm²/s [148 SUS]

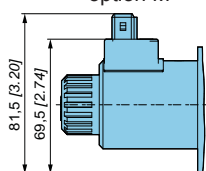
Valve operates stable for all flow directions - spool position 0, a and b at flow up to 100 l/min [26.4 GPM] and pressure up to 350 bar [5 076 PSI].

Dimensions

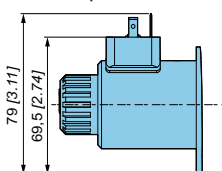
Connector EN 175301-803
(with signal lamp) -
option L



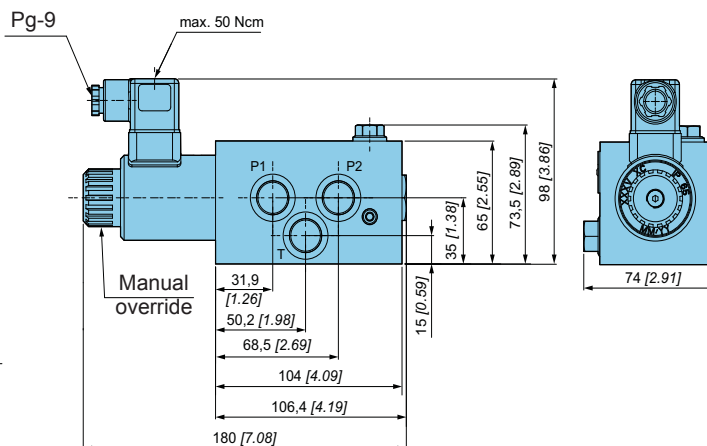
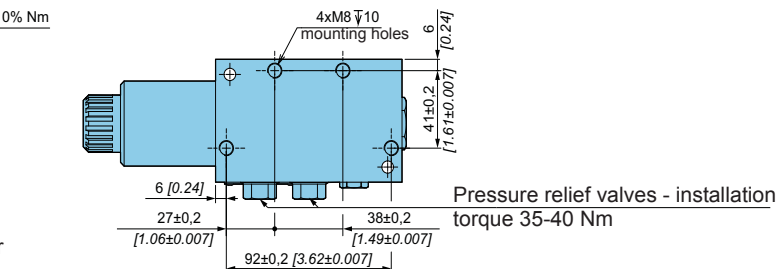
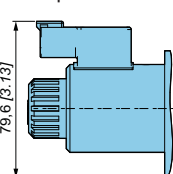
Terminal AMP Junior
timer -
option M



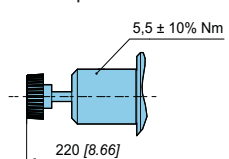
Without connector -
option K



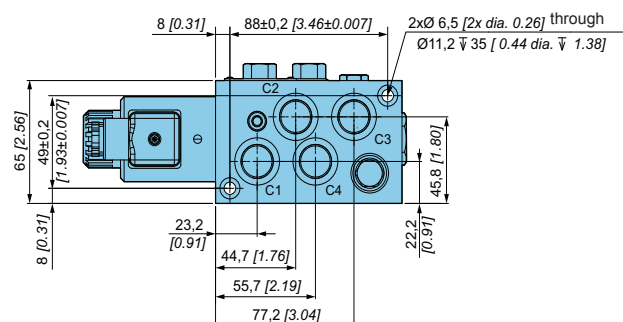
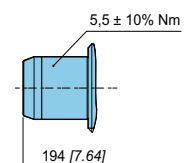
Terminal Deutsch -
option V



Lockable
manual override
- option C



Manual override
with rubber
cover - option G

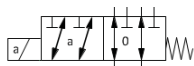




Model code

K **V** - **7** / **2** - **6** - **2** - [] [] [] [] [] [] [] -

Spool type



2

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

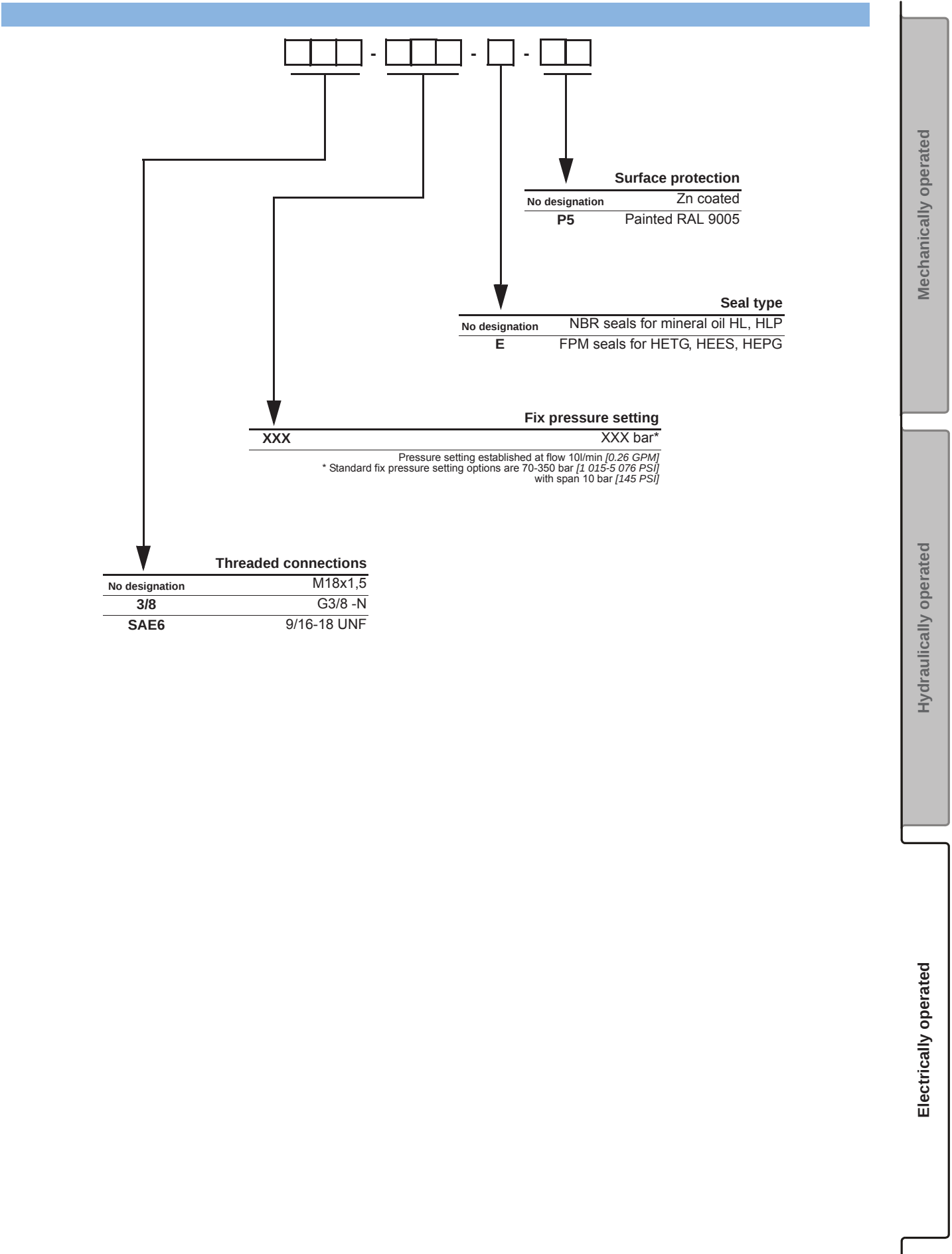
12V DC	12DC
24V DC	24DC
48V DC	48DC

Terminal/connector type

Connector EN 175301-803	No designation
Connector EN 175301-803 with signal lamp	L
Terminal EN 175301-803 w/o connector	K
Terminal AMP Junior timer w/o connector	M
Terminal Deutsch w/o connector	V

Overvoltage protection

Without overvoltage protection	No designation
With overvoltage protection	T





7/3 WAY DIRECTIONAL VALVE KV-7/3-6

- NG 6
- Up to 350 bar [5 076 PSI]
- Up to 50 L/min [13.2 GPM]
- Threaded connections to ISO 1179-1-N (BSPP/Gas) / ISO 9974 (metric) / ISO 11926 (SAE)
- Protection of solenoid:
 - IP 65 to EN 60529 / IEC 60529 - ISO and AMP Junior timer connector
 - IP 69 to EN 60529 / IEC 60529 - Deutsch connector
- Fulfill EMC (89/336/EEC)
- Zinc coated surface



KV-7/3-6-1

Operation

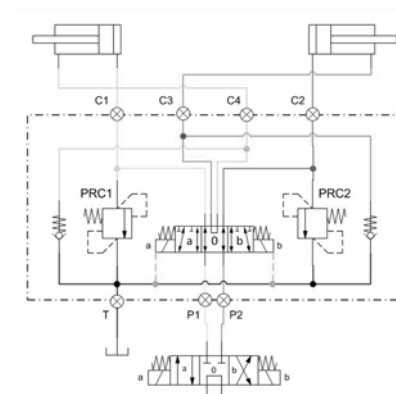
The valve has been designed especially for use on variable V-blade snow plows. Each of two blades are connected to hydraulic cylinder.

Valve KV-7/3-6 allows to switch between tilting each blade individually (spool pos. "a" and "b") or both simultaneously (spool pos. "0").

Integrated pressure relief valves prevent hydraulic system against pressure peaks on working ports C1 and C2. The oil from pressure relief valves can be released over T port to tank or to accumulator assembled on T port.

Hydraulic accumulator absorbs impact energy, and return it back to system through check valves.

Hydraulic symbol



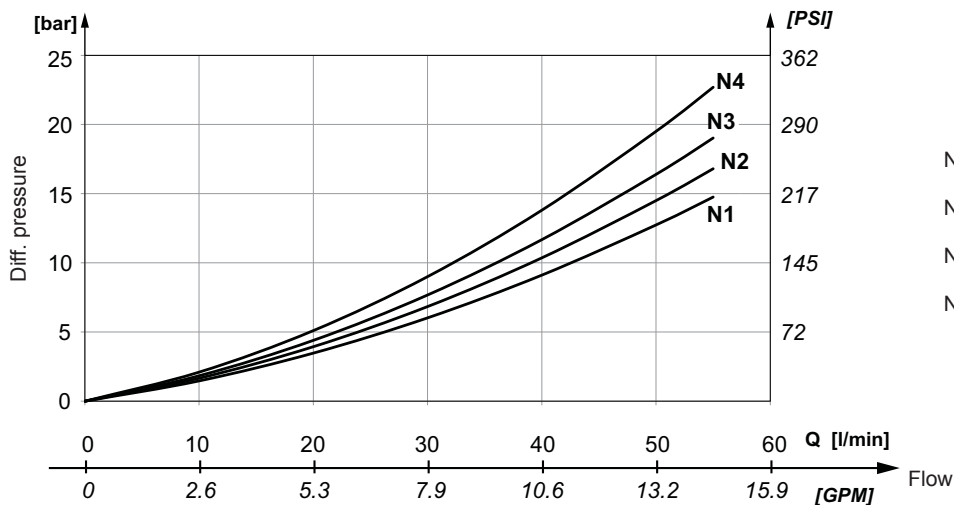
Features

Hydraulic

Size	6	
Flow rate	L/min [GPM]	50 [13.2]
Operating pressure	Ports P1, P2, C1, C2, C3, C4	bar [PSI]
	port T	bar [PSI]
Oil temperature range	°C [°F]	-20 to +70 [-4 to 158]
Viscosity range	mm ² /s [SUS]	15 to 380 [75 to 1 760]
Fluid contamination	ISO 4406:1999	19/17/14
Mass	kg [lb]	3,6 [7.94]

Electrical

Supply voltage	V	12 DC, 24 DC
Power	W	31
Coil temperature	°C [°F]	to 180 [to 356]
Duty cycle		Continuous

**ΔP- Q Performance curves**Measured at 50 °C [122 °F] and viscosity 32 mm²/s [148 SUS]

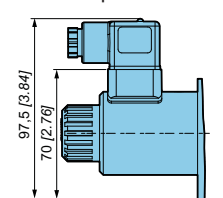
N1: P2-C2 (a)
 N2: P1-C1 (b) and P2-C2 (0)
 N3: P2-C4 (b) and P1-C1 (0)
 N4: C3-C4 (0) and P1-C3 (a)

p/Q Operating limitsMeasured at 50 °C [122 °F] and viscosity 32 mm²/s [148 SUS]

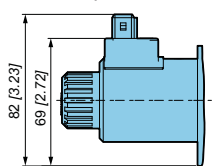
Valve operates stable for all flow directions - spool position 0, a and b at flow up to 100 l/min [26.4 GPM] and pressure up to 350 bar [5 076 PSI].

