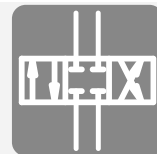
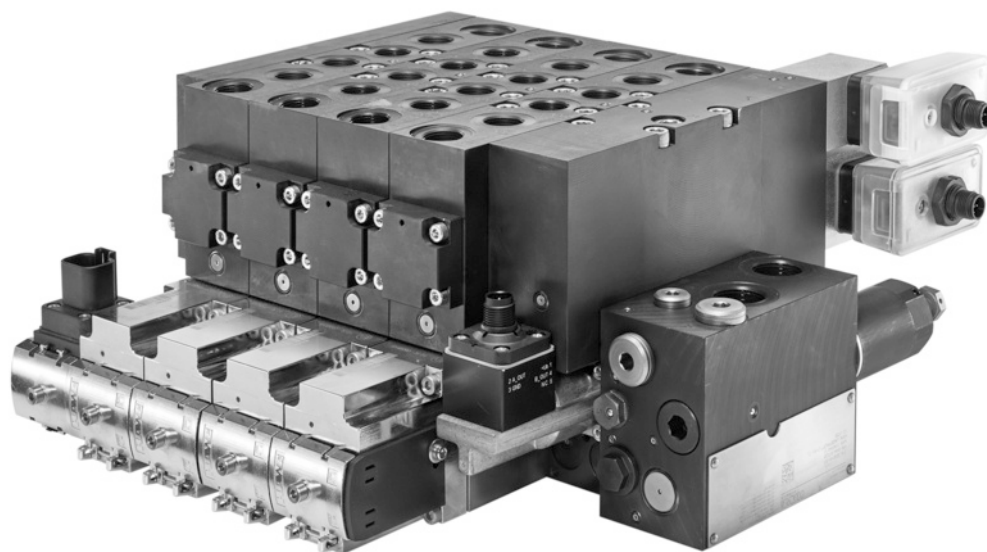


Proportional directional spool valve type MICK 2

Product documentation



Operating pressure $p_{\max}$:	420 bar
Flow rate (pump) $Q_{\max}$:	100 l/min
Flow rate (consumer) $Q_{\max A/B}$:	60 l/min



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Printing date / document generated on: 2026-03-02

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1**Overview of proportional directional spool valve type MICK 2**

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

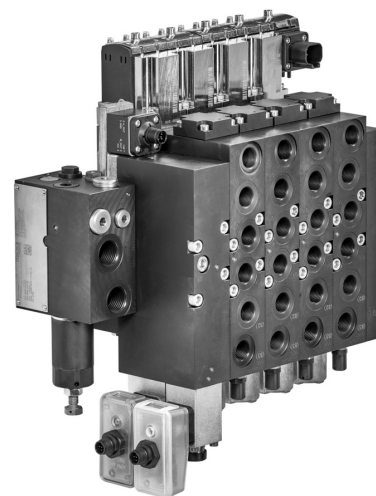
The PSL sections proportionally control the flow rate and the downstream diverter valves distribute it to the individual consumers. Up to three dual-acting consumers can thus be supplied with one valve section.

Features and advantages

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

Intended applications

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

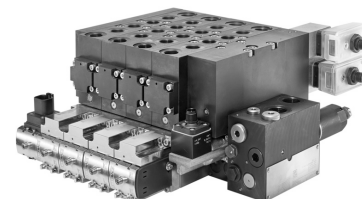


Proportional directional spool valve type MICK 2

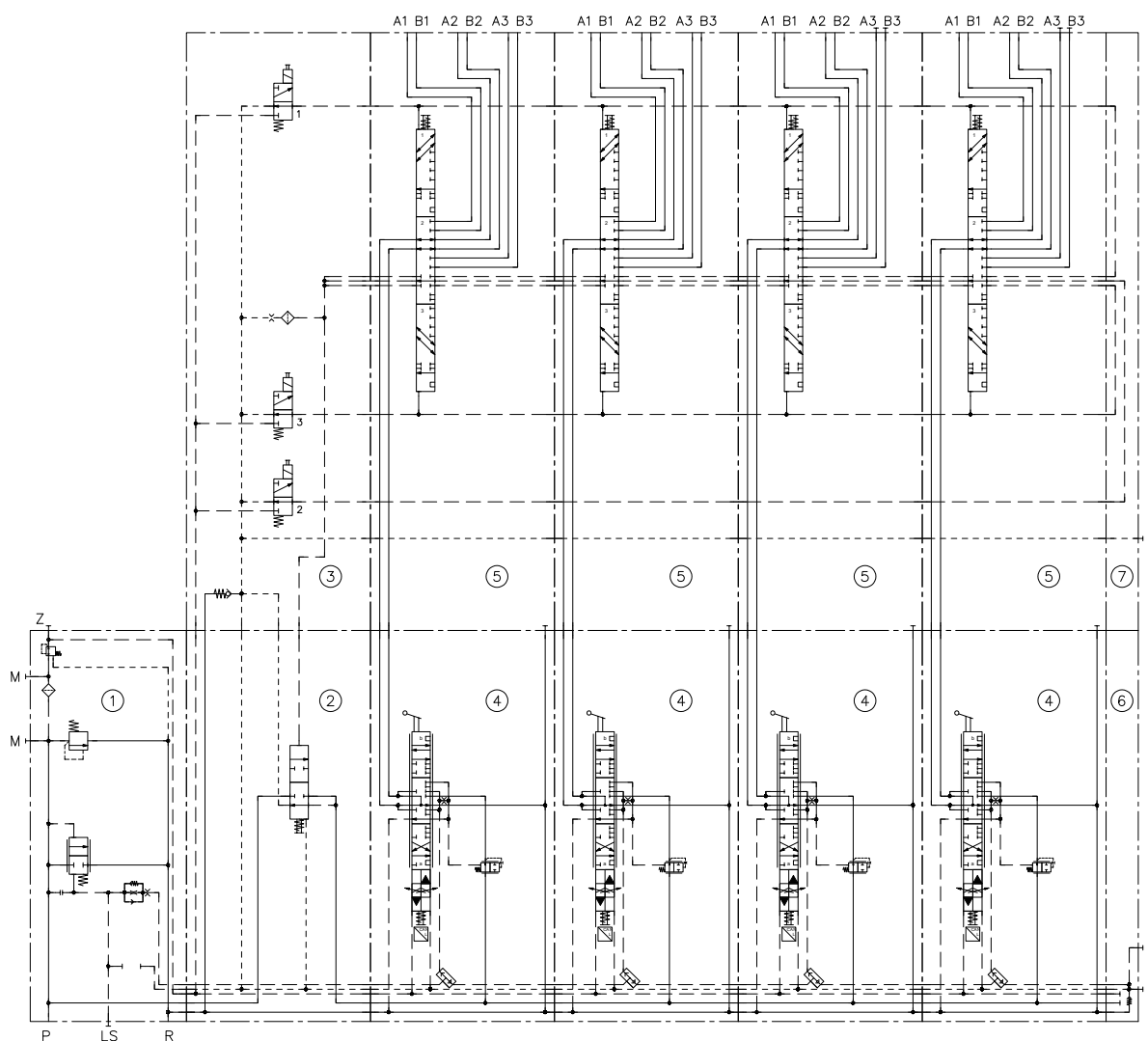
1.1 Configuration example MICK 2

MICK 2

-PSL 3 H 1/D 420-2
-ZPL 2 H/IU-M12/PM 1-14
-A2 HW 40/40/EACAN-E/222 C250/I
-A2 HW 40/40/EACAN/222 C250/I
-A2 HW 40/40/EACAN/222 C250/I
-A2 HW 40/40/EACAN-C/222 C250/I
-E 4/E 0-DT-G 24 TH

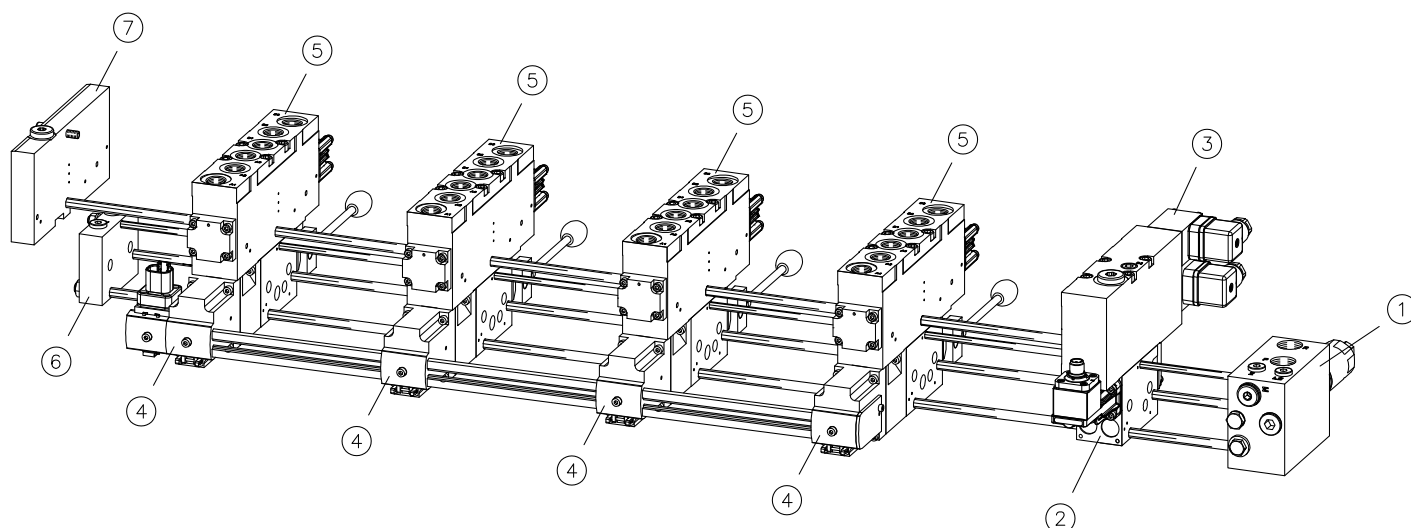


Proportional directional spool valve
type MICK 2



- 1 Connection block
- 2 Intermediate plate
- 3 Ancillary block for intermediate plate
- 4 Valve section
- 5 Ancillary block for diverter
- 6 End plate for valve sections
- 7 End plate for ancillary blocks

Both pilot valves (1) and (3) switch all diverter valves simultaneously and in doing so release one of three consumer groups (A1/B1, A2/B2 or A3/B3). An integrated, hydraulic safety circuit checks that all diverter valves are in the correct switching position. Then, in the intermediate plate (position 2), a valve to the P-line shut-off is opened and the P-line relief is closed. Optionally, the valve to the P-line shut-off can be equipped with a displacement transducer or a position switch in order to monitor whether the diverter valves are in switching position 2 (e.g. work functions) or in switching position 1/3 (e.g. outriggers or travel drive).

