Proportional directional spool valve type PSL, PSV, PSM size 3

Product documentation

Series connection

Operating pressure p_{max}:	420 bar
Flow rate (pump) Q_{max}:	200 l/min
Flow rate (consumer) $Q_{max\ A/B}$:	120 l/min



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1 Introductory description of proportional directional spool valves type PSL, PSV, PSM size 3

Proportional directional spool valves are a type of directional valve. They control the direction of movement and the velocity of individual or multiple hydraulic consumers actuated simultaneously. Control is independent of the load and continuous.

The proportional directional spool valve type PSL is suitable for constant pump systems and type PSV is for variable pump systems. The flow rates and load pressures for the individual consumers can be individually adjusted. The proportional directional spool valve type PSL and PSV can be adapted to various control tasks, e.g. for safety functions. All sizes can be combined with each other.

The proportional directional spool valve type PSL and PSV is used in mobile hydraulics – in particular, in loading cranes, lifting platforms, municipal trucks, construction machines, drilling equipment and machines for forestry and agricultural purposes.



Proportional directional spool valve Type PSL 3

Features and advantages

- Universally usable product for various flow rates and functions
- Extensive modular system with many variants and combination options
- Compact and lightweight design
- Robust and long-lived design for pressures up to 420 bar
- Highest energy efficiency thanks to low Δp and low-energy solutions
- Suitable for use in potentially explosive areas

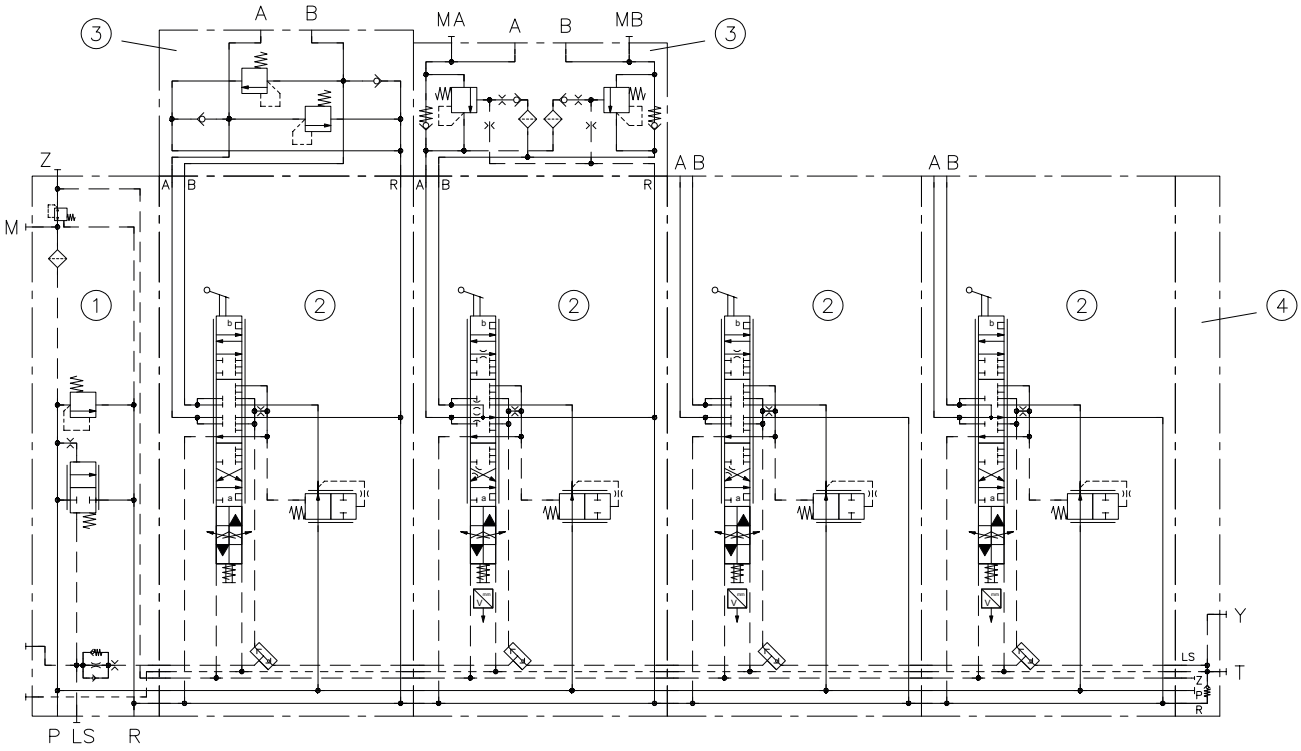
Intended applications

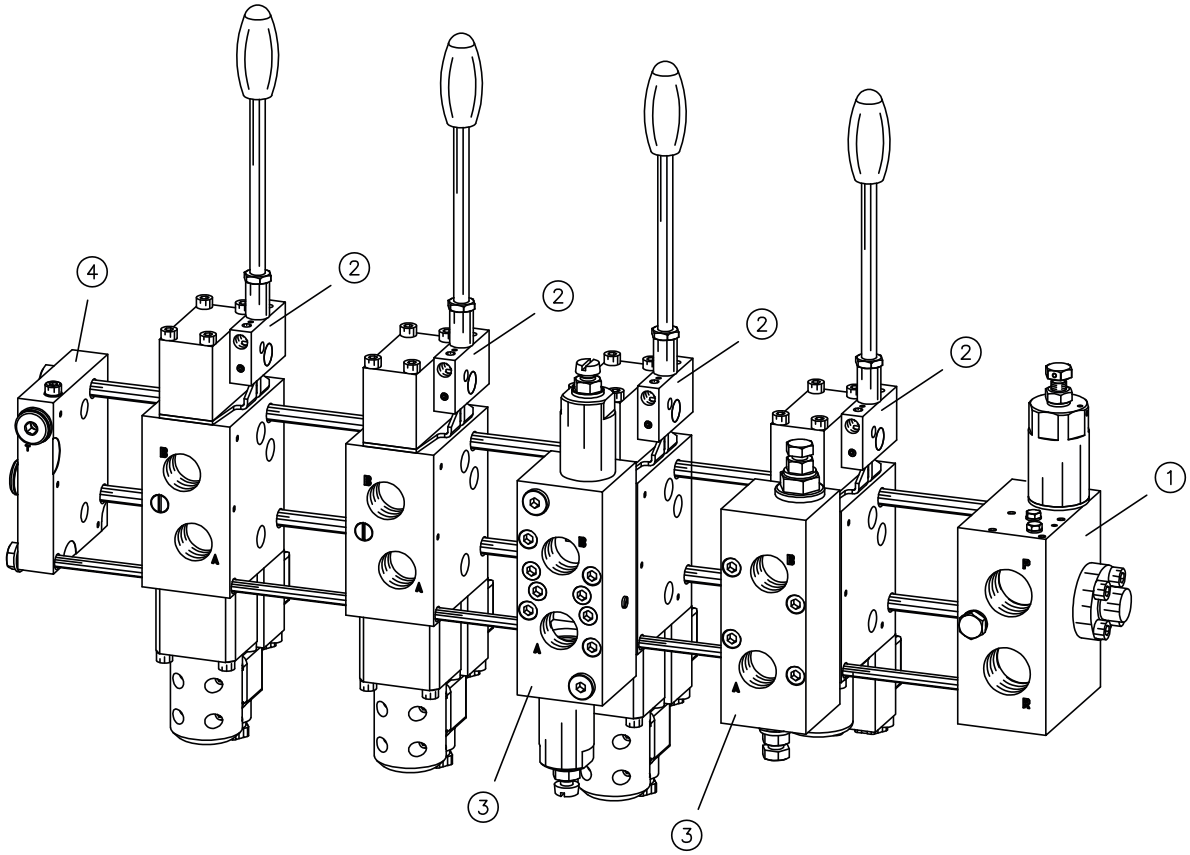
- Loading cranes
- Lifting platforms
- Municipal trucks
- Construction machines
- Drilling equipment
- Machines for forestry and agricultural purposes

1.1 Configuration example PSL 3

PSL 41/420-3
- A2 L 80/63/EA/3 AN350 BN350
- A2 O 80/80/EAWA/3 AL-0-A 7/400-BL-0-B 7/400
- 32 J 63/40/EAWA
- 32 H 25/25/EAWA
- E 4 - G 24





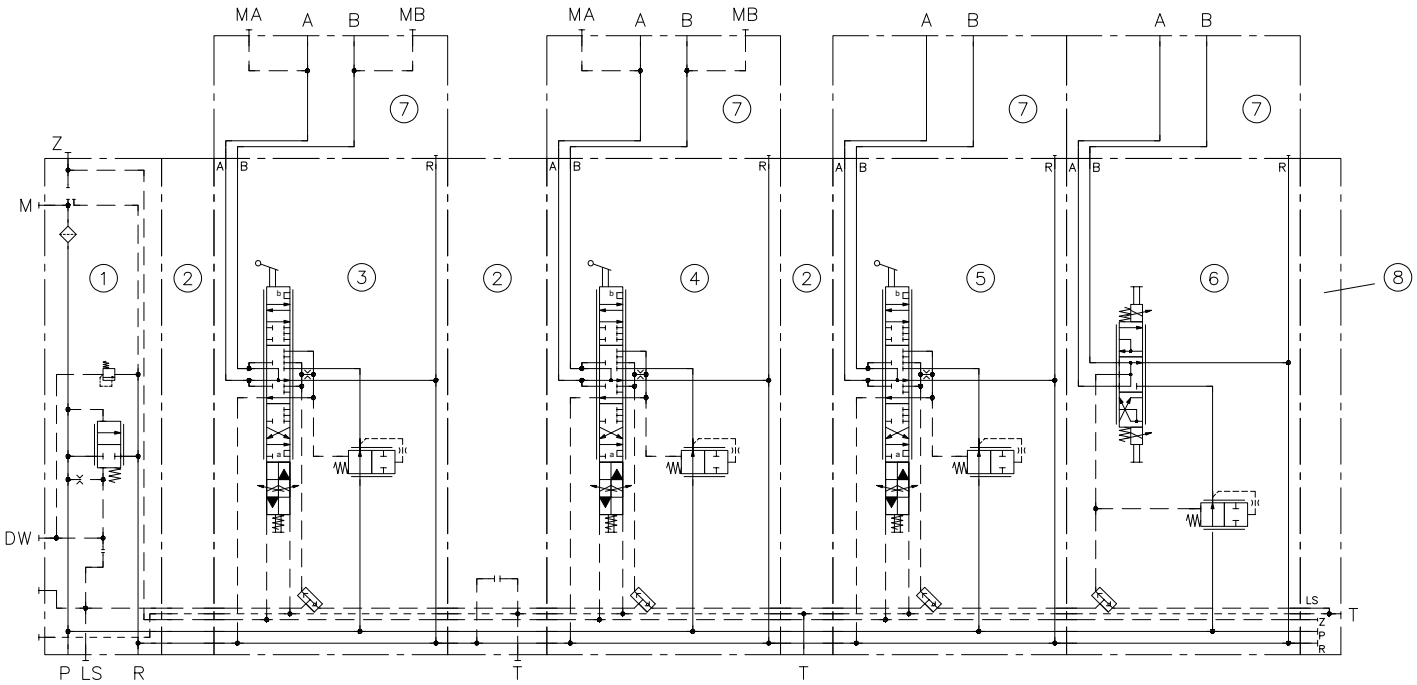


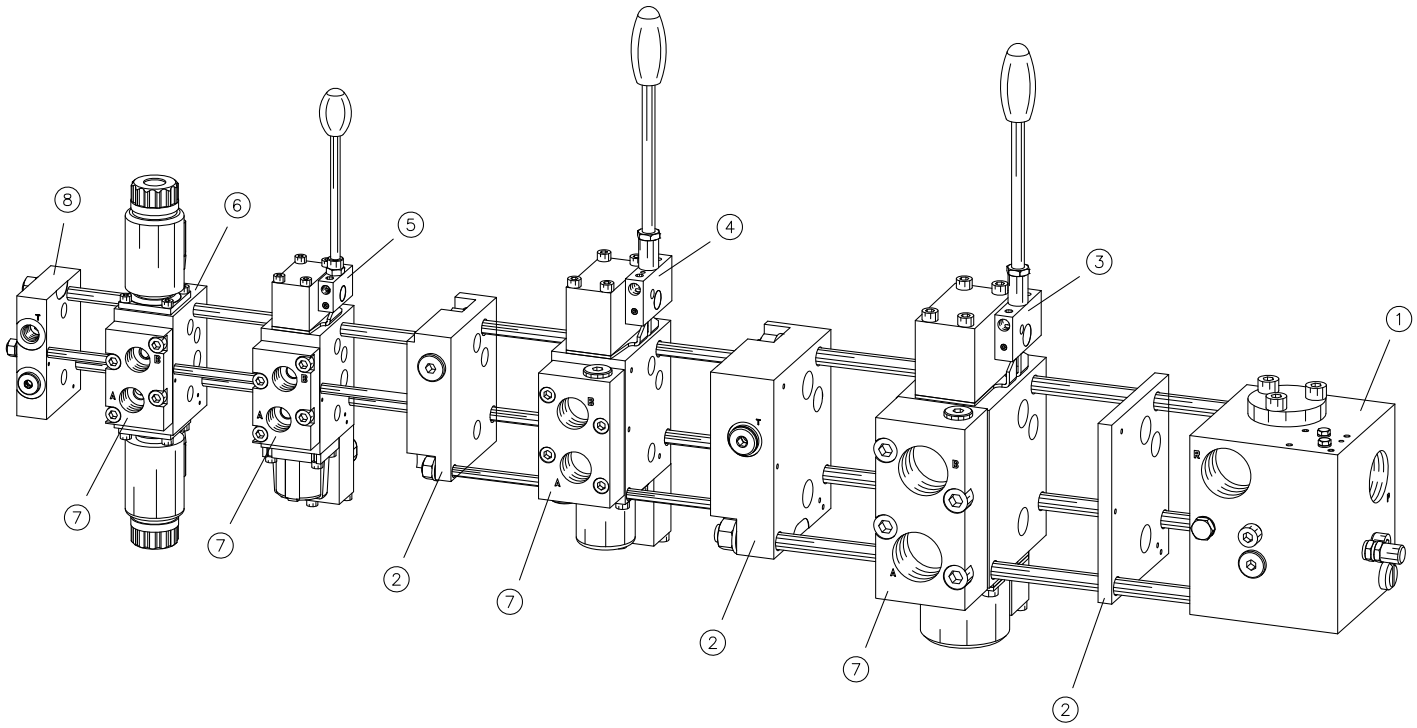
1 Connection block
2 Valve section
3 Ancillary block
4 End plate

1.2 Configuration example PSL 3 in conjunction with PSL 5, PSL 2 and EDL 2

PSV 51/300-5
- ZPL 55/9
- A2 H 160/160/EA/5
- ZPL 531
- A2 H 80/80/EA/3
- ZPL 32
- A2 H 40/40/EA/2
- DA2 H 40/40/EI/2
- E 1-DT 24





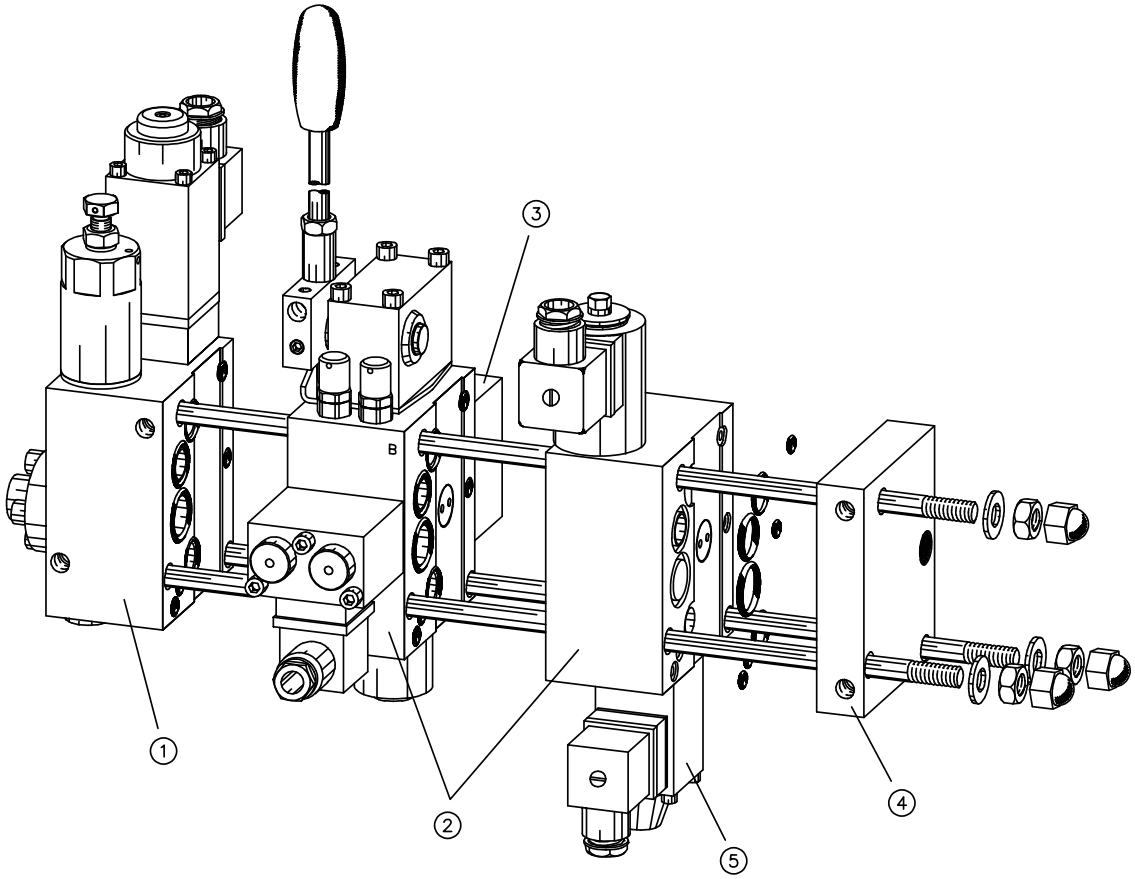


1 PSL 5 connection block
2 Series intermediate plate
3 PSL 5 valve section
4 PSL 3 valve section
5 PSL 2 valve section
6 EDL 2 valve section
7 Ancillary block
8 PSL 2 end plate

2 Available versions

Ordering example

PSL 31F/420-3	Connection block (see Chapter 2.1)
-A2 L 80/63 A350 B300 F 3/E0A/3	Valve section with intermediate plate (see Chapter 2.2) and ancillary block
-A1RR VPV/5	Series intermediate plate (see Chapter 2.3)
-E 2-G 24	End plate with solenoid version and solenoid voltage (Chapter 2.5.1 and Chapter 2.6)



1 Connection block (Chapter 2.1)
2 Valve section (Chapter 2.2),
series intermediate plate (Chapter 2.3) or
valve section with integrated load-holding valves
3 Ancillary block (Chapter 2.2.2) or intermediate plate (Chapter 2.2.3)
4 End plate (Chapter 2.5.1)
5 Solenoid voltage and solenoid version (Chapter 2.6)

A single manifold can merge up to 12 valve sections of size 3.

This number can be increased by combining with PSL 5 or PSL 2. In this case, transition plates are used and each size has its own tension rod.

Limits to the maximum possible number of valve sections result from:

a) tension rod strength
b) internal control oil supply for the electro-hydraulic actuation
c) the available control pressure difference for supply to the rear valve sections

2.1 Connection block

Connection blocks come in three basic variants:

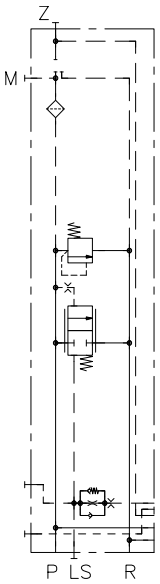
- **PSL:** Connection block with integrated 3-way controller for use in Open Center systems with constant pumps
- **PSV:** Connection block without 3-way controller for use in Closed Center systems with variable pumps or for simultaneous supply of two or more manifolds from a shared constant pump
- **PSM:** Connection block capable of switching between Open Center and Closed Center

Ordering example

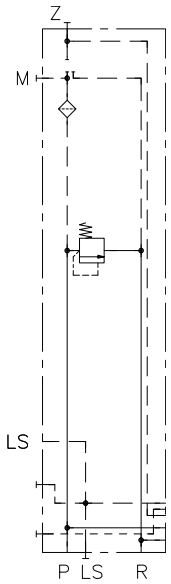
PSL 4 Y	H	G	1	F	/420	-3

- 2.1.9 "Size"
- 2.1.8 "System pressure limitation"
- 2.1.7 "LS relief or LS pressure limitation"
- 2.1.6 "Internal control oil supply"
- 2.1.5 "LS damping elements"
- 2.1.4 "Additional elements for 3-way controller"
- **Basic type**
  - 2.1.1 "Basic version"
  - 2.1.2 "Ports for P and R"
  - 2.1.3 "Connection block basic types"

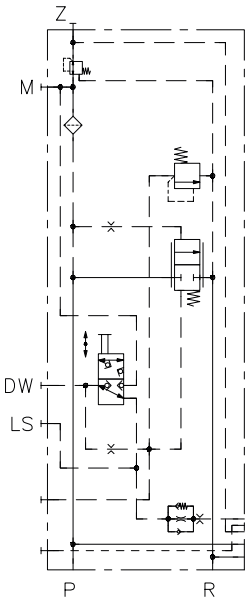
PSL



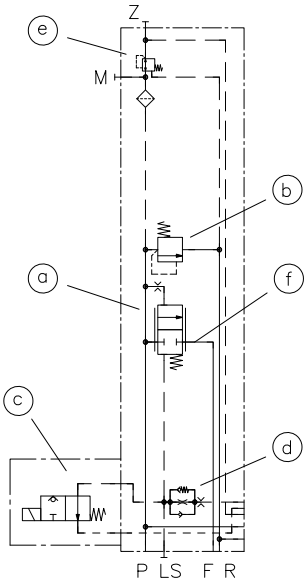
PSV

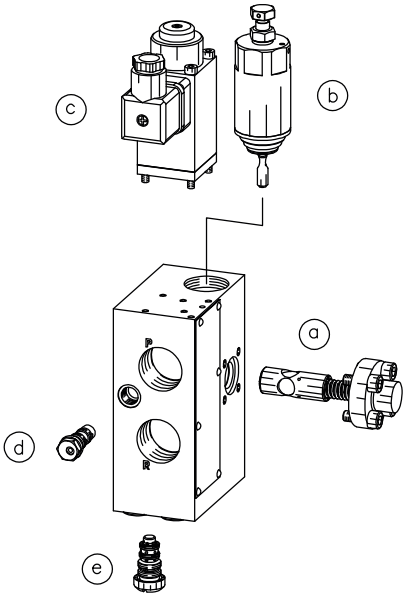


PSM



Depending on the configuration, the connection blocks incorporate:





a. A 3-way controller for Open Center systems with constant pump
b. A pressure-limiting valve to ensure maximum system pressure
c. An LS pressure-limiting valve to cap or relieve LS pressure
d. A damping element to attenuate LS signal oscillation
e. A pressure reducing valve for internal control oil supply to the downstream valve sections
f. Various additional elements (e.g. idle circulation valve, power-beyond function, P-line shut-off, mechanical locking of the 3-way controller)

2.1.1 Basic version

Type	Description
PSL	Connection block with integrated 3-way controller for use in Open Center systems with constant pumps
PSV	Connection block without 3-way controller for use in Closed Center systems with variable pumps or for simultaneous supply of two or more manifolds from a shared constant pump
PSM	Connection block capable of switching between Open Center and Closed Center

NOTICE
For instructions on how to convert the connection block from PSL to PSV, see Chapter 5.2.3

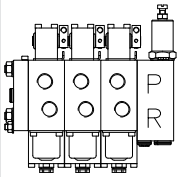
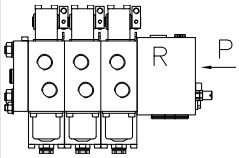
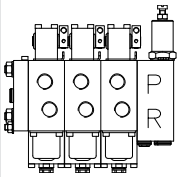
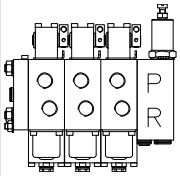
2.1.2 Ports for P and R

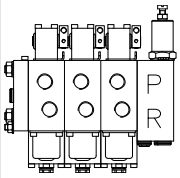
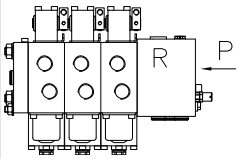
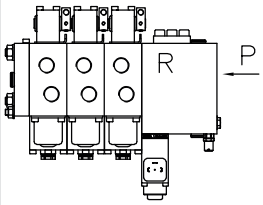
Coding	Description of P and R port
3	G 1/2 (ISO 228-1)
4	G 3/4 (ISO 228-1)
45	P connection: G 3/4 (ISO 228-1) R port: G 1 (ISO 228-1)
5, 55	G 1 (ISO 228-1)
6	G 1 1/4 (ISO 228-1)
UNF 4, UNF 44	SAE-12 or 1 1/16-12 UN-2B (SAE J 514)
UNF 5	SAE-16 or 1 5/16-12 UN-2B (SAE J 514)
JIS 4	G 3/4 (JIS B 2351)

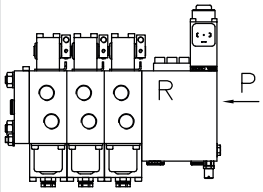
NOTICE
If the connection block basic types PSL 45.., PSL 5.., PSV 45.., PSV 5.., PSV 55.., PSM 5.. are used and a valve section with ancillary block (coding SL 3-A..) follows, a 5-mm-thick spacer plate is required in between (SL 3-ZPL 33/5). During assembly, this prevents a collision between the fitting on the R port and the ancillary block.

2.1.3 Connection block basic types

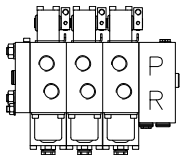
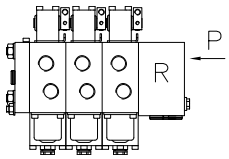
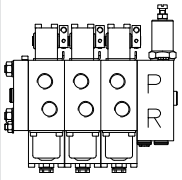
PSL connection blocks

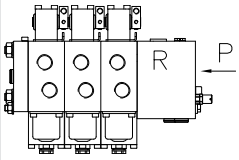
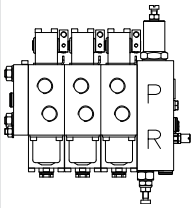
Type	Description
PSL 3.../...-3 **PSL 4.../...-3** **PSL JIS 4.../...-3**	Standard connection block with integrated 3-way controller. Pressure-limiting valve: direct actuation P port: aligned towards consumer ports A/B 
PSL 45.../...-3 **PSL 5.../...-3** **PSL UNF 4.../...-3**	Standard connection block with integrated 3-way controller. Pressure-limiting valve: pilot-controlled P connection: on side 
PSL 4 Y.../...-3 **PSL UNF 4 Y.../...-3**	Special version with an additional connection suitable for pressure loads for the 3-way controller's outflow (power beyond function). You can connect a second manifold to the F port. The first manifold’s valve sections are prioritised. The second manifold's valve sections are supplied with the remaining flow rate. Pressure-limiting valve: direct actuation P port: aligned towards consumer ports A/B 
PSL 4 Z.../...-3	Special version with LS damper valve type G as per Chapter 2.1.5 and an additional release valve. The release valve provides rapid LS relief when all directional spool valves are in neutral position. Once all valve sections signal an LS pressure below around 1/3 of the 3-way controller's spring cavity pressure, the release valve opens and funnels pressure from the spring cavity to the reflux. Version Z combines good damping characteristics with rapid relief. Common applications include systems that are susceptible to vibration and combinations with load-holding valves. Pressure-limiting valve: direct actuation P port: aligned towards consumer ports A/B 

Type	Description
PSL 4 K.../...-3	Special version with cascade damping and an additional release valve. The release valve provides rapid LS relief when all directional spool valves are in neutral position. Once all valve sections signal an LS pressure below around 1/3 of the 3-way controller's spring cavity pressure, the release valve opens and funnels pressure from the spring cavity to the reflux. Version K combines good damping characteristics with rapid relief. Common applications include systems that are susceptible to vibration and combinations with load-holding valves. Pressure-limiting valve: direct actuation P port: aligned towards consumer ports A/B 
PSL 45 U.../...-3 **PSL 5 U.../...-3**	Special version with an additional idle circulation valve for automatic reduction of circulation pressure. The idle circulation valve opens when the current LS pressure drops below 25% of the pump pressure. Electro-hydraulic actuation with internal control oil supply requires a pump flow rate of at least 80 l/min, pilot pressure will otherwise not suffice to shift the spool valve. Load pressure must be at least 20 bar. Pressure-limiting valve: pilot-controlled P port: on side 
PSL 6...UC 22 2/...-3	Special version with an option to reduce the circulation pressure, in particular at high flow rates. The idle circulation valve reduces the circulation pressure to approx. 2.5 bar, resulting in improved energy efficiency in unpressurised circulation. It can be deactivated by an electric pilot valve. This additional valve can optionally be selected according to Chapter 2.1.7, "LS relief or LS pressure limitation". Common applications are road vehicles with large constant pumps that frequently run in unpressurised circulation (e.g. municipal trucks). Pressure-limiting valve: pilot-controlled P port: on side Position of optional LS relief or LS pressure limitation: On the side of the spring housings and solenoids  **Ordering example:** PSL 61 F UC22 2/350-3

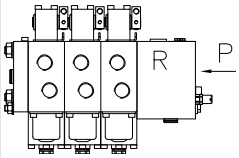
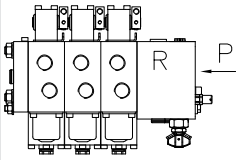
Type	Description
PSL 6...UC 22 A/...3	Special version with an option to reduce the circulation pressure, in particular at high flow rates. The idle circulation valve reduces the circulation pressure to approx. 2.5 bar, resulting in improved energy efficiency in unpressurised circulation. It can be deactivated by an electric pilot valve. This additional valve can optionally be selected according to Chapter 2.1.7, "LS relief or LS pressure limitation". Common applications are road vehicles with large constant pumps that frequently run in unpressurised circulation (e.g. municipal trucks). Pressure-limiting valve: pilot-controlled P port: on side Position of optional LS relief or LS pressure limitation: On the side of the lever housing  **Ordering example:** PSL 61 F UC 22 2A/350-3

PSV connection blocks

Type	Description
PSV 3...-3 **PSV 4...-3** **PSV 5...-3** **PSV 6...-3** **PSV UNF 4...-3**	Standard connection block without 3-way controller. Pressure-limiting valve: without P port for coding 3, 4, 5 and UNF 4: aligned towards consumer ports A/B P port for coding 6: on side Coding **3, 4, 5, UNF 4**  Coding **6**  PSV 6...-3 cannot be combined with an LS release valve or LS pressure-limiting valve as per Chapter 2.1.7.
PSV 3.../...-3 **PSV 4.../...-3** **PSV 5.../...-3**	Standard connection block without 3-way controller. Pressure-limiting valve: direct actuation P port: aligned toward consumer ports A/B 

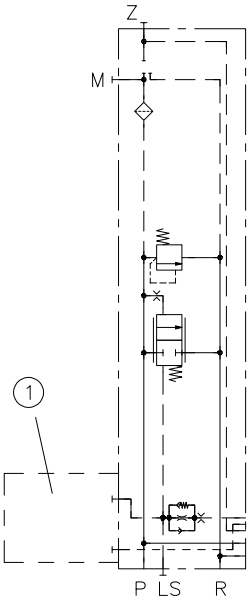
Type	Description
PSV 45.../...-3 **PSV 55.../...-3** **PSV UNF 44.../...-3**	Standard connection block without 3-way controller. Pressure-limiting valve: pilot-controlled P connection: on side 
PSV 5 N.../.../...-3 **PSV UNF 5 N.../.../...-3**	Special version with additional P channel shut-off to safely shut off pump and consumer from one another and prevent undesired movements. The P channel incorporates a piston controlled by a 2/2-way directional valve. In the de-energised state, the piston safely shuts off the P channel. The P channel is opened by actuating the 2/2-way directional valve. ▪ PSV (UNF) **N.. :** 2/2-way directional valve type EM 11 S as per D 7490/1 ▪ PSV (UNF) **NM.. :** with wing bolt for mechanical locking (EM 11 S-...M) ▪ PSV (UNF) **NP.. :** with button for manual override (EM 11 ST) Optionally, an additional LS release valve is available to depressurise the LS signal and switch the pump to standby pressure. ▪ PSV (UNF) 5 N **V:** LS relief, closed when unpowered (EM 11 V as per D 7490/1) ▪ PSV (UNF) 5 N **Z:** LS relief, open when unpowered (EM 11 S as per D 7490/1) ▪ PSV (UNF) 5 N **ZM:** LS relief, open when unpowered, with wing bolt for mechanical locking (EM 11 S-...-M) ▪ PSV (UNF) 5 N **ZP:** LS relief, open when unpowered, with button for manual override (EM 11 ST) The LS pressure-limiting valve can optionally be deselected. ▪ PSV (UNF) 5 N../ **X**-3 Only possible in conjunction with LS damping (see Chapter 2.1.5) **Ordering example:** PSV 5 NMB 61ZM/220/200-3 – Setting for main pressure-limiting valve: 220 bar – Setting for LS pressure-limiting valve: 200 bar Pressure-limiting valve: direct actuation P port: aligned toward consumer ports A/B  **NOTICE** If a P channel shut-off is being used, there will be an additional pressure drop in the P channel. This may mean that the nominal value is no longer reached in the downstream sections. **The undershooting of the nominal value depends on the** ▪ control pressure difference in the variable pump's pump controller, ▪ position of the valve section in the manifold and ▪ flow rate through the P channel shut-off. The undershooting of the nominal value can reach up to 30% of $Q_{nominal}$, see Chapter 2.2.1.6.

PSM connection blocks

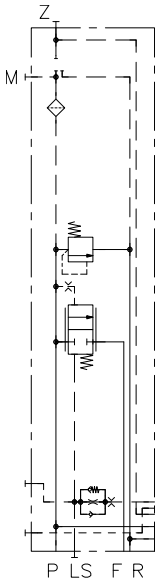
Type	Description
PSM 5.../...-3 **PSM UNF 4.../...-3**	Special version capable of switching between Open Center and Closed Center. Switchover is performed using an external 3/2-way directional valve. This valve is not included in the scope of delivery. Pressure-limiting valve: pilot-controlled P port: on side 
PSM 5 L.../...-3	Special version capable of switching between Open Center and Closed Center. Switchover is performed using an integrated 3/2-way directional valve. In the case of a screwed-in 3/2-way directional valve: PSV / Closed Center In the case of an unscrewed directional valve: PSL / Open Center Pressure-limiting valve: pilot-controlled P port: on side 

Circuit symbols

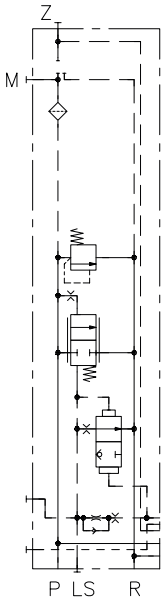
PSL 3.../...-3
PSL 4.../...-3
PSL JIS 4.../...-3



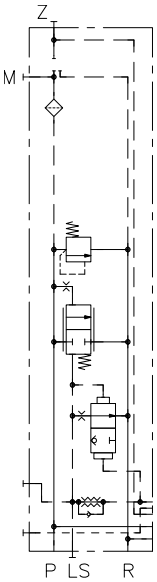
PSL 4 Y.../...-3
PSL UNF 4 Y.../...-3



PSL 4 Z.../...-3

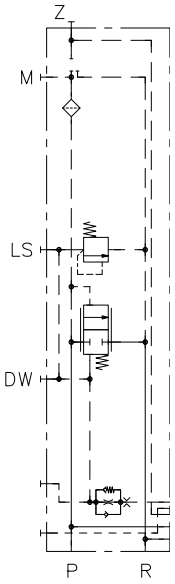


PSL 4 K.../...-3

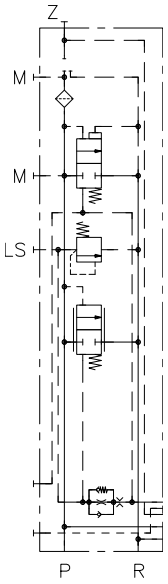


1 Interface for LS relief or LS pressure limitation see Chapter 2.1.7, "LS relief or LS pressure limitation"
(by way of example for all connection blocks)

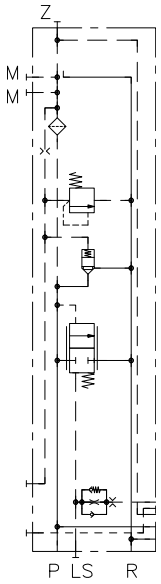
PSL 45.../...-3
PSL 5.../...-3
PSL UNF 4.../...-3



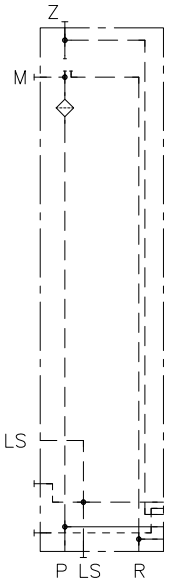
PSL 45 U.../...-3
PSL 5 U.../...-3



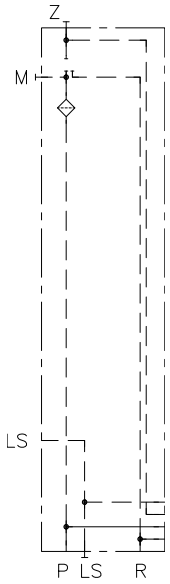
PSL 6...UC 22 2/...-3



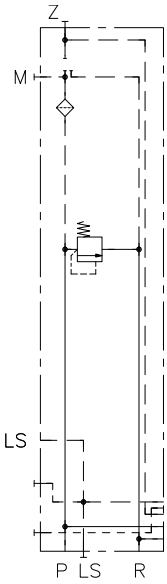
PSV 3...-3
PSV 4...-3
PSV 5...-3
PSV UNF 4...-3



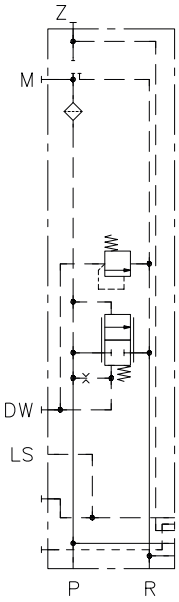
PSV 6...-3



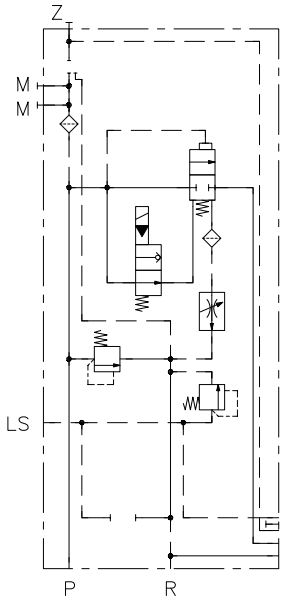
PSV 3.../...-3
PSV 4.../...-3
PSV 5.../...-3



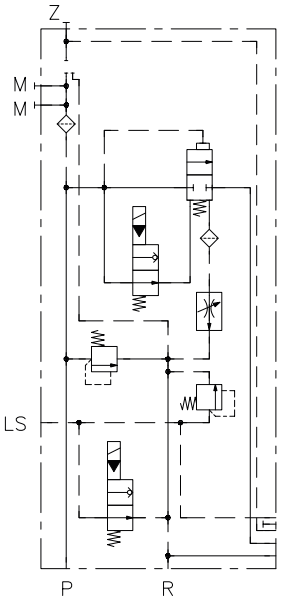
PSV 45.../...-3
PSV 55.../...-3
PSV UNF 44.../...-3



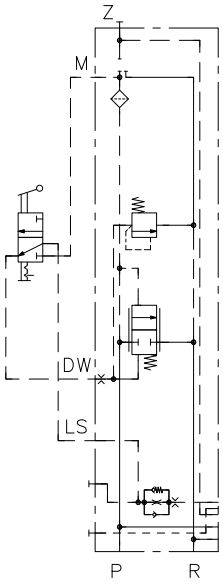
PSV 5 N.../.../...-3
PSV UNF 5 N.../.../...-3



PSV 5 N...Z/.../...-3

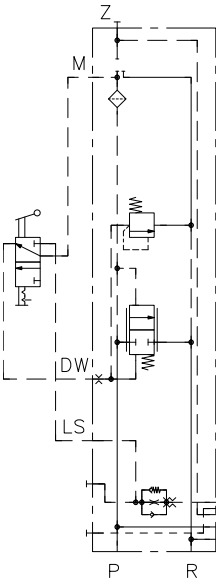


PSM 5.../...-3
PSM UNF 4.../...-3



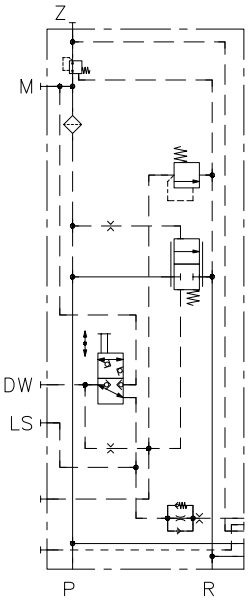
Schematic for
constant pump systems

PSM 5.../...-3
PSM UNF 4.../...-3



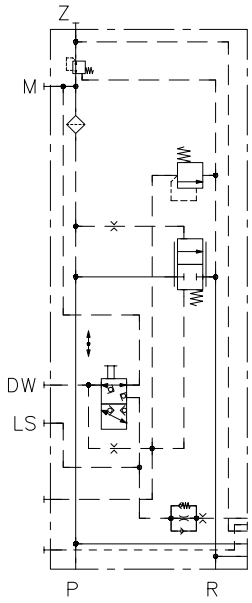
Schematic for
variable pump systems

PSM 5 L.../...-3



Schematic for
constant pump systems
3/2-way directional valve
unscrewed

PSM 5 L.../...-3

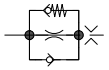
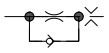


Schematic for
variable pump systems
3/2-way directional valve
screwed in

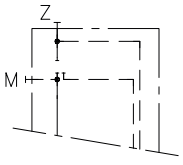
2.1.4 Additional elements for 3-way controller

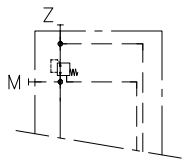
Coding	Description
without coding	Standard version 3-way controller with 9 bar circulation pressure
H	Special version 3-way controller with higher circulation pressure (14 bar)
T, TR	Special version for mechanical locking of the 3-way controller Only for connection blocks type PSL 3 and PSL 4 ▪ T: tool adjustable ▪ TR: manually adjustable using turning knob
HT, HTR	Special version 3-way controller with higher circulation pressure (14 bar) and mechanical locking Only for connection blocks type PSL 3 and PSL 4 ▪ HT: tool adjustable ▪ HTR: manually adjustable using turning knob

2.1.5 LS damping elements

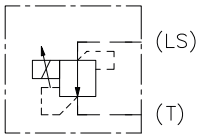
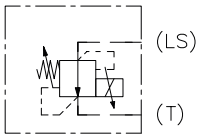
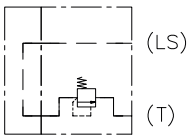
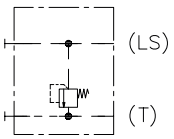
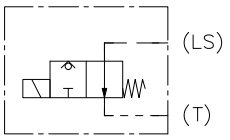
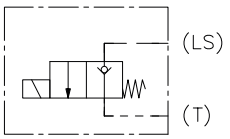
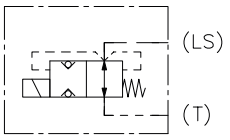
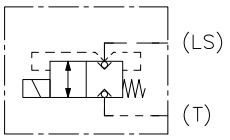
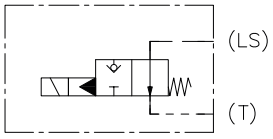
Coding	Description	Circuit symbol
without coding	▪ For PSL and PSM: as for coding S ▪ For PSV: without LS damping	-
B	∅ 0.8 mm orifice	
B 4 **B 5** **B 6** **B 7**	∅ 0.4 / 0.5 / 0.6 / 0.7 mm orifice	
B 55	Two ∅ 0.5 mm orifices in series	
S	Pre-load and damper valve (pre-load pressure: 25 bar)	
W	Pre-load and damper valve with increased throttle effect (pre-load pressure: 25 bar)	
E	Damper valve without pre-load valve Because there is no pre-load valve, LS relief with all directional spool valves in neutral position occurs with a slight delay, system pressure drops only slowly. Common applications include consumers with a tendency to oscillate at low frequencies.	
G	Damper valve with increased throttle effect without pre-load valve (Throttle cross-section smaller than for coding E) Because there is no pre-load valve, LS relief with all directional spool valves in neutral position occurs with a slight delay, system pressure drops only slowly. Common applications include consumers with a tendency to oscillate at low frequencies.	

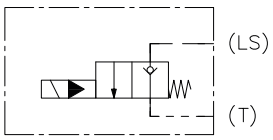
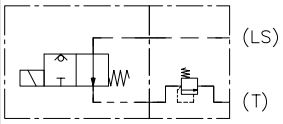
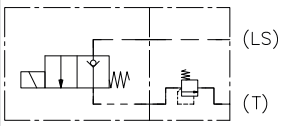
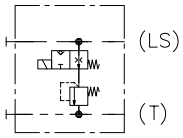
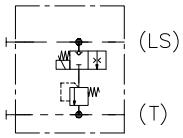
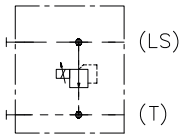
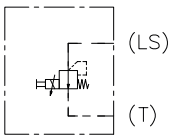
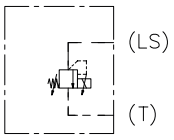
2.1.6 Internal control oil supply

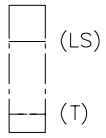
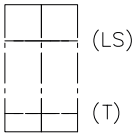
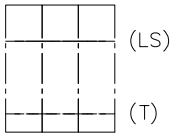
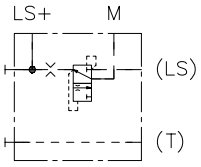
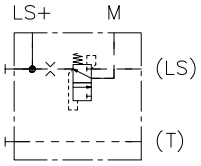
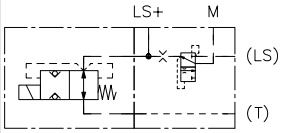
Coding	Description	Circuit symbol
without coding	Without internal control oil supply For valve sections with manual, hydraulic or pneumatic actuation. Or for external control oil supply (required pilot pressure: 20 to 40 bar).	

Coding	Description	Circuit symbol
1, 2	With internal control oil supply For valve sections with electro-hydraulic actuation. Optionally, a small quantity of control oil can be siphoned from the Z port to supply externally connected additional valves. In this case, the maximum permissible flow rate is 2 l/min. ▪ 1: 20 bar pilot pressure ▪ 2: 40 bar pilot pressure **NOTICE** If multiple valve sections need to be actuated simultaneously, we recommend a pilot pressure of 40 bar.	

2.1.7 LS relief or LS pressure limitation

Coding	Description	Circuit symbol
without coding	Without LS relief or LS pressure limitation	⊢ (LS) ⊢ (T)
PMVE 1 S... **PMVE 1 R...**	Proportional LS pressure limitation ▪ **PMVE 1 S...:** rising characteristic line according to D 8143 ▪ **PMVE 1R...:** falling characteristic line according to D 8143 Ordering example: PSL 31 PMVE1RD200/200-3 **PMVE 1** **R** **D** **200** Pressure setting Pressure range Circuit symbol Basic type	PMVE 1 S...  PMVE 1 R... 
X...	LS pressure limitation (Adjustment range: 50 to 400 bar)	
VX...	LS pressure limitation (Adjustment range: 50 to 400 bar) Prepared for later conversion to coding ZD..., ZDM..., ZDP... or VD...	
F	LS relief, open when unpowered (WN 1 F as per D 7470 A/1)	
D	LS relief, closed when unpowered (WN 1 D as per D 7470 A/1)	
F BVE	LS relief, open when unpowered (BVE 1 S as per D 7921) When combined with solenoid version G 24 EX 55 FM, only approved for up to 400 bar.	
D BVE	LS relief, closed when unpowered (BVE 1 R as per D 7921) When combined with solenoid version G 24 EX 55 FM, only approved for up to 400 bar.	
ZA **ZAM** **ZAP**	LS relief, open when unpowered ▪ **ZA:** EM 11 S as per D 7490/1 ▪ **ZAM:** with wing bolt for mechanical locking (EM 11 S-...-M) ▪ **ZAP:** with button for manual override (EM 11 ST)	

Coding	Description	Circuit symbol
VA	LS relief, closed when unpowered (EM 11 V as per D 7490/1)	
F...	Switchable LS pressure limitation, active when unpowered (WN 1 F as per D 7470 A/1) (Adjustment range: 50 to 400 bar)	
D...	Switchable LS pressure limitation, disabled when unpowered (WN 1 D as per D 7470 A/1) (Adjustment range: 50 to 400 bar)	
ZD... **ZDM...** **ZDP...**	Switchable LS pressure limitation, active when unpowered. ▪ **ZD...**: EM 21 DS as per D 7490/1 ▪ **ZDM...**: with wing bolt for mechanical locking (EM 21 DS-...-M) ▪ **ZDP...**: with button for manual override (EM 21 DST)	
VD...	Switchable LS pressure limitation, disabled when unpowered (EM 21 D as per D 7490/1 E)	
PA **PB** **PC** **PD**	Proportional LS pressure limitation with ascending characteristic line Pressure ranges: ▪ **PA:** 35 to 320 bar ▪ **PB:** 25 to 210 bar ▪ **PC:** 40 to 400 bar ▪ **PD:** 50 to 420 bar	
Z **ZM** **ZP**	Proportional LS pressure limitation with ascending characteristic line ▪ **Z:** EM 21 DSE as per D 7490/1 E ▪ **ZM:** with wing bolt for mechanical locking (EM 21 DSE-...-M) ▪ **ZP:** with button for manual override (EM 21 DSET) **NOTICE** In conjunction with the connection block PSV 5 N..., EM 21 DSE is not used; instead, the valve EM 11 V as per D 7490/1 is used.	
V	Proportional LS pressure limitation with descending characteristic line (EM 21 DE as per D 7490/1) **NOTICE** In conjunction with the connection block PSV 5 N..., EM 21 DSE is not used; instead, the valve EM 11 V as per D 7490/1 is used.	

Coding	Description	Circuit symbol
X9 **X18** **X27**	Intermediate plate for turning the downstream valve for LS relief or LS pressure limitation ▪ **X9:** Turns clockwise through 90° ▪ **X18:** Turns through 180° ▪ **X27:** Turns clockwise through 270°	X9  X18  X27 
Z ADM 0 **Z ADM 3**	Intermediate plate with copier valve for amplifying LS signal ▪ **0:** without LS pressure amplification ▪ **3:** with 3 bar LS pressure amplification The M port of the copier valve is connected externally to the M port on the connection block. Optionally, additional LS damping is possible. The copier valve is designed as an intermediate plate. Port T and LS+ are usually sealed. If required, you can connect a release valve type F, D, F BVE or D BVE there (e.g. Z ADM 0/F BVE). Not in conjunction with connection block PSM 5 L.../...-3, as per Chapter 2.1.3, "Connection block basic types". **NOTICE** When used in conjunction with the connection blocks PSL 3.../...-3, PSL 4.../...-3, PSL 4 Y.../...-3, PSL 4 Z.../...-3, PSL 4 K.../...-3 , PSV 3.../...-3, PSV 4.../...-3, PSV 5.../...-3, an X9 intermediate plate must be used. Hoses or pipes for M ports are not included in the scope of delivery.	Z ADM 0  Z ADM 3  Z ADM 0/F BVE 

NOTICE

LS relief valves and LS pressure-limiting valves of types X..., VX..., ZA, ZAM, ZAP, VA, F..., D..., ZD..., ZDM..., ZDP..., VD..., PA, PB, PC, PD, Z, ZM, ZP and V require the intake to be limited by means of LS damping, in order to ensure reliable release/pressure limitation, Chapter 2.1.5, "LS damping elements"

NOTICE
If LS pressure-limiting valves of types PA, PB, PC, PD, Z, ZM, ZP, V are used for emergency stop functions, it is important to note that a certain residual pressure will always remain while the directional spool valve is shifted and there is a load pressure.

LS damping	Residual pressure at load pressure of	
Coding	**250 bar**	**350 bar**
B, S, W, E, G	125	150
B 7	100	120
B 6	85	95
B 5	75	80
B 4	60	70

see Chapter 2.1.5, "LS damping elements"

2.1.8 System pressure limitation

Coding	Description
without coding	Without pressure-limiting valve (only in the case of PSV)
/...	With pressure-limiting valve (Adjustment range 50 to 420 bar)
/.../...	With pressure-limiting valve and LS pressure-limiting valve (only for PSV 5 N and PSV UNF 5 N) The first value is the setting for the main pressure-limiting valve, the second value is the setting for the LS pressure-limiting valve.

2.1.9 Size

Coding	Description
-3	Size 3

For size 2, see D 7700-2, and for size 5, see D 7700-5

2.1.10 Variants and potential combinations

PSL connection blocks

Type	P and R port as per ISO 228-1 or SAE J 514 or JIS B 2351	Max. recommended flow rate (l/min)	Pressure-limiting valve		Position of P connection	
			direct actuation	pilot-controlled	aligned toward consumer ports A/B	on side, with horizontal intake
PSL 3.../...-3	G 1/2	80	●		●	
PSL 4.../...-3	G 3/4	100	●		●	
PSL 4 Y.../...-3	G 3/4	100	●		●	
PSL 4 Z.../...-3	G 3/4	100	●		●	
PSL 4 K.../...-3	G 3/4	100	●		●	
PSL 45.../...-3	G 3/4 and G 1	200		●		●
PSL 5.../...-3	G 1	200		●		●
PSL 45 U.../...-3	G 3/4 and G 1	200		●		●
PSL 5 U.../...-3	G 1	200		●		●
PSL 6...UC 22 2/ ...-3	G 1 1/4	200		●		●
PSL UNF 4.../...-3	SAE-12 (1 1/16-12 UN-2B)	200		●		●
PSL UNF 4 Y.../...-3	SAE-12 (1 1/16-12 UN-2B)	100	●		●	
PSL JIS 4.../...-3	JIS G 3/4	100	●		●	

PSV connection blocks

Type	P and R port as per ISO 228-1 or SAE J 514	Max. recommended flow rate (l/min)	Pressure-limiting valve			Position of P connection	
			none	direct actuation	pilot-controlled	aligned toward consumer ports A/B	on side, with horizontal intake
PSV 3...-3	G 1/2	80	●			●	
PSV 4...-3	G 3/4	100	●			●	
PSV 5...-3	G 1	150	●			●	
PSV 6...-3	G 1 1/4	200	●				●
PSV 3.../...-3	G 1/2	80		●		●	
PSV 4.../...-3	G 3/4	100		●		●	
PSV 5.../...-3	G 1	130		●		●	
PSV 45.../...-3	G 3/4 and G 1	200			●		●
PSV 55.../...-3	G 1	200			●		●
PSV 5 N...-3	G 1	150		●		●	
PSV UNF 4...-3	SAE-12 (1 1/16-12 UN-2B)	130	●			●	
PSV UNF 44.../...-3	SAE-12 (1 1/16-12 UN-2B)	200			●		●
PSV UNF 5 N...-3	SAE-16 (1 5/16-12 UN-2B)	150		●		●	

PSM connection blocks

Type	P and R port as per ISO 228-1 or SAE J 514	Pressure-limiting valve		Position of P port	
		direct actuation	pilot-controlled	aligned toward consumer ports A/B	on side, with horizontal intake
PSM 5.../...-3	G 1		●		●
PSM 5 L.../...-3	G 1		●		●
PSM UNF 4.../...-3	SAE-12 (1 1/16-12 UN-2B)		●		●

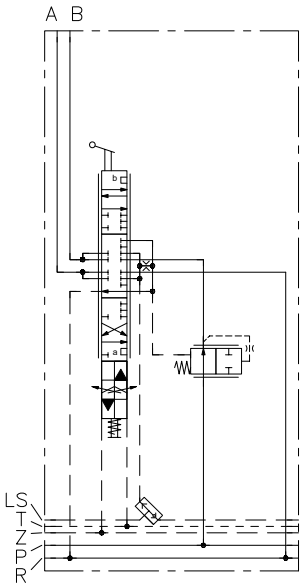
INFORMATION
You can find the dynamic pressure characteristic lines for the various connection blocks in Chapter 3.4, "Characteristic lines".
The characteristic lines assist in choosing a connection block suitable for the respective flow rate.

2.2 Valve section

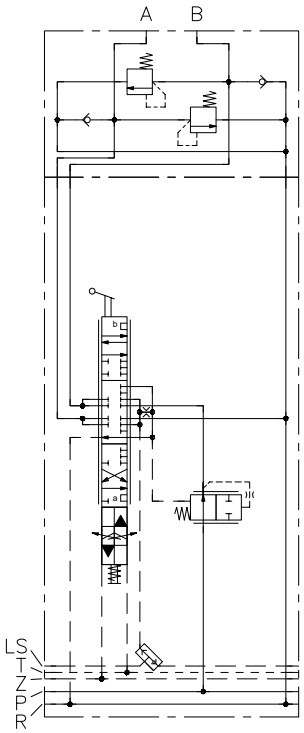
A directional valve section is either available with integrated threads for the consumer ports A and B, or with a flange surface for mounting an ancillary block or an intermediate plate.

- see Chapter 2.2.1, " Directional valve section "
- see Chapter 2.2.2, "Ancillary block"
- see Chapter 2.2.3, "Intermediate plate"

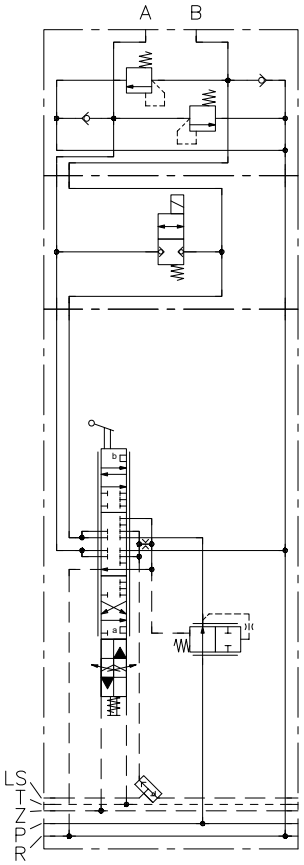
Valve section
with integrated connection threads



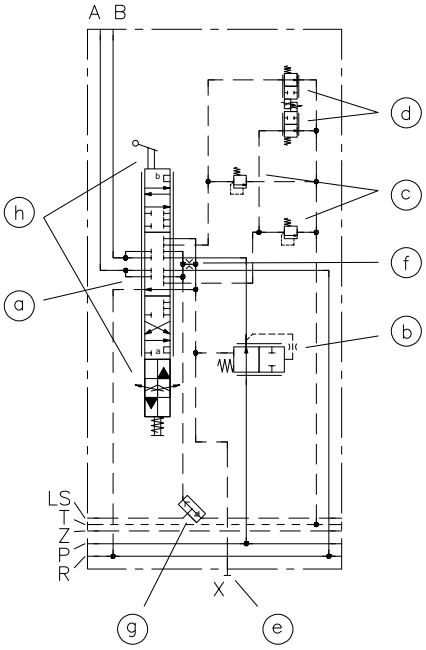
Valve section
with ancillary block

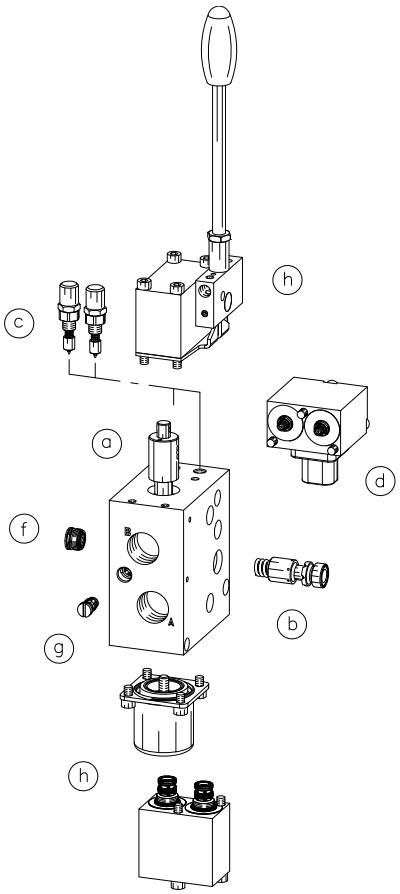


Valve section
with intermediate plate and ancillary block



Depending on the configuration, the directional valve sections incorporate





a. A valve spool for controlling proportional flow rate
b. A 2-way controller (pressure compensator) for controlling a constant pressure difference using the valve spool, irrespective of the current load pressure and pump pressure
c. Fixed LS pressure-limiting valves
d. Electric LS pressure-limiting valves for relief or electro-proportional limitation of the LS pressure
e. Additional connections for external LS pressure limitation
f. An LS orifice for damping the LS signal
g. A shuttle valve for linking the LS line to additional valve sections
h. An actuation for shifting the valve spool

Ordering example

SL 3	- A	R5X	H 80/80	A200 B300 F3 XH	9	W3	L	/EFA1	WA	/ZDRH	/3

- /3 → 2.2.2 "Ancillary block"
- /ZDRH → 2.2.3 "Intermediate plate"
- WA → 2.2.1.15 "Switching position monitoring, displacement transducer"
- /EFA1 → **Actuation**
  - 2.2.1.13 "Actuation"
  - 2.2.1.14 "Additional elements for actuation"
- L → 2.2.1.12 "Additional functions"
- W3 → 2.2.1.11 "Shuttle valve"
- 9 → 2.2.1.10 "LS orifice"
- A200 B300 F3 XH → **LS pressure limitation**
  - 2.2.1.7 "LS pressure limitation"
  - 2.2.1.8 "Electric LS relief or LS pressure limitation"
  - 2.2.1.9 "LS port for external limitation"
- H 80/80 → **Valve spool**
  - 2.2.1.5 "Circuit symbol"
  - 2.2.1.6 "Flow rate"
- R5X → **Valve section, 2-way controller**
  - 2.2.1.2 "2-way controller"
  - 2.2.1.3 "2-way controller spring"
  - 2.2.1.4 "2-way controller damping"
- - A → 2.2.1.1 "Consumer ports"

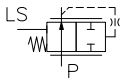
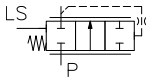
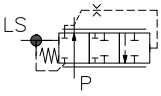
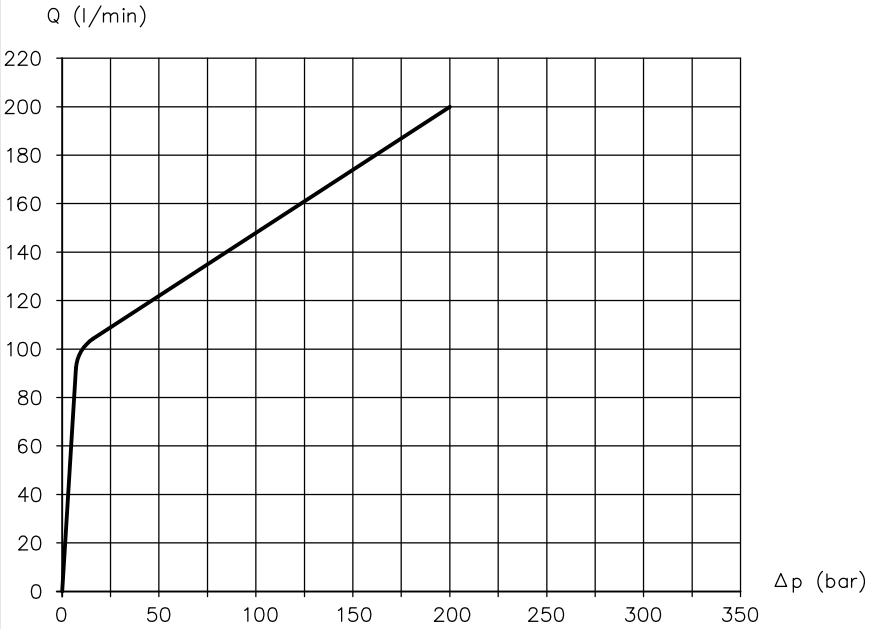
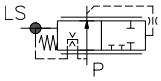
2.2.1 Directional valve section

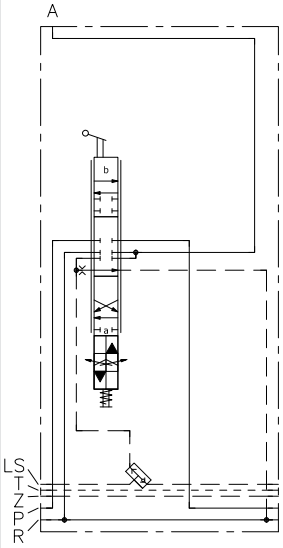
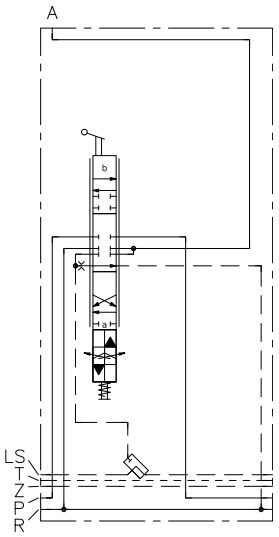
2.2.1.1 Consumer ports

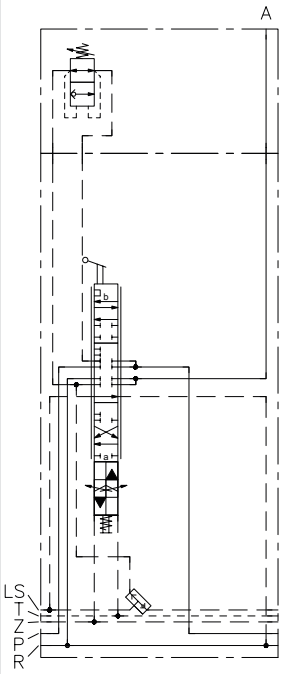
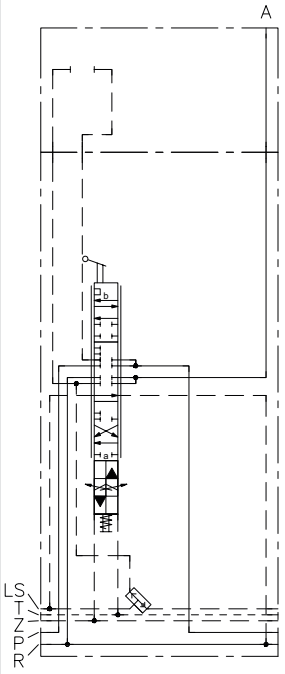
Coding	Description
A	Spool block without integrated thread for combining with an ancillary block (Chapter 2.2.2) or an intermediate plate (Chapter 2.2.3)
3	Consumer ports A and B in G 1/2 (ISO 228-1)
4	Consumer ports A and B in G 3/4 (ISO 228-1)
UNF 3	Consumer ports A and B in SAE-10 or 7/8-14 UNF-2B (SAE J 514) Only in conjunction with ▪ Actuation coding E... (Chapter 2.2.1.13) ▪ LS pressure limitation without designation or coding AB, A..., B... or A... B... (Chapter 2.2.1.7)
UNF 4	Consumer ports A and B in SAE-12 or 1 1/16-12 UN-2B (SAE J 514) Only in conjunction with ▪ Actuation coding E... (Chapter 2.2.1.13) ▪ Valve section coding 8 (Chapter 2.2.1.2)

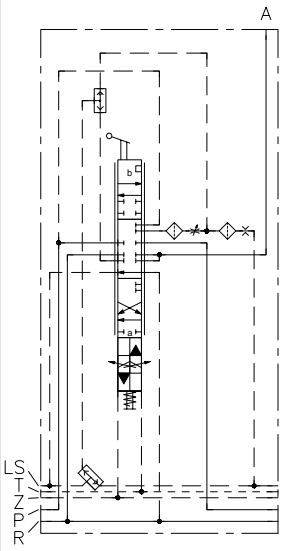
NOTICE
When combining a connection block type PSL 5, PSV 55 and PSM 5 with a valve section with ancillary block (coding SL 3-A...), you will need to fit a 5 mm spacer plate (SL 3-ZPL 33/5) behind the connection block to prevent a collision with the ancillary block when installing the fitting on the R port.

2.2.1.2 2-way controller

Coding	Description	Circuit symbol
without coding	Standard 2-way controller	
1	Without 2-way controller	-
R	2-way controller with check valve function In the event of a shortage in supply, the controller prevents return flow from the load line (A or B-line) to the P-line. Only in conjunction with 2-way controller spring coding 2 and 5, Chapter 2.2.1.3	
D	2-way controller with release of pressure The controller prevents pressure creep in the P-line between the 2-way controller and valve spool. Common applications include consumers with very low load pressures and without additional check valves. When using standard 2-way controllers, phantom movements may occur here. The D-controller can prevent this because the pressure is relieved towards T. In applications with check valves, the D-controller prevents undesired check valve intervention.	
I	Special controller with ascending characteristic line The controller has an inclined characteristic line. Flow rate increases with increasing differential pressure.  *Δp differential pressure (bar); Q flow rate (l/min)* Common applications include drives for tracked crawlers. In these, one side is always slightly ahead, its load pressure thus higher. The controller makes driving straight ahead easier by automatically accelerating the lagging side and neutralising the offset between the two sides.	