Dimensions

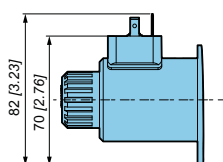
Connector EN 175301-803
 (with signal lamp) -
 option L



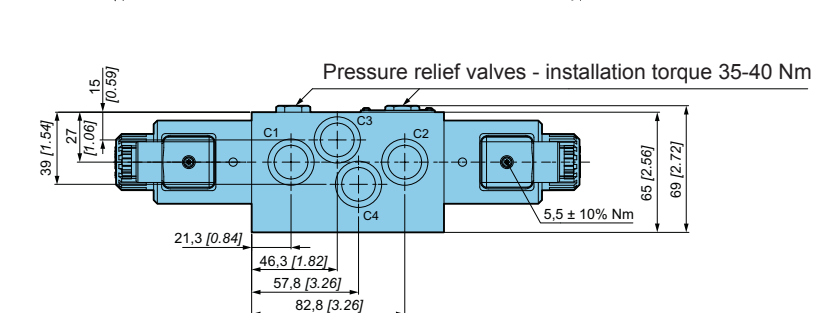
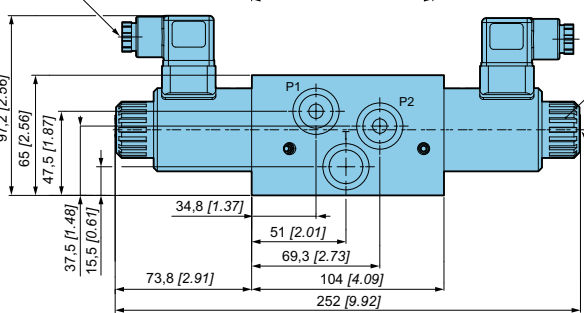
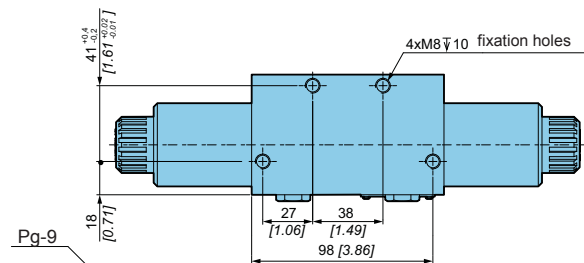
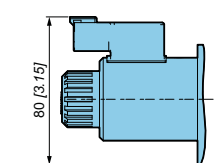
Terminal AMP Junior
 timer -
 option M



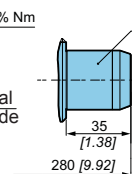
Without connector -
 option K



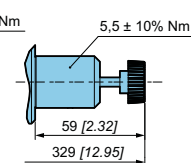
Terminal Deutsch -
 option V



Manual override
 with rubber
 cover - option G



Lockable
 manual override
 - option C



Mechanically operated

Hydraulically operated

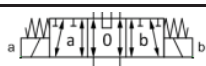
Electrically operated



Model code

K V - 7 / 3 - 6 - 1 - [] [] [] [] [] [] [] [] -

Spool type



1

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

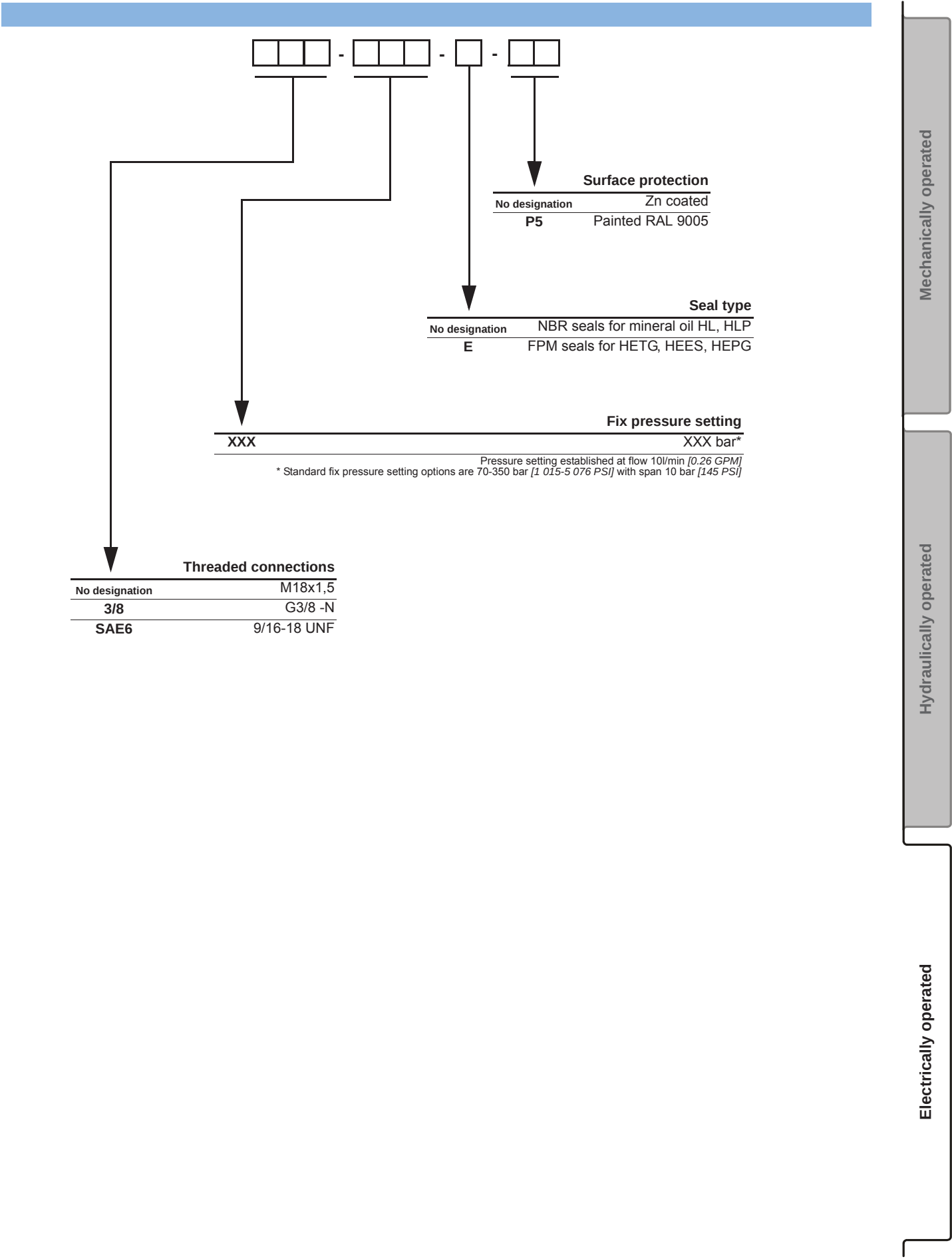
12V DC	12DC
24V DC	24DC

Terminal/connector type

Connector EN 175301-803	No designation
Connector EN 175301-803 with signal lamp	L
Terminal EN 175301-803 w/o connector	K
Terminal AMP Junior timer w/o connector	M
Terminal Deutsch w/o connector	V

Overvoltage protection

Without overvoltage protection	No designation
With overvoltage protection	T







8/3 WAY DIRECTIONAL VALVES KV

- NG 6
- Up to 250 bar [3 625 PSI]
- Up to 50 l/min [13.2 GPM]
- Plug-in connector for solenoids to ISO 4400.
- Threaded connections to ISO 9974 (Metric), ISO 1179 (BSPP/Gas), ISO 11926 (UNF).
- Protection of solenoid IP65 to EN 50529 / IEC 60529.
- Fulfil EMC (89/336/EEC).



KV-8/3-6

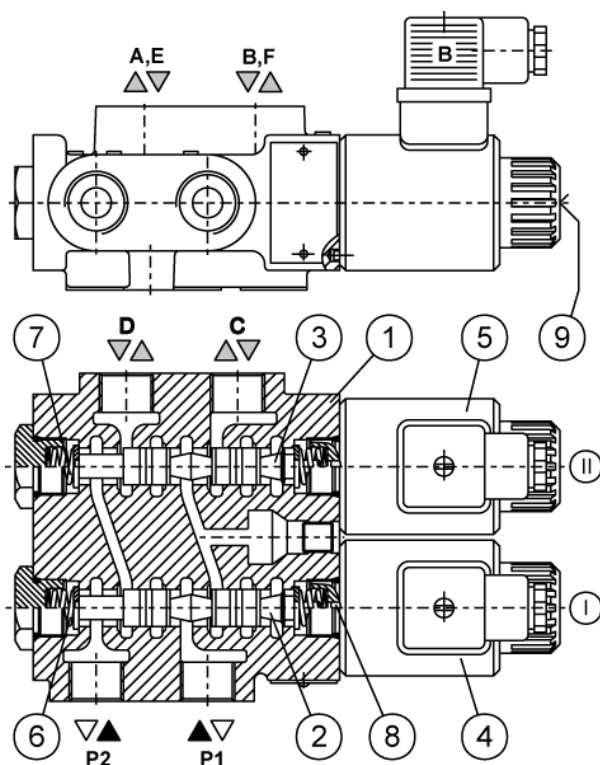
Operation

Directional valves type KV with direct solenoid operation control the direction of the hydraulic medium flow. They are mostly used as link between three consumers and the basic directional valve, when we wish to control both consumers alternately by means of one basic directional valve.

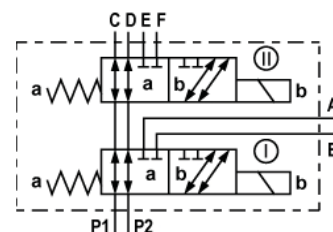
The KV type directional valves consist of a housing (1), a control spool (2,3), two solenoids (4,5) with return spring (6,7). Change-over to one of the operating positions is done by combination of operation of solenoids (4,5), whereby the solenoid plunger acts on the control spool (2,3) via the operating pin (8), thus clearing the corresponding flow ways and establishing respective links between the ports P1, A, B, C, D, E, F and P2, as seen forth in the schematic diagram of a mounting example.

When the solenoid (4,5) is de-energized, the control spool (2,3) is returned to their neutral position by the return spring (6,7).

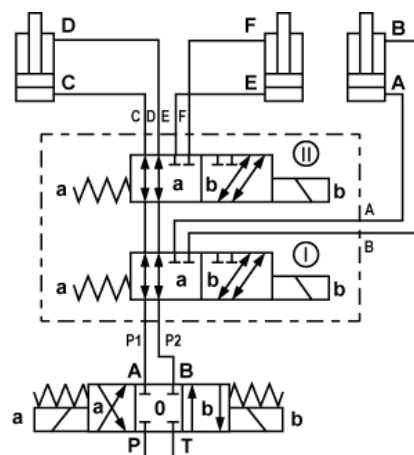
The change-over can also be done manually by pressing the emergency manual override (9).