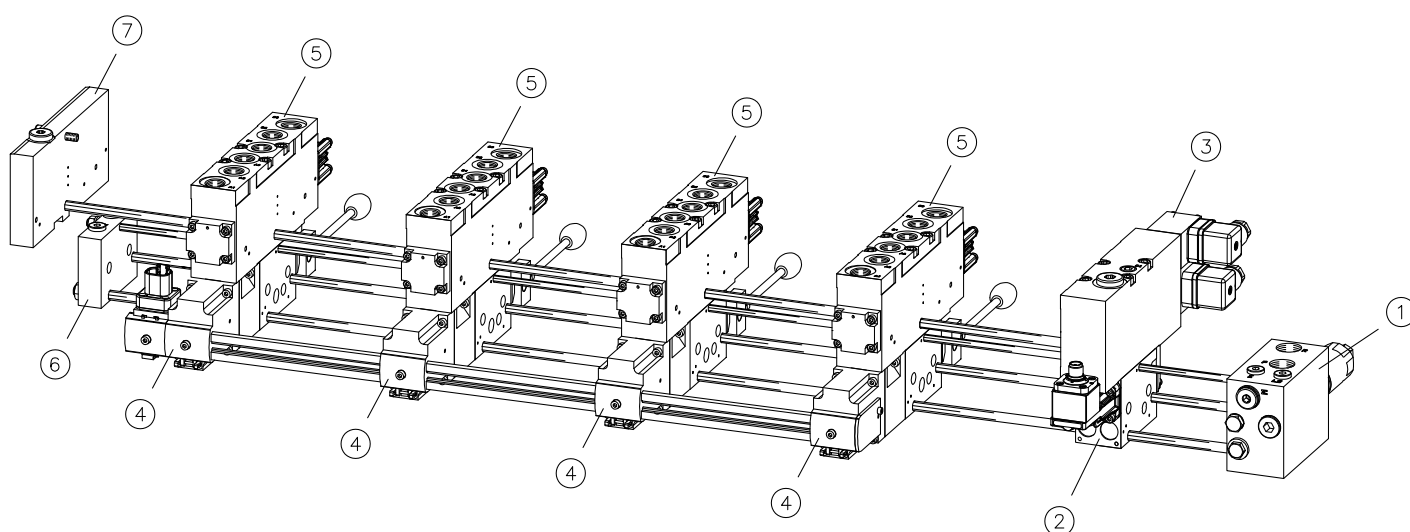


- 1 Chapter 2.1, "Connection block"
- 2 Chapter 2.2, "Intermediate plate"
- 3 Chapter 2.2.4, "Ancillary block" for intermediate plate
- 4 Chapter 2.3, "Valve section "
- 5 Chapter 2.3.2, "Ancillary block with diverter"
- 6 Chapter 2.4, "End plate" for valve sections
- 7 Chapter 2.4.2, "End plate for diverter ancillary blocks"

2 Available versions

Ordering example

MICK 2	Basic type and size
-PSL 3 H 1/D 420-2	2.1 "Connection block"
-ZPL 2 H/IU-M12/PM 1-14	2.2 "Intermediate plate"
-A2 HW 40/40/EACAN-E/222 C200/I	2.3 "Valve section "
-E 4/E 0	2.4 "End plate"
-DT-DT 24 TH	2.5 "Solenoid voltage and solenoid version"



- 1 Chapter 2.1, "Connection block"
- 2 Chapter 2.2, "Intermediate plate"
- 3 Chapter 2.2.4, "Ancillary block" for intermediate plate
- 4 Chapter 2.3, "Valve section "
- 5 Chapter 2.3.2, "Ancillary block with diverter"
- 6 Chapter 2.4, "End plate" for valve sections
- 7 Chapter 2.4.2, "End plate for diverter ancillary blocks"

A single manifold can merge up to 13 valve sections.

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 two basic variants:

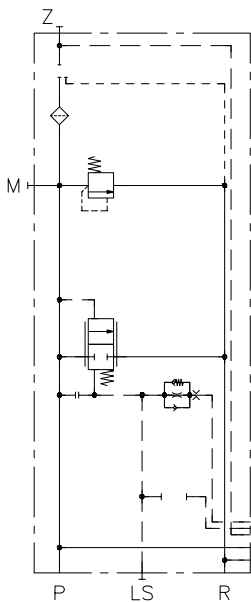
- **PSL:** Connection block with integrated 3-way controller for use in Open Center systems with constant pumps
- **PSV:** Connection block without 3-way controller for use in Closed Center systems with variable pumps or for simultaneous supply of two or more manifolds from a shared constant pump

Ordering example

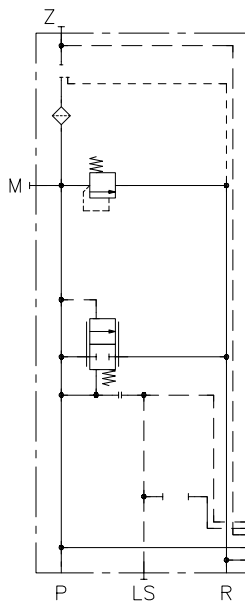
PSL 3	H	G	1	F	/420	-2
						2.1.9 "Size"
						2.1.8 "System pressure limitation"
						2.1.7 "LS relief or LS pressure limitation"
						2.1.6 "Internal control oil supply"
						2.1.5 "LS damping elements"
						2.1.4 "Additional elements for 3-way controller"

- Basic type**
- 2.1.1 "Basic version"
 - 2.1.2 "Ports for P and R"
 - 2.1.3 "Connection block basic types"

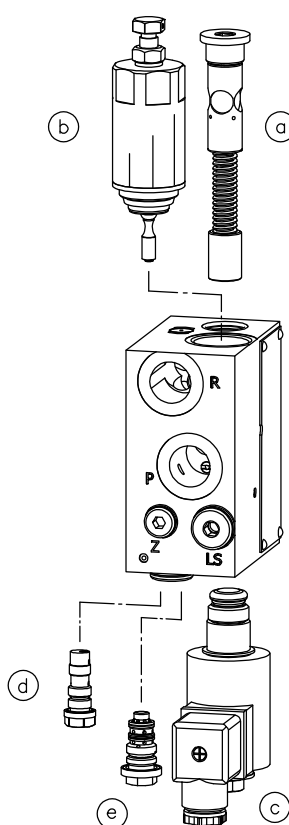
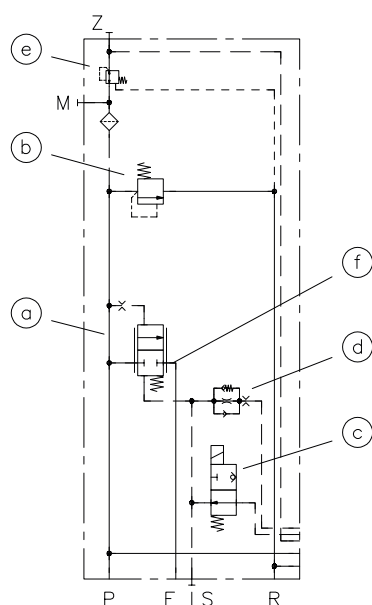
PSL



PSV



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. A valve for LS relief or LS pressure limitation
- 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



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)
UNF 2	SAE-8 or 3/4-16 UNF-2B (SAE J 514)
UNF 4	SAE-12 or 1 1/16-12 UN-2B (SAE J 514)

2.1.3 Connection block basic types

PSL connection blocks

Type	Description
PSL 3.../D...-3 PSL UNF 2.../D...-2	Standard connection block with integrated 3-way controller. Pressure-limiting valve: direct actuation
PSL 3U.../...-2 PSL UNF 2U.../...-2	Additional idle circulation valve for automatic reduction of circulation pressure. In order to reliably close the idle circulation valve, the LS pressure must be at least 20 bar. If the LS pressure then falls below 25% of the pump pressure, the valve returns to idle circulation and the P gallery is relieved to the reflux. Electro-hydraulic actuation with internal control oil supply requires a pump flow rate of at least 60 l/min; otherwise, there will not be enough pilot pressure available to actuate the spools. Pressure-limiting valve: pilot-controlled
PSL 3 Z.../D...-2 PSL UNF 2 Z.../D...-2	Additional release valve for quick release of pressure 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 to the reflux. The LS pressure in the 3-way controller's spring cavity is released to R. Common applications include systems that are susceptible to vibration and combinations with load-holding valves. Pressure-limiting valve: direct actuation  NOTICE A spacer plate ZPL 22/7 is included below; this is not included in the order coding.
PSL 3 Y.../D...-2	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

Type	Description
PSL 3 C...D/...-2 PSL 3 CR...D/...-2	Additional integrated copier valve (LS booster valve) Via the optional blocking of the 3-way controller (Chapter 2.1.4), this connection block can also be operated with a variable pump as a closed-centre load-sensing valve (like PSV). In this case, the copier valve amplifies the externally reported LS signal and can thus compensate for losses in the LS line or at the pump controller. There are two versions: ▪ C: fixed ▶ selectable LS pressure increases - 2 bar - 10 bar - 15 bar - 20 bar ▪ CR: manually adjustable ▶ selectable LS pressure settings - 5 to 15 bar Ordering example: PSL 3 CR 10 T B 1/D...-2 Version LS pressure increase Pressure limitation: directly actuated ! NOTICE Depending on the LS damping element (Chapter 2.1.5), the copied pressure may increase further. The stronger the damping, the higher the increase.

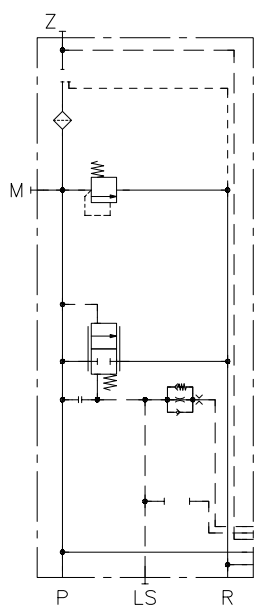
PSV connection blocks

Type	Description
PSV 3...-2 PSV UNF 2...-2	Standard connection block without 3-way controller. Pressure-limiting valve: without
PSV 3.../D...-2 PSV UNF 2.../D...-2	Standard connection block without 3-way controller. Pressure-limiting valve: direct actuation
PSV 4 N.../.../...-2 PSV UNF 4 N.../.../...-2	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) Also available with external hydraulic actuation. The P-channel lock is open unless min. pump pressure is present. - PSV 4 N 7490 105 E...: without EM, with external hydraulic connection Optionally, an additional LS release valve is available to depressurise the LS signal and switch the pump to standby pressure. - PSV (UNF) 4 N V: LS relief, closed when unpowered (EM 11 V as per D 7490/1) - PSV (UNF) 4 N Z: LS relief, open when unpowered (EM 11 S as per D 7490/1) - PSV (UNF) 4 N ZM: LS relief, open when unpowered, with wing bolt for mechanical locking (EM 11 S-...-M) - PSV (UNF) 4 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) 4 N../X-3 Only possible in conjunction with LS damping (see Chapter 2.1.5) Ordering example: PSV 4 N B 61ZM/220/200-2 - Setting for main pressure-limiting valve: 220 bar - Setting for LS pressure-limiting valve: 200 bar ! 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 nominal value may fall short of Q_{nominal} by up to 30%, see Chapter 2.3.1.6.

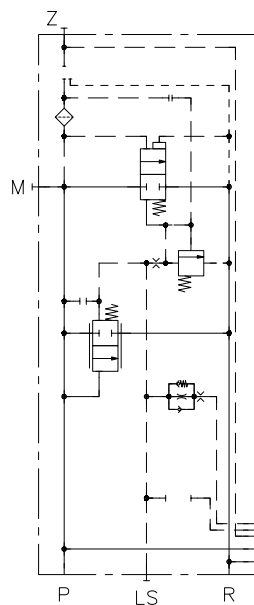
Type	Description
PSV 3X...-2	Special version - without 3-way controller - without pressure-limiting valve - Without pressure reducing valve for internal control oil supply (only possible for E0A, E0H, E0Z, E0AR, E0K) - without interface for LS pressure-limiting valve or LS release valve Only for EDL valve sections or PSL/PSV with actuations A, H and P. Damping in LS: Standard - none B4, B5, ...: with orifice $\varnothing$ 0.4, 0.5, ...; e.g. PSV 3X B5-2  NOTICE No retrofitting on electro-hydraulic actuation E.. possible.