Coding	Description	Circuit symbol
8	Pre-selector valve section without 2-way controller The pre-selector valve section shuts off the P-line in neutral position. Once the pre-selector valve is activated, it supplies either the downstream valve sections (switching position b) or a second manifold connected to port A (switching position a). ▪ **8:** LS signal is signalled from port A (switching position a) and the following valve section (switching position b). Standard configuration if an open-centre valve (PSL) is used on port A. ▪ **8 with shuttle valve W1 :** LS signal is only signalled by the downstream valve sections (switching position b). Is used if a Closed Center LS valve (PSV) is connected to port A; the LS signal is then usually signalled externally to the variable pump. Common applications include loading cranes, concrete line pumps and lifting platforms. In these, the pre-selector valve is used to switch between operating the crane or mast and the outriggers. The pre-selector valve can further also be used as a P-line shut-off in safety functions. ▪ SL 3-38.. : B port provided and sealed ▪ SL 3-48.. : B port not provided ▪ SL 3-UNF48.. : B port not provided Only in conjunction with ▪ PSL connection block with 3-way controller spring coding H (Chapter 2.1.4) or PSV connection block ▪ Consumer ports coding 3, 4 or UNF 4 (Chapter 2.2.1.1) ▪ Circuit symbol L or H (Chapter 2.2.1.5) ▪ Actuation coding E... (Chapter 2.2.1.13) **NOTICE** When using a pre-selector valve, there is an additional pressure drop in the P-line that can lead to the downstream sections no longer reaching the nominal value. **The undershooting of the nominal value depends on the** a) control pressure difference of the 3-way controller (PSL) or variable pump's pump controller (PSV), b) position of the valve section in the manifold and c) flow rate through the pre-selector valve or P-line shut-off. The undershooting of the nominal value can reach up to 30% of $Q_{nominal}$, Chapter 2.2.1.6.	• Standard (SL 3-48.. shown)  • With shuttle valve W1 

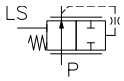
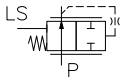
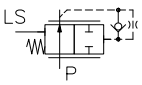
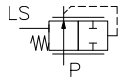
Coding	Description	Circuit symbol
A8...L1	Pre-selector valve with additional LS pressure increase for the downstream valve sections. In switching position b, the P line is switched to LS through the ancillary block with CDSV 1 A (as per D 7876). The pressure that should be applied in P when in switching position b can be adjusted by the CDSV. As a result, there is already pressure in P before one of the downstream valve sections signals LS. In the case of fast switching operations, a negative impact on the load can be prevented before the pump responds to the LS signal. The ancillary block in which the CDSV is installed is available in two versions: ▪ /3 CDSV 1 A-...: adjustment range of 100 - 420 bar ▪ /3 XCDSV 1: prepared for use with CDSV Not in conjunction with ▪ Shuttle valve W1 ▪ Shuttle valve W3 (In the case of a sub-optimal shuttle valve position relating to the downstream valve sections, the LS could be relieved via the end plate in R)	• A8..L1/../3 CDSV 1 A-..  • A8..L1/../3 XCDSV 1 

Coding	Description	Circuit symbol
...8...PVB	Pre-selector valve with LS pressure increase for the following valve sections. **Function:** The pre-selector valve generates an additional pressure loss in the P channel. As a result, the available flow rate for the downstream valve sections is also reduced, in particular in the case of PSL with a circulation pressure of 9 or 14 bar. The LS pressure increase increases the circulation pressure using a targeted feed-in from P in LS when the pre-selector valve is in switching position b. The increase is also active if no consumer signals LS. The higher the circulation pressure/standby pressure (delta between signalled LS and P), the higher the pressure increase will be. **Use with PSL:** If the circulation pressure is approx. 9 bar (PSL standard), LS will be increased by approx. 13 bar. This compensates for the pressure loss and it is no longer necessary to use 14 bar circulation pressure (coding H) for the pre-selector valve. **Use with PSV:** At a standby pressure of approx. 20 bar, the LS pressure increases by approx. 20 bar. The standby pressure can be reduced further in order to additionally save energy when the PSV valve bank is not in use. **Ordering example:** SL 3-38 L 80/80 **PV805** /EA Pressure vaccinated (pressure vaccinated B-side) orifice ∅ 0.5 mm Only in conjunction with **Consumer ports** Chapter 2.2.1.1 / **Actuation** Chapter 2.2.1.13 SL3-3... / with E **INFORMATION** ▪ In order to be able to correctly set the LS pressure limitation in the valve section, it is essential that the pressure gauge has been connected to the consumer pressure because the higher LS pressure is applied at the connection block. ▪ In the case of PSL, the pump flow rate may influence the LS pressure increase. The circulation pressure is influenced by the flow rate via the 3-way controller (P → R).	See 7700 240 C 

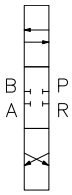
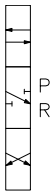
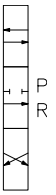
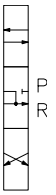
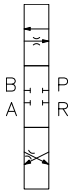
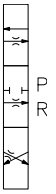
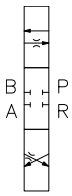
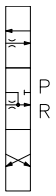
2.2.1.3 2-way controller spring

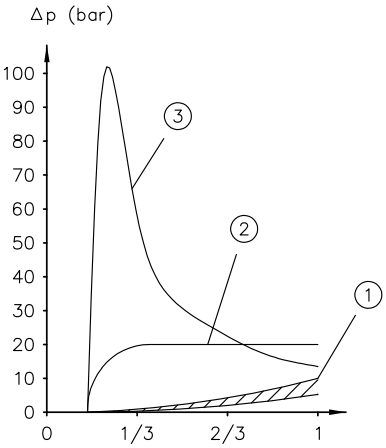
Coding	Description
without coding	Without coding for configurations without 2-way controller (coding 1 or 8 Chapter 2.2.1.2)
2	Standard version (6 bar spring)
5	Heavy-duty version (9 bar spring) Only possible in conjunction with PSL connection block with 3-way controller spring coding H (Chapter 2.1.4) or with PSV connection block
7	Heavy-duty version (13 bar spring) Only possible in conjunction with PSV connection block

2.2.1.4 2-way controller damping

Coding	Description	Circuit symbol
without coding	Standard version (damping with ∅ 0.5mm orifice)	
4 **6D**	Special version with stronger or weaker damping (∅ 0.4 or 0.6 mm orifice) ▪ Only in conjunction with standard 2-way controller (without coding) Chapter 2.2.1.2 ▪ **6D:** Only in conjunction with standard 2-way controller (without coding) or 2-way controller with check valve function (coding R) Chapter 2.2.1.2	
S	Special version with closing damping Only in conjunction with standard 2-way controller (without coding) Chapter 2.2.1.2 Sample application: Hydraulic motors with a small number of pistons or low rotation speed, leading to oscillating changes in the requested flow rate.	
X	Special version without damping Only in conjunction with standard 2-way controller (without coding) or 2-way controller with check valve function (coding R) Chapter 2.2.1.2	

2.2.1.5 Circuit symbol

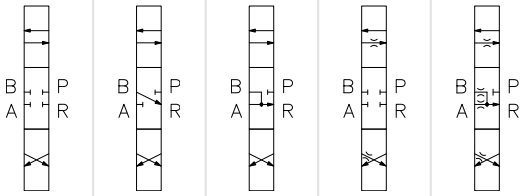
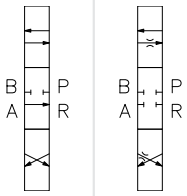
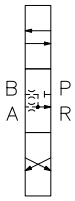
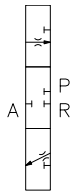
Coding	Description	Circuit symbol			
L, M, F, H	Standard spool valve with low return pressure	L 	M 	F 	H 
J, B, R, O	Standard spool valve with constant return pressure of 20 bar Common applications: Stabilising cylinders with dragging loads, especially when used with load-holding valves or when used without additional check valves.	J 	B 	R 	O 
I, Y, Z, V	Special spool valve with high return pressure at < 1/3 spool stroke. Rapid subsequent return pressure drop. Common applications: Controlled deceleration of winches, slewing gear or other rotating consumers.	I 	Y 	Z 	V 

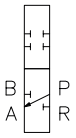
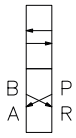
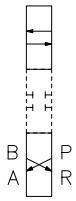


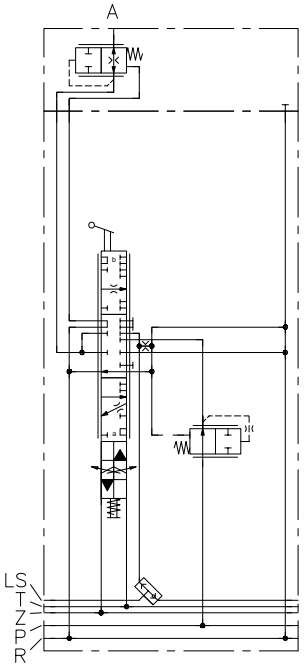
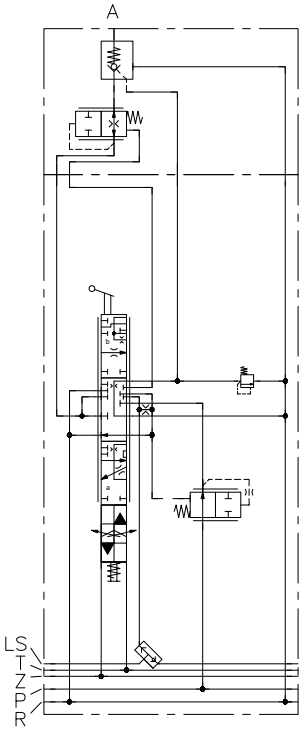
Δ$p_{A/B}$ return pressure (bar)

1 Circuit symbols L, M, F, H
2 Circuit symbols J, B, R, O
3 Circuit symbols I, Y, Z, V

NOTICE
The return pressure is in relation to the nominal flow rate. It may be higher or lower than shown in the diagram depending on the cylinder ratio or 2-way controller spring.

Coding	Description	Circuit symbol
LW, MW, HW, JW, OW	Standard spool valve with broad fitting tolerance. ▪ Advantage: reduces risk of jamming spool valve in systems prone to soiling. ▪ Drawback: higher spool valve leak rate **NOTICE** Not in conjunction with Chapter 2.2.1.8, "Electric LS relief or LS pressure limitation"	LW MW HW JW OW 
FE, JE	Standard spool valve with tight fitting tolerance. ▪ Advantage: lower spool valve leak rate ▪ Drawback: greater hysteresis Spool valves with tight fitting tolerance cannot be replaced later	FE JE 
LB	Special version with minimal release of pressure from A and B-line when spool valve in idle position. Sample application: Combined with load-holding valves that require closed spool valve in neutral position due to safety requirements, e.g. lifting platform. In this case, the LB spool valve prevents pressure from being trapped between the load-holding valve and spool valve.	LB 
G	Standard 3/3-way directional spool valve for single-acting cylinders The G spool valve can be combined with any valve section, port B is sealed with a tapped plug when doing so. No LS signal is produced when load drops. If used in conjunction with electro-hydraulic actuation and a PSL connection block with standard 3-way controller spring, this can result in the internally generated pilot pressure not being sufficient for the full spool valve stroke, Chapter 2.1.4. Load reduction is throttled using the spool valve's meter-out edge. If desired, the maximum reduction rate can be capped using a separate flow control valve (e.g. type SB as per D 6920). To obtain pressure-compensated load reduction, you can alternatively also use an N or NX spool valve.	G 

Coding	Description	Circuit symbol	
X **W**	Special spool valve in conjunction with P → A in neutral position Common applications: Fan drives, generator drives or other consumers requiring a specific flow rate when unpowered for safety reasons. ▪ **X:** 2/2-way directional spool valve Maximum flow rate in neutral position. By shifting the spool valve to switching position b, the flow rate can be reduced to zero proportionally. ▪ **W:** 4/2-way directional spool valve In neutral position, the maximum flow rate is towards A-side. By shifting the spool valve to switching position b, the direction is reversed and the flow rate is towards B-side. Decelerating consumer to zero as well as proportional flow rate control are only possible to a limited degree. This makes the W spool valve suitable primarily for applications with constant speed. LS is signalled in both switching positions. **Combination options:** Only with actuation concepts Chapter 2.2.1.13 that have stroke limitation. Available versions: ▪ X 80 ▪ W 50/50 Not in conjunction with actuation concepts which contain these codings: ▪ EI ▪ HI ▪ FI ▪ N ▪ K	X  	W  W Interme-diate position 

Coding	Description	Circuit symbol
N	Special 3/3-way directional spool valve for single-acting cylinders with outflow pressure compensator for pressure-compensated load reduction. The N spool valve is combined with a valve section designed specifically for this purpose and cannot be used with any other valve sections. No LS signal is produced when load drops. If used in conjunction with electro-hydraulic actuation and a PSL connection block with standard 3-way controller spring (Chapter 2.1.4), this can result in the internally generated pilot pressure not being sufficient for the full spool valve stroke. **Not compatible with LS pressure limitation and only in conjunction with** ▪ Ancillary block coding /3 DW, /4 DW or /UNF 3 DW (Chapter 2.2.2) ▪ Consumer ports coding A (Chapter 2.2.1.1) ▪ Actuation coding E... (Chapter 2.2.1.13)	
NX	Special 3/3-way directional spool valve for single-acting cylinders with outflow pressure compensator and releasable check valve for pressure-compensated load reduction and load holding without leaking seating. The NX spool valve is combined with a valve section designed specifically for this purpose and cannot be used with any other valve sections. An LS signal from P is generated internally when the load drops (switching position B). It is used to open the releasable check valve (HRP) and generate the control oil pressure required for the actuation. This LS pressure in switching position B (reduction) can be set to a maximum value using an integrated LS pressure-limiting valve. The HRP 4 V used requires a pilot pressure of approx. 25 bar at a load pressure of 420 bar. We therefore recommend only setting the LS pressure to 40 - 50 bar. The LS pressure-limiting valve only acts when load drops. Only in conjunction with ▪ Ancillary block coding /4.. HRP 4, /4.. HRP 4 V, /4.. HRPH 4, or /4.. HRPH 4 V (Chapter 2.2.2) ▪ Consumer ports coding A (Chapter 2.2.1.1) ▪ LS pressure limitation coding A... (Chapter 2.2.1.7) ▪ Actuation coding E... (Chapter 2.2.1.13) ▪ Internal control oil supply coding 2... (Chapter 2.1.6)	

NOTICE

- For instructions on how to replace the valve spool, Chapter 5.2.4.

2.2.1.6 Flow rate

Coding 2-way controller spring, see Chapter 2.2.1.3	Coding Flow rate ($Q_{nominal}$ in l/min) With maximum spool valve actuation							
	3	6	10	16	25	40	63	80
2	3	6	10	16	25	40	63	80
5	4	9	14	22	34	54	85	107
7	5	10	15	24	37	59	93	118

Flow rate for coding 1 and 8

On valve sections without a 2-way controller (coding 1 or 8, see Chapter 2.2.1.2, "2-way controller"), it is possible to calculate the flow rate using the following formula:

$$Q_{A/B} = Q_{nominal} \cdot \sqrt{0,2 \cdot \Delta p_{controller}}$$

$Q_{A/B}$ = flow rate to port A or B

$Q_{nominal}$ = Nominal flow rate of valve spool at pressure difference of 6 bar

$\Delta p_{controller}$ = control pressure difference of the 3-way controller (PSL) or variable pump's pump controller (PSV)

Example:

- PSL connection block, standard 3-way controller spring (9 bar)
  $Q_{A/B} = 80\ l/min \cdot \sqrt{0,2 \cdot 9} = 107\ l/min$
- PSL connection block, 3-way controller with heavy-duty spring (14 bar)
  $Q_{A/B} = 80\ l/min \cdot \sqrt{0,2 \cdot 14} = 134\ l/min$
- PSV connection block, pump controller with 25 bar standby pressure
  $Q_{A/B} = 80\ l/min \cdot \sqrt{0,2 \cdot 25} = 179\ l/min$

NOTICE
The calculated values are rough reference values!
They apply only to the highest-load consumer. If multiple consumers are being actuated in parallel, the pressure difference may be considerably greater at the lower-load consumers.

Flow rate for all codings

NOTICE
When using a pre-selector valve (coding 8 as per Chapter 2.2.1.2), a P channel shut-off (coding PSV 5 N or PSV UNF 5 N as per Chapter 2.1.1) or an intermediate plate (coding ZPL 3 S..., ZPL 3 V..., ZPL VQ..., ZPL 3P/... as per Chapter 2.3), there is an additional pressure drop in the P channel that can result in the downstream valve sections no longer reaching the nominal value.

The undershooting of the nominal value depends on

- the control pressure difference of the 3-way controller (PSL, Open Center) or variable pump's pump controller (PSV, Closed Center)
- the position of the valve section in the valve bank
- the flow rate through the pre-selector valve or P channel shut-off

The undershooting of the nominal value can reach up to 30% of $Q_{nominal}$, Chapter 2.2.1.6.

Flow rate coding

Spool valves are defined using two flow rate codings in the order coding. The first number defines the nominal flow rate on the A-side (Q_A) and the second number defines the nominal flow rate on the B-side (Q_B). The shape of the spool valve's two meter-out edges is defined by the circuit symbol, see Chapter 2.2.1.5, "Circuit symbol".

► **Ordering example:** L 80/40, J 80/63, H 80/80, O 40/25

Flow rate setting value

If the desired flow rate lies between two flow rate codings, the desired setting value can be specified separately in brackets.

The maximum flow rate is then limited to this value by the mechanical spool valve stroke limitation of the actuation, see Chapter 2.2.1.13, "Actuation"

Not possible in conjunction with CAN actuation, see Chapter 2.2.1.13, "Actuation".

► **Ordering example:** SL 3-A2 L 63/80/EA (60/75)
Setting values: A – 60 l/min, B – 75 l/min

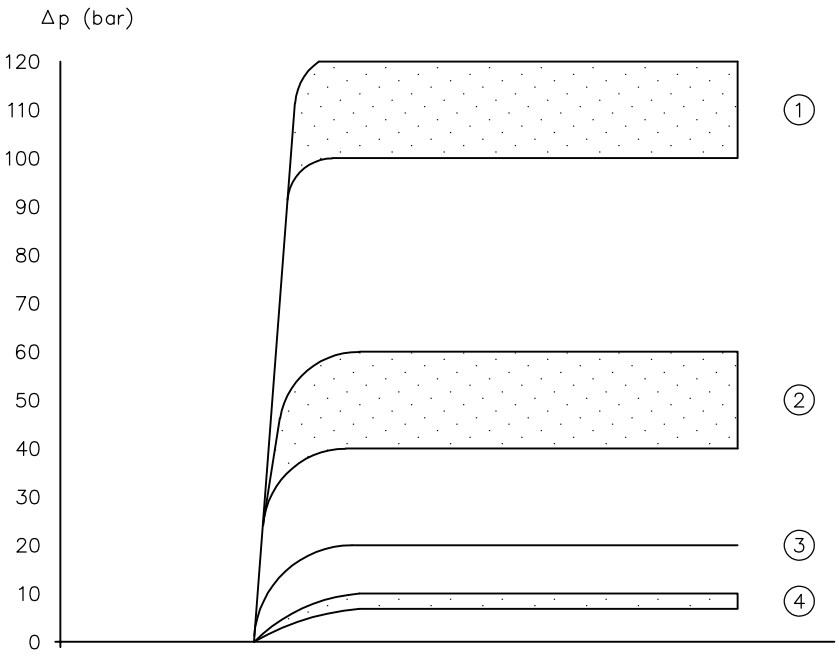
► **Ordering example:** SL 3-A2 L 63/80/EA (60/-)
Setting values: A – 60 l/min, B – no stroke limitation

NOTICE
The valve spools' sizes are designed to make actual flow rate slightly higher than $Q_{nominal}$ in practice. You can use stroke limitation to limit the maximum flow rate. Setting values are specified in l/min.

Flow rate coding with larger or smaller meter-out edges

For J and O spool valves, the meter-out edge can also be customised. In such a case, the order coding has 4 digits and looks like this: $Q_{A \rightarrow R}$ – $Q_{P \rightarrow A}$ / $Q_{P \rightarrow B}$ – $Q_{B \rightarrow R}$. Choosing a smaller key figure increases return pressure. A larger key figure reduces return pressure.

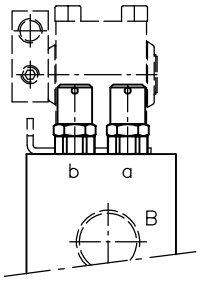
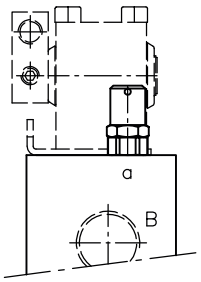
► **Ordering example:** J 63-63/80-40, O 25-80/40-63



1 Outflow edge two numbers smaller
2 Outflow edge one number smaller
3 Standard version
4 Outflow edge one number larger

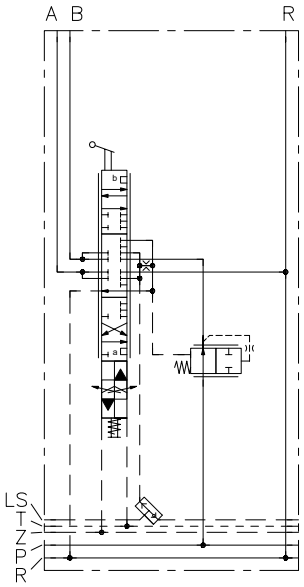
NOTICE
The return pressure is in relation to the nominal flow rate. It may be higher or lower than shown in the diagram depending on the cylinder ratio or 2-way controller spring.

2.2.1.7 LS pressure limitation

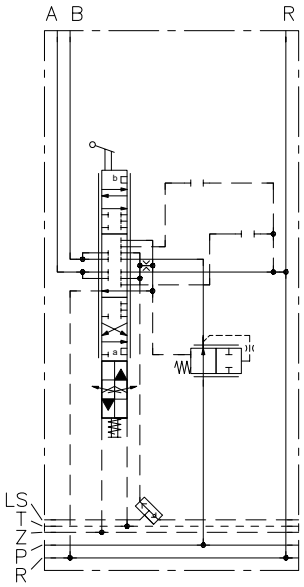
Coding	Description	View
without coding	Without LS pressure limitation	-
AB	Without LS pressure limitation, but prepared for later conversion to coding A.., B.. or A.. B..	
A..	LS pressure limitation for A-side (Adjustment range: 50 to 400 bar)	
B..	LS pressure limitation for B-side (Adjustment range: 50 to 400 bar)	
A.. B..	LS pressure limitation for A and B-side with two separate pressure settings (Adjustment range: 50 to 400 bar)	
C..	LS pressure limitation for A and B-side with a single shared pressure setting for both sides (Adjustment range: 50 to 400 bar) **Only in conjunction with** ▪ Consumer ports coding 3, 4 (Chapter 2.2.1.1) or ▪ Consumer ports coding A (Chapter 2.2.1.1) and actuation coding E... (Chapter 2.2.1.13)	

Circuit symbols

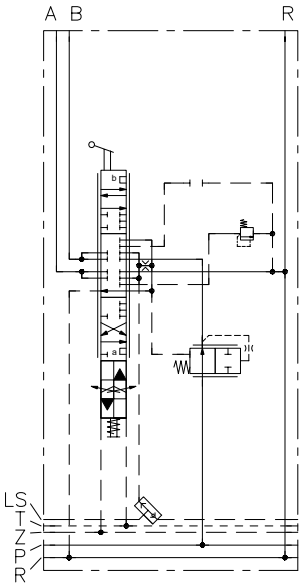
without coding



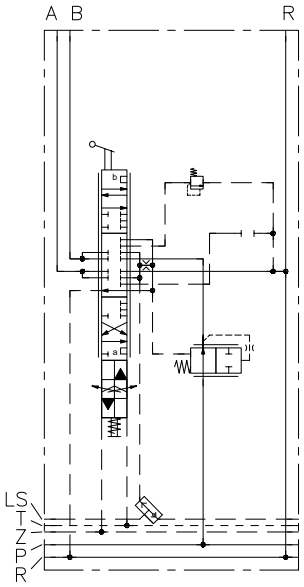
AB



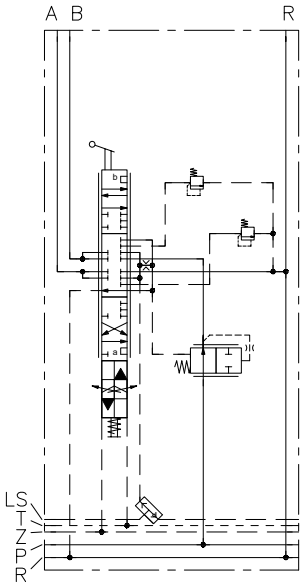
A..



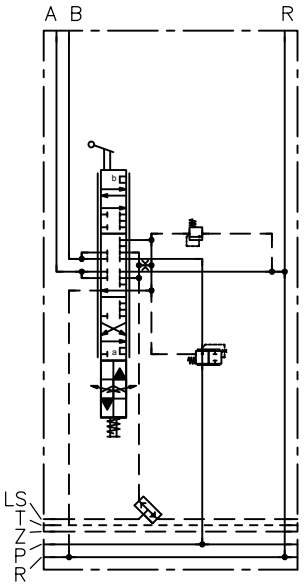
B..



A.. B..



C..



NOTICE
LS pressure limitation is only available in conjunction with a 2-way controller (Chapter 2.2.1.2).

2.2.1.8 Electric LS relief or LS pressure limitation

Coding	Description
without coding	Without electric LS relief or LS pressure limitation
F 0	Without electric LS relief or LS pressure limitation, but prepared for later conversion to coding F, FH, FP, FPH. Only in conjunction with actuation coding E... (Chapter 2.2.1.13)
F 1, F 2, F 3 **FH 1, FH 2, FH 3**	Electric LS relief (function deactivation) LS signal without load when unpowered. ▪ F1: A-side only ▪ F2: B-side only ▪ F3: A and B-side separate ▪ FH 1, FH 2, FH 3: additionally with button for manual override Only in conjunction with actuation coding E... (Chapter 2.2.1.13)

Coding	Description
FP.. **FPH..**	Electro-proportional LS pressure limitation with ascending characteristic line **Pressure ranges for A and for B-side** ▪ 0 = sealed ▪ 1 = 20 to 150 bar ▪ 2 = 25 to 210 bar ▪ 3 = 35 to 320 bar ▪ 5 = 40 to 400 bar ▪ 7 = 50 to 420 bar **INFORMATION** The values apply to a 2-way controller spring as per coding 2 (Chapter 2.2.1.3). The values increase with the spring pressure. The first number applies to A-side. The second number applies to B-side. **Ordering example:** FP12 ▪ **FPH..:** additionally with button for manual override Only in conjunction with actuation coding E... (Chapter 2.2.1.13)

<table>
<tr><th>Coding</th><th>Description</th></tr>
<tr><td>FPC-S..
FPC-R../..</td><td>
Electro-proportional LS pressure limitation with ascending characteristic line
Limits the pressure for A and B-side.
Different pressure values in A and B are controlled electrically.

FPC-S..:
ascending characteristic line / normally open (PMVE 1 S... according to D 8143)
FPC-R../..:
falling characteristic line / normally closed (PMVE 1 R according to D 8143)
with additional mechanical p_{max} setting (75 – 100 % from pressure range)

Pressure stage

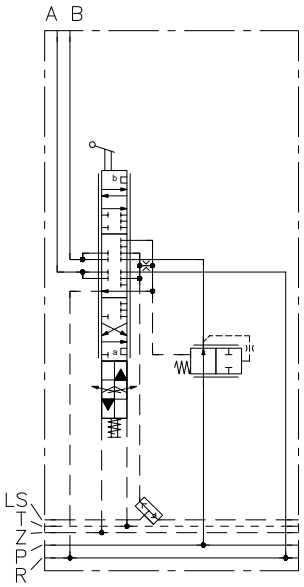
A = up to 50 bar
B = up to 100 bar
C = up to 150 bar
D = up to 200 bar
E = up to 250 bar
F = up to 300 bar
G = up to 350 bar
H = up to 420 bar

Only in conjunction with:
<table>
<tr><th>Consumer ports
(Chapter 2.2.1.1)</th><th>LS pressure limitation
(Chapter 2.2.1.7)</th><th>Actuation
(Chapter 2.2.1.13)</th></tr>
<tr><td>SL 3-3..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr>
<tr><td>SL 3-A..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr>
<tr><td>SL 3-UNF 3..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr>
</table>
</td></tr>
<tr><td>FPCX</td><td>
Prepared for electro-proportional LS pressure release FPC-S.. and FPC-R../..

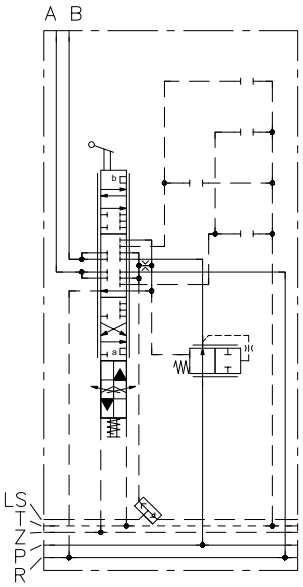
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(Chapter 2.2.1.7)</th><th>Actuation
(Chapter 2.2.1.13)</th></tr>
<tr><td>SL 3-3..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr>
<tr><td>SL 3-A..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr>
<tr><td>SL 3-UNF 3..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr>
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Circuit symbols

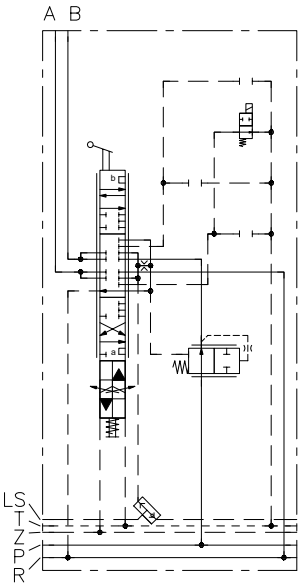
without coding



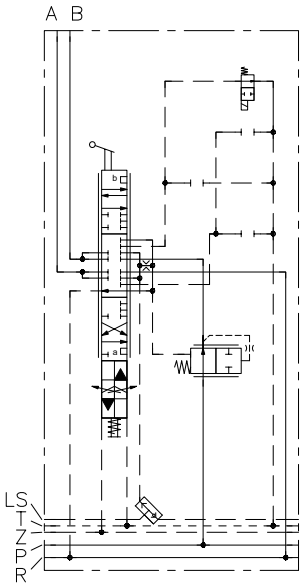
F 0



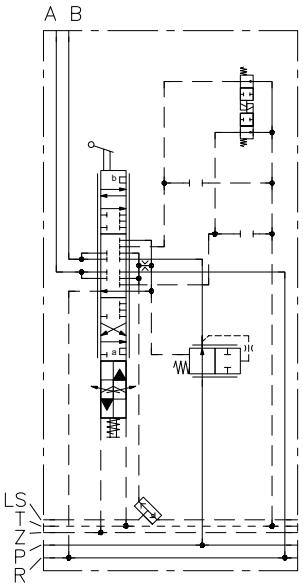
F 1, FH 1



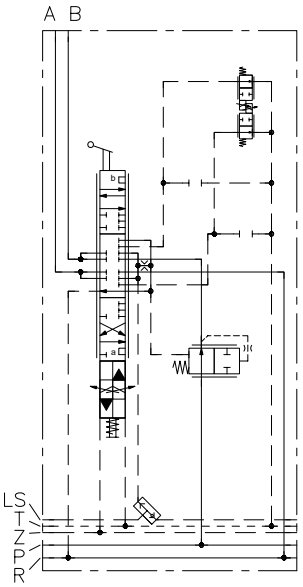
F 2, FH 2



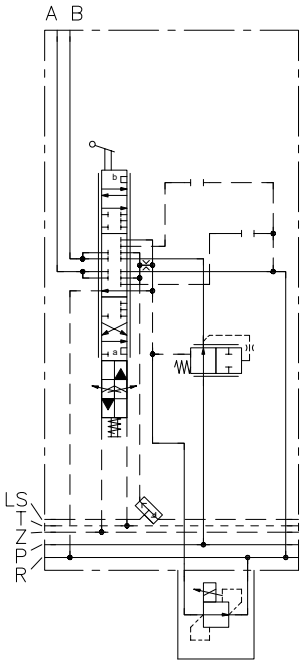
F 3, FH 3



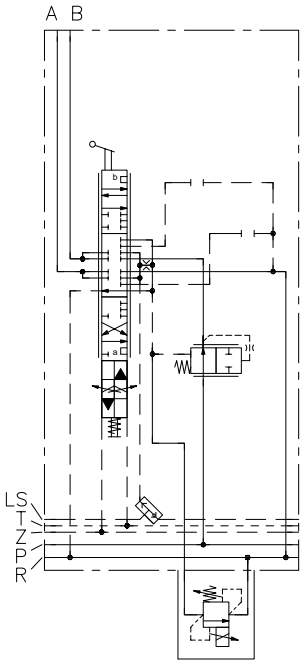
FP.., FPH..



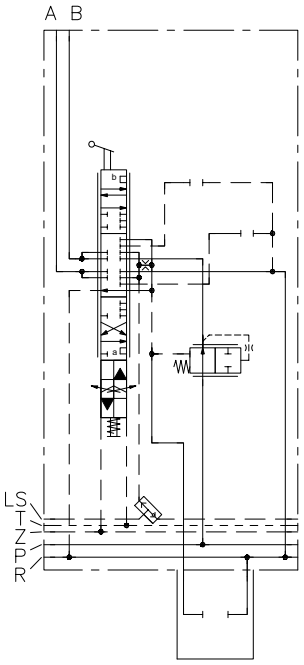
FPC-S..



FPC-R../..



FPCX



NOTICE

Electric LS relief or LS pressure limitation is only available in conjunction with a 2-way controller, Chapter 2.2.1.2

NOTICE

Even with LS relief, pressure in consumer line A or B cannot be reduced completely to 0 bar. The remaining minimum pressure in A or B ($p_{min, A/B}$) is the sum of:

a) control pressure in the 2-way controller ($\Delta p_{2\text{-way controller}}$)
b) internal dynamic pressure in block (Δp_{Block})
c) Tank or return pressure (depending on the end plate used)

Resulting minimum pressures, without tank or return pressure

FP...: approx. 40 bar

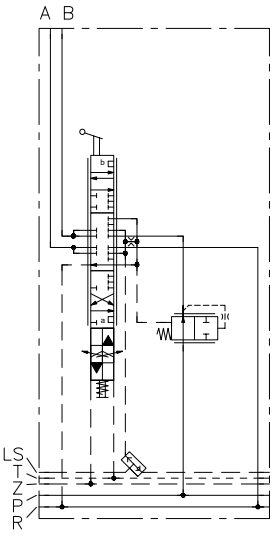
FPC...: approx. 13 bar

2.2.1.9 LS port for external limitation

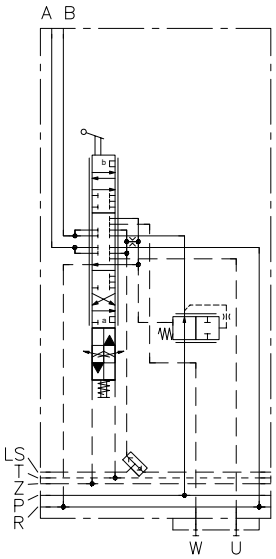
Coding	Description
without coding	Without LS port for external limitation
S1 **S1 UNF**	U and W port for connecting external pilot valve ▪ U port = LS_A ▪ W port = LS_B ▪ **S1:** G 1/8 (ISO 228-1) ▪ **S1 UNF:** SAE-4 or 7/16-20 UNF-2B (SAE J 514) **Only in conjunction with** ▪ Actuation coding E... (Chapter 2.2.1.13)
S	U and W port (G 1/8) for connecting external pilot valve ▪ U port = LS_A ▪ W port = LS_B The ports are integrated directly in the spool block. **Only in conjunction with** ▪ Consumer ports coding 3, 4, A (Chapter 2.2.1.1) ▪ LS pressure limitation coding AB, A.., B.. or A.. B.. (Chapter 2.2.1.7) ▪ Actuation coding E... (Chapter 2.2.1.13) ▪ 2-way controller without coding and coding 1 (Chapter 2.2.1.2)
X	X port for connecting external pilot valve ▪ X port = $LS_{A/B}$ The port is integrated directly in the spool block. **Only in conjunction with** ▪ Consumer ports coding 3, UNF 3 (Chapter 2.2.1.1) ▪ LS pressure limitation coding AB, A.., B.. or A.. B.. (Chapter 2.2.1.7) ▪ Electric LS relief or LS pressure limitation coding F 0, F.., FP.. (Chapter 2.2.1.8) ▪ Actuation coding E... (Chapter 2.2.1.13) **Connection thread:** ▪ G 1/8 (ISO 228-1) for valve sections with consumer ports coding 3 ▪ SAE-4 or 7/16-20 UNF (SAE J 514) for valve sections with consumer port coding UNF 3
XH	XH port (G 1/8) for connecting external pilot valve ▪ XH port = $LS_{A/B}$ Unlike with coding X, LS signal pick-up is upstream of the LS orifice. This makes a greater flow rate available for auxiliary functions (e.g. releasing a brake). The port is integrated directly in the spool block. **Only in conjunction with** ▪ Consumer ports coding A (Chapter 2.2.1.1) ▪ LS pressure limitation coding AB, A.., B.. or A.. B.. (Chapter 2.2.1.7) ▪ Electric LS relief or LS pressure limitation coding F 0, F.., FP. (Chapter 2.2.1.8) ▪ Actuation coding E... (Chapter 2.2.1.13)

Circuit symbols

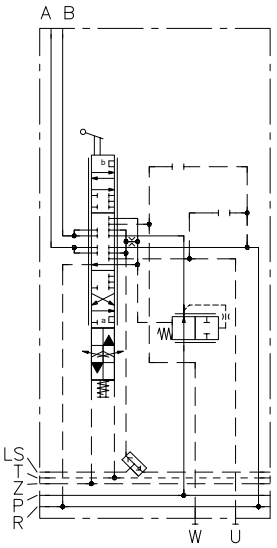
without coding



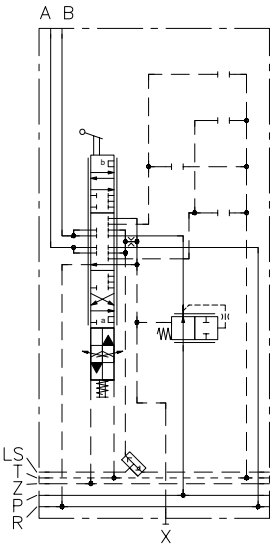
S1, S1 UNF



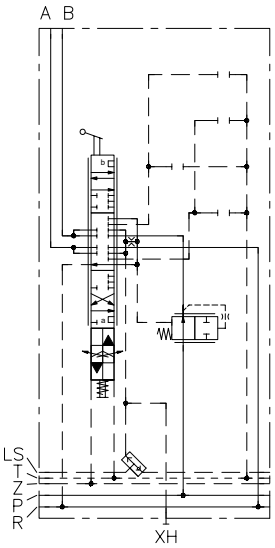
S



X



XH



NOTICE

An LS port for external limitation is only possible in conjunction with a 2-way controller (Chapter 2.2.1.2).

NOTICE

Even with LS relief, pressure in consumer line A or B cannot be reduced completely to 0 bar. The remaining minimum pressure in A or B ($p_{min, A/B}$) is the sum of:

a) control pressure in the 2-way controller ($\Delta p_{2\text{-way controller}}$)

b) internal dynamic pressure in block (Δp_{Block})

c) Return pressure (p_{reflux}).

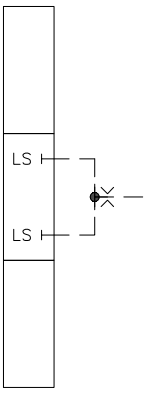
$p_{min,A/B} = \Delta p_{2\text{-way controller}} + \Delta p_{Block} + p_{reflux}$

$\Delta p_{2\text{-way controller}}$: see Chapter 2.2.1.3

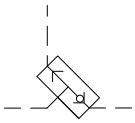
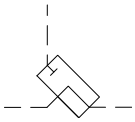
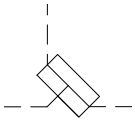
Δp_{Block} for coding S, S1 = 5 bar

Δp_{Block} for coding X, XH = 1 bar

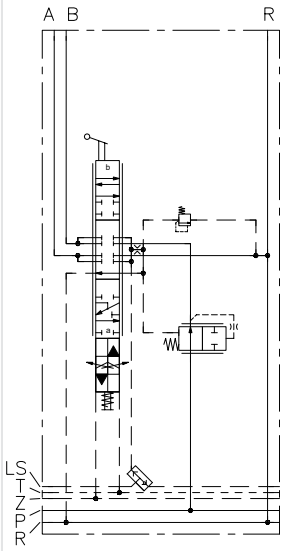
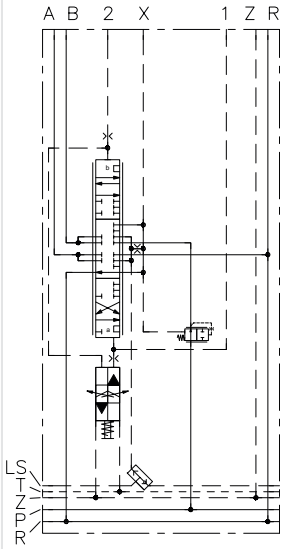
2.2.1.10 LS orifice

Coding	Description	Circuit symbol
without coding	Standard version with ∅ 0.8 mm orifice	
7	Special version with ∅ 0.7 mm orifice	
9	Special version with ∅ 0.9 mm orifice	

2.2.1.11 Shuttle valve

Coding	Description	Circuit symbol
without coding	Standard version	
W1	Special version without LS signal for own valve section Common applications include a pre-selector valve section together with closed-centre LS valves (Chapter 2.2.1.2, detailed description for coding 8)	
W3	Special version without ball Only useful in manifold's final valve section in case the downstream LS-line is not relieved by the end plate.	

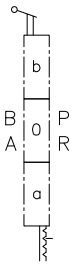
2.2.1.12 Additional functions

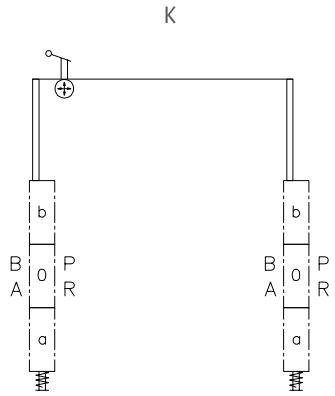
Coding	Description	Circuit symbol
D	Valve section with differential circuit (regeneration function) When in switching position a, the valve section links the A, B and P-lines. In this case, A connects to the piston side and B to the cylinder's rod side. Due to the differential circuit (regeneration function), significantly higher extension speeds can be achieved at the cylinder with the same pump flow rate. At the same time, the force available becomes lower because the pressure applied on the cylinder's piston and rod side is identical. The effective area on the piston side is reduced to the piston rod cross-section. Formula for calculating the required pump flow rate (Q_{pump}) as a function of desired flow rate for cylinder extension (Q_{piston}) and cylinder ratio: $Q_{Pumpe} = Q_{Kolben} \cdot \left(1 - \frac{1}{\varphi}\right)$ **Only in conjunction with** ▪ Consumer ports coding A (Chapter 2.2.1.1) ▪ LS pressure limitation coding C... (Chapter 2.2.1.7) ▪ Actuation coding E... (Chapter 2.2.1.13)	
FL	Valve section with additional 1-, 2-, X- and Z-port facing ancillary block The X port can be used, for example, for the intermediate plate /ZN BC... for pressure reduction (Chapter 2.2.3). The Z port can be used for ancillary block /4 BN...-EM. 3...-PMVPS 8... for pilot pressure supply for the PMVPS valve (Chapter 2.2.2). **Only in conjunction with** ▪ Consumer ports coding A (Chapter 2.2.1.1) ▪ LS pressure limitation coding AB, A.., B.. or A.. B.. (Chapter 2.2.1.7) ▪ Actuation coding E... (Chapter 2.2.1.13)	

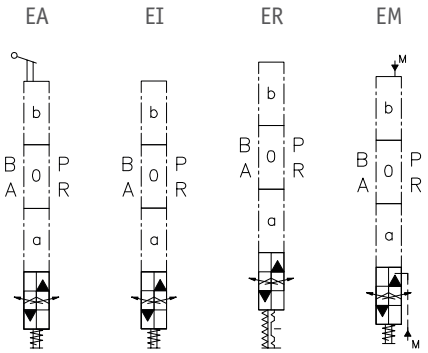
2.2.1.13 Actuation

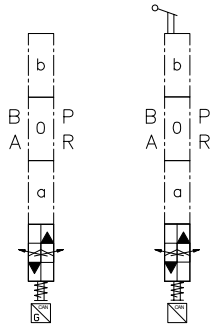
Actuation types

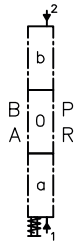
The different actuation types can be combined with one another.

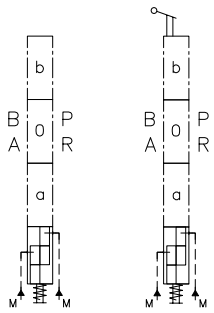
Coding	Description	Circuit symbol
Electro-hydraulic actuation prepared		
EO	Prepared for electro-hydraulic actuation	-
Manual actuation		
A	Manual actuation with spring return Only in conjunction with actuation variants: ▪ A, EOA, AR, EOAR, EAR ▪ EA, EMA(UNF) ▪ HA(UNF), FA(UNF), EHA(UNF), EFA(UNF), EOHA(UNF), EOFA(UNF), EOZA, EOZMA ▪ EPA, PA, EOPA	A 
C	Manual actuation, infinitely variable Only in conjunction with actuation variants: ▪ C, EOC	C 
R	Actuation supplement for a 3-stage detent for switching position 0, a or b. Without stroke limitation. With spring return. No flow rate setting possible. Only in conjunction with actuation variants: ▪ AR, EOAR ▪ EAR, ER	EOAR 
D	Manual actuation with 3 positions for switching positions 0, a and b. Without stroke limitation. Only in conjunction with actuation variants: ▪ D, EOD	D 
N	Manual actuation with mechanically disconnected hand lever. The hand lever is not connected to the valve spool until it is pressed down. As a result, the individual stroke limitation only engages during manual actuation. Only in conjunction with actuation variants: ▪ ON Common applications: Safety functions that restrict speeds in setup or emergency mode.	N 

Coding	Description	Circuit symbol
K	Joystick actuation Combined manual actuation for two adjacent valve sections with shared 2-axis actuation. With hand lever Only in conjunction with actuation variants: ▪ K, EOK ▪ EK **NOTICE** The pressure in T must not rise above 10 bar to ensure the functionality is not impaired.	

Coding	Description	Circuit symbol
Electro-hydraulic actuation		
EA **EI** **EM** **EM UNF**	Electro-hydraulic actuation. ▪ **EA:** with manual actuation ▪ **EI:** no stroke limitation ▪ **EM:** with measurement fitting, with stroke limitation on spring housing and lever housing ▪ EM: G 1/4 (ISO 228-1) ▪ EM UNF: SAE-4 or 7/16-20UNF-2B (SAE J 514) Only in conjunction with actuation variants: ▪ EA, EMA ▪ EACAN(L), EMACAN(L), EHACAN(L), EFACAN(L) ▪ EHA, EFA ▪ EAR ▪ EPA ▪ EM ▪ EI, EIM ▪ ON ▪ EICAN(L), EIMCAN(L) ▪ EHI, EFI (also as UNF variants)	

Coding	Description	Circuit symbol
CAN actuation		
CAN **CANL**	Directly mounted CAN controls as per D 7700 CAN ▪ **CAN:** CAN actuation with integrated displacement transducer for spool valve position control. The spool valve characteristic line is linearised and hysteresis is minimised. ▪ **CANL:** CAN Lite actuation without integrated displacement transducer. Spool valve position is controlled; start and end point are calibrated. Only in conjunction with actuation variants: ▪ EACAN(L) ▪ EMACAN(L) ▪ EICAN(L) ▪ EIMCAN(L) ▪ EHACAN(L) ▪ EFACAN(L) (also as UNF variants) **NOTICE** When using CAN actuation, the nominal flow rate may be undershot under certain circumstances. To enable optimum control, an additional tolerance for the mechanical travel stop has been programmed.	EICAN EACANL 

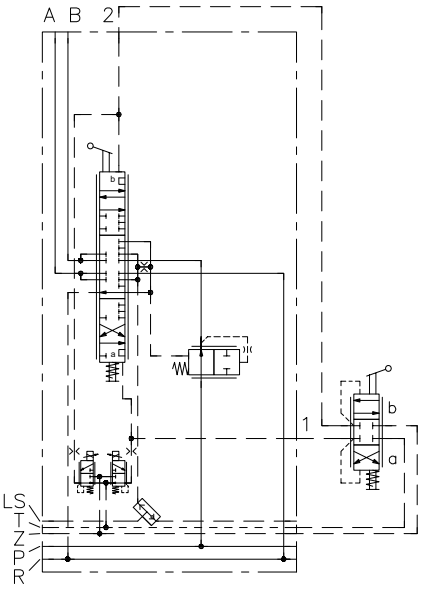
Coding	Description	Circuit symbol
Hydraulic actuation		
H **F** **H UNF** **F UNF**	Hydraulic actuation with pilot pressure ports on spring housing and lever housing. ▪ **H**: Ports 1 and 2 perpendicular to spool valve axis. Not in conjunction with connection blocks or intermediate plates that have additional valves, as port 1 would otherwise be concealed by the additional valves. ▪ **F, FI:** Ports 1 and 2 parallel to spool valve axis. ▪ **H / F:** with stroke limitation ▪ **HI / FI:** without stroke limitation ▪ H / F: G 1/4 (ISO 228-1) ▪ H UNF / F UNF: SAE-4 or 7/16-20UNF-2B (SAE J 514) Pilot pressure: min.: approx. 5 bar max.: approx. 18 bar max. perm.: 50 bar Only in conjunction with actuation variants: ▪ H, F, EOH, EOF, HI, FI, EOHI, EOFI ▪ HA, FA, EOHA, EOFA ▪ EH, EF, EHI, EFI ▪ EHA, EFA (also as UNF variants)	H, F 

Coding	Description	Circuit symbol
EOZ **EOZ UNF**	Hydraulic actuation with pilot pressure ports in the spool block beneath spring housing. ▪ EOZ: G 1/8 (ISO 228-1) ▪ EOZ UNF: SAE-2 or 5/16-24 UNF-2B (SAE J 514) Only in conjunction with actuation variants: ▪ EOZM ▪ EOZI, EOZIM ▪ EOZA, EOZMA (also as UNF variants)	EOZM EOZMA 

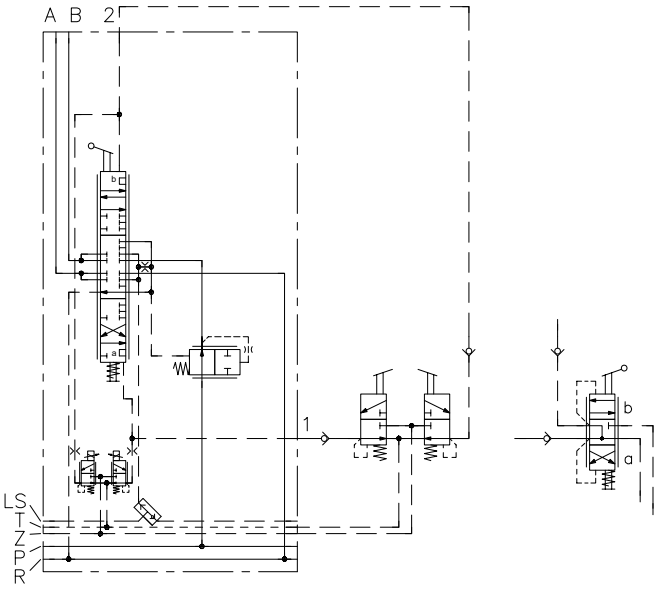
Coding	Description	Circuit symbol
Pneumatic actuation		
P	Pneumatic actuation with pilot pressure ports on lever housing. Suitable for switching the valve spool on/off. Ports 1 and 2: G 1/8 (ISO 228-1) Pilot pressure required: approx. 7 bar P_{max}: 15 bar Only in conjunction with actuation variants: ▪ P, EOP, EP ▪ PA, EOPA , EPA	P 

Combination with hydraulic joysticks

with closed centre position



with open centre position



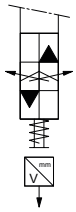
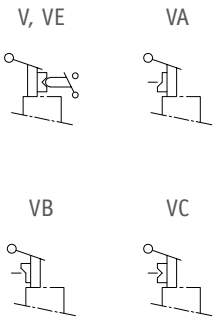
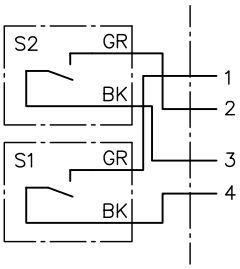
There are two ∅ 0.7 mm orifices between the electro-hydraulic actuation's pilot valves and the pilot pressure ports 1 and 2. The control oil flow for the hydraulic joystick needs to be sufficiently large to compensate for bypass leakage through the orifice.

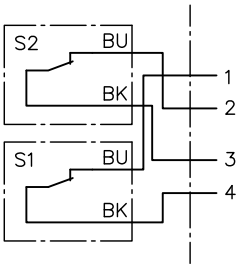
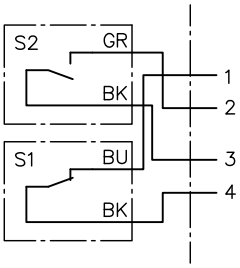
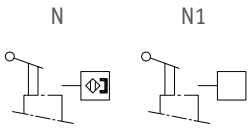
For joysticks with open centre position, pilot pressure ports 1 and 2 are connected to the tank when the joystick is in neutral position. Electro-hydraulic actuation would then result in the entire control oil flow escaping that way, and no pressure would be built up to shift the valve spool. For this reason, additional check valves need to be added to the control lines in this case.

2.2.1.14 Additional elements for actuation

Coding	Description
without coding	Standard version Hand lever straight approx. 180 mm
1 **2** **045** **212**	Add-on for manual actuation A ▪ **1:** Without hand lever ▪ **2:** Hand lever straight approx. 106 mm ▪ **045:** Hand lever 45° curved approx. 152 mm ▪ **212:** Hand lever 12.5° curved approx. 104 mm Ordering example: SL 3-32 L 80/80/EA212-DT 24
8 **9**	Additional description for stronger or weaker spring package ▪ **8:** Actuation torques as for E actuation (neutral position: 2.4 Nm; end position: 6.0 Nm) ▪ **9:** Actuation torques as for H actuation (neutral position: 2.9 Nm; end position: 6.0 Nm) Ordering example: SL 3-32 L 80/80/EA9-DT 24
BE...	Add-on for actuation E0Z actuation. With restrictor check valve type BE 0-... as per D 7555 B in the ports. Ordering example: SL 3-32 L 80/80/E0Z BE0806
04 **05** **06** **07** **08** **10** **12**	Add-on for actuation with E Additional damping in the electro-hydraulic pilot control. ▪ **04:** 0.4 mm orifice ▪ **05:** 0.5 mm orifice ▪ **06:** 0.6 mm orifice ▪ **07:** 0.7 mm orifice ▪ **08:** 0.8 mm orifice ▪ **10:** 1.0 mm orifice ▪ **12:** 1.2 mm orifice Ordering example: SL 3-32 H63/40/EI06 (if A and B are the same, 0.6 mm orifice here) SL 3-32 H63/40/EI1008 (if A and B are different, 1.0 mm orifice here in A and 0.8 mm orifice in B)
G	Spring housing with additional reinforcement flange to prevent damage and leakages in the spring housing for applications with high pressure peaks in reflux or T-line Ordering example: SL 3-32 L 80/80/EAG-DT 24

2.2.1.15 Switching position monitoring, displacement transducer

Coding	Description	Circuit symbol
U	Comparator for monitoring spool valve position. ▪ In neutral position: A and B on ▪ P → A: A on, B off ▪ P → B: A off, B on ▪ Voltage U: 10 - 32 V DC Connector types: X Ordering example: SL 3-A2 H16/16/EAU	
WA **WA-EX** **WA-M2FP**	Integrated displacement transducer (Hall sensor) for spool valve position monitoring with analogue output signal. Connector types: AMP, DT, X, G, C ▪ **WA-EX:** explosion-proof version ▪ **WA-M2FP:** explosion-proof version Ordering example: SL 3-A2 H16/16/EAW-AMP	
V **VA** **VB** **VC** **VE**	Contact switch for monitoring spool valve position. ▪ **Resp.:** Neutral position monitoring (normally open contact / NO, signal upon activation without distinguishing between the sides) ▪ **VA:** Direction detection direction A (signal upon activation toward A) ▪ **VB:** Direction detection direction B (signal upon activation toward B) ▪ **VC:** Direction detection direction A and B (signal upon separate activation toward A and B incl. distinguishing between the sides) ▪ **VE:** Neutral position monitoring (normally open contact / NO, signal upon activation without distinguishing between the sides) Micro switch MZW1.191.050 50 cm cable with AMP socket Contact switch type V 4 NS® with lever AR 1 by BURGESS. Switch actuated in neutral position. **Only in conjunction with** ▪ Actuation coding A, EA, EMA or HA (Chapter 2.2.1.13)	
VCHO **VCHO2K**	Contact switch for monitoring spool valve position. Direction detection direction A (S2) and B (S1) as normally open contact (NO)  ▪ **VCHO:** With connector, without cable ▪ **VCHO2K:** With connector and 2 m cable Contact switch type V 4 N 4 Sk 2 ® with lever AR 1 and Hirschmann connector by BURGESS. Ordering example: SL 3-A2 H16/16/EAVCHO **Only in conjunction with** ▪ Actuation coding A, EA, EMA or HA (Chapter 2.2.1.13)	

Coding	Description	Circuit symbol
VCHC **VCHC2K**	Contact switch for monitoring spool valve position. Direction detection direction A (S2) and B (S1) as normally closed contact (NC)  ▪ **VCHC:** With connector, without cable ▪ **VCHC2K:** With connector and 2 m cable Contact switch type V 4 N 4 Sk 2 ® with lever AR 1 and Hirschmann connector by BURGESS. Ordering example: SL 3-A2 H16/16/EAVCHC **Only in conjunction with** ▪ Actuation coding A, EA, EMA or HA (Chapter 2.2.1.13)	
VCHOC **VCHOC2K**	Contact switch for monitoring spool valve position. Direction detection direction A (S2) as normally open contact (NO) and B (S1) as normally closed contact (NC)  ▪ **VCHOC:** With connector, without cable ▪ **VCHOC2K:** With connector and 2 m cable Contact switch type V 4 N 4 Sk 2 ® with lever AR 1 and Hirschmann connector by BURGESS. Ordering example: SL 3-A2 H16/16/EAVCHOC **Only in conjunction with** ▪ Actuation coding A, EA, EMA or HA (Chapter 2.2.1.13)	
N **N1**	Proximity switch for monitoring spool valve neutral position without distinguishing between the sides. ▪ **N:** includes proximity switch type IFFM 08P/3701/02L® by BAUMER Electric GmbH ▪ **N1:** prepared for installation of proximity switch **Only in conjunction with** ▪ Actuation coding A or EA (Chapter 2.2.1.13)	

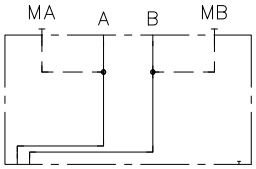
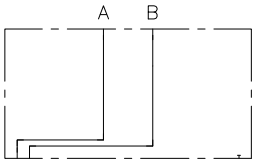
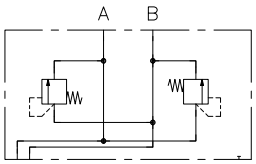
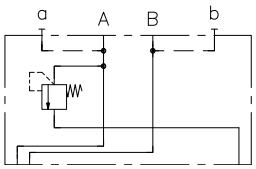
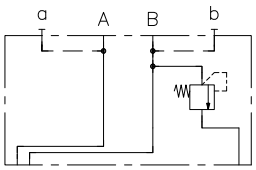
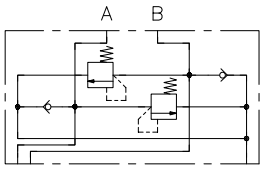
A detailed description of the electric parameters is available in Chapter 3.5.3, "Switching position monitoring, displacement transducer".

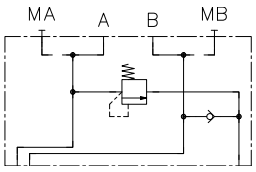
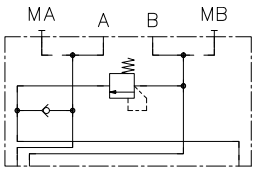
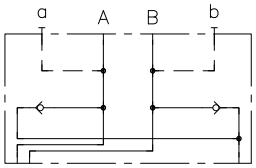
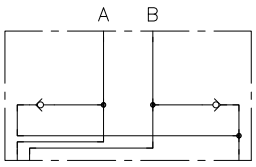
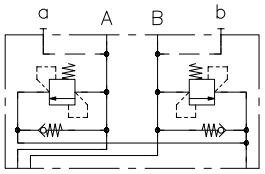
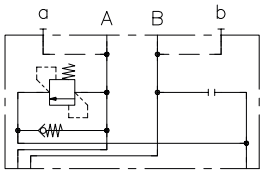
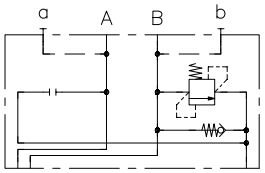
2.2.2 Ancillary block

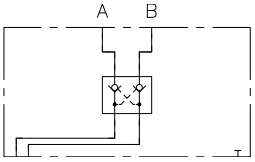
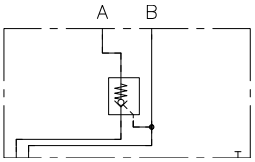
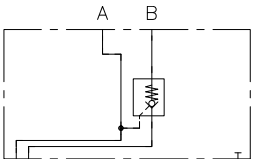
Depending on their version, the ancillary blocks comprise different kinds of additional valves (e.g. shock valves, releasable check valves, load-holding valves or electrically actuated 2/2-way directional seated valves). They can be flange-mounted either on a valve section with flange surface (coding A as per Chapter 2.2.1.1) or on an intermediate plate (Chapter 2.2.3).

Ports A and B as per ISO 228-1 or SAE J 514 or JIS B 2351

- **/3:** G 1/2
- **/4:** G 3/4
- **/UNF 12:** SAE-6 (9/16-18 UNF-2B)
- **/UNF 2:** SAE-8 (3/4-16 UNF-2B)
- **/UNF 3:** SAE-10 (7/8-14 UNF-2B)
- **/JIS 3:** JIS G 1/2

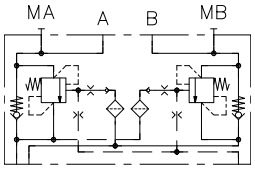
Coding	Description	Circuit symbol
/3 **/4** **/UNF 12** **/UNF 2** **/UNF 3**	No additional function	
/JIS 3		
/3 AS... BS... **/31 AS... BS...** **/4 AS... BS...** **/UNF 3 AS... BS...**	Shock valves in A and B. (Adjustment range: 40 to 420 bar) The shock valves are each connected to their opposite side. Common applications: Pressure safeguard in hydraulic motors. ▪ **/31 AS... BS...:** permanently set ▪ **/3 AS... BS..., /4 AS... BS..., /UNF 3 AS... BS...:** adjustable	
/4 A...	Shock valves in A or B. (Adjustment range: 40 to 420 bar) The shock valves are each connected to the reflux.	
/4 B...		
/3 AN... BN... **/31 AN... BN...** **/4 AN... BN...** **/44 AN... BN...** **/UNF 3 AN... BN...**	Shock and anti-cavitation valves in A and B. (Adjustment range: 40 to 420 bar) The shock and anti-cavitation valves are each connected to the reflux. Common applications: Pressure safeguard in hydraulic cylinders. ▪ **/31 AN... BN...:** permanently set ▪ **/3 AN... BN..., /4 AN... BN..., /UNF 3 AN... BN...:** adjustable ▪ **/44 AN... BN...:** adjustable and additionally with internal link between both reflux sides, specially for large anti-cavitation flow rates	

Coding	Description	Circuit symbol
/4 AN...	Shock valve in A and anti-cavitation valve in B. (Adjustment range: 40 to 420 bar)	
/4 BN...	Shock valve in B and anti-cavitation valve in A. (Adjustment range: 40 to 420 bar)	
/4 AN BN	Anti-cavitation valves in A and B.	
/UNF 3 AN BN		
/3 M ANV...BNV... **/4 M ANV...BNV...**	Shock and anti-cavitation valve in A and B ▪ Permanently set pressure ▪ Available pressure settings for A or B: – 100 bar – 170 bar – 250 bar – 325 bar – 350 bar – 420 bar ▪ Measurement fittings in A and B: G 1/4	
/3 M ANV... **/4 M ANV...**	Shock and anti-cavitation valve in A ▪ Permanently set pressure ▪ Available pressure settings: – 100 bar – 170 bar – 250 bar – 325 bar – 350 bar – 420 bar	
/3 M BNV... **/4 M BNV...**	Shock and anti-cavitation valve in B ▪ Permanently set pressure ▪ Available pressure settings: – 100 bar – 170 bar – 250 bar – 325 bar – 350 bar – 420 bar	

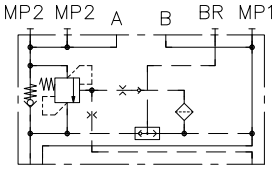
Coding	Description	Circuit symbol
/3 DRH **/3 DRH VV** **/UNF 3 DRH** **/UNF 3 DRH VV**	Releasable check valves (type DRH 3 as per D 6110). ▪ **/3 DRH:** releasable check valves in A and B ▪ **/3 DRH A:** releasable check valve in A ▪ **/3 DRH B:** releasable check valve in B ▪ **/3 DRH VV:** releasable check valves with hydraulic release in A and B	
/3 DRH A	**Pressure required for releasing:** ▪ **/3 DRH, /3 DRH A, /3 DRH B:** 0.4-fold of checked pressure ▪ **/3 DRH VV:** 0.1-fold of checked pressure	
/3 DRH B		

Coding	Description
/3 AL... BL... **/UNF 3 AL... BL...** **/3 AL...** **/UNF 3 AL...** **/3 BL...** **/UNF 3 BL...**	Load-holding valves (type LHT 30 as per D 7918). ▪ **/3 AL... BL...:** Load-holding valves in A and B ▪ **/3 AL...:** Load-holding valve in A ▪ **/3 BL...:** Load-holding valve in B

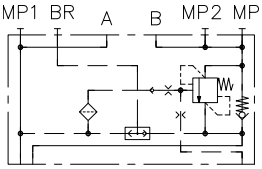
/3(/UNF 3) AL.. BL..



/3(/UNF 3) AL..



/3(/UNF 3) BL..



Ordering example:

/3 AL	- 0	- A	7	/420

Pressure setting in bar

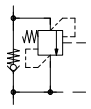
Geometric pilot ratio

Flow rate

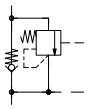
Bypass orifice

- Inflow orifice D1:
  - ∅ 0.5 mm
- Bypass orifice D2:
  - 0 = sealed
  - ∅ 0.4 / 0.5 / 0.6 / 0.7 / 0.8 mm
- Geometric pilot ratio:
  - 1:7 (coding 7)
  - 1:∞ (coding 0)

Coding **7**



Coding **0**



For coding 0, the load pressure has no effect, and the load-holding valve is opened by the pilot pressure alone. In this case, the load-holding valve does not have an overpressure function.

Actual pilot ratio depends on bypass orifice:

Coding	**0**	**4**	**5**	**6**	**7**	**8**
Bypass orifice ∅ (mm)	sealed	0.4	0.5	0.6	0.7	0.8
Geometric pilot ratio	1:7	1:7	1:7	1:7	1:7	1:7
Actual pilot ratio	1:7	1:5.0	1:3.5	1:2.3	1:1.3	1:0.9

Flow rate:

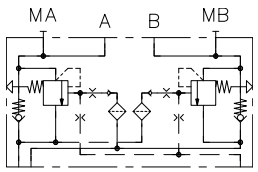
Coding	**A**	**B**	**C**	**D**	**E**	**F**
Q_{max} (l/min)	130	85	55	35	20	10

Maximum pilot pressure in the case of geometric pilot ratio 1:∞ (coding 0):

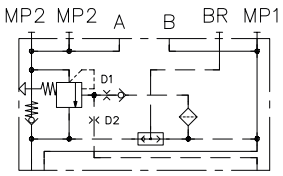
Bypass orifice ∅ (mm)	**0**	**4**	**5**	**6**	**7**	**8**
Min. pilot pressure (bar)	9	13	18	24	44	68
Max. pilot pressure (bar)	90	127	180	276	420	420

Coding	Description
/3 AC... BC... **/3 ACX... BCX...** **/UNF 3 AC... BC...** **/UNF 3 ACX... BCX...**	Load-holding valves with relief (type LHTE 30 as per D 7918). As type /3 AL... BL... but with additional spring cavity relief. By relieving the spring cavity, the load-holding valve's opening signal is unaffected by return pressure.
/3 AC... **/UNF 3 AC...**	▪ **/3 AC... BC...:** Load-holding valves in A and B ▪ **/3 AC...:** Load-holding valve in A
/3 BC... **/UNF 3 BC...**	▪ **/3 BC...:** Load-holding valve in B ▪ **AC or BC:** Pressure setting adjustable from the outside using a tool ▪ **ACX or BCX:** permanently set

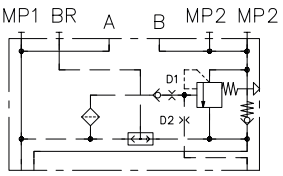
/3(/UNF 3) AC(X).. BC(X)..



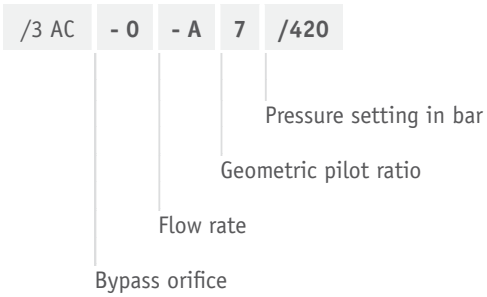
/3(/UNF 3) AC(X)..



/3(/UNF 3) BC(X)..

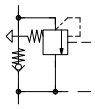


Ordering example:

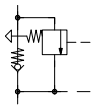


- Inflow orifice D1:
  - ∅ 0.5 mm
- Bypass orifice D2:
  - 0 = sealed
  - ∅ 0.4 / 0.5 / 0.6 / 0.7 / 0.8 mm
- Geometric pilot ratio:
  - 1:7 (coding 7)
  - 1:∞ (coding 0)

Coding **7**



Coding **0**



For coding 0, the load pressure has no effect, and the load-holding valve is opened by the pilot pressure alone. In this case, the load-holding valve does not have an overpressure function.

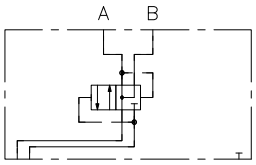
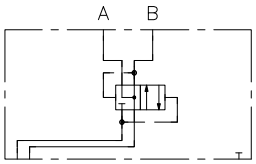
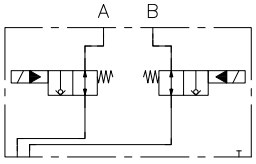
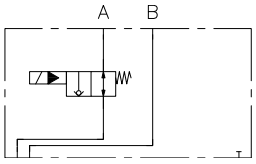
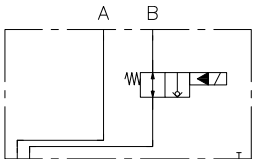
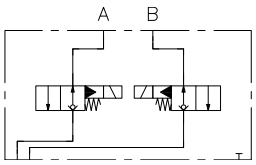
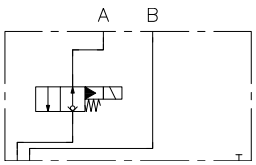
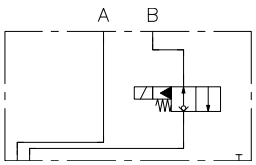
Actual pilot ratio depends on bypass orifice:

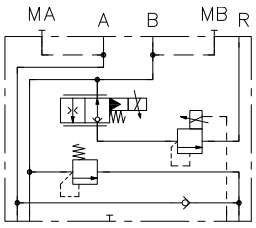
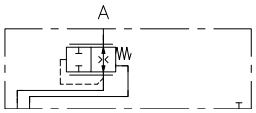
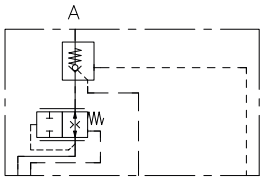
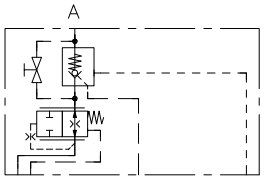
Coding	0	4	5	6	7	8
Bypass orifice ∅ (mm)	sealed	0.4	0.5	0.6	0.7	0.8
Geometric pilot ratio	1:7	1:7	1:7	1:7	1:7	1:7
Actual pilot ratio	1:7	1:5.0	1:3.5	1:2.3	1:1.3	1:0.9

Flow rate:

Coding	A	B	C	D	E	F
Q_{max} (l/min)	130	85	55	35	20	10

Coding	Description						
	Bypass orifice ∅ (mm)	**0**	**4**	**5**	**6**	**7**	**8**
	Min. pilot pressure (bar)	9	13	18	24	44	68
	Max. pilot pressure (bar)	90	127	180	276	420	420

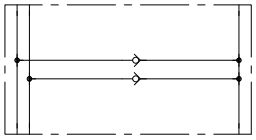
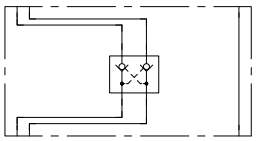
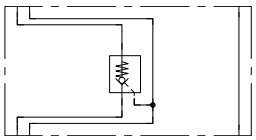
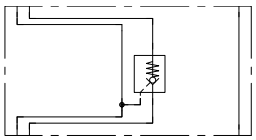
Coding	Description	Circuit symbol
/43 DFA	Differential function (regeneration function) – The differential circuit makes it possible to reach considerably greater cylinder extension speeds at the same pump flow rate. – The force available becomes lower because the pressure applied on the cylinder's piston and rod side is the same; only the effective areas differ. Therefore, the differential function is suitable for loads that pull on the cylinder. ▪ **/43 DFA:** Cylinder's piston side on A-side, rod side on B-side ▪ **/43 DFB:** Cylinder's piston side on B-side, rod side on A-side Formula for calculating the required pump flow rate (Q_{pump}) as a function of desired flow rate for cylinder extension (Q_{piston}) and cylinder ratio (φ). $Q_{pump} = Q_{piston} \cdot \left(1 - \frac{1}{\varphi}\right)$	
/43 DFB		
/3 SS **/UNF 3 SS**	Electrically actuated 2/2-way directional seated valve open in neutral position as check valve in A or B (type EM 32 S as per D 7490/1). Q_{max} = 80 l/min; p_{max} = 400 bar ▪ **/3 SS, /UNF 3 SS:** Check valves in A and B ▪ **/3 SX, /UNF 3 SX:** Check valve at A ▪ **/3 XS, /UNF 3 XS:** Check valve at B Common applications: seat-tight sealing of consumers.	
/3 SX **/UNF 3 SX**		
/3 XS **/UNF 3 XS**		
/3 VV **/UNF 3 VV**	Electrically actuated 2/2-way directional seated valve closed in neutral position as check valve in A or B (type EM 32 V as per D 7490/1). Q_{max} = 80 l/min; p_{max} = 400 bar ▪ **/3 VV, /UNF 3 VV:** Check valves in A and B ▪ **/3 VX, /UNF 3 VX:** Check valve at A ▪ **/3 XV, /UNF 3 XV:** Check valve at B Common applications: seat-tight sealing of consumers.	
/3 VX **/UNF 3 VX**		
/3 XV **/UNF 3 XV**		

Coding	Description	Circuit symbol
/4 BN...-EM 3...-PMVPS 8...	**Special version comprising** ▪ shock valve in B and anti-cavitation valve after A (coding BN..., adjustment range: 40 to 420 bar) ▪ Electro-proportional pressure-limiting valve in B (type PMVPS 8... as per D 7485/1) ▪ Electrically actuated 2/2-way directional seated valve (type EMP 31 V100 as per D 7490/1) for activating or deactivating the PMVPS. Q_{max} = 80 l/min; p_{max} = 400 bar Common applications: electro-proportional pressure safeguard in hydraulic cylinders. **Ordering example:** /4 BN 250-EMP 31 V100-PMVPS 8-44 **Only in conjunction with** ▪ Spacer plate type ZPL 33/22 (Chapter 2.3) upstream of directional valve section on which the ancillary block is mounted ▪ Directional valve section with additional function FL (Chapter 2.2.1.12)	
/3 .. DW **/4 .. DW** **/UNF 3 .. DW**	Output controller for proportional lowering speed independent of load pressure in single-acting cylinder. Only possible in conjunction with circuit symbol N (Chapter 2.2.1.5). **Ordering example /32 DW:** with standard 2-way controller and 2-way controller spring coding 2 as per Chapter 2.2.1.2 and Chapter 2.2.1.3	
/4.. HRP 4 **/4.. HRP 4 V**	Output controller for proportional lowering speed independent of load pressure in single-acting cylinders combined with a releasable check valve for seat-tight load holding. Only possible in conjunction with circuit symbol NX (Chapter 2.2.1.5) ▪ **V:** releasable check valve with hydraulic release ▪ **H:** with drain screw	
/4.. HRPH 4 **/4.. HRPH 4 V**	**Ordering example /42 HRP 4:** with standard 2-way controller and 2-way controller spring coding 2 as per Chapter 2.2.1.2 and Chapter 2.2.1.3 Not in conjunction with “Lever housing rotated 180°”.	

2.2.3 Intermediate plate

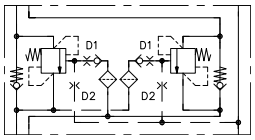
Depending on their version, the intermediate plates mount different kinds of additional valves (e.g. anti-cavitation valves, releasable check valves, load-holding valves or electrically actuated 2/2-way directional seated valves).

They are mounted between a valve section with a flange surface (coding A as per Chapter 2.2.1.1, "Consumer ports") and an ancillary block (Chapter 2.2.2, "Ancillary block") and are often used to combine two or more additional valves with each other.