Hydraulic symbol



Mounting example



Mechanically operated

Hydraulically operated

Electrically operated



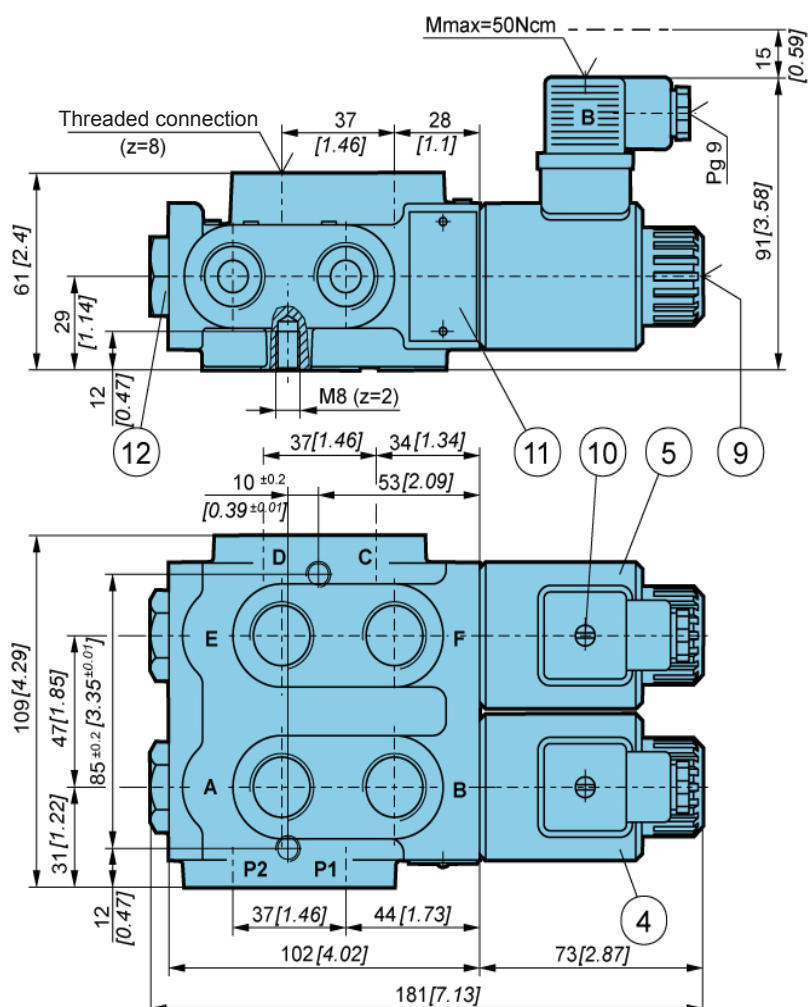
Features

Hydraulic		
Size		6
Flow rate	L/min [GPM]	50 [13.21]
Operating pressure	bar [PSI]	250 [3 625]
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]
Viscosity range	mm ² /s [SUS]	15 to 380 [3.24 to 82]
Mounting position		Optional
Mass	kg [lb]	3,8 [8.38]
Filtration	NAS 1638	8

Electrical

Supply voltage	V	12, 24 DC
Power	(12 V DC supply voltage) W	29
		36
Switching frequency	1/h	15000
Ambient temperature	°C [°F]	to +50 [to +122]
Coil temperature	°C [°F]	to +180 [to +356]
Duty cycle		Continuous

Dimensions

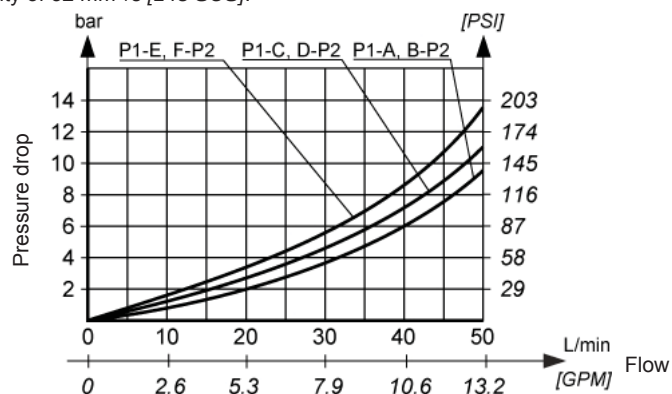


- 4.5. Solenoid "b" MR-045
- 9. Emergency manual override
- 10. Plug-in connector «b» - black
- 11. Nameplate
- 12. Valve cap



ΔP-Q Performance curves

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS].



Model code

K V - **8** / **3** - **6** - **□** - **□** - **□** - **□** - **□** - **□** - *****

Manual override option

Emergency manual override	No designation
Manual override with rubber cover	G
Lockable manual override	C

Supply voltage

Direct voltage 24V	No designation
Direct voltage 12V	12 DC

Connector type

EN 175301-803 without signal lamp	No designation
EN 175301-803 with signal lamp	L
EN 175301-803 without connector	K
AMP Junior timer without connector	M
Deutsch	V

Overvoltage

Without overvoltage protection	No designation
With overvoltage protection	T

Threaded connections

M18x1,5	No designation
M22x1,5	M22
M20x1,5	M20
G3/8	G3/8
G1/2	G1/2
3/4-16 UNF-2B	SAE 8

Seal type

NBR seals for mineral oil HL, HLP, to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

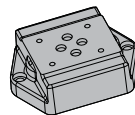
Special requirements to be briefly specified

Mechanically operated

Hydraulically operated

Electrically operated





CONNECTING COMPONENTS



SUBPLATES

Subplates (NG 6, 10, 16)

221

221

Subplates



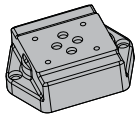
MANIFOLD BLOCKS

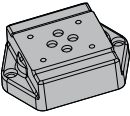
Manifold blocks BP (NG 6, 10)

223

223

Manifold blocks





SUBPLATES

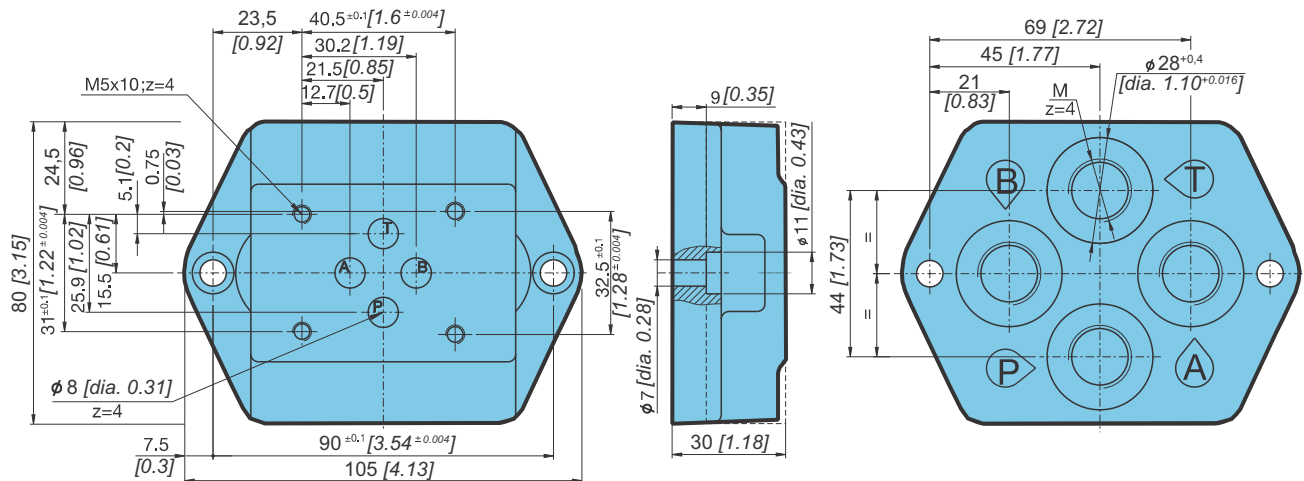
- NG 6, 10, 16
- Up to 350 bar [5076 PSI]
- Up to 300 l/min [79.3 GPM]
- Connecting dimensions to ISO 4401.
- Threaded connection to ISO 1179 (BSPP/Gas).



PP-KV-6, PP-KV-10, PP-KV-16

Dimensions

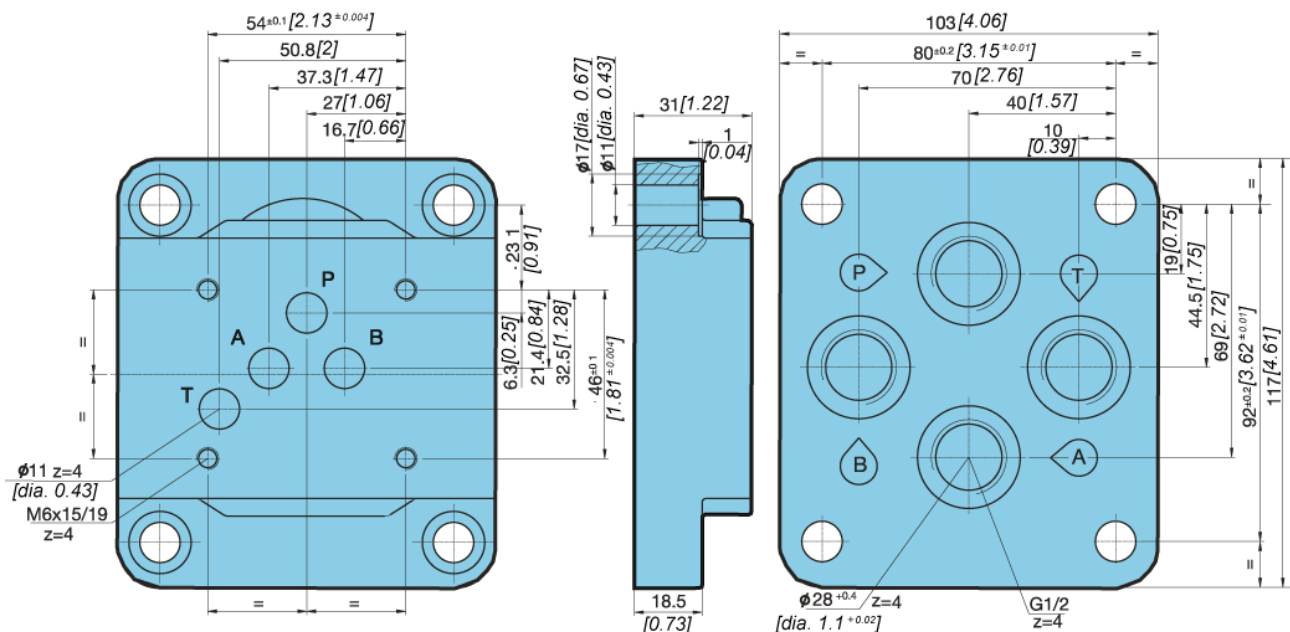
Subplate, type PP-KV-6-...

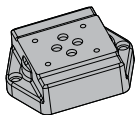


Type	PP-KV-6-2-G3/8-Ø28-L mm [Zoll]	PP-KV-6-2-G3/8-Ø28-L-ZN mm [Zoll]	PP-KV-6-2-G1/2-Ø28-L mm [Zoll]
M	G3/8	G3/8	G1/2
Surface protection	Phosphated	Zinc - plated	Phosphated