Circuit symbols

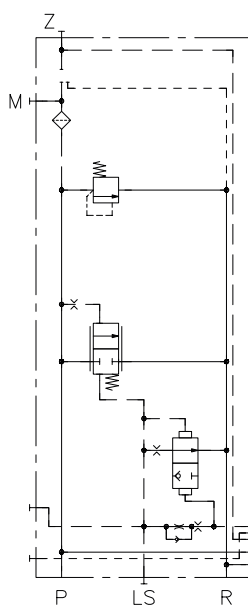
PSL 3.../D...-2
PSL UNF 2.../D...-2



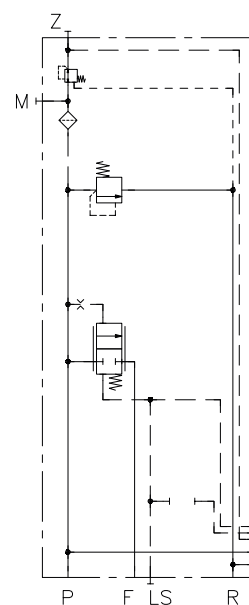
PSL 3U.../...-2
PSL UNF 2U.../...-2



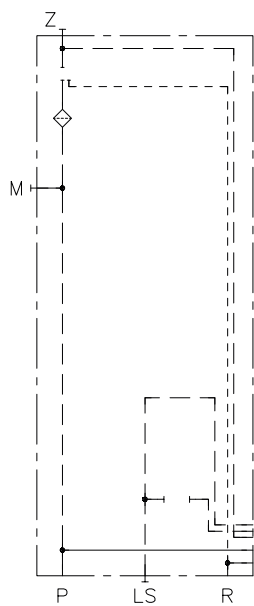
PSL 3 Z.../D...-2



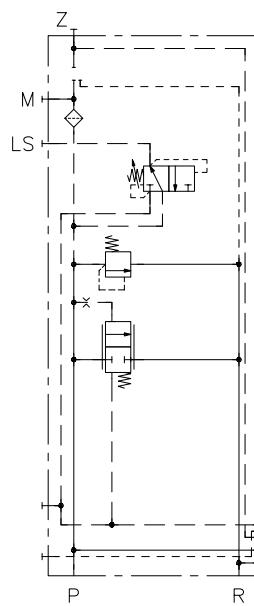
PSL 3 Y.../D...-2



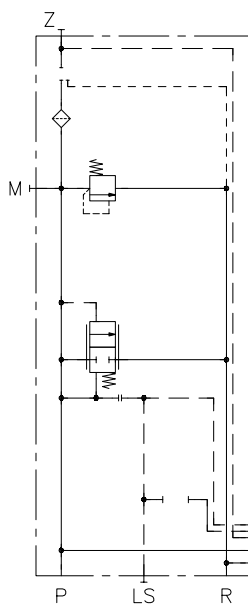
PSV 3...-2
PSV UNF 2...-2



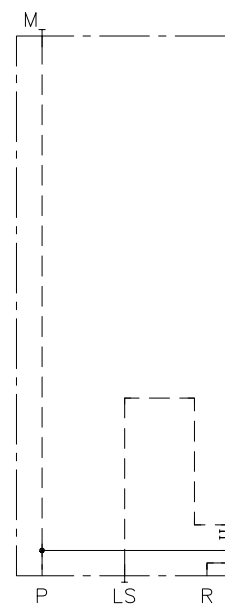
PSL 3 C... D/...-2
PSL 3 CR... D/...-2



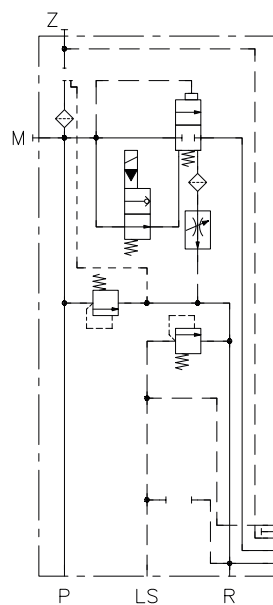
PSV 3.../D...-2
PSV UNF 2.../D...-2



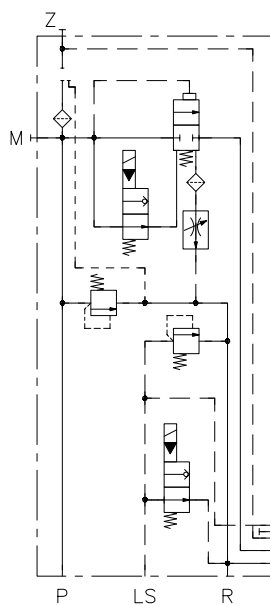
PSV 3X...-2



PSV 4 N.../.../...-2
PSV UNF 4 N.../.../...-2



PSV 4 N...Z/.../...-2
PSV UNF 4 N...Z/.../...-2



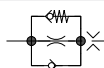
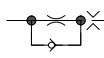
2.1.4 Additional elements for 3-way controller

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

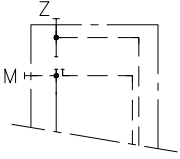
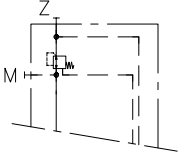
! NOTICE

Only available for connection block **PSL 3 Z.../D...-2**.

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	Ø 0.8 mm orifice	
B 4 B 5 B 6 B 7	Ø 0.4 / 0.5 / 0.6 / 0.7 mm orifice	
B 55	Two Ø 0.5 mm orifices in series	
B 55	Two Ø 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.	

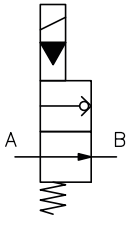
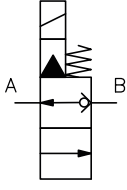
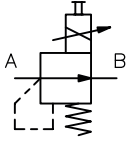
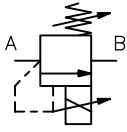
2.1.6 Internal control oil supply

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).	
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	

2.1.7 LS relief or LS pressure limitation

For the connection blocks with EM 2... interface:

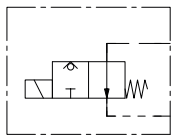
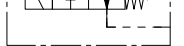
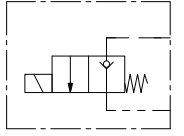
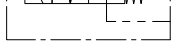
- PSL 3.../D...-2, PSL UNF 2.../D...-2
- PSL 3 U.../...-2, PSL UNF 2U.../...-2
- PSL 3 Y.../...-2 PSV 3...-2, PSV UNF 2...-2
- PSV 3.../D...-2
- PSV UNF 2.../D...-2

Coding	Description	Circuit symbol
without coding	Without LS relief or LS pressure limitation	
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) Contains adapter for EM 2.. hole to EM ..	
VA	LS relief, closed when unpowered (EM 11 V as per D 7490/1) Contains adapter for EM 2.. hole to EM ..	
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)	
V	Proportional LS pressure limitation with descending characteristic line (EM 21 DE as per D 7490/1)	

! NOTICE
LS relief valves and LS pressure-limiting valves of types ZA, ZAM, ZAP, VA, F..., D... Z, ZM, ZP and V require the intake to be limited by means of LS damping, in order to ensure reliable release/pressure limitation, see [Chapter 2.1.5, "LS damping elements"](#)

For the connection blocks with WN hole pattern interface:

- PSL 3 Z.../D...-2

Coding	Description	Circuit symbol
without coding	Without LS relief or LS pressure limitation	 (LS)  (T)
F	LS relief, open when unpowered (WN 1 F as per D 7470 A/1)	 (LS)  (T)
D	LS relief, closed when unpowered (WN 1 D as per D 7470 A/1)	 (LS)  (T)

2.1.8 System pressure limitation

Coding	Description
without coding	Without pressure-limiting valve (only in the case of PSV)
/D...	With pressure-limiting valve Pressure setting in bar (adjustment range 50 to 420 bar). Directly actuated.
/...	With pressure-limiting valve (Adjustment range 50 to 420 bar) Pilot control of the 3-way controller via a pilot valve.
/.../...	With pressure-limiting valve and LS pressure-limiting valve (only for PSV 4 N and PSV UNF 4 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
-2	Size 2

For size 3, see [D 7700-3](#), 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	Max. recommended flow rate (l/min)	Pressure-limiting valve	
			direct actuation	pilot-controlled
PSL 3.../D...-2	G 1/2	80	●	
PSL 3 U.../...-2	G 1/2	100		●
PSL 3 Z.../D...-2	G 1/2	80	●	
PSL 3 Y.../D...-2	G 1/2	80	●	
PSL UNF 2.../D...-2	SAE-8 (3/4-16 UNF 2B)	80	●	
PSL UNF 2U .../...-2	SAE-8 (3/4-16 UNF 2B)	100		●

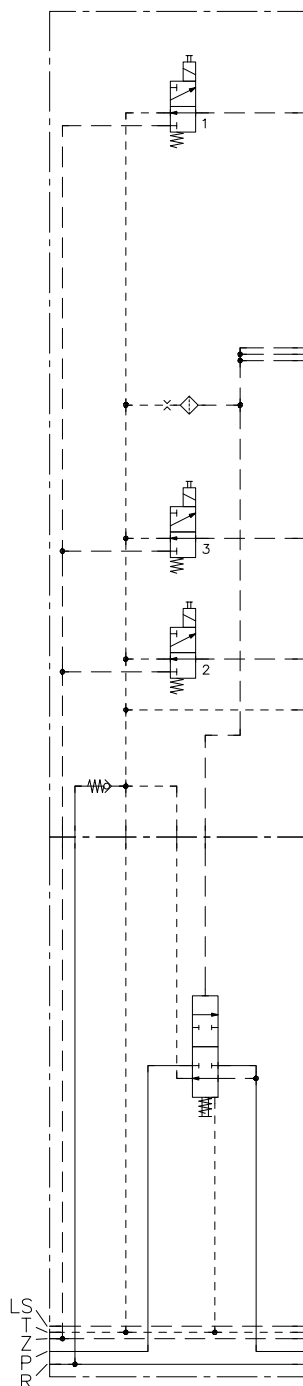
PSV connection blocks

Type	P and R port as per ISO 228-1 or SAE J 514	Max. recommended flow rate (l/min)	Pressure-limiting valve	
			without	direct actuation
PSV 3...-2	G 1/2	80	●	
PSV 3.../D...-2	G 1/2	80		●
PSV 4N.../.../...-2	G 3/4	100		●
PSV 3 X...-2	G 1/2	80	●	
PSV UNF 2...-2	SAE-8 (3/4-16 UNF 2B)	80	●	
PSV UNF 2.../D...-2	SAE-8 (3/4-16 UNF 2B)	80		●
PSV UNF 4 N.../.../...-2	SAE-12 (1 1/16-12 UN-2B)	100		●

2.2 Intermediate plate

The series intermediate plate consists of a base plate with spool valve to the P-line shut-off, see Chapter 2.2.1, "Base plate", and an ancillary block built on it with three pilot valves for switching the diverter valves and the P-line shut-off, see Chapter 2.2.4, "Ancillary block".

Base section with ancillary block



Ordering example

MICK 2	-ZPL 2	H	/I	U-M12	/PM 1-14
--------	--------	---	----	-------	----------

2.2.4 "Ancillary block"

2.2.3 "Switching position monitoring, displacement transducer"

2.2.2 "Housing and spring housing"

Valve spool

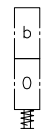
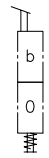
Series intermediate plate

Basic type and size

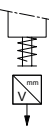
2.2.1 Base plate

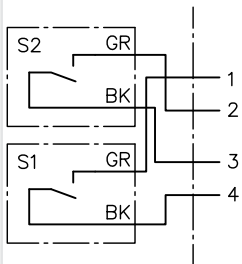
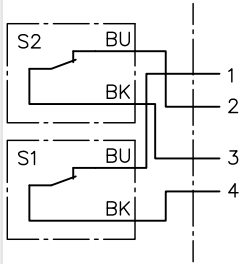
Coding	Description	Circuit symbol
-ZPL 2 H	Base plate with locked spool valve in the neutral position (coding H)	

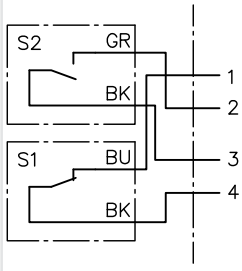
2.2.2 Housing and spring housing

Coding	Description	Circuit symbol
I	Housing and spring housing without additional functions	
A	Spring housing without additional functions. Housing with control lever to mount a contact switch or proximity switch	

2.2.3 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: DT, M12, X Ordering example: MICK 2-ZPL 2 H/IU-M12	
WA	Integrated displacement transducer (Hall sensor) for spool valve position monitoring with analogue output signal. Connector types: DT, X, G, C Ordering example: MICK 2-ZPL 2 H/IWA-DT ! NOTICE Not possible if an LS pressure limitation or LS release valve with coding V, Z or ZM is selected in the connection block. The electric field of the solenoid influences the displacement transducer.	