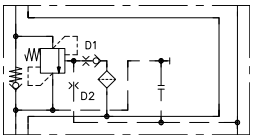
Coding	Description	Circuit symbol
/Z 40	Spacer plate, height 40 mm, for compensating height differences relative to adjacent valve sections.	
/Z 40 M **/Z 40 M UNF**	Spacer plate, height 40 mm, with measurement fittings A and B for compensating height differences between adjacent valve sections. ▪ **/Z 40 M:** G 1/4 (ISO 228-1) ▪ **/Z 40 M UNF:** SAE-4 or 7/16-20 UNF-2B (SAE J 514)	
/Z AN BN	Anti-cavitation valves in A and B.	
/ZDRH **/ZDRH VV** **/ZDRH 5 VV**	Releasable check valves (type DRH 3 as per D 6110). ▪ **/ZDRH:** releasable check valves in A and B ▪ **/ZDRH .. A:** releasable check valve in A ▪ **/ZDRH .. B:** releasable check valve in B ▪ **VV:** releasable check valves with hydraulic release ▪ **5 VV:** with heavy-duty spring and hydraulic release **Pressure required for releasing:** ▪ **/ZDRH, /ZDRH A, /ZDRH B:** 0.4-fold of checked pressure ▪ **/Z DRH VV, /Z DRH VV A, /Z DRH VV B, /Z DRH 5 VV, /Z DRH 5 VV A, /Z DRH 5 VV B:** 0.1-fold of checked pressure	
/ZDRH A **/ZDRH VV A** **/ZDRH 5 VV A**		
/ZDRH B **/ZDRH VV B** **/ZDRH 5 VV B**		

Coding	Description
/Z AL... BL... **/Z AL...** **/Z BL...**	Load-holding valves (type LHT 3 as per D 7918). ▪ **/Z AL... BL...:** Load-holding valves at A and B ▪ **/Z AL...:** Load-holding valve in A ▪ **/Z BL...:** Load-holding valve in B

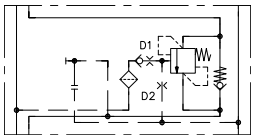
/Z AL.. BL..



/Z AL..



/Z BL..



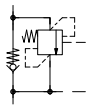
Ordering example:

/ZAL **- 0** **- A** **7** **/420**

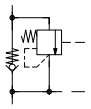
- /420 – Pressure setting in bar
- 7 – Geometric pilot ratio
- - A – Flow rate
- - 0 – Bypass orifice

- Inflow orifice D1:
  - ∅ 0.5 mm
- Bypass orifice D2:
  - 0 = sealed
  - ∅ 0.4 / 0.5 / 0.6 / 0.7 / 0.8 mm
- Geometric pilot ratio:
  - 1:7 (coding 7)
  - 1:∞ (coding 0)

Coding **7**



Coding **0**



For coding 0, the load pressure has no effect, and the load-holding valve is opened by the pilot pressure alone. In this case, the load-holding valve does not have an overpressure function.

Actual pilot ratio depends on bypass orifice:

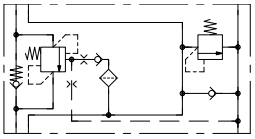
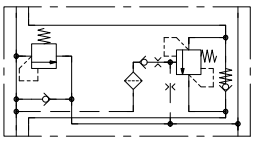
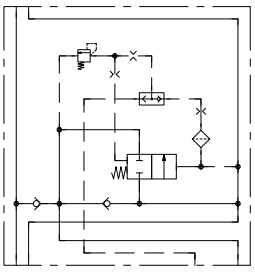
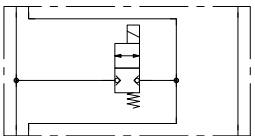
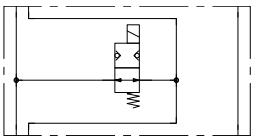
Coding	**0**	**4**	**5**	**6**	**7**	**8**
Bypass orifice ∅ (mm)	sealed	0.4	0.5	0.6	0.7	08
Geometric pilot ratio	1:7	1:7	1:7	1:7	1:7	1:7
Actual pilot ratio	1:7	1:5.0	1:3.5	1:2.3	1:1.3	1:0.9

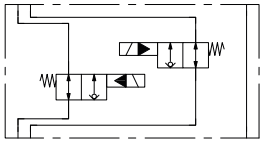
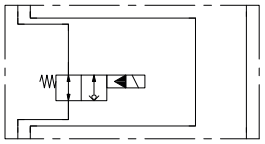
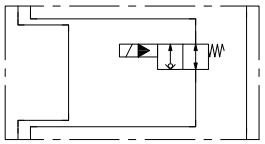
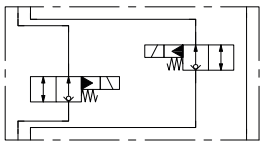
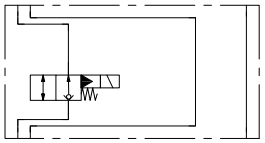
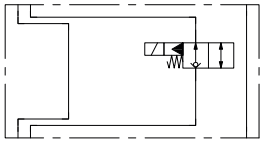
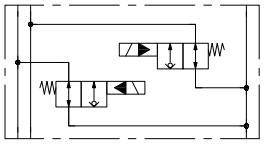
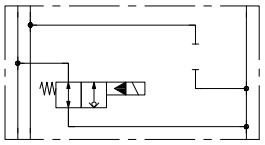
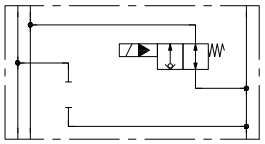
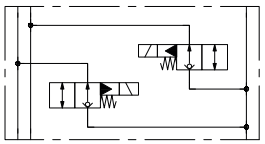
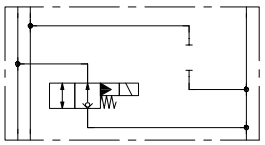
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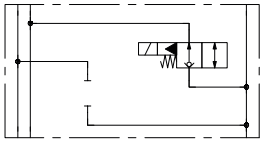
Coding	**A**	**B**	**C**	**D**	**E**	**F**
Q_{max} (l/min)	130	85	55	35	20	10

Maximum pilot pressure in the case of geometric pilot ratio 1:∞ (coding 0):

Bypass orifice D2	**0**	**4**	**5**	**6**	**7**	**8**
Min. pilot pressure (bar)	9	13	18	24	44	68
Max. pilot pressure (bar)	90	127	180	276	420	420

Coding	Description	Circuit symbol
/Z AL... - BN...	Combination of load-holding valve on one side and shock and anti-cavitation valve on the other side. ▪ **/Z AL... - BN...:** Load-holding valve in A and shock anti-cavitation valve in B ▪ **/Z BL... - AN...:** Load-holding valve in B and shock anti-cavitation valve in A	
/Z BL... - AN...	**Load-holding valve:** Description and order coding example see /Z AL... BL... **Shock and anti-cavitation valve:** each connected to the reflux. (Adjustment range: 40 to 420 bar)	
/ZN BC...	Pressure reduction in B. Q_{max} = 25 l/min; p_{max} = 240 bar The intermediate plate comprises a pilot valve for adjusting the pressure to be controlled at port B (adjustment range: 40 - 200 bar) and a 3-way controller. The pilot valve acts through the LS gallery on the 2-way controller in the valve section to control inflow pressure. At the same time, the pilot valve also acts on the 3-way controller. The latter acts as a shock valve and ensures that external forces cannot raise pressure in B beyond the value set. The reflux should be pre-loaded to ensure the hydraulic fluid does not flow into the reflux, but rather towards A. **Ordering example:** /ZN BC 250 Typical applications: Contact pressure control, press force control or tensile force control Only in conjunction with directional valve sections with additional function coding FL (Chapter 2.2.1.12)	
/ZDR	Electrically actuated 2/2-way directional seated valve as short-circuit valve. Q_{max} = 20 l/min ▪ **/ZDR:** closed in neutral position (type BV 1 R) ▪ **/ZDS:** open in neutral position (type BV 1 S)	
/ZDS	Cannot be combined with ancillary block types **/(UNF) 3 AS... BS..., /4 AS... BS..., /4 B..., /(UNF) 3 AN... BN..., /4 AN... BN..., /44 AN... BN..., /4 BN..., /(UNF) 3 AL... BL..., /(UNF) 3 BL..., /(UNF) 3 AC... BC..., /(UNF) 3 BC..., /(UNF) 3 SS, /(UNF) 3 XS, /(UNF) 3 VV, /(UNF) 3 XV** or **/4 BN...-EM 3...-PMVPS 8...**	

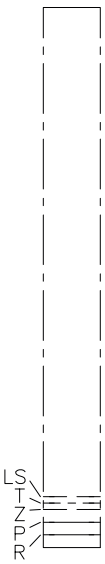
Coding	Description	Circuit symbol
/ZSS	Electrically actuated 2/2-way directional seated valve open in neutral position as check valve in A or B (EM 32 S as per D 7490/1). Q_{max} = 80 l/min; p_{max} = 400 bar ▪ **/ZSS:** Check valves in A and B ▪ **/ZSX:** Check valve at A ▪ **/ZXS:** Check valve at B Common applications: seat-tight sealing of consumers.	
/ZSX		
/ZXS		
/ZVV	Electrically actuated 2/2-way directional seated valve closed in neutral position as check valve in A or B (EM 32 V as per D 7490/1). Q_{max} = 80 l/min; p_{max} = 400 bar ▪ **/ZVV:** Check valves in A and B ▪ **/ZVX:** Check valve at A ▪ **/ZXV:** Check valve at B Common applications: seat-tight sealing of consumers.	
/ZVX		
/ZXV		
/ZRSS	Electrically actuated 2/2-way directional seated valve open in neutral position as check valve from A or B to R (EM 32 S as per D 7490/1). ▪ **/ZRSS:** Check valves A → R and B → R ▪ **/ZRSX:** Check valve A → R ▪ **/ZRXS:** Check valve B → R	
/ZRSX		
/ZRXS		
/ZRVV	Electrically actuated 2/2-way directional seated valve closed in neutral position as check valve from A or B to R (EM 32 V as per D 7490/1). ▪ **/ZRVV:** Check valves A → R and B → R ▪ **/ZRVX:** Check valve A → R ▪ **/ZRXV:** Check valve B → R	
/ZRVX		

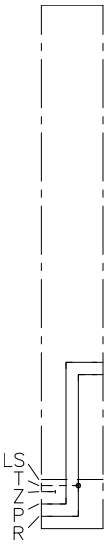
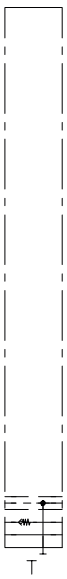
Coding	Description	Circuit symbol
/ZRXV		

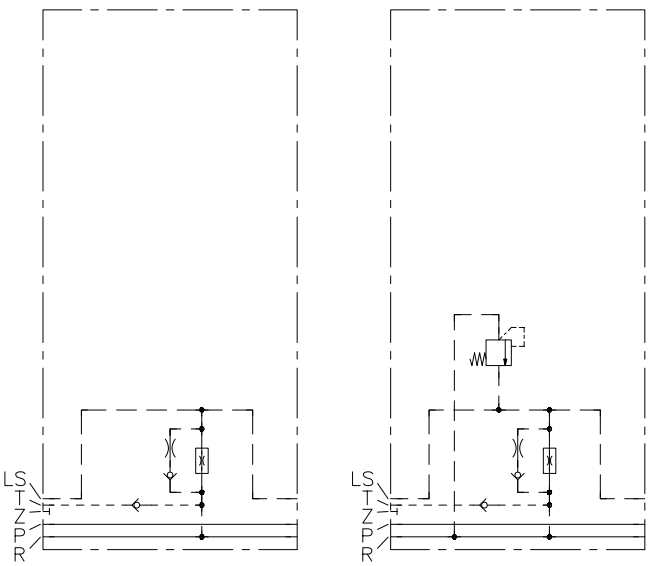
2.3 Series intermediate plate

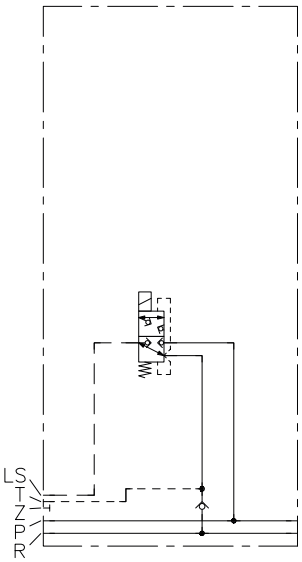
Series intermediate plates can be placed into a manifold in any position instead of a regular valve section.

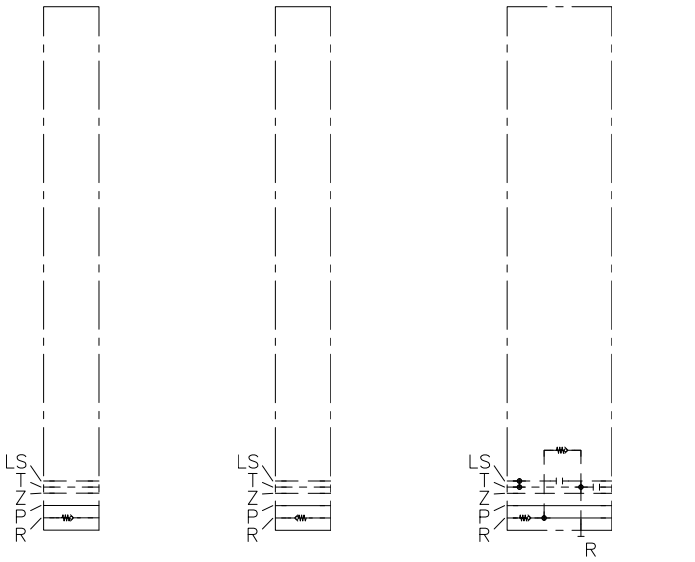
Depending on the version, they mount different kinds of additional valves (e.g. as P-gallery shut-offs, for controlling a second pressure stage or for supplying single-acting consumers). They can also act as spacer plates or transition plates to other PSL sizes or another valve series.

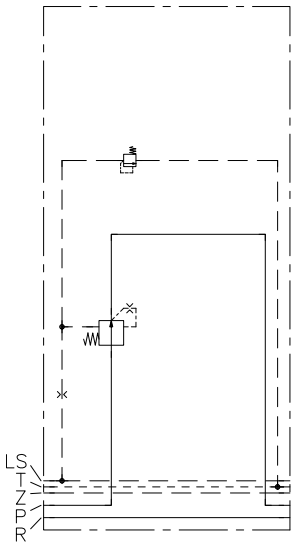
Coding	Description
ZPL 33/5 **ZPL 33/15** **ZPL 33/22** **ZPL 33**	Spacer plate ▪ **ZPL 33/5:** Width 5 mm ▪ **ZPL 33/15:** Width 15 mm ▪ **ZPL 33/22:** Width 22 mm ▪ **ZPL 33:** Width 49.5 mm **ZPL 33/5(15.22)**  **ZPL 33** 

Coding	Description
ZPL 32 **ZPL 3-SWS 2**	Transition plate to other PSL sizes or other valve series. ▪ **ZPL 32:** Transition to PSL 2 as per D 7700-2 ▪ **ZPL 3-SWS 2:** Transition to SWS as per D 7951 **ZPL 32**  **ZPL 3-SWS 2** 
ZPL 32/P2	Transition plate to PSL/PSV/EDL. Check valve RB 1 as per D 7445 in the P channel. Up up to 20 l/min. The check valve causes an additional flow resistance in the P channel. **ZPL 32/P2** 

Coding	Description
ZPL 3-CWL **ZPL 3-CWL P/...**	Transition plate to CWL as per D 7953 CWL. P_{max}: 315 bar The control oil in the T channel of the PSL / PSV valve sections is returned to the R channel internally. The LS gallery is connected to the R channel by means of a flow control valve (setting value: 0.6 l/min). As a result, the LS of the CWL valve sections is relieved when in neutral position. ▪ **ZPL 3-CWL P/..:** Additionally with LS pressure limitation (pressure setting: 40 to 300 bar) **ZPL 3-CWL** **ZPL 3-CWL P/...**  Width: 49.5 mm **INFORMATION** Internal control oil recirculation through R line is permissible only for return pressures < 10 bar.

Coding	Description
ZPL 3-CWS BV 1 Z	Transition plate to CWS as per D 7951 CWS. P_{max}: 315 bar The control oil in the T channel of the PSL / PSV valve sections is returned to the R channel internally. Since CWS does not signal LS, it is generated through actuation of BV 1 Z from the P channel. When in neutral position, it connects LS to the T channel. **ZPL 3-CWS BV 1 Z**  Width: 49.5 mm **INFORMATION** Internal control oil recirculation through R line is permissible only for return pressures < 10 bar.

Coding	Description
ZPL 33/15/R1 **ZPL 33/15/R2** **ZPL 33/20/RB R1 XTL**	Check valve in R channel. ▪ **ZPL 33/15/R1:** Locking direction from connection block toward end plate ▪ **ZPL 33/15/R2:** Locking direction from end plate toward connection block ▪ **ZPL 33/20/RB R1 XTL:** - Locking direction from connection block toward end plate - Shut-off for LS and T gallery as well as internal link between LS, T and R2 **ZPL 33/15/R1** **ZPL 33/15/R2** **ZPL 33/20/RB R1 XTL**  **INFORMATION** Internal control oil recirculation through R line is permissible only for return pressures < 10 bar.
ZPL 3-Z 3	P port for second pump circuit. - Port P2: G 1/2 (ISO 228-1) 

Coding	Description
ZPL 3 P/...	P pressure limitation for all downstream valve sections. (Adjustment range: 40 to 420 bar) There is a pilot-controlled pressure reducing valve in the P gallery consisting of a 2-way controller and a pressure-limiting valve. The pressure reducing valve limits the P pressure for downstream valve sections to a set value. **Ordering example:** ZPL 3 P/250 Application instruction to restrict the pressure level for several downstream valve sections: as the ZPL works like a 2-way controller, 2-way controllers should not be used in the downstream valve sections. **NOTICE** Only possible in conjunction with PSL connection block with 3-way controller spring coding H (Chapter 2.1.4) or with PSV connection block. The downstream valve sections cannot have a 2-way controller spring coding 5 or 7 (Chapter 2.2.1.3). **NOTICE** When using a the series intermediate plate, there is an additional pressure drop in the P gallery that can lead to the downstream sections no longer reaching nominal flow. **The undershooting of the nominal value depends on the** a) control pressure difference of the 3-way controller (PSL) or variable pump's pump controller (PSV), b) position of the valve section in the manifold and c) flow rate through the intermediate plate. The undershooting of the nominal value can reach up to 30% of $Q_{nominal}$, Chapter 2.2.1.6. 

Coding	Description
ZPL 3 S/H **ZPL 3 V/H** **ZPL 3 S/E** **ZPL 3 V/E**	P channel shut-off. There is a pilot-controlled 2/2-way directional valve for securely sealing the P gallery and all downstream valve sections against the pump. ▪ **ZPL 3 S:** P gallery open when not actuated ▪ **ZPL 3 V:** P gallery sealed when not actuated ▪ **/H:** hydraulic actuation through port S ▪ **/E:** electro-hydraulic actuation by means of a 3/2 directional seated valve (type WN 1 H as per D 7470 A/1) - Port S: G 1/4 (ISO 228-1) Common applications: Second switch-off method for safety functions.

NOTICE
Only possible in conjunction with PSL connection block with 3-way controller spring coding H (Chapter 2.1.4) or with PSV connection block.

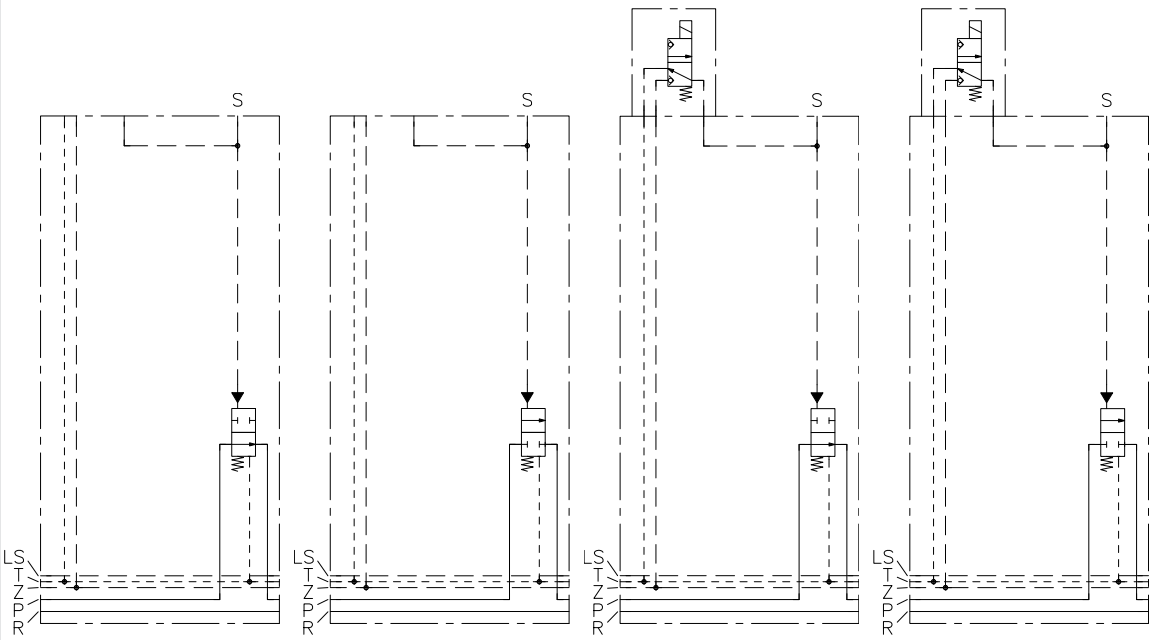
NOTICE
When using a P-line shut-off, there is an additional pressure drop in the P-line that can lead to the downstream sections no longer reaching the nominal value.

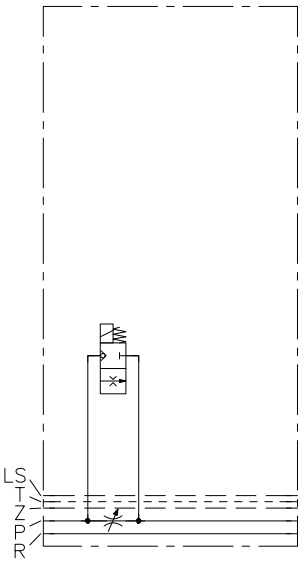
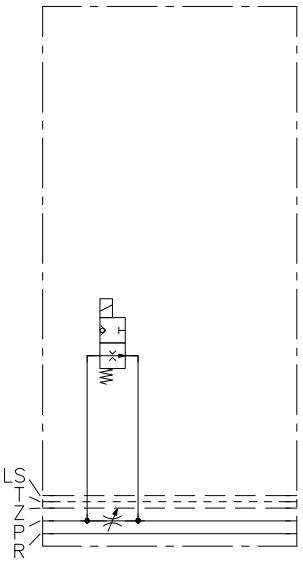
The undershooting of the nominal value depends on the

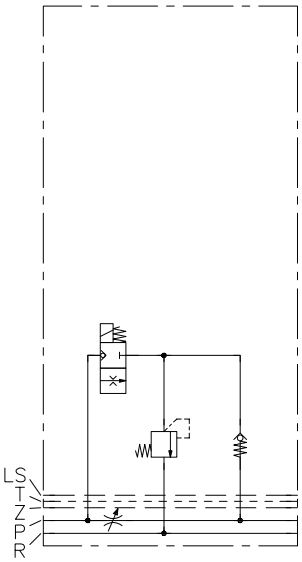
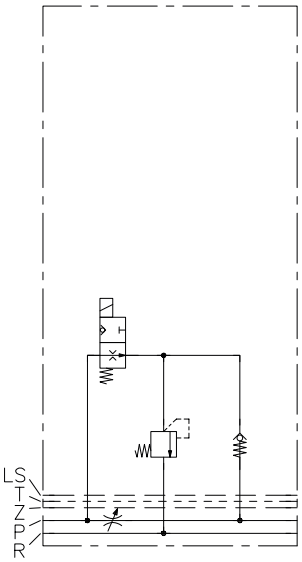
a) control pressure difference of the 3-way controller (PSL) or variable pump's pump controller (PSV),
b) position of the valve section in the manifold and
c) flow rate through the P-line shut-off.

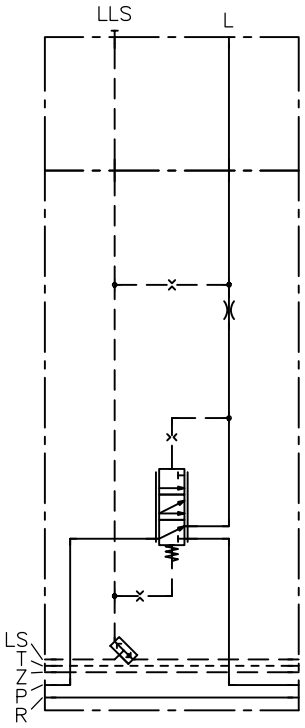
The undershooting of the nominal value can reach up to 30% of $Q_{nominal}$, Chapter 2.2.1.6.

ZPL 3 S/H **ZPL 3 V/H** **ZPL 3 S/E** **ZPL 3 V/E**

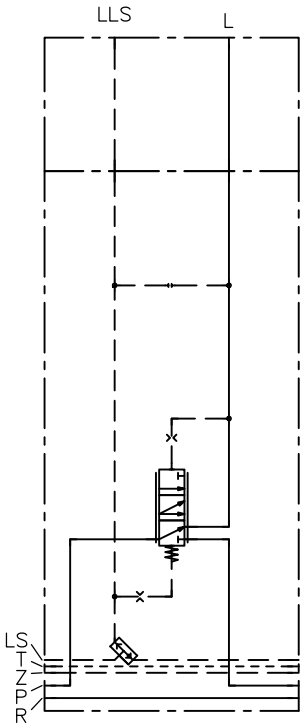


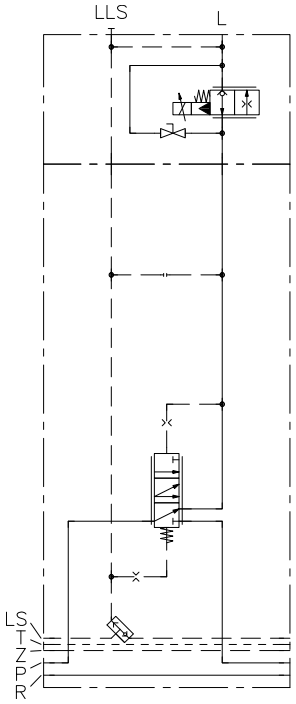
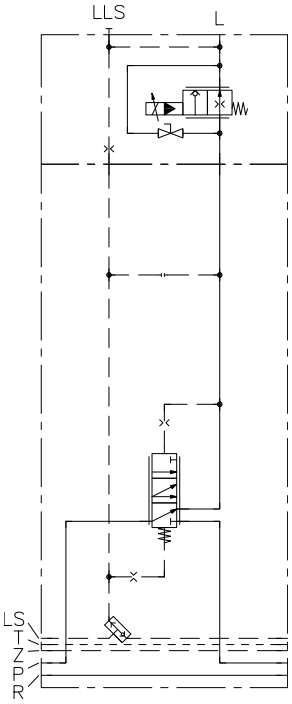
Coding	Description
ZPL 3 D **ZPL 3 DS**	Intermediate plate for activating/deactivating a second speed for all downstream valve sections. There is an adjustable throttle in the P gallery for limiting the flow rate supplied to the downstream valve sections. The throttle can be bypassed through an electrically actuated 2/2 directional seated valve. ▪ **ZPL 3 D:** reduced speed when unpowered (EM 21 D as per D 7490/1). ▪ **ZPL 3 DS:** reduced speed when powered (EM 21 DS as per D 7490/1). $Q_{max,\ pump}$ = 60 l/min; $Q_{reduced}$ = 0 ... 20 l/min Common applications: Speed reduction for setup mode or emergency mode or other specific operating states (e.g. transporting passengers). **ZPL 3 D**  **ZPL 3 DS** 

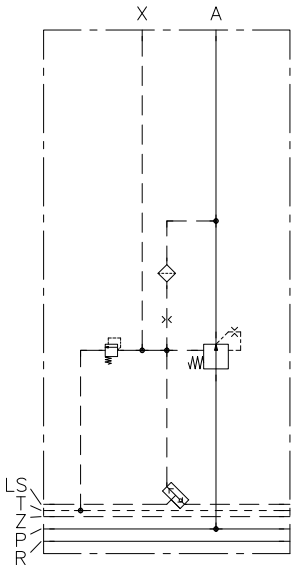
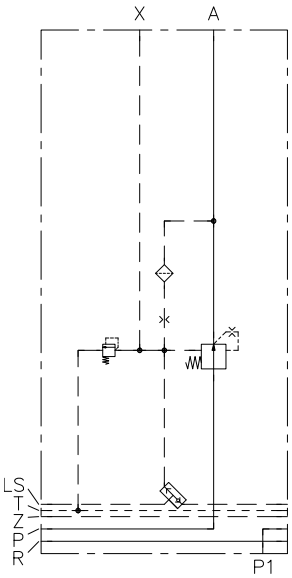
Coding	Description
ZPL 3 D/... **ZPL 3 DS/...**	Like ZPL 3 D and ZPL DS, but additionally with pressure-limiting valve to limit maximum pressure when speed is unthrottled. (Adjustment range: 40 to 420 bar) **This results in two operating modes:** a) reduced speed at high pressure b) reduced pressure at high speed ▪ **ZPL D/...:** reduced speed when unpowered (EM 21 D as per D 7490/1). ▪ **ZPL 3 DS/...:** reduced speed when powered (EM 21 DS as per D 7490/1). Common applications: Load increase at reduced speed for loading cranes **ZPL 3 D/...**  **ZPL 3 DS/...** 

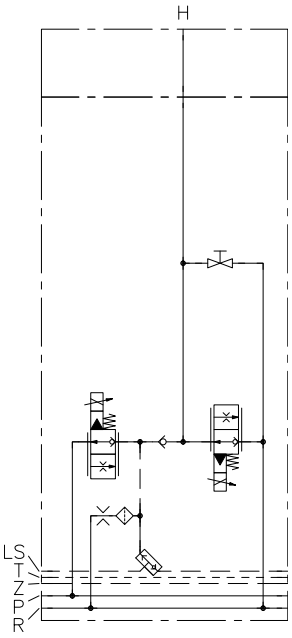
Coding	Description
ZPL 3 VQ..	Priority flow divider The priority flow divider sets a certain flow rate for port L for supplying one or more external consumers. The remaining flow is available to the downstream valve sections. Ordering example: ZPL 3 VQ **3** **-X** **/3QV** **-6** -6: Damping orifice (only possible when used with 2/2-way directional valve) /3QV: Ancillary block -X: Locking tapped plug between L and LLS 3: Flow rate range **Flow rate range:** ▪ **1:** $Q_L \leq 20$ l/min ▪ **2:** Q_L = 21 to 50 l/min ▪ **3:** $Q_L > 50$ l/min **The regulated flow rate at port L can be determined in 3 different ways:** **1. Fixed orifice** ▪ Available orifices in L gallery: (the orifice must be appropriate for the flow rate range) ▪ **2.0**: with ∅ 2.0 mm orifice, Q_L = 8 l/min ▪ **3.0**: with ∅ 3.0 mm orifice, Q_L = 18 l/min ▪ **4.0**: with ∅ 4.0 mm orifice, Q_L = 30 l/min ▪ **5.0**: with ∅ 5.0 mm orifice, Q_L = 40 l/min ▪ **6.0**: with ∅ 6.0 mm orifice, Q_L = 60 l/min ▪ Available ancillary block: ▪ **/3 Q** (UNF): without additional function, LLS port sealed ▪ Ordering example: ZPL 3 VQ 2-5.0/3 Q ▪ If no oil is taken at L, the controller remains opened towards L. No oil is conveyed to the downstream valve sections. **ZPL 3 VQ .-./3 Q** 

Coding	Description

	2. External LS signal
	▪ The external LS is fed in at the LLS port.
	  ▪ **X**: without additional function, LLS port open
	▪ Ordering example: ZPL 3 VQ 3-X/3 Q
	
	ZPL 3 VQ .-X/3 Q
	
	
	3. Electro-proportional 2/2-way directional valve
	▪ Available ancillary blocks, LLS port sealed:
	  ▪ **/3 QV** (UNF): EMP 31 V
	  ▪ **/3 QV 80** (UNF): EMP 31 V 80
	  ▪ **/3 QS** (UNF): EMP 31 S
	  ▪ **/3 Q21V** (UNF): EMP 21 V
	  ▪ **/3 Q21V 10** (UNF): EMP 21 V 10
	  ▪ **/3 Q21V 15** (UNF): EMP 21 V 15
	  ▪ **/3 Q21V 20** (UNF): EMP 21 V 20
	  ▪ **/3 Q21V H** (UNF): EMP 21 VH
	  ▪ **/3 Q21S** (UNF): EMP 21 S
	  ▪ **/3 Q21S 10** (UNF): EMP 21 S 10
	  ▪ **/3 Q21S 20** (UNF): EMP 21 S 20
	▪ Ordering example: ZPL 3 VQ 3-X/3 QV
	▪ Optionally with additional damping orifice in LS:
	  ▪ **No designation**: Standard version without damping orifice
	  ▪ **5**: ∅ 0.5 mm
	  ▪ **6**: ∅ 0.6 mm
	  ▪ **7**: ∅ 0.7 mm
	  ▪ Ordering example: ZPL 3 VQ 3-X/3 QS-6 (UNF): without additional function, LLS port sealed
	▪ If no oil is taken at L and the 2/2-way directional valve is open, the controller remains opened towards L. No oil is conveyed to the downstream valve sections.

Coding	Description
	ZPL 3 VQ .-X/3 QV  **ZPL 3 VQ .-X/3 QS-6** 

Coding	Description
ZPL 3 TX... **ZPL 3 TV...**	Pressure reduction for external consumer. (Adjustment range: 40 to 420 bar) There is a pilot-controlled pressure reducing valve on the intermediate plate consisting of a 2-way controller and a pressure-limiting valve. The pressure reducing valve sets a constant flow rate for port A for supplying one or more external consumers. ▪ **ZPL 3 TX:** with continuous P gallery ▪ **ZPL 3 TV:** P1 port for second pump circuit **Various orifice variants are available for damping the 2-way controller:** ▪ **5:** ∅ 0.5 mm ▪ **6:** ∅ 0.6 mm ▪ **7:** ∅ 0.7 mm ▪ **8:** ∅ 0.8 mm ▪ **9:** ∅ 0.9 mm **Ordering example:** ZPL 3 TV 7/250 – Port A: G 1/2 (ISO 228-1) – Port P1: G 1/2 (ISO 228-1) – Connection X: G 1/4 (ISO 228-1) **ZPL 3 TX**  **ZPL 3 TV** 

Coding	Description
A1 RR PVPV/5	Intermediate plate with two electro-proportional 2/2-way directional seated valves (type EMP 41 V as per D 7490/1) for lifting and lowering single-acting cylinders. Q_{max} = 160 l/min; p_{max} = 350 bar - Port H: G 1 (ISO 228-1) 

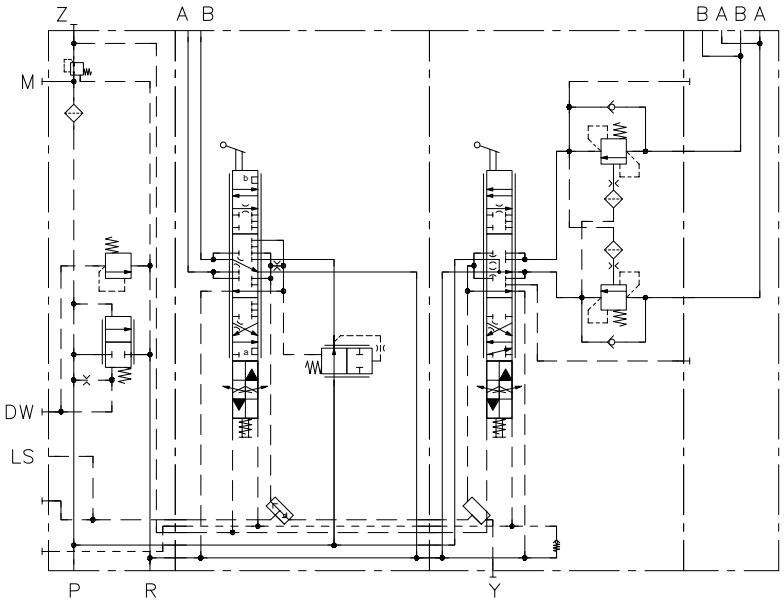
2.4 Valve section with integrated load-holding valves

This special valve section features directly integrated load-holding valves. It can only be used as a manifold's final valve section and is combined with specially designed end plates. Optionally, a differential circuit (regeneration function) is possible.

Common applications: Skip lorries

Example schematic:

PSV 551/275 - 3	- 32 B 40/63/EAB - F1 O 80/80 - 0 - B 6/280 - 0 - C 6/280/EA - EF 30 - G 24



Ordering example:

SL 3	- F1	H 80/80	- 0 - B 6/350	- 0 - C 6/300	/EA	- EF 30

2.4.4 "End plate"

- 2.2.1.13 "Actuation"
- 2.2.1.14 "Additional elements for actuation"

Load-holding valve on side B Section configuration load-holding valve

Load-holding valve on side A Section configuration load-holding valve

Valve spool

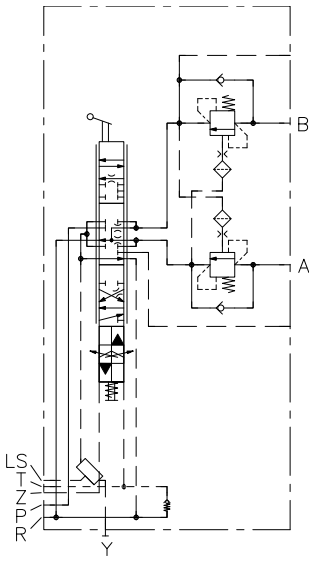
- 2.4.2 "Circuit symbol"
- 2.4.3 "Flow rate"

2.4.1 "Valve section"

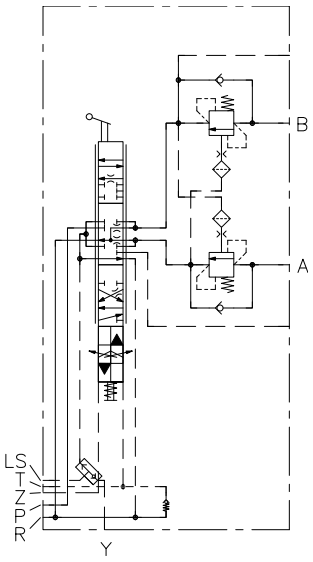
2.4.1 Valve section

Coding	Description
F1	Standard version.
F5	Version with Y port and shuttle valve for connecting a downstream manifold's LS signal.

Circuit symbols

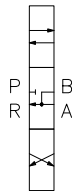
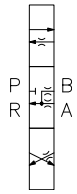
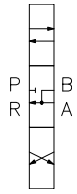


F1



F5

2.4.2 Circuit symbol

Coding	Description	Circuit symbol
H **HW**	Standard spool valve with low return pressure. ▪ **HW:** Special version with broad fitting tolerance.	
O **OW**	Standard spool valve with constant return pressure 20 bar. ▪ **OW:** Special version with broad fitting tolerance.	
HV	Special spool valve for differential circuit together with end plate type EF 31. Just before reaching maximum spool valve elevation in direction a, the HV spool valve activates the differential circuit in end plate EF 31.	

2.4.3 Flow rate

Flow rate coding ($Q_{nominal}$)							
3	6	10	16	25	40	63	80

The valve section does not include a 2-way controller, which means that flow rate is dependent on pressure difference between pump pressure (p_{pump}) and consumer pressure ($p_{A/B}$). It can be calculated using the following equation:

$$Q_{A/B} = Q_{Nominal} \cdot \sqrt{0.2 \cdot \Delta p_{Controller}}$$

$Q_{A/B}$ = flow rate to port A or B

$Q_{nominal}$ = nominal flow rate of valve spool at pressure difference of 6 bar

$\Delta p_{controller}$ = control pressure difference of the 3-way controller (PSL) or variable pump's pump controller (PSV)

Example:

- PSL connection block, standard 3-way controller spring (9 bar)

$$Q_{A/B} = 80\ l/\min \cdot \sqrt{0.2 \cdot 9} = 107\ l/\min$$

- PSL connection block, 3-way controller with heavy-duty spring (14 bar)

$$Q_{A/B} = 80\ l/\min \cdot \sqrt{0.2 \cdot 14} = 134\ l/\min$$

- PSV connection block, pump controller with 25 bar standby pressure

$$Q_{A/B} = 80\ l/\min \cdot \sqrt{0.2 \cdot 25} = 179\ l/\min$$

INFORMATION
The calculated values are rough reference values! They apply only to the highest-load consumer. If multiple consumers are being actuated in parallel, the pressure difference may be considerably greater at the lower-load consumers.

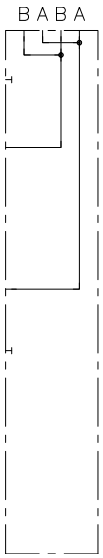
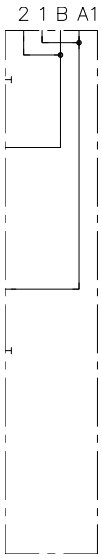
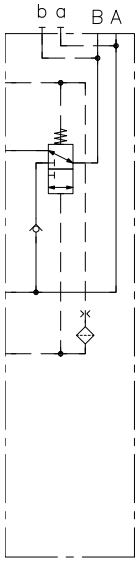
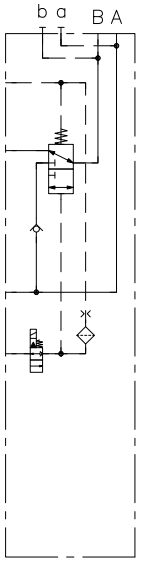
Configuration load-holding valve (example: 0-B 6/350)

- LHT 50 as per D 7918
- Inflow orifice D1: ∅ 0.5 mm
- Bypass orifice D2: sealed (coding 0)
- Flow rate:

Coding	A	B	C	D	E	F
Q_{max} (l/min)	250	200	150	100	50	25

- Pilot ratio: 1:6 (coding 6)
- Pressure setting in bar

2.4.4 End plate

Coding	Description	Circuit symbol	
EF 30 **EF 41** **EF 42**	Standard end plate for valve sections with integrated load-holding valves with four consumer ports each. ▪ **EF 30:** 4x G 1/2 ▪ **EF 41:** 2x G 3/4 and 2x G 1/4 ▪ **EF 42:** 2x G 3/4 and 2x G 1/4	EF 30(41) 	EF 42 
EF 31 **EF 31 D**	Special end plate for valve section with integrated load-holding valves. Additionally with integrated 3/2-way directional valve for differential circuit (regeneration function). ▪ **EF 31 D:** electro-hydraulic actuation of regeneration function by means of a 2/2-way directional seated valve (type EM 21 D as per D 7490/1)	EF 31 	EF 31 D 

2.5 End plate

End plates are the final element in a manifold and close off the valve bank.

Depending on the version, the end plates feature ports themselves (e.g. P, R or LS port) or additional valves (e.g. flow control valve or pressure reducing valves) for supplying downstream valves.

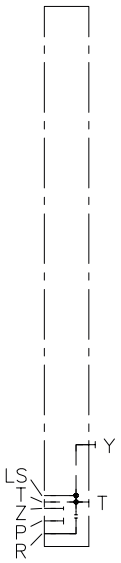
Coding	Description
E 1, E 1 UNF **E 7** **E 13** **E 17, E 17 UNF**	T port for external recirculation of control oil to tank. ▪ **E 7:** with additional R port ▪ **E 13:** with additional P port ▪ **E 17:** with additional P and R port ▪ **T:** G 1/4 or SAE-4 (7/16-20 UNF-2B) ▪ **P:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **R:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **Y:** G 1/4 or SAE-4 (7/16-20 UNF-2B) - (sealed)
E 4, E 4 UNF **E 9** **E 15** **E 19, E 19 UNF**	T-line internally linked with R-line for internal recirculation of control oil through R line. ▪ **E 9:** with additional R port ▪ **E 15:** with additional P port ▪ **E 19:** with additional P and R port ▪ **T:** G 1/4 or SAE-4 (7/16-20 UNF-2B) - (sealed) ▪ **P:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **R:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **Y:** G 1/4 or SAE-4 (7/16-20 UNF-2B) - (sealed)
E 2, E 2 UNF **E 8** **E 14** **E 18, E 18 UNF**	With additional Y port for connecting a downstream manifold's LS signal. T port for external recirculation of control oil to tank. ▪ **E 8:** with additional R port ▪ **E 14:** with additional P port ▪ **E 18:** with additional P and R port ▪ **T:** G 1/4 or SAE-4 (7/16-20 UNF-2B) ▪ **P:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **R:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **Y:** G 1/4 or SAE-4 (7/16-20 UNF-2B)
E 5, E 5 UNF **E 10** **E 16** **E 20, E 20 UNF**	With additional Y port for connecting a downstream manifold's LS signal. T-line internally linked with R-line for internal recirculation of control oil through R line. ▪ **E 10:** with additional R port ▪ **E 16:** with additional P port ▪ **E 20:** with additional P and R port ▪ **T:** G 1/4 or SAE-4 (7/16-20 UNF-2B) - (sealed) ▪ **P:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **R:** G 3/4 or SAE-10 (7/18-14 UNF-2B) ▪ **Y:** G 1/4 or SAE-4 (7/16-20 UNF-2B)
E 3 **E 6**	With integrated 3/2-way directional valve (WN 1 H as per D 7470 A/1) to switch P to LS when required and shut off the PSL connection block's unpressurised circulation. ▪ **E 3:** T port for external recirculation of control oil to tank ▪ **E 6:** T-line internally linked with R-line for internal recirculation of control oil through R-line ▪ **E 3 - T:** G 1/4 or SAE-4 (7/16-20 UNF-2B) ▪ **E 6 - T:** G 1/4 or SAE-4 (7/16-20 UNF-2B) - (sealed)
E 1 M **E 2 M** **E 4 M** **E 5 M**	End plates with two additional measurement fittings in P. In terms of the other functions, they correspond to the end plates E 1, E 2, E 4 and E 5. ▪ Measurement fittings **M:** G 1/4 or SAE-4 (7/16-20 UNF-2B)

Coding	Description
E 1 ZR5 **E 2 ZR5** **E 4 ZR5** **E 5 ZR5**	Connection from Z to R in order to generate a permanent control oil flow rate. In terms of the other functions, they correspond to the end plates E 1, E 2, E 4 and E 5. A 0.5 mm orifice is installed as standard. Sample application: In a cold environment, the valves that are not used constantly can be continuously maintained at operating temperature using pre-warmed oil from the system.

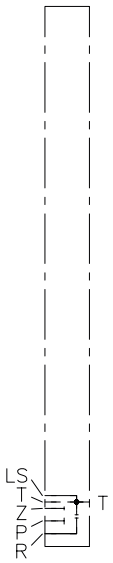
NOTICE
Internal control oil recirculation through R line is permissible only for return pressures < 10 bar.

Circuit symbols

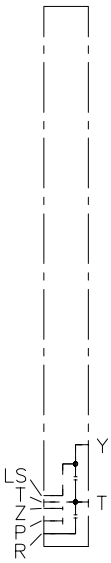
E 1



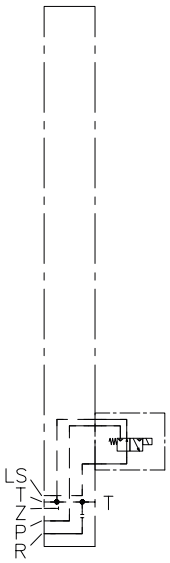
E 1 UNF



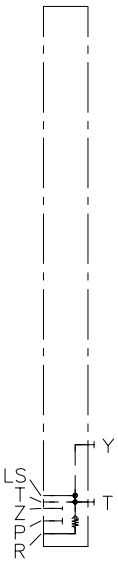
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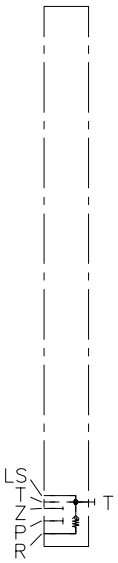
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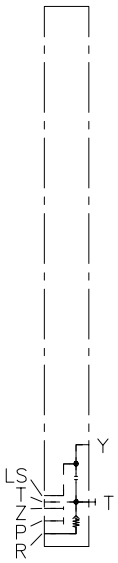
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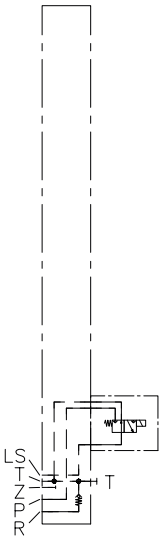
E 4 UNF



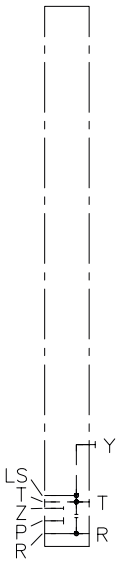
E 5



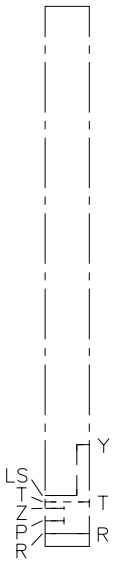
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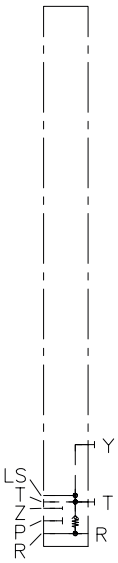
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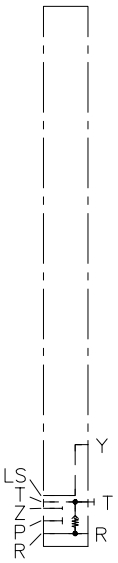
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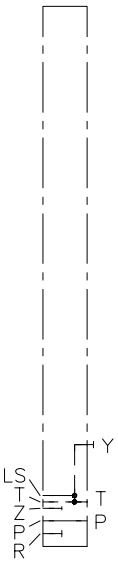
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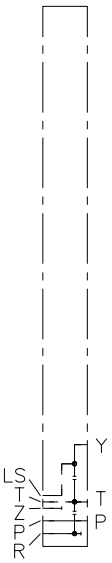
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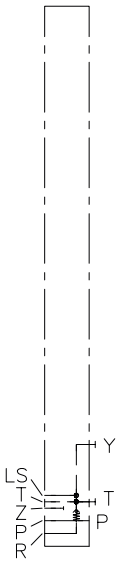
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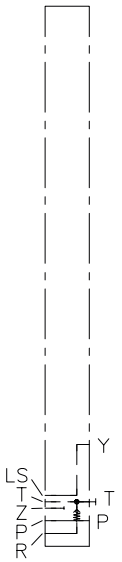
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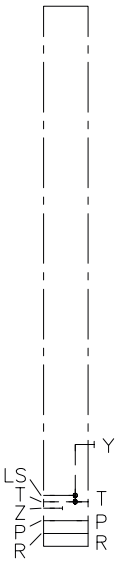
E 15



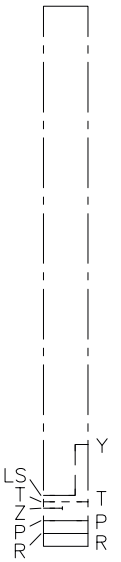
E 16



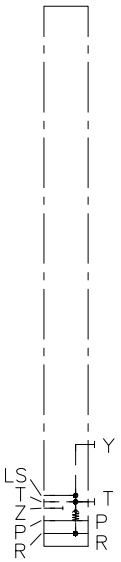
E 17, E 17 UNF



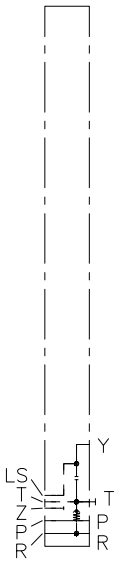
E 18, E 18 UNF



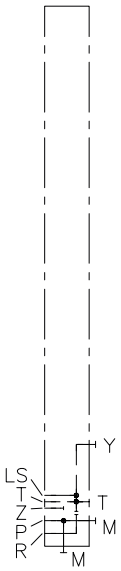
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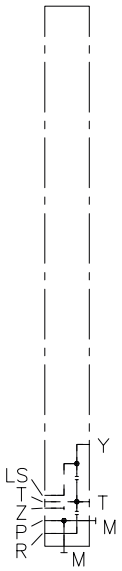
E 20, E 20 UNF



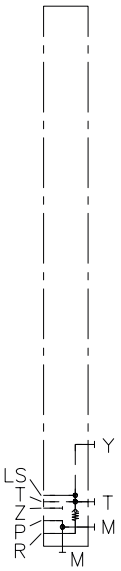
E 1 M



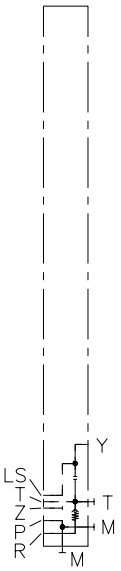
E 2 M



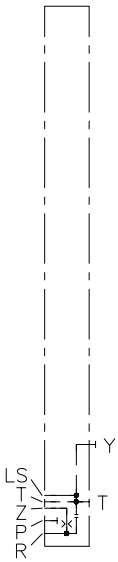
E 4 M



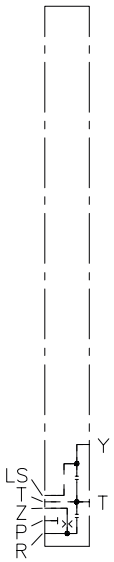
E 5 M



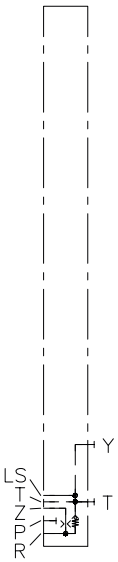
E 1 ZR5



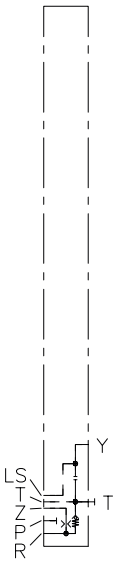
E 2 ZR5



E 4 ZR5



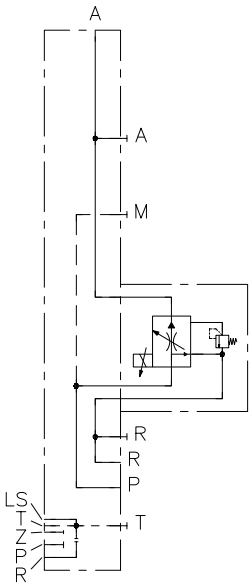
E 5 ZR5



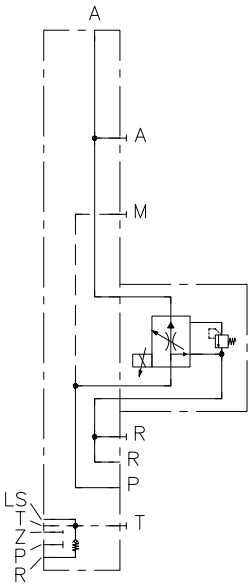
Coding	Description
E 1 SEH. 3-4/...FP... **E 4 SEH. 3-4/...FP...**	As for E 1 or E 4 but with mounted 3-way flow control valve type SEH. 3-4 as per D 7557/1 for controlling a proportional flow rate to a downstream manifold. Common application is for supplying simple black/white actuation NG 6 manifolds used for additional functions in the vehicle. **Example order coding:** E4 SEHD 3-4/70 FPS-230
E 28-ADM 22 .-... **E 28-PDM 22 .-...**	Like E 4 but with mounted pressure reducing valve for controlling pressure at port Z 3 and for attaching a 4/2-way directional valve of type SWS 2 as per D 7951 ▪ **E 28-ADM 22 .-...:** With mechanically adjustable pressure reducing valve of type ADM 22 as per D 7120 ▪ **E 28-PDM 22 .-...:** With electro-proportionally adjustable pressure reducing valve type PDM 22 as per D 7584/1 **Example order coding:** E 28-ADM 22 D-50-SWS 2

Circuit symbols

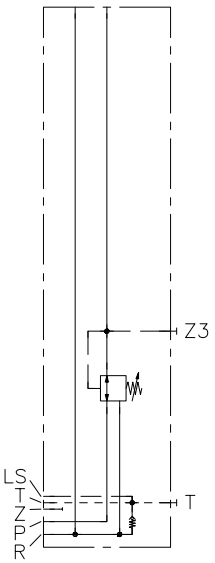
E 1 SEH. 3-4/...FP...



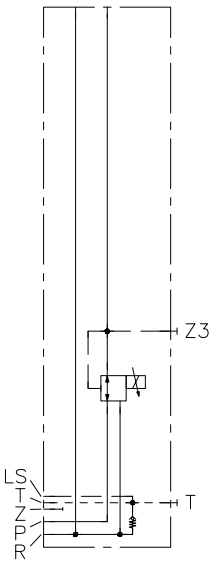
E 4 SEH. 3-4/...FP...



E 28-ADM 22 .-...



E 28-PDM 22 .-...



2.6 Solenoid voltage and solenoid version

2.6.1 standard solenoid versions

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)	Valve section with electro-hydraulic actuation (EI, EA, EH, EHA etc.)	Can be combined with certain additional valves				
					WN	BVE	EM, EMP	F, FH	FP, FPH
AMP 12 K 4 **AMP 24 K 4**	AMP Junior Timer	12 V DC 24 V DC	IP 67	4-pin, connector position front		●	●		●
AMP 12 H 4 **AMP 24 H 4**		12 V DC 24 V DC		4-pin, connector position side (bottom)		●	●		●
AMP 12 H 4 T **AMP 24 H 4 T**		12 V DC 24 V DC		4-pin, connector position side (bottom), with override		●	●		●
AMP 12 K **AMP 24 K**		12 V DC 24 V DC		3-pin, connector position front		●	●		●
DT 12 **DT 24**	German (DT 04-4P)	12 V DC 24 V DC	IP 69k	4-pin, connector position side (bottom)		●	●		●
DT 12 T **DT 24 T**		12 V DC 24 V DC		4-pin, connector position side (bottom), with override		●	●		●
DT 12 TH **DT 24 TH**		12 V DC 24 V DC		4-pin, connector position side (bottom), with override button		●	●		●
DT 12 K **DT 24 K**		12 V DC 24 V DC		4-pin, connector position front		●	●		●
S 12 **S 24**	Bayonet coupling PA6 Schlemmer	12 V DC 24 V DC	IP 67	3-pin, connector position front	●	●	●		●
S 12 T **S 24 T**		12 V DC 24 V DC		3-pin, connector position front, with override	●	●	●		●
G 12 **G 24**	EN 175 301-803 A ▪ **G:** with male connector (MSD 3-309 as per D 7163) ▪ **X:** without male connector ▪ **L:** with male connector with LED (SVS 296365 as per D 7163) ▪ **L5K:** with male connector with LED and 5 m cable (L5K-VZP as per D 7163 Erg. 78/1) ▪ **L10K:** with male connector with LED and 10 m cable (L10K-VZP as per D 7163 Erg. 78/1)	12 V DC 24 V DC	IP 65	3-pin, connector position side (bottom)	●	●	●	●	●
X 12 **X 24**		12 V DC 24 V DC			●	●	●	●	●
L 12 **L 24**		12 V DC 24 V DC			●	●	●	●	●
L5K 12 **L5K 24**		12 V DC 24 V DC			●	●	●	●	●
L10K 12 **L10K 24**		12 V DC 24 V DC			●	●	●	●	●
G 12 T **G 24 T**		12 V DC 24 V DC		3-pin, connector position side (bottom), with override	●	●	●	●	●
X 12 T **X 24 T**		12 V DC 24 V DC			●	●	●	●	●
L 12 T **L 24 T**		12 V DC 24 V DC			●	●	●	●	●
L5K 12 T **L5K 24 T**		12 V DC 24 V DC			●	●	●	●	●
L10K 12 T **L10K 24 T**		12 V DC 24 V DC			●	●	●	●	●

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)	Valve section with electro-hydraulic actuation (EI, EA, EH, EHA etc.)	Can be combined with certain additional valves				
					WN	BVE	EM, EMP	F, FH	FP, FPH
G 12 TH **G 24 TH**	EN 175 301-803 A ▪ **G:** with male connector (MSD 3-309 as per D 7163) ▪ **X:** without male connector ▪ **L:** with male connector with LED (SVS 296365 as per D 7163) ▪ **L5K:** with male connector with LED and 5 m cable (L5K-VZP as per D 7163 Erg. 78/1) ▪ **L10K:** with male connector with LED and 10 m cable (L10K-VZP as per D 7163 Erg. 78/1)	12 V DC 24 V DC	IP 65	3-pin, connector position side (bottom), with override button	●	●	●	●	●
X 12 TH **X 24 TH**		12 V DC 24 V DC			●	●	●	●	●
L 12 TH **L 24 TH**		12 V DC 24 V DC			●	●	●	●	●
L5K 12 TH **L5K 24 TH**		12 V DC 24 V DC			●	●	●	●	●
L10K 12 TH **L10K 24 TH**		12 V DC 24 V DC			●	●	●	●	●
G 12 DS * **G 24 DS** *		12 V DC 24 V DC		3-pin, connector position side (bottom), deep-sea version (coil and connector socket not potted)					
X 12 DS * **X 24 DS** *		12 V DC 24 V DC							
G 12 H 4 **G 24 H 4**		12 V DC 24 V DC		4-pin, connector position side (bottom)	●	●	●	●	●
X 12 H 4 **X 24 H 4**		12 V DC 24 V DC			●	●	●	●	●
L 12 H 4 **L 24 H 4**		12 V DC 24 V DC			●	●	●	●	●
X 12 C **X 24 C**	EN 175 301-803 C	12 V DC 24 V DC	IP 65	3-pin, connector position front					
X 12 C 4 **X 24 C 4**	EN 175 301-803 C	12 V DC 24 V DC	IP 65	3-pin, connector position front					
DTL 12 **DTL 24**	MIL-DTL-38999 series III	12 V DC 24 V DC	IP 67	4-pin, connector position side (bottom)			●		
ITT 12 **ITT 24**	VG 95234 MIL	12 V DC 24 V DC	IP 67	4-pin, connector position side (bottom)			●		

* (available upon request only)

Electrical connection for additional valves:

- **WN:** see D 7470 A/1
- **BVE:** see D 7921
- **EM 21:** see D 7490/1 E
- **EM 3, EMP 4:** see D 7490/1
- **SEH:** see D 7557/1
- **PDM:** see D 7584/1
- **SWS:** see D 7951
- **PMVP:** see D 7485/1

Different types of plug (e.g. EA actuation with AMP 24 K 4 and WN valve with G 24) are available upon request.

Electrical connection for LS relief coding F 1, F 2, F3, FH 1, FH 2, FH 3:

The electrical LS relief's on/off twin solenoids are only available with DIN connectors and manual override (coding -G...T(H), -X...T(H) or -L...T(H). Should you require another plug option, the electro-proportional LS pressure limitation coding FP.., FPH.. can be used instead.

Electrical connection for electro-proportional LS pressure limitation coding FP.., FPH..:

Only twin solenoids with manual override (coding -...T or -...TH) are possible.
If a twin solenoid without manual override was chosen for the valve section's electro-hydraulic actuation, the same twin solenoid type is automatically used for the LS pressure limitation's electro-proportional actuation, but with additional manual override. If the twin solenoid type is not possible with manual override, coding -G...T is used by default.

2.6.2 Solenoid versions for potentially explosive atmospheres

Coding	Description
X 24 TEX 4 70 FM **X 24 TEX 4 M 70 FM**	Explosion-proof solenoid in terminal box Thread for electric connection ▪ **X 24 TEX 4 70 FM:** 1/2"-14 NPT ▪ **X 24 TEX M 4 70 FM:** M20x1.5-6H Number of solenoids permitted per valve section: ▪ SL 3: 1 solenoid ▪ SLF 3 (D 7700-F): 2 solenoids ▪ SL 5 (D 7700-5): 2 solenoids ▪ SLF 5 (D 7700-F): 2 solenoids Information on the solenoid is provided in the operating instructions B ATEX
G 24 EX **G 24 EX-10 m**	Explosion-proof solenoid with cable ▪ **No additional specification:** with 3 m cable ▪ **10 m:** with 10 m cable Number of solenoids permitted per valve section: ▪ SL 3: 1 solenoid ▪ SLF 3 (D 7700-F): 2 solenoids ▪ SL 5 (D 7700-5): 2 solenoids ▪ SLF 5 (D 7700-F): 2 solenoids Information on the solenoid is provided in the operating instructions B ATEX
G 12 IS **G 12 IS-10 m** **G 24 M2FP** **G 24 M2FP-10 m** **G 24 MSHA** **G 24 MSHA-10 m** **G 24 MSHA-20 m** **G 24 MA** **G 24 MA-10 m** **G 24 MA-20 m**	Explosion-proof solenoid with cable. ▪ **No additional specification:** with 3 m cable ▪ **10 m:** with 10 m cable ▪ **20 m:** with 20 m cable Before each individual valve section, at least one 5 mm spacer plate (e.g. ZPL 33/5) is required because the solenoid is wider. Number of solenoids permitted per valve section: ▪ SL 3: 1 solenoid ▪ SLF 3 (D 7700-F): 2 solenoids ▪ SL 5 (D 7700-5): 2 solenoids ▪ SLF 5 (D 7700-F): 2 solenoids With manual override. When combined with actuation **H**, two extensions of 20 mm each are installed underneath the actuating solenoid. Information on the solenoid is provided in the operating instructions B ATEX

INFORMATION
Solenoid versions for potentially explosive areas cannot be selected with manual override **T** and **TH**.

2.7 Additional versions

2.7.1 Sealing

Coding	Description
Sealed-p_{max}	Pressure-limiting valve on connection block is provided with a wire seal as per the pressure setting
Sealed	All pressure-limiting valves are provided with a wire seal as per the pressure setting

2.7.2 Paint finish

Coding	Description
-painted RAL 9005	Colour
GLOSS 20-40	Gloss level

3 Parameters

3.1 General data

Designation	Proportional directional spool valves PSL, PSV, PSM
Design	Manifold with up to 12 valve sections
Material	Steel; Nitrocarburised surfaces (anti-corrosion), Hardened and ground functional inner parts, Surfaces of the solenoids electro-galvanised If the valve is exposed to corrosive factors, we recommend an additional coating or housing.
Attachment	Mounting thread M10, see Chapter 4, "Dimensions"
Installation position	As desired In the case of types with CANL and hand lever: Ideally assemble the hand lever upright to avoid any negative impact from gravity on the current values (I_{min}, I_{max}) and, in turn, on the maximum flow rate.
Ports/connections	▪ **P** = Pump ▪ **R** = Reflux ▪ **A, B** = Consumers ▪ **LS, DW, U, W, X, XH, Y** = load pressure signals ▪ **M** = Pressure gauge connection for pump pressure ▪ **a, b** = Pressure gauge connection for consumer pressure ▪ **Z** = Pilot pressure ▪ **T** = Tank line for control oil **Connecting thread:** ▪ **P, R, A, B** = as per type designation ▪ **M, LS, DW, Y, Z, T** = G 1/4 (ISO 228-1) or SAE-4, or 7/16-20 UNF-2B (SAE J 514) ▪ **U, W, X, XH** = G 1/8 (ISO 228-1) ▪ **a, b** = G 1/4 or G 1/8 (ISO 228-1)
Hydraulic fluid	Hydraulic fluid, according to DIN 51524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 1500 mm²/s Optimal operating range: approx. 10 - 500 mm²/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C. Not suitable for HETG such as rapeseed oil and water-glycol solutions, e.g. HFA and HFC.
Cleanliness level	**ISO 4406** 20/17/14
Temperatures	Environment: approx. -40 to +80 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C. **NOTICE** Observe restrictions on electronic components and explosion-proof solenoids.

3.2 Pressure and volumetric flow

Operating pressure	▪ p_{max} = 420 bar (ports P, P1, P2, A, B, LS, M, Y) ▪ Pilot pressure ≤ 40 bar (port Z) ▪ Return pressure ≤ 50 bar (ports R, R1, T) for high return pressures, T port should be routed to the tank separately (end plate E 1, E 2, E 3, etc. see Chapter 2.5, "End plate")
Flow rate	▪ Q_{max} connection block: see Chapter 3.4, "Characteristic lines" ▪ Q_{max} consumer: see Chapter 2.2.1.6, "Flow rate"

3.3 Weight

Connection block	**Type**	
	PSL 3, 4	= 3.8 kg
	PSL 5	= 4.3 kg
	PSV 3, 4, 5	= 3.6 kg
	PSV 45, PSV 55	= 4.3 kg
	PSV 6	= 3.3 kg
	PSM 5	= 4.3 kg
	Supplement	
	F, D, PA, PB, PC, PD	+ 0.6 kg
Directional valve section	**Valve section with actuation**	
	Coding	
	A, H, F, P, E0A	= 3.3 kg
	HA, FA	= 3.6 kg
	EA, PA, K	= 3.7 kg
	EHA, EFA, KE	= 4.0 kg

Ancillary block	**Coding**	
	/3, /UNF 3	= 0.6 kg
	/3 AS..BS.., /31 AS...BS..., /UNF 3 AS...BS...	= 0.8 kg
	/3 DW., /4 DW., /UNF 4 DW.	= 0.8 kg
	/4, /4 AN BN, /UNF 3 AN BN.	= 0.9 kg
	/3 DRH, /UNF 3 DRH, /43 DFA, /43 DFB	= 1.1 kg
	/3 VX, /3 XV, /3 SX, /3 XS, /UNF 3 VX, /UNF 3 XV, /UNF 3 SX, /UNF 3 XS	= 1.5 kg
	/4 AN..., /4 BN...	= 1.7 kg
	/4 AS... BS..., /3 AN... BN..., /31 AN... BN..., /UNF 3 AN... BN..., /4 AN... BN...	= 1.8 kg
	/3 VV, /UNF 3 VV	= 1.9 kg
	/3 AL... BL..., /3 AL..., /3 BL..., /3 AC... BC..., /3 ACX... BCX..., /UNF 3 AL... BL..., /UNF 3 AL..., /UNF 3 BL..., /UNF 3 AC... BC..., /UNF 3 ACX... BCX...	= 2.0 kg
Intermediate plate	**Coding**	
	ZDR, ZDS	= 1.0 kg
	ZAL... BL...	= 2.0 kg
Series intermediate plate	**Coding**	
	ZPL 33/5	= 0.3 kg
	ZPL 33/15	= 0.8 kg
	ZPL 32	= 1.2 kg
	ZPL 33, ZPL 3-Z 3	= 1.9 kg
	ZPL 3 P/...	= 2.5 kg
	ZPL 3 S(V)/H	= 2.7 kg
	ZPL 3 S(V)/E	= 3.3 kg
	ZPL 3 DS/...	= 3.6 kg
	ZPL 3 D/..	= 3.6 kg
End plate	**Coding**	
	E 1, E 2, E 4, E 5, E 1 UNF, E 4 UNF	= 1.0 kg
	E 3, E 6	= 1.6 kg
	E 17, E 18, E 19, E 20, E 17 UNF, E 20 UNF	= 2.1 kg

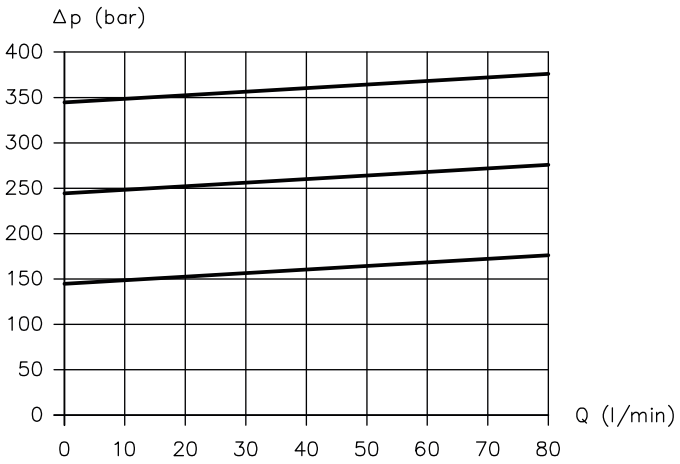
3.4 Characteristic lines

Viscosity of the hydraulic fluid approx. 60 mm²/s

3.4.1 Connection block

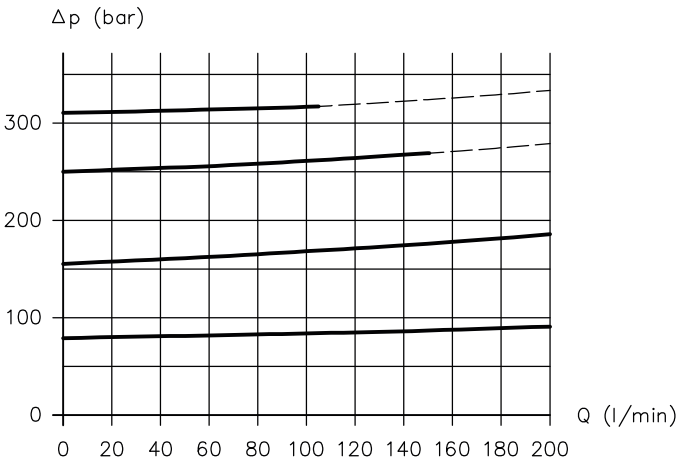
Pressure-limiting valve (P → R)

PSL 3(4).../...-3
PSL 4 Y(Z, K).../...-3
PSL JIS 4.../...-3
PSV 3(4, 5).../...-3
PSV 5 N...-3
PSV UNF 5 N...-3



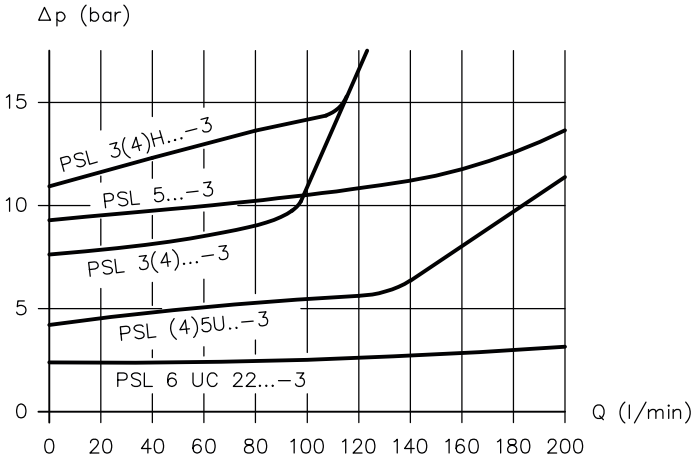
Q flow rate (l/min); Δp pressure difference (bar)

PSL 45(5, UNF 4).../...-3
PSL 6...UC 22 2/...-3
PSV 45(55, UNF 44).../...-3
PSM 5.../...-3, PSM 5 L.../...-3
PSM UNF 4.../...-3



Q flow rate (l/min); Δp pressure difference (bar)

Circulation pressure (P → R) in PSL connection blocks

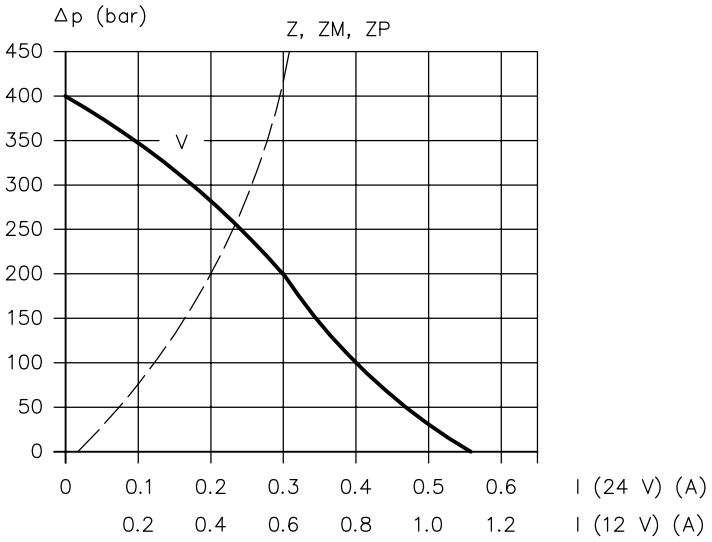


Q flow rate (l/min); Δp pressure difference (bar)

Electro-proportional LS pressure limitation

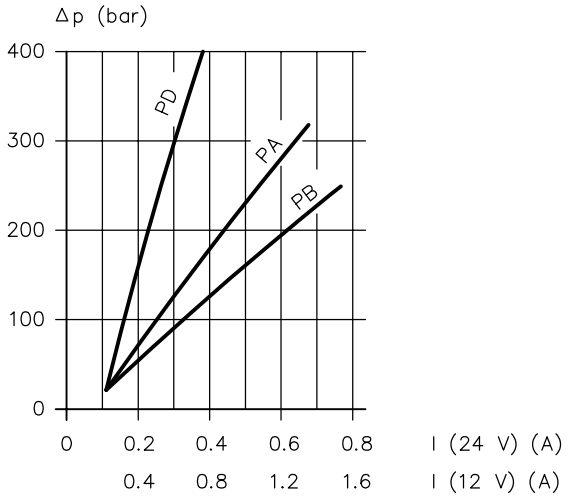
see Chapter 2.1.7, "LS relief or LS pressure limitation"

Coding **V, Z, ZM, ZP**



I control current (A) at 24 V DC or 12 V DC; Δp pressure difference LS - R (bar)

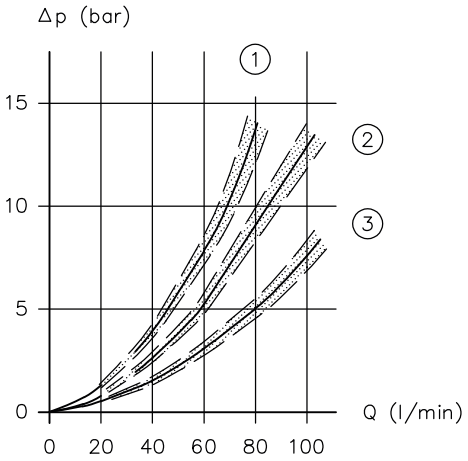
Coding **PA, PB, PD**



I control current (A) at 24 V DC or 12 V DC; Δp pressure difference LS - R (bar)

3.4.2 Directional valve section

Pressure difference P → A/B and A/B → R



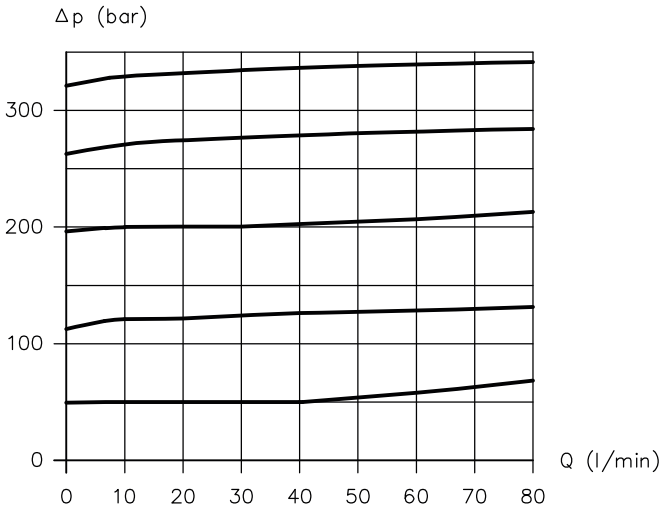
Q flow rate (l/min); Δp pressure difference (bar)

1 P → A/B in valve section with 2-way controller
2 P → A/B in valve section without 2-way controller
3 A/B → R in spool valve coding L, M, F, H

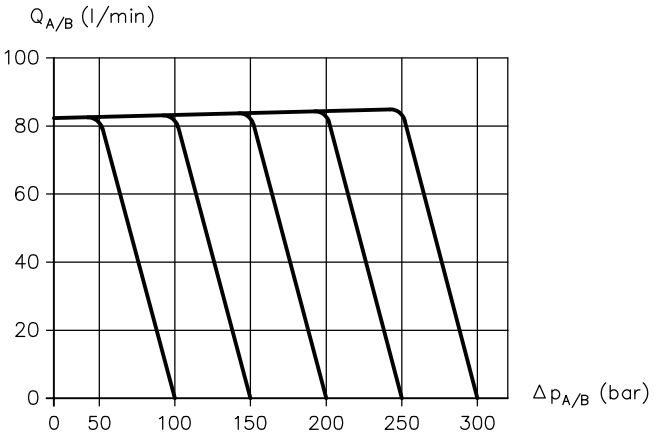
NOTICE

Pressure difference between the measurement fitting (M) in the connection block and the valve section downstream of the valve spool. Without fittings at P and A/B.