Subplate type PP-KV-10-G1/2-Ø28L

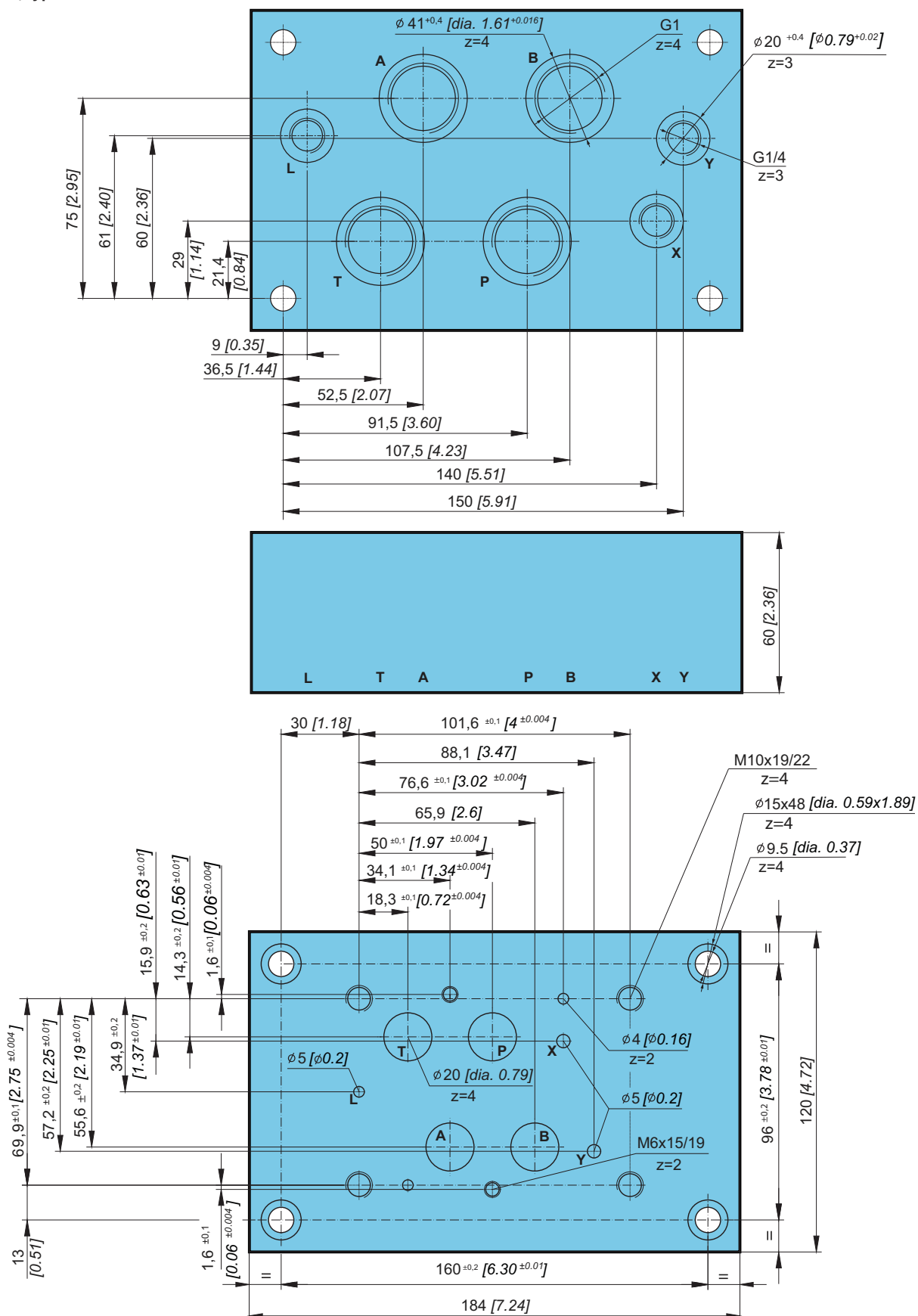
Surface protection - Phosphated

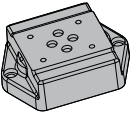




Dimensions

Subplate, type PP-KV-16-G1-Ø41





MANIFOLD BLOCKS BP

- NG 6, 10
- Up to 350 bar [5076 PSI]
- Connecting dimensions to ISO 4401.
- Threaded connection to ISO 1179-1 (BSPP/Gas).
- Mounting position unrestricted (valve axis preferably horizontal).
- Because of the large drilling diameters the pressure drop through the manifolds is very low.

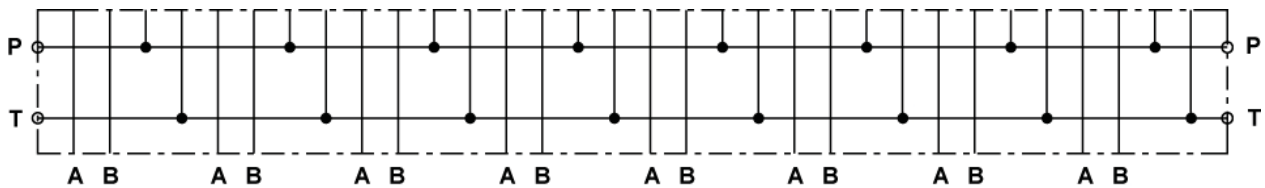


BP-6-4-S

Operation

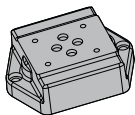
Manifold blocks serve for transmission of hydraulic fluid from source to valves. On the block can be two or up to seven valves (NS 10) or up to eight valves (NS 6) mounted in parallel connection. Manifold blocks are used for easily realizing of hydraulic circuits without piping between valves and minimal overall dimensions.

Hydraulic symbol



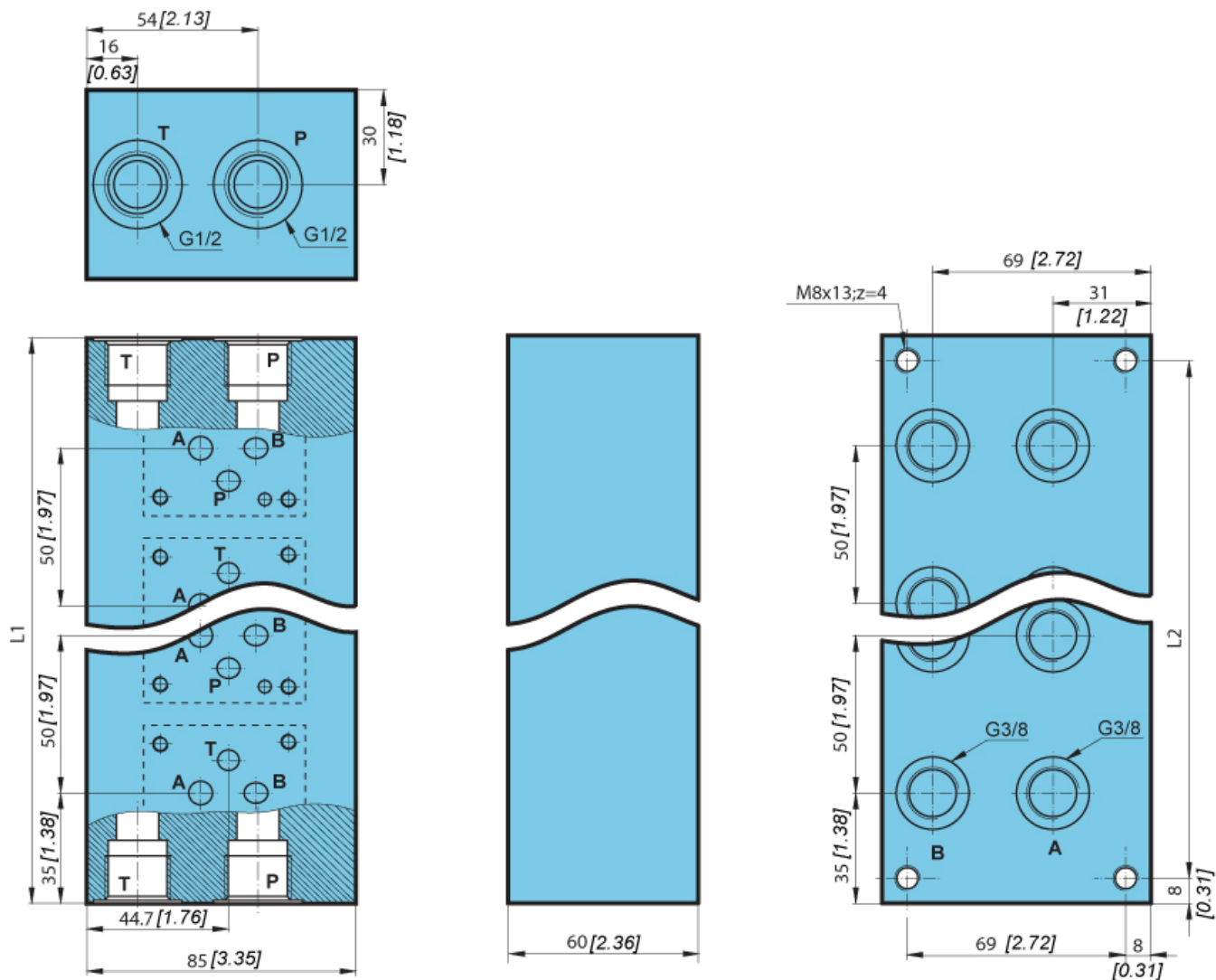
Subplates

Manifold blocks

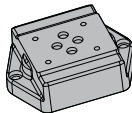


Dimensions

BP-6-....

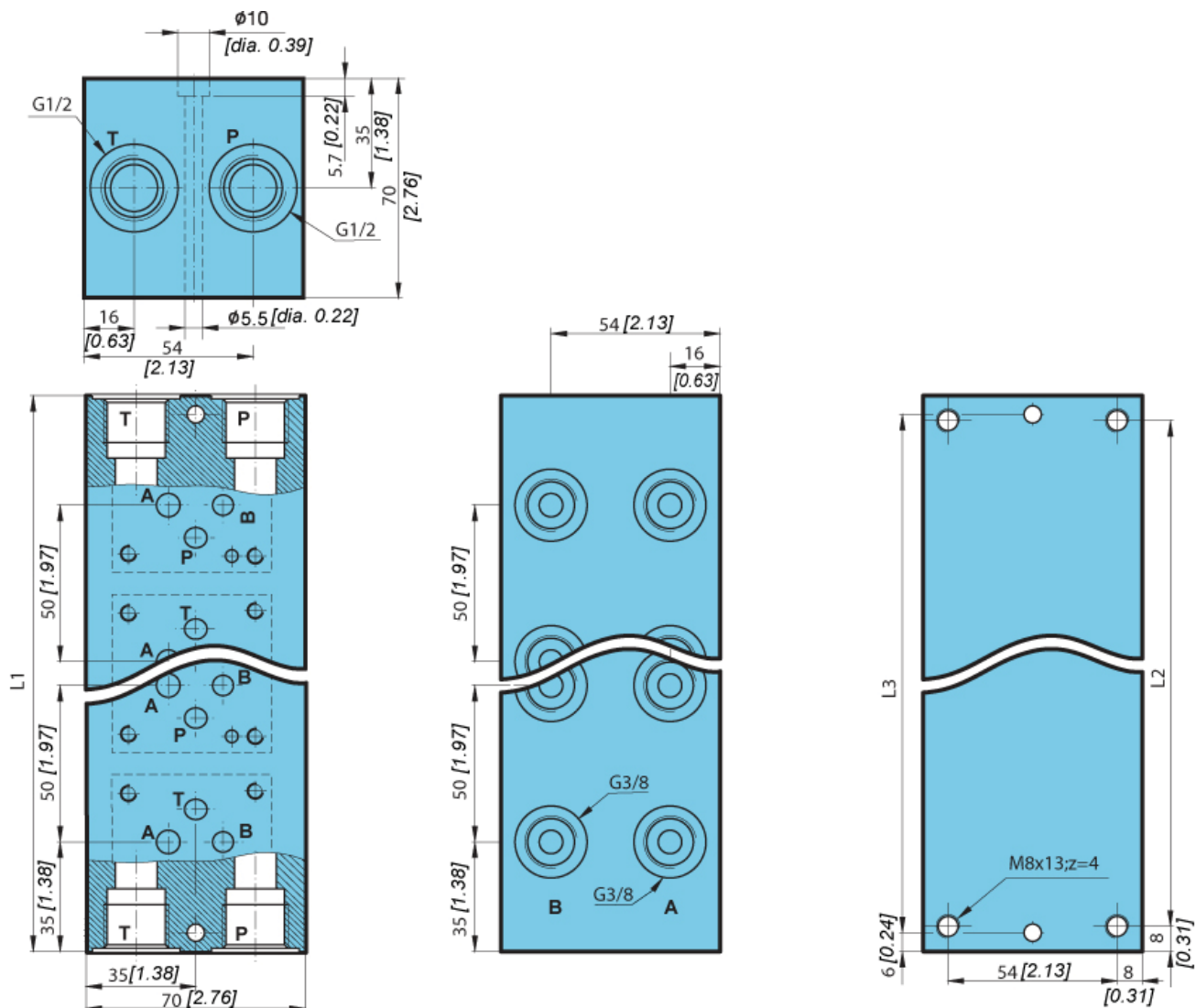


Type	Nominal size	Stations	L1 mm [Zoll]	L2 mm [Zoll]	Ports size		Mass kg [lb]
					P-T	A-B	
BP-6-1	6	1	70 [2.75]	54 [2.12]	G1/2	G3/8	2,3 [5.07]
BP-6-2		2	120 [4.72]	104 [4.09]			3,9 [8.60]
BP-6-3		3	170 [6.69]	154 [6.06]			5,5 [12.12]
BP-6-4		4	220 [8.66]	204 [8.03]			7,2 [15.87]
BP-6-5		5	270 [10.63]	254 [10.00]			8,8 [19.40]
BP-6-6		6	320 [12.60]	304 [11.97]			10,5 [23.15]
BP-6-7		7	370 [14.56]	354 [13.93]			12,1 [26.67]
BP-6-8		8	420 [16.53]	404 [15.90]			13,7 [30.20]