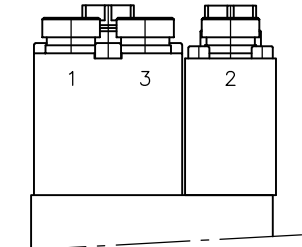
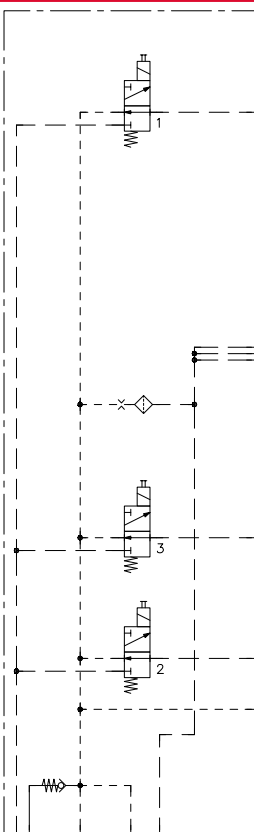
Coding	Description	Circuit symbol
VCHO VCHO2K	Contact switch for monitoring spool valve position. Direction detection direction A (S2) and B (S1) as normally open contact (NO)  ▪ VCHO: With connector, without cable ▪ VCHO2K: With connector and 2 m cable Ordering example: MICK 2-ZPL 2 H/AVCHO Only in conjunction with ▪ Housing and spring housing coding A, see Chapter 2.2.2, "Housing and spring housing"	
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: MICK 2-ZPL 2 H/AVCHC Only in conjunction with ▪ Housing and spring housing coding A, see Chapter 2.2.2, "Housing and spring housing"	

Coding	Description	Circuit symbol
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: MICK 2-ZPL 2 H/AVCHOC Only in conjunction with ▪ Housing and spring housing coding A, see Chapter 2.2.2, "Housing and spring housing"	

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

2.2.4 Ancillary block

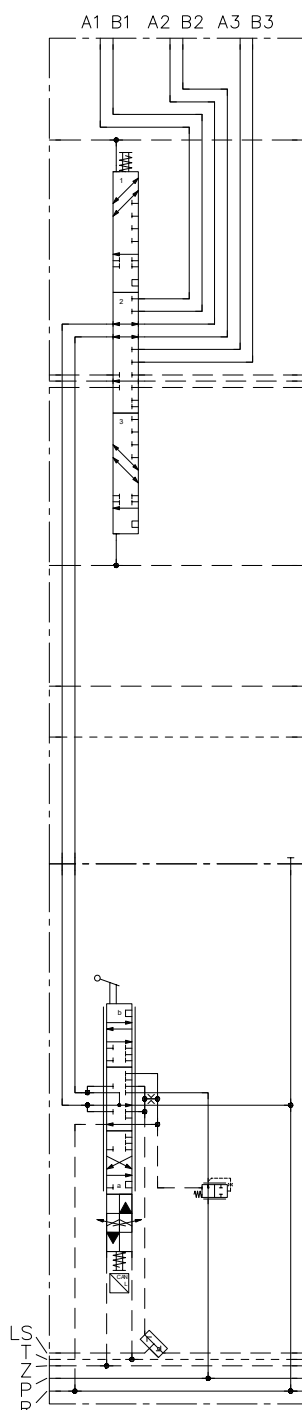
The ancillary block includes three pilot valves for switching the diverter valves and the P-line shut-off. The arrangement of the solenoids, the three buttons for emergency override and the respective switching position is shown in [see Chapter 2.2, "Intermediate plate"](#).

Coding	Description	Circuit symbol
/PM 1-14	Ancillary block with three pilot valves for switching the diverter valves and the P-line shut-off without additional pre-load valve. - Valve 2 is operated via a single-action solenoid and switches the P-line shut-off. - Valves 1 and 3 are operated via a twin solenoid and switch the P-line shut-off and the diverter valves. - Valve 1 switches the diverter valves to switching position 1. Valve 3 switches them to switching position 3. - The pilot pressure is relieved via a orifice. Arrangement of emergency override button to pilot valve:  1 Pilot valve 1 2 Pilot valve 2 3 Pilot valve 3	

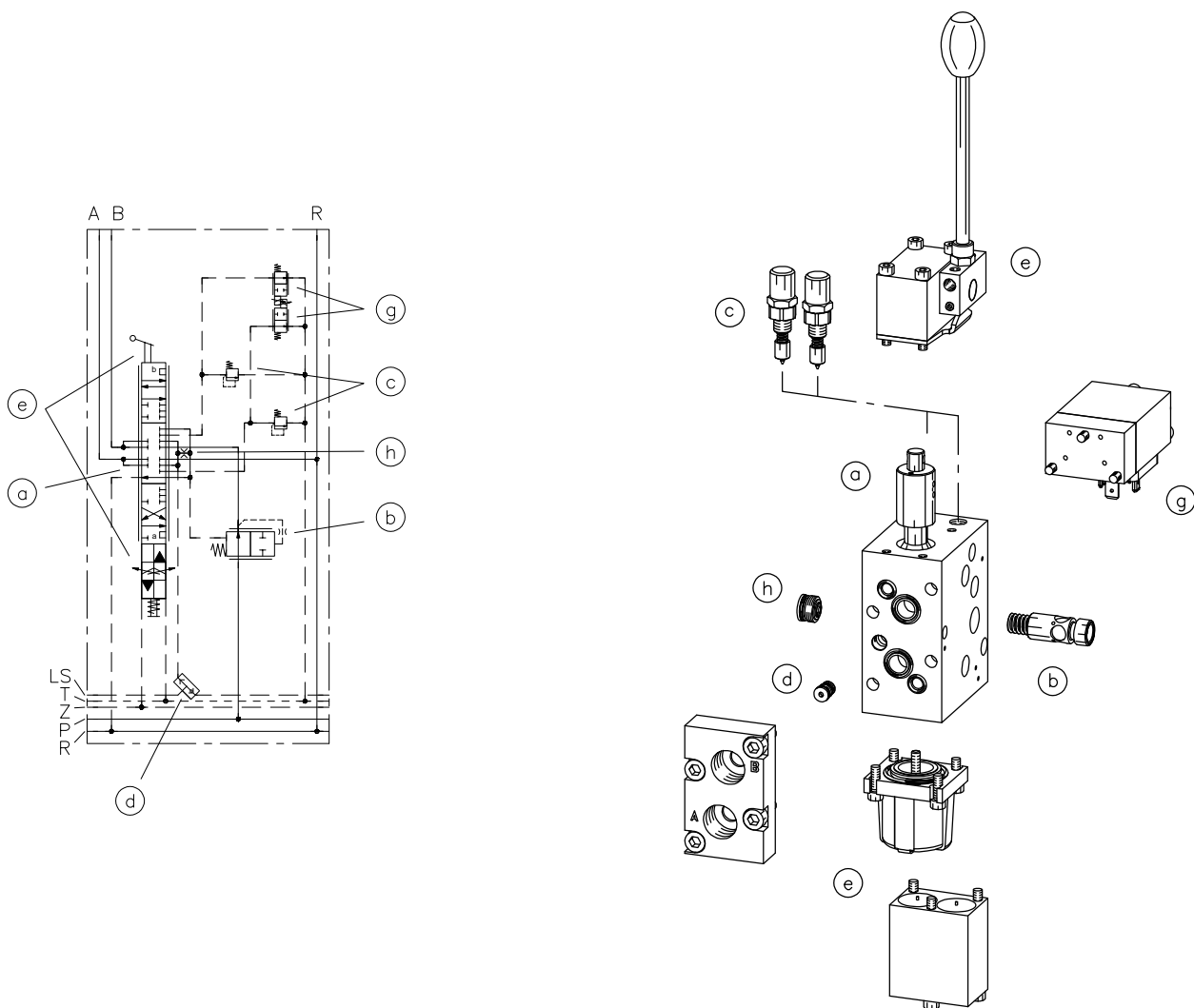
2.3 Valve section

The valve section consists of the base section (see Chapter 2.3.1, "Basic section") onto which an ancillary block with a diverter valve (see Chapter 2.3.2, "Ancillary block with diverter") is mounted.

Base section with ancillary block



Depending on the configuration, the directional valve sections incorporate



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

Ordering example

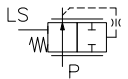
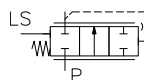
SL 2	-A	R2	H 40/40	A200 B300 F3	9	W1	L	/EA1	WA
									2.3.1.15 "Switching position monitoring, displacement transducer"
								Actuation	2.3.1.13 "Actuation" 2.3.1.14 "Additional elements for actuation"
									2.3.1.12 "Additional functions"
									2.3.1.11 "Shuttle valve"
									2.3.1.10 "LS orifice"
								LS pressure limitation	2.3.1.7 "LS pressure limitation" 2.3.1.8 "Electric LS relief or LS pressure limitation" 2.3.1.9 "LS port for external limitation"
								Valve spool	2.3.1.5 "Circuit symbol" 2.3.1.6 "Flow rate"
								Valve section, 2-way controller	2.3.1.2 "2-way controller" 2.3.1.3 "2-way controller spring" 2.3.1.4 "2-way controller damping"
									2.3.1.1 "Consumer ports"

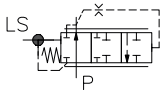
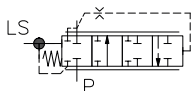
2.3.1 Basic section

2.3.1.1 Consumer ports

Coding	Description
A	Spool block without integrated thread for combining with an ancillary block ("Ancillary block with diverter") or an intermediate plate ("Intermediate plate")

2.3.1.2 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 2.3.1.3	

Coding	Description	Circuit symbol
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. Typical applications - 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.	
B	2-way controller with release of pressure and check valve function 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 channel. Release of pressure: The controller prevents pressure creep in the P channel between the 2-way controller and valve spool. Typical applications - 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. Only in conjunction with 2-way controller spring coding 2 and 5, Chapter 2.3.1.3	



NOTICE

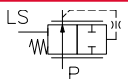
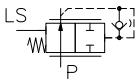
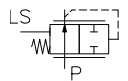
2-way controller depicted with applicable LS pressure.

For B and R: $LS > P$

2.3.1.3 2-way controller spring

Coding	Description
without coding	Without coding for configurations without 2-way controller (coding 1 or 8 Chapter 2.3.1.2)
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

2.3.1.4 2-way controller damping

Coding	Description	Circuit symbol
without coding	Standard version (damping with $\varnothing 0.4$ mm orifice)	
S	Special version with closing damping Only in conjunction with standard 2-way controller (without coding) Chapter 2.3.1.2 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 2.3.1.2	

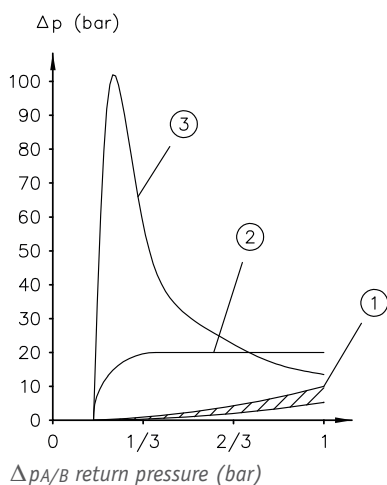


NOTICE

2-way controller depicted with applicable LS pressure.

2.3.1.5 Circuit symbol

Coding	Description	Circuit symbol			
L, M, F, H	Standard spool valve with low return pressure				
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.				
I, Y, V	Standard spool valve with high reflux at < 1/3 spool stroke and rapid subsequent return pressure drop. Common applications: Controlled deceleration of winches, slewing gear or other rotating consumers.				



- 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	Special version with broad fitting tolerance. - Advantage: reduces risk of jamming spool valve in systems prone to soiling. - Drawback: higher spool valve leak rate	LW	MW	HW	JW	OW
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	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 NX spool valve.					G
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 2.3.1.13 that have stroke limitation. Available versions: - X 40 - W 30/30	X		W		

NOTICE

- For instructions on how to replace the valve spool, [Chapter 5.2.4](#).

2.3.1.6 Flow rate

Coding 2-way controller spring, see Chapter 2.3.1.3	Coding Flow rate (Q_{nominal} in l/min) With maximum spool valve actuation					
	3	6	10	16	25	40
2	3	6	10	16	25	40
5	4	9	14	22	34	54
7	5	10	15	24	37	59

Flow rate for coding 1 and 8

On valve sections without a 2-way controller (coding 1 or 8, see Chapter 2.3.1.2, "2-way controller"), it is possible to calculate the flow rate using the following formula:

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

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

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

$\Delta p_{\text{controller}}$ = 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)

$$Q_{A/B} = 40 \text{ l/min} \cdot \sqrt{0,2 \cdot 9} = 54 \text{ l/min}$$

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

$$Q_{A/B} = 40 \text{ l/min} \cdot \sqrt{0,2 \cdot 14} = 67 \text{ l/min}$$

! 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 P channel shut-off (coding PSV 4 N or PSV UNF 4 N as per Chapter 2.1.1 or coding ZPL 2 H 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 nominal value may fall short of Q_{nominal} by up to 30%, Chapter 2.3.1.6.

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 2.3.1.5, "Circuit symbol"](#).

- **Ordering example:** L 40/25, J 40/16, H 40/40, O 25/10

Flow rate setting value

The valve spools' sizes are designed to make actual flow rate slightly higher than Q_{nominal} in practice. If the actuation includes a mechanical spool stroke limitation, this is set to the nominal flow rate as standard (see [Chapter 2.3.1.13, "Actuation"](#))

If the spool stroke should not be limited or should be set to a lower value, this can be specified in the type designation using two separate bracket values.

Not possible in conjunction with CAN actuation, see [Chapter 2.3.1.13, "Actuation"](#).