LS pressure-limiting valves see Chapter 2.2.1.7, "LS pressure limitation"



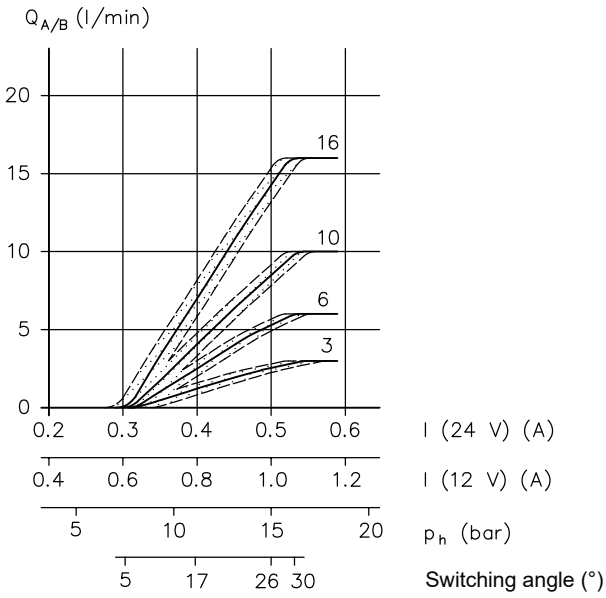
Q flow rate (l/min); Δp pressure difference LS - R (bar)

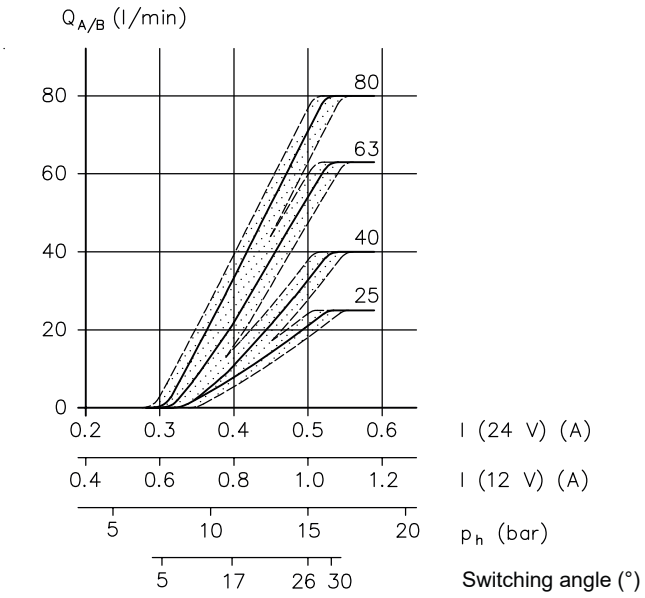


$\Delta p_{A/B}$ consumer pressure (bar); $Q_{A/B}$ flow rate (l/min)

Control characteristic line for consumer flow rate

see Chapter 2.2.1.6, "Flow rate"
(reference values measured with 2-way controller and standard 2-way controller spring)

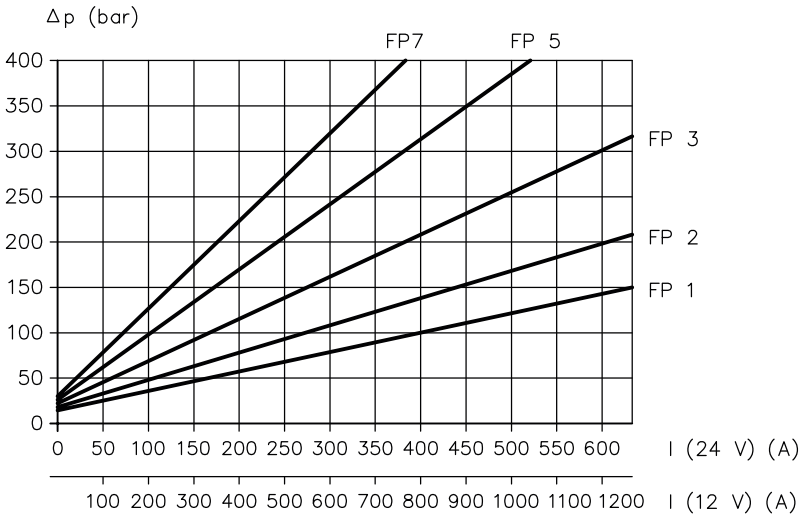




I control current (A) at 24 V DC or 12 V DC for electro-hydraulic actuation
$p_{hydr.}$ Pilot pressure (bar) for hydraulic actuation
$p_{pneum.}$ Pilot pressure (bar) for pneumatic actuation
Switching angle (°) for manual actuation with hand lever
$Q_{A/B}$ flow rate (l/min)

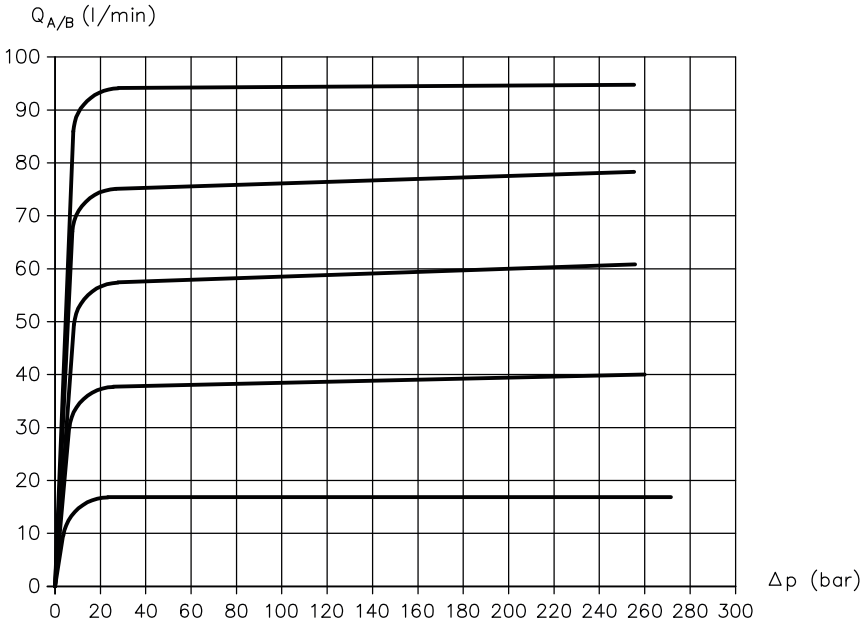
Electro-proportional LS pressure limitation

see Chapter 2.2.1.8, "Electric LS relief or LS pressure limitation"



I control current (A) at 24 V DC or 12 V DC; Δp pressure difference LS - T (bar)

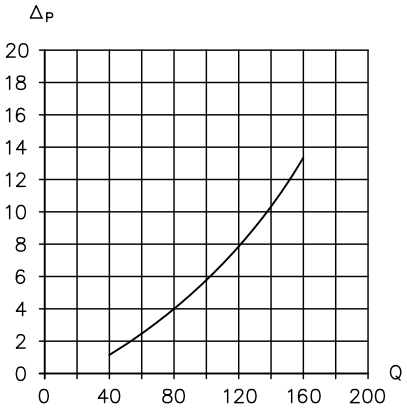
2-way controller



Δp pressure difference P → A/B (bar); $Q_{A/B}$ flow rate (l/min)

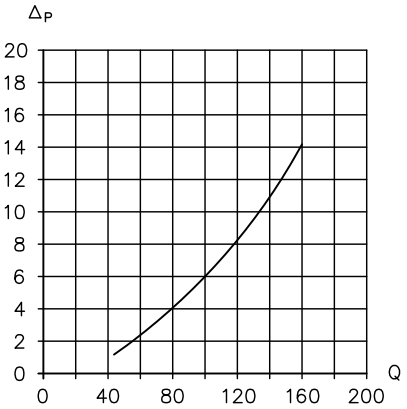
3.4.3 Series intermediate plate A1 RR PVPV/5

Pressure difference P → H (extend)



Q flow rate (l/min); Δp pressure difference P - H (bar)

Pressure difference H → R (retract)



Q flow rate (l/min); Δp pressure difference H - R (bar)

3.5 Electrical data

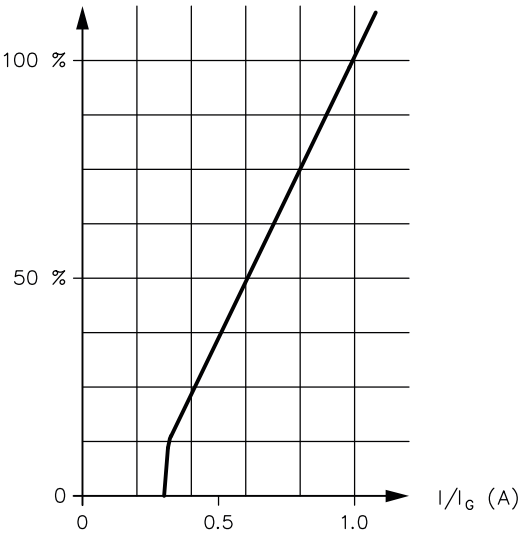
3.5.1 Electro-hydraulic actuation EI, EA, EH, EF, etc. with standard solenoid

Proportional solenoid, produced and tested in accordance with DIN VDE 0580

Twin solenoid with anchor chambers sealed on the outside and connected to the return duct. The anchors in the anchor chambers are thereby lubricated by the hydraulic fluid and protected against corrosion without the need for maintenance.

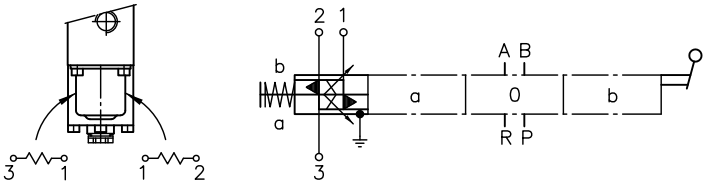
Nominal voltage U_N	12 V DC	24 V DC
Resistance R_{20}	6.3 Ω	27.0 Ω
Current, cold I_{20}	1.9 A	0.9 A
Limit current I_G	1.26 A	0.63 A
Limit power P_G	15.1 W	15.1 W
Duty cycle	S1 (100%)	
Dither frequency	40 - 70 Hz (recommended value 55 Hz)	
Dither amplitude $A_D(\%) = \frac{I_{Peak-Peak}}{IG} \cdot 100$	20% ≤ A_D ≤ 50%	

I stroke characteristic curve

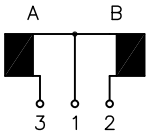
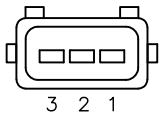
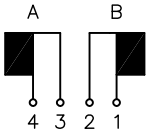
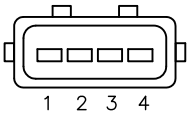
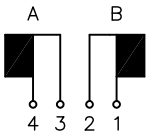
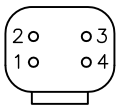
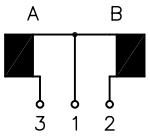
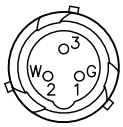
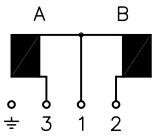
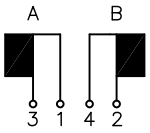
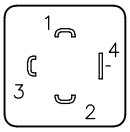
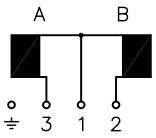
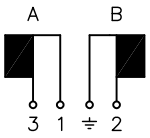
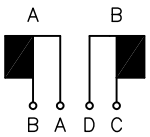
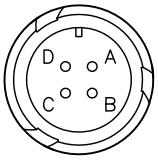
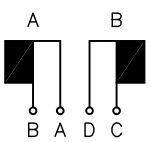
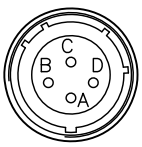


I/I_G control current (A); spool stroke (%)

Ports



Electrical connection

Coding	Specification	Connection	Plug
AMP 12 (24) K	AMP Junior Timer 3-pin IP 67 (IEC 60529)		
AMP 12 (24) K 4 **AMP 12 (24) H 4** **AMP 12 (24) H 4 T**	AMP Junior Timer 4-pin IP 67 (IEC 60529)		
DT 12 (24) **DT 12 (24) T** **DT 12(24) K**	German (DT04 – 4p) 4-pin IP 69k (IEC 60529)		
S 12 (24) **S 12 (24) T**	Bayonet coupling PA6 Schlemmer 3-pin IP 67 (IEC 60529)		
X 12 (24) **G 12 (24)** **L 12 (24)** **X 12 (24) T** **G 12 (24) T** **L 12 (24) T** **X 12 (24) TH** **G 12 (24) TH** **L 12 (24) TH** **X 12 (24) DS** **G 12 (24) DS**	EN 175 301-803 A 3-pin IP 65 (IEC 60529)		
X 12 (24) H 4 **G 12 (24) H 4** **L 12 (24) H 4**	EN 175 301-803 A 4-pin IP 65 (IEC 60529)		
X 12 (24) C **G 12 (24) C**	EN 175 301-803 C 3-pin IP 65 (IEC 60529)		
X 12 (24) C4 **G 12 (24) C4**	EN 175 301-803 C 3-pin IP 65 (IEC 60529)		
ITT 12 (24)	VG 95234 MIL 4-pin IP 67 (IEC 60529)		
DTL 12 (24) **DTL 12 (24) T**	MIL-DTL 38999 series III 4-pin IP 67 (IEC 60529)		

3.5.2 Electro-hydraulic actuation EI, EA, EH, EF, etc. with solenoid for potentially explosive atmospheres

NOTICE

When using solenoids for potentially explosive atmospheres: observe operating instructions B ATEX and the separate operating instructions for the respective solenoid.

Refer to the applicable operating instructions for operating thresholds, classifications, electrical parameters and electrical connections.

Coding	Operating instructions with declaration of conformity
X 24 TEX 4 70 FM	▪ B ATEX ▪ B 41/2017 (EX23)
G 24 EX **G 24 EX-10 m**	▪ B ATEX ▪ B 01/2002 (EX01)
G 24 TEX 70 FM-10 m	▪ B ATEX ▪ B 21/2011 (EX12)
G 12 IS **G 12 IS-10 m**	▪ B ATEX ▪ B 17/2011 (EX05)
G 24 M2FP **G 24 M2FP-10 m**	▪ B ATEX ▪ B 04/2005 (EX05)
G 24 MSHA **G 24 MSHA-10 m** **G 24 MSHA-20 m**	▪ B ATEX ▪ B 04/2005 (EX05)
G 24 MA **G 24 MA-10 m** **G 24 MA-20 m**	▪ B ATEX ▪ Q HAWE 01-2021 (EX05)

3.5.3 Switching position monitoring, displacement transducer

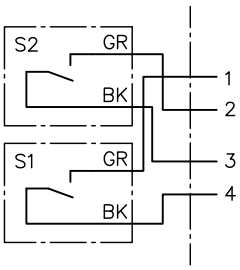
Coding V, VA, VB, VC

Cable	▪ 3x 0.5 mm² flex with PVC insulation; 50 cm long ▪ Black: Input ▪ Blue: NO contact ▪ Green: N/C contact
Resistance load up to 30 V DC	5 A
Inductive load	3 A
Protection class	IP 67 (IEC 60529)

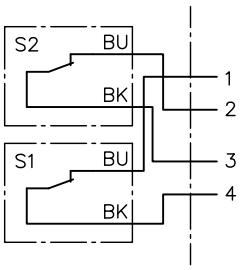
Coding VCHO, VCHC

connector	G 4 W 1 F ® Hirschmann
Resistance load up to 30 V DC	5 A
Inductive load	3 A
Protection class	IP 65 (IEC 60529)
Labelling	▪ **VCHO:** NO ▪ **VCHC:** NC

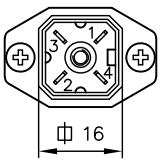
VCHO



VCHC



Contact switch S2 = towards A
Contact switch S1 = towards B



Coding N

Model	▪ IFFM 08P/3701/02L® BAUMER Electric GmbH ▪ 8x8x40 mm with LED display ▪ N/C contact, positive-switching and flush
Connecting line	∅ 3 mm, 3-core PVC, 2 m long
Operating voltage	10 to 30 V DC
Current consumption without load	up to 10 mA
Max. load current	200 mA
Operating temperature	-25 to 80°C
Protection class	IP 67 (IEC 60529)

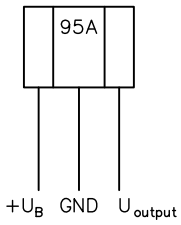
Coding WA

Coding	Electrical connection	Protection class (IEC 60529)
WA	EN 175 301-803 A	IP 65
WA-AMP	AMP Junior Timer	IP 67
WA-DT	German (DT 04-4P)	IP 69k
WA-C	EN 175 301-803 C	IP 65

Pin assignment:

1 = U_{output}
2 = $+U_B$ (5 to 10 V)
3 = GND
Earth = not assigned

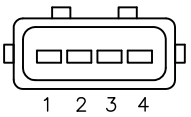
Sensor assignment:



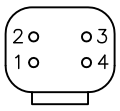
WA



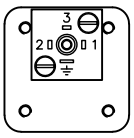
WA-AMP

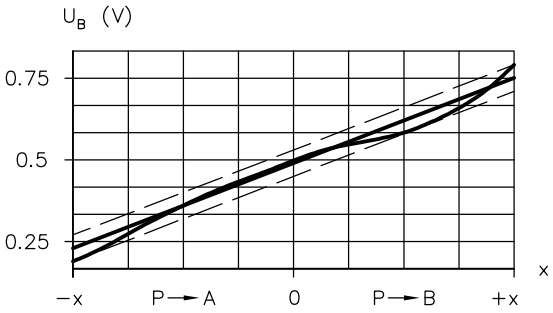


WA-DT



WA-C





x spool stroke; U_B signal voltage (V)

U_B = supply voltage
$U_{B\ max}$ = 76%
$U_{B\ min}$ = 24%
Accuracy +/- 9% (of U_B)

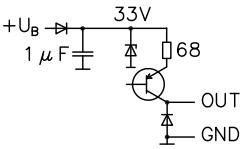
Use stabilised, smoothed DC voltage only.

NOTICE
The displacement transducer will be destroyed by strong magnetic fields.

Coding U

Protection class	IP 65 (IEC 60529)

Pin assignment

Pin	Signal	Description	
1	OUTA	PNP positive-switching	
2	OUTB	PNP positive-switching	
3	+U_B	10 ... 32 V DC	
⏚	GND	0 V DC	

Open-Collector:
I_{max} = 10 mA
short-circuit-proof

Status table

Running no.	Spool valve action	Signal outputs PNP transistor with open collector:	
		OUTA	OUTB
1	Neutral position in centre	ON	ON
2	P → B	OFF	ON
3	P → A	ON	OFF

U



3.5.4 Switching position monitoring, displacement transducer for potentially explosive atmospheres

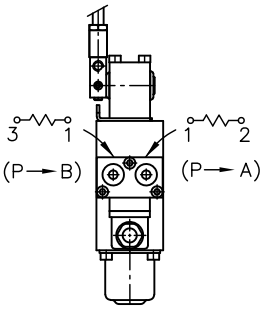
NOTICE
When using displacement transducers for potentially explosive atmospheres, it is essential to observe the operating instructions B ATEX and the separate operating instructions for the respective displacement transducer.
Refer to the applicable operating instructions for operating thresholds, classifications, electrical parameters and electrical connections.

Coding	Operating instructions with declaration of conformity
WA-EX	▪ B ATEX ▪ B 10/2008 (EX09)
WA-M2FP	▪ B ATEX ▪ B 10/2008 (EX09)

3.5.5 Electric LS relief or LS pressure limitation

Electric LS relief coding F 1, F 2, F 3, FH 1, FH 2, FH 3

Nominal voltage U_N	12 V DC	24 V DC
Resistance R_{20}	8.7 Ω	34.8 Ω
Current, cold I_{20}	1.38 A	0.69 A
Limit current I_G	0.97 A	0.48 A
Limit power P_G	11.6 W	11.6 W
Duty cycle	S1 (100%)	

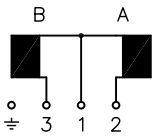
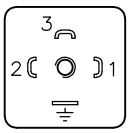


For specifications for **A** and **B** see Table “Electrical connection”, “Connection” column.

NOTICE
Duty cycle applies separately for a single twin solenoid coil. If both coils are powered simultaneously, only 50% is permitted as duty cycle.

NOTICE
The electrical LS relief’s on/off twin solenoids are only available with DIN connectors and manual override (coding -G..T(H), -X..T(H) or -L..T(H).

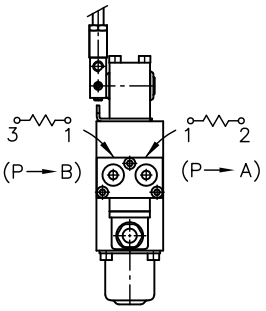
Electrical connection

Coding	Specification	Connection	Plug
X 12 (24) T G 12 (24) T L 12 (24) T X 12 (24) TH G 12 (24) TH L 12 (24) TH	EN 175 301-803 A 3-pin IP 65 (IEC 60529)		

Electro-proportional LS pressure limitation coding FP.., FPH..

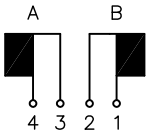
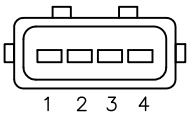
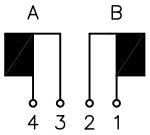
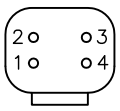
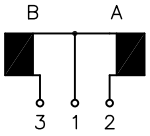
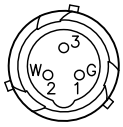
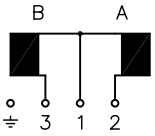
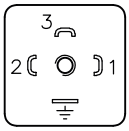
Nominal voltage U_N	12 V DC	24 V DC
Resistance R_{20}	6.3 Ω	27.0 Ω
Current, cold I_{20}	1.9 A	0.9 A
Limit current I_G	1.26 A	0.63 A

Nominal voltage U_N	12 V DC	24 V DC
Limit power P_G	15.1 W	15.1 W
Duty cycle	S1 (100%)	
Dither frequency	40 - 70 Hz (recommended value 55 Hz)	
Dither amplitude $A_D(\%) = \frac{I_{Peak-Peak}}{I_G} \cdot 100$	$20\% \leq A_D \leq 50\%$	



For specifications for **A** and **B** see Table “Electrical connection”, “Connection” column

Electrical connection

Coding	Specification	Connection	Plug
AMP 12 (24) H 4 T	AMP Junior Timer 4-pin IP 67 (IEC 60529)		
DT 12 (24) T **DT 12 (24) TH**	German (DT04 – 4p) 4-pin IP 69k (IEC 60529)		
S 12 (24) T	Bayonet coupling PA6 Schlemmer 3-pin IP 67 (IEC 60529)		
X 12 (24) T **G 12 (24) T** **L 12 (24) T** **X 12 (24) TH** **G 12 (24) TH** **L 12 (24) TH**	EN 175 301-803 A 3-pin IP 65 (IEC 60529)		

NOTICE

Duty cycle applies separately for a single twin solenoid coil. If both coils are powered simultaneously, only 50% is permitted as duty cycle.

NOTICE

- Only twin solenoids with manual override (coding T or -TH) are possible.
- If a twin solenoid without manual override was chosen for the valve section’s electro-hydraulic actuation, the same twin solenoid type is automatically used for the LS pressure limitation’s electro-proportional actuation, but with additional manual override.
- If the twin solenoid type is not possible with manual override, coding -G..T is used by default.

3.5.6 Electric LS relief or LS pressure limitation for potentially explosive atmospheres

NOTICE

When using solenoids for potentially explosive atmospheres: observe operating instructions B ATEX and the separate operating instructions for the respective solenoid.

Refer to the applicable operating instructions for operating thresholds, classifications, electrical parameters and electrical connections.

Coding	Operating instructions with declaration of conformity
X 24 TEX 4 70 FM	▪ B ATEX ▪ B 41/2017 (EX23)

3.5.7 Additional valves

The types of plugs available are described in Chapter 2.6, "Solenoid voltage and solenoid version". Refer to the respective additional valve's data sheet for electrical parameters.

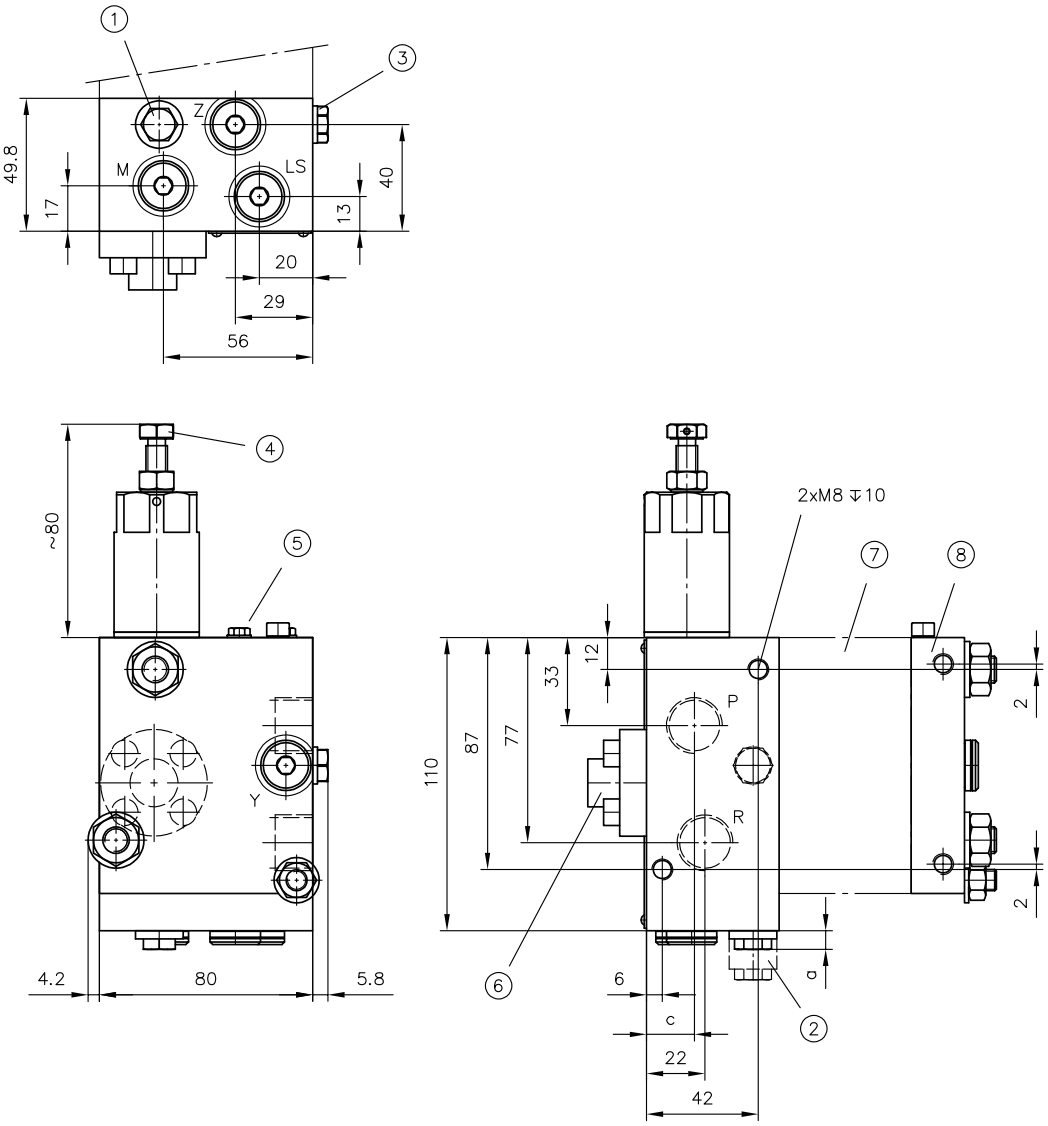
4 Dimensions

All dimensions in mm, subject to change.

4.1 Connection block

see Chapter 2.1.3, "Connection block basic types"

PSL 3.../...-3
PSL 4.../...-3



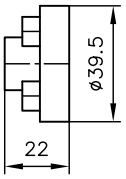
1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 3-way controller's spring housing
7 Valve section
8 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

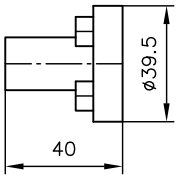
Type	c	Ports (ISO 228-1)	
		P, R	LS, M, Y, Z
PSL 3.../...-3	18	G 1/2	G 1/4
PSL 4.../...-3	21	G 3/4	G 1/4

3-way controller's spring housing

without coding

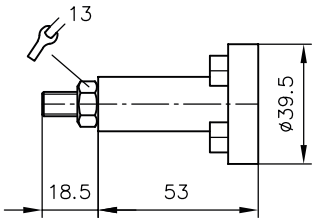


Coding **H**

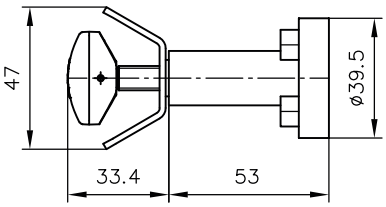


3-way controller's spring housing with locking tapped plug

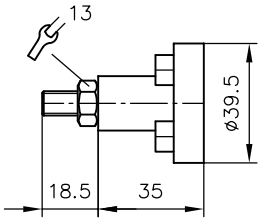
Coding **HT**



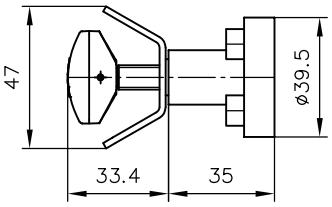
Coding **HTR**



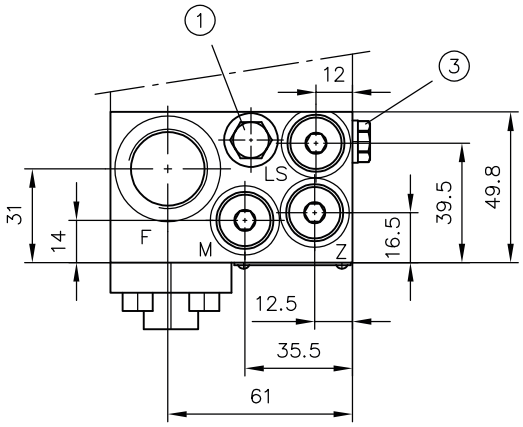
Coding **T**

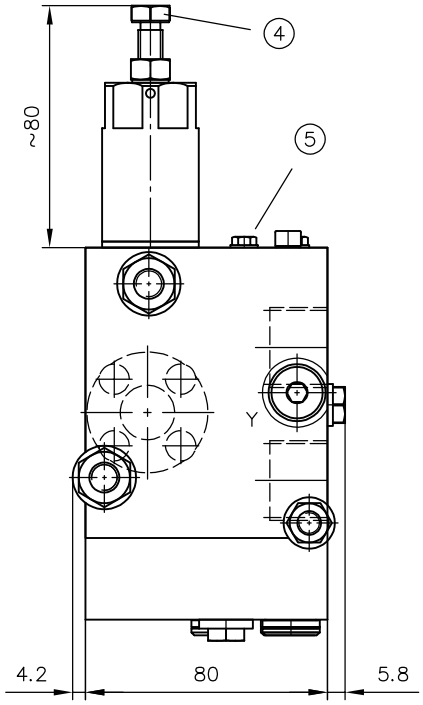


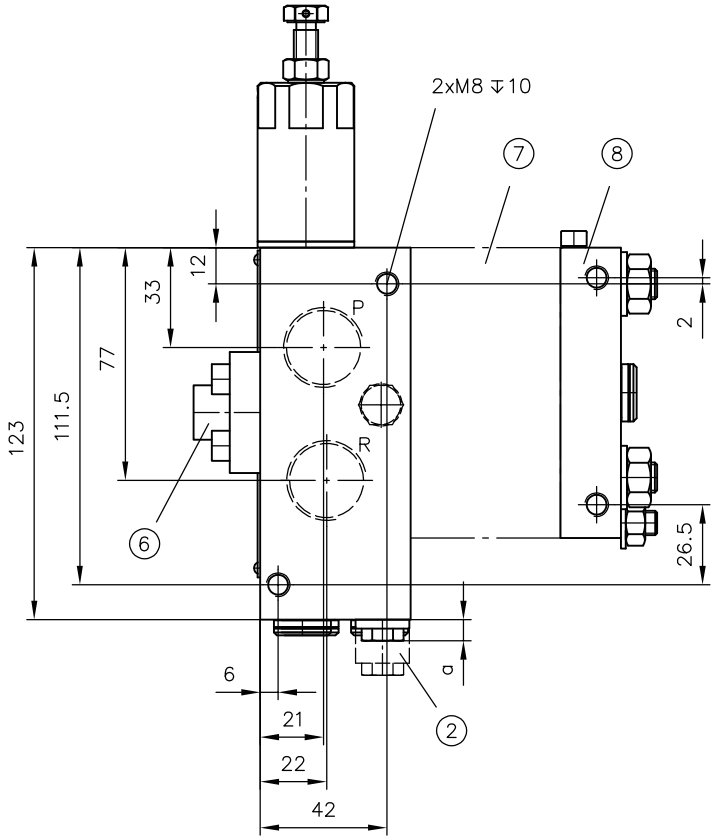
Coding **TR**



PSL 4 Y.../...-3
PSL UNF 4 Y.../...-3





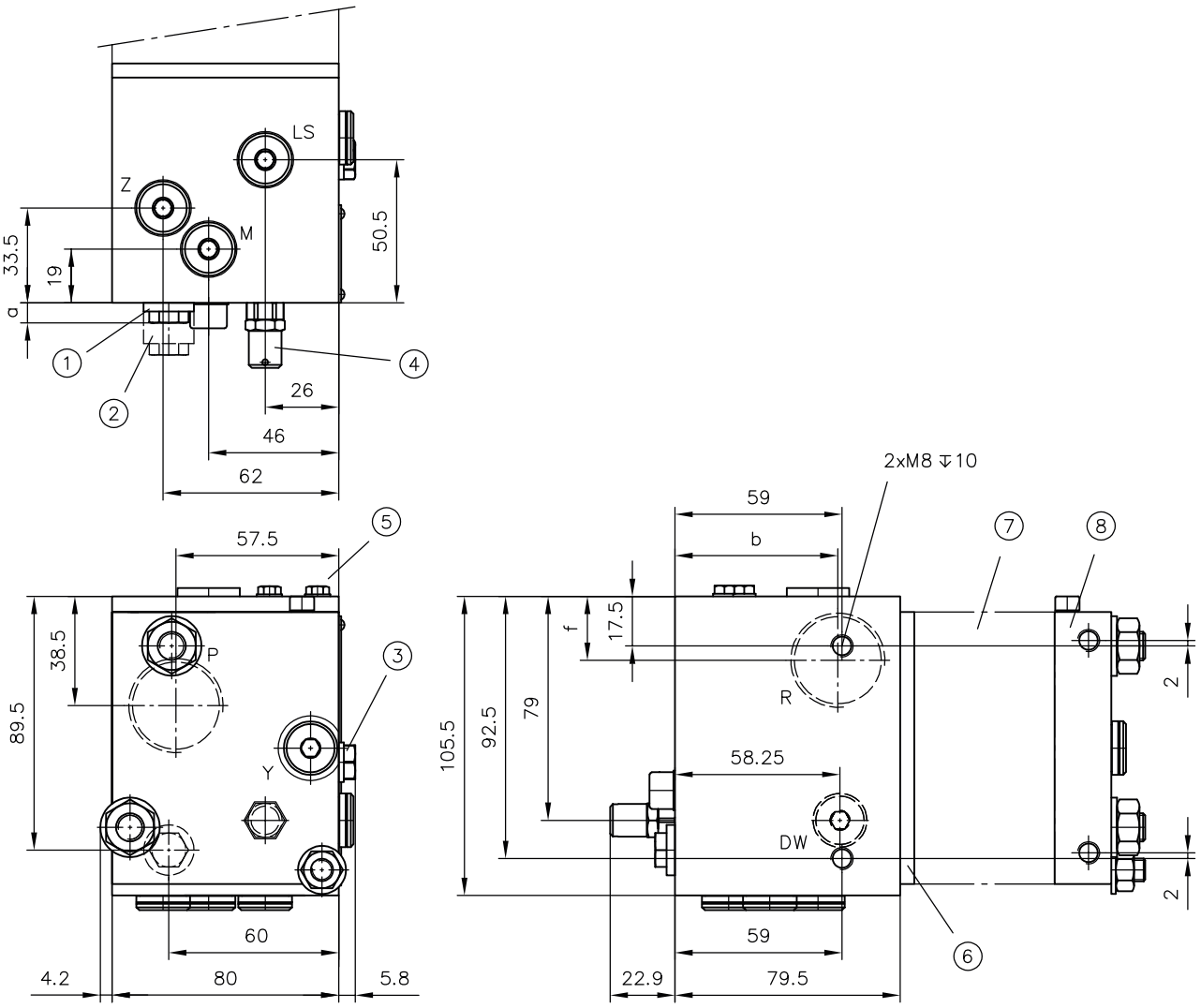


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 3-way controller's spring housing
7 Valve section
8 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1 or SAE J 514)	
	F, P, R	LS, M, Y, Z
PSL 4 Y../...-3	G 3/4	G 1/4
PSL UNF 4 Y.../...-3	SAE-12 (1 1/16-12 UN-2B)	SAE-4 (7/16-20 UNF-2B)

PSL 45../..-3, PSL 5../..-3, PSL UNF 4../..-3
PSV 45../..-3, PSV 55../..-3, PSV UNF 44../..-3

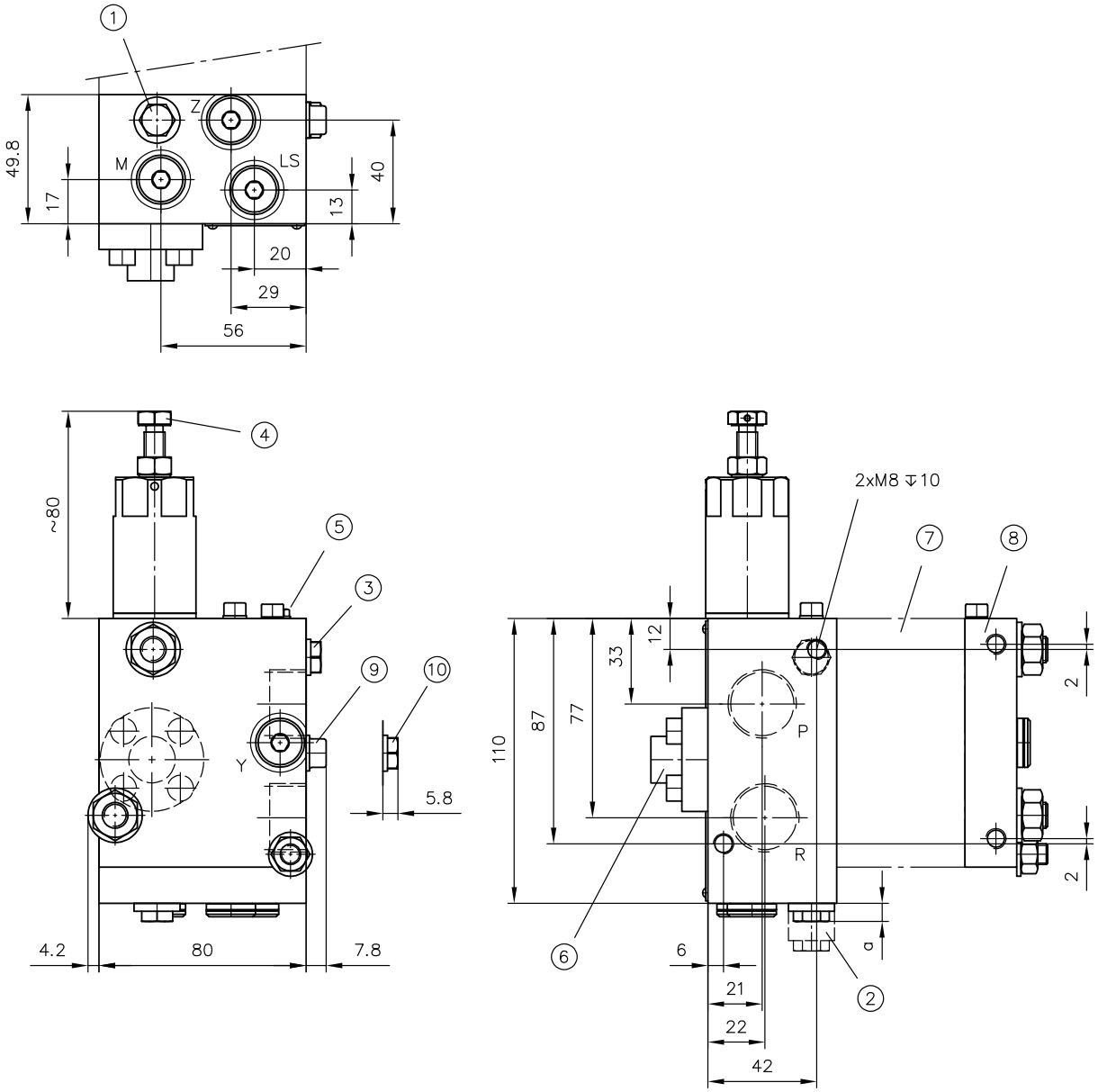


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 Spacer plate SL 3-ZPL 33/5
7 Valve section
8 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	b	f	Ports (ISO 228-1 or SAE J 514)		
			P	R	DW, LS, M, Y, Z
PSL 45../..-3 PSV 45../..-3	57.5	22.5	G 3/4	G 1	G 1/4
PSL 5../..-3 PSV 55../..-3			G 1	G 1	G 1/4
PSL UNF 4../..-3 PSL UNF 44../..-3	53.5	24.5	SAE-12 (1 1/16-12 UN-2B)	SAE-12 (1 1/16-12 UN-2B)	SAE-4 (7/16-20 UNF-2B)

PSL 4 K.../...-3
PSL 4 Z.../...-3

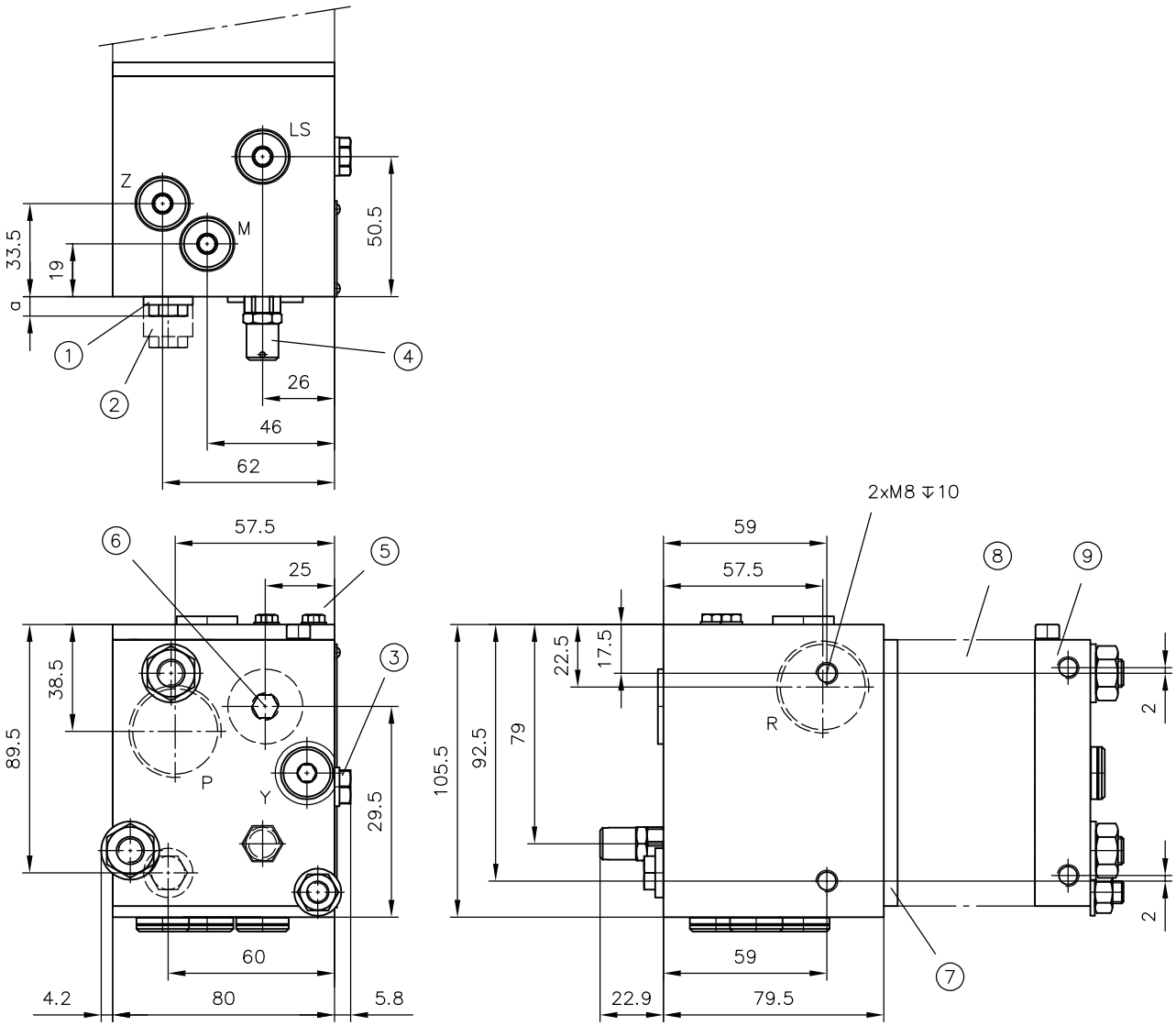


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 3-way controller's spring housing
7 Valve section
8 End plate
9 PSL 4 K
10 PSL 4 Z

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1)	
	P, R	LS, M, Y, Z
PSL 4 K../...-3	G 1/2	G 1/4
PSL 4 Z.../...-3	G 3/4	G 1/4

PSL 45 U.../...-3
PSL 5 U.../...-3

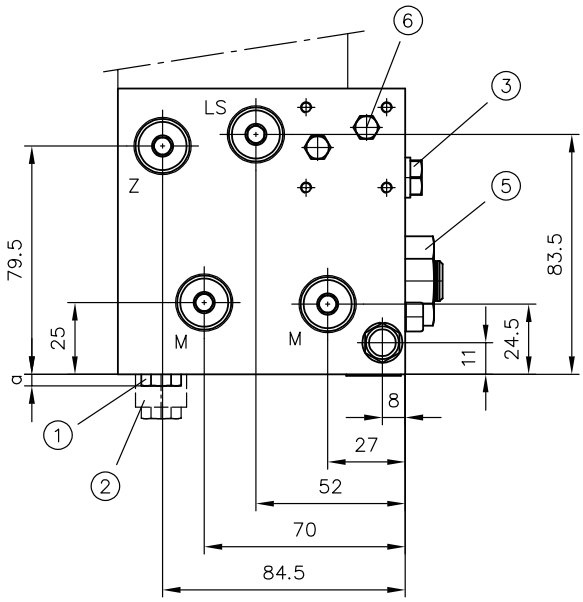


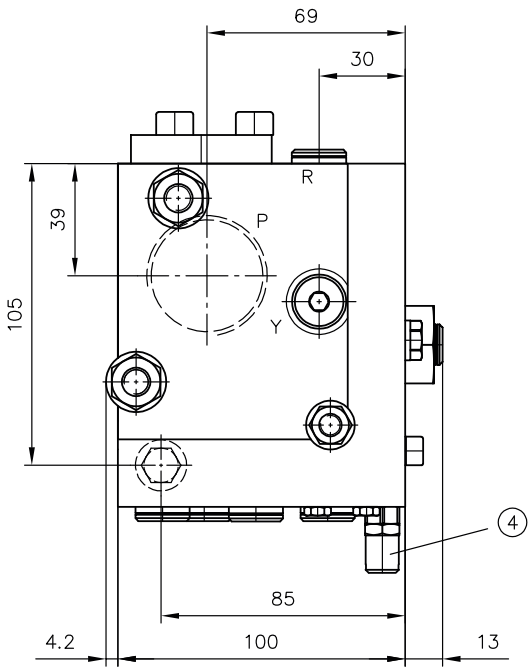
1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 Idle circulation valve
7 Spacer plate SL 3-ZPL 33/5
8 Valve section
9 End plate

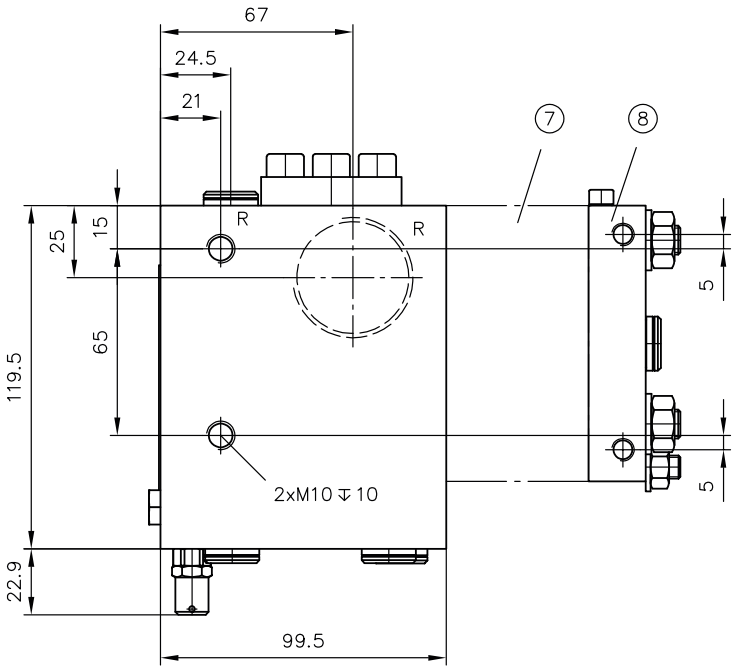
Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1)		
	P	R	LS, M, Y, Z
PSL 45 U../...-3	G 3/4	G 1	G 1/4
PSL 5 U.../...-3	G 1	G 1	G 1/4

PSL 6 UC 22 2/...-3





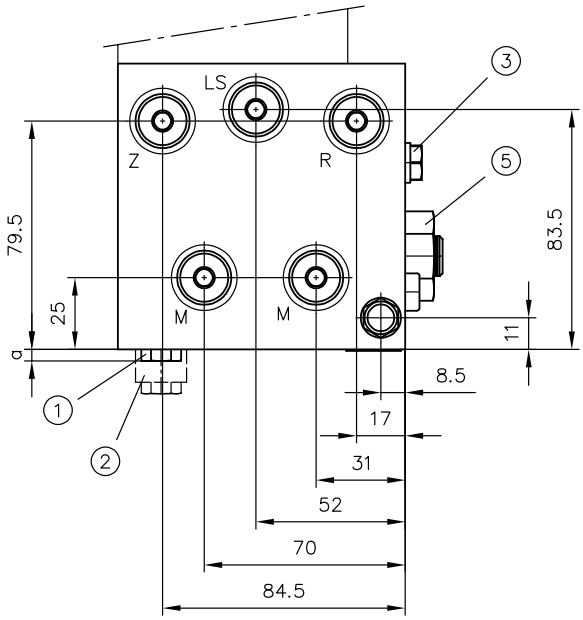


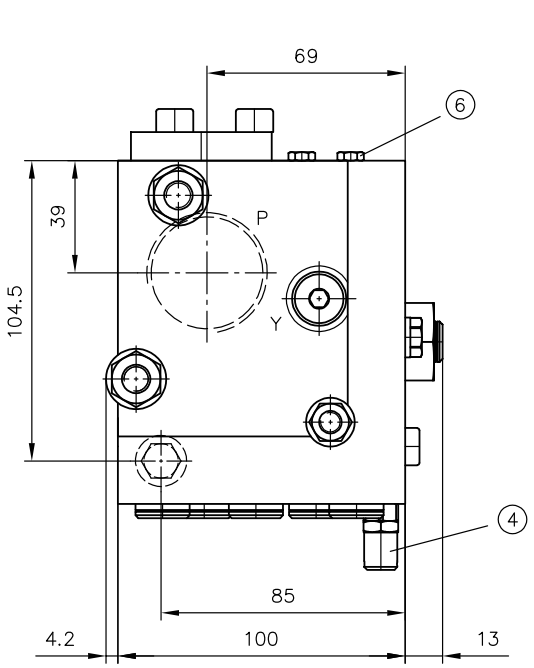
1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Idle circulation valve
6 Mounting point for additional valve for switching the idle circulation valve
7 Valve section
8 End plate

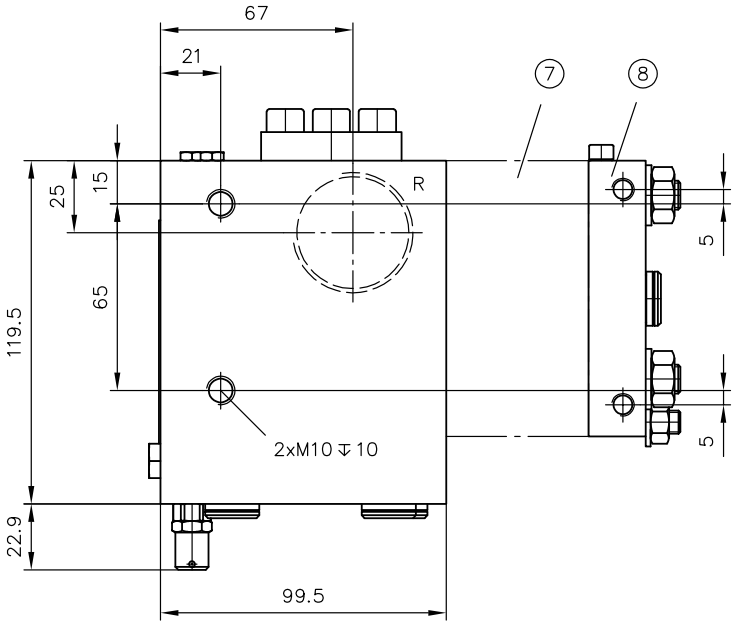
Coding	a
without coding	3.9
1	3.9
2	15.8

Type	Ports (ISO 228-1)	
	P, R	LS, Z, M, Y
PSL 6 UC 22 2/...-3	G 1 1/4	G 1/4

PSL 6 UC 22 2A-...-3





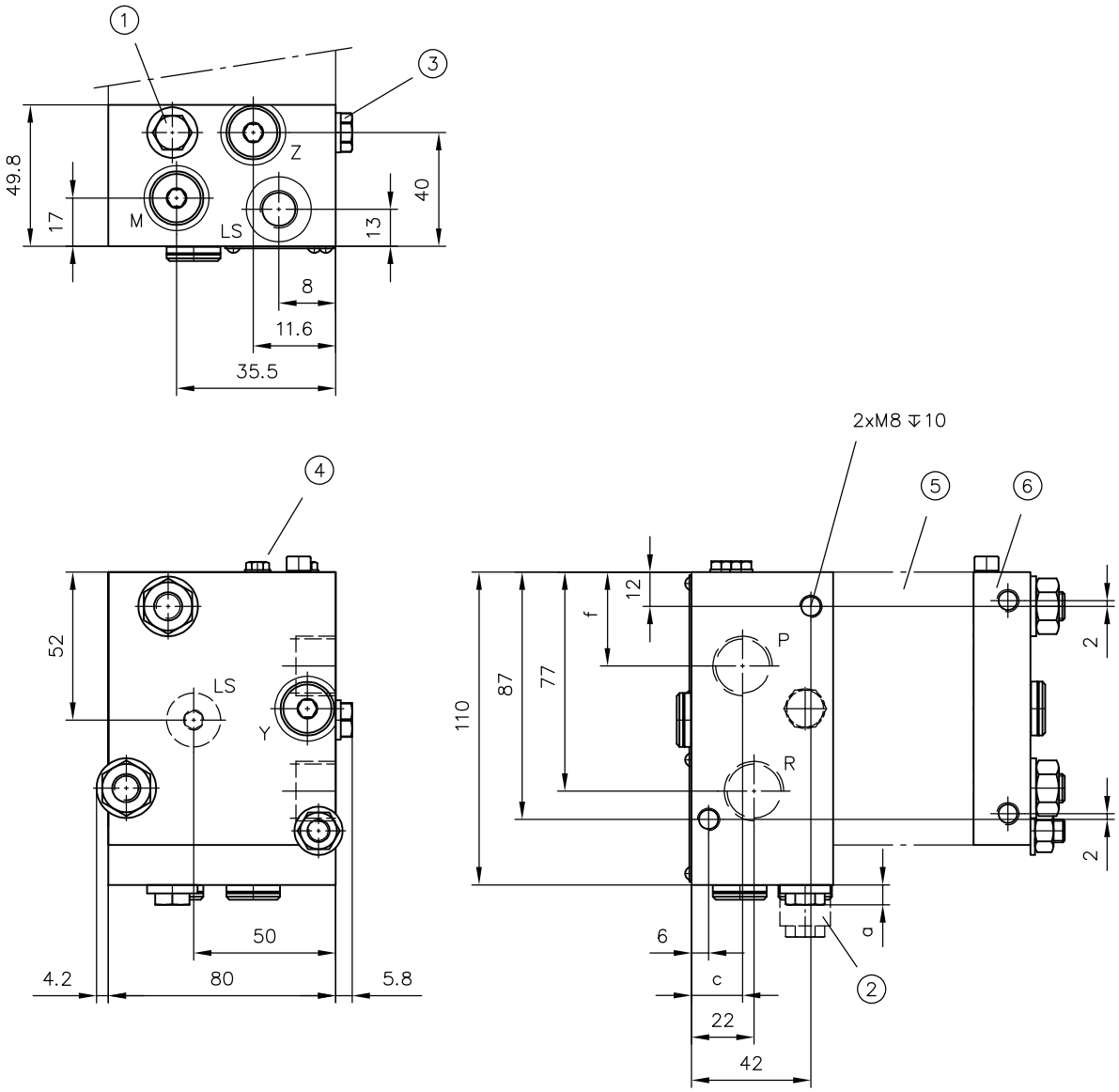


1 Internal control oil supply coding 1 or without designation
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Idle circulation valve
6 Mounting point for additional valve for switching the idle circulation valve
7 Valve section
8 End plate

Coding	a
without coding	4.3
1	4.3
2	16.2

Type	Ports (ISO 228-1)	
	P, R	LS, Z, M, Y
PSL 6 UC 22 2A/...-3	G 1 1/4	G 1/4

PSV 3...-3
PSV 4...-3
PSV UNF 4...-3

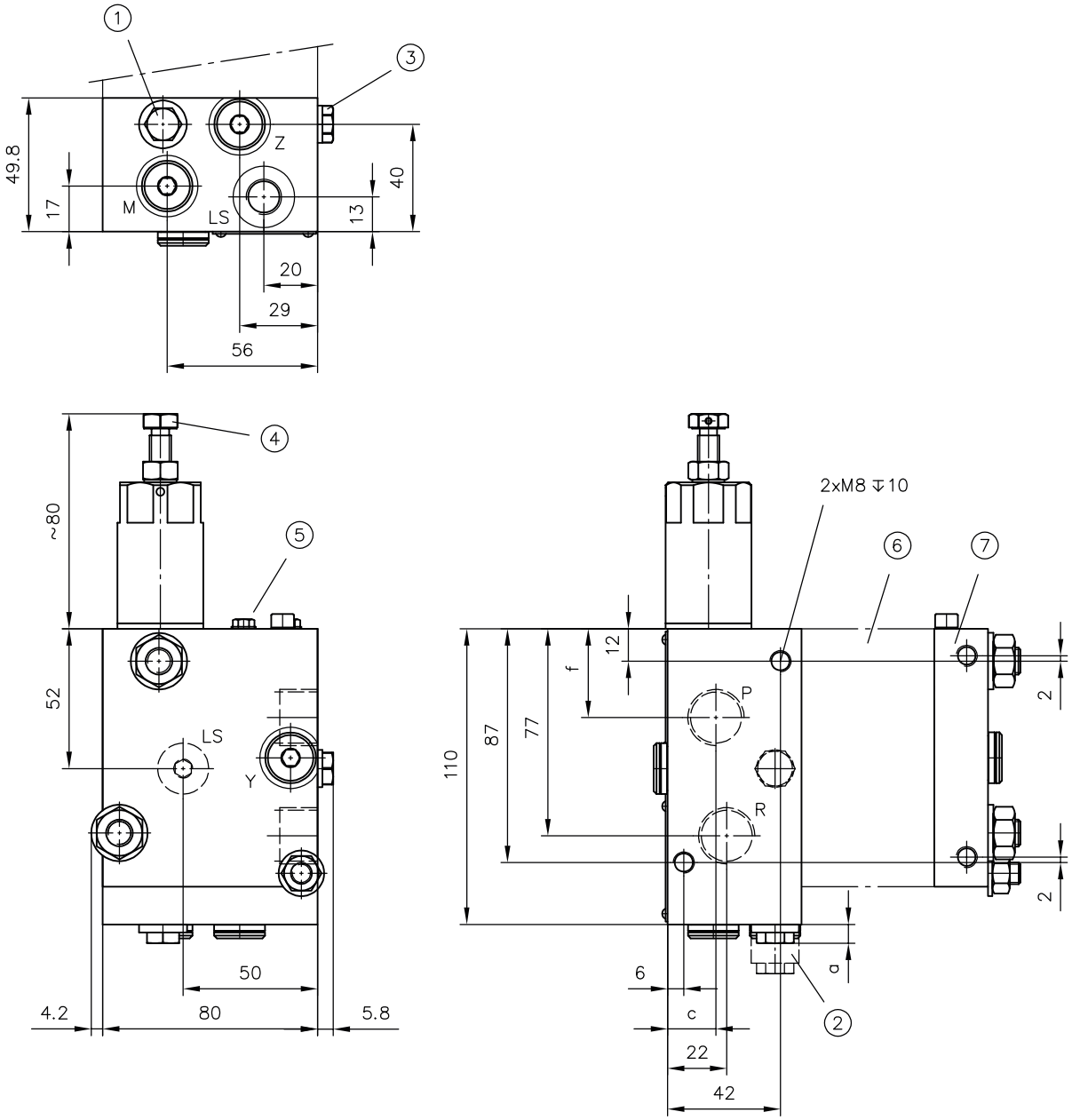


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Mounting point for additional valve for LS relief or LS pressure limitation
5 Valve section
6 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	c	f	Ports (ISO 228-1 or SAE J 514)	
			P, R	LS, M, Y, Z
PSV 3...-3	18	33	G 1/2	G 1/4
PSV 4...-3	21	33	G 3/4	G 1/4
PSV UNF 4...-3	21	30.5	SAE-12 (1 1/16-12 UN-2B)	SAE-4 (7/16-20 UNF-2B)

PSV 3.../...-3
PSV 4.../...-3

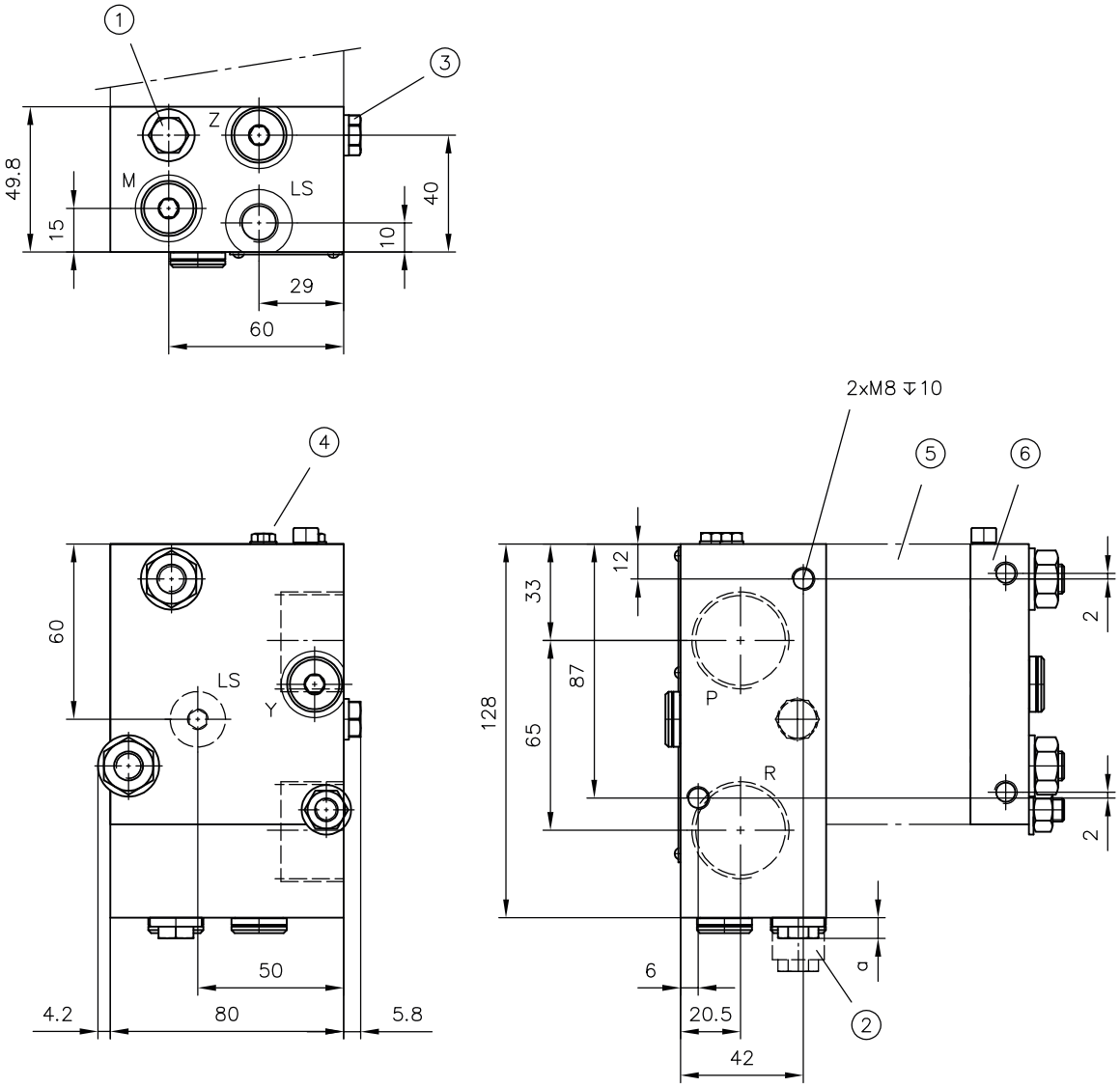


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Adjusting screw of pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 Valve section
7 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	c	f	Ports (ISO 228-1 or SAE J 514)	
			P, R	LS, M, Y, Z
PSV 3.../...-3	18	33	G 1/2	G 1/4
PSV 4.../...-3	21	33	G 3/4	G 1/4

PSV 5..-3

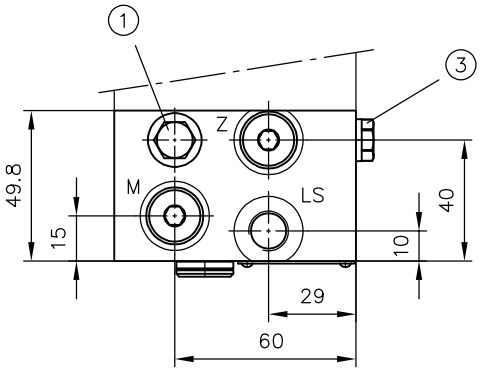


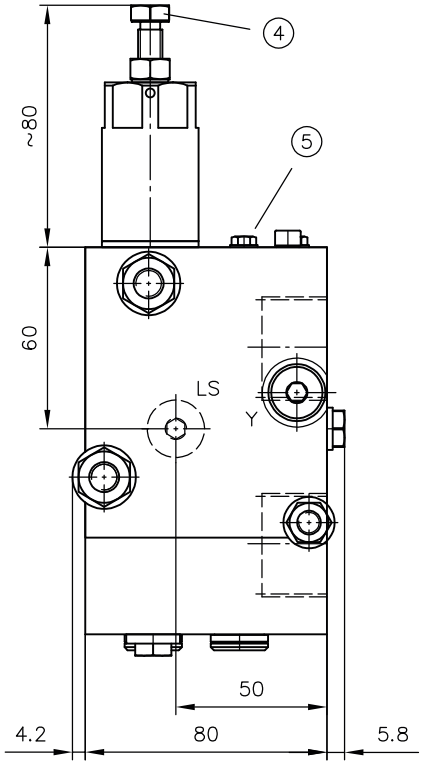
1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Mounting point for additional valve for LS relief or LS pressure limitation
5 Valve section
6 End plate