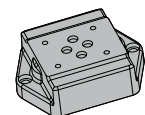


Dimensions

BP-6-...-S

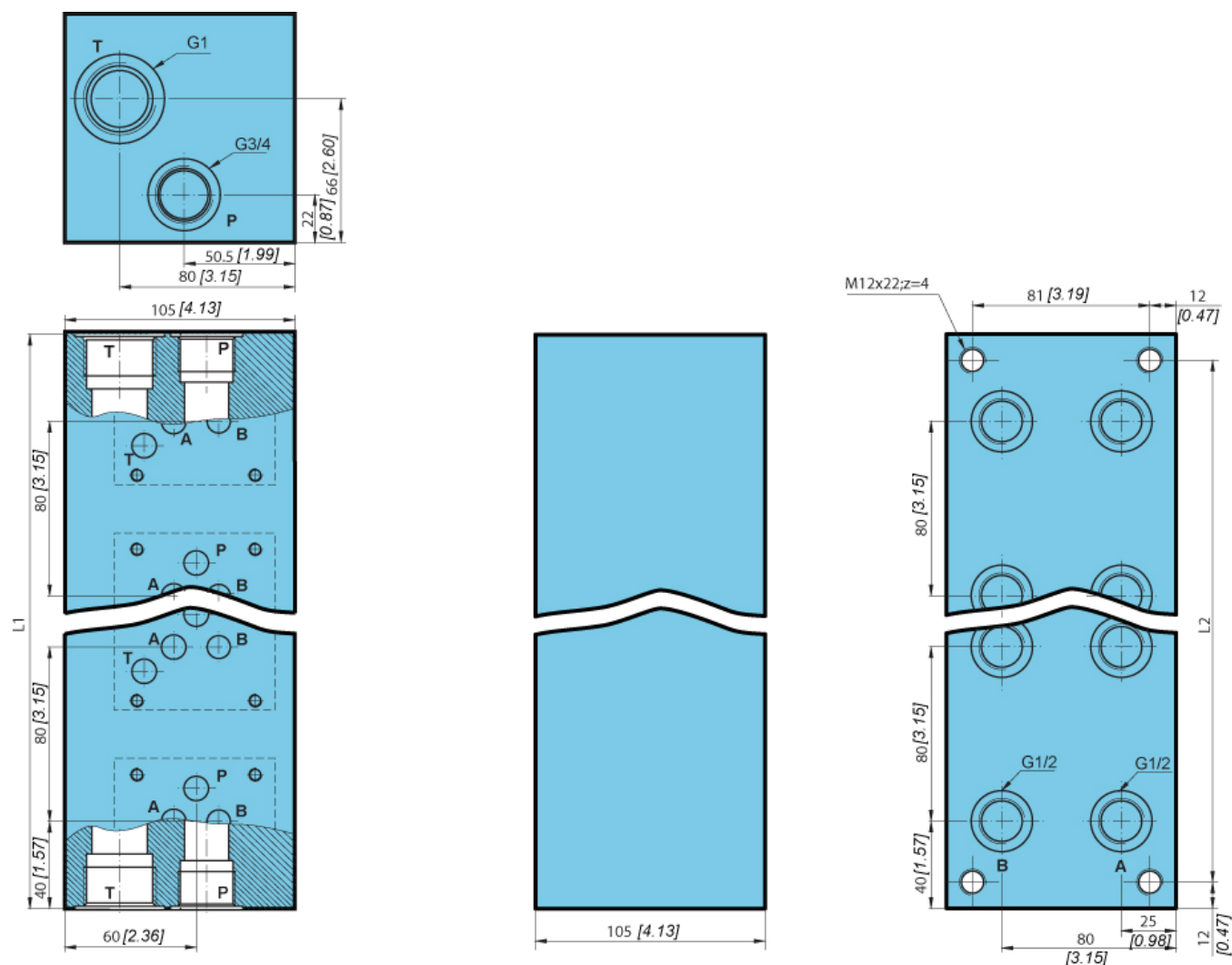


Type	Nominal size	Stations	L1	L2	L3	Ports size		Mass kg [lb]
			mm [Zoll]	mm [Zoll]	mm [Zoll]	P-T	A-B	
BP-6-1-S	6	1	70 [2.75]	54 [2.12]	58 [2.28]	G1/2	G3/8	2,3 [5.07]
BP-6-2-S		2	120 [4.72]	104 [4.09]	108 [4.25]			3,9 [8.60]
BP-6-3-S		3	170 [6.69]	154 [6.06]	158 [6.22]			5,5 [12.12]
BP-6-4-S		4	220 [8.66]	204 [8.03]	208 [8.19]			7,2 [15.87]
BP-6-5-S		5	270 [10.63]	254 [10.00]	258 [10.15]			8,8 [19.40]
BP-6-6-S		6	320 [12.60]	304 [11.97]	308 [12.12]			10,5 [23.15]
BP-6-7-S		7	370 [14.56]	354 [13.93]	358 [14.09]			12,1 [26.67]
BP-6-8-S		8	420 [16.53]	404 [15.90]	408 [16.06]			13,7 [30.20]

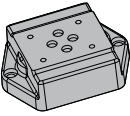


Dimensions

BP-10-...-...

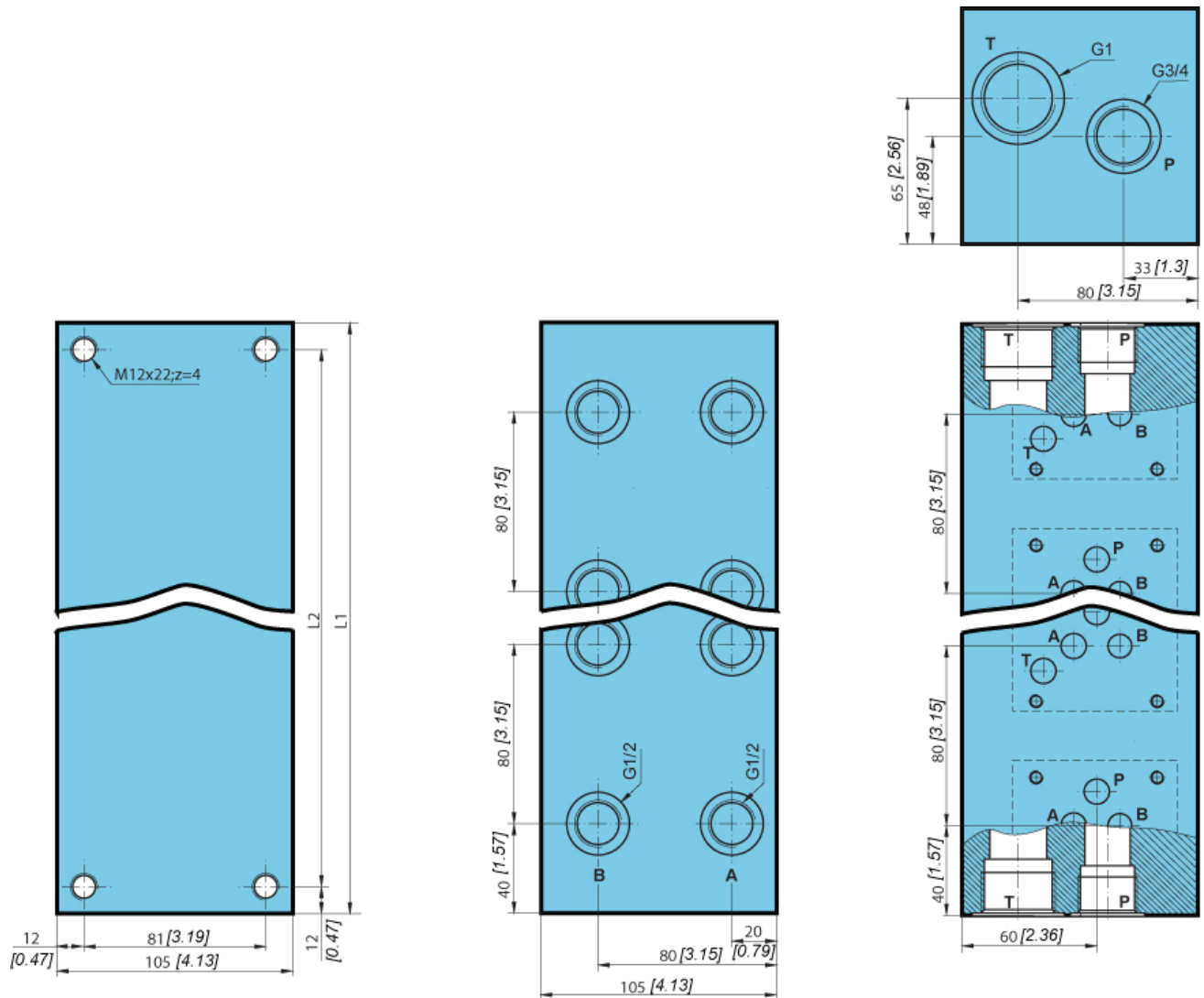


Type	Nominal size	Stations	L1 mm [Zoll]	L2 mm [Zoll]	Ports size			Mass kg [lb]
					P	A-B	T	
BP-10-1	10	1	80 [3.15]	56 [2.20]	G3/4	G1/2	G1	5,9 [13.00]
BP-10-2		2	160 [6.30]	136 [5.35]				11,8 [26.01]
BP-10-3		3	240 [9.45]	216 [8.50]				17,7 [39.02]
BP-10-4		4	320 [12.60]	296 [11.65]				23,5 [51.80]
BP-10-5		5	400 [15.74]	376 [14.80]				29,4 [64.81]
BP-10-6		6	480 [18.90]	456 [17.95]				35,3 [77.82]
BP-10-7		7	560 [22.04]	536 [21.10]				41,2 [90.83]



Dimensions

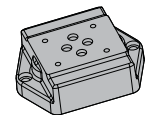
BP-10-...-S



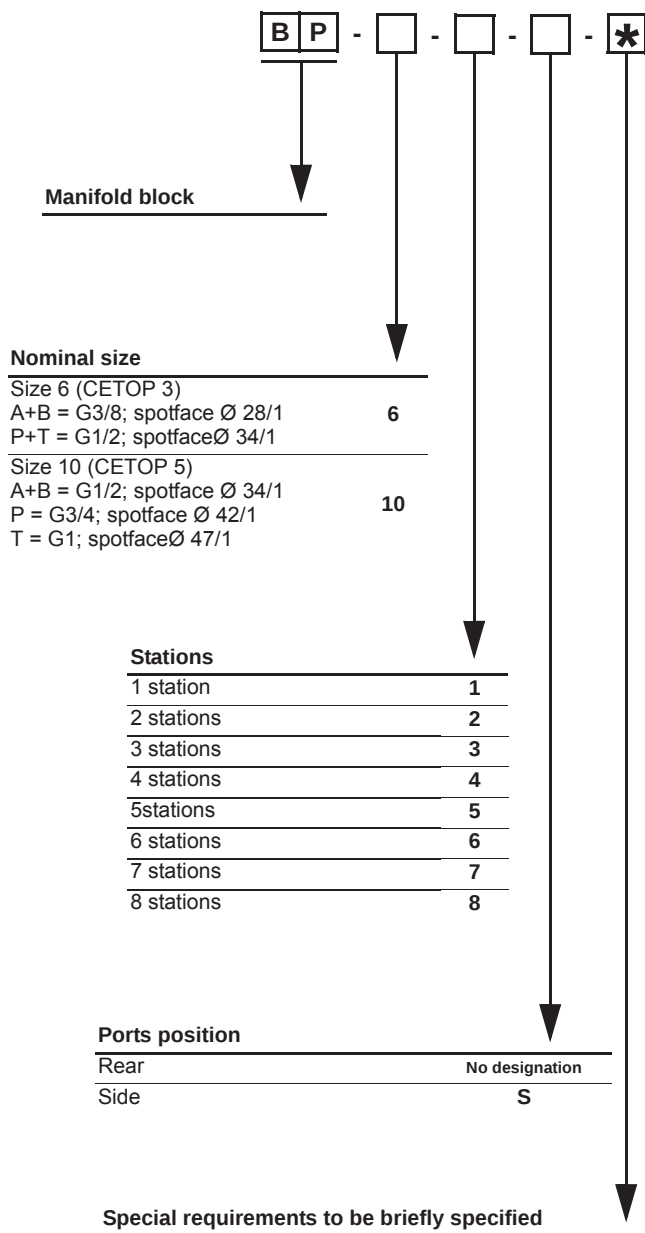
Subplates

Type	Nominal size	Stations	L1 mm [Zoll]	L2 mm [Zoll]	Ports size			Mass kg [lb]
					P	A-B	T	
BP-10-1-S	10	1	80 [3.15]	56 [2.20]	G3/4	G1/2	G1	5,9 [13.00]
BP-10-2-S		2	160 [6.30]	136 [5.35]				11,8 [26.01]
BP-10-3-S		3	240 [9.45]	216 [8.50]				17,7 [39.02]
BP-10-4-S		4	320 [12.60]	296 [11.65]				23,5 [51.80]
BP-10-5-S		5	400 [15.74]	376 [14.80]				29,4 [64.81]
BP-10-6-S		6	480 [18.90]	456 [17.95]				35,3 [77.82]
BP-10-7-S		7	560 [22.04]	536 [21.10]				41,2 [90.83]

Manifold blocks



Model code



Max. pressure depends on type of used seals.