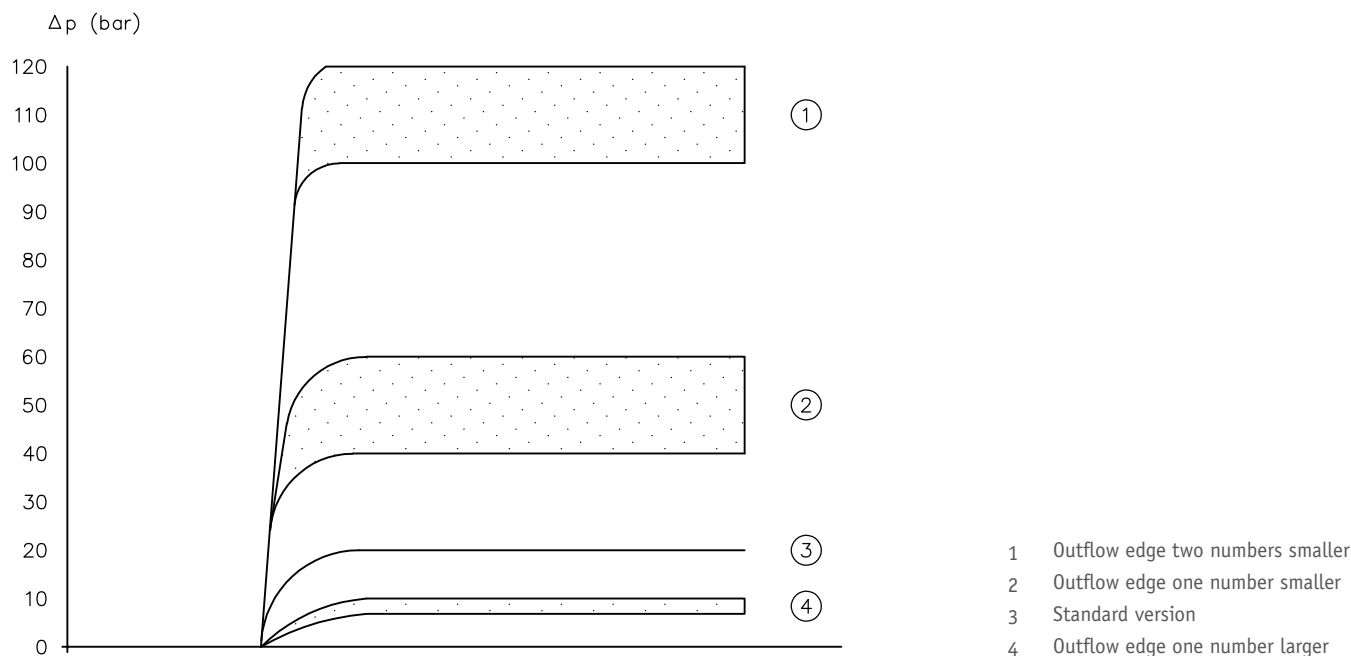
- **Ordering example:** SL 2-A2 L 25/40/EA (22/35)
Setting values: A – 22 l/min, B – 35 l/min
- **Ordering example:** SL 3-A2 L 25/400/EA (20/-)
Setting values: A – 20 l/min, B – no stroke limitation

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 25/40-16, O 25-16/40-25



! NOTICE

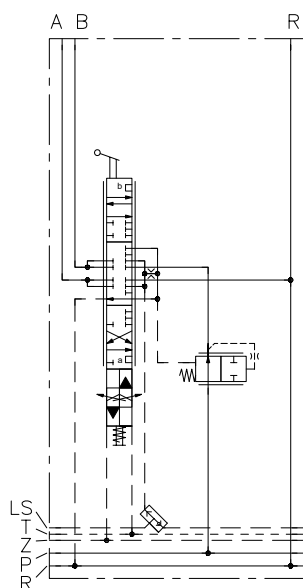
The return pressure is in relation to the nominal flow rate. It may be higher or lower than shown in the diagram depending on the cylinder ratio or 2-way controller spring.

2.3.1.7 LS pressure limitation

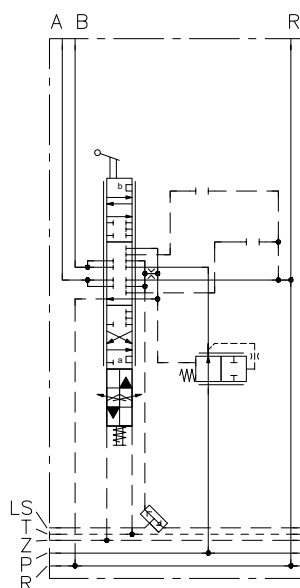
Coding	Description	View
without coding	Without LS pressure limitation	-
AB	Without LS pressure limitation, but prepared for later conversion to coding A.., B.. or A.. B..	
A..	LS pressure limitation for A-side (Adjustment range: 50 to 400 bar)	
B..	LS pressure limitation for B-side (Adjustment range: 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)	

Circuit symbols

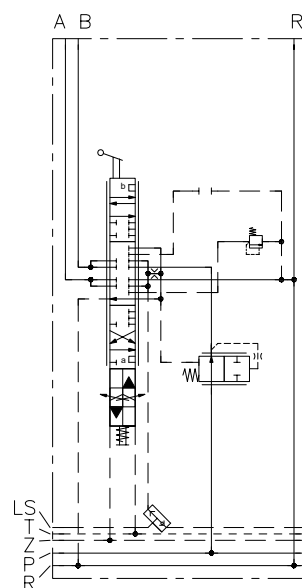
without coding



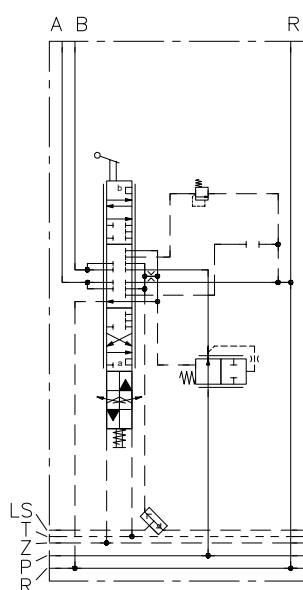
AB



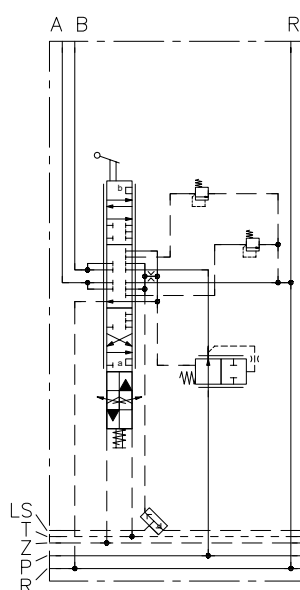
A..



B..



A.. B..



NOTICE

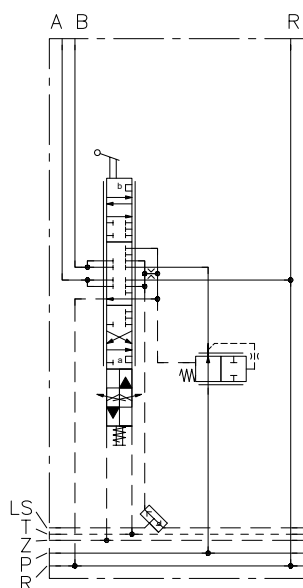
LS pressure limitation is only available in conjunction with a 2-way controller ([Chapter 2.3.1.2](#)).

2.3.1.8 Electric LS relief or LS pressure limitation

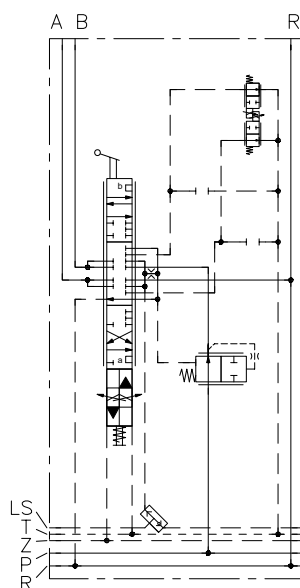
Coding	Description						
without coding	Without electric LS relief or LS pressure limitation						
FP.. FPH..	Electro-proportional LS pressure limitation with ascending characteristic line Pressure ranges for A and for B-side <table><tr><td>▪ 1 = 10 to 100 bar</td><td>▪ 4 = 30 to 250 bar</td></tr><tr><td>▪ 2 = 15 to 150 bar</td><td>▪ 6 = 40 to 350 bar</td></tr></table> i INFORMATION 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 LS DBV... (Chapter 2.3.1.13)	▪ 1 = 10 to 100 bar	▪ 4 = 30 to 250 bar	▪ 2 = 15 to 150 bar	▪ 6 = 40 to 350 bar		
▪ 1 = 10 to 100 bar	▪ 4 = 30 to 250 bar						
▪ 2 = 15 to 150 bar	▪ 6 = 40 to 350 bar						
FPC-S.. FPC-R../..	Electro-proportional LS pressure limitation 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><td>Consumer ports (Chapter 2.3.1.1)</td><td>LS pressure limitation (Chapter 2.3.1.7)</td><td>Actuation (Chapter 2.3.1.13)</td></tr><tr><td>SL 2-A..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr></table>	Consumer ports (Chapter 2.3.1.1)	LS pressure limitation (Chapter 2.3.1.7)	Actuation (Chapter 2.3.1.13)	SL 2-A..	AB, A..B.., A.., B..	with E
Consumer ports (Chapter 2.3.1.1)	LS pressure limitation (Chapter 2.3.1.7)	Actuation (Chapter 2.3.1.13)					
SL 2-A..	AB, A..B.., A.., B..	with E					
FPCX	Prepared for electro-proportional LS pressure release FPC-S.. and FPC-R../.. Only in conjunction with: <table><tr><td>Consumer ports (Chapter 2.3.1.1)</td><td>LS pressure limitation (Chapter 2.3.1.7)</td><td>Actuation (Chapter 2.3.1.13)</td></tr><tr><td>SL 2-A..</td><td>AB, A..B.., A.., B..</td><td>with E</td></tr></table>	Consumer ports (Chapter 2.3.1.1)	LS pressure limitation (Chapter 2.3.1.7)	Actuation (Chapter 2.3.1.13)	SL 2-A..	AB, A..B.., A.., B..	with E
Consumer ports (Chapter 2.3.1.1)	LS pressure limitation (Chapter 2.3.1.7)	Actuation (Chapter 2.3.1.13)					
SL 2-A..	AB, A..B.., A.., B..	with E					

Circuit symbols

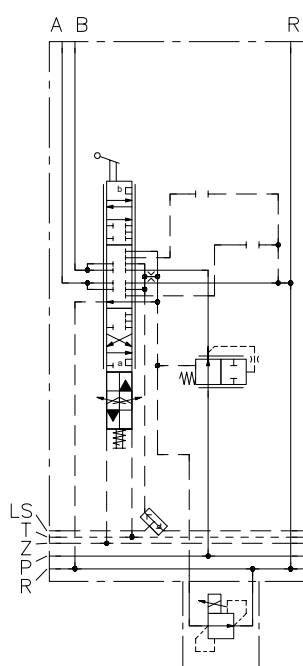
without coding



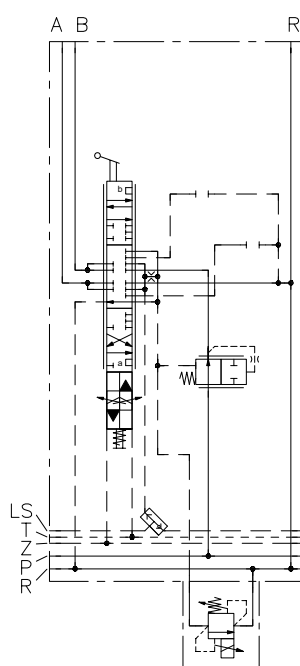
FP., FPH..



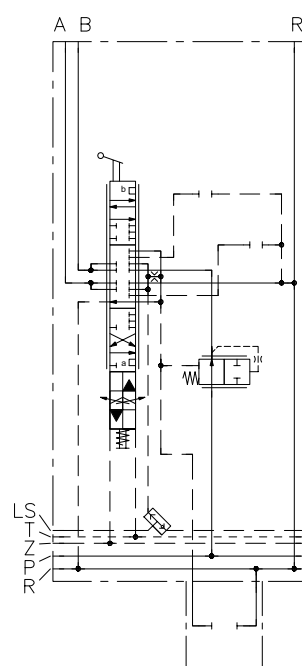
FPC-S..



FPC-R../..