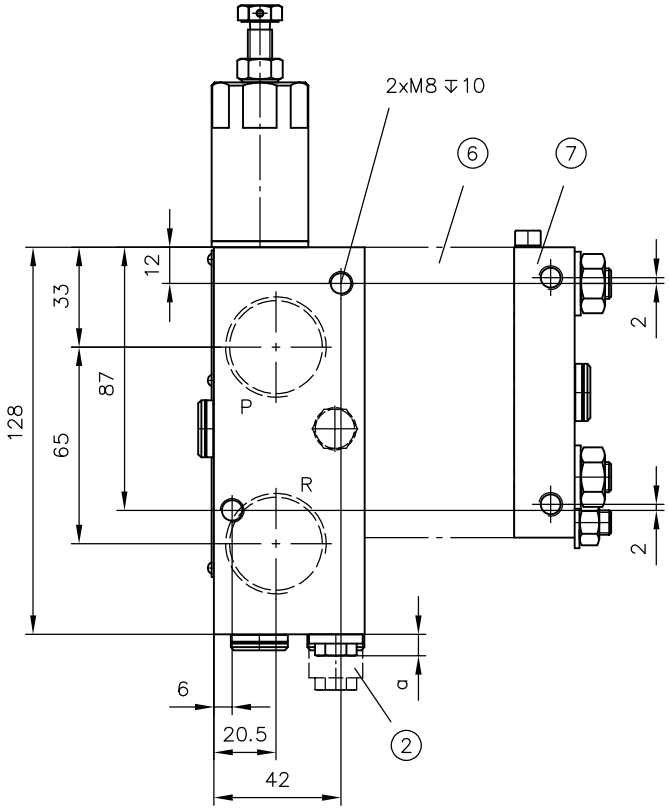
Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1)	
	P, R	LS, M, Y, Z
PSV 5...-3	G 1	G 1/4

PSV 5.../...-3





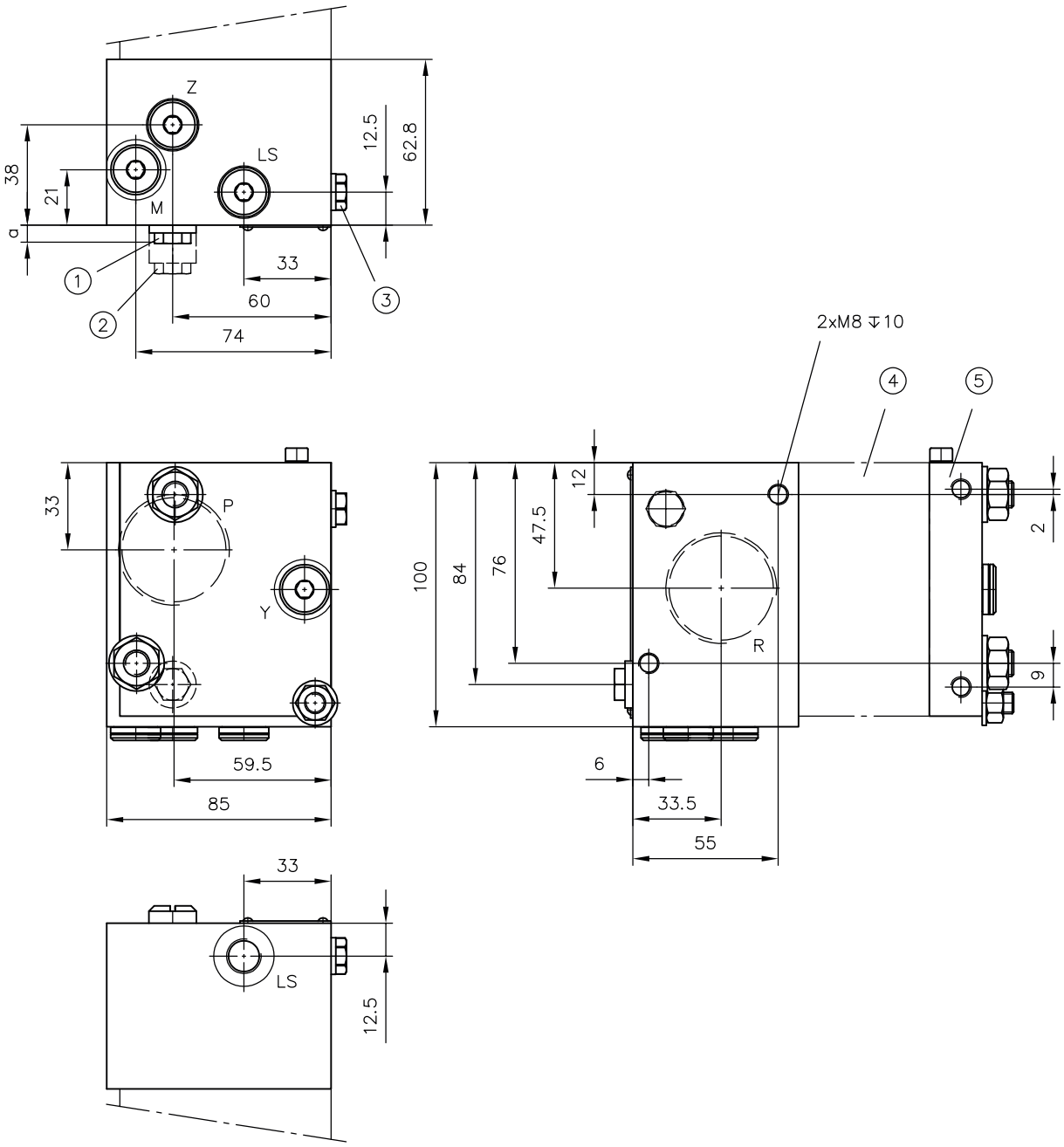


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 Valve section
7 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1)	
	P, R	LS, M, Y, Z
PSV 5.../...-3	G 1	G 1/4

PSV 6...-3

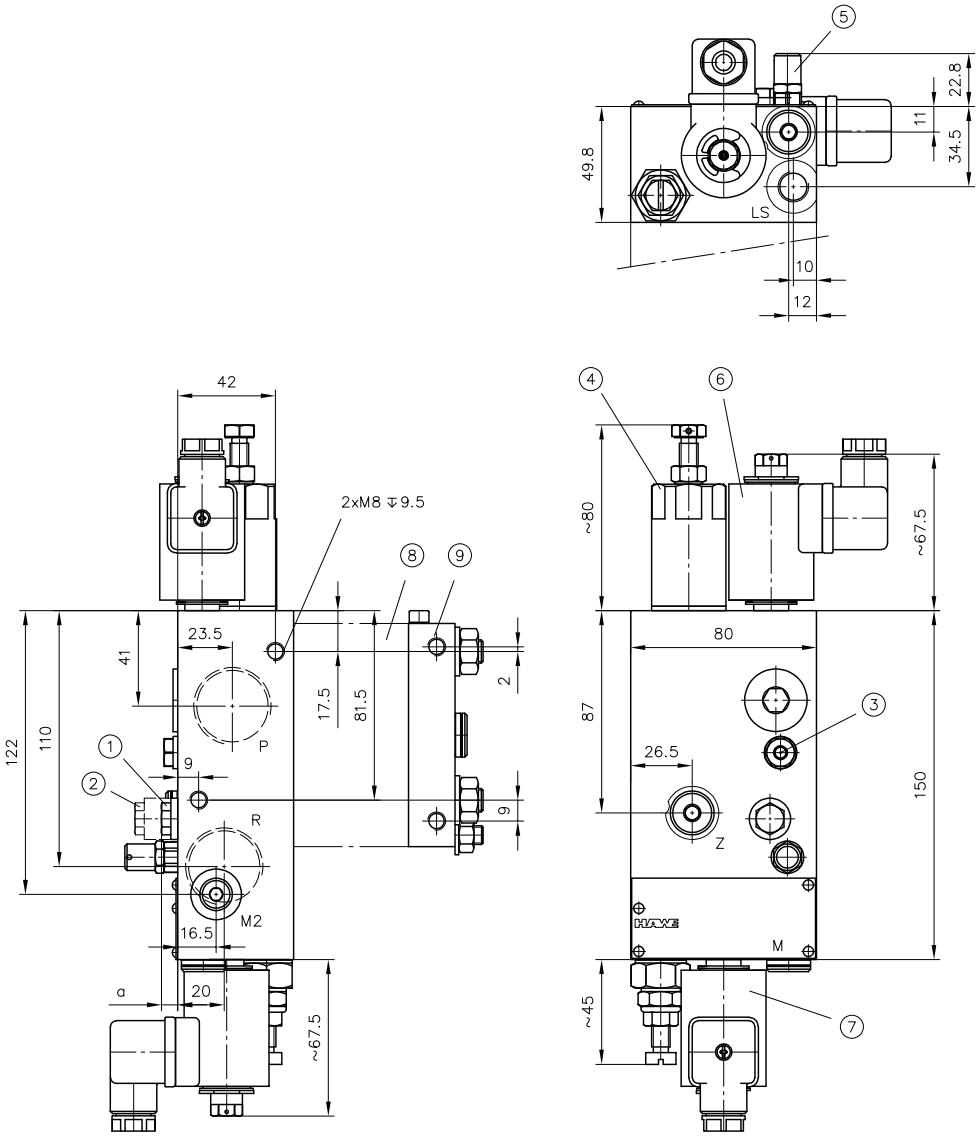


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Valve section
5 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1)	
	P, R	LS, M, Y, Z
PSV 6..-3	G 1 1/4	G 1/4

PSV 5 N...-3
PSV UNF 5 N...-3

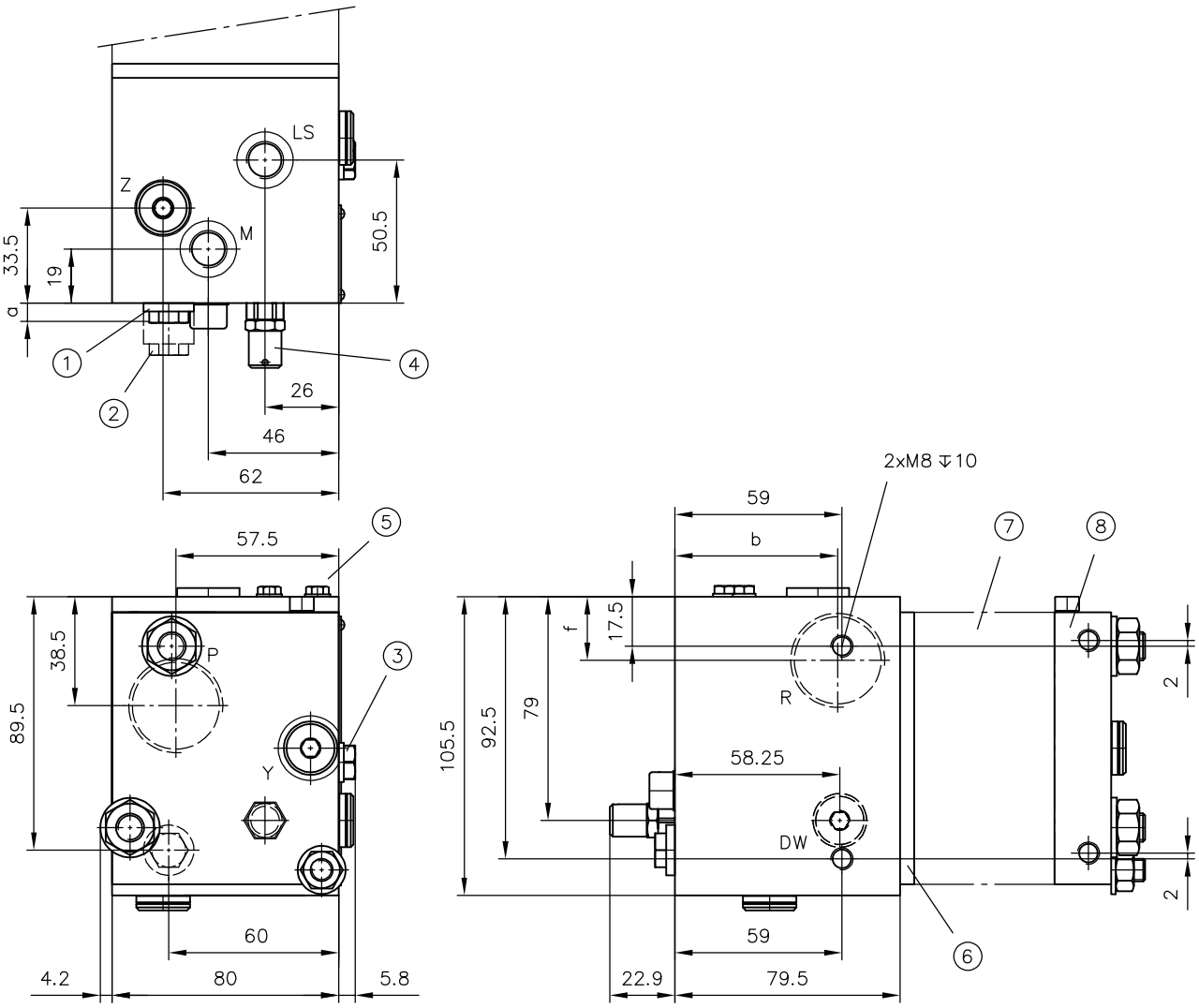


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 LS pressure-limiting valve
6 2/2-way directional valve for switching P-line shut-off
7 Optional: LS release valve
8 Valve section
9 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1 or SAE J 514)		
	P, R	LS, M, Z	M2
PSV 5 N...-3	G 1	G 1/4	G 1/8
PSV UNF 5 N...-3	SAE-16 (1 5/16-12 UN-2B)	SAE-4 (7/16-20 UNF-2B)	--

PSM 5.../...-3
PSM UNF 4.../...-3

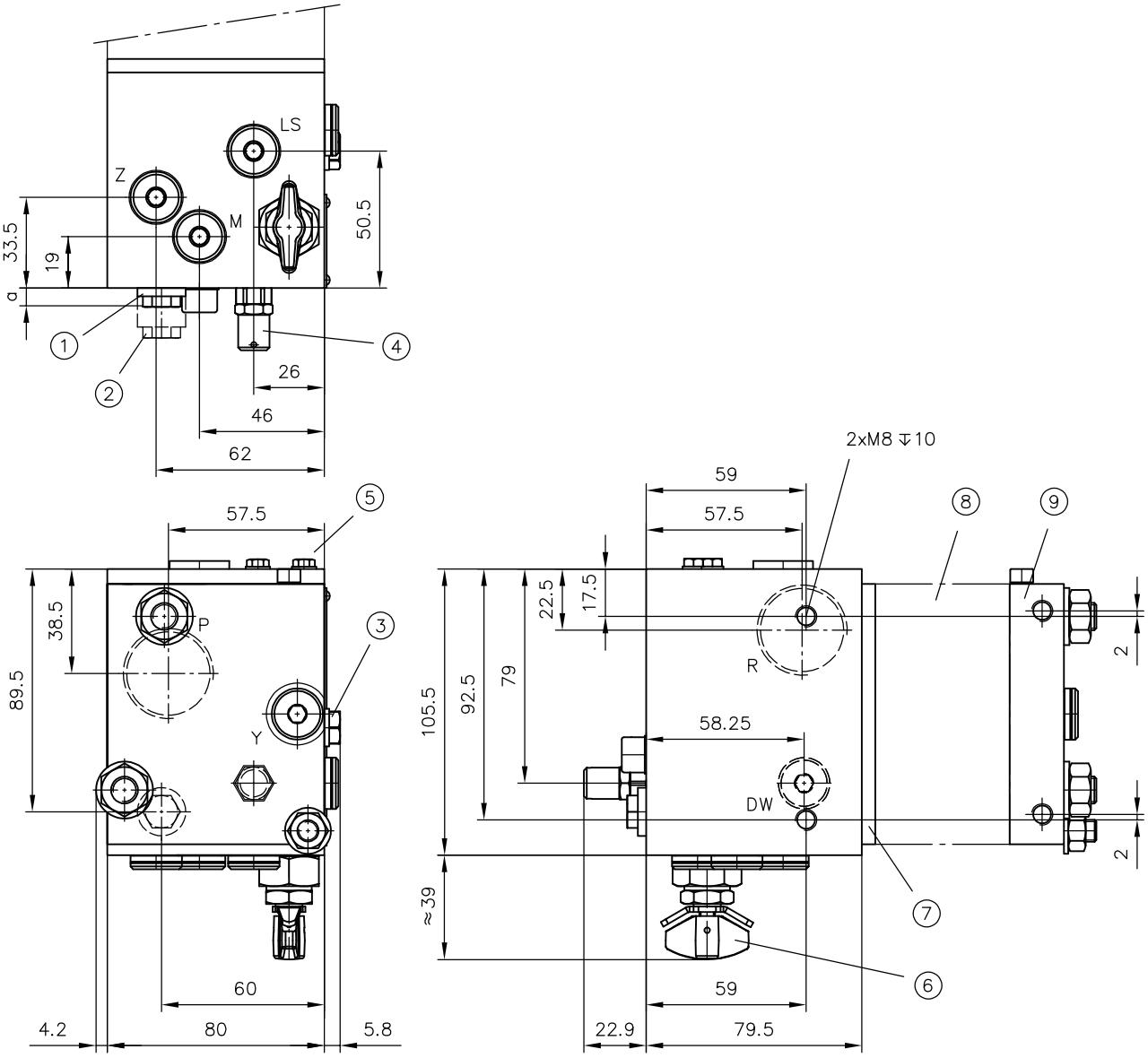


1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 Spacer plate SL 3-ZPL 33/5
7 Valve section
8 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	b	f	Ports (ISO 228-1 or SAE J 514)	
			P, R	DW, LS, M, Y, Z
PSM 5...-...-3	57.5	22.5	G 1	G 1/4
PSM UNF 4.../...-3	53.5	24.5	SAE-12 (1 1/16-12 UN-2B)	SAE-4 (7/16-20 UNF-2B)

PSM 5 L.../...-3



1 Internal control oil supply without coding or coding 1
2 Internal control oil supply coding 2
3 LS damping
4 Pressure-limiting valve
5 Mounting point for additional valve for LS relief or LS pressure limitation
6 3/2-way directional valve for mechanical switchover between Open Center and Closed Center
7 Spacer plate SL 3-ZPL 33/5
8 Valve section
9 End plate

Coding	a
without coding	6.4
1	6.4
2	18.3

Type	Ports (ISO 228-1)	
	P, R	LS, M, Y, Z
PSM 5 L.../...-3	G 1	G 1/4

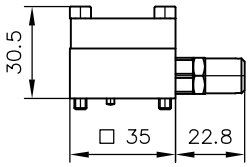
Additional valves for LS relief or LS pressure limitation

see Chapter 2.1.7, "LS relief or LS pressure limitation"

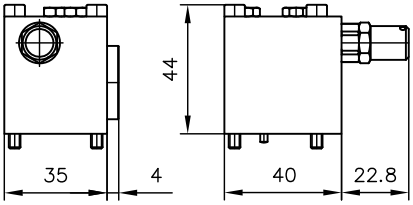
without coding



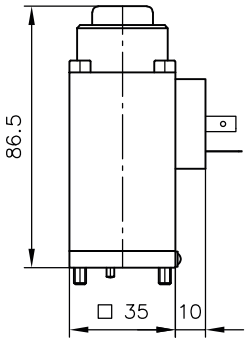
Coding **X**



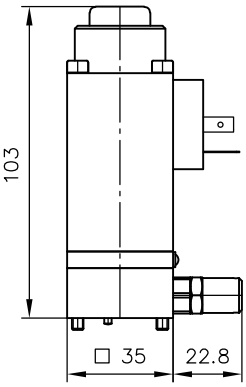
Coding **VX**



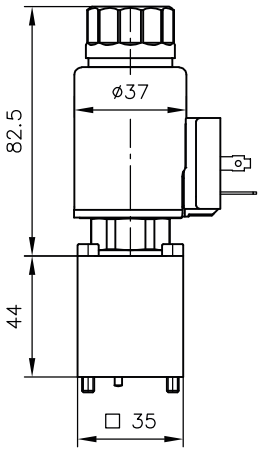
Coding **F, D**



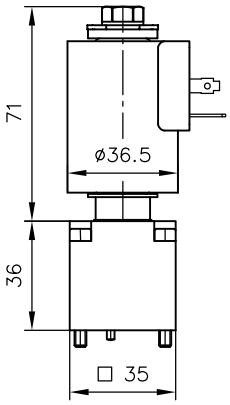
Coding **F..., D...**



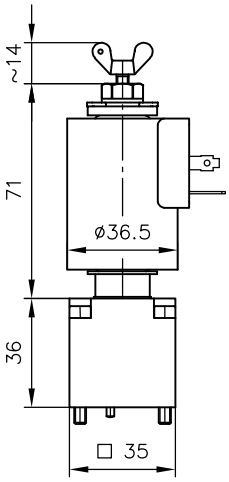
Coding **F BVE, D BVE**



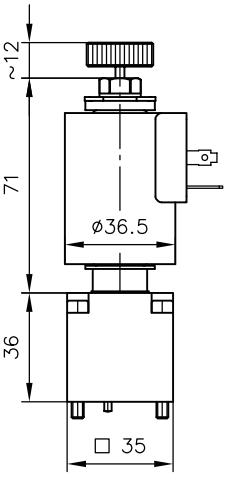
Coding **V, Z**



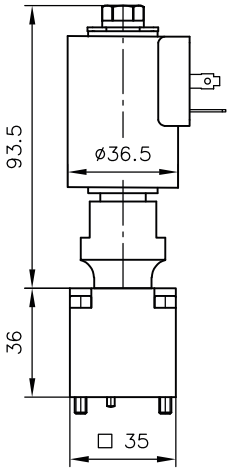
Coding **ZM**



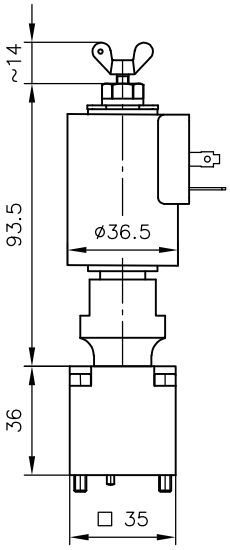
Coding **ZP**



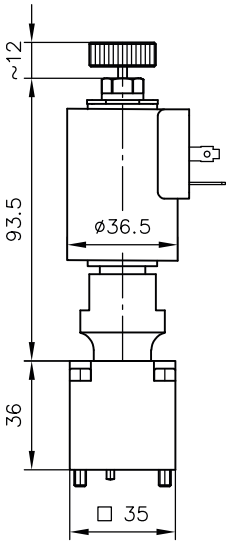
Coding **VA, ZA**



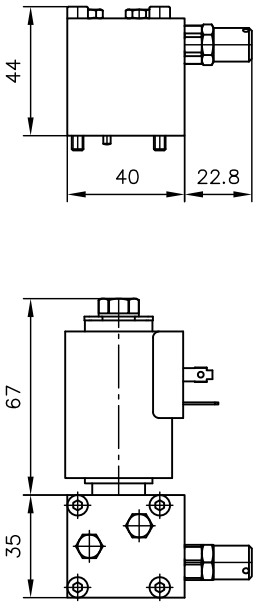
Coding **ZAM**



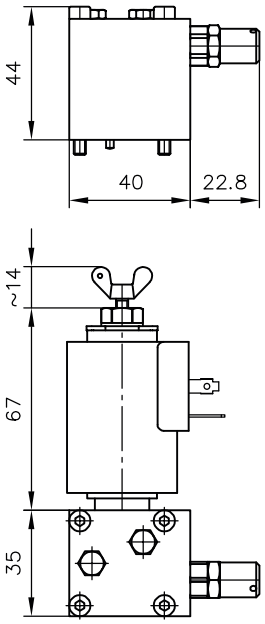
Coding **ZAP**



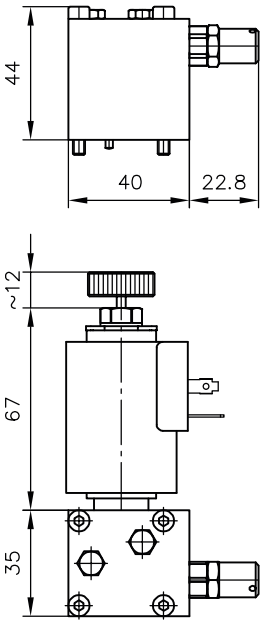
Coding **VD, ZD**



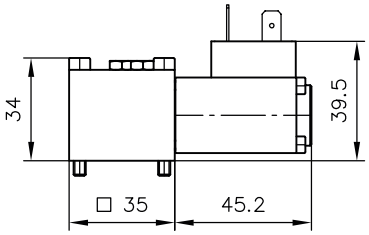
Coding **ZDM**



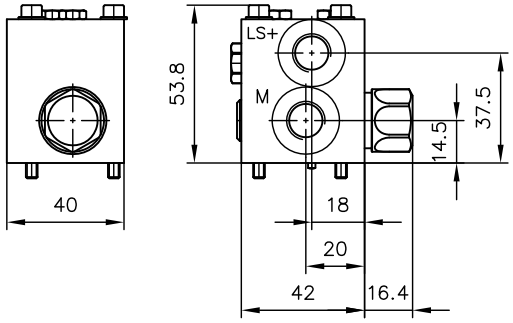
Coding **ZDP**



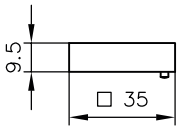
Coding **PA, PB, PC, PD**



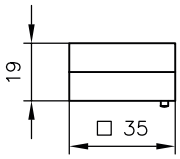
Coding **Z ADM..**



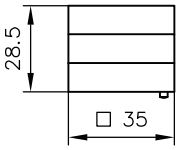
Coding **X9**



Coding **X18**



Coding **X27**

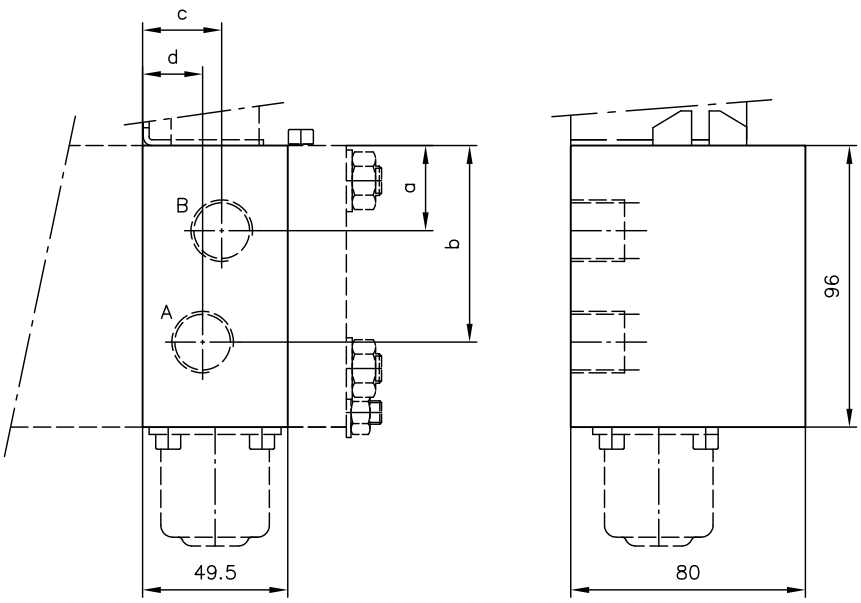


4.2 Valve section

4.2.1 directional valve section

Directional valve section with integrated consumer ports

(coding 3, 4, UNF 3 and UNF 4 as per 2.2.1.1 "Consumer ports")

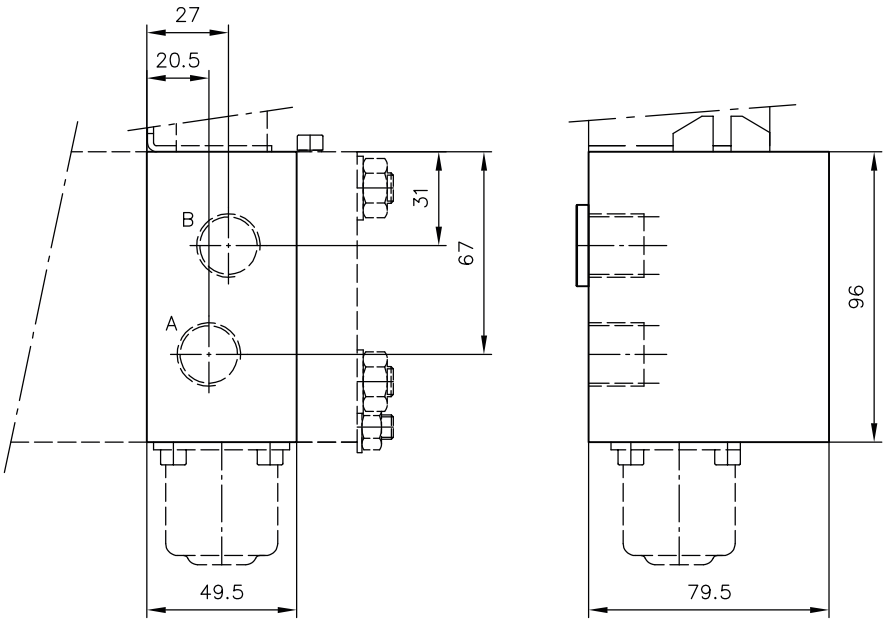


Coding	a	b	c	d	Ports (ISO 228-1 or SAE J 514)
					A, B
3	29	67	27	20.5	G 1/2
4	27	69	31.5	21.5	G 3/4
UNF 3	29	67	27	20.5	SAE-10 (7/8-14 UNF-2B)
UNF 4	--	69	--	21.5	SAE-12 (1 1/16-12 UN-2B)

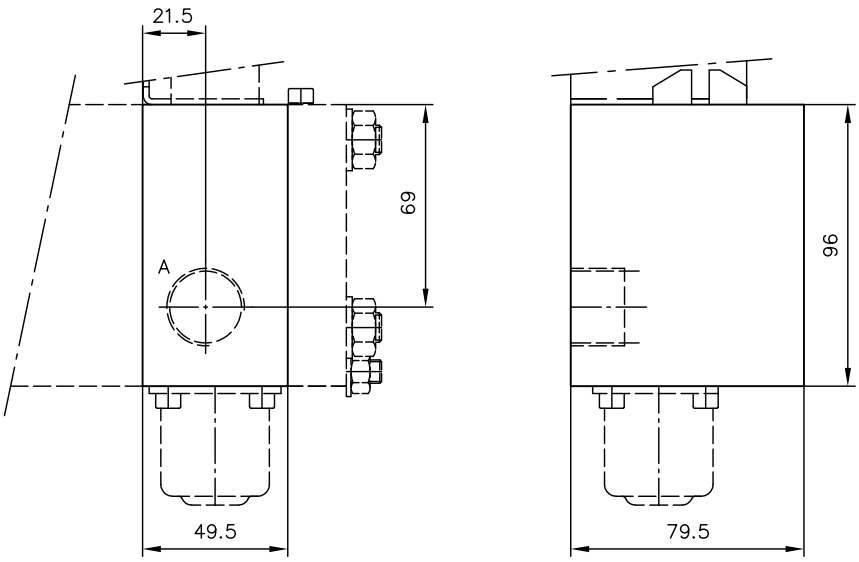
Pre-selector directional valve section with integrated ports

(coding 8 as per 2.2.1.2 "2-way controller")

Coding **38**



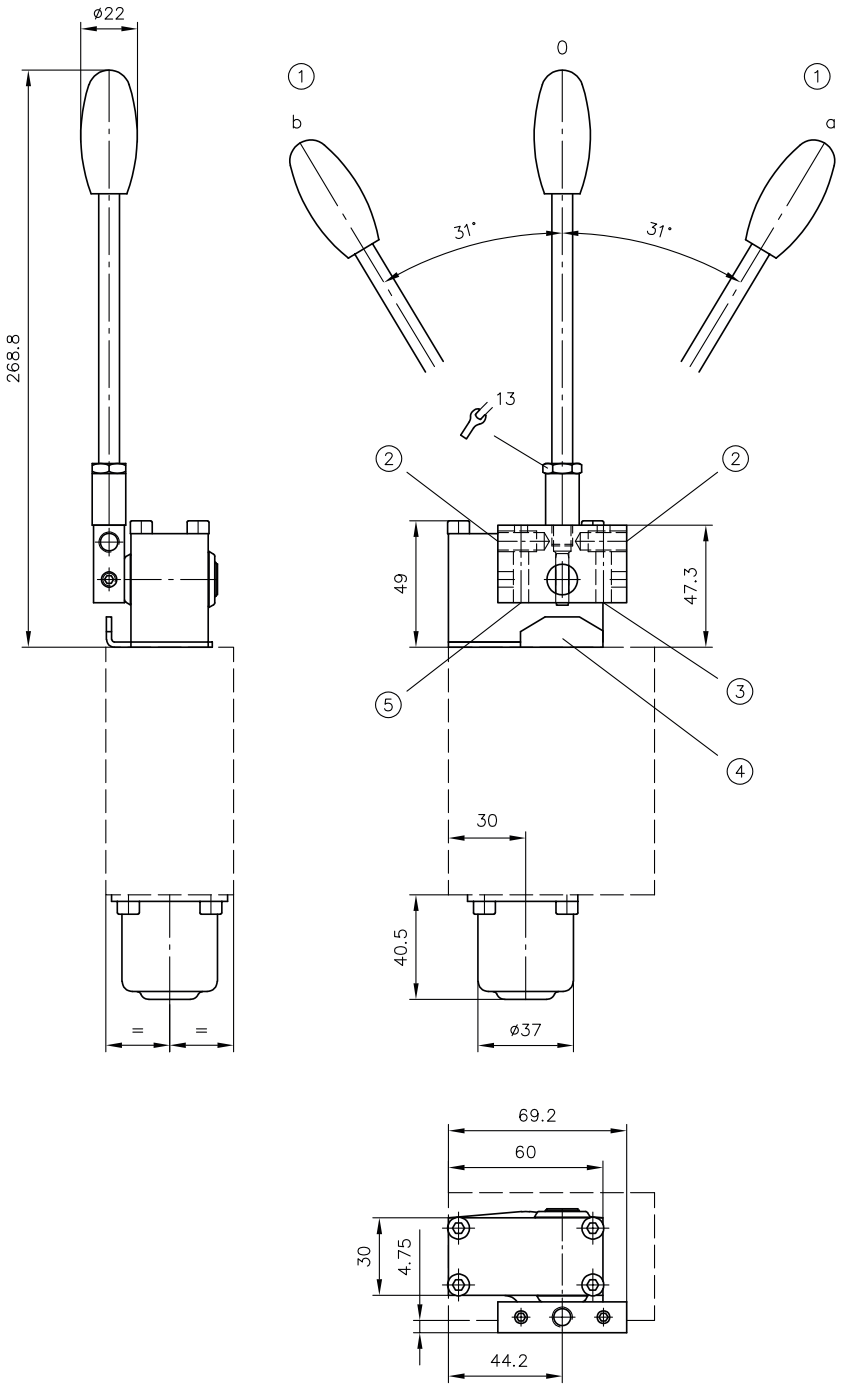
Coding **48, UNF 48**



Coding	Ports (ISO 228-1 or SAE J 514)
	A, B
38	G 1/2
48	G 3/4
UNF 48	SAE-12 (1 1/16-12 UNF-2B)

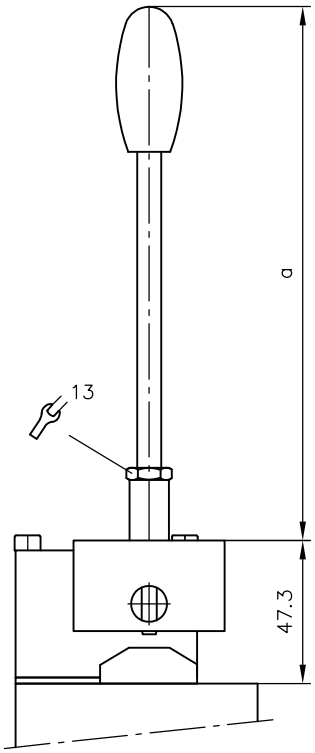
Directional valve section with manual actuation

Actuation **A, C, D**



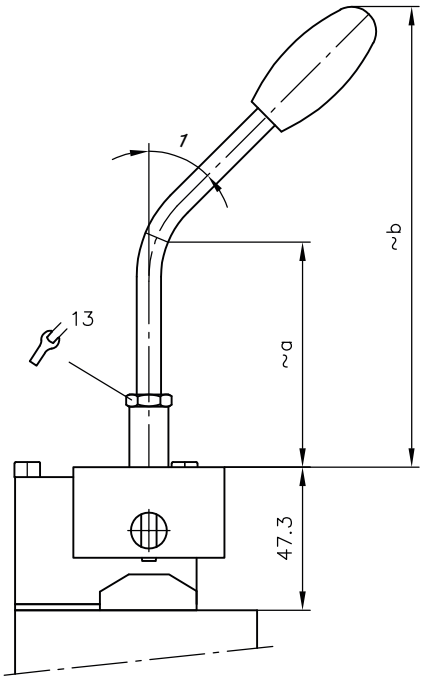
1 Switching position 0, a and b
2 Alternative mounting position for hand lever (thread M8, 15 mm deep)
3 Stroke limitation for A
4 Intermediate sheet to act as stop for stroke limitation
5 Stroke limitation for B

Lever straight



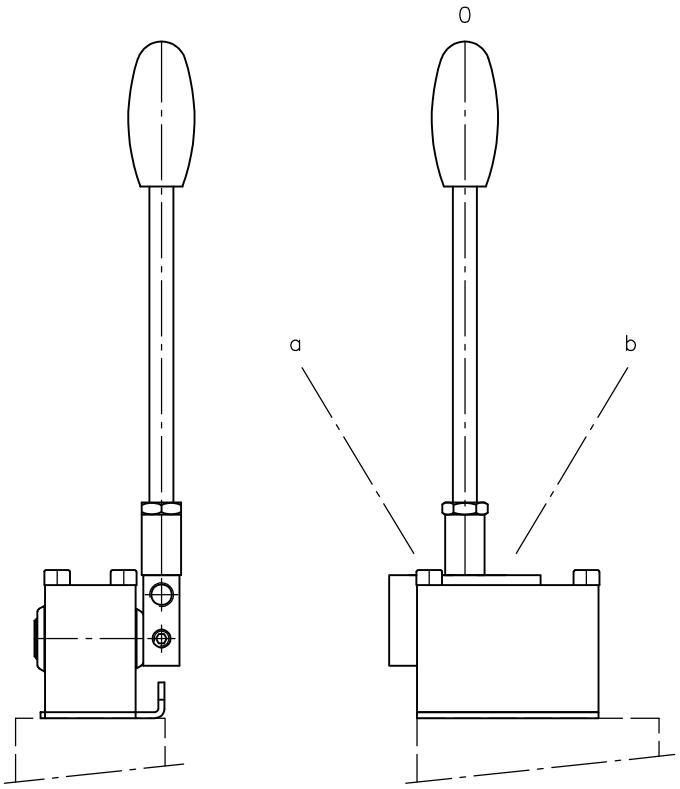
Coding	a
without coding	180
1	--
2	106

Lever for angle

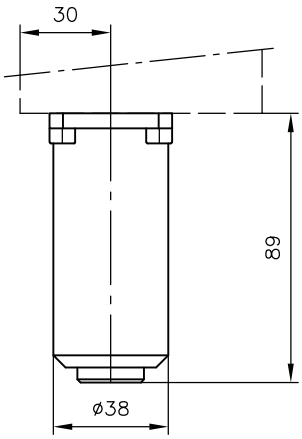


Coding	a	b	α
045	74.5	152.5	45°
212	26.5	104.5	12.5°

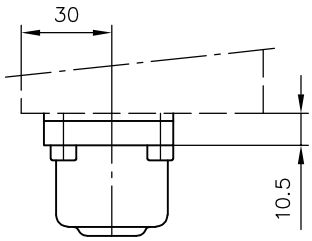
Lever housing can be mounted offset by 180°. Please state so explicitly when ordering.



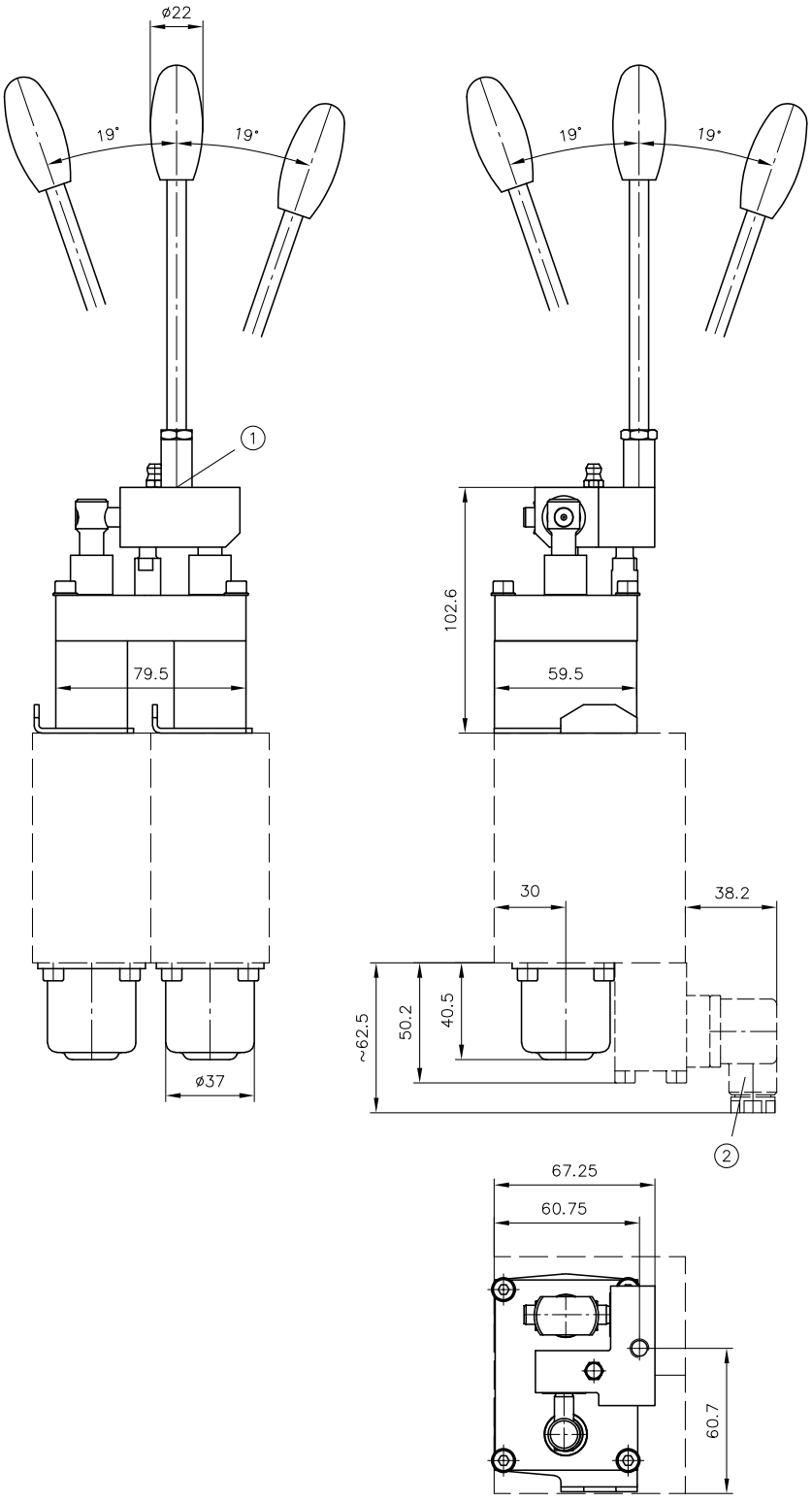
Actuation **AR**

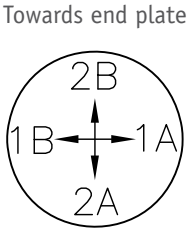


Actuation **AG**



Actuation **K, K 12, EK, EK 12**

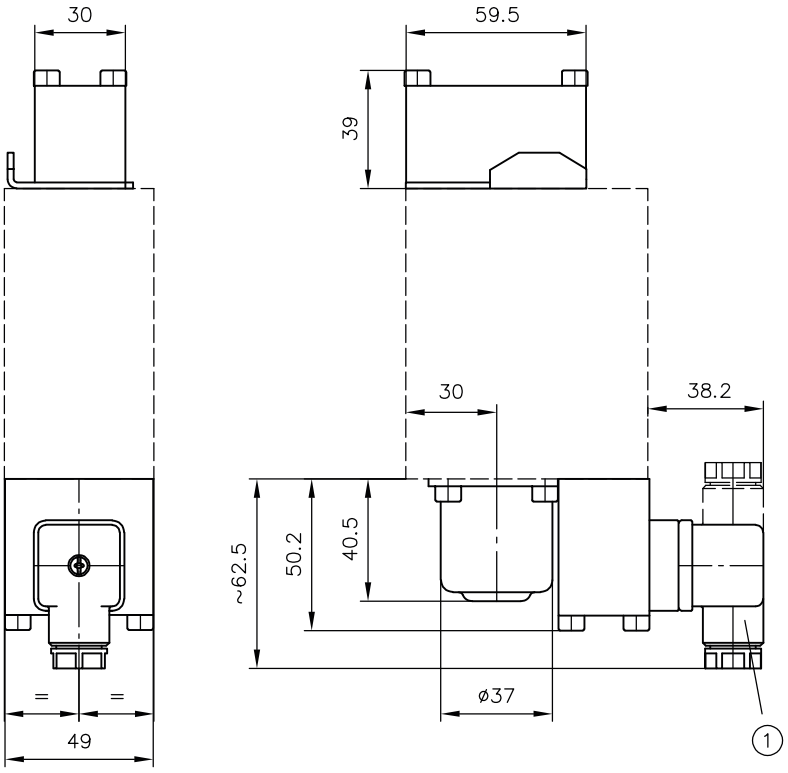




1 Coding **K:** M8 thread, with hand lever
Coding**K 12:** M12 thread, without hand lever

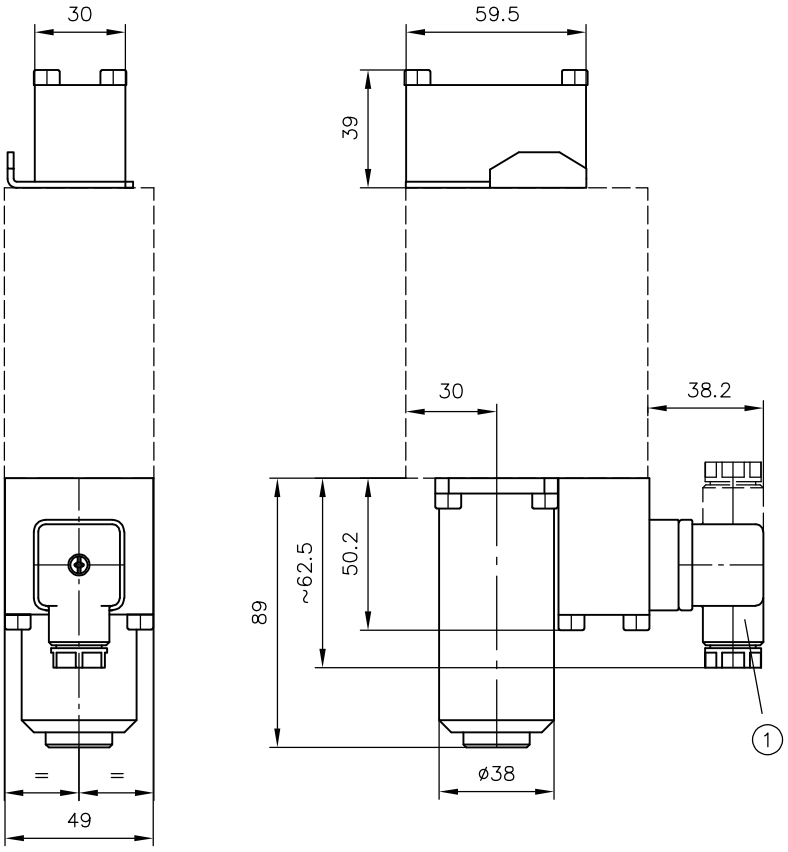
2 Solenoid for coding **EK** and **EK 12**

Actuation **EI**



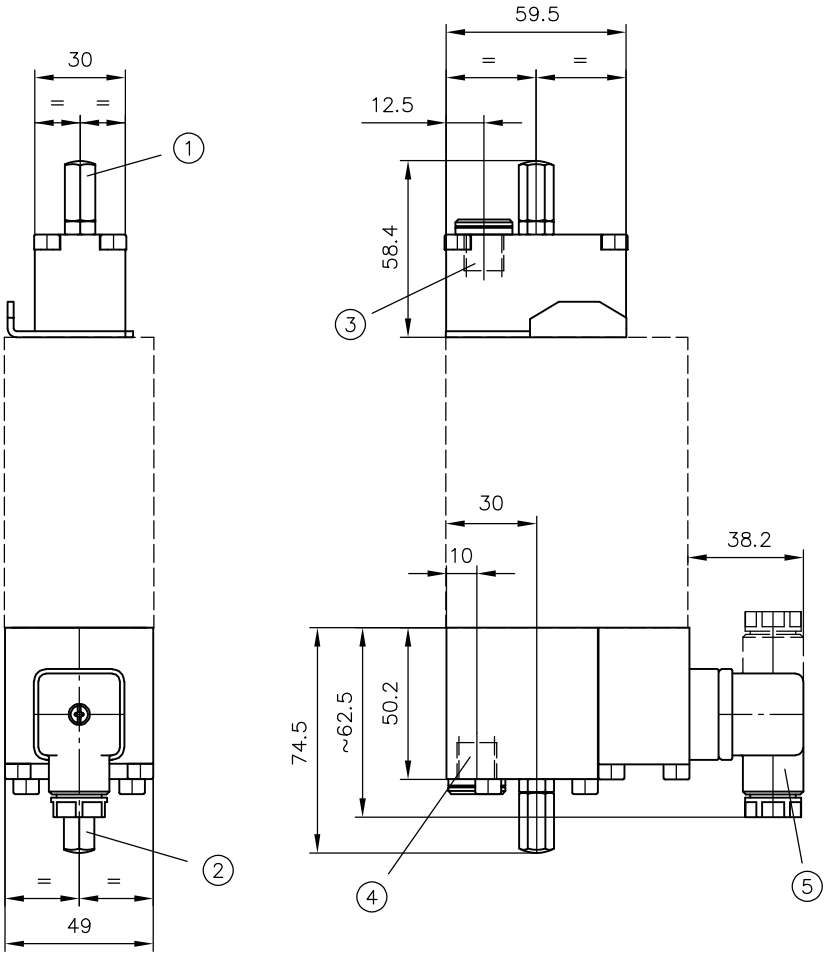
1 Male connector can be mounted offset by 180° (depending on version)

Actuation **ER**



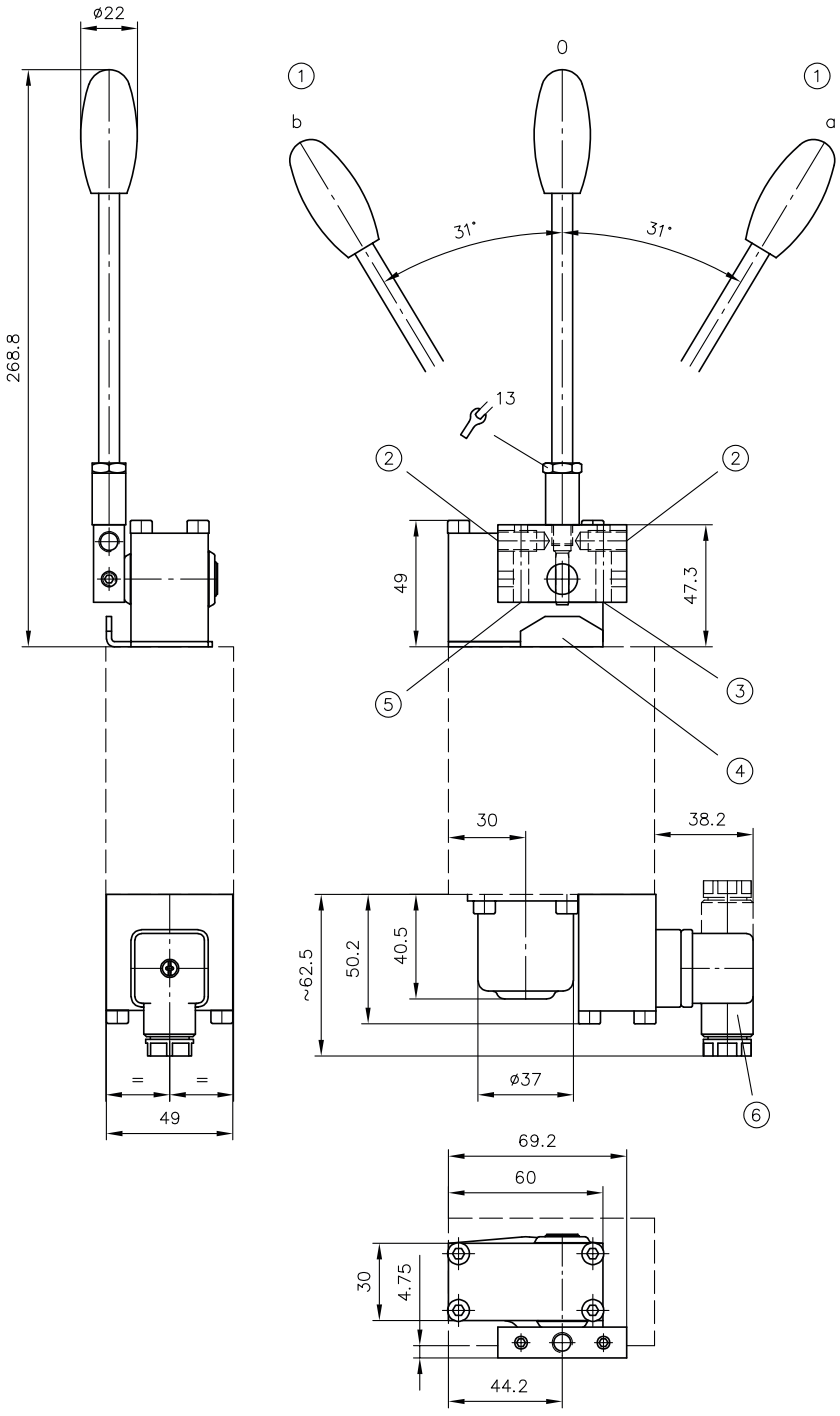
1 Male connector can be mounted offset by 180° (depending on version)

Actuation **EM**



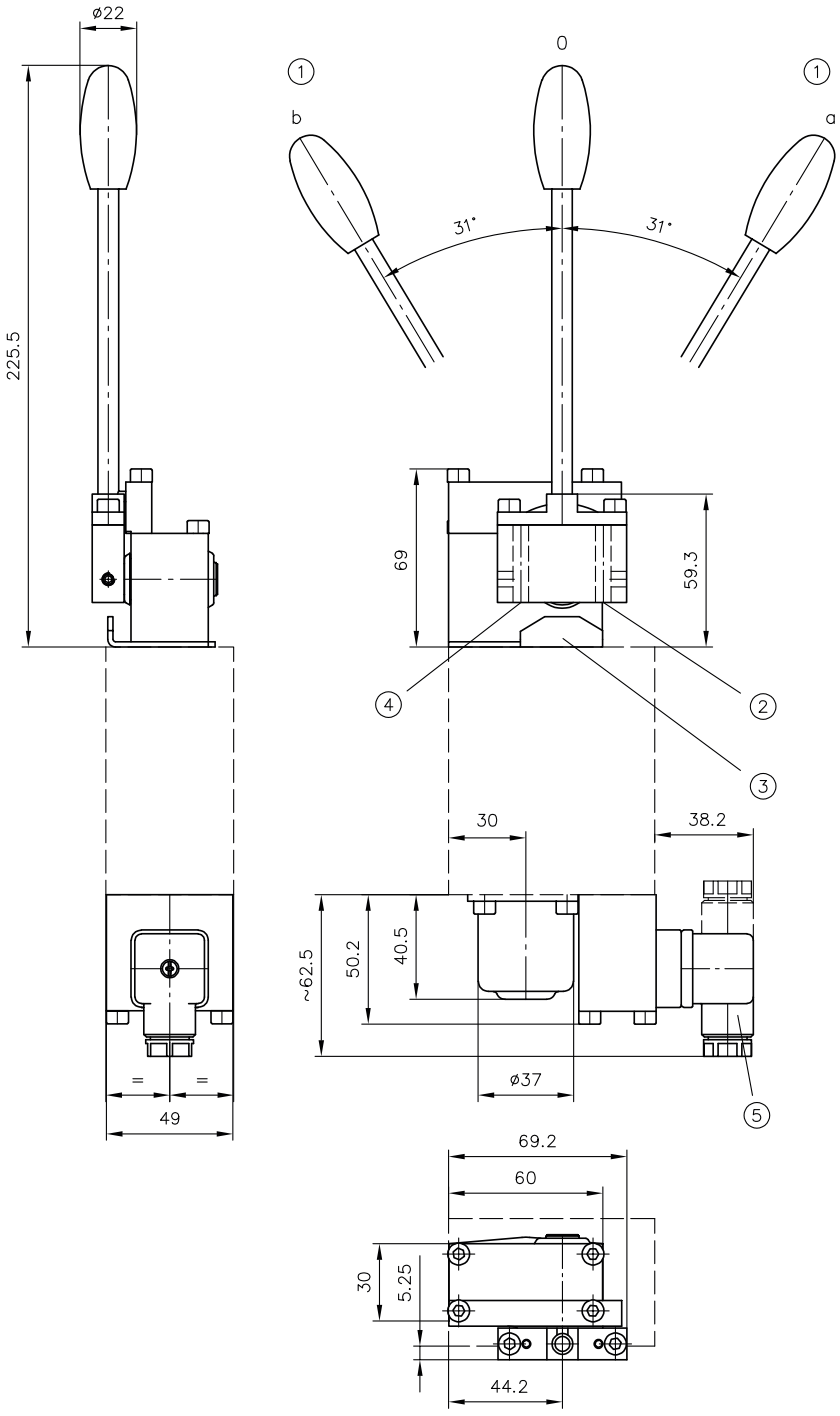
1 Stroke limitation for A
2 Stroke limitation for B
3 Measurement fitting in switching position a
4 Measurement fitting in switching position b
5 Male connector can be mounted offset by 180° (depending on version)

Actuation **EA**



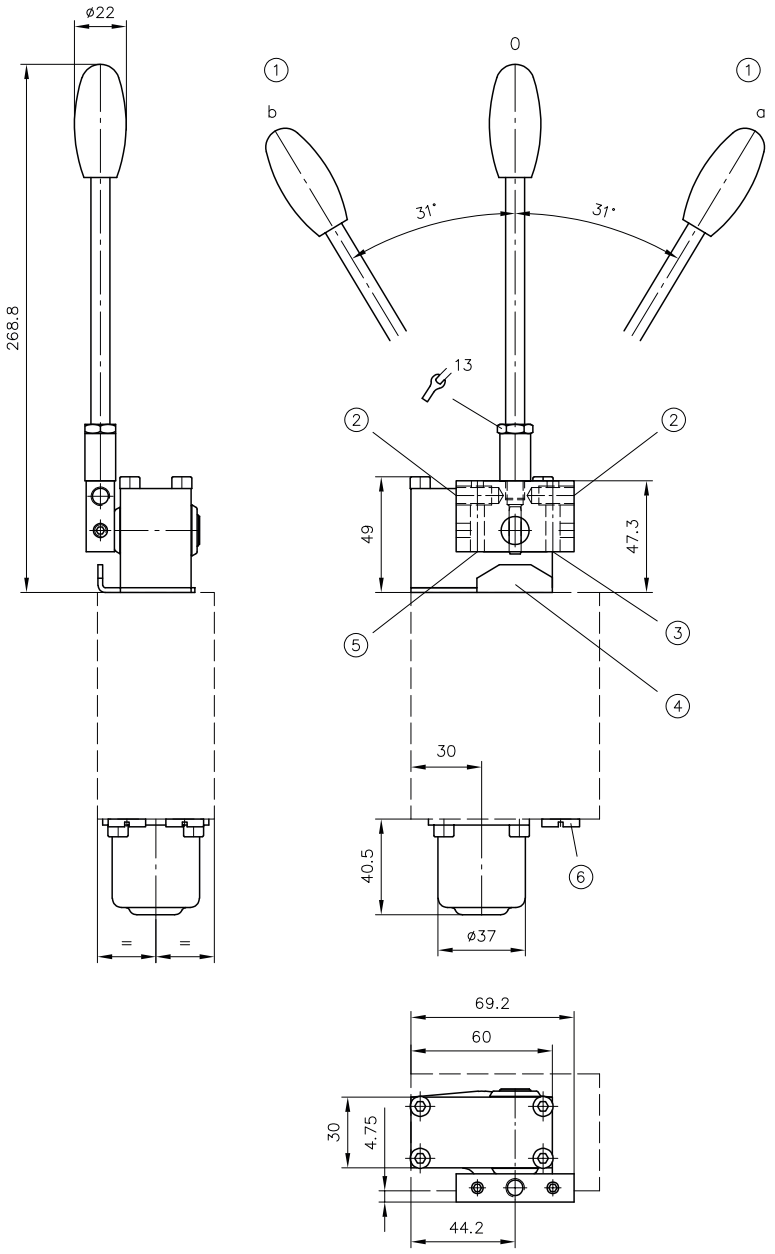
1 Switching position 0, a and b
2 Alternative mounting position for hand lever (thread M8, 15 mm deep)
3 Stroke limitation for A
4 Intermediate sheet to act as stop for stroke limitation
5 Stroke limitation for B
6 Male connector can be mounted offset by 180° (depending on version)

Actuation **EIN**



1 Switching position 0, a and b
2 Stroke limitation for A
3 Intermediate sheet to act as stop for stroke limitation
4 Stroke limitation for B
5 Male connector can be mounted offset by 180° (depending on version)

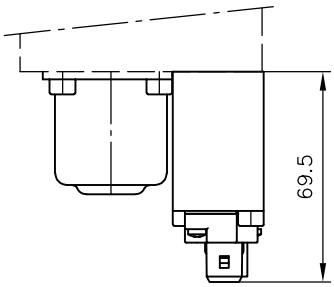
Actuation **EOA**



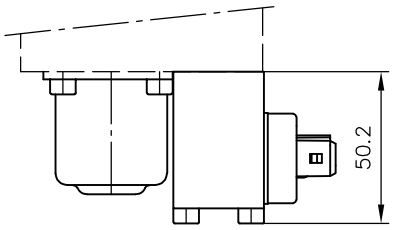
1 Switching position 0, a and b
2 Alternative mounting position for hand lever (thread M8, 15 mm deep)
3 Stroke limitation for A
4 Intermediate sheet to act as stop for stroke limitation
5 Stroke limitation for B
6 Tapped plugs

Solenoid versions

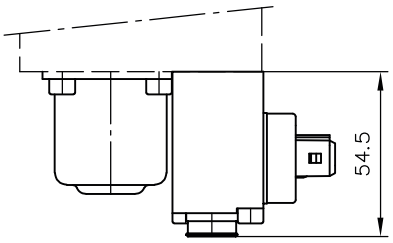
Coding
AMP 12(24) K, AMP 12(24) K 4



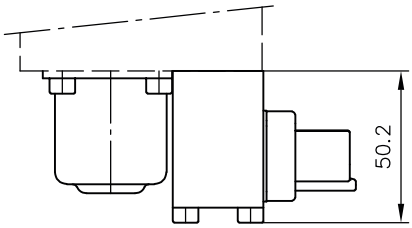
Coding
AMP 12(24) H 4



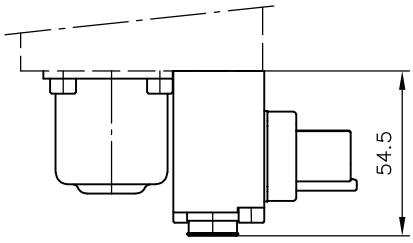
Coding
AMP 12(24) H 4 T



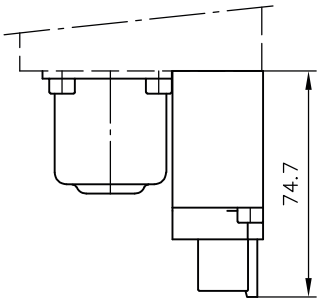
Coding
DT 12(24)



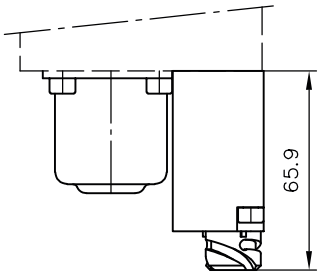
Coding
DT 12(24) T



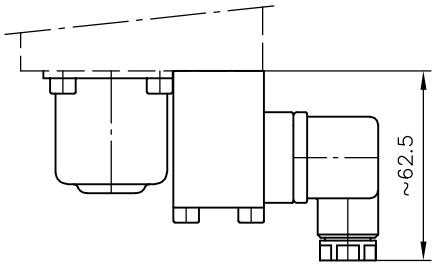
Coding
DT 12(24) K



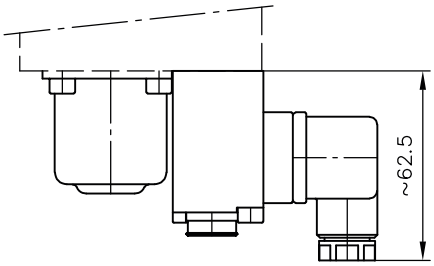
Coding
S 12(24) T



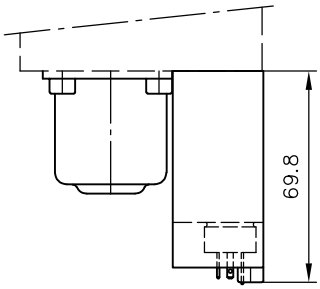
Coding
G 12(24) H 4



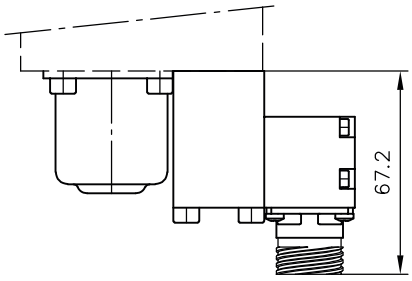
Coding
G 12(24) T



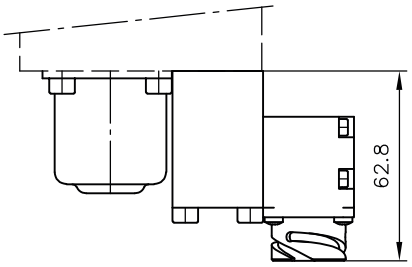
Coding
X 12(24) C, X 12(24) C 4



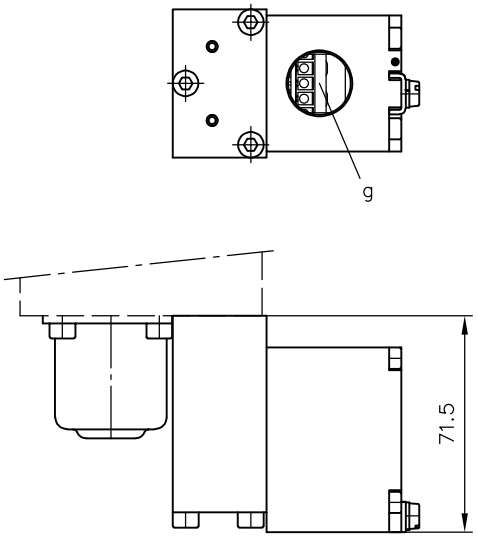
Coding
DTL 12(24)



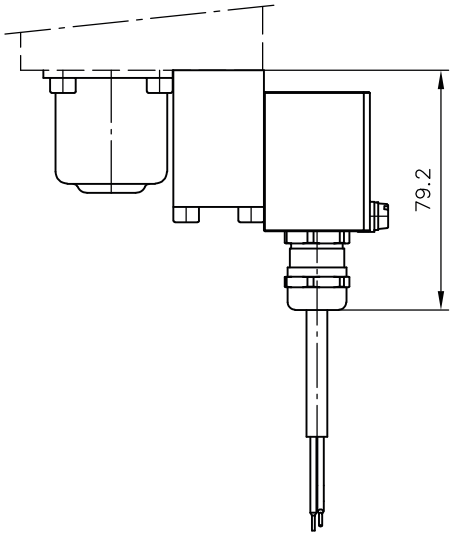
Coding
ITT 12(24)



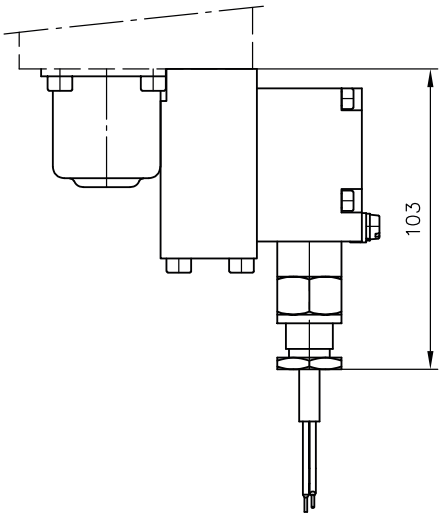
Coding
X 24 TEX 4 70 FM



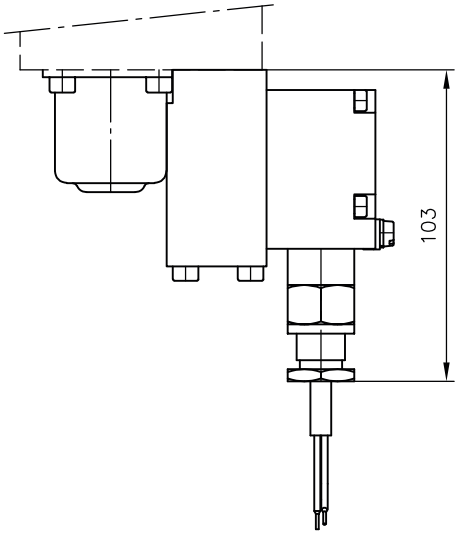
Coding
G 24 EX, G 24 EX-10 m



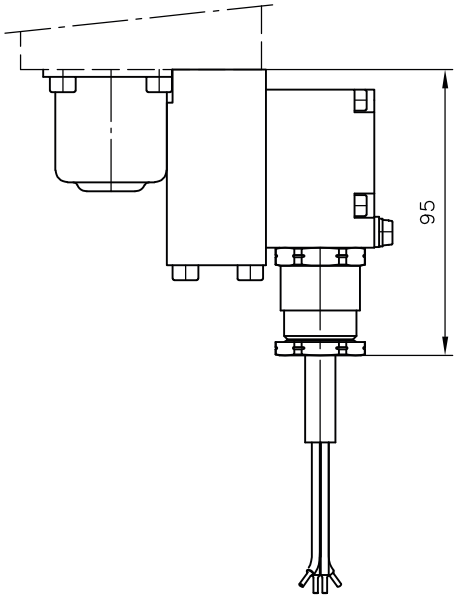
Coding
G 12 IS, G 12 IS -10 m, G 12 M2FP, G 12 M2FP-10 m