ELECTRIC AND ELECTRONIC COMPONENTS



PRESSURE SWITCHES

231

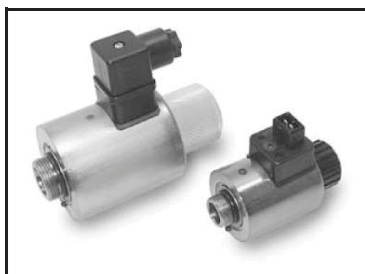
Pressure switch TS-4 (NG 4)

231

Stacking sandwich plate VP-TS-4 (NG 6, 10)

235

Pressure switches



SOLENOIDS

237

Direct current solenoids for hydraulics MR

237

Solenoids



JOYSTICK

241

Joystick with two switches KRSS

241

Joystick



AMPLIFIER

243

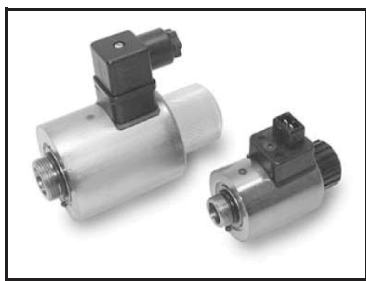
Amplifier for supply of the proportional solenoid 1659574

243

Amplifier



Pressure switches



Solenoids



Joystick



Amplifier



PRESSURE SWITCH TS-4

- NG 4
- Up to 400 bar [5801 PSI]
- Minimal dimensions.
- Four pressure ranges.
- Three mounting methods (horizontal, vertical, built into pipeline).
- Three pressure setting methods (by means of Allan key, knob, or lockable knob).
- Lockable pressure setting.
- Operation supervision by means of signal lamp.
- Plug-in connector for solenoids to ISO 4400.

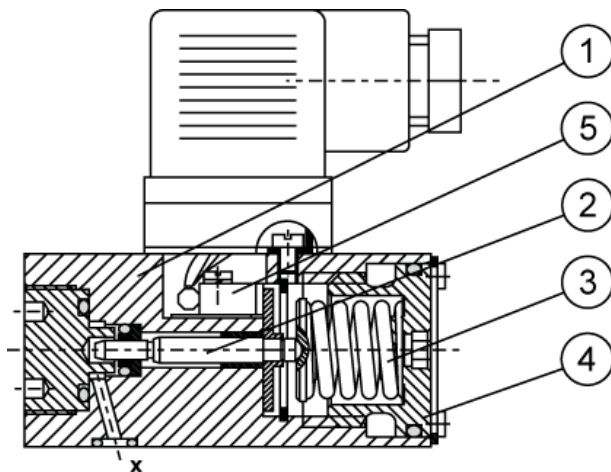


TS-4

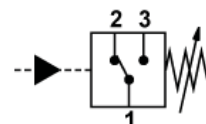
Operation

Pressure switches type TS are used for switching electric circuits on and off, respectively, depending on the pressure rate in the hydraulic system. These switches can be mounted as control or monitoring elements. When the pressure switch is used as monitoring element, the operation of hydraulic systems can be supervised by means of light or sound signals.

The TS type pressure switch consist of a housing (1), a piston (2), a spring (3), a setting knob (4) and a microswitch (5). Pressure acts on the piston (2), pushing it against the spring (3). When the piston force exceeds the preset tension of the spring, the microswitch (5) turns the electric power on, or respectively, off. The tension and thereby the switching - on and off pressure rates can be preset by means of the setting knob (4).

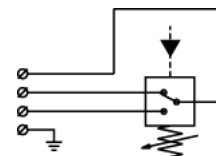


Symbol

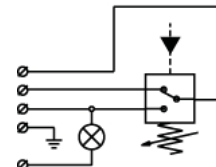


Circuit diagram

Without signal lamp

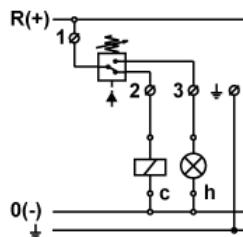


With signal lamp

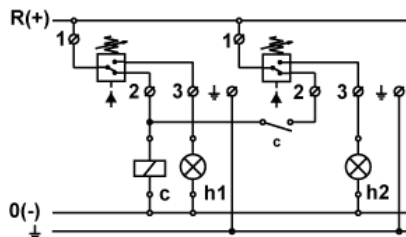


Mounting example

One pressure switch



Two pressure switches



h, h1, h2 = Control lamps.
c = Relay (contactor).

Pressure switches

Solenoids

Joystick

Amplifier



Features

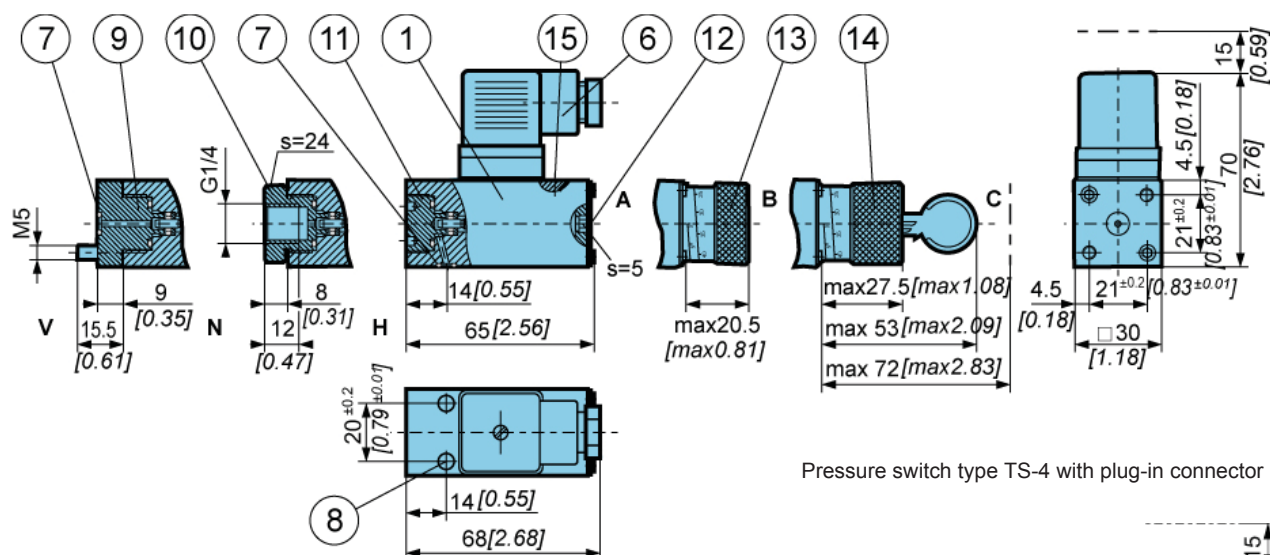
Hydraulic

Type		TS-4-70	TS-4-160	TS-4-250	TS-4-400
Size		4			
Min. pressure at pressure rise	bar [PSI]	< 9 [<i>< 131</i>]	< 17 [<i>< 247</i>]	< 20 [<i>< 290</i>]	< 25 [<i>< 363</i>]
Max. pressure at pressure rise	bar [PSI]	70 ±2 [<i>1 015 ±29</i>]	160 ±4 [<i>2 320 ±58</i>]	250 ±6 [<i>3 625 ± 87</i>]	400 ±10 [<i>5 801± 145</i>]
Hysteresis at min. pressure	bar [PSI]	≤ 4 [<i>? 58</i>]	≤ 8 [<i>? 116</i>]	≤ 10 [<i>? 145</i>]	≤ 13 [<i>? 189</i>]
Hysteresis at max. pressure	bar [PSI]	≤ 8,5 [<i>? 123</i>]	≤ 15 [<i>? 218</i>]	≤ 20 [<i>? 290</i>]	≤ 25 [<i>? 363</i>]
Max. pressure	bar [PSI]	400 [<i>5 801</i>]		500 [<i>7 251</i>]	
Repeating accuracy	%	< ±1			
Shift frequency	min ⁻¹	120			
Oil temperature range	°C [<i>°F</i>]	-20 to +70 [<i>-4 to +158</i>]			
Viscosity range	mm ² /s [<i>SUS</i>]	15 to 380 [<i>3.24 to 82</i>]			
Filtration	NAS 1638	8			
Mass	kg [<i>lb</i>]	0,2 to 0.4 [<i>0.44 to 0.88</i>]			

Electrical

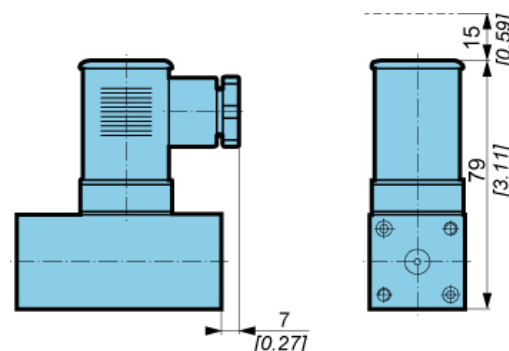
Switching capacity	Alternating current	Voltage	V	125; 250
		Ohm load	A	5
		Inductive load	A	5
	Direct current	Voltage	V	30; 50; 75; 125; 250
		Ohm load	V	5; 2; 1; 0,5; 0,25
		Inductive load	A	5; 2; 1; 0,06; 0,03

Dimensions



Pressure switch type TS-4 with plug-in connector L.

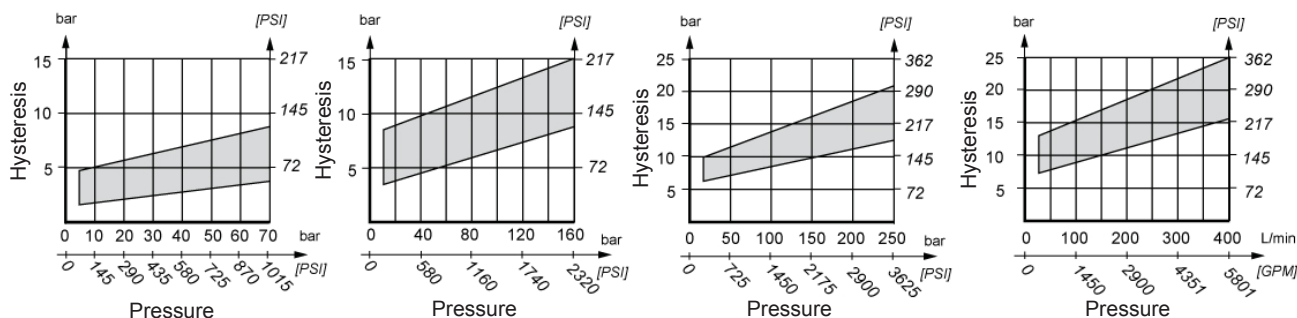
1. Pressure switch body
6. Plug-in connector
7. O-ring 5x1,5
8. Fixing screws holes, 2 pcs M5x40 to ISO 4762-10.9
Tightening torque Md=9 Nm (not included)
9. Fixing the switch to stacking sandwich plate
10. Installation into line
11. Fixing the switch to subplate
12. Pressure setting by means of Allan key
13. Pressure setting by means of knob
14. Pressure setting by means of lockable knob
15. Screw for protection of the seat pressure





Opening pressure

Measured at 50°C [122°F] and viscosity of 32 mm²/s [148 SUS]..