FPCX



NOTICE

Electric LS relief or LS pressure limitation is only available in conjunction with a 2-way controller, [Chapter 2.3.1.2](#)

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

NOTICE

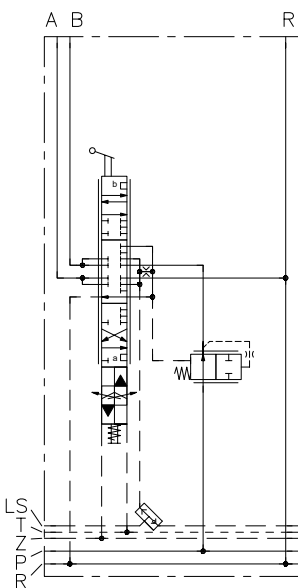
The electrical LS relief or LS pressure limitation cannot be combined with circuit symbols with a wide fitting tolerance, [Chapter 2.3.1.5](#)

2.3.1.9 LS port for external limitation

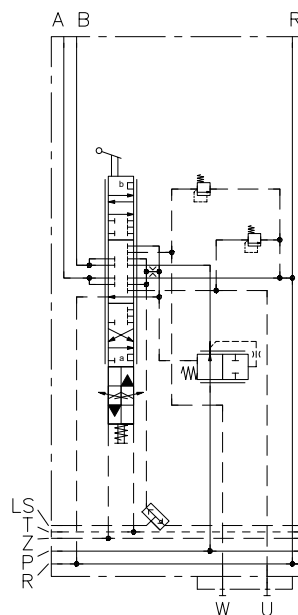
Coding	Description
without coding	Without LS port for external limitation
S1 S1 UNF	U and W port for connecting external pilot valve ▪ U port = LS_A ▪ W port = LS_B ▪ S1: G 1/8 (ISO 228-1) ▪ S1 UNF: SAE-2 or 5/16-24 UNF-2B (SAE J 514) Only in conjunction with ▪ LS pressure limitation coding AB, A..B.., A.., B.. (Chapter 2.3.1.7)

Circuit symbols

without coding



S1, S1 UNF



! NOTICE

An LS port for external limitation is only possible in conjunction with a 2-way controller (Chapter 2.3.1.2).

! 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:

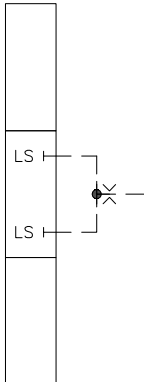
- a) control pressure in the 2-way controller ($\Delta p_{2\text{-way controller}}$)
- b) internal dynamic pressure in block (Δp_{Block})
- c) Return pressure (p_{reflux}).

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

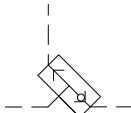
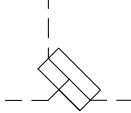
$\Delta p_{2\text{-way controller}}$: see Chapter 2.3.1.3

Δp_{Block} for coding S1 = 5 bar

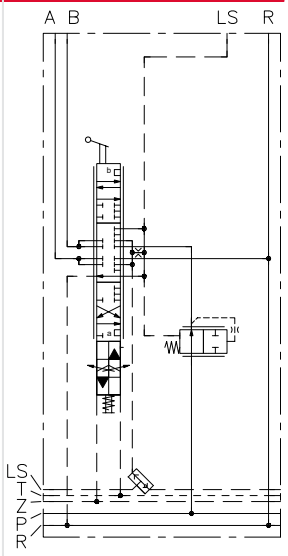
2.3.1.10 LS orifice

Coding	Description	Circuit symbol
without coding	Standard version with $\varnothing 0.6$ mm orifice	

2.3.1.11 Shuttle valve

Coding	Description	Circuit symbol
without coding	Standard version	
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.	

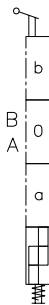
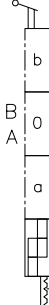
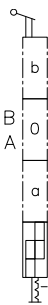
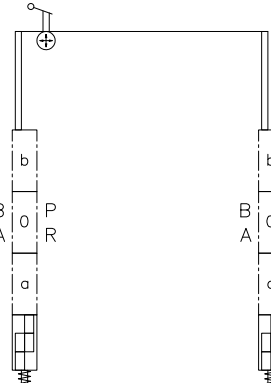
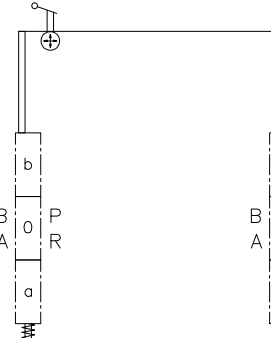
2.3.1.12 Additional functions

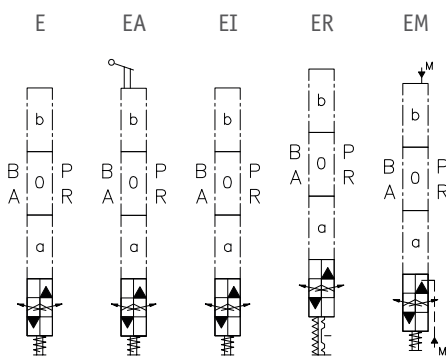
Coding	Description	Circuit symbol
L	Valve section with additional LS port facing ancillary block. The LS signal is picked up downstream of the LS orifice. Combination options ▪ The additional LS port is required for the ancillary block MICK 2-/222 C.../I or MICK 2-/UNF 222 C.../I, see Chapter 2.3.2, "Ancillary block with diverter". ▪ In conjunction with other ancillary blocks, the LS port is closed.	

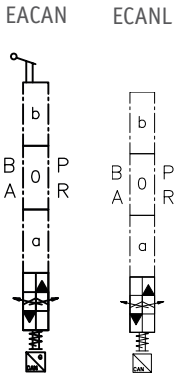
2.3.1.13 Actuation

Actuation types

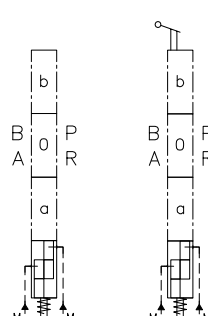
The different actuation types can be combined with one another.

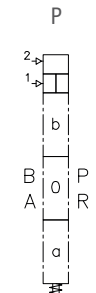
Coding	Description	Circuit symbol
Electro-hydraulic actuation prepared		
E0	Prepared for electro-hydraulic actuation	-
Manual actuation		
A	Manual actuation with spring return Only in conjunction with actuation variants: - EA, EACAN(L), EMA, EMACAN(L) - EOA, EOZA, EAR, EOAR - EHA, EOHA - EHACAN, EOZA, EOZMA	E0A  E0C  E0AR 
C	Manual actuation, infinitely variable Only in conjunction with actuation variants: C, EOC	E0K 
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	
K	Joystick actuation Combined manual actuation for two adjacent valve sections with shared 2-axis actuation. Only in conjunction with actuation variants: EOK ! NOTICE If the subsequent valve section is also to be equipped with a manual actuation, a ZPL 22 must be installed directly after the EOK actuation to avoid a collision between the hand levers.	K 

Coding	Description	Circuit symbol
Electro-hydraulic actuation		
E EI EM EM UNF	Electro-hydraulic actuation. E: with stroke limitation EI: no stroke limitation EM: with measurement fitting, with stroke limitation on spring housing and lever housing - EM: G 1/8 (ISO 228-1) - EM UNF: SAE-4 or 7/16-20UNF-2B (SAE J 514) Only in conjunction with actuation variants: - E, EA, EMA - ECAN(L), EICAN(L), EACAN(L), EMACAN(L), EHACAN(L) - EHA - ER, EAR - EI	

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) - EHACAN ! 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.	

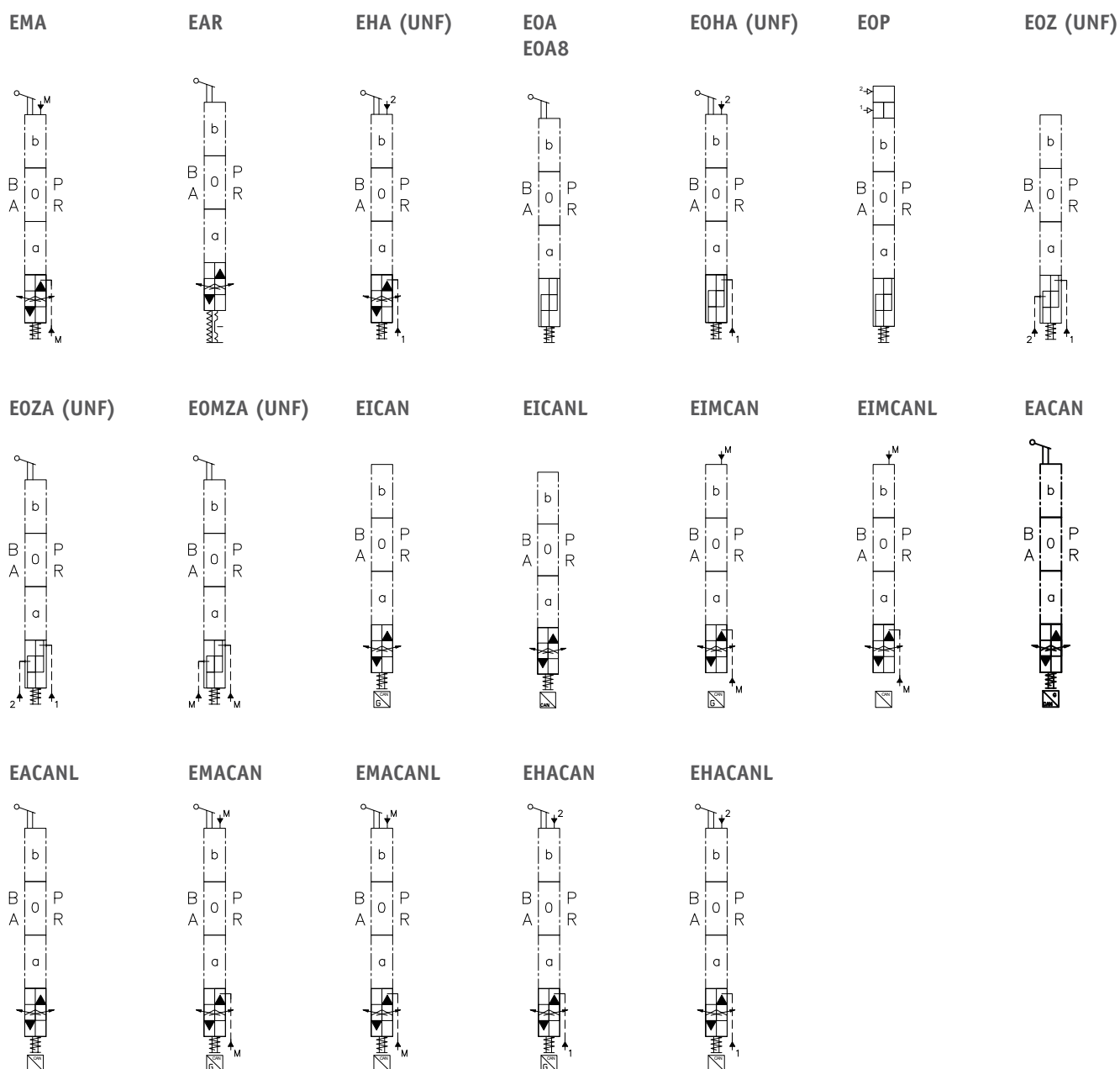
Coding	Description	Circuit symbol
Hydraulic actuation		
HA HA UNF	Combination of hydraulic and manual actuation with control pressure connections on the spring housing and lever housing. With stroke limitation. Ports 1 and 2 in spool valve axis. - HA: G 1/8 (ISO 228-1) - HA UNF: SAE-4 or 5/16-24 UNF-2B (SAE J 514) Only in conjunction with actuation variants: - EOHA - EHA - EHACAN	

Coding	Description	Circuit symbol
Z Z UNF	Hydraulic actuation with pilot pressure ports in the spool block beneath spring housing. ▪ Z: G 1/8 (ISO 228-1) ▪ Z UNF: SAE-2 or 5/16-24 UNF-2B (SAE J 514) Only in conjunction with actuation variants: ▪ EOZ ▪ EOZI ▪ EOZA, EOZA UNF ▪ EOZMA UNF	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: M10x1 with 24° sealing bevel Pilot pressure required: approx. 6–13 bar P_{max}: 15 bar Only in conjunction with actuation variants: ▪ EOP	P 

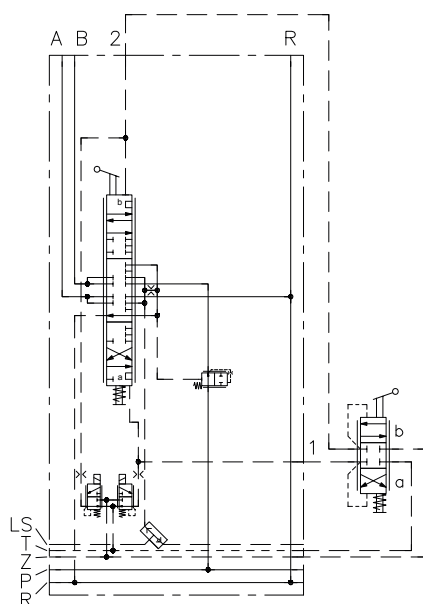
Actuation combinations

Actuation	combined with		= coding
manual	+ electro-hydraulic	--	= EA, EMA(UNF)
manual	+ hydraulic	--	= EOHA(UNF), EOZA, E0ZMA
electro-hydraulic	+ 3-stage detent	--	= ER
electro-hydraulic	+ manual	+ 3-stage detent	= EAR
electro-hydraulic	+ hydraulic	--	= EHA(UNF)