Coding
G 24 MSHA, G 24 MSHA-10 m

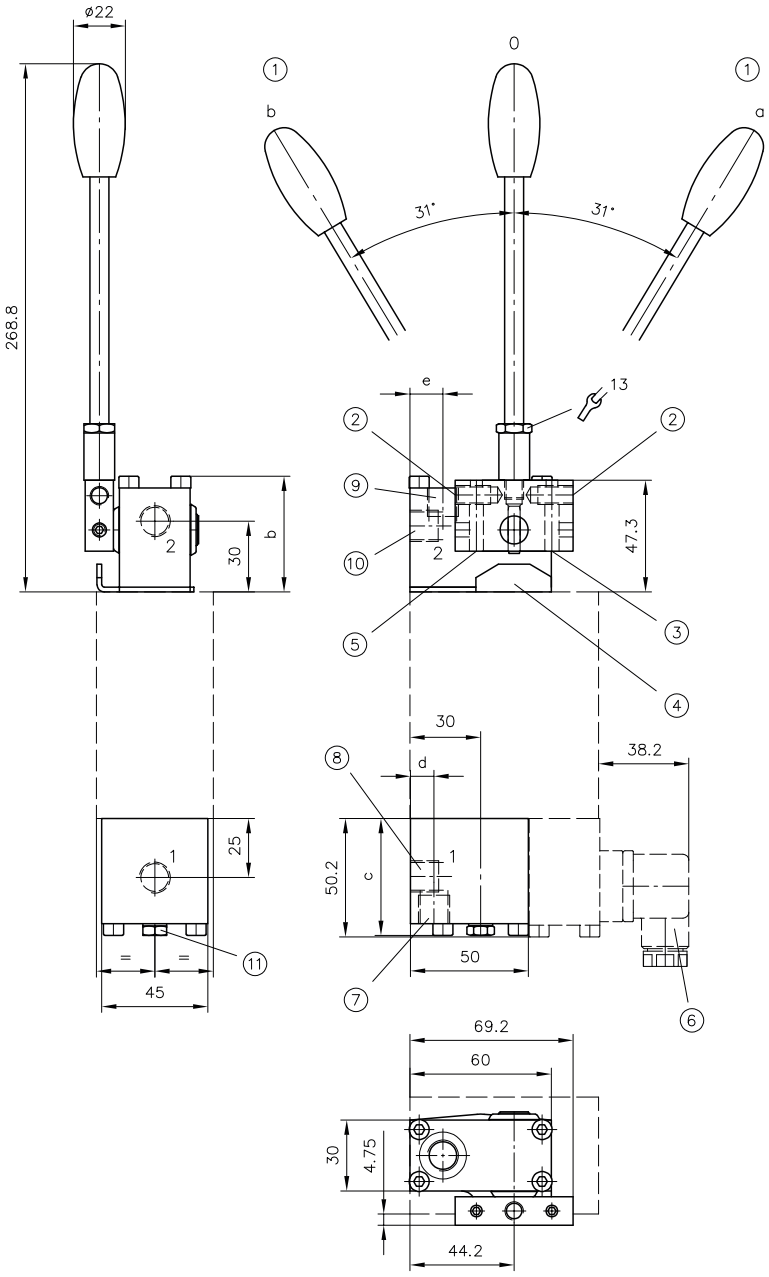


Coding
G 24 MA, G 24 MA-10 m



Directional valve section with hydraulic actuation

Actuation **HA (UNF), FA (UNF), EHA (UNF), EFA (UNF), EOHA (UNF), EOFA (UNF)**



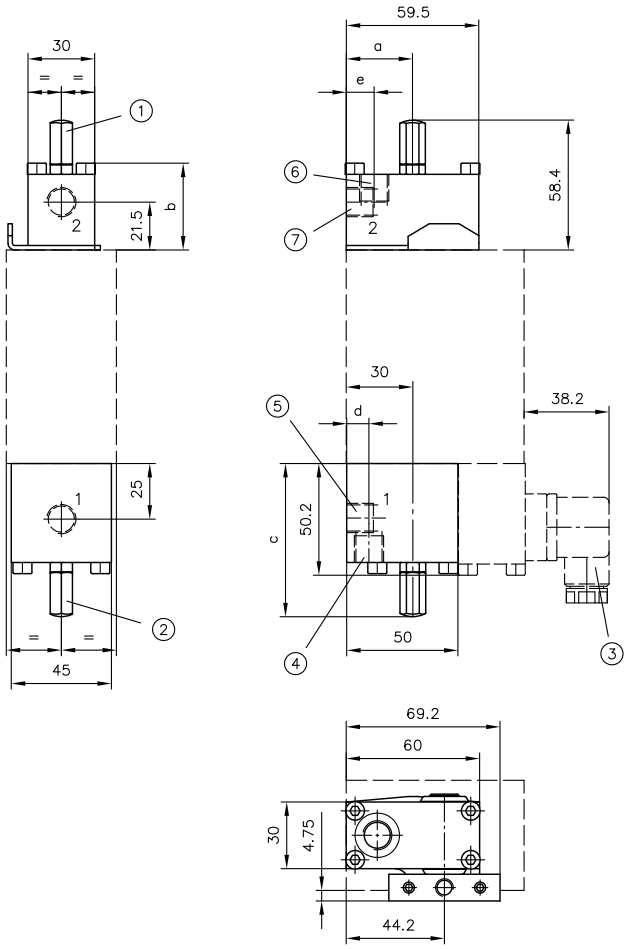
1 Switching position 0, a and b
2 Alternative mounting position for hand lever (thread M8, 15 mm deep)
3 Stroke limitation for A
4 Intermediate sheet to act as stop for stroke limitation
5 Stroke limitation for B
6 Solenoid with male connector (for coding E only), male connector can be mounted offset by 180° (depending on version)
7 Port 1 for coding **F**
8 Port 1 for coding **H**
9 Port 2 for coding **F**
10 Port 2 for coding **H**
11 for coding HA only

Coding	a
A (standard lever arm)	221.5
A2 (stub lever arm)	147.5

Coding	b	c	d	e
HA, EHA, EOHA HA UNF, EHA UNF, EOHA UNF	49	49.5	--	--
FA, EFA, EOFA	44	55	10	13.8
FA UNF, EFA UNF, EOFA UNF	44	49.5	7	14.8

	Ports (ISO 228-1 or SAE J 514)
	1, 2
H, F	G 1/4
H UNF, F UNF	SAE-4 (7/16-20 UNF-2B)

Actuation **H (UNF), F (UNF), FI (UNF), EH (UNF), EF (UNF), EFI (UNF), EOH (UNF), EOF (UNF), EOFI (UNF)**

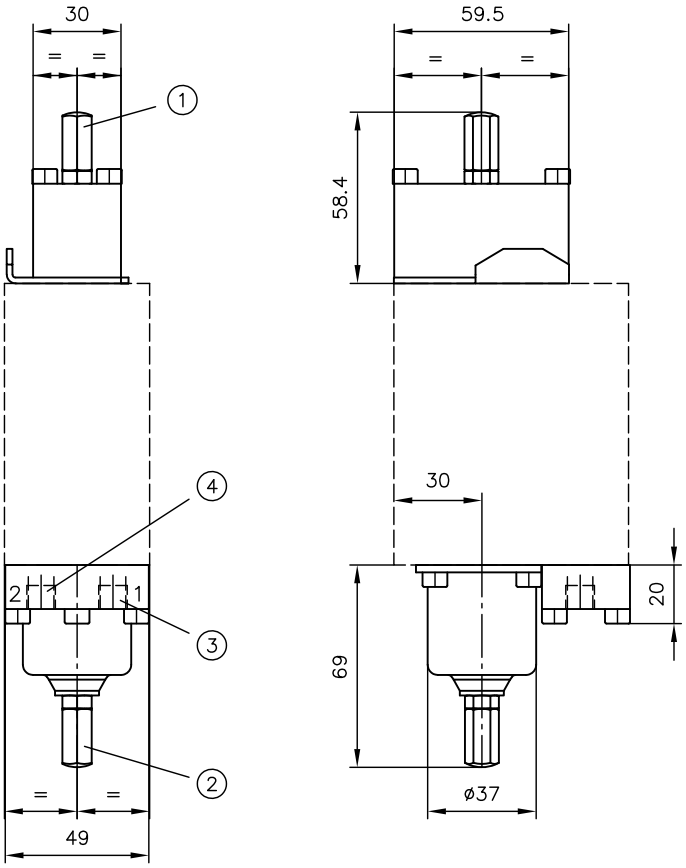


1 Stroke limitation for A (not for coding I)
2 Stroke limitation for B (not for coding I)
3 Solenoid with male connector (for coding E only), male connector can be mounted offset by 180° (depending on version)
4 Port 1 for coding **F**
5 Port 1 for coding **H**
6 Port 2 for coding **F**
7 Port 2 for coding **H**

Coding	a	b	c	d	e
H, EH, EOH H UNF, EH UNF, EOH UNF	29.75	39	68.9	--	--
F, EF, EOF	31	34	74.5	10	12.5
F UNF, EF UNF, EOF UNF	31	34	68.9	7	12
FI, EFI, EOFI	--	34	55	10	12.5
FI UNF, EFI UNF, EOFI UNF	--	34	49.5	7	14.1

	Ports (ISO 228-1 or SAE J 514)
	1, 2
H, F	G 1/4
H UNF, F UNF	SAE-4 (7/16-20 UNF-2B)

Actuation **EOZ (UNF)**

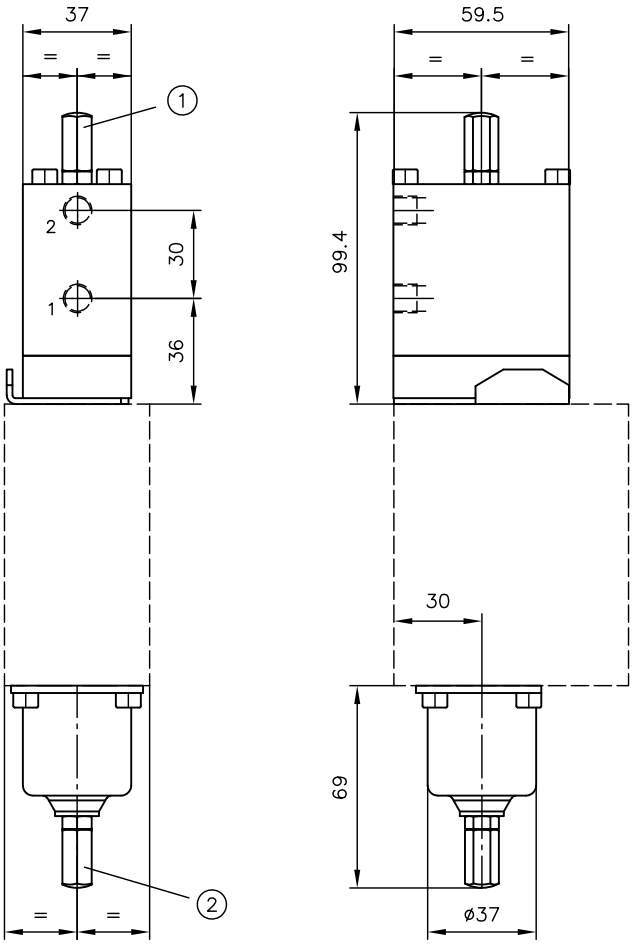


1 Stroke limitation for A
2 Stroke limitation for B
3 Port 1
4 Port 2

Coding	Ports (ISO 228-1 or SAE J 514)
	1, 2
EOZ	G 1/8
EOZ UNF	SAE-4 (7/16-20 UNF-2B)

Directional valve section with pneumatic actuation

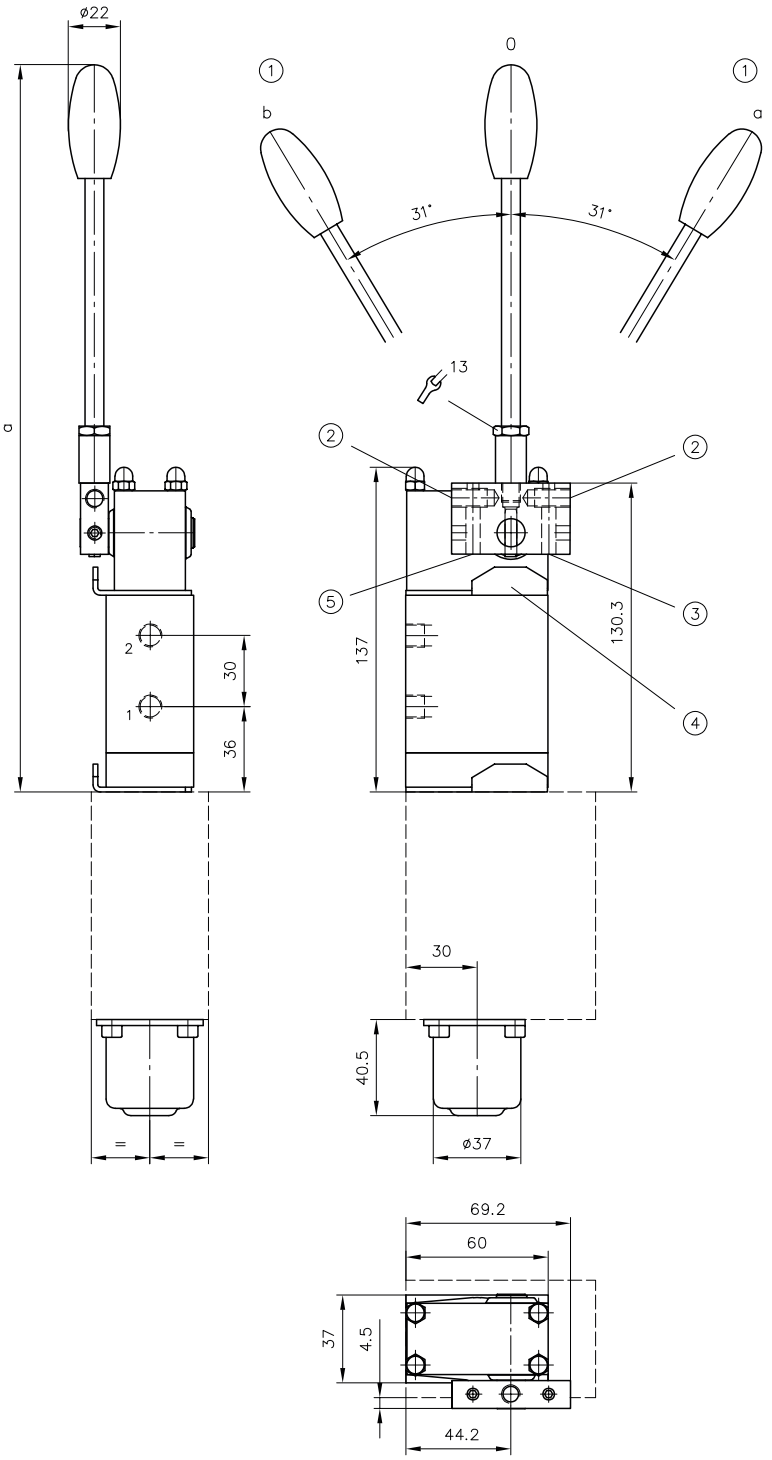
Actuation **P**



1 Stroke limitation for A
2 Stroke limitation for B

Coding	Ports (ISO 228-1)
	1, 2
P	G 1/8

Actuation **PA**



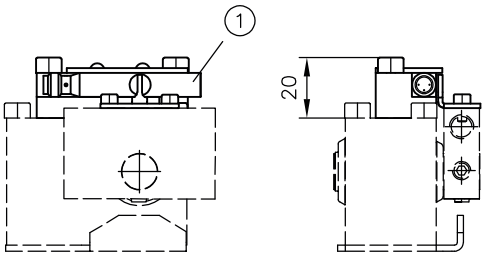
1 Switching position 0, a and b
2 Alternative mounting position for hand lever (thread M8, 15 mm deep)
3 Stroke limitation for A
4 Intermediate sheet to act as stop for stroke limitation
5 Stroke limitation for B

Coding	a
A (standard lever arm)	306.8
A2 (stub lever arm)	231

Coding	Ports (ISO 228-1)
	1, 2
PA	G 1/8

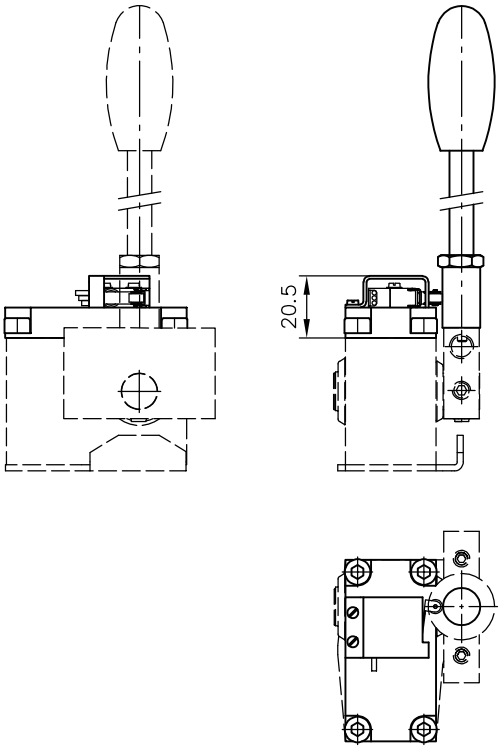
Switching position monitoring, displacement transducer

Coding **N, N1**

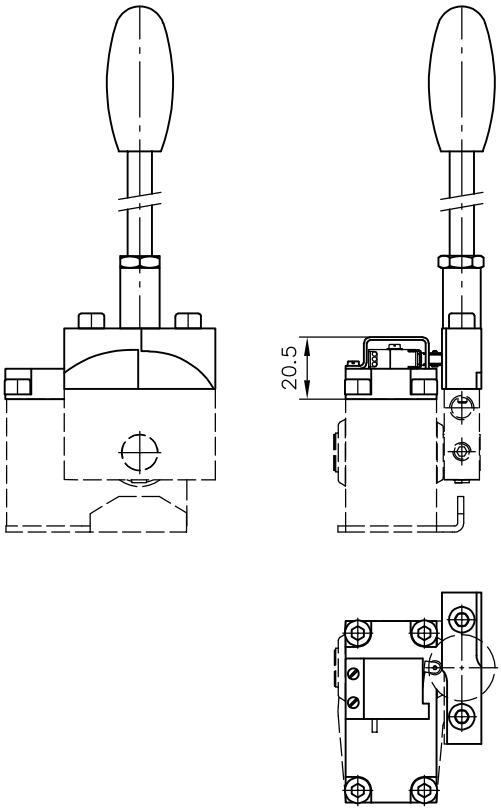


1 Coding N only

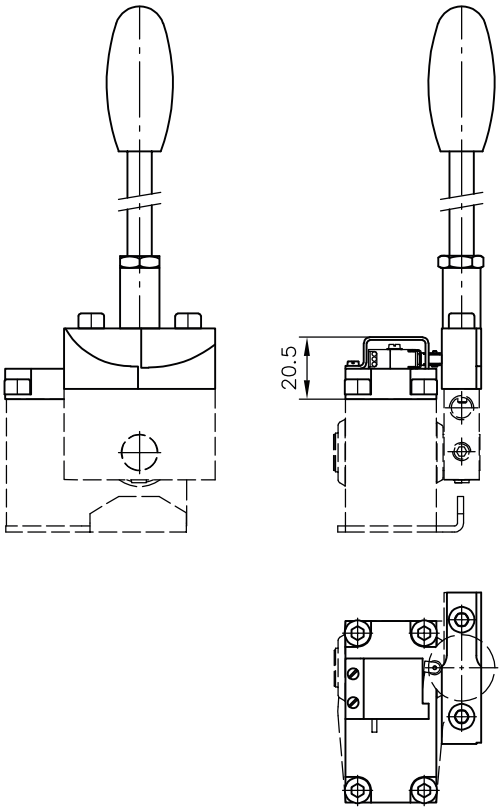
Coding **V**



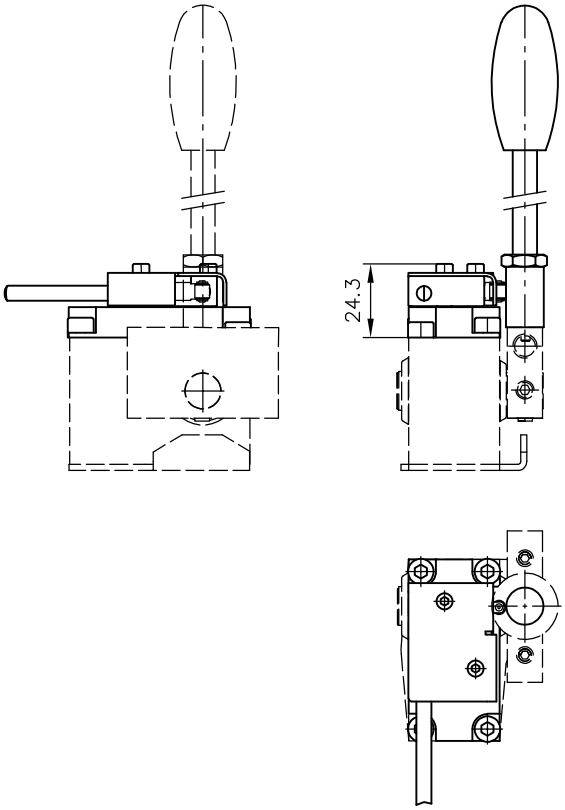
Coding **VA**



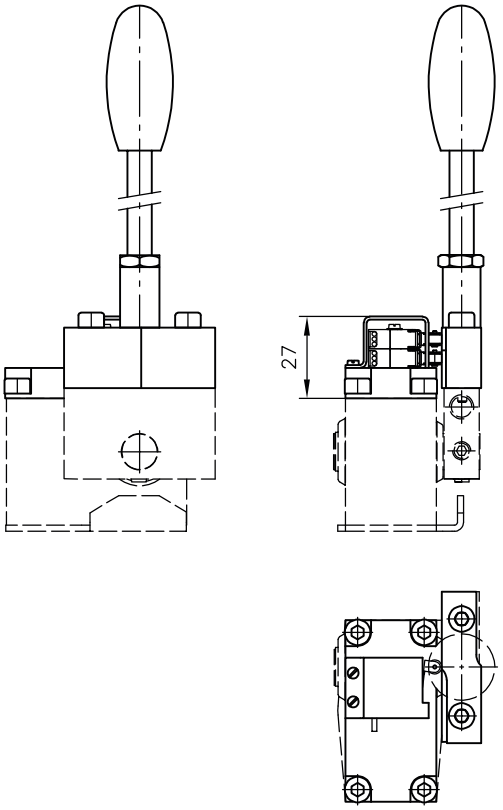
Coding **VB**



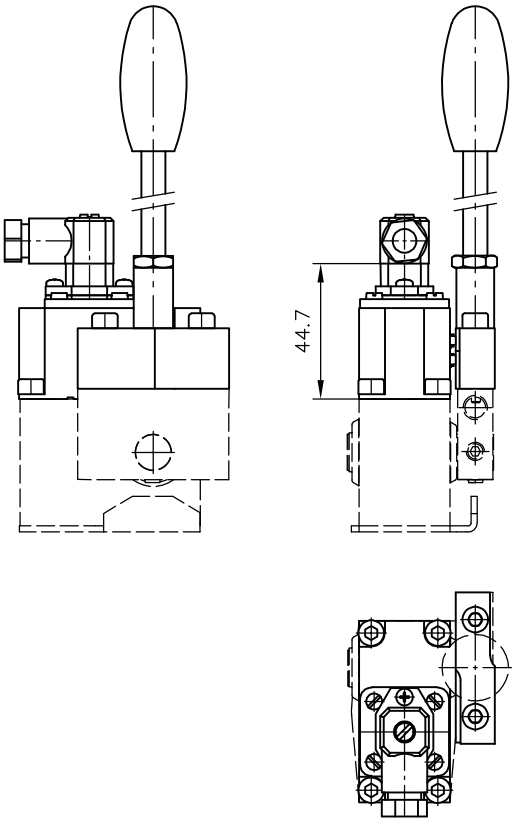
Coding **VE**



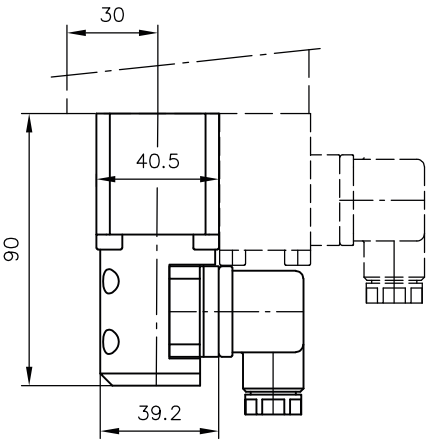
Coding **VC**



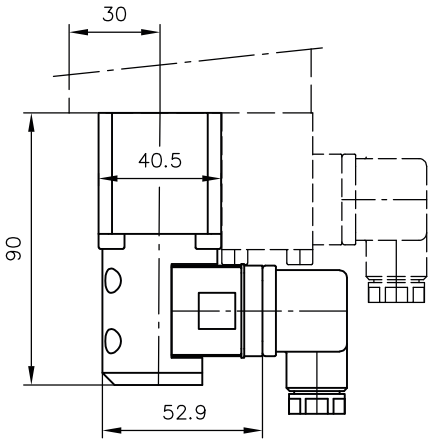
Coding **VCHO, VCHC**



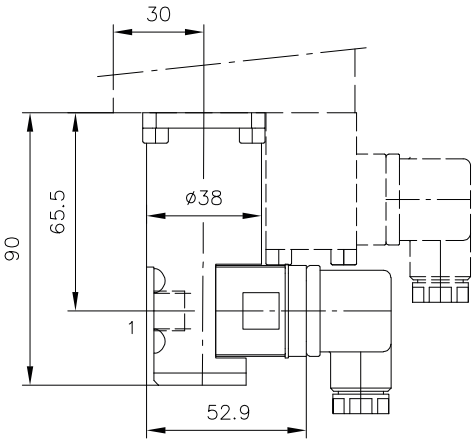
Coding **WA**



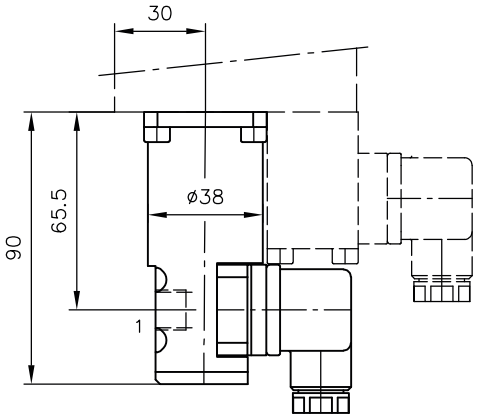
Coding **U**



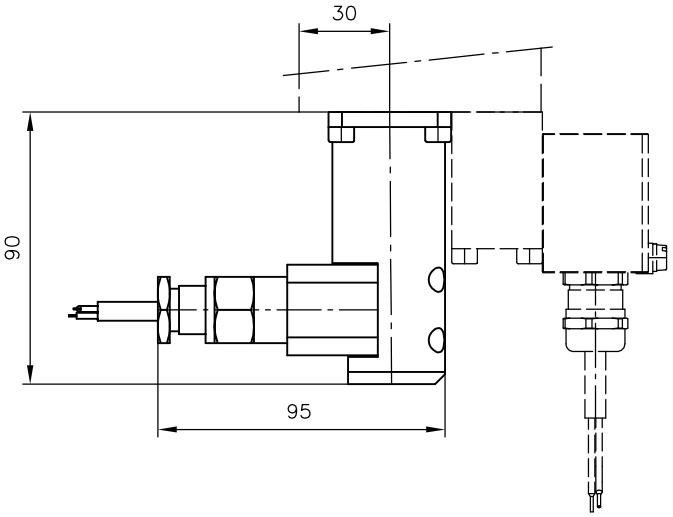
Coding **H...U**



Coding **H...WA**



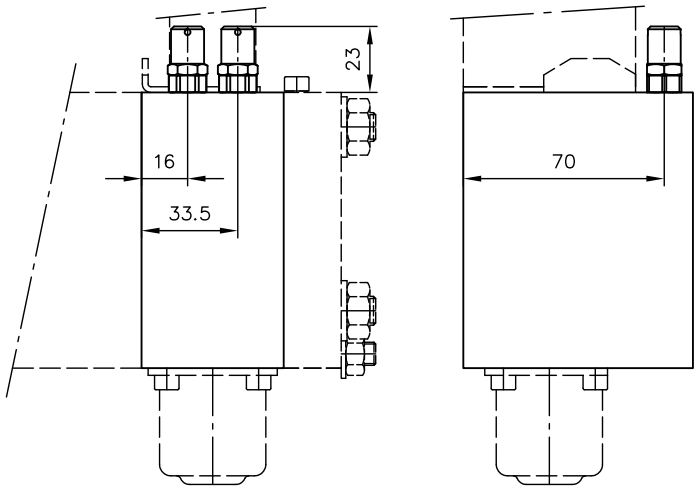
Coding **WA-M2FP**



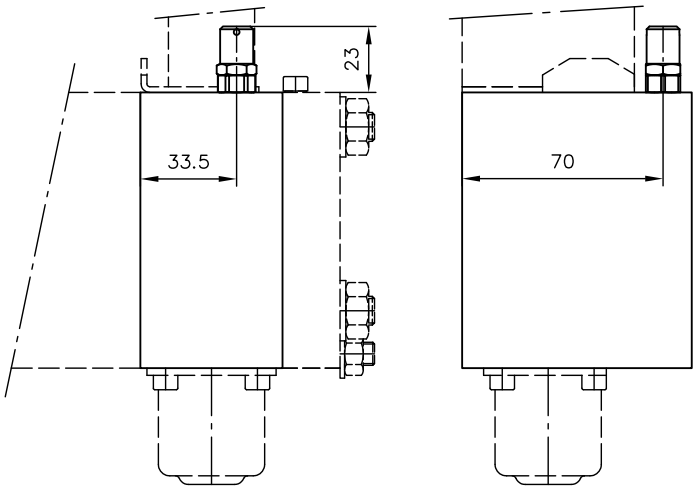
	Port (ISO 228-1)
1	G 1/4

Directional valve section with LS pressure limitation

Coding **AB, A..., B..., A... B...**

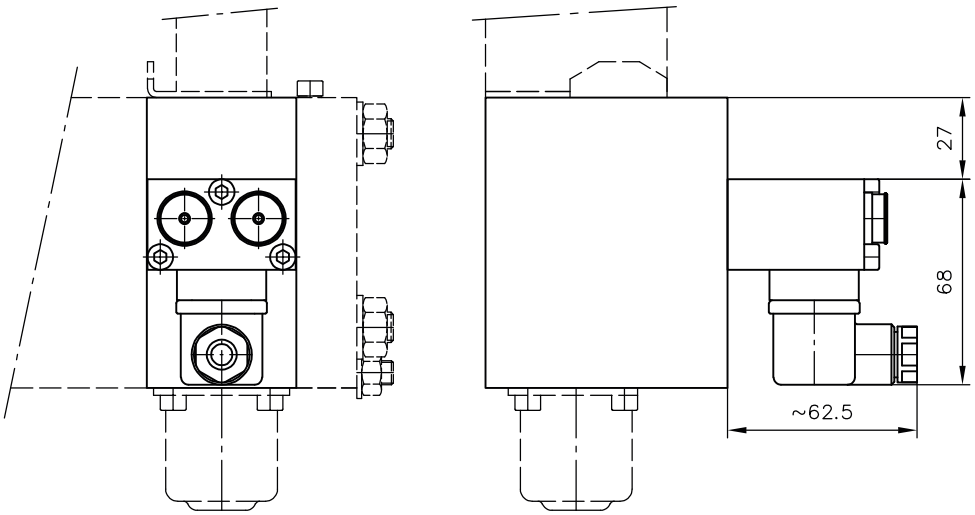


Coding **C...**

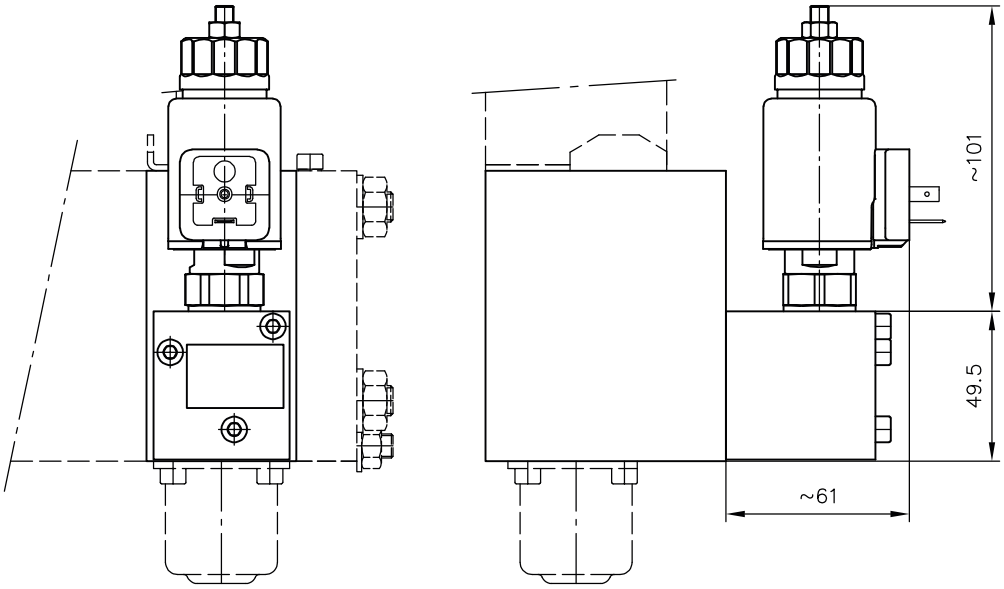


Directional valve section with electric LS relief or LS pressure limitation

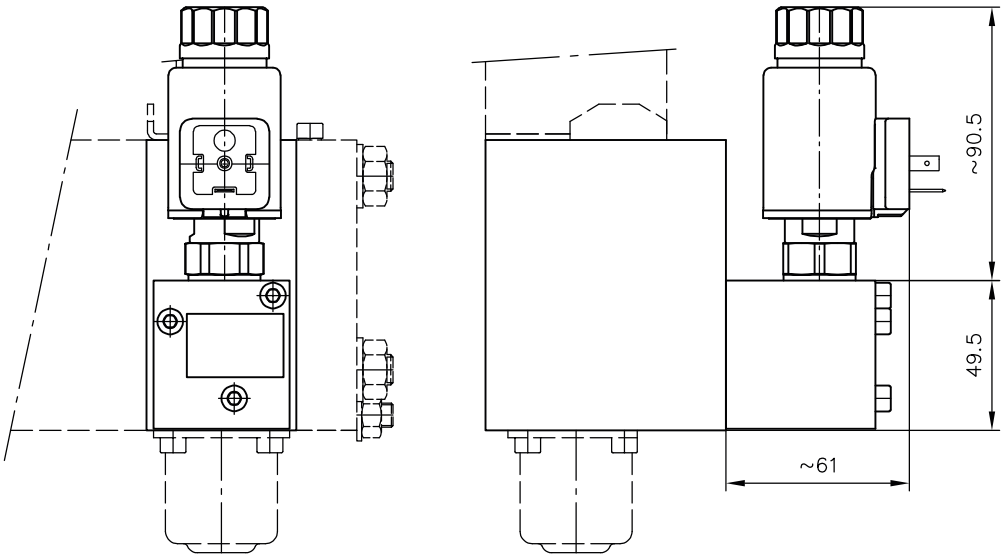
Coding **F1, F2, F3, FP**



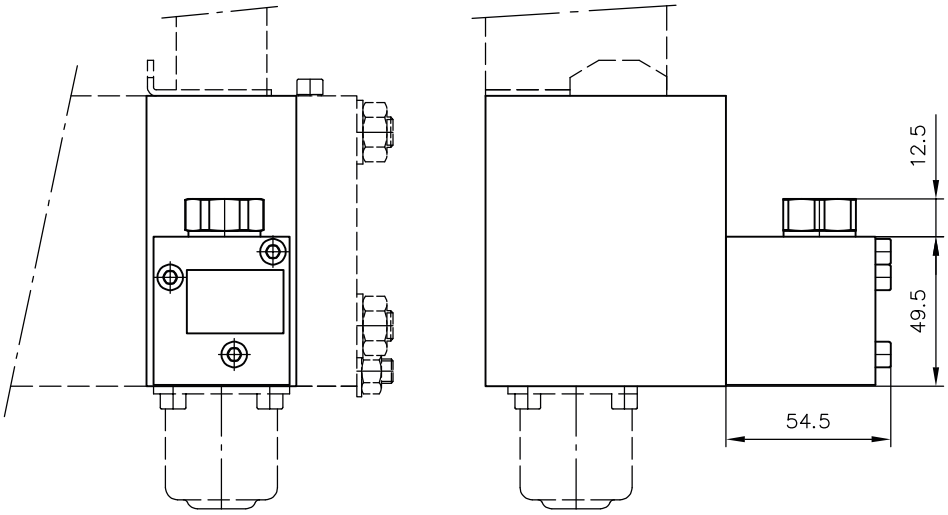
Coding **FPC-R...**



Coding **FPC-S...**

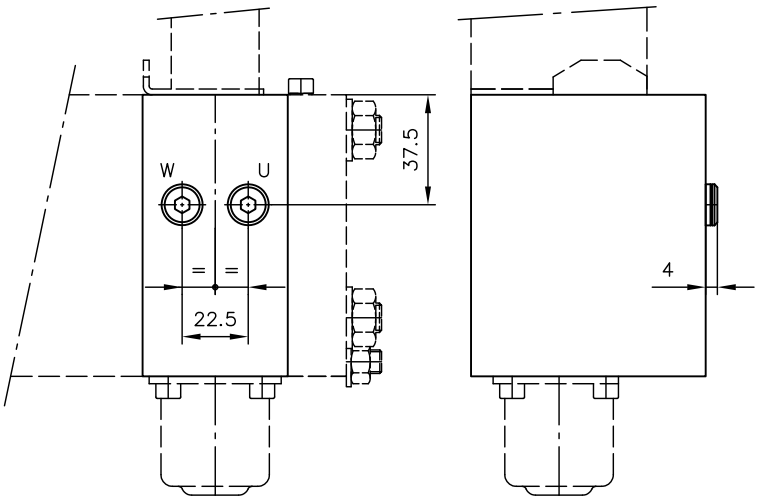


Coding **FPCX**

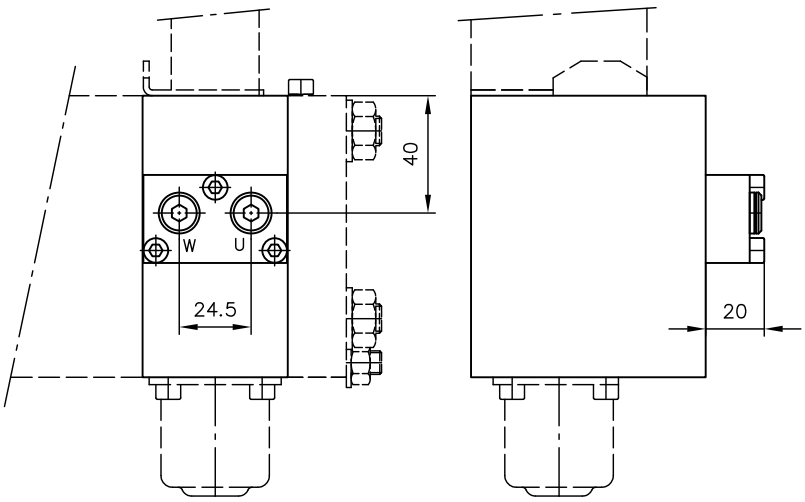


Directional valve section with LS port for external limitation

Coding **S**

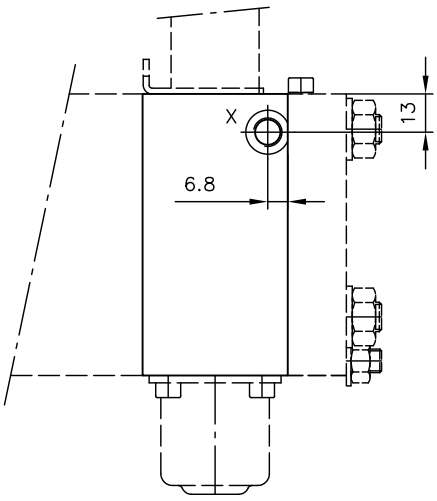


Coding **S1, S1 UNF**

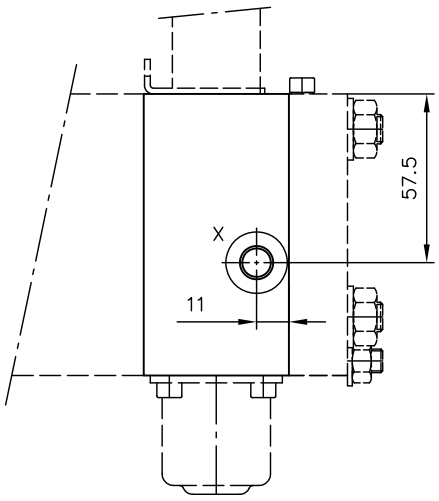


Coding	Ports (ISO 228-1 or SAE J 514)
	U, W
S, S1	G 1/8
S1 UNF	SAE-4 (7/16-20 UNF-2B)

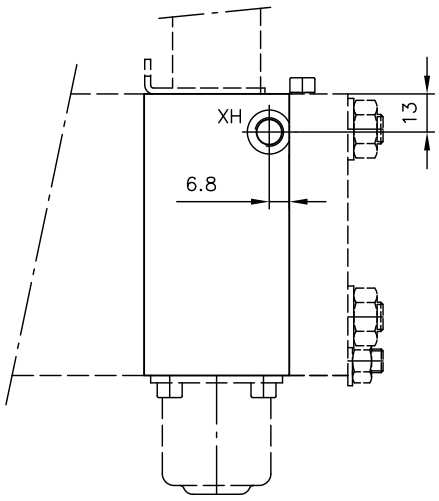
Coding **X**
(for valve sections with coding 3)



Coding **X**
(for valve sections with coding UNF 3)



Coding **XH**

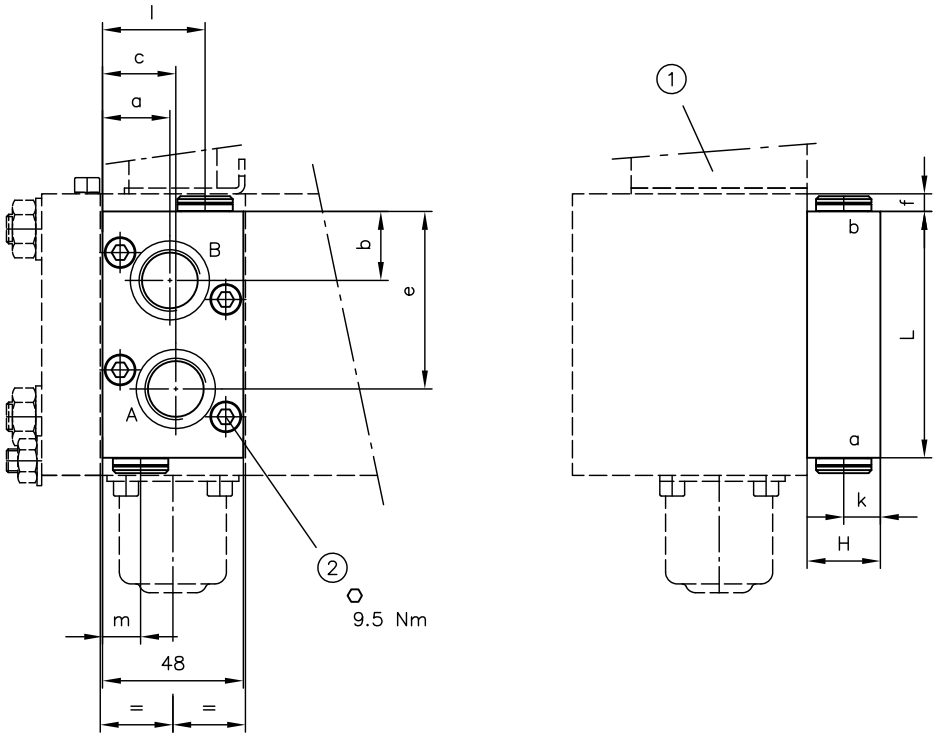


Coding	Ports (ISO 228-1 or SAE J 514)
	X
X (for valve sections with coding 3)	G 1/8
X (for valve sections with coding UNF 3)	SAE-4 (7/16-20 UNF-2B)
XH	G 1/8

4.2.2 Ancillary block

see Chapter 2.2.2, "Ancillary block"

/3, /4,
/UNF 12, /UNF 2, /UNF 3, /JIS 3,
/4 AN BN, /UNF 3 AN BN

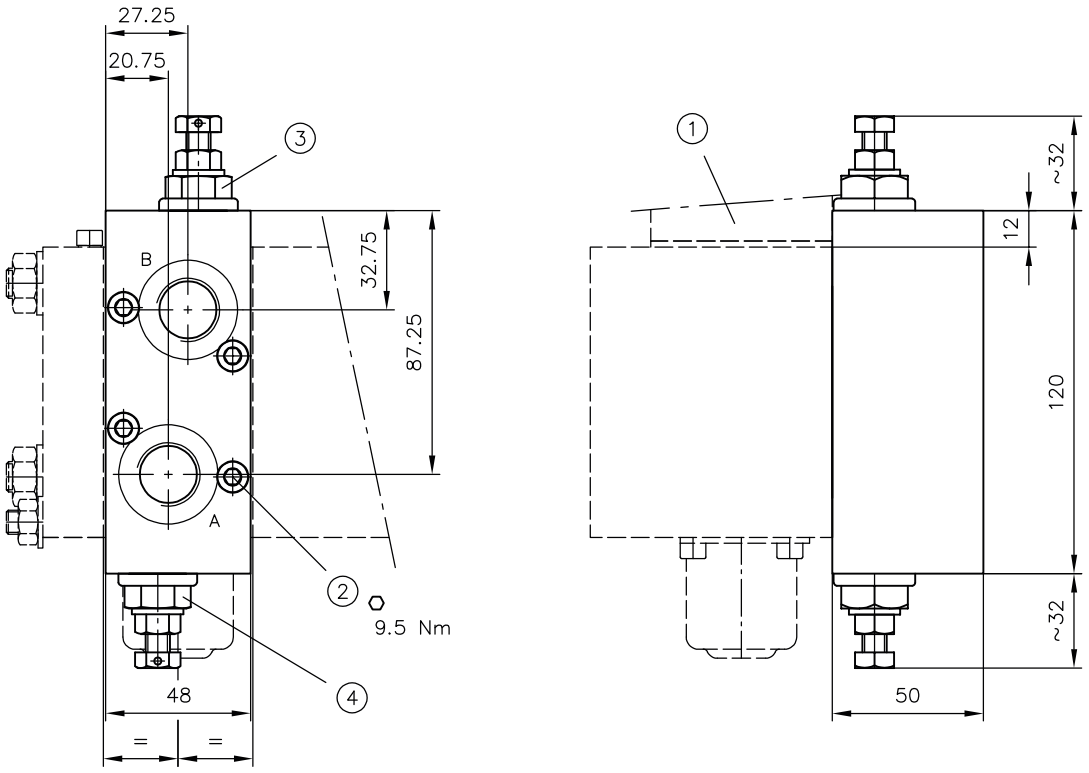


1 Directional valve section
2 Cylinder screws ISO 4762-M6x **25** -A2-70 for coding /3, /UNF 12, /UNF 2
Cylinder screws ISO 4762-M6x **30** -A2-70 for coding /4, /UNF 3, /JIS 3, /4 AN BN, /UNF 3 AN BN

Coding	H	L	a	b	c	e	f	k	l	m
/3	24.7	84	23	24	25	60	6	12.5	35	13
/4	30	105	27.25	25.25	20.75	79.75	-4.5	16	12	36
/UNF 12	24.7	84	22	25	26	59	6	12.5	30	18
/UNF 2	24.7	84	23.5	21	24.5	63	6	13	36.5	11.5
/UNF 3	29.7	96	26.25	23.75	21.75	72.25	0	17	13.5	34.5
/JIS 3	29.7	96	26.25	23.75	21.75	72.25	0	--	--	--
/4 AN BN	30	105	27.25	25.25	20.75	79.75	-4.5	16	12	36
/UNF 3 AN BN	30	90	27.25	17.75	20.75	72.25	3	--	--	--

Coding	Ports (ISO 228-1 or SAE J 514 or JIS B 2351)	
	A, B	a, b
/3	G 1/2	G 1/4
/4	G 3/4	G 1/4
/UNF 12	SAE-6 (9/16-18 UNF-2B)	SAE-4 (7/16-20 UNF-2B)
/UNF 2	SAE-8 (3/4-16 UNF-2B)	SAE-4 (7/16-20 UNF-2B)
/UNF 3	SAE-10 (7/8-14 UN-2B)	SAE-4 (7/16-20 UNF-2B)
/JIS 3	JIS G 1/2	--
/4 AN BN	G 3/4	G 1/4
/UNF 3 AN BN	SAE-10 (7/8-14 UN-2B)	--

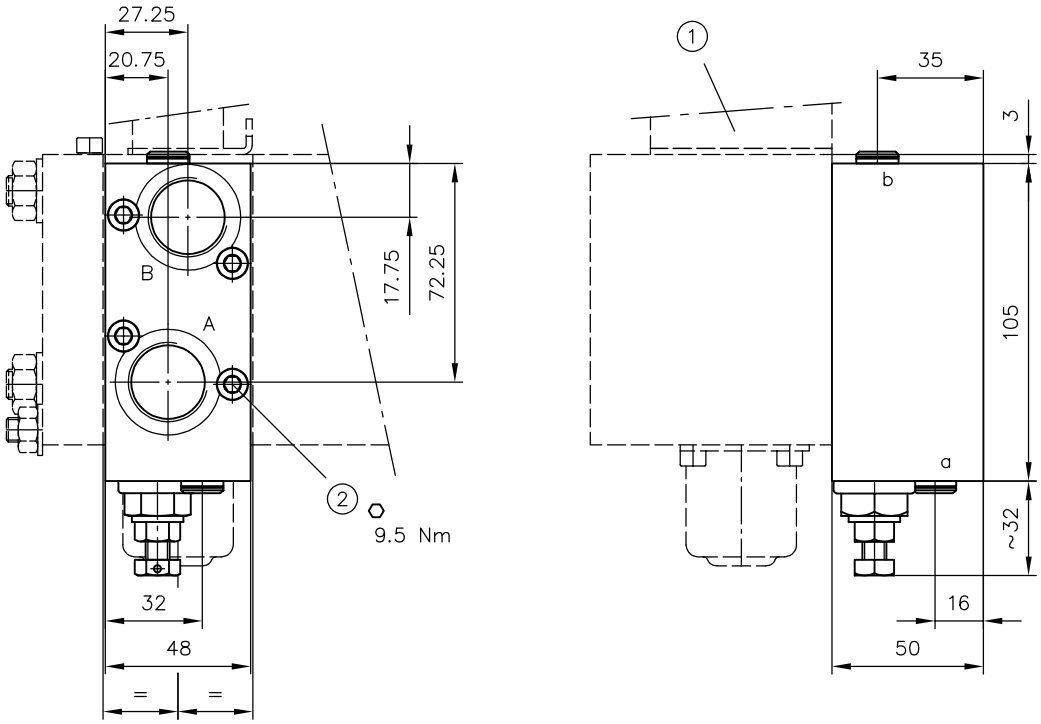
/3 AS.. BS..
/4 AS.. BS..
/UNF 3 AS.. BS..



1 Directional valve section
2 Cylinder screws ISO 4762-M6x50-A2-70
3 Pressure setting A-side
4 Pressure setting B-side

Coding	Ports (ISO 228-1 or SAE J 514)
	A, B
/3 AS.. BS..	G 1/2
/4 AS.. BS..	G 3/4
/UNF 3 AS.. BS..	SAE-10 (7/8-14 UN-2B)

/4 A...

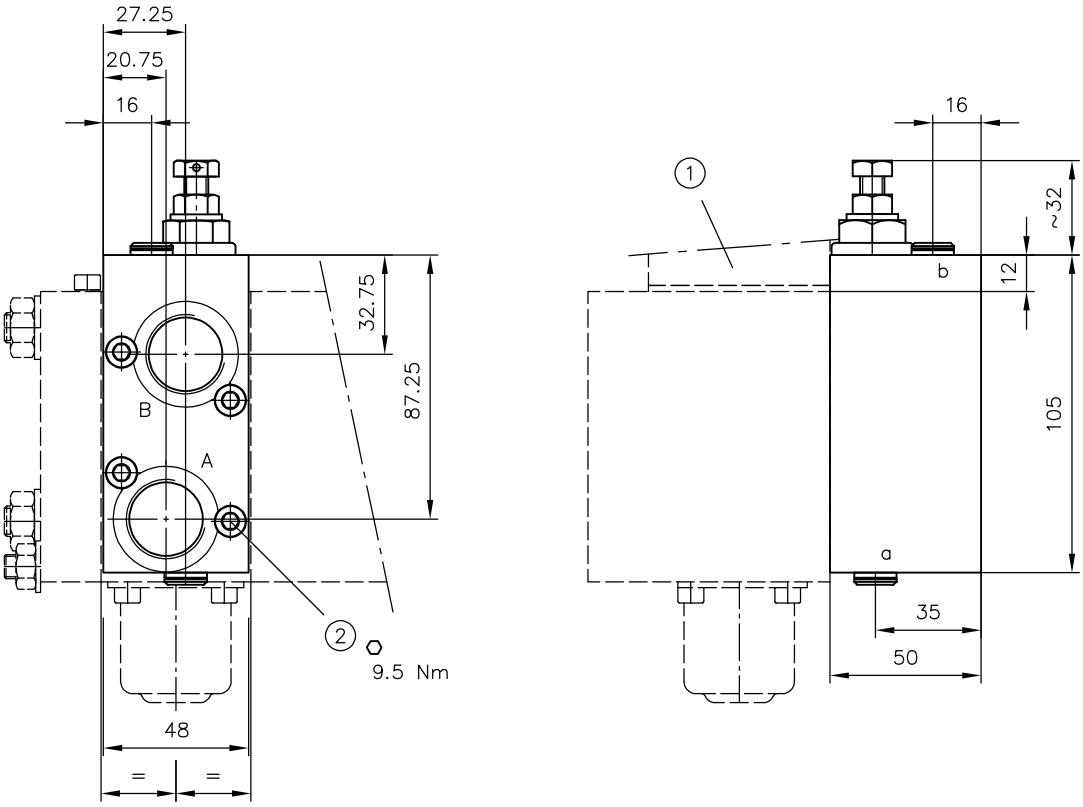


1 Directional valve section

2 Cylinder screws ISO 4762-M6x50-A2-70

Coding	Ports (ISO 228-1)	
	A, B	a, b
/4 A...	G 3/4	G 1/8

/4 B...

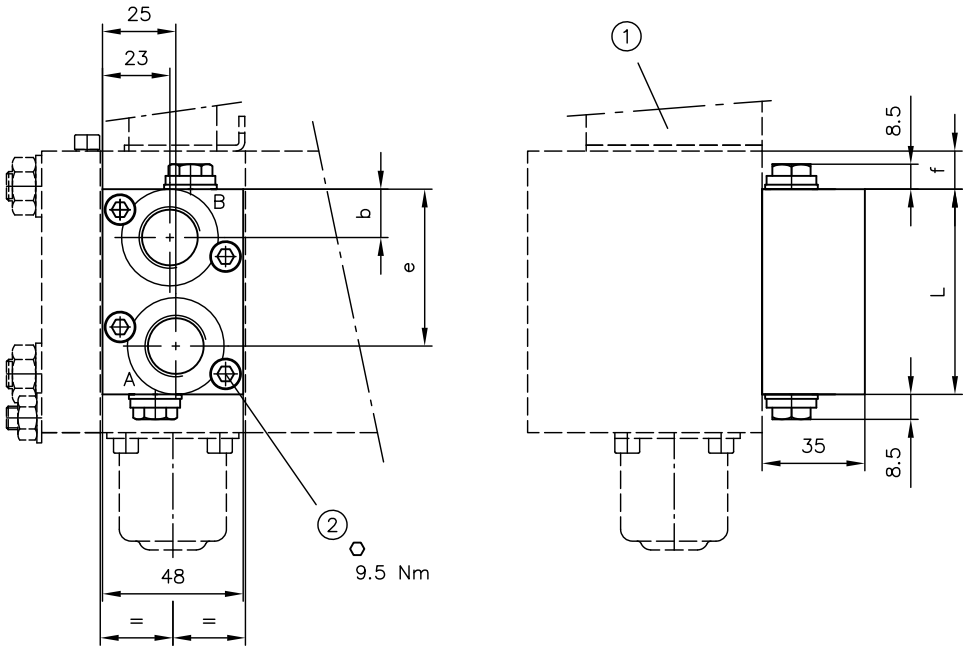


1 Directional valve section

2 Cylinder screws ISO 4762-M6x50-A2-70

Coding	Ports (ISO 228-1)	
	A, B	a, b
/4 B...	G 3/4	G 1/8

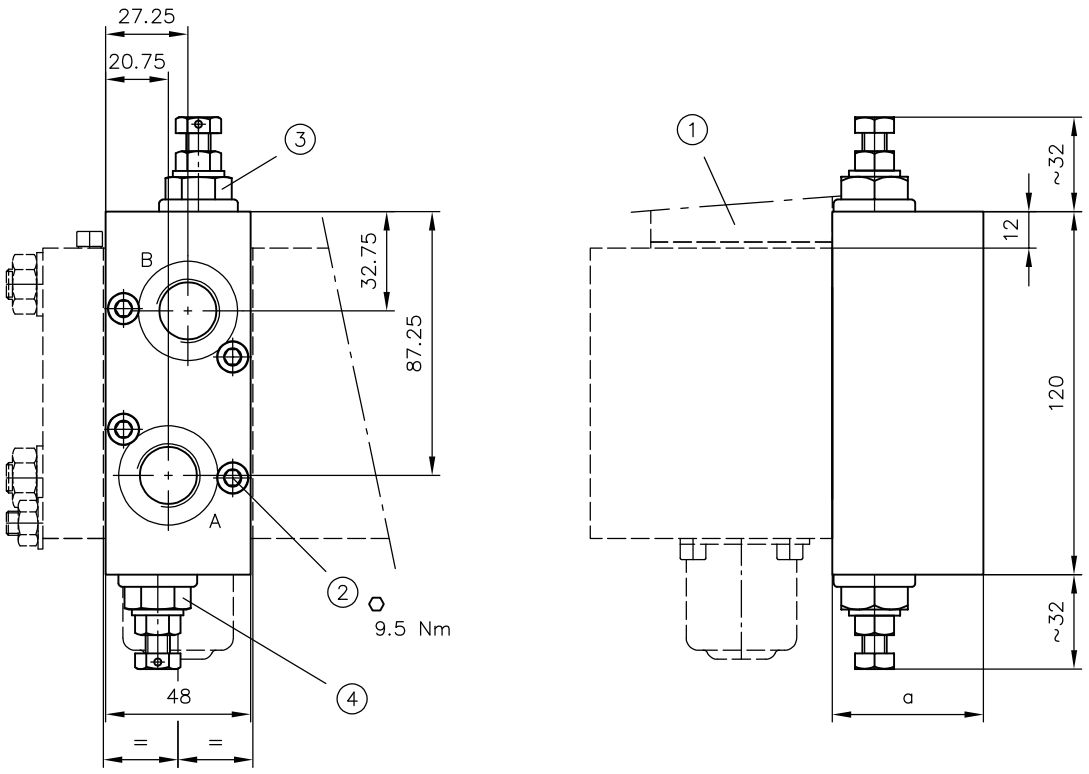
/31 AS... BS...
/31 AN... BN...



1 Directional valve section
2 Cylinder screws ISO 4762-M6x35-A2-70

Coding	L	b	e	f	Ports (ISO 228-1)
					A, B
/31 AS... BS...	70	16.5	53.5	13	G 1/2
/31 AN... BN...	100	31.5	68.5	2	G 1/2

/3 AN.. BN..
/4 AN.. BN..
/44 AN.. BN..
/UNF 3 AN.. BN..

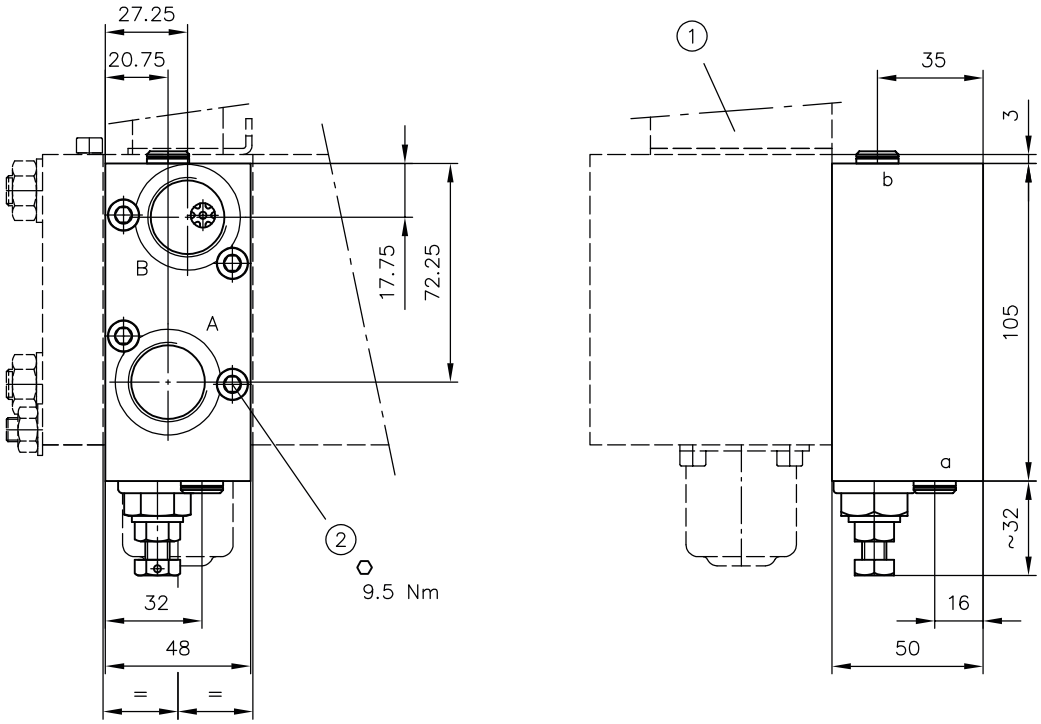


1 Directional valve section
2 Cylinder screws ISO 4762-M6x**50**-A2-70 for coding /3(4, UNF 3) AN.. BN..
Cylinder screws ISO 4762-M6x**60**-A2-70 for coding /44 AN.. BN..
3 Pressure setting B-side
4 Pressure setting A-side

Coding	a
/3 AN.. BN.. /4 AN.. BN.. /UNF 3 AN.. BN..	50
/44 AN.. BN..	60

	Ports (ISO 228-1 or SAE J 514)
	A, B
/3 AN.. BN..	G 1/2
/4 AN.. BN.. /44 AN.. BN..	G 3/4
/UNF 3 AN.. BN..	SAE-10 (7/8-14 UN-2B)

/4 AN...

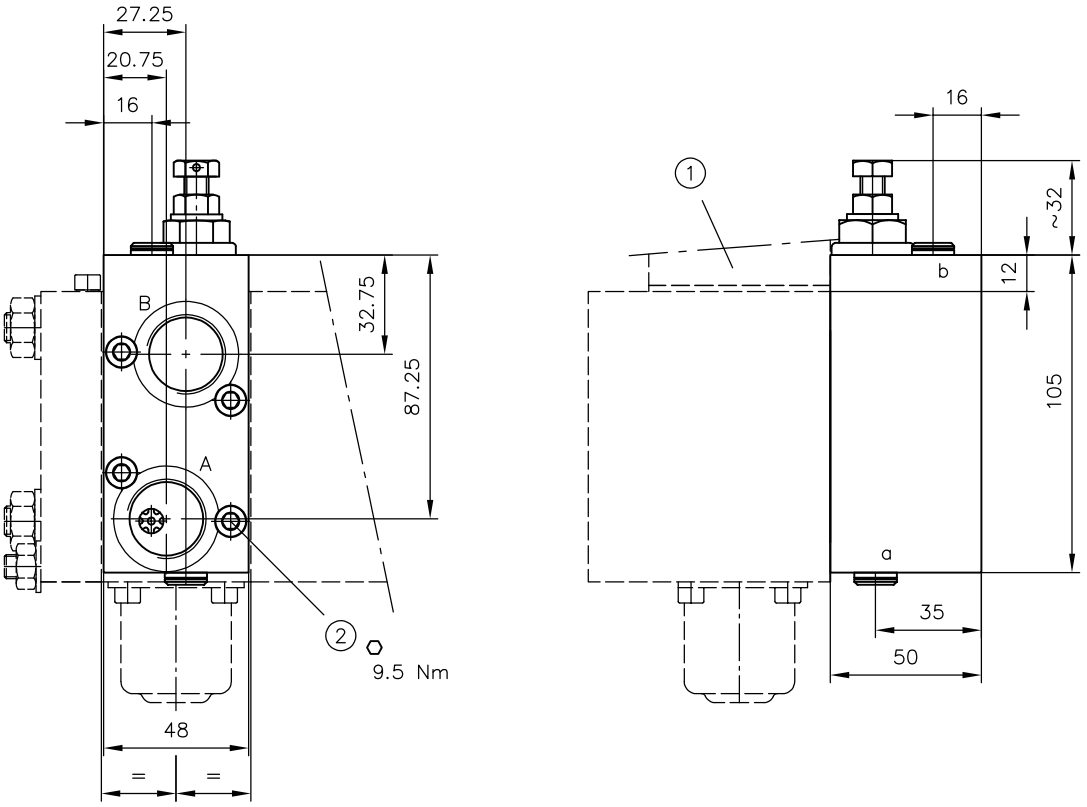


1 Directional valve section

2 Cylinder screws ISO 4762-M6x50-A2-70

Coding	Ports (ISO 228-1)	
	A, B	a, b
/4 AN...	G 3/4	G 1/8

/4 BN...

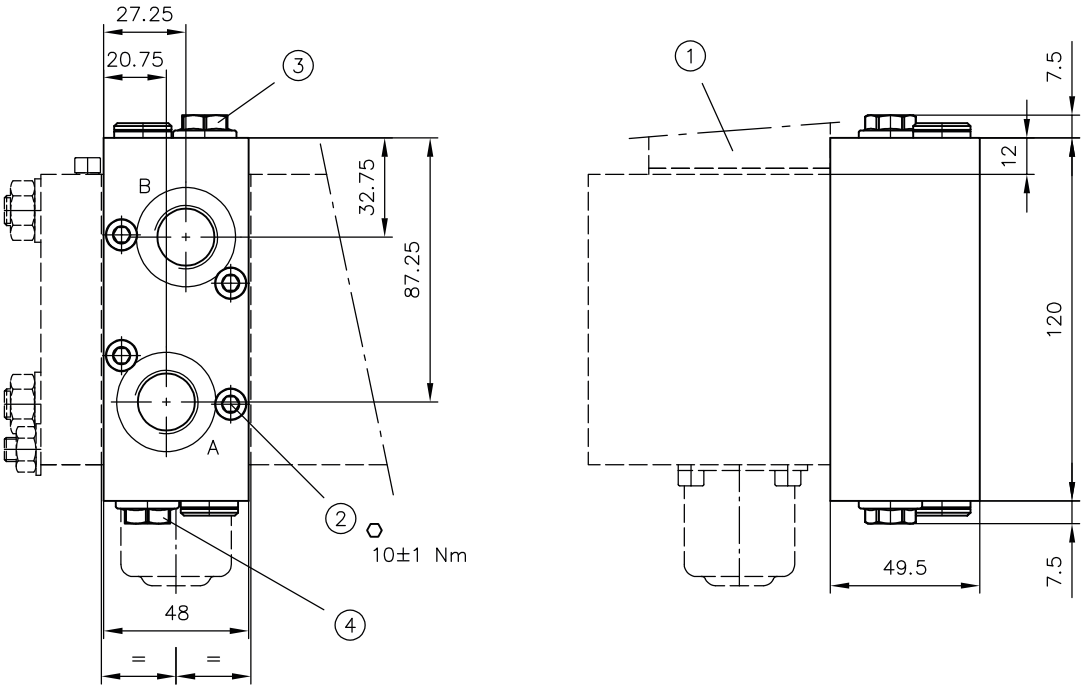


1 Directional valve section

2 Cylinder screws ISO 4762-M6x50-A2-70

Coding	Ports (ISO 228-1)	
	A, B	a, b
/4 BN...	G 3/4	G 1/8

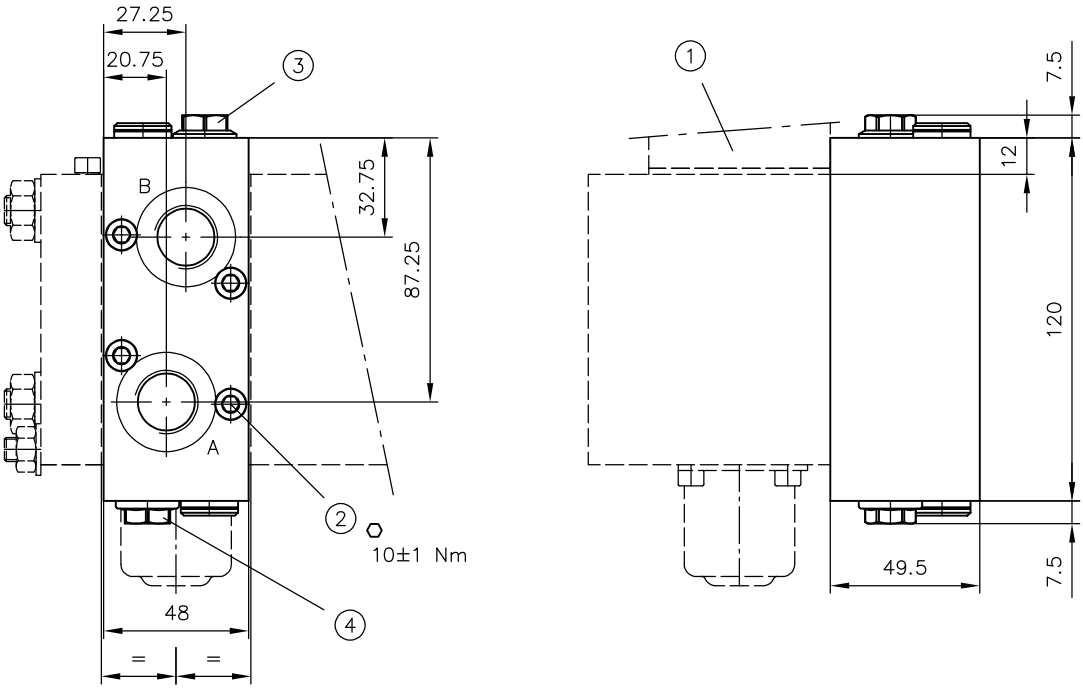
/3 M ANV...BNV...
/4 M ANV...BNV...



1 Directional valve section
2 Cylinder screws ISO 4762-M6x50-A2-70
3 Pressure setting B-side
4 Pressure setting A-side

Coding	Ports (ISO 228-1)
	A, B
/3 M ANV...BNV...	G 1/2
/4 M ANV...BNV...	G 3/4

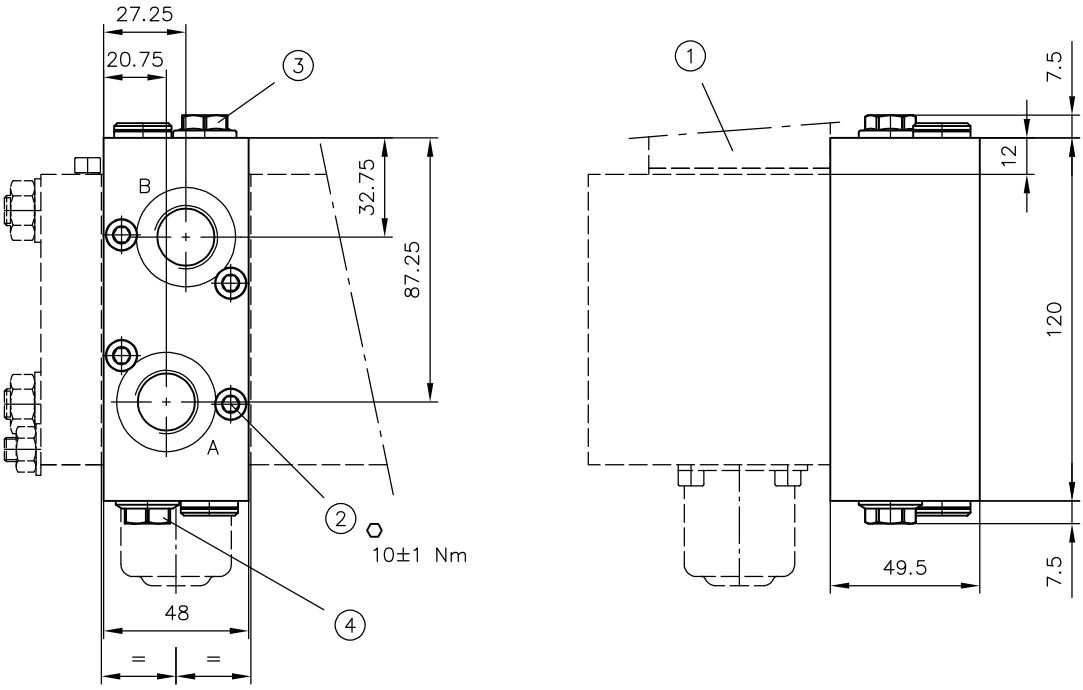
/3 M ANV...
/4 M ANV...



1 Directional valve section
2 Cylinder screws ISO 4762-M6x50-A2-70
3 Pressure setting B-side
4 Pressure setting A-side

Coding	Ports (ISO 228-1)
	A, B
/3 M ANV...	G 1/2
/4 M ANV...	G 3/4

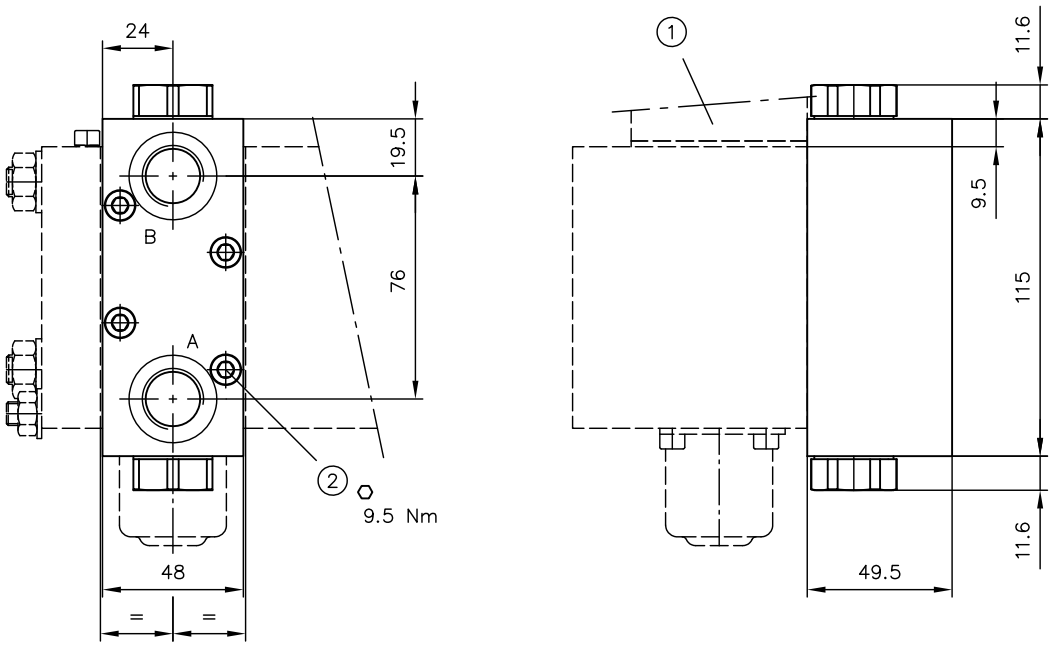
/3 M BNV...
/4 M BNV...