Model code

T S - 4 - [] - [] - [] - [] - [] - *

Pressure setting range

To 70 bar [1,015 PSI]	70
To 160 bar [2,320 PSI]	160
To 250 bar [3,625 PSI]	250
To 400 bar [5,801 PSI]	400

Mounting method

Vertical	V
Horizontal	H
Built-in	N

Pressure setting element

Allan key	A
Knob	B
Lockable key	C

Plug-in connector

Without signal lamp	No designation
12; 24 V	L24
With signal lamp	48 V
110; 230 V	L230

Seals type

NBR seals for mineral oil HL, HLP to DIN 51524	No designation
FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380	E

Special requirements to be briefly specified

Pressure switches

Solenoids

Joystick

Amplifier





STACKING SANDWICH PLATE VP-TS-4

- NG 6, 10
- Up to 400 bar [5801 PSI]

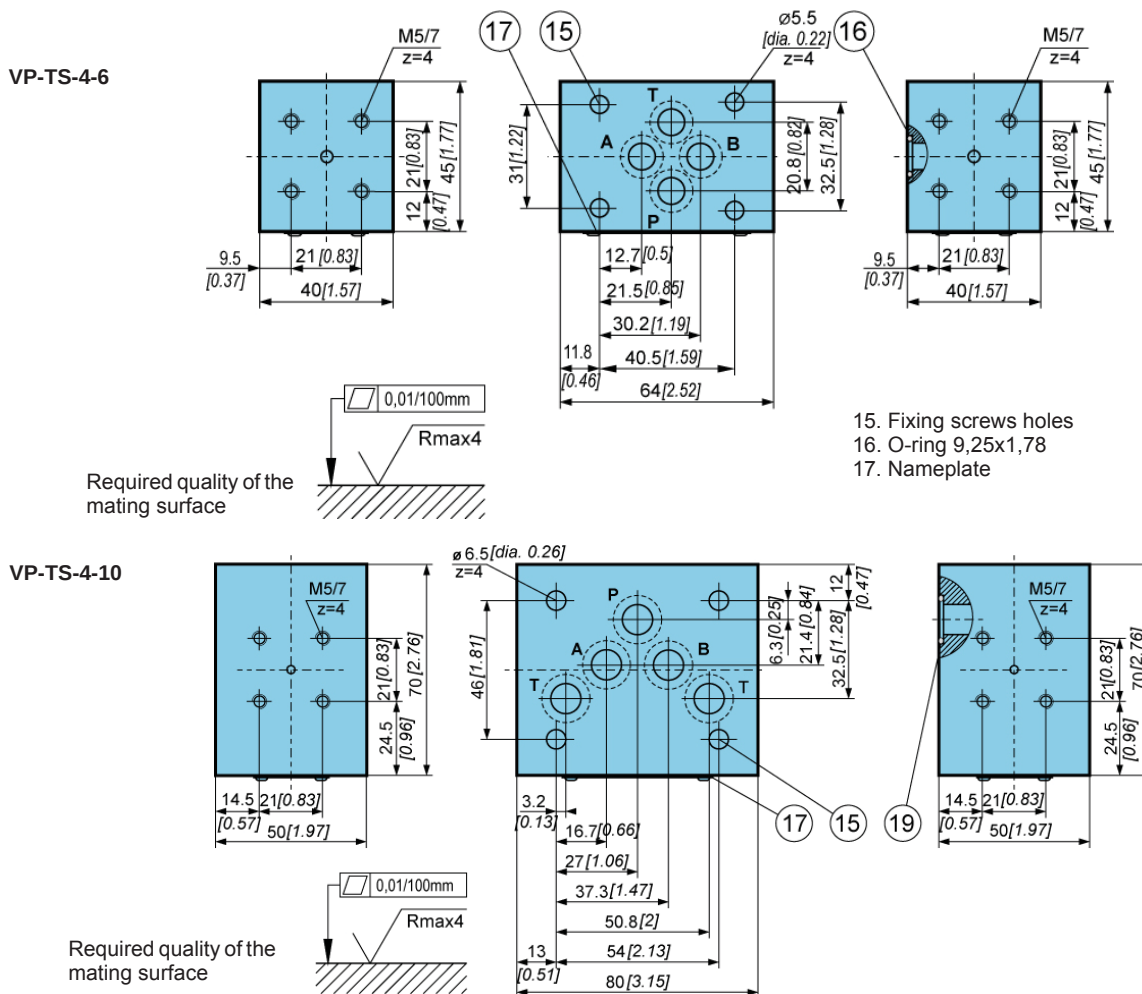


VP-TS-4...

Features

Size		6	10
Flow rate	L/min [GPM]	80 [21.1]	120 [31.7]
Operating pressure	bar [PSI]	400 [5 801]	
Oil temperature range	°C [°F]	-20 to +70 [-4 to +158]	
Viscosity range	mm ² /s [SUS]	15 to 380 [3.24 to 82]	
Filtration	NAS 1638	8	
Mass	kg [lb]	0,9 [1.98]	2,1 [4.63]

Dimensions





Model code

V P - T S - 4 - - - *

Size

Size 6	6
Size 10	10

Symbol

	A
	AI
	B
	BI
	AB
	P
	PI
	AP
	BP
	AA
	BB
	PP

Seals type

NBR seals for mineral oil HL, HLP to DIN 51524

No designation

FPM seals for HETG, HEES, HEPG to VDMA 24568 and ISO 15380

E

Special requirements to be briefly specified



DIRECT CURRENT SOLENOIDS FOR HYDRAULICS MR

- Fast and simple installation.
- Reliable functioning in every position.
- Long life span.
- Solenoid screws into valve block.
- Removable coil.
- Corresponding to VDE 0580 recommendations.
- Plug-in connector corresponding to EN 175301-803 standards.
- MR - 045 fulfil EMC (89/336/EEC).
- Protection of solenoid: IP 69 for Deutsch connector
IP 65 to EN 50529 / IEC 60529 for AMP connector



MR - 060, MR - 045, MR - 045/1

Operation

A piston that can move freely lengthwise, is placed in an oiltight core (1). A coil (2) protected by housing surrounds the core. The plug-in connector (4) is fixed to the housing. The coil is fixed on the core by retaining nut (3) and protected against rotation with a pin (5).

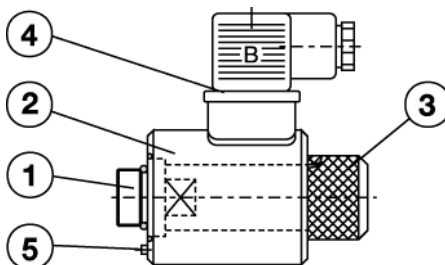
This type of solenoid is used for controlling of directional control valves.

They are activated by passing electric current through the solenoid's coil. For manually operation of the solenoid, there is the emergency switch at the back of the solenoid. Solenoids are of «push-design». When the solenoid is activated the piston pushes the piston rod out of it. The force with which the piston pushes at various points of its stroke (solenoid's movement) is given in the tables. The solenoids are designed for direct current. If a rectifier bridge is added, the alternating current can also be used. They are built for voltages of 12, 24, 48, 110 and 230V. Allowed deviation from the nominal voltage is within -10 to +5%. Their intermittence is 100% at the ambient temperature of 40°C [104°F]. When the ambient temperature is increased the intermittence is correspondingly lowered.

If the buyer so wishes, solenoids have the degree of protection of enclosures IP 65.

They are tested to the pressure of 250 bar [3 626 PSI].

Their life span in normal working conditions is 10⁷ operations.

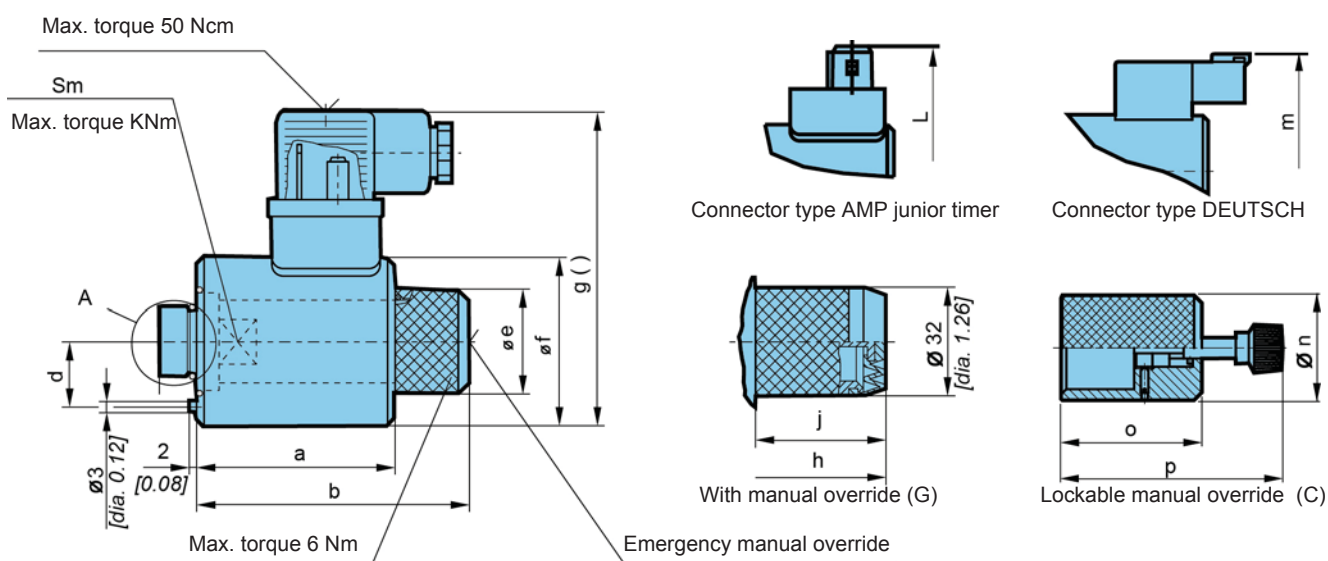


Features

	Strokemm [Zoll]		MR-045 for NG6 5KO	MR-045/1 for NG6 3KO	MR-060 for NG10
			100 [22.5]	90 [20.2]	240 [53.9]
Force F at 90% Un, and working temperature when ED is 100% (* 230 V AC supply voltage)	1 [0.04]	N [lbf]	75 [16.9] / 70* [15.7]*	50 [11.2]	130 [29.2]
	2 [0.08]		60 [13.5] / 50* [11.2]*	35 [7.9]	140 [31.5]
	3 [0.12]		30 [6.7] / 20* [4.5]*	20 [4.5]	
	4 [0.16]		20 [4.5] / 10* [2.2]*	10 [2.2]	85 [19.1]
	5 [0.20]		8 [1.8] / 5* [1.1]*	5 [1.1]	50 [11.2]
	6 [0.24]		5 [1.1] / 3* [0.7]*	3 [0.7]	35 [7.9]
	7 [0.28]		-	-	23 [5.2]
	8 [0.31]		-	-	18 [4.0]
	9 [0.35]		-	-	13 [2.9]
Power (** 12V supply voltage - 36W)	W		29**	26	45
Pression	Bar [PSI]		250 [3 626]		
Intermittence	%		100		
Mass	kg [lbs]		0,6 [1.32]	0,45 [0.99]	1,6 [3.52]