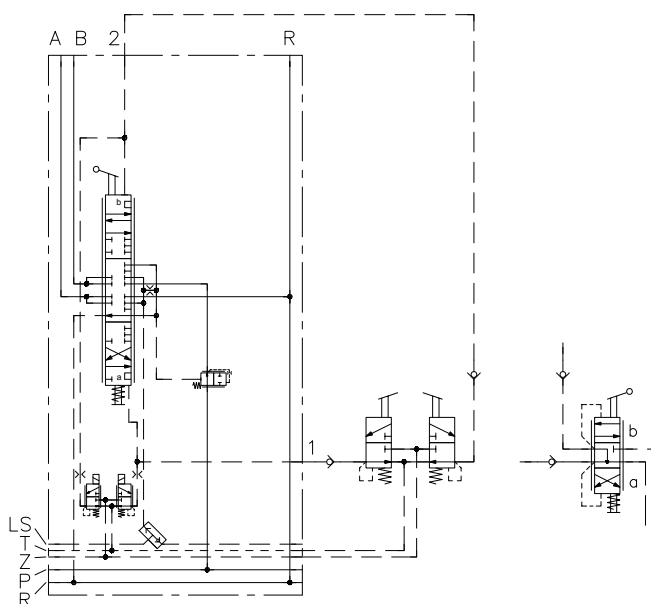


Combination with hydraulic joysticks

with closed centre position



with open centre position

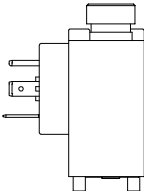
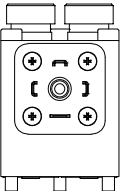


There are two $\varnothing 0.8$ mm orifices between the electro-hydraulic actuation's pilot valves and the pilot pressure ports 1 and 2. The control oil flow for the hydraulic joystick needs to be sufficiently large to compensate for bypass leakage through the orifice.

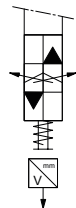
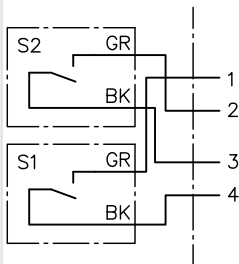
For joysticks with open centre position, pilot pressure ports 1 and 2 are connected to the tank when the joystick is in neutral position. Electro-hydraulic actuation would then result in the entire control oil flow escaping that way, and no pressure would be built up to shift the valve spool. For this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

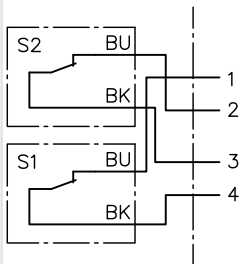
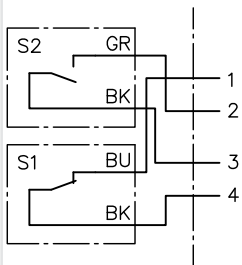
2.3.1.14 Additional elements for actuation

Coding	Description
without coding	Standard version Hand lever straight approx. 122 mm
1 2 3 4 005 015 025 030	Add-on for manual actuation 1: Without hand lever 2: Hand lever straight approx. 78 mm 3: Hand lever straight approx. 174 mm 4: Hand lever straight approx. 92 mm 005: Hand lever 5° curved approx. 122 mm 015: Hand lever 15° curved approx. 120 mm 025: Hand lever 25° curved approx. 115 mm 030: Hand lever 30° curved approx. 114 mm Ordering example: SL 2-A2 H 40/25 A150 B200/EA025/2
S	Reinforced version of spring housing made from steel (seaworthy version). Not in conjunction with the actuations as per coding - C - R - CAN - CANL
8 9	Additional description for stronger or weaker spring package 8: Actuation torques as for E actuation 9: Actuation torques as for H actuation Ordering example: SL 2-A2 H 40/25 A150 B200/EA9/2
BE...	Add-on for actuation E0Z, E0ZA. With restrictor check valve type BE 0-... as per D 7555 B in the ports. Ordering example: SL 2-A2 H16/16/E0Z BE0606
00 04 05 06 07	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 Ordering example: SL 2-A2 H16/16/E0Z 07 (if A and B are the same, 0.7 mm orifice here) SL 2-A2 H16/16/E0Z 0705 (if A and B are different, 0.7 mm orifice here in A and 0.5 mm orifice in B)

Coding	Description
H	Push buttons for the solenoid versions with manual override H, see Chapter 2.5.1, "PSV/PSL standard solenoid versions" Colours: ▪ Side A: white ▪ Side B: black  

2.3.1.15 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: DT, M12, X Ordering example: SL 2 A2 H16/16/EAU Only in conjunction with - Actuation coding E, EI, EA, EOZ, EOZI, EOZA, EOA, EOC and EOK Chapter 2.3.1.13	
WA	Integrated displacement transducer (Hall sensor) for spool valve position monitoring with analogue output signal. Connector types: DT, X, G, C Ordering example: SL 2 A2 H16/16/EAWA ! NOTICE Not possible if an LS pressure limitation or LS release valve with coding V, Z or ZM is selected in the connection block. The electric field of the solenoid influences the displacement transducer. Only in conjunction with Actuation coding E is the stroke limitation only possible for consumer A. Chapter 2.3.1.13 Only in conjunction with the ancillary blocks - /2 AL-0-..-BL-0-.. - /UNF 2 AL-0-..-BL-0-.., because this results in a collision.	
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 Ordering example: SL 2-A2 H16/16/EAVCHO Only in conjunction with - Actuation coding EA, EAR, ER, EOZA, EOA, EOC and EOAR (Chapter 2.3.1.13)	

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 2-A2 H16/16/EAVCHC Only in conjunction with ▪ Actuation coding EA, EAR, ER, EOZA, EOA, EOC and EOAR (Chapter 2.3.1.13)	
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 2-A2 H16/16/EAVCHOC Only in conjunction with ▪ Actuation coding EA, EAR, ER, EOZA, EOA, EOC and EOAR (Chapter 2.3.1.13)	

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

2.3.2 Ancillary block with diverter

Depending on the version, the ancillary blocks have either an 8/3-way diverter valve for connecting three double-acting consumers (e.g. outriggers, work functions and travel drive) or a 4/3-way diverter valve for which only one consumer is connected (e.g. because there are more work functions than outrigger and travel drive functions in the vehicle).

An LS pressure-limiting valve that acts on two of the three consumers (e.g. to limit the supply pressure for the outriggers and the travel drive) is optionally available.

The ancillary blocks have an integrated, hydraulic safety circuit which checks that all diverter valves are in the same switching position. They are switched centrally by the three pilot valves in the upstream ancillary block MICK 2-/PM 1-14, see Chapter 2.2.4, "Ancillary block".

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

- 2: G 3/8
- UNF 2: SAE-8 (3/4-16 UNF-2B)

Coding	Description	Circuit symbol
/222/I /UNF 222/I	8/3-way diverter valve for connecting three dual-acting consumers. ► Spring housing and housing without additional functions. ▪ /222/I: – A1, B1, A2, B2, A3, B3: G 3/8 ▪ /UNF 222/I: – A1, B1, A2, B2, A3, B3: SAE-8 (3/4-16 UNF-2B)	

Coding	Description	Circuit symbol
/222 C.../I /UNF 222 C.../I	8/3-way diverter valve for connecting three dual-acting consumers and additionally with an LS pressure-limiting valve for the four ports A1, B1, A3, B3. (Adjustment range: 50 to 250 bar) ► Spring housing and housing without additional functions. Only in conjunction with additional function coding L, see Chapter 2.3.1.12, "Additional functions" ▪ /222 C.../I: – A1, B1, A2, B2, A3, B3: G 3/8 ▪ /UNF 222 C.../I: – A1, B1, A2, B2, A3, B3: SAE-8 (3/4-16 UNF-2B) i INFORMATION ▪ By default, the maximum possible setting value is limited to 250 bar ▪ On request, up to 400 bar is also possible in conjunction with a 0.8 mm LS orifice (see Chapter 2.3.1.10, "LS orifice")	
/020/I /UNF 020/I	4/3-way diverter valve for connecting one dual-acting consumer. ► Spring housing and housing without additional functions. ▪ /020/I: – A2, B2: G 3/8 ▪ /UNF 020/I: – A2, B2: SAE-8 (3/4-16 UNF-2B)	

 NOTICE

- Ancillary blocks with a diverter are designed for use with consumers with load-holding valves or releasable check valves.
- They are only allowed to be switched in the unpressurised state. In other words, before switching the 8/3-way diverter valves, the 4/3-way spool valves from the base section first need to be switched back to the neutral position in order to relieve the pressure in A, B and LS.

2.4 End plate

End plates are the final element in a manifold and close off the valve bank. The PSL valve sections below and the diverter ancillary blocks above have their own respective and separate end plates, see Chapter 2.4.2, "End plate for diverter ancillary blocks".

2.4.1 End plate for PSL valve sections

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 17, E 17 UNF	T port for external recirculation of control oil to tank. E 17, E 17 UNF: with additional P and R port T: G 1/8 or SAE-4 (7/16-20 UNF-2B) P: G 3/8 or SAE-8 (3/4-16 UNF-2B) R: G 3/8 or SAE-8 (3/4-16 UNF-2B) Y: G 1/8 or SAE-4 (7/16-20 UNF-2B) - (sealed)  NOTICE Before the end plate, a 22 mm spacer plate (SL 2-ZPL 22/15 + SL 2-ZPL 22/7) is additionally required in order to prevent collision of the T or R port with the end plate of the diverter ancillary blocks.
E 4, E 4 UNF E 19, E 19 UNF	T-line internally linked with R-line for internal recirculation of control oil through R line. E 19, E 19 UNF: with additional P and R port T: G 1/8 or SAE-4 (7/16-20 UNF-2B) - (sealed) P: G 3/8 or SAE-8 (3/4-16 UNF-2B) R: G 3/8 or SAE-8 (3/4-16 UNF-2B) Y: G 1/8 or SAE-4 (7/16-20 UNF-2B) - (sealed)  NOTICE For E 19, a 22 mm spacer plate (SL 2-ZPL 22/15 + SL 2-ZPL 22/7) is additionally required before the end plate in order to prevent collision of the R port with the end plate of the diverter ancillary blocks.
E 2 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 18, E 18 UNF: with additional P and R port T: G 1/8 or SAE-4 (7/16-20 UNF-2B) P: G 3/8 or SAE-8 (3/4-16 UNF-2B) R: G 3/8 or SAE-8 (3/4-16 UNF-2B) Y: G 1/8 or SAE-4 (7/16-20 UNF-2B)  NOTICE Before the end plate, a 22 mm spacer plate (SL 2-ZPL 22/15 + SL 2-ZPL 22/7) is additionally required in order to prevent collision of the T or R port with the end plate of the diverter ancillary blocks.

Coding	Description
E 5, E 5 UNF 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 20, E 20 UNF: with additional P and R port ▪ T: G 1/8 or SAE-8 (7/16-20 UNF-2B) - (sealed) ▪ P: G 3/8 or SAE-8 (3/4-16 UNF-2B) ▪ R: G 3/8 or SAE-8 (3/4-16 UNF-2B) ▪ Y: G 1/8 or SAE-4 (7/16-20 UNF-2B) ! NOTICE For E 20, a 22 mm spacer plate (SL 2-ZPL 22/15 + SL 2-ZPL 22/7) is additionally required before the end plate in order to prevent collision of the R port with the end plate of the diverter ancillary blocks.
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 1/8 or SAE-4 (7/16-20 UNF-2B) ▪ E 6 - T: G 1/8 or SAE-4 (7/16-20 UNF-2B) - (sealed) ! NOTICE For E 6, a 22 mm spacer plate (SL 2-ZPL 22/15 + SL 2-ZPL 22/7) is additionally required before the end plate in order to prevent collision of the T port with the end plate of the diverter ancillary blocks.

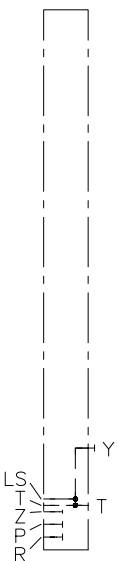


NOTICE

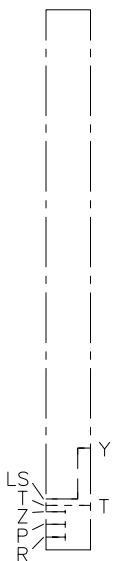
Internal control oil recirculation through R line is permissible only for return pressures < 10 bar.