1 Directional valve section
2 Cylinder screws ISO 4762-M6x50-A2-70
3 Pressure setting B-side
4 Pressure setting A-side

Coding	Ports (ISO 228-1)
	A, B
/3 M BNV...	G 1/2
/4 M BNV...	G 3/4

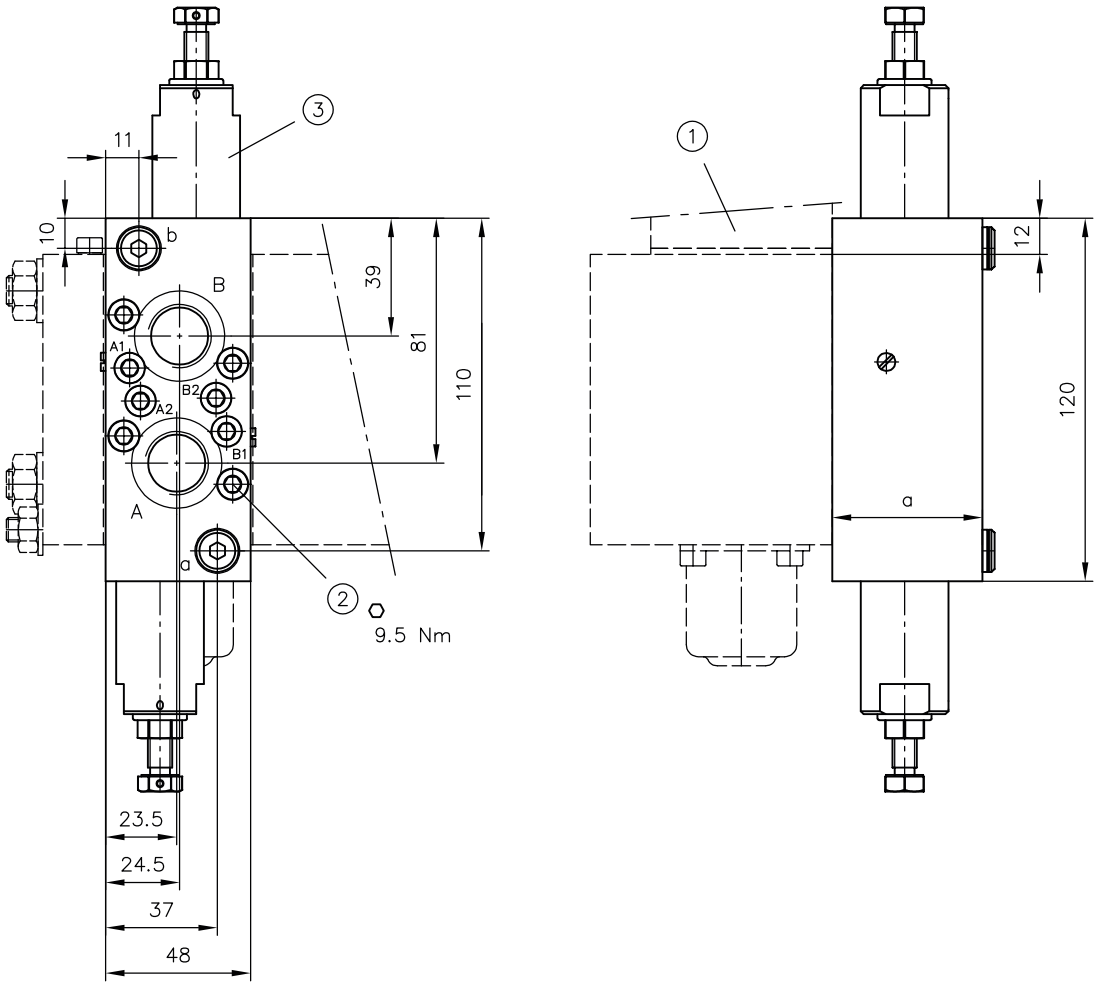
/3 DRH, /3 DRH VV
/3 DRH A, /3 DRH B
/UNF 3 DRH, /UNF 3 DRH VV



1 Directional valve section
2 Cylinder screws ISO 4762-M6x50-A2-70

Coding	Ports (ISO 228-1 or SAE J 514)
	A, B
/3 DRH, /3 DRH VV /3 DRH A, /3 DRH B	G 1/2
/UNF 3 DRH, /UNF 3 DRH VV	SAE-10 (7/8-14 UN-2B)

/3 AL.. BL.., /3 AC.. BC, /3 ACX.. BCX..
/UNF 3 AL.. BL.., /UNF 3 AC.. BC.., /UNF 3 ACX.. BCX..



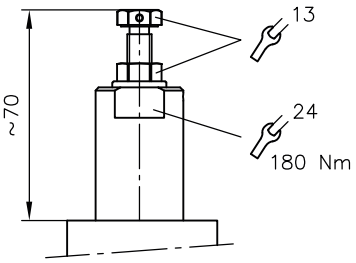
1 Directional valve section
2 Cylinder screws ISO 4762-M6x50-A2-70
3 Over-centre valves assembly kit

Coding	a
/AL.. BL... /3 AC.. BC.... /3 ACX.. BCX..	49.7
/UNF AL.. BL.. /UNF 3 AC.. BC.. /UNF 3 ACX.. BCX...	59.0

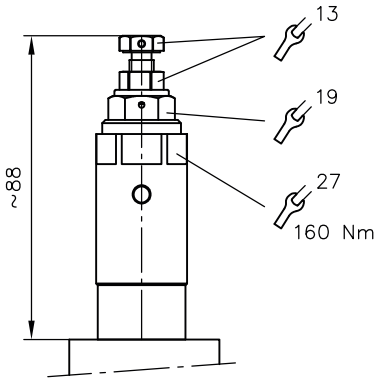
Coding	Ports (ISO 228-1 or SAE J 514)	
	A, B	a, b
/3 AL.. BL.. /3 AC.. BC.. /3 ACX.. BCX..	G 1/2	G 1/8
/UNF 3 AL.. BL.. /UNF 3 AC.. BC.. /UNF 3 ACX.. BCX..	SAE-10 (7/8-14 UN-2B)	SAE-2 (5/16-24 UNF-2B)

Load-holding valve

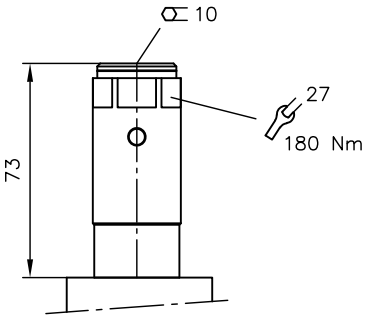
Coding **L**
(LHT 30)



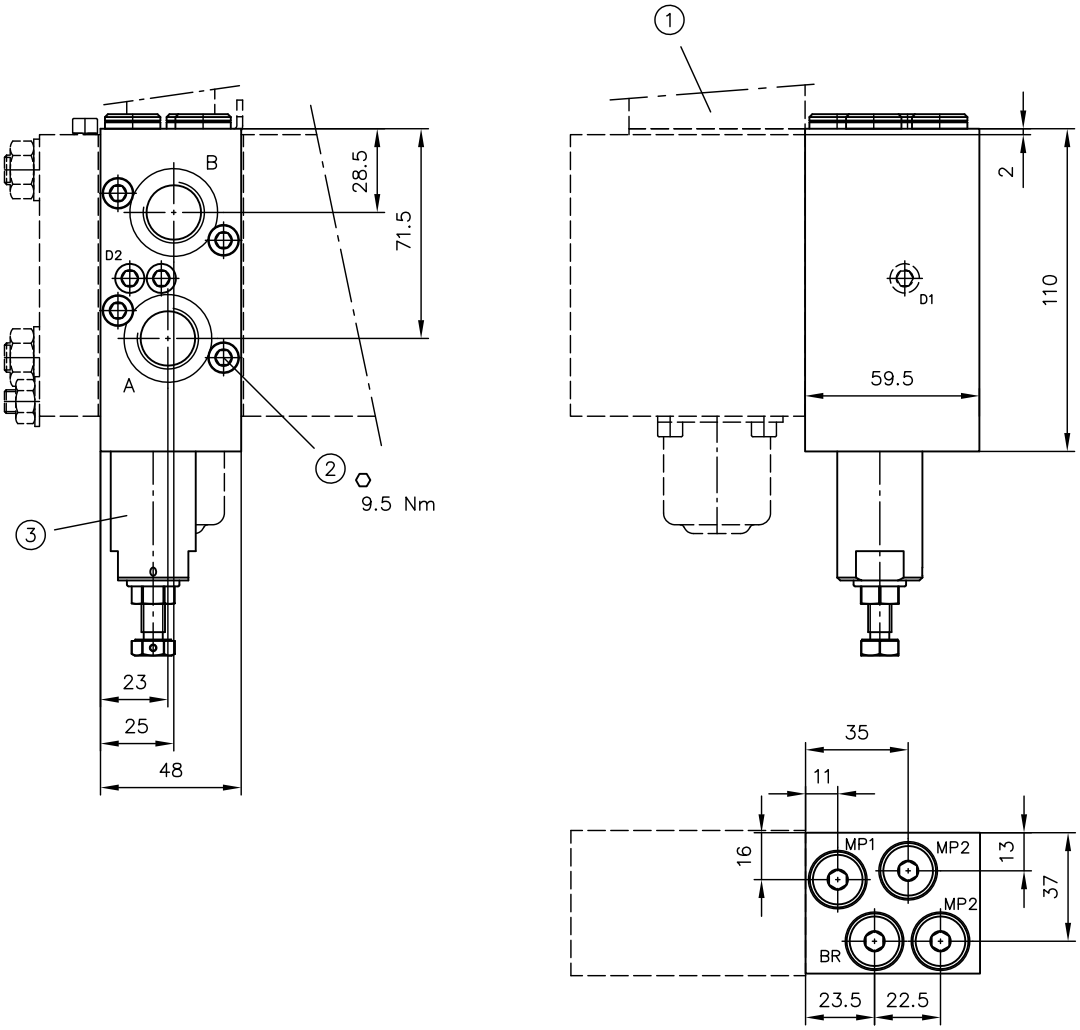
Coding **C**
(LHTE 30)



Coding **CX**
(LHTE 30X)



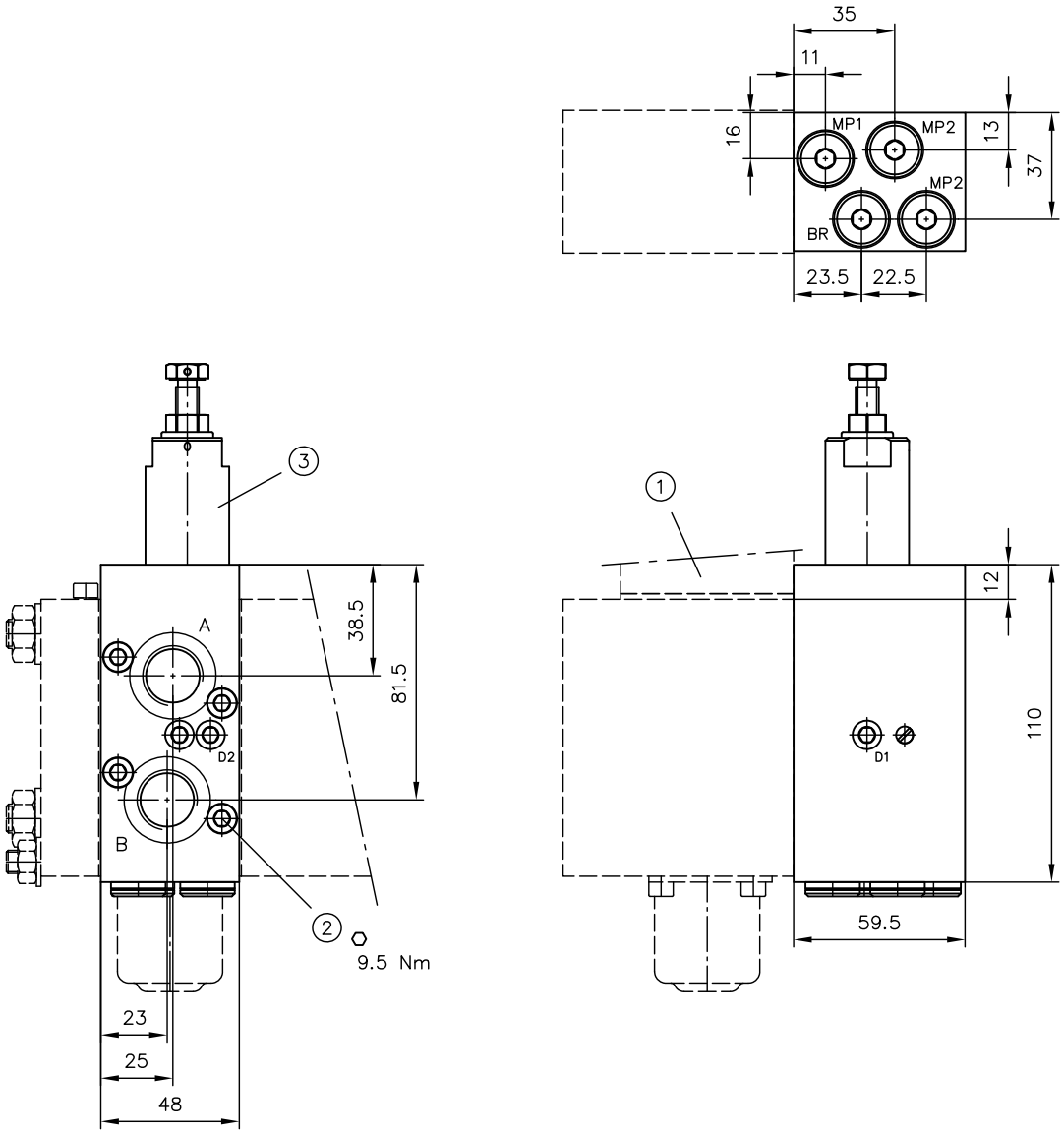
/3 AL..., /3 AC
/UNF 3 AL..., /UNF 3 AC...



1 Directional valve section
2 Cylinder screws ISO 4762-M6x60-A2-70
3 Over-centre valves assembly kit

Coding	Ports (ISO 228-1 or SAE J 514)	
	A, B	BR, MP1, MP2
/3 AL... /3 AC...	G 1/2	G 1/4
/UNF 3 AL... /UNF 3 AC...	SAE-10 (7/8-14 UN-2B)	SAE-4 (7/16-20 UNF-2B)

/3 BL..., /3 BC...
/UNF 3 BL..., /UNF 3 BC...

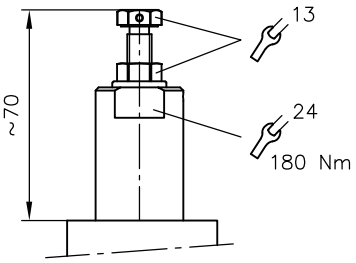


1 Directional valve section
2 Cylinder screwsISO 4762-M6x60-A2-70
3 Over-centre valves assembly kit

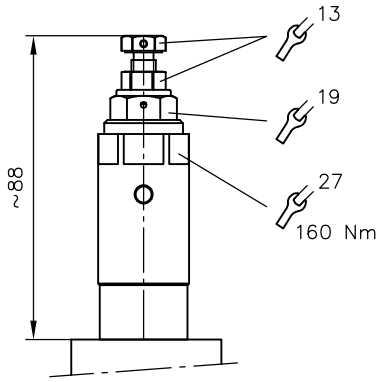
Coding	Ports (ISO 228-1 or SAE J 514)	
	A, B	BR, MP1, MP2
/3 BL... /3 BC...	G 1/2	G 1/4
/UNF 3 BL... /UNF 3 BC...	SAE-10 (7/8-14 UN-2B)	SAE-4 (7/16-20 UNF-2B)

Load-holding valve

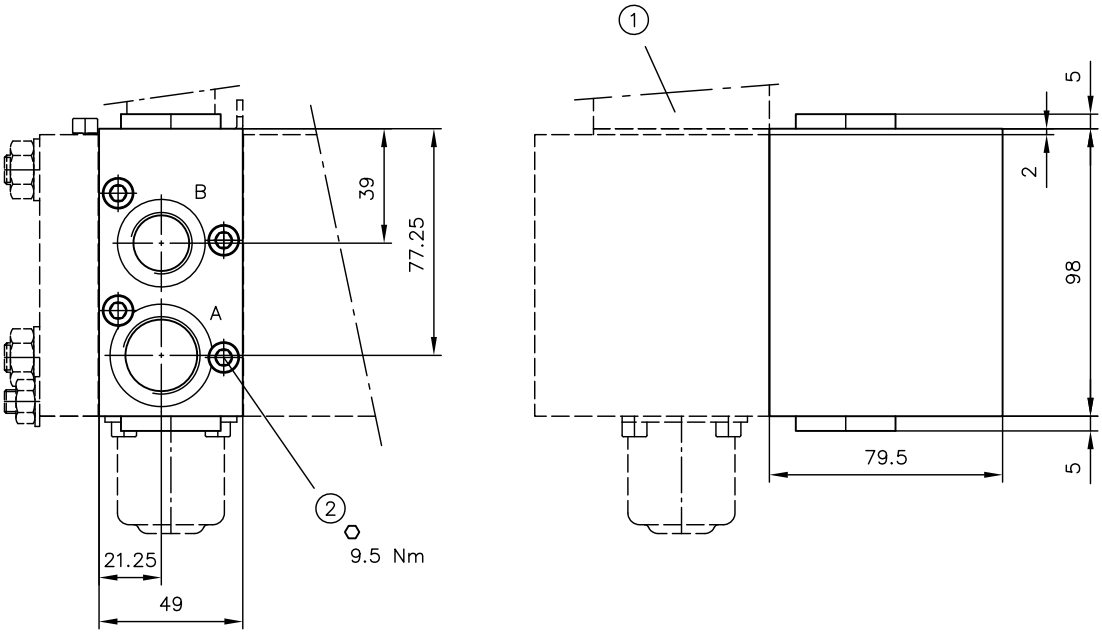
Coding **L**
(LHT 30)



Coding **C**
(LHTE 30)

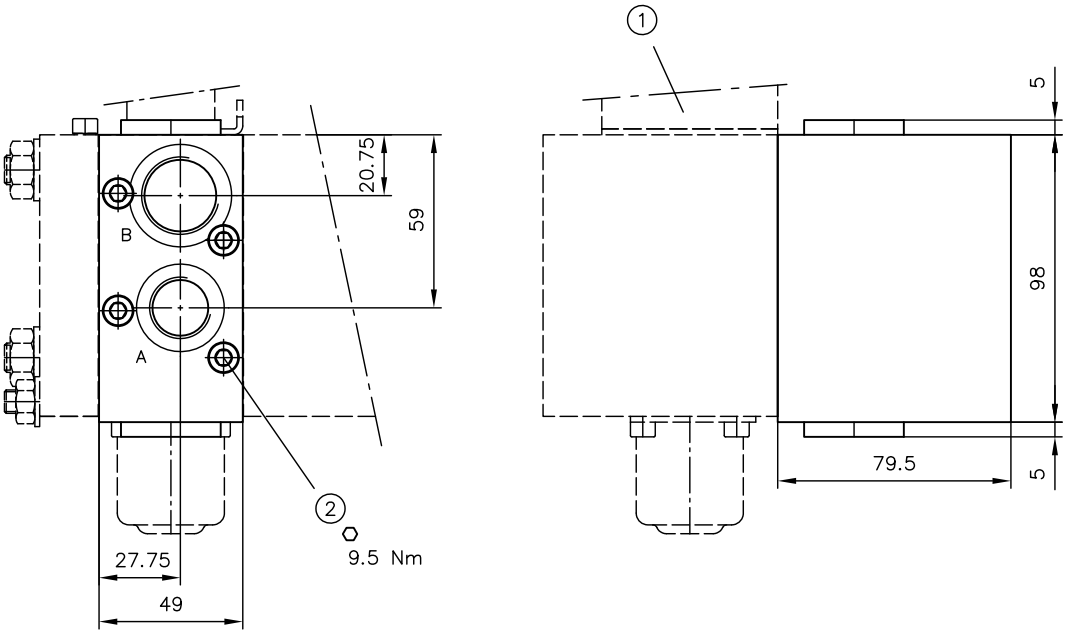


/43 DFA



1 Directional valve section
2 Cylinder screws ISO 4762-M6x80-A2-70

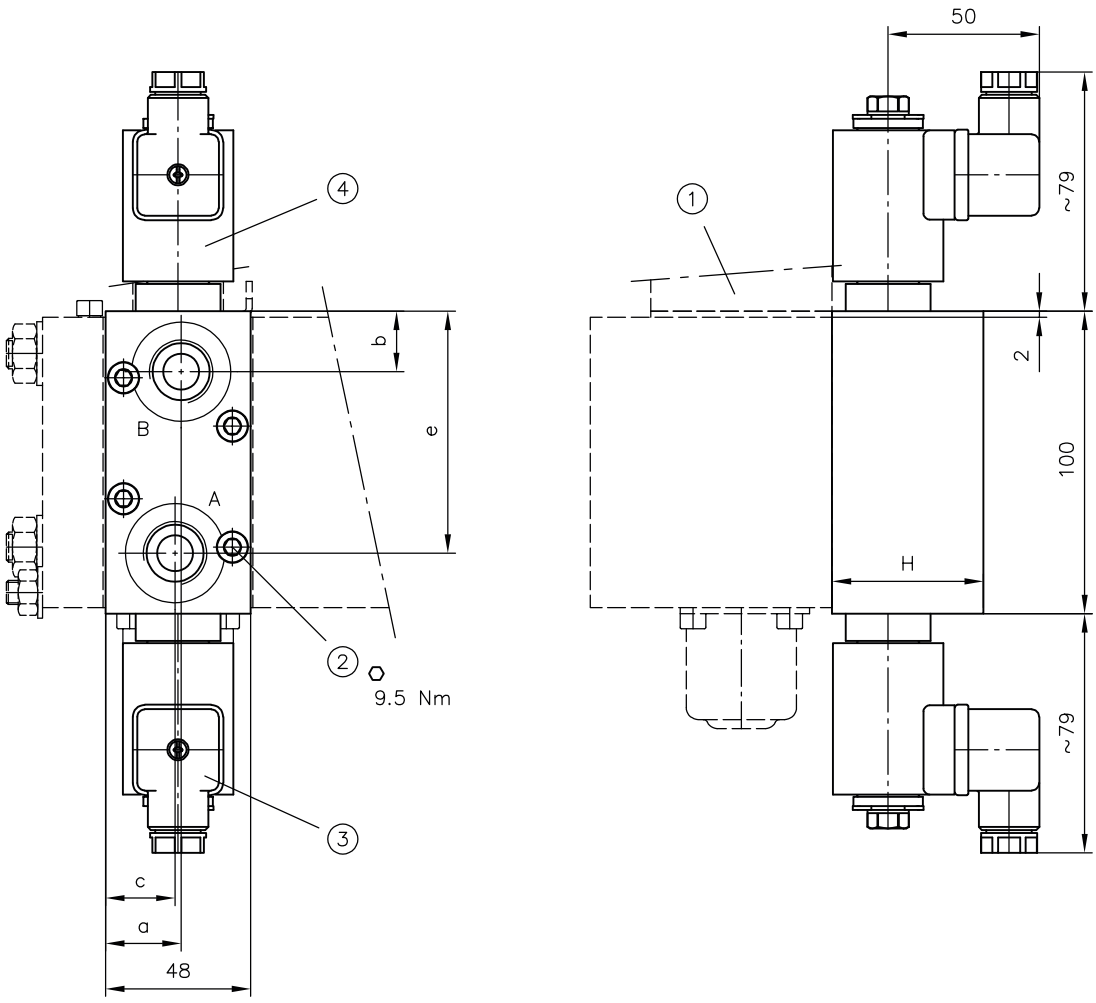
/43 DFB



1 Directional valve section
2 Cylinder screws ISO 4762-M6x80-A2-70

Coding	Ports (ISO 228-1)	
	A	B
/43 DFA	G 3/4	G 1/2
/43 DFB	G 1/2	G 3/4

/3 SS, /3 SX, /3 XS
/3 VV, /3 VX, /3 XV
/UNF 3 SS, /UNF 3 SX, /UNF 3 XS
/UNF 3 VV, /UNF 3 VX, /UNF 3 XV

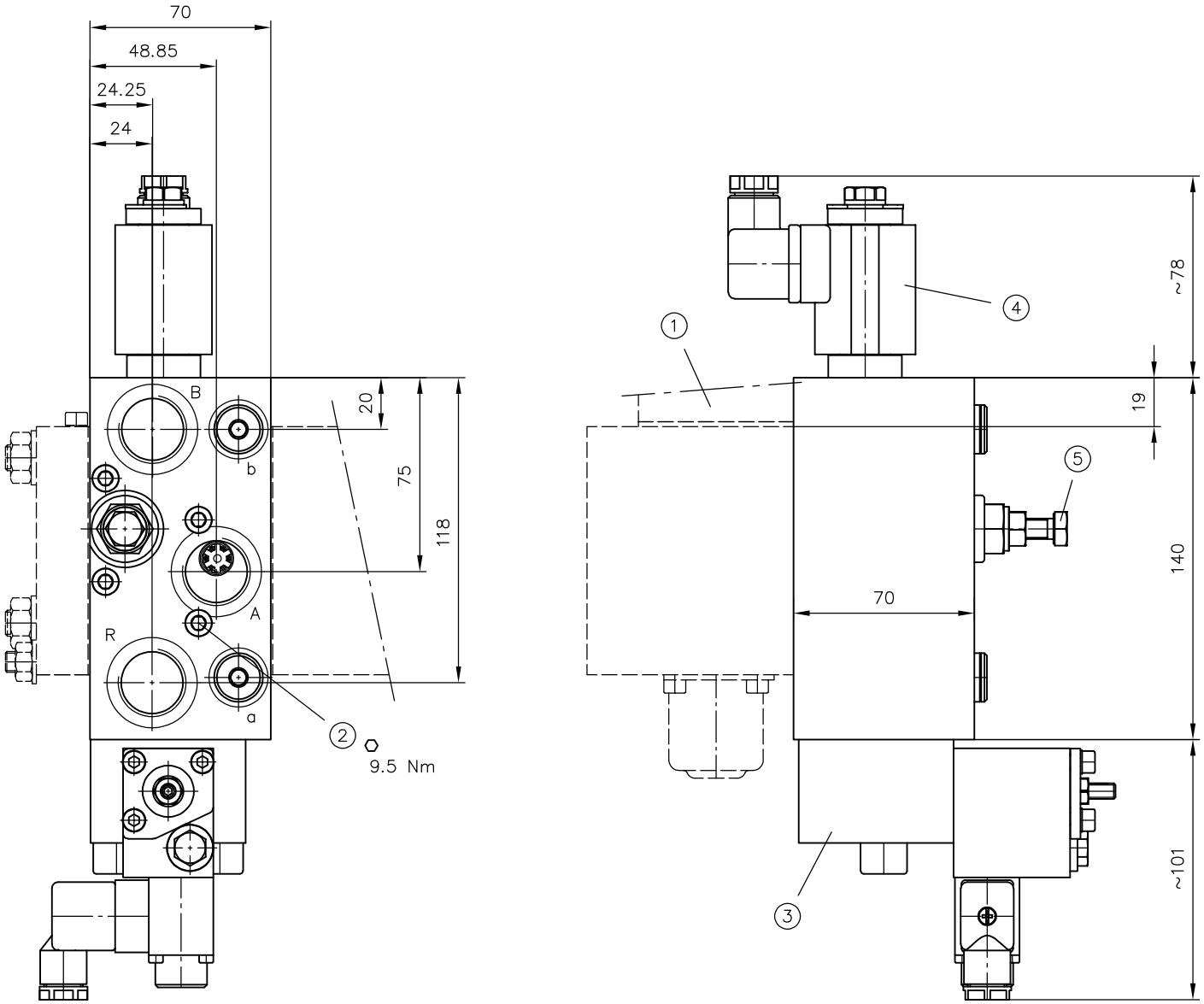


1 Directional valve section
2 Cylinder screws ISO 4762-M6x **g** -A2-70
3 Check valve type EM 32 not present on /3 XS, /3 XV, /UNF 3 XS, /UNF 3 XV
4 Check valve type EM 32 not present on /3 SX, /3 VX, /UNF 3 SX, /UNF 3 VX

Coding	H	a	b	c	e	g
/3 SS, /3 SX, /3 XS /3 VV, /3 VX, /3 XV	50	25	20	23	80	50
/UNF 3 SS, /UNF 3 SX, /UNF 3 XS /UNF 3 VV, /UNF 3 VX, /UNF 3 XV	55	27.25	22.25	20.75	77.75	55

	Ports (ISO 228-1 or SAE J 514)
	A, B
/3 SS, /3 SX, /3 XS /3 VV, /3 VX, /3 XV	G 1/2
/UNF 3 SS, /UNF 3 SX, /UNF 3 XS /UNF 3 VV, /UNF 3 VX, /UNF 3 XV	SAE-10 (7/8-14 UN-2B)

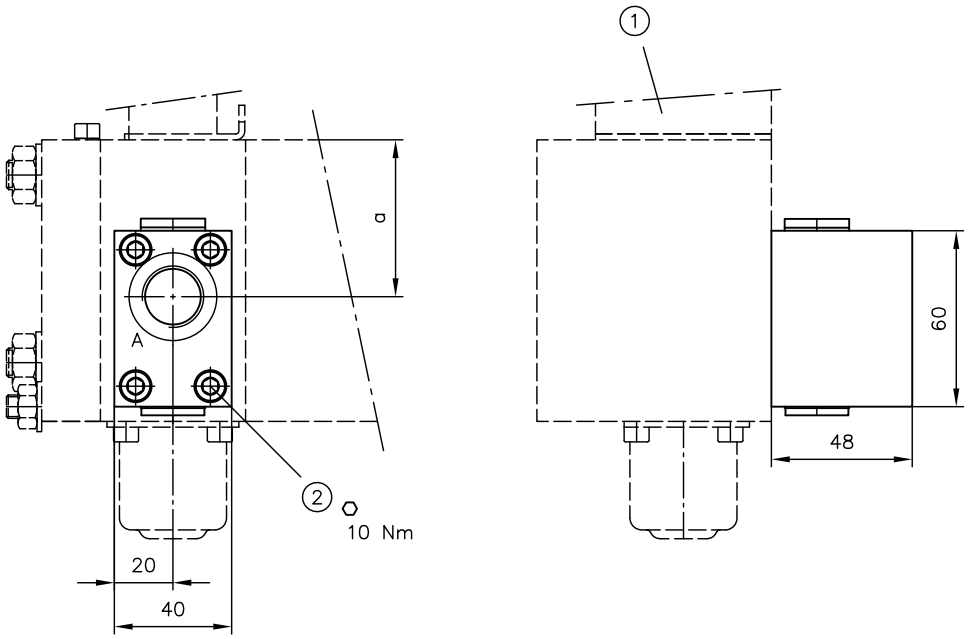
/4 BN...-EM 3...-PMVPS 8...



1 Directional valve section
2 Cylinder screws ISO 4762-M6x70-A2-70
3 Proportional pressure-limiting valve type PMVPS 8
4 2/2-way directional seated valve type EM. 3
5 Pressure setting B-side

Coding	Ports (ISO 228-1)	
	A, B, R	a, b
/4 BN...-EM 3...-PMVPS 8...	G 3/4	G 1/4

/3.. DW
/4.. DW
/UNF 3.. DW

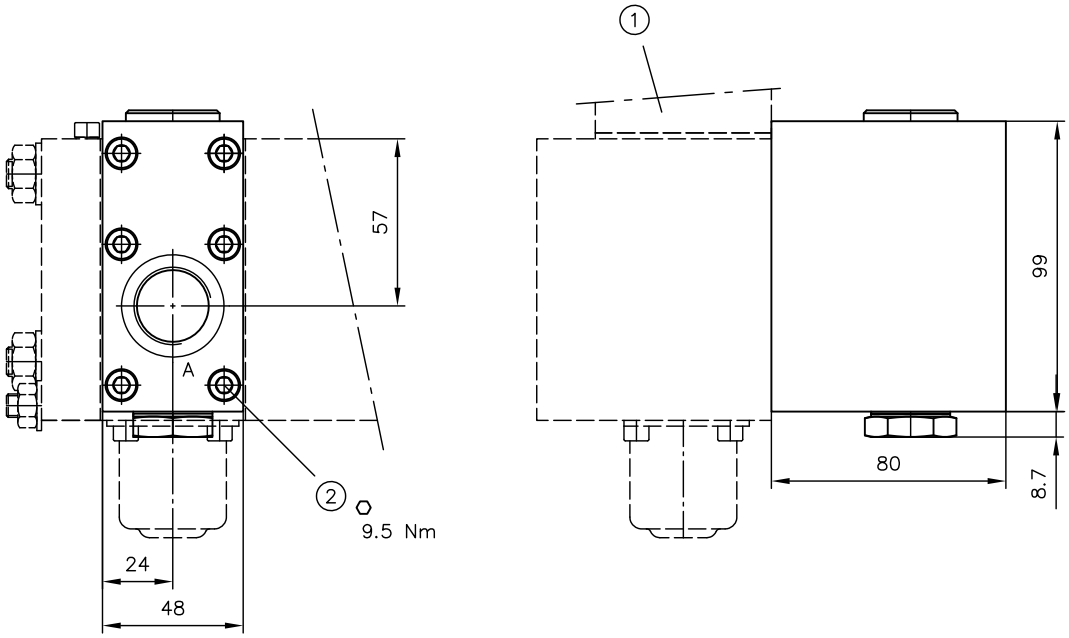


1 Directional valve section
2 Cylinder screws ISO 4762-M6x45-8.8-A2-70

Coding	a
/3.. DW	53.5
/4.. DW /UNF 3.. DW	56.5

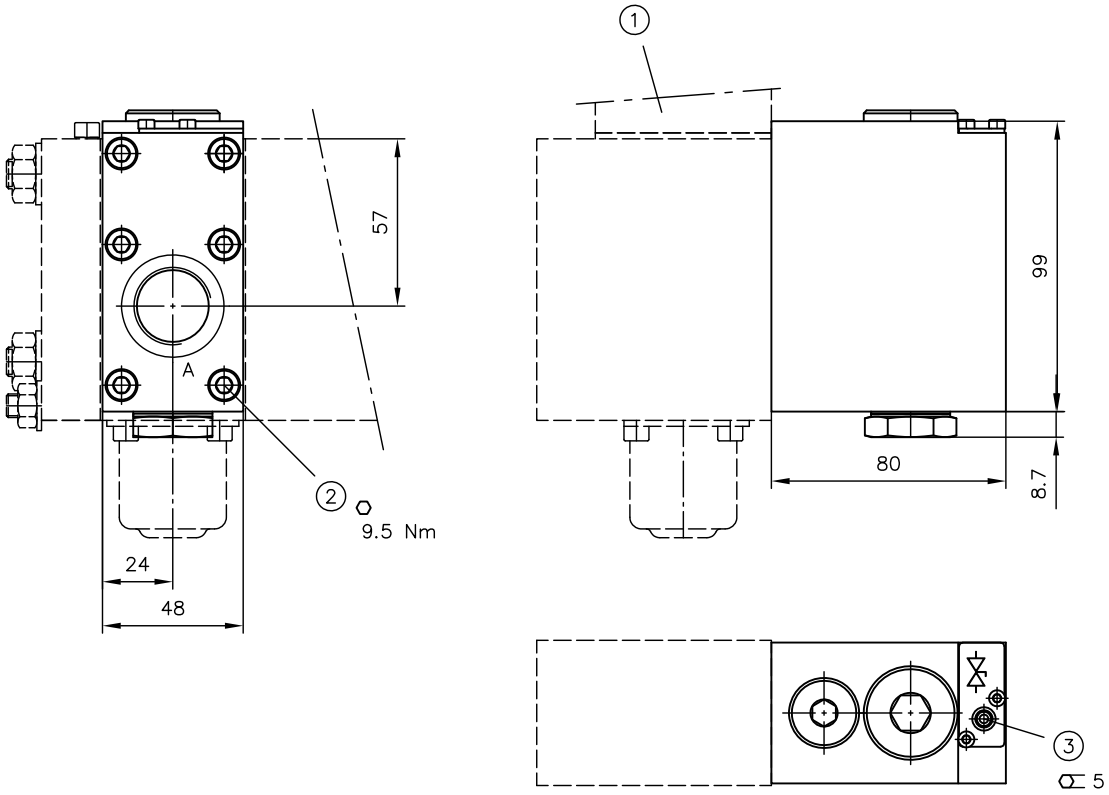
	Ports (ISO 228-1 or SAE J 514)
	A
/3.. DW	G 1/2
/4.. DW	G 3/4
/UNF 3.. DW	SAE-12 (1 1/16-12 UNF-2B)

/4.. HRP 4
/4.. HRP 4 V



1 Directional valve section
2 Cylinder screws ISO 4762-M6x80-A2-70

/4.. HRPH 4
/4.. HRPH 4 V

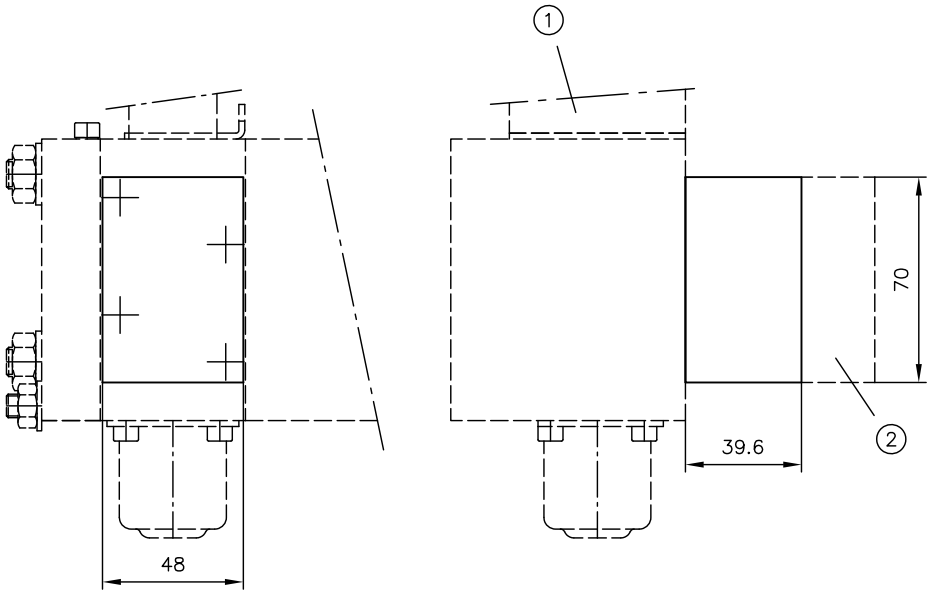


1 Directional valve section
2 Cylinder screws ISO 4762-M6x80-A2-70
3 Drain screw

Coding	Ports (ISO 228-1)
	A
/4.. HRP 4, /4.. HRP 4 V /4.. HRPH 4, /4.. HRPH 4 V	G 3/4

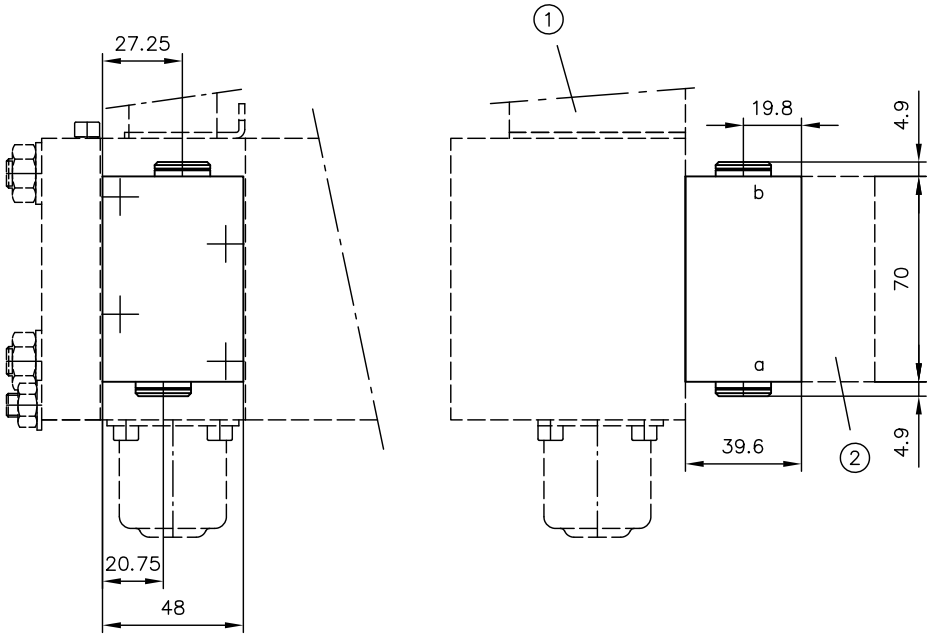
4.2.3 Intermediate plate

/Z 40



1 Directional valve section
2 Ancillary block

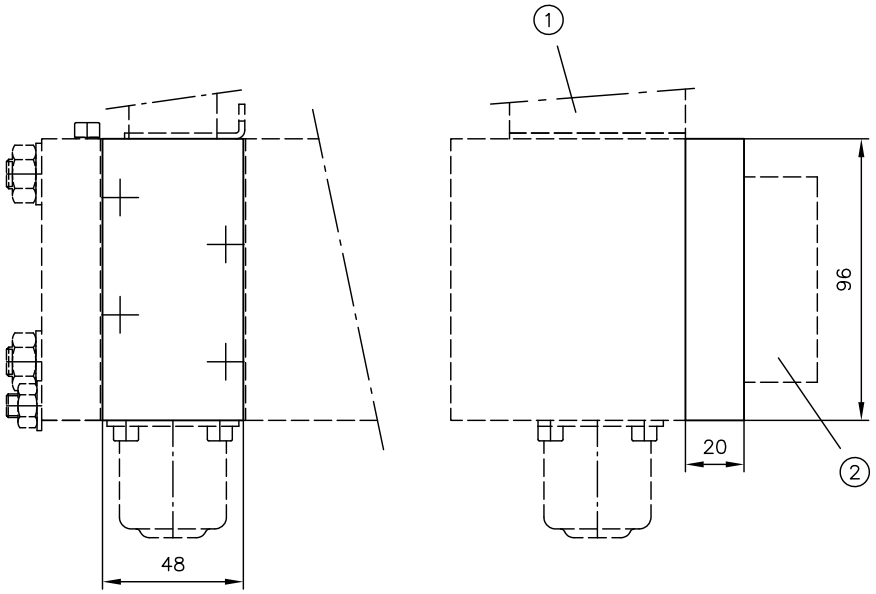
/Z 40 M
/Z 40 M UNF



1 Directional valve section
2 Ancillary block

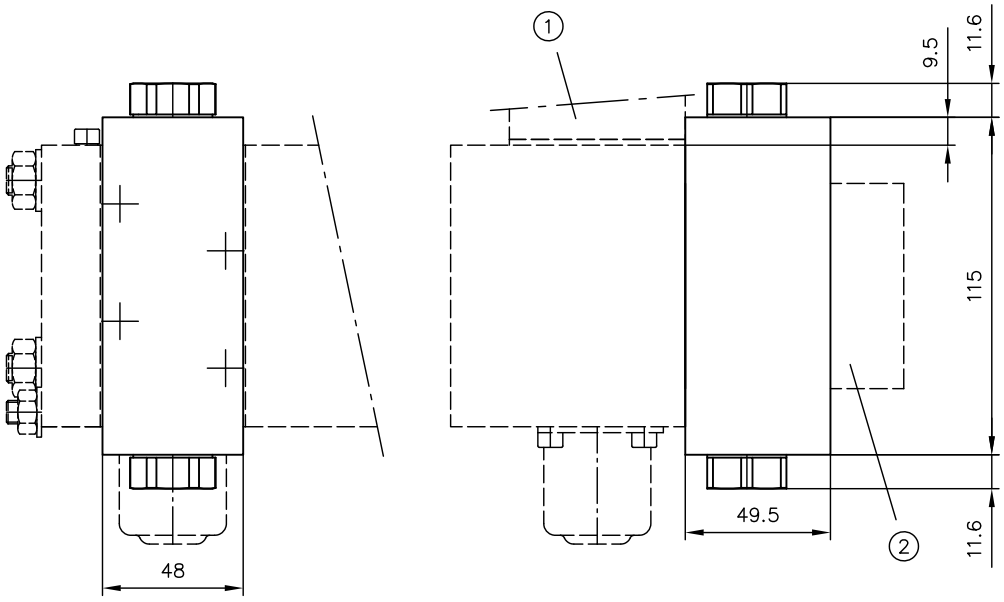
Coding	Ports (ISO 228-1 or SAE J 514)
	a, b
/Z 40 M	G 1/4
/Z 40 M UNF	SAE-4 (7/16-20 UNF-2B)

/Z AN BN



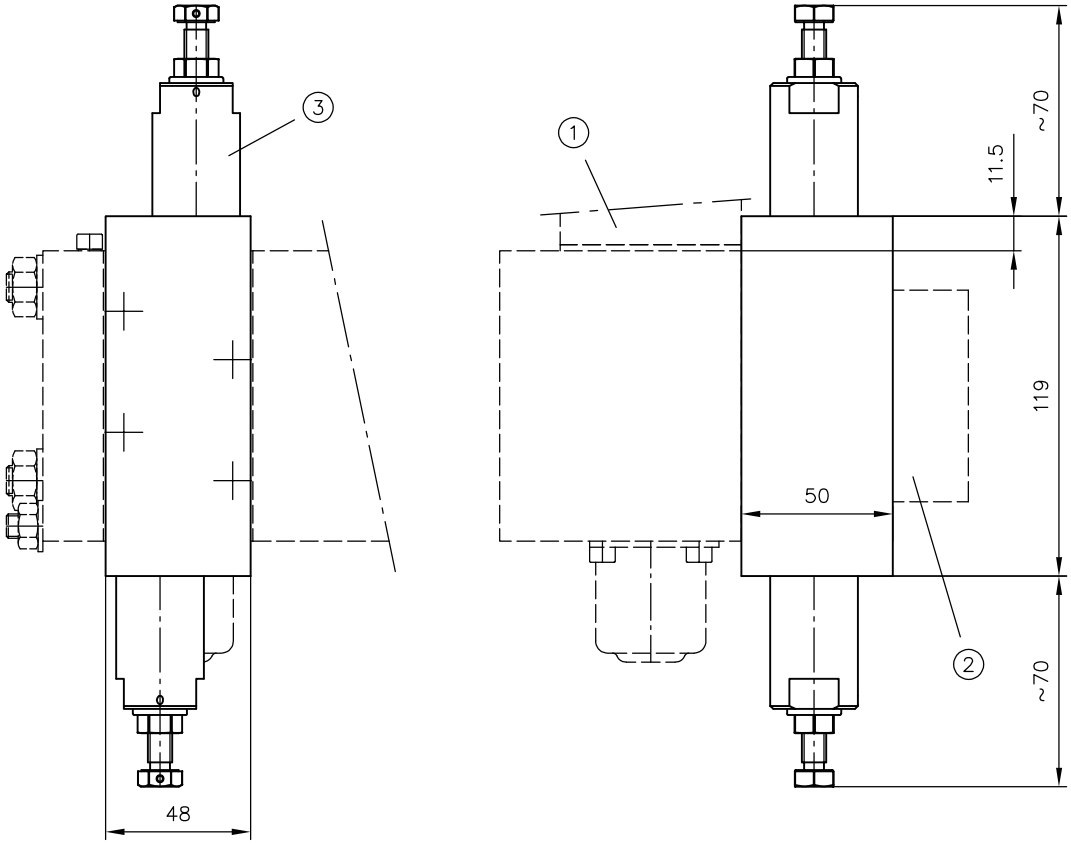
1 Directional valve section
2 Ancillary block

/Z DRH, /Z DRH VV, /Z DRH 5 VV
/Z DRH A, /Z DRH VV A, /Z DRH 5 VV A
/Z DRH B, /Z DRH VV B, /Z DRH 5 VV B



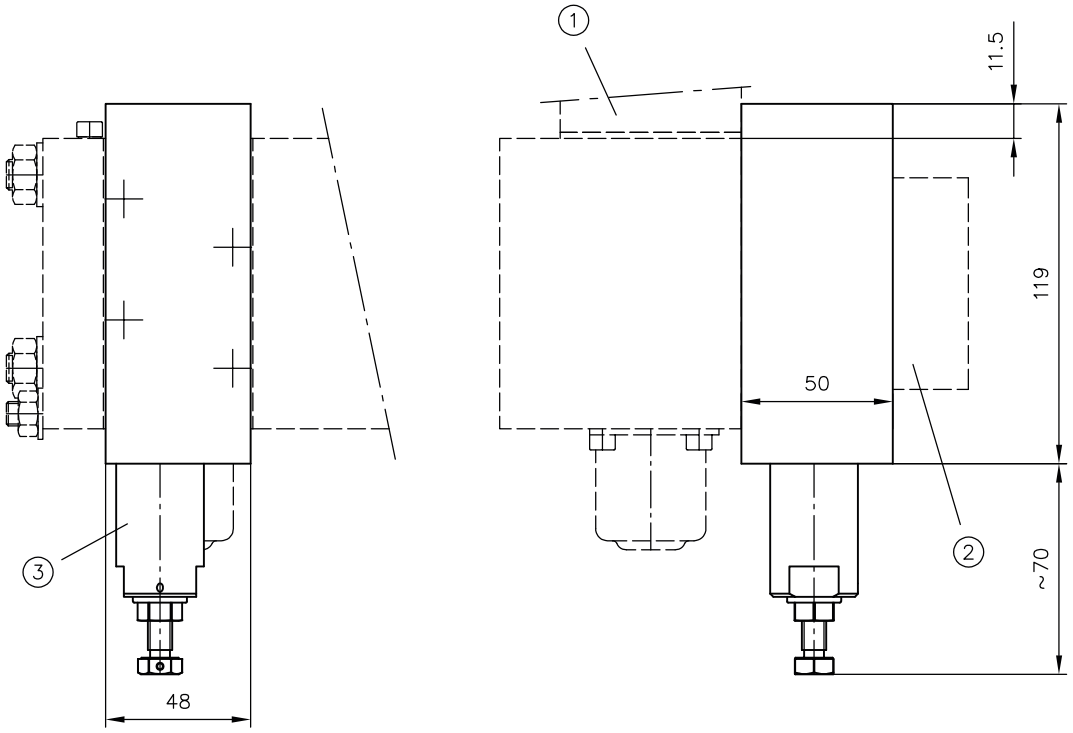
1 Directional valve section
2 Ancillary block

/Z AL... BL...



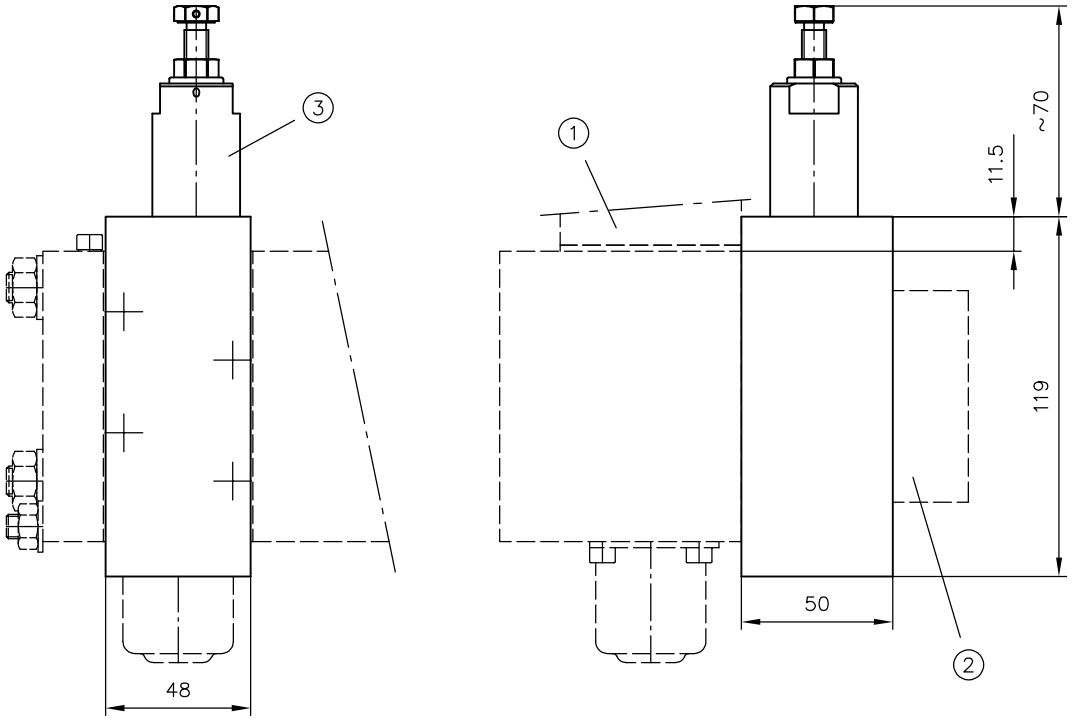
1 Directional valve section
2 Ancillary block
3 Load-holding valve

/Z AL...



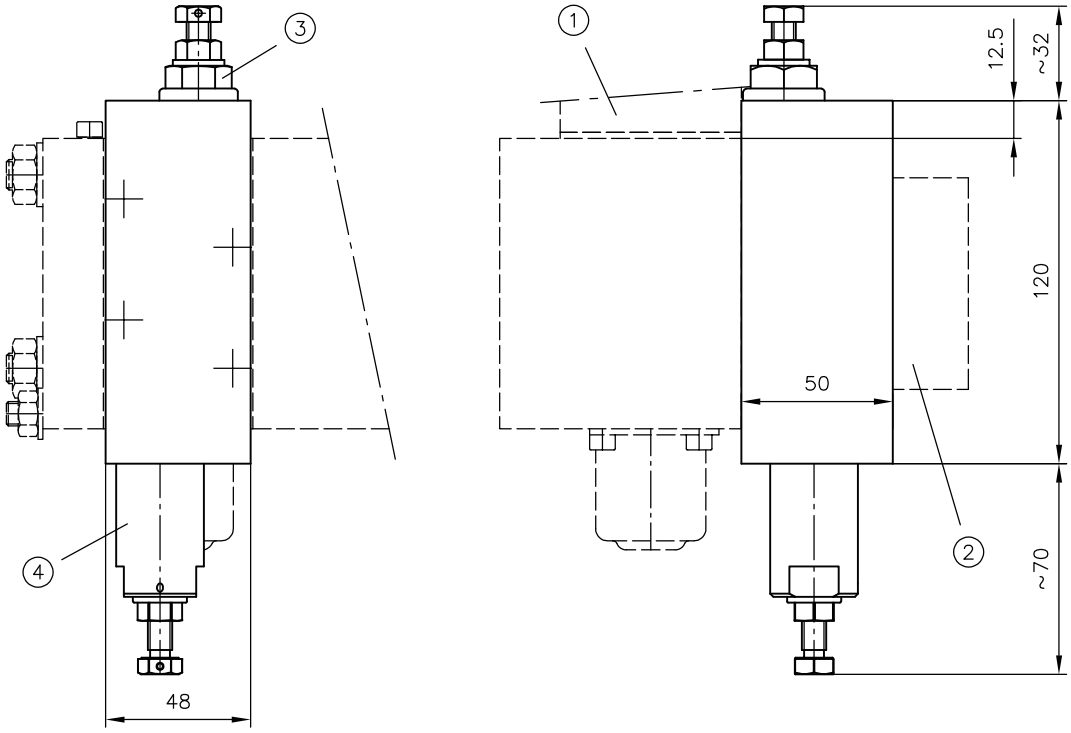
1 Directional valve section
2 Ancillary block
3 Load-holding valve

/Z BL...



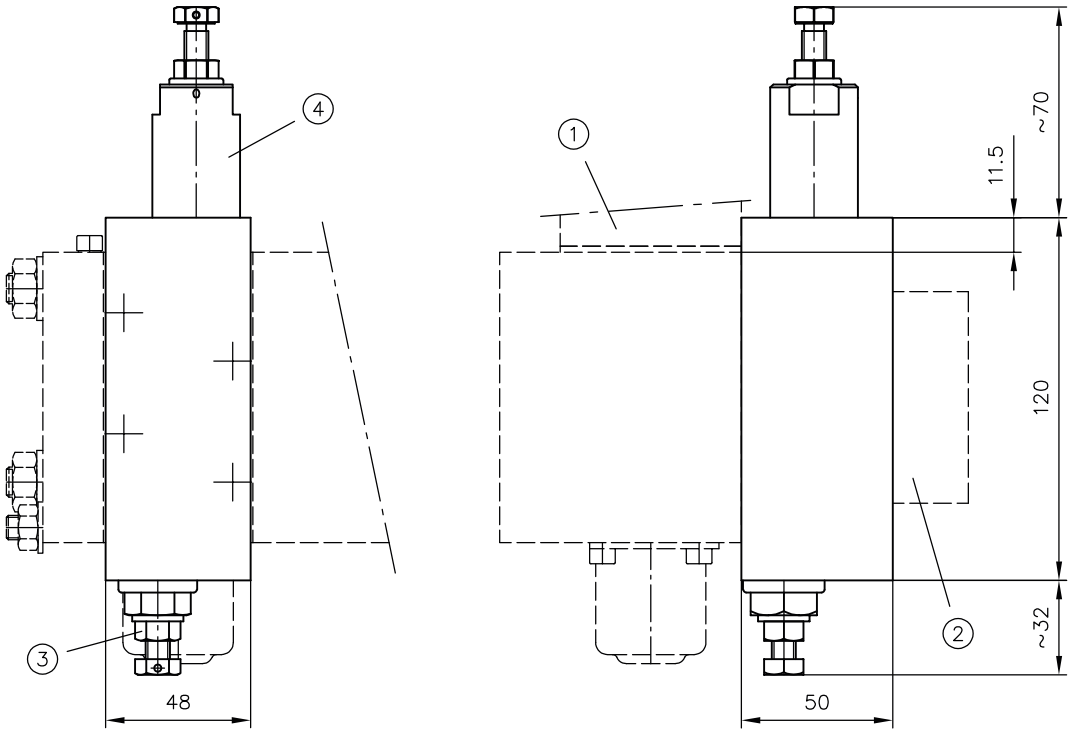
1 Directional valve section
2 Ancillary block
3 Load-holding valve

/Z AL... BN...



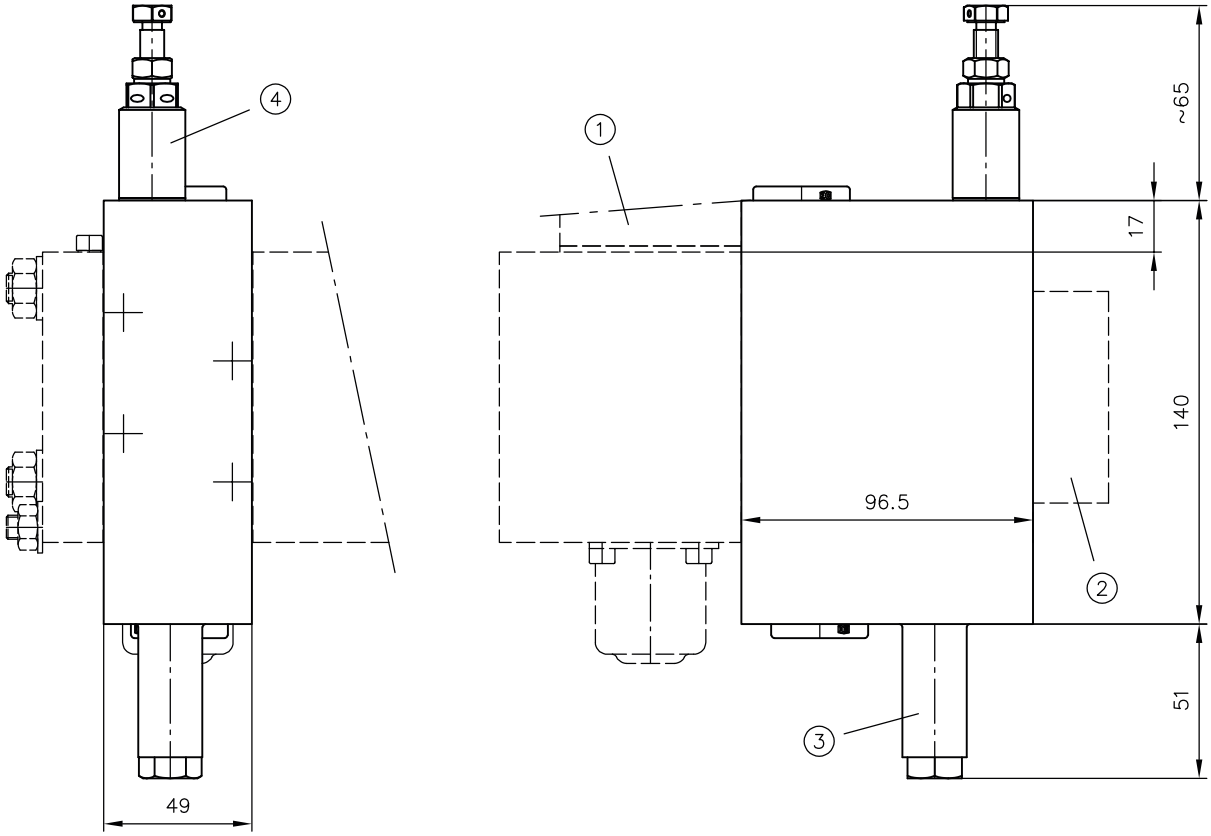
1 Directional valve section
2 Ancillary block
3 Pressure setting B-side
4 Load-holding valve

/Z BL... AN...



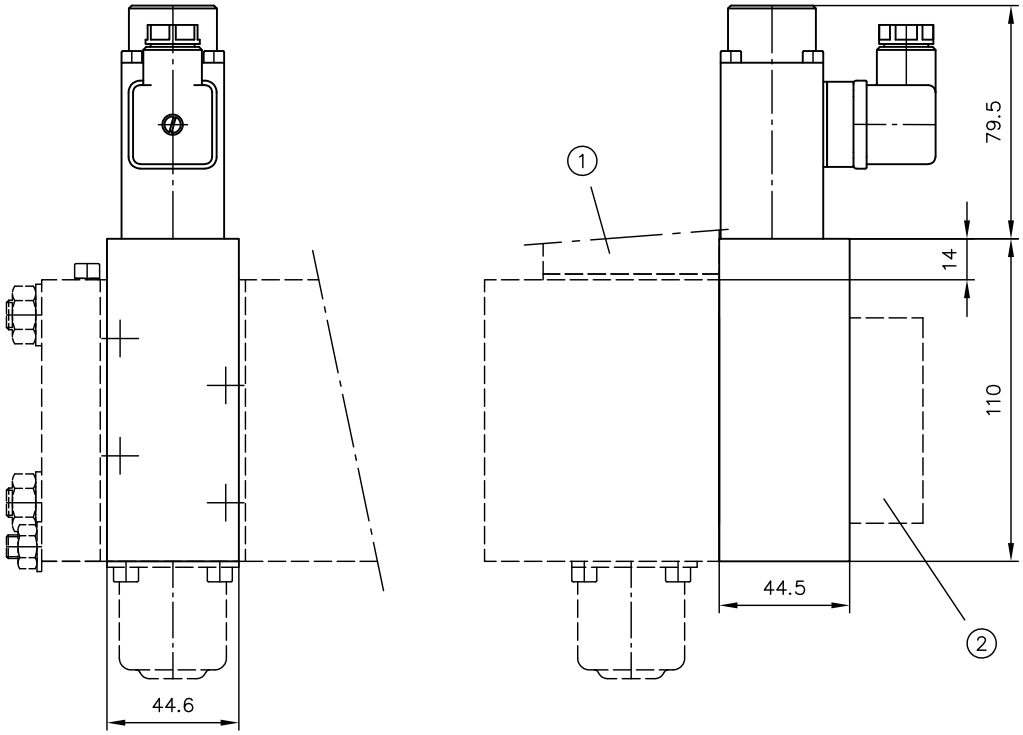
1 Directional valve section
2 Ancillary block
3 Pressure setting A-side
4 Load-holding valve

/ZN BC...



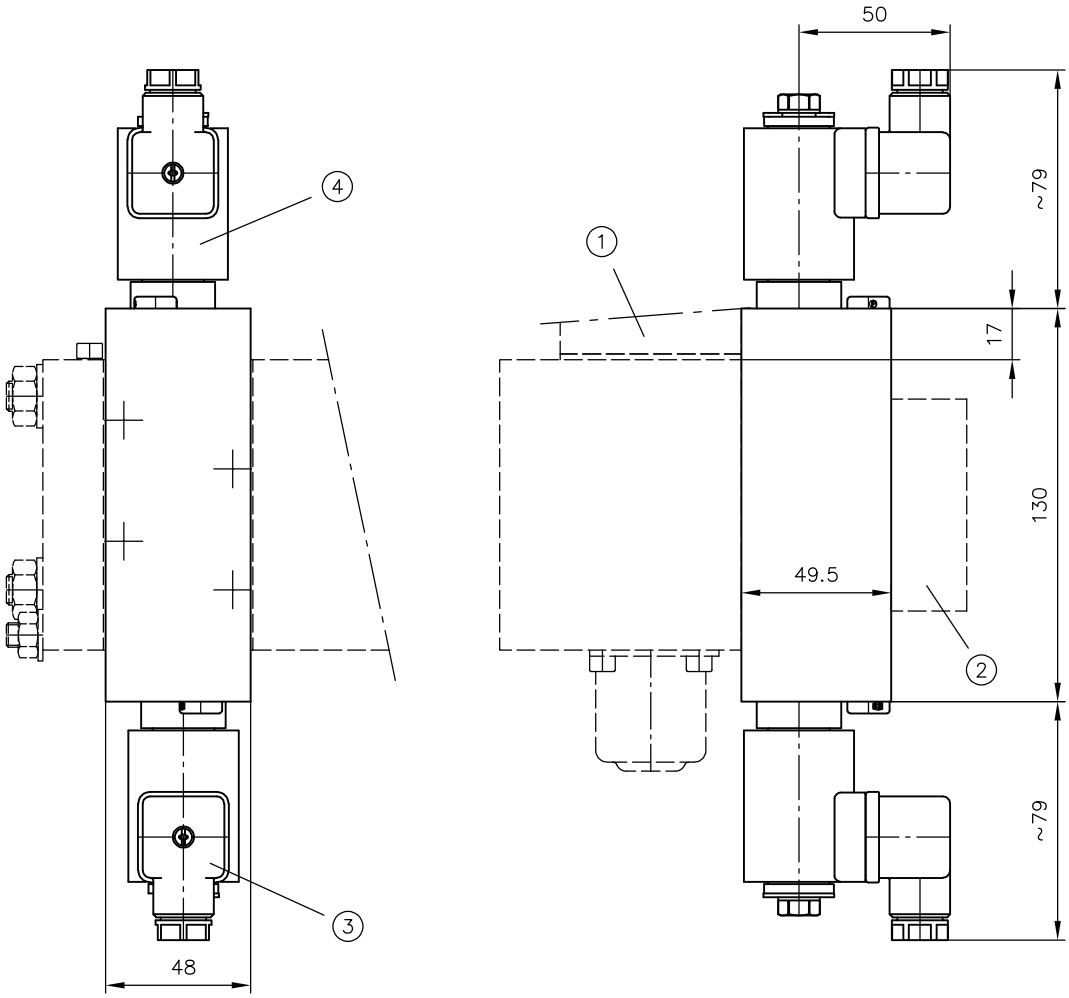
1 Directional valve section
2 Ancillary block
3 3-way controller
4 Pilot valve for 3-way controller

/ZDR
/ZDS



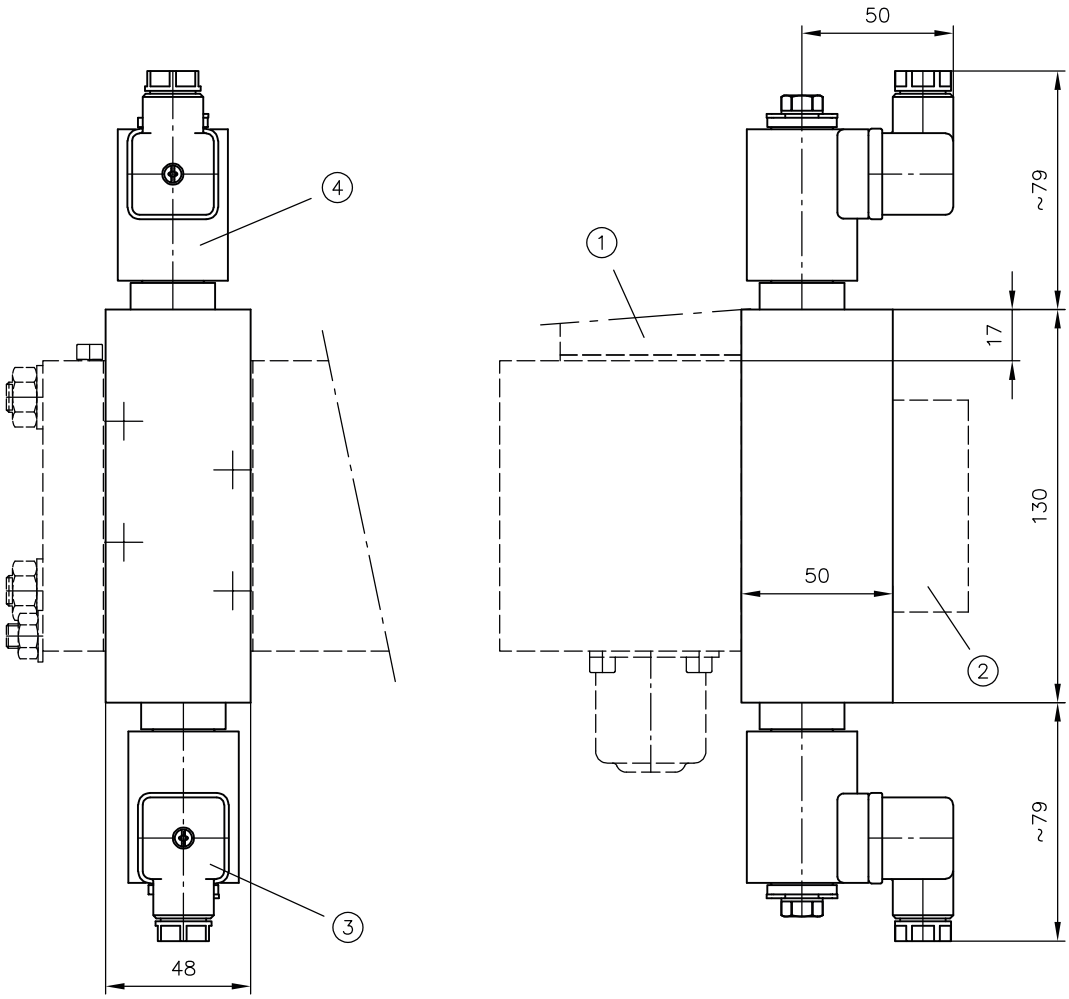
1 Directional valve section
2 Ancillary block

/ZSS, /ZSX, /ZXS
/ZVV, /ZVX, /ZXV



1 Directional valve section
2 Ancillary block
3 Check valve type EM 32 not present on /ZXS, /ZXV
4 Check valve type EM 32 not present on /ZSX, /ZVX

/ZRVV
/ZRVX
/ZRXV

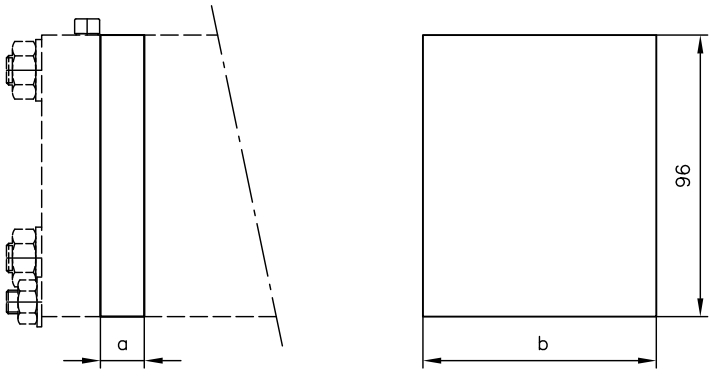


1 Directional valve section
2 Ancillary block
3 Check valve type EM 32, not present on /ZRXS, /ZRXV
4 Check valve type EM 32, not present on /ZRSX, /ZRVX

4.3 Series intermediate plate

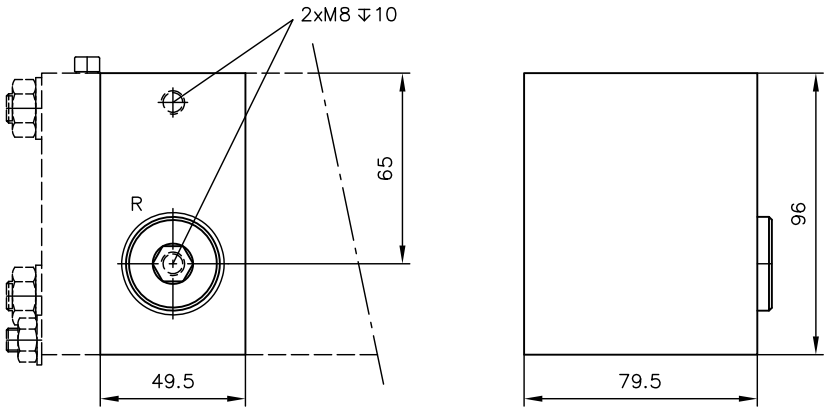
see Chapter 2.3, "Series intermediate plate"

ZPL 33/5
ZPL 33/15
ZPL 33/15/R1
ZPL 33/15/R2
ZPL 33/22



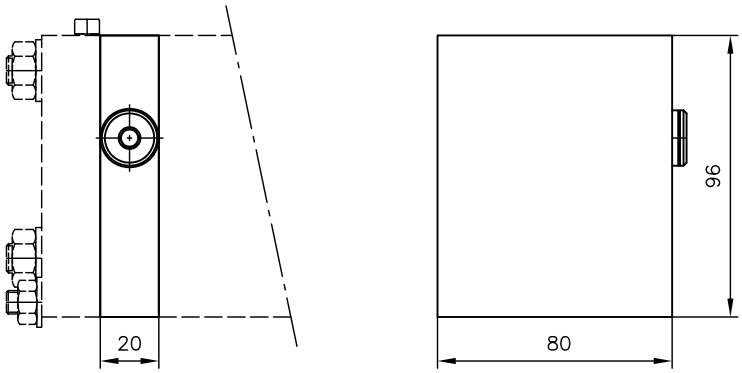
Coding	a	b
ZPL 33/5	5	79.6
ZPL 33/15	15	80
ZPL 33/15/R1	15	79.5
ZPL 33/15/R2	15	79.5
ZPL 33/22	22	79.5

ZPL 33

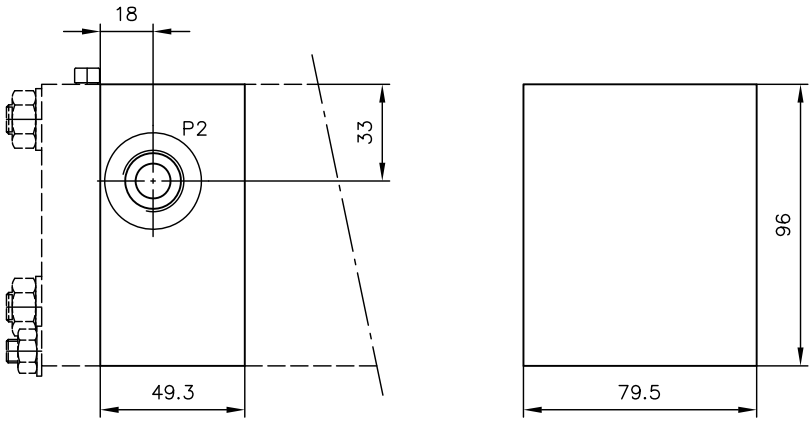


	Port (ISO 228-1)
R	G 3/4

ZPL 33/20/RB R1 XTL

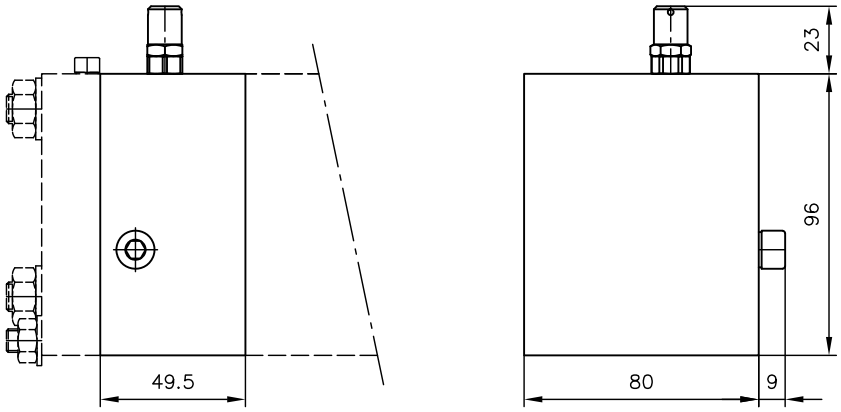


ZPL 3-Z3

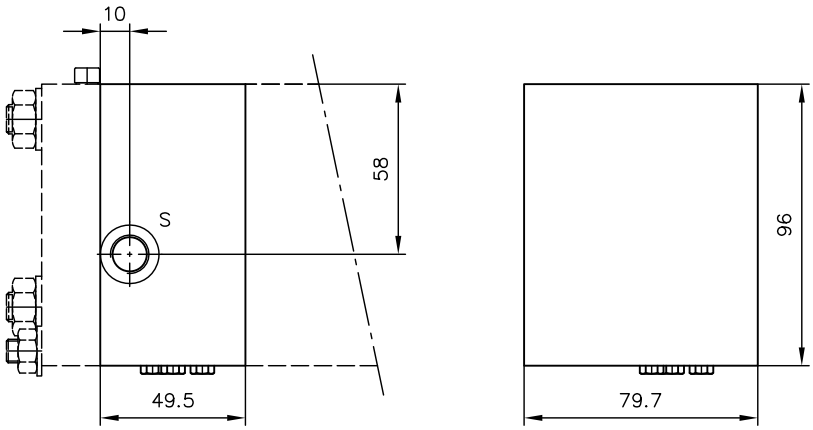


	Port (ISO 228-1)
P2	G 1/2

ZPL 3 P/...