Dimensions



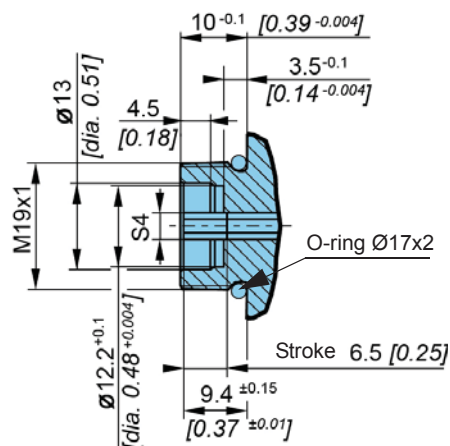
	a	b	D ^{+0.1}	Øe	Øf	g	h	j
MR-045	53 [2.08]	73 [2.87]	17,5 [0.69]	30 [1.18]	45 [1.77]	85 [3.35] / 91* [3.58]*	87 [3.42]	34 [1.34]
MR-045/1	38 [1.49]	58 [2.28]					72 [2.83]	
MR-060	72 [2.83]	108 [4.25]	23,9 [0.94]	40 [1.57]	62 [2.44]	103 [4.05] / 109* [4.29]*	122 [4.80]	50 [1.97]

* AC supply voltage

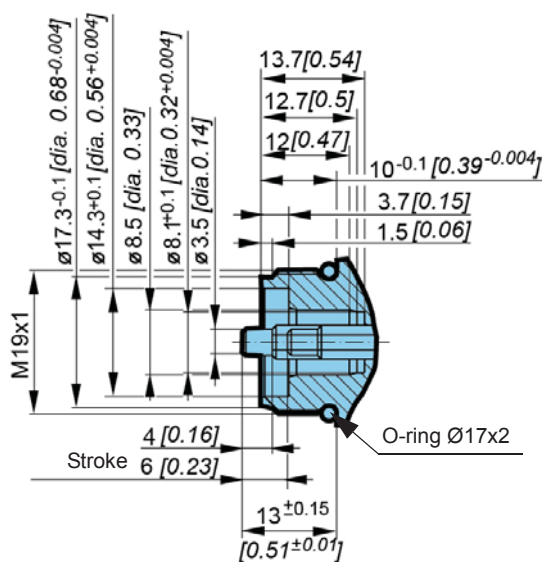
	k	L	Sm	m	n	o	p
MR-045	30 [1.18]	69 [2.72]	20 [0.78]	67 [2.64]	28 [1.10]	35 [1.38]	61 [2.40]
MR-045/1							
MR-060	50 [1.97]	86 [3.38]	27 [1.06]	82 [3.23]	40 [1.57]	54 [2.13]	79,5 [3.13]



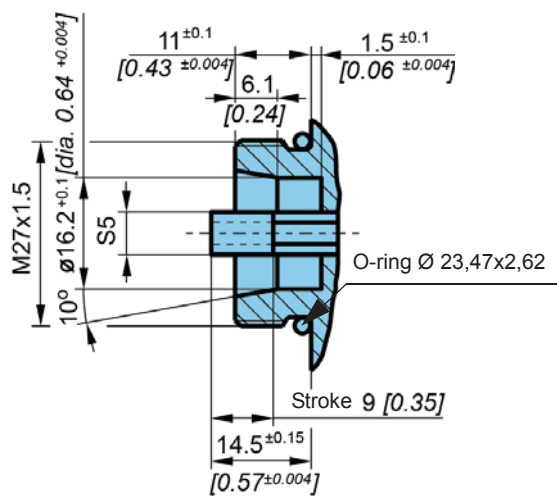
A MR-045



A MR-045/1



A MR-060



Pressure switches

Solenoids

Joystick

Amplifier



Model code (Every part of solenoid has to be ordered separately)

Core

M R - - **J**

Size mm [Zoll]

Ø 45 [1.77 dia] / Lenght 73 [2.87]	045
Ø 45 [1.77 dia] / Lenght 58 [2.28]	045/1
Ø 60 [2,36 dia] / Lenght 108 [4,25]	060

For DC and AC voltage the same core is used.

Retaining nut

M R - - **M** -

Size mm [Zoll]

Ø 45 [1.77 dia] / Lenght 73 [2.87]	045
Ø 45 [1.77 dia] / Lenght 58 [2.28]	045/1
Ø 60 [2,36 dia] / Lenght 108 [4,25]	060

Hand operation of solenoid

Without	No designation
Manual override	G
Lockable manual override	C

Coil

M R - - **O** - - -

Size mm [Zoll]

Ø 45 [1.77 dia] / Lenght 73 [2.87]	045
Ø 45 [1.77 dia] / Lenght 58 [2.28]	045/1
Ø 60 [2,36 dia] / Lenght 108 [4,25]	060

Supply voltage

	Direct voltage	Alternating voltage
12V	12 DC	12 AC
24V	24 DC	24AC
48V	48DC	48AC
110 V	110DC	110AC
230V	230DC	230AC*

* To fulfil EMC (89/336/EEC) a capacitor must be built in.

Connector type

EN 175301-803	No designation
AMP Junior Timer	AMP
DEUTSCH	DEU

Overvoltage

Without overvoltage protection	No designation
With overvoltage protection	T

Plug-in connector

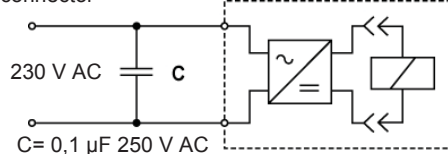
M R - **K** - - -

Supply voltage

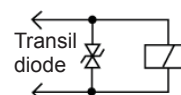
	Direct voltage	Alternating voltage
12V	12 DC	12 AC
24V	No designation	24AC
48V	48DC	48AC
110 V	110DC	110AC
230V	230DC	230AC*

* To fulfil EMC (89/336/EEC) a capacitor must be built in.

Solenoid with rectifier bridge built in connector



Solenoid with overvoltage protection



Colour signal lamp

Grey without signal lamp	A**
Black without signal lamp	B
Transparent with signal lamp	L**

Cable gland**

S. 9	No designation
S. 11	11

** not valid for AMP and DEUTSCH



JOYSTICK WITH TWO SWITCHES KRSS

- Switching capacity 5 A by 12 V.
- Fast and simple installation.



KRSS-CO10-B

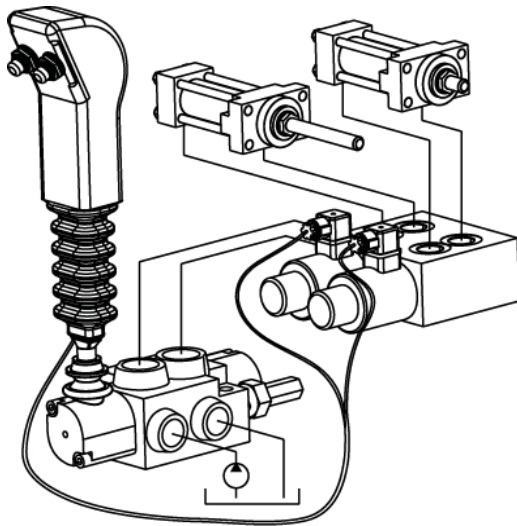
Operation

Control lever with switches provides control of the valve with direct mechanical operation and optional control of valves with direct solenoid operation. The lever is usually mounted on the operating pin lever of the valve with direct mechanical operation. The optional thumb switches mounted on the control lever have to be connected with power supply and solenoids on solenoid valves. The valve with direct mechanical operation is activated by deflection of the control lever. The solenoid valves are activated by pressing of thumb switches mounted on the control lever.

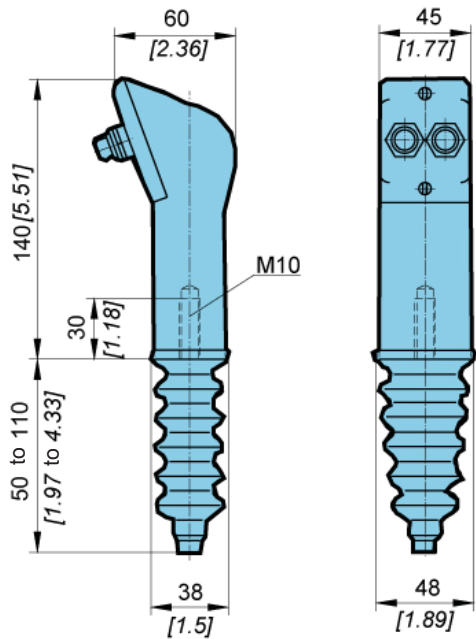
Features

Switching capacity	5A by 12 V
Element terminals	FASTON A6, 3-0, 8 EN 61210
Mounting	Inner thread M10
Material	Black plastic

Mounting example



Dimensions

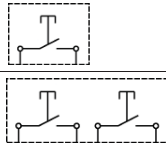


Model code

K R S S - C O 1 0 -

Type of joystick

Switches



A

B

Pressure switches

Solenoids

Joystick

Amplifier





AMPLIFIER FOR SUPPLY OF THE PROPORTIONAL SOLENOID 1659574

- Plug-in connector for solenoids to ISO 4400



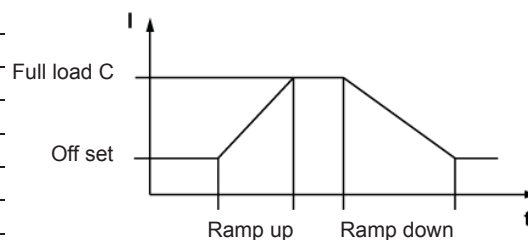
1659574

Operation

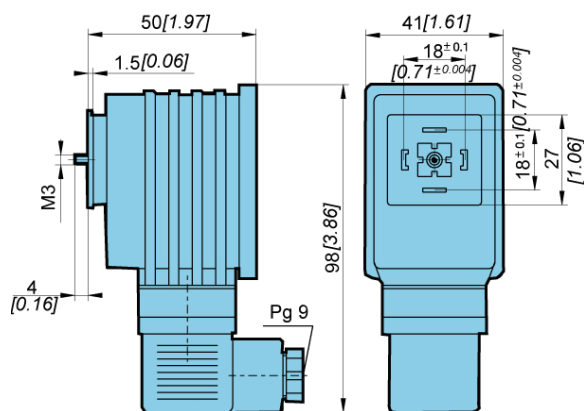
These switch mode units provide stepless control for proportional valves. Start current (OFF.SET) and full load current (FLC) can be individually preset. The current in the solenoid is substantially independent of changes in solenoid resistance and supply voltage variation. The inherent Dither, due to switch-mode operation helps to overcome friction effects in the solenoid. Ramp controls are fitted to give up to 10 seconds for the current in the solenoid to built up to its full load value, or to return to the offset point.

Features

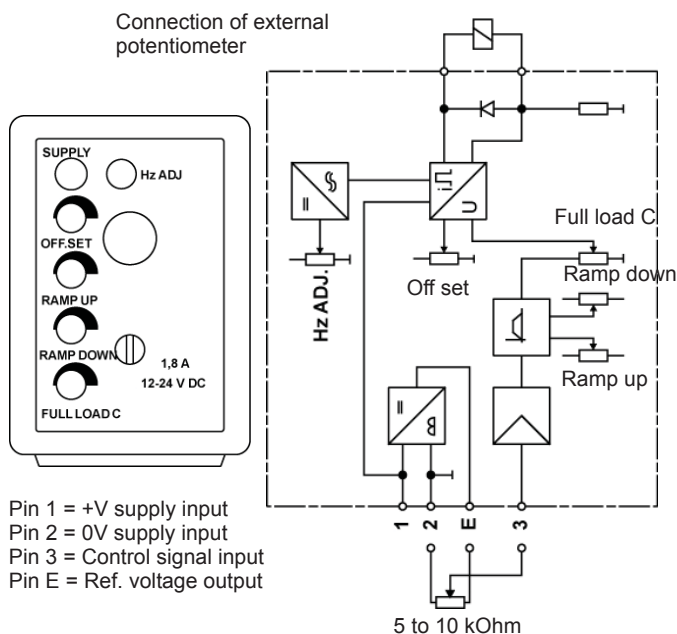
Switching frequency	HZ	100 to 500
Two reg. ramp up and down	s	0 to 10
Power supply voltage	V DC	9 to 30
Control signal	V DC	0 to 10
Full load current	mA	1 800
Offset range	12 V	0 to 900
	24 V	0 to 600
Operating temperature range	°C [°F]	-5 to 80 [23 to 176]
Storage temperature range	°C [°F]	-45 to 100 [-49 to 212]



Dimensions



Connection and adjustment elements





Poclain Hydraulics reserves the right to make any modifications it deems necessary to the products described in this document without prior notification. The information contained in this document must be confirmed by Poclain Hydraulics before any order is submitted.

Illustrations are not binding.

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12/12/2016



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