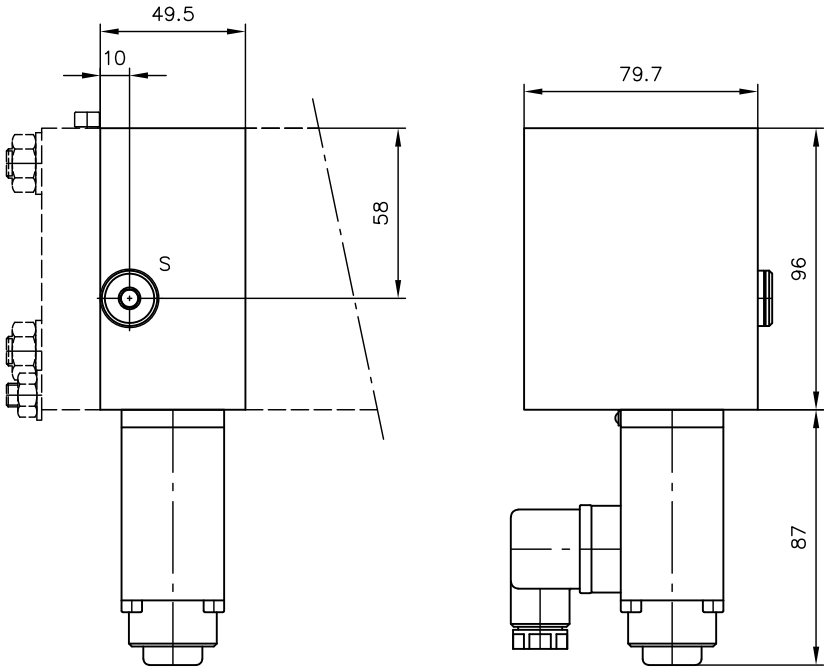


ZPL 3 S/H
ZPL 3 V/H



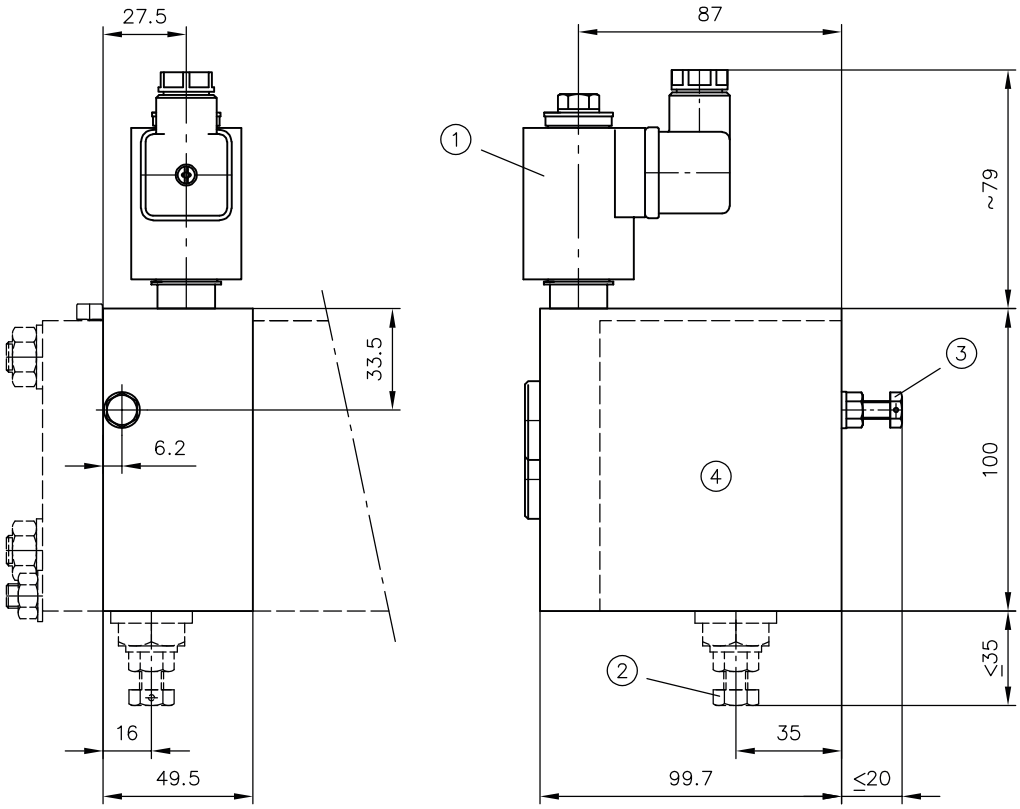
	Port (ISO 228-1)
S	G 1/4

ZPL 3 S/E
ZPL 3 V/E



	Port (ISO 228-1)
S	G 1/4

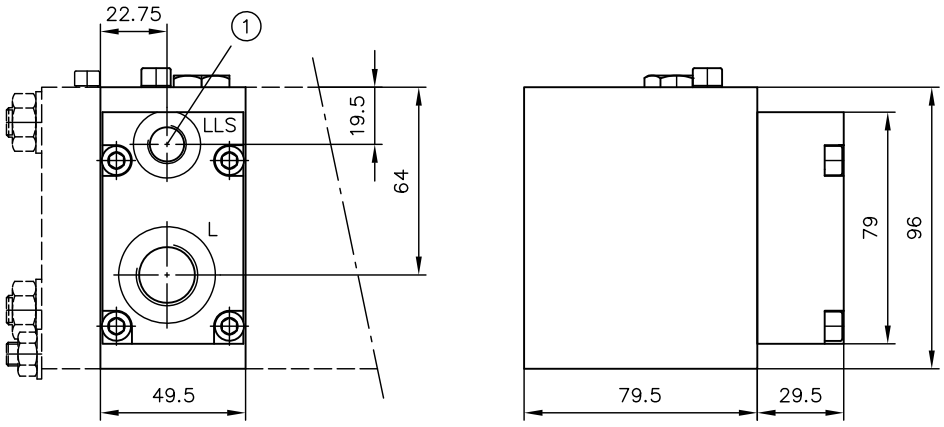
ZPL 3 D, ZPL 3 DS
ZPL 3 D/..., ZPL 3 DS/...



1 Solenoid valve type EM 21 D(S) as per D 7490/1
2 Setting screw size 13 for pressure-limiting valve (only for type ZPL 3 D(S)/...)
3 Setting screw size 10 for second speed
4 Directional valve section

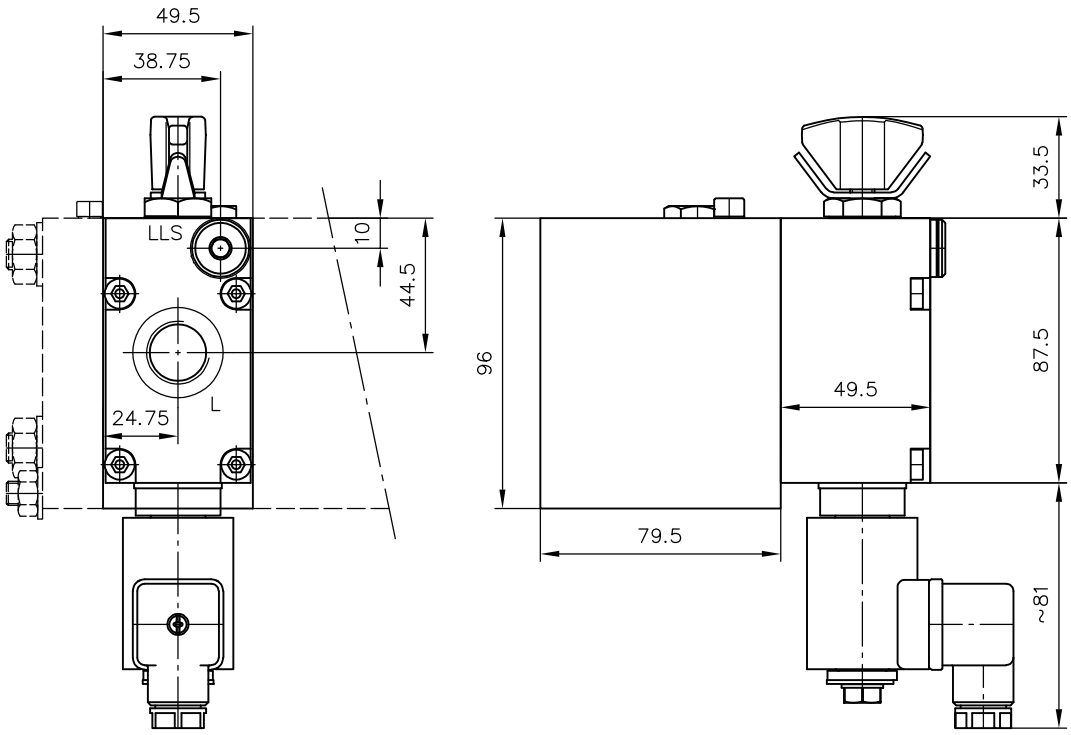
INFORMATION
Loosen lock nut (seal lock nut) sufficiently before adjusting the throttle screw to prevent the thread from damaging the vulcanised sealing ring!

ZPL 3 VQ../3 Q
ZPL 3 VQ../UNF 3 Q



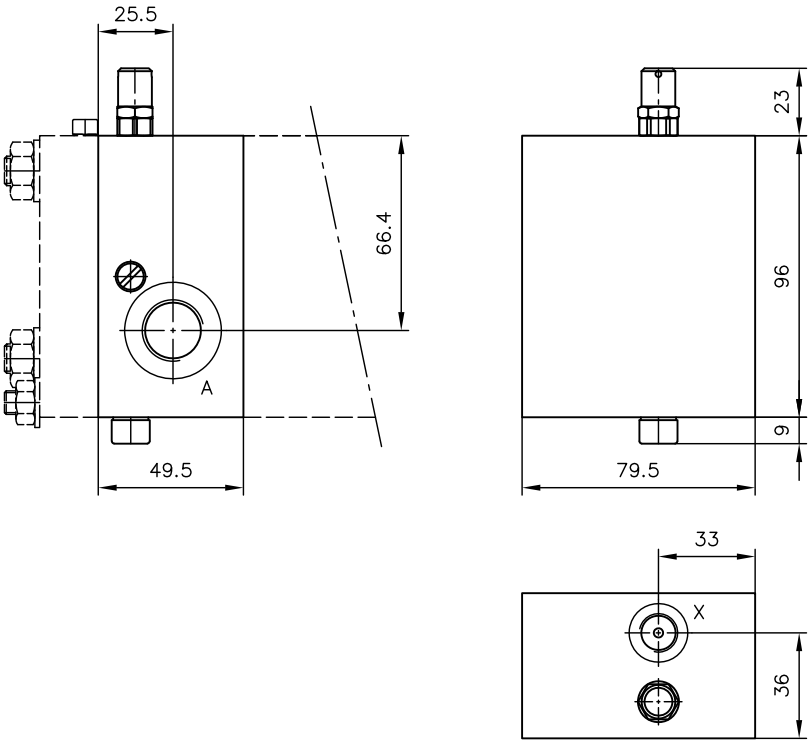
1 only open on type ZPL 3 VQ.-X/...

ZPL 3 VQ../3 QS(QV)
ZPL 3 VQ../UNF 3 QS(QV)

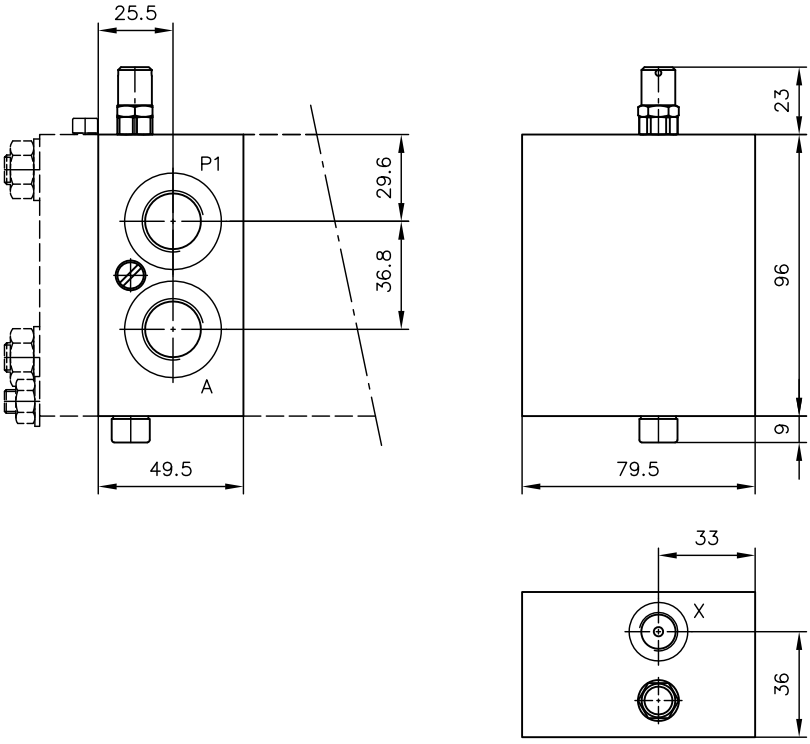


Coding	Ports (ISO 228-1 or SAE J 514)	
	L	LLS
/3 Q..	G 1/2	G 1/4
/UNF 3 Q..	SAE-10 (7/8-14 UN-2B)	SAE-4 (7/16-20 UNF-2B)

ZPL 3 TX...

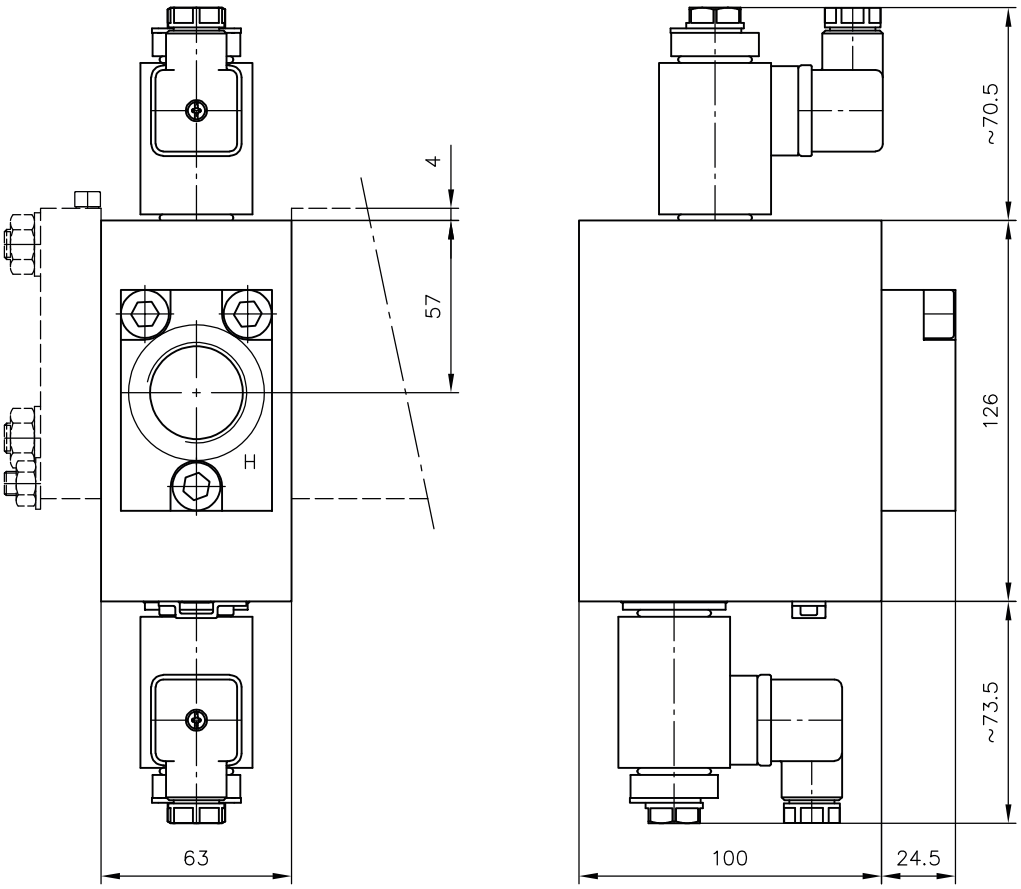


ZPL 3 TV...



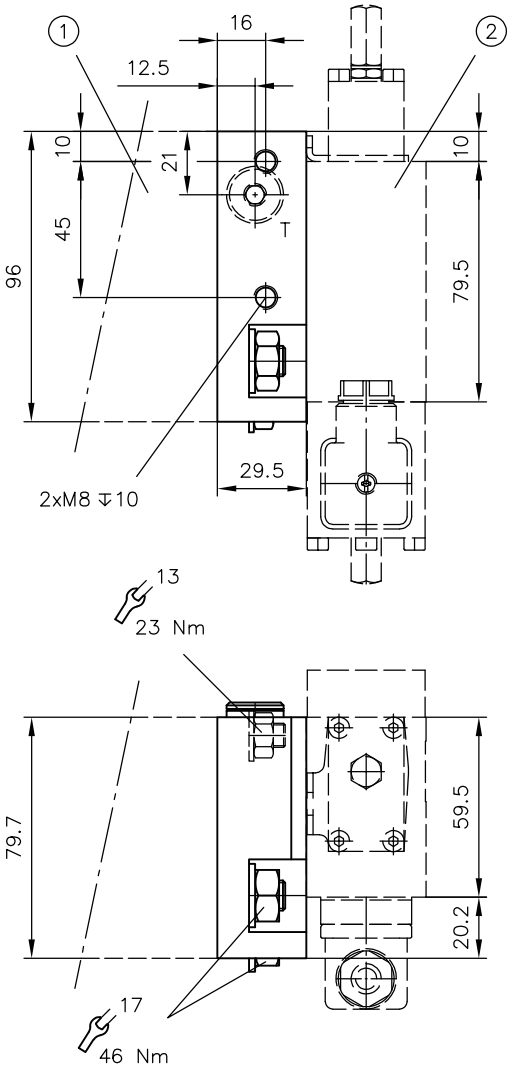
Coding	Ports (ISO 228-1 or SAE J 514)	
	A, P1	X
ZPL 3 TX... ZPL 3 TV...	G 1/2	G 1/4

A1 RR PVPV/5



	Ports (ISO 228-1)
H	G 1

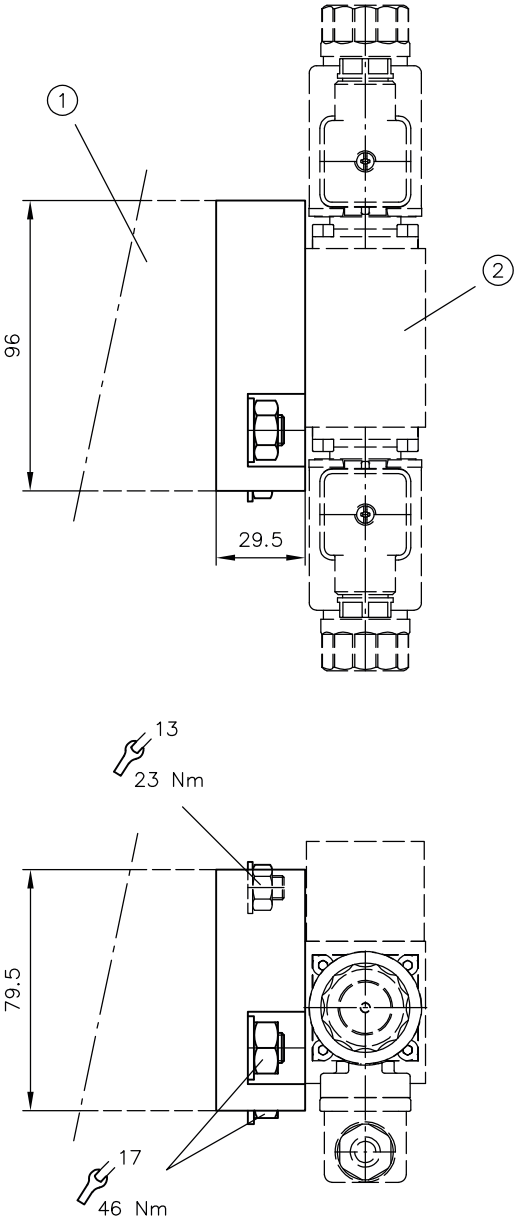
ZPL 32



ZPL 32

1 Directional valve section PSL 3
2 Directional valve section PSL 2

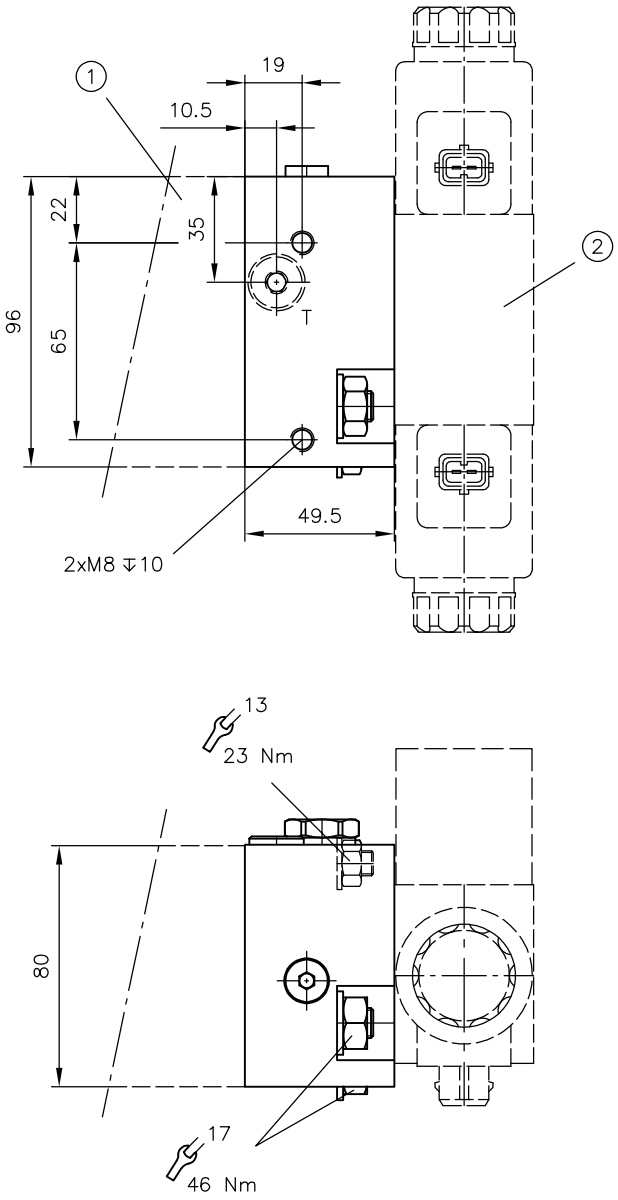
ZPL 3-SWS 2



1 Directional valve section PSL 3
2 Directional valve section SWS 2

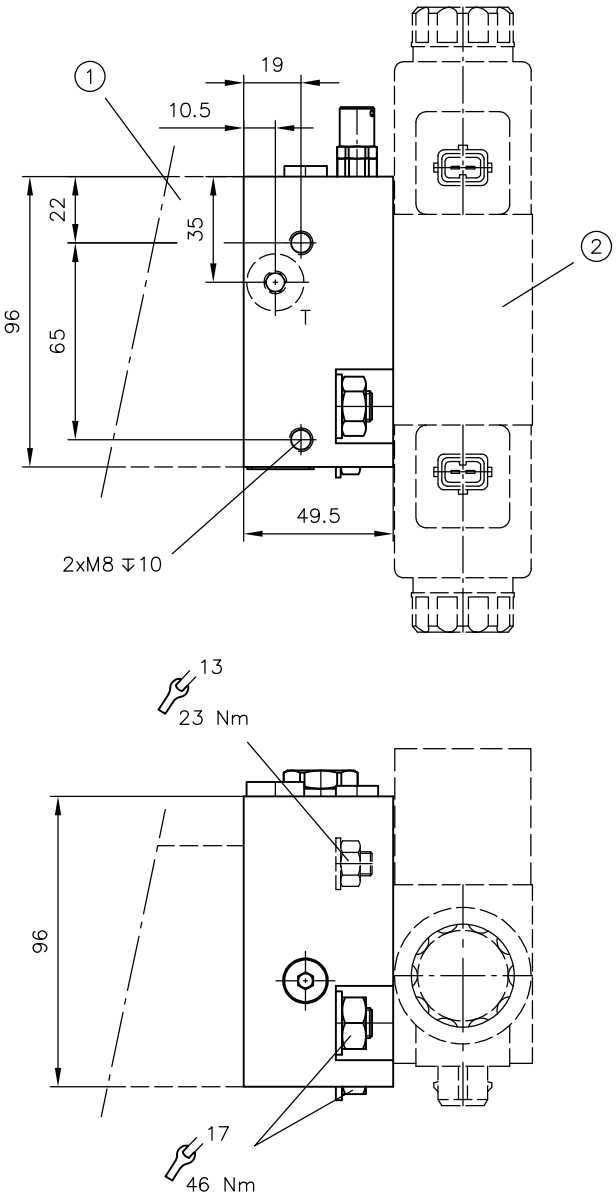
	Ports (ISO 228-1)
T	G 1/4

ZPL 3 CWL



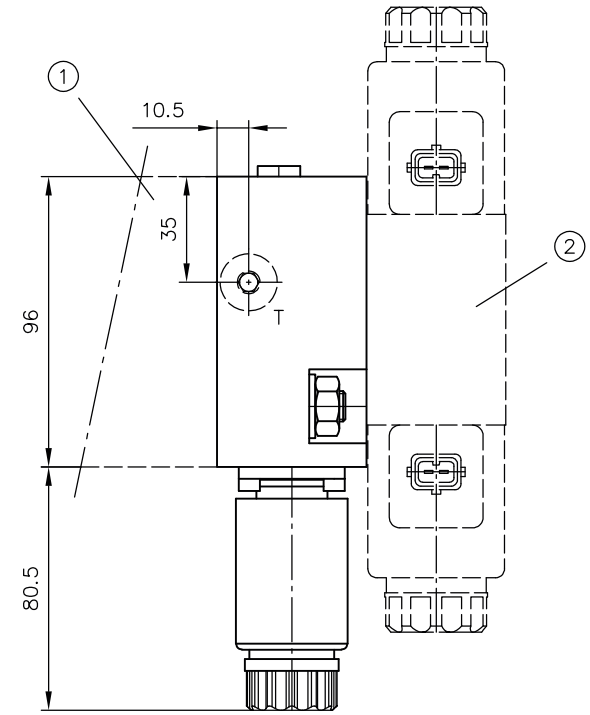
1 Directional valve section PSL 3
2 Directional valve section CWL

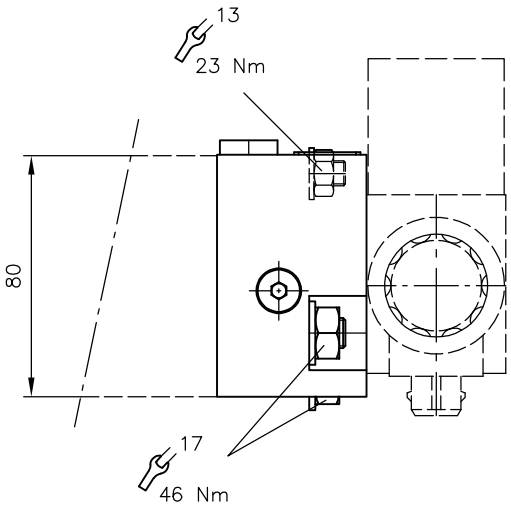
ZPL 3 CWL P



1 Directional valve section PSL 3
2 Directional valve section CWL

ZPL 3 CWS BV



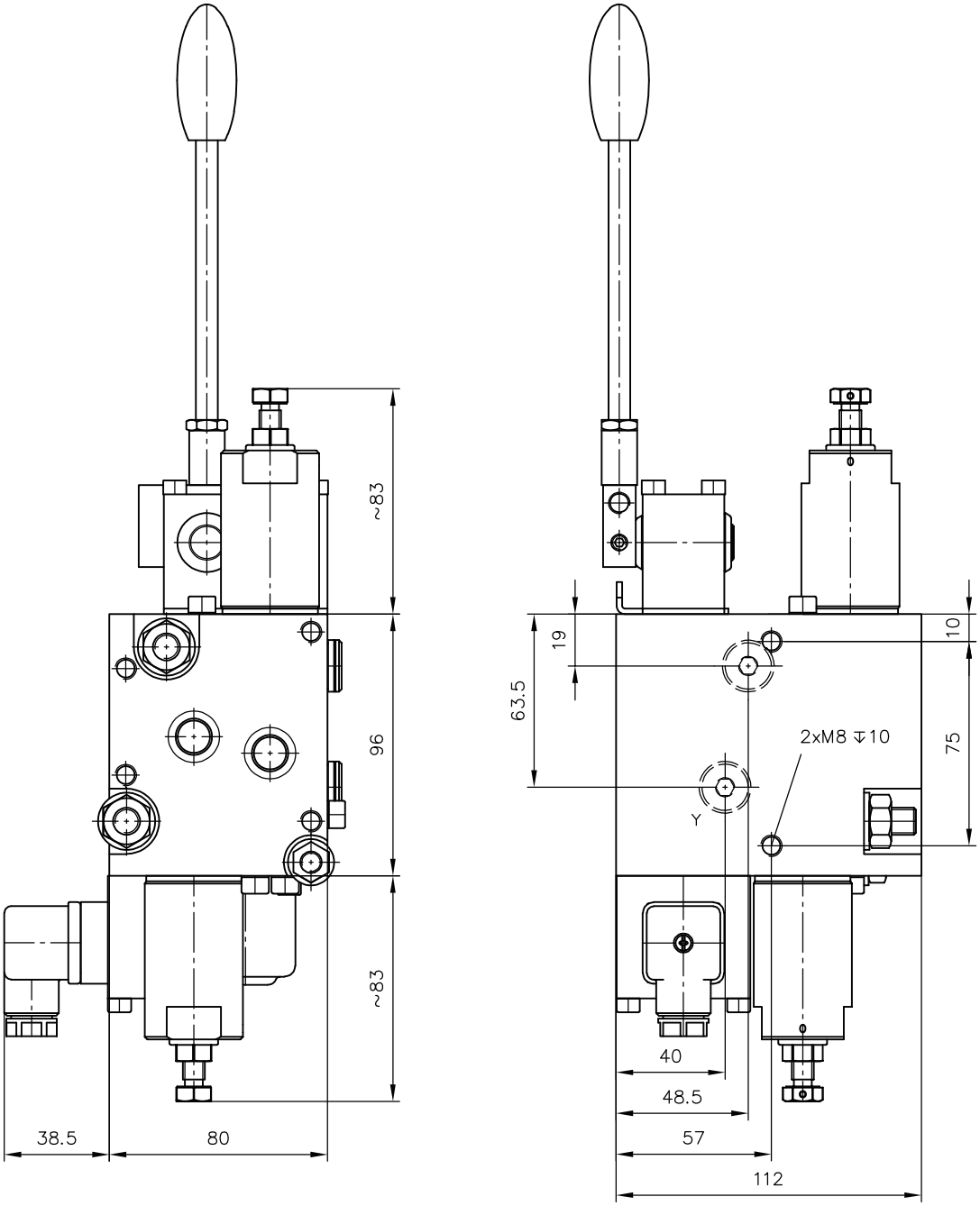


1 Directional valve section PSL 3
2 Directional valve section CWS

4.4 Valve section with integrated load-holding valves

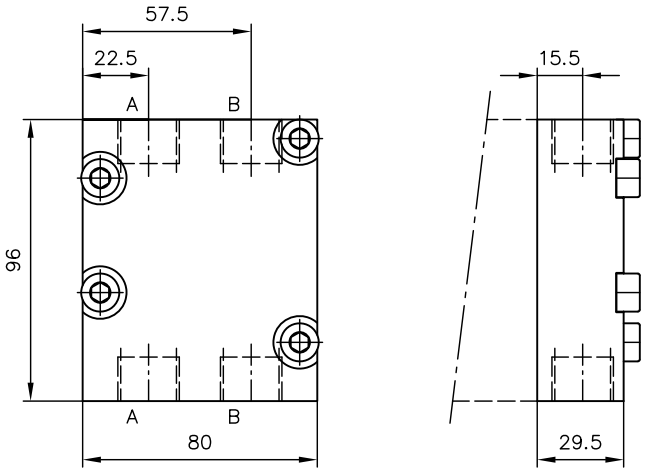
as per Chapter 2.4, "Valve section with integrated load-holding valves"

SL3 - F1...
SL3 - F5...

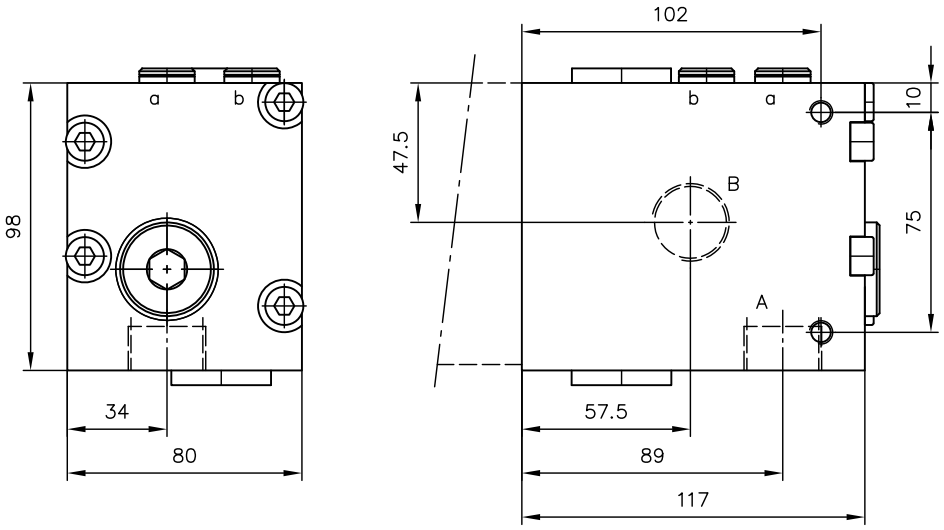


	Port (ISO 228-1)
Y	G 1/4

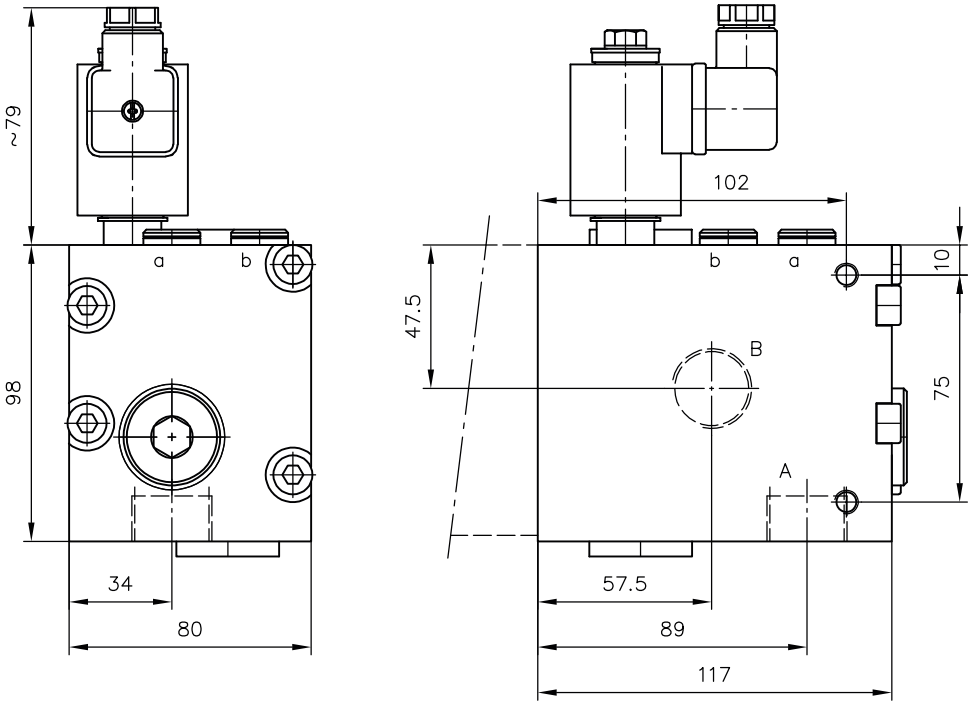
EF 30



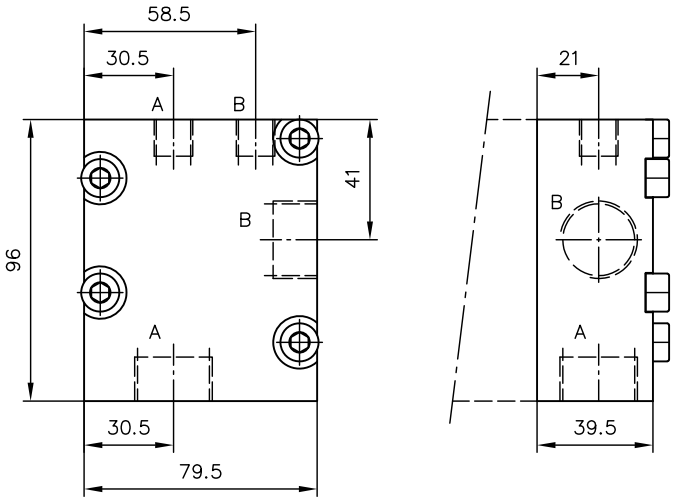
EF 31



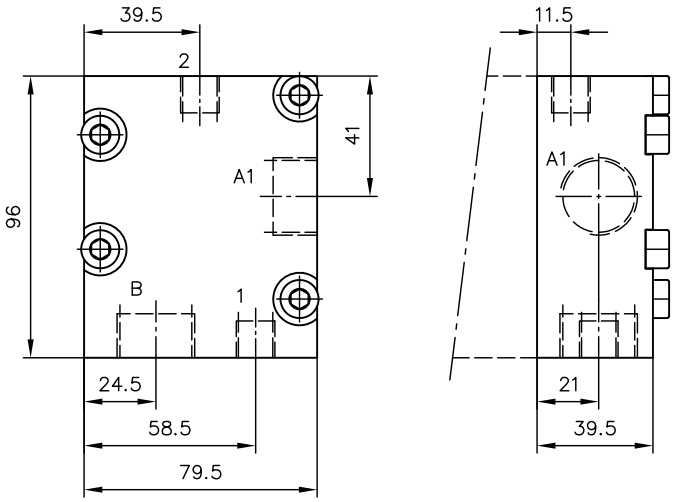
EF 31 D



EF 41



EF 42

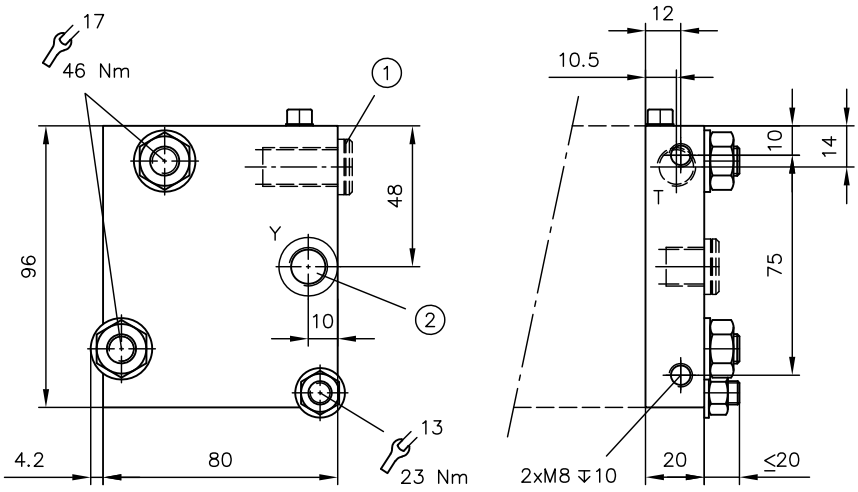


Coding	Ports (ISO 228-1)	
	A (A1), B	A (a, 1), B (b, 2)
EF 30	G 1/2	--
EF 31 EF 31 D	G 3/4	G 1/4
EF 41	G 3/4	G 1/4
EF 42	G 3/4	G 1/4

4.5 End plate

see Chapter 2.5, "End plate"

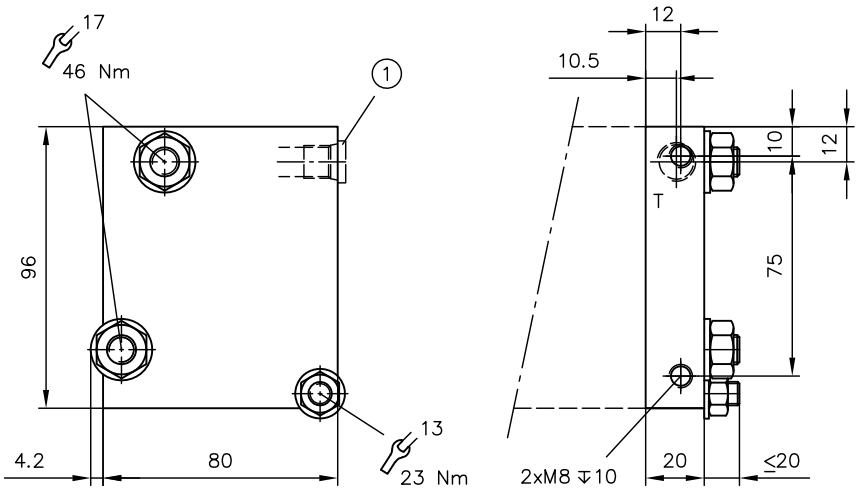
E 1, E 2, E 4, E 5



1 Port T sealed on E 4 and E 5!

2 Port Y sealed on E 1 and E 4!

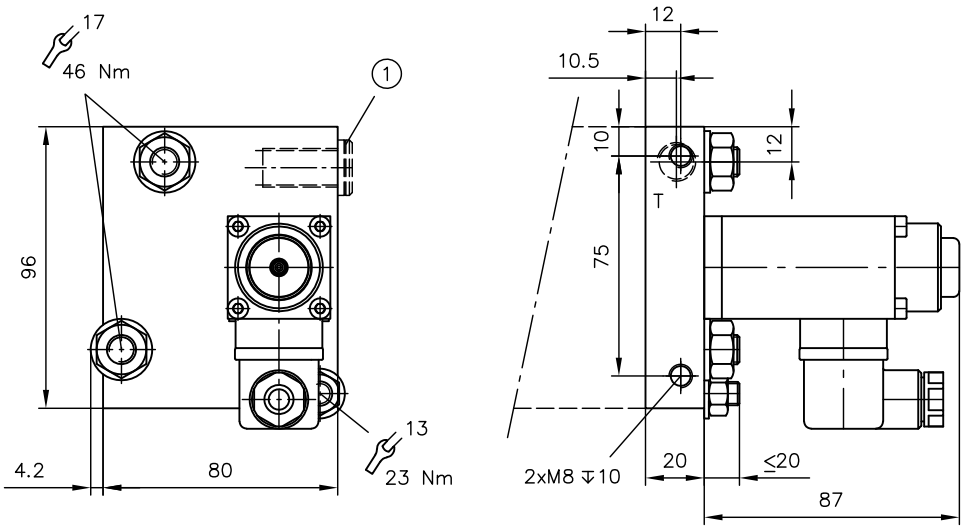
E 1 UNF, E 4 UNF



1 Port T sealed on E 4 UNF!

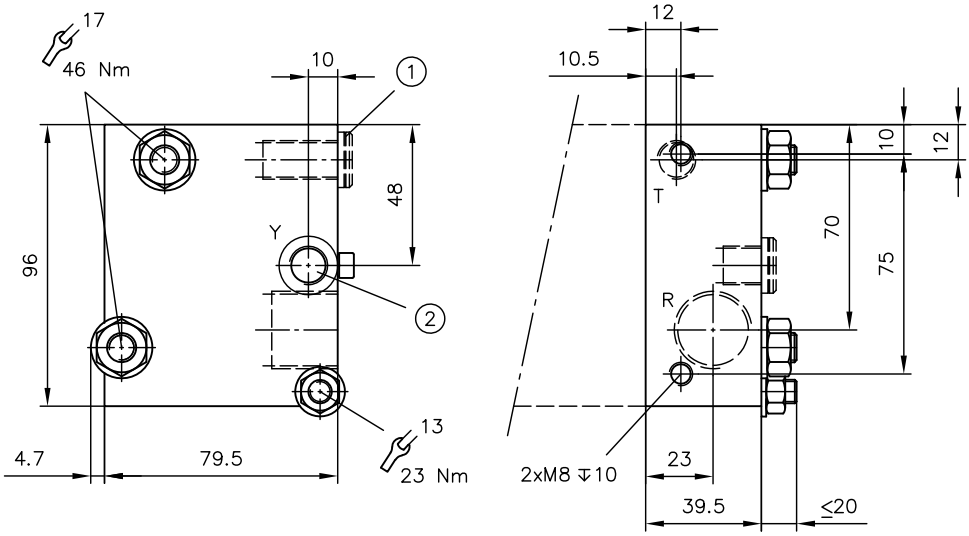
Coding	Ports (ISO 228-1 or SAE J 514)	
	T	Y
E 1, E 2, E 4, E 5	G 1/4	G 1/4
E 1 UNF, E 4 UNF	SAE-4 (7/16-20 UNF-2B)	--

E 3, E 6



1 Port T sealed on E 6!

E 7, E 8, E 9, E 10

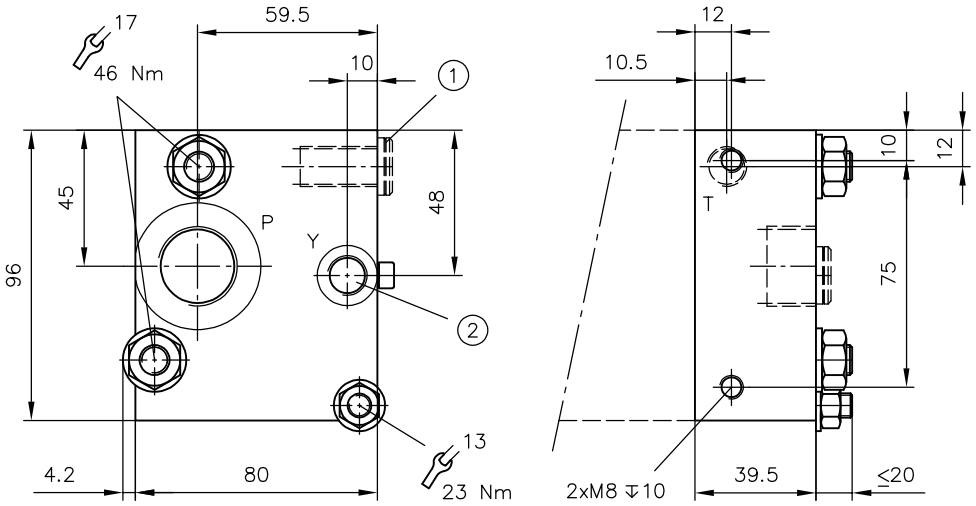


1 Port T sealed on E 9 and E 10!

2 Port Y sealed on E 7 and E 9!

Coding	Ports (ISO 228-1)		
	T	Y	R
E 3, E 6	G 1/4	G 1/4	--
E 7, E 8, E 9, E 10	G 1/4	--	G 3/4

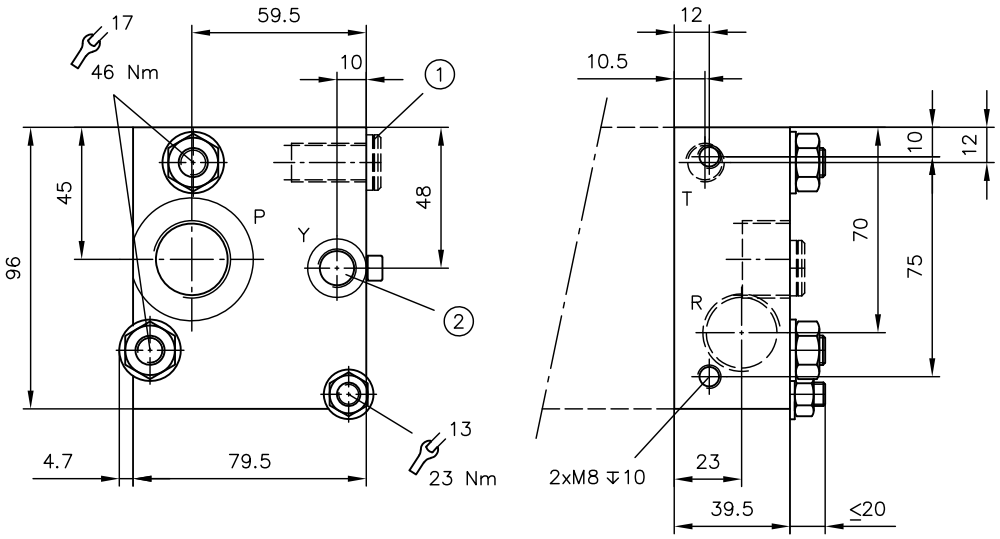
E 13, E 14, E 15, E 16



1 Port T sealed on E 15 and E 16!

2 Port Y sealed on E 13 and E 15!

E 17, E 18, E 19, E 20
E 17 UNF, E 18 UNF, E 19 UNF, E 20 UNF

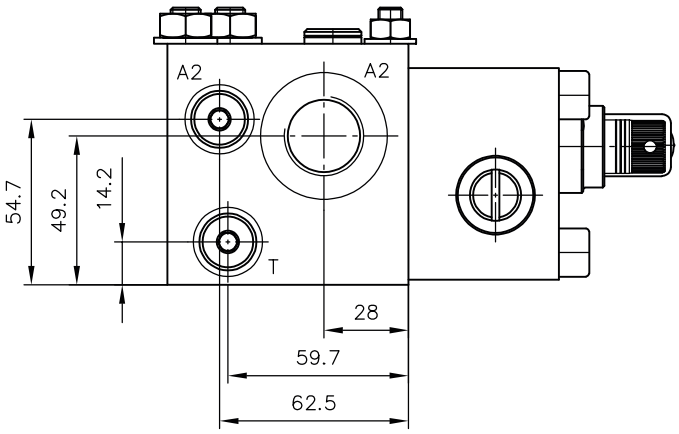


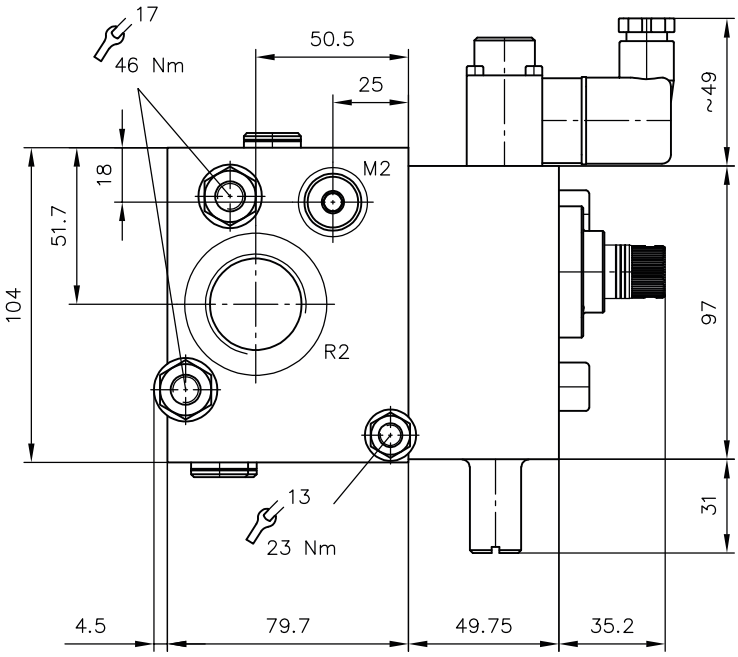
1 Port T sealed on E 19, E 19 UNF, E 20 and E 20 UNF!

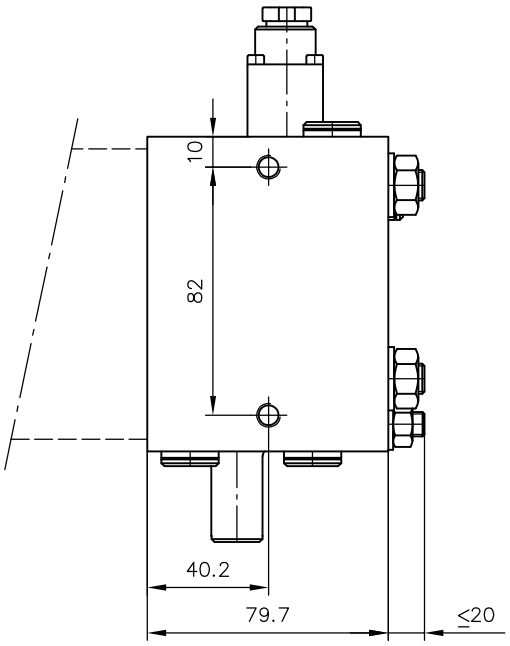
2 Port Y sealed on E 17, E 17 UNF, E 19 and E 19 UNF!

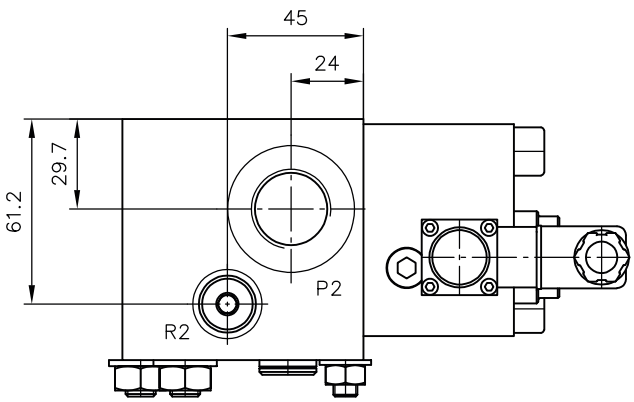
Coding	Ports (ISO 228-1 or SAE J 514)	
	T, Y	P, R
E 13, E 14, E 15, E 16 E 17, E 18, E 19, E 20	G 1/4	G 3/4
E 17 UNF, E 18 UNF E 19 UNF, E 20 UNF	SAE-4 (7/16-20 UNF-2B)	SAE-10 (7/8-14 UNF-2B)

E 1 SEH. 3-4-...FP...
E 4 SEH. 3-4-...FP...



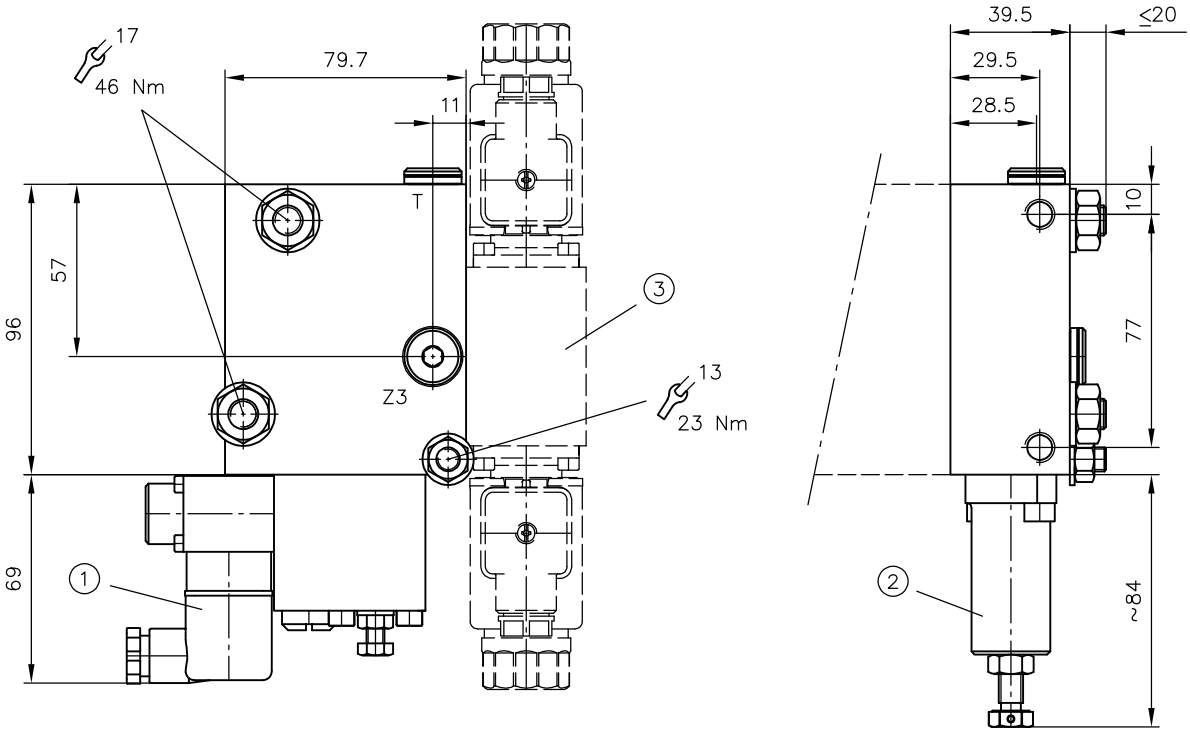






Coding	Ports (ISO 228-1)		
	A2, P2	R2	A2, M2, R2, T
E 1 SEH. 3-4-...FP... E 4 SEH. 3-4-...FP...	G 3/4	G 1	G 1/4

E 28-ADM 22 .-...
E 28-PDM 22 .-...



1 End plate E28-PDM 22
2 End plate E28-ADM 22
3 Directional spool valve SWS 2

Coding	Ports (ISO 228-1)	
	T, Z3	A, B
E 28-ADM 22 .-... E 28-PDM 22 .-...	G 1/4	as per D 7951

5 Installation, operation and maintenance information

Observe the document B 5488 “General operating instructions for assembly, commissioning, and maintenance.”

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ► All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ► The product must only be assembled and put into operation by specialist personnel.
- ► The product must only be operated within the specified technical parameters described in detail in this document.
- ► All components must be suitable for the operating conditions when using an assembly.
- ► The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
   ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).

⚠ **DANGER**
Sudden movement of the hydraulic drives when disassembled incorrectly
Risk of serious injury or death

- ► Depressurise the hydraulic system.
- ► Perform safety measures in preparation for maintenance.

5.2.1 Attachment

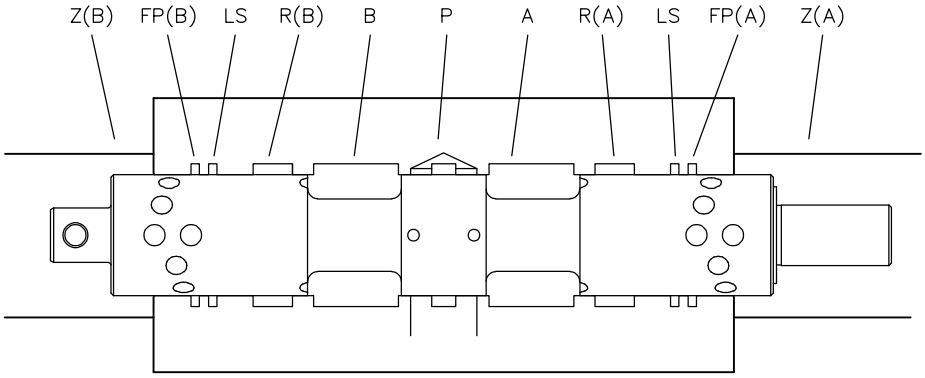
The valve bank must be mounted to the frame or base of the machine in such a way that no stress is induced. Three screws and elastic washers between the bank and the frame are recommended for attachment.

5.2.2 Piping

All fittings used must utilise deformable seals. The recommended tightening torque values must not be exceeded.

5.2.2.1 Reflux piping routed externally to the tank

If the reflux line from the consumer is routed externally back to the tank, this may impair the film of lubrication between the spool block and spool valve between R(B) and Z(B).



This could lead to a higher level of wear if the following conditions are also fulfilled:

- A consumer is actuated on a sustained basis for longer than 10 minutes.
- These three configurations apply
  - ► without LS pressure limitation (Chapter 2.2.1.7)
  - ► without LS relief or LS pressure limitation coding (Chapter 2.2.1.8)
  - ► without LS port for external limitation (Chapter 2.2.1.9)

Recommendation for improving the lubrication in this case:

- Pre-load the reflux in PSL/PSV(max. 5 bar)
- Valve section with one of these three functions
  - ► LS pressure limitation
    - AB
    - A..B..
    - B..
  - ► LS relief or LS pressure limitation
    - F0
    - F..
  - ► LS port for external limitation
    - S
    - S1
    - X
    - XH
- On valve sections (Chapter 2.2.1.3) with code 8 and code 81, do not use dither.

5.2.3 Converting the connection block from PSL to PSV

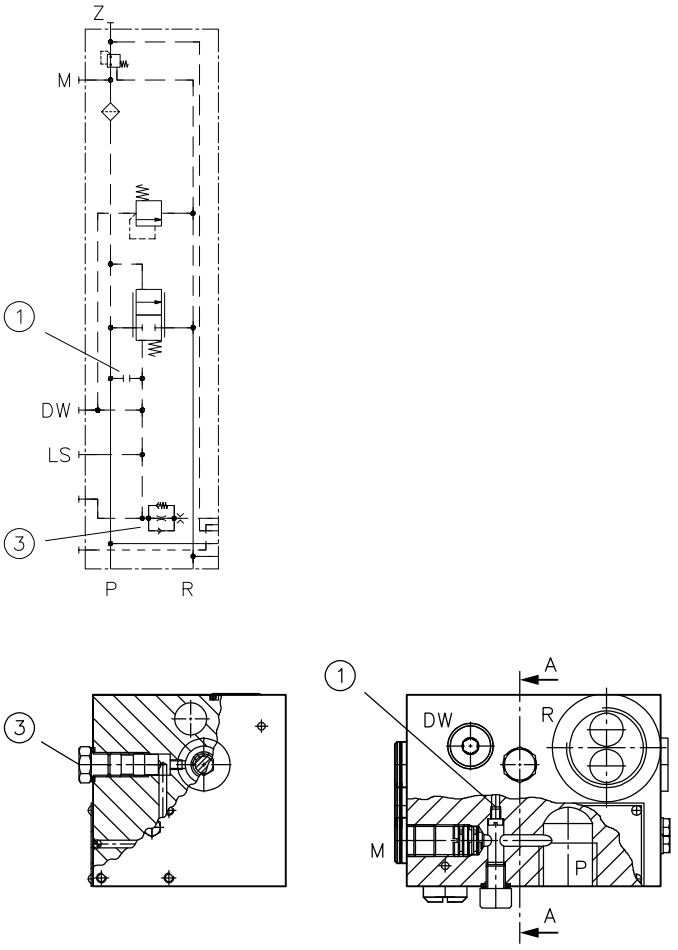
The connection blocks of type PSL 45../..-3, PSL 5../..-3 or PSL UNF 4../..-3 can be converted into a connection block for a control pump system (Closed Center). For this purpose, the components listed below must be installed as shown.

The connection blocks of type PSV 45../..-3, PSV 55../-3 or PSV UNF 44../..-3 can be converted into a connection block for a constant pump system (Open Center). For this purpose, the components listed below must be installed as shown.

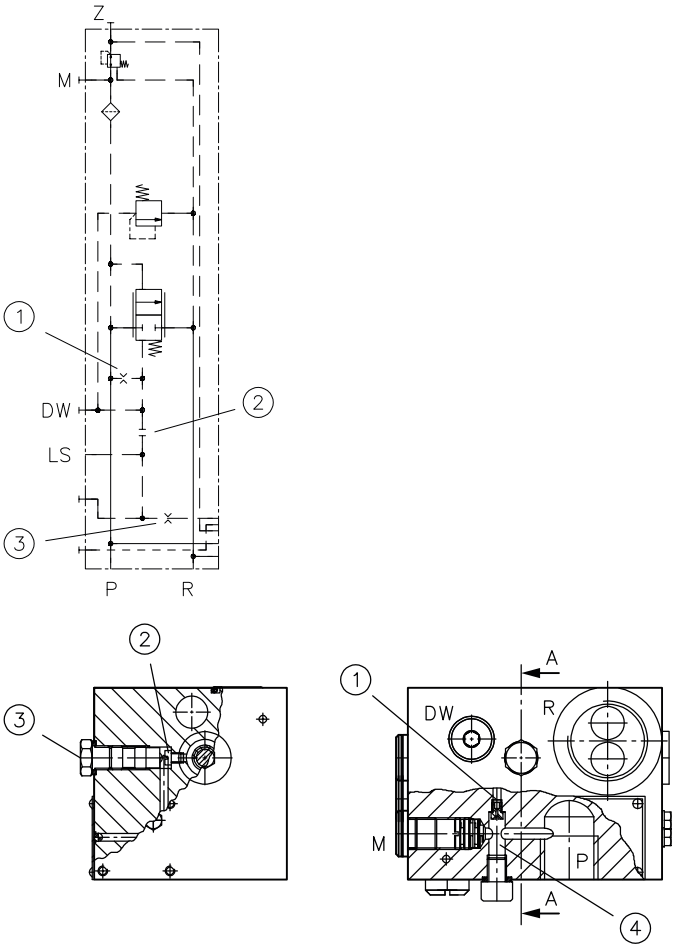
NOTICE

The screw (order no. 6380 013) / carburettor orifice M4x0.6 are glued in place using liquid threadlocker. During the conversion process, secure the parts against coming loose again. The conversion cannot be performed for type PSL 5(6) U(H) or PSL 6 Y as the integrated valve combinations prohibit any combinations with variable pump systems. If type PSV is to be converted to type PSL, the existing tapped plug must also be exchanged for dampening screw S (order no. 7778 301) (not applicable for types PSV 5(6) S..-5 or PSV UNF 6 S..-5, as there is already one there).

PSL 51./...-3



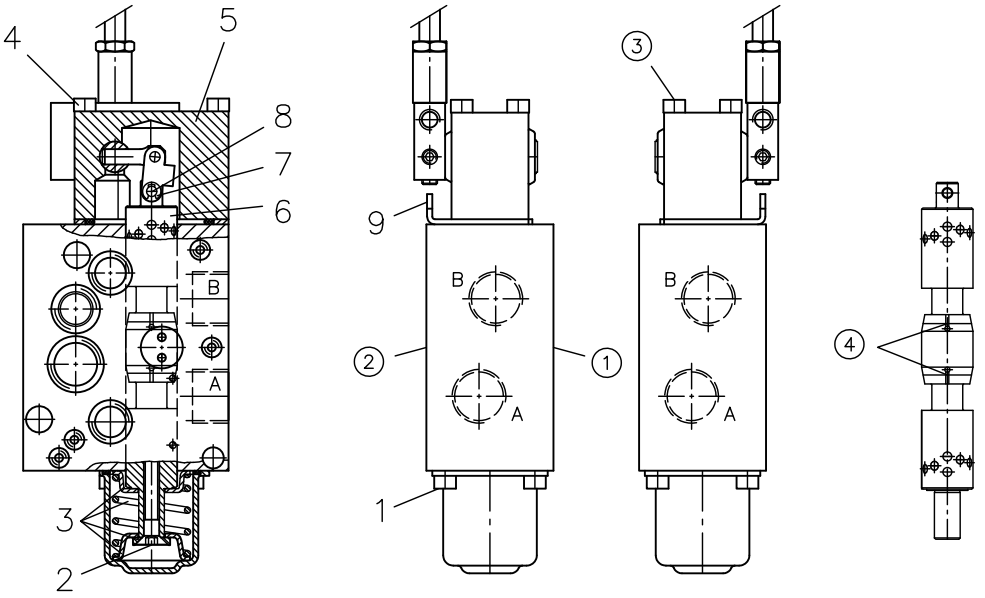
PSV 55 B../...-3



Position	PSL 51../...-3	PSV 55 B../...-3
1	Screw 6380 013	Orifice M4x0.6 (3059 4369-00)
2	--	Screw 6380 013
3	Dampening screw S	Dampening screw B
4	--	Filter screw

5.2.4 Changing the valve spool

With the exception of valve spools type FE and JE as per Chapter 2.2.1.5, "Circuit symbol", all valve spool variants can be exchanged in the spool block at a later date.



1 End plate side
2 Connection block side
3 Lever housing, turned through 180°
4 Metering ports

Changing the valve spool

1. Unscrew screws **1** (ISO 4762-M5x8-8.8-A2K), remove spring housing
2. Unscrew screw **2** M6x40
3. Take off spring package with spring plates **3**
4. Screws **4** (ISO 4762-M5x50-8.8-A2K) are to be unscrewed
5. Pull the lever housing out of the spool block together with the valve spool **5 6**
6. Remove lock washer DIN 6799-3.2 and bolt **7 8**
7. Proceed in reverse order to reassemble with (new) valve spool

INFORMATION
When assembled, the valve spool's metering ports must always face towards the end plate!
Exception: Valve spools with coding 80 do not have metering ports and can be installed any way around.

Turning the lever housing through 180° (reversing the switching direction)

1. As instructed under 1. - 7., but instead of a new valve spool, detach the existing valve spool and re-install it rotated through 180° (see note above).
2. Turn the intermediate sheet **9** through 180° together with the lever housing.
3. All lever housings in the valve bank must be turned.

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTICE

- ► Read the documentation carefully before usage.
- ► The documentation must be accessible to the operating and maintenance staff at all times.
- ► Keep documentation up to date after every addition or update.

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.

Damage to the product is possible.

- ► Filter new hydraulic fluid to a high quality when filling.
- ► Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 oil recommendations

5.4 Maintenance information

Check regularly (at least once a year) by visual inspection whether the hydraulic connections or the surfaces of the valve blocks are damaged. If damage or external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

6 Other information

6.1 Accessories, spare and individual parts

Seal kits

Connection block	DS 7700-31
Valve section	DS 7700-32
Additionally for pneumatic actuation	DS 7700-33
Intermediate plate ZPL 32	DS 7700-22

References

Additional versions

- Proportional directional spool valve type PSL, PSV size 2 and EDL: D 7700-2
- Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5
- Proportional directional spool valve type PSLF, PSVF and SLF: D 7700-F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F
- Actuation for proportional directional spool valves type PSL/PSV: D 7700 CAN
- Valve bank (directional spool valve) type CWS: D 7951 CWS

D 7700-3 10-2025-1.2

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