Circuit symbols

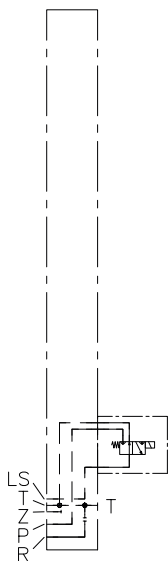
E 1, E 1 UNF



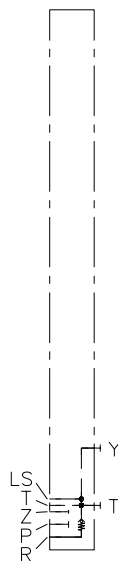
E 2, E 2 UNF



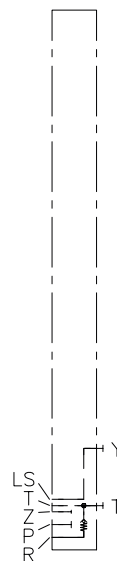
E 3



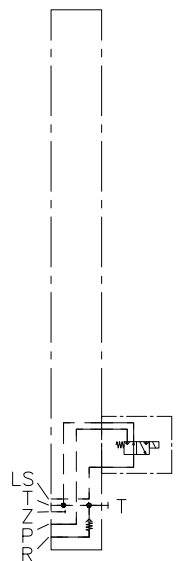
E 4, E 4 UNF



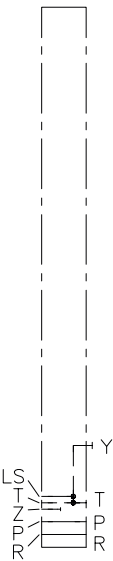
E 5, E 5 UNF



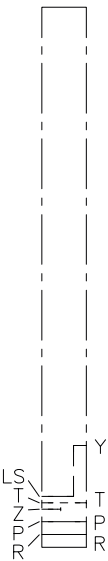
E 6



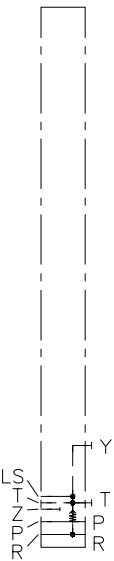
E 17, E 17 UNF



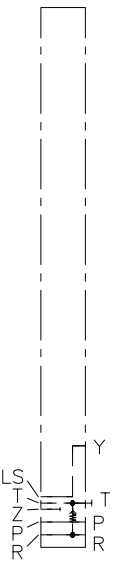
E 18, E 18 UNF



E 19, E 19 UNF



E 20, E 20 UNF



Coding

E 4 PMZ1-...-...

Description

Like E 4 but with a mounted proportional pressure reducing valve of type PMZ 1 as per [D 7625](#) up to approx. 30 bar.
Typical application is for supply to a brake.

Ordering example:

E 4 PMZ1	-30	-AMP 24 K 4
-----------------	------------	--------------------

Solenoid version and solenoid voltage

Coding PM - round insert assembly

Designation

Coding

Description

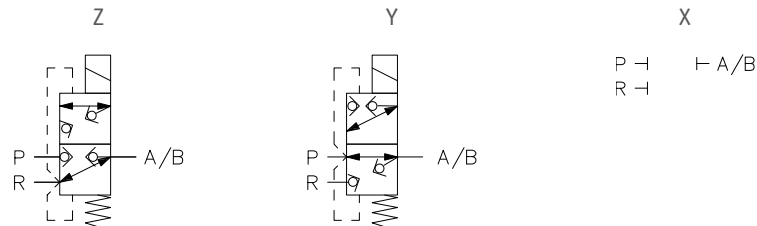
E 19 UNF-...-ADM 22 P...-...

T-line internally linked with R-line for internal recirculation of control oil through R line.
With additional P and R port.

The mounted pressure reducing valve ADM 22 P as per [D 7120](#) is upstream of two optional valves type NBVP 16 as per [D 7765 N](#). This means the pressure is set for consumers A and B.

- $p_{\max}$ A, B: 250 bar
- $Q_{\max}$ A, B: 20 l/min

Combination:



Ordering example:

E 19 UNF	-Z	X	-ADM 22 P	150	-DT 12	-AMP 24 K
						Solenoid version, if different from actuation
						Solenoid version actuations at PSL
						Pressure setting ADM 22 P
						Pressure reducing valve
						Seated valve NBVP 16 - consumer B
						Seated valve NBVP 16 - consumer A
						Designation / basic version

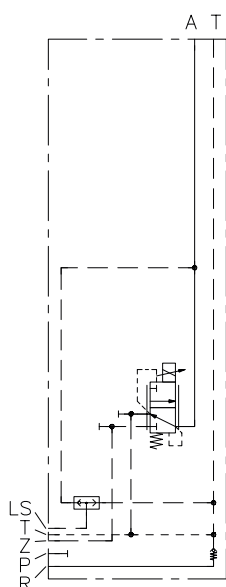


NOTICE

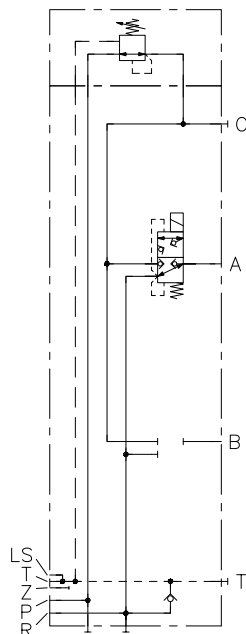
Before the end plate, a 22 mm spacer plate (SL 2-ZPL 22/15 + SL-ZPL 22/7) is additionally required in order to prevent a collision with the end plate of the diverter ancillary blocks.

Circuit symbols

E 4 PMZ1-...-...



E 19 UNF-...-



2.4.2 End plate for diverter ancillary blocks

Coding	Description	Circuit symbol
E 0	End plate without ports and additional functions ! NOTICE To prevent unwanted consumer pressure from creeping into one of the neighbouring ports, MICK ancillary blocks have internal relief channels. Depending on the number of sections actuated simultaneously in one direction, the respective consumer pressures, the viscosity of the hydraulic fluid and the pressure in T, the internal discharge of the leakage via the intermediate plate MICK 2-ZPL 2 H (see Chapter 2.2, "Intermediate plate") may not be entirely sufficient and the residual pressure in the application may be too high. In this case, we recommend using the optional T port on the end plate MICK 2-E 0 for external relief in addition to the internal relief of the T pressure in the intermediate plate.	

2.5 Solenoid voltage and solenoid version

2.5.1 PSV/PSL 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	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	Deutsch (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	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 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)			●	
DTL 12 DTL 24	MIL-DTL-38999 series III	12 V DC 24 V DC	IP 67	4-pin, connector position side (bottom), with manual override				
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 31, EMP 31:** see [D 7490/1](#)
- **SWS:** see [D 7951](#)
- **PM 1, PMZ 1:** see [D 7625](#)

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 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.

2.5.2 PSV/PSL Solenoid versions for potentially explosive atmospheres

Coding	Description
G 24 TEX 4 55 FM	Explosion-proof solenoid with cable
G 24 TEX 4 55 FM-10 m	▪ No additional specification: with 3 m cable ▪ 10 m: with 10 m cable In the case of PSL valve banks, ZPL 22/7 EX are also required as mechanical protection plates. They are inserted downstream of the connection block and upstream of the end plate. A ZPL 52 (D 7700-5) or ZPL 32 (D 7700-3) replaces the protection plate on size combinations. Information on the solenoid is provided in the operating instructions B ATEX

2.6 Additional versions

2.6.1 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

2.6.2 Paint finish

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

3 Parameters

3.1 General data

Designation	Proportional directional spool valves MICK 2
Design	Manifold with up to 13 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 M8, see Chapter 4, "Dimensions"
Installation position	As desired
Ports/connections	▪ P = Pump ▪ R = Reflux ▪ A, B = Consumers ▪ LS, U, W, Y = load pressure signals ▪ M = Pressure gauge connection for pump pressure ▪ Z = Pilot pressure ▪ T = Tank line for control oil Connecting thread: ▪ P, R, A, B = as per type designation ▪ M, LS, Y, Z, T = G1/8, G 1/4 (ISO 228-1) or SAE-4, or 7/16-20 UNF-2B (SAE J 514) ▪ U, W = 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 mm ² /s Optimal operating range: approx. 10 - 500 mm ² /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, A, B, LS, M, Y) ▪ Pilot pressure ≤ 40 bar (port Z) ▪ Return pressure ≤ 50 bar (ports R, 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 2.4, "End plate")
Flow rate	▪ $Q_{\max}$ connection block: see Chapter 3.4, "Characteristic lines" ▪ $Q_{\max}$ consumer: see Chapter 2.3.1.6, "Flow rate"

3.3 Weight

Connection block	Type	
	PSL 3	= 1.7 kg
	PSL 3 Z	= 2.0 kg
	PSV 3	= 1.7 kg
	PSV 4	= 2.0 kg
	PSV 3X-2	= 1.7 kg
	PSV E0-2	= 0.3 kg
	Supplement	
	F, D, PA, PB, PC, PD	+ 0.6 kg
Intermediate plate	Coding	
	ZPL 2 H/I	= 1.6 kg
Directional valve section	Valve section with actuation	
	Coding	
	SL 2... A, E, E0A	= 1.6 kg
	SL 2... EA	= 1.9 kg
	SL 2... EHA	= 1.8 kg
	SL 2... HA	= 2.2 kg
	Supplement:	
Ancillary block	SL 2... A...B...FP(H) 1(2, 3), S1	+ 0.4 kg
	Coding	
	/PM 1-14	= 4.3 kg
	/222/I, /UNF 222/I	= 4.0 kg
	/222 C.../I, /UNF 222 C.../I	= 4.0 kg
	/020/I, /UNF 020/I	= 4.2 kg

End plate for valve sections	Coding	
	E 1(UNF), E 2(UNF), E 4(UNF), E 5(UNF)	= 0.5 kg
	E 3, E 6	= 1.1 kg
	E 17(UNF), E 18(UNF), E 19(UNF), E 20(UNF)	= 1.0 kg
End plate for ancillary blocks	Coding	
	E 0	= 1.9 kg

3.4 Characteristic lines

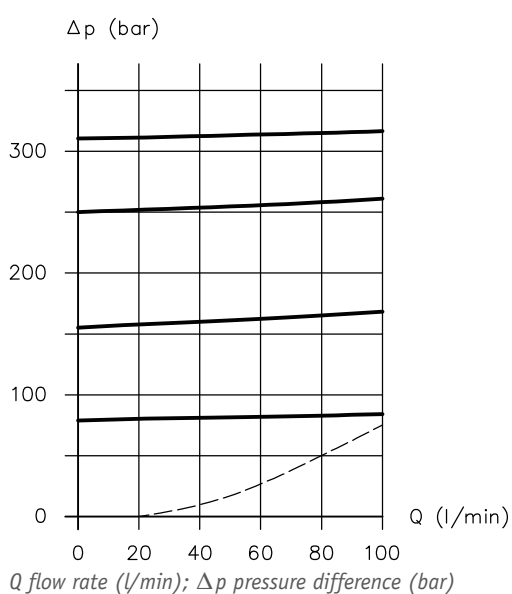
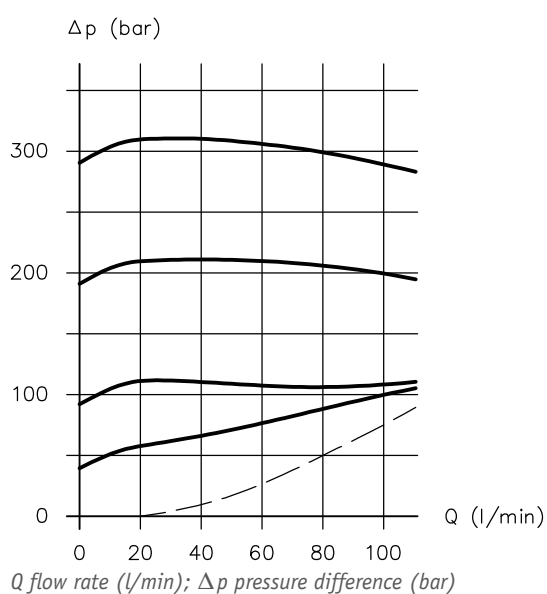
Viscosity of the hydraulic fluid approx. 60 mm²/s

3.4.1 Connection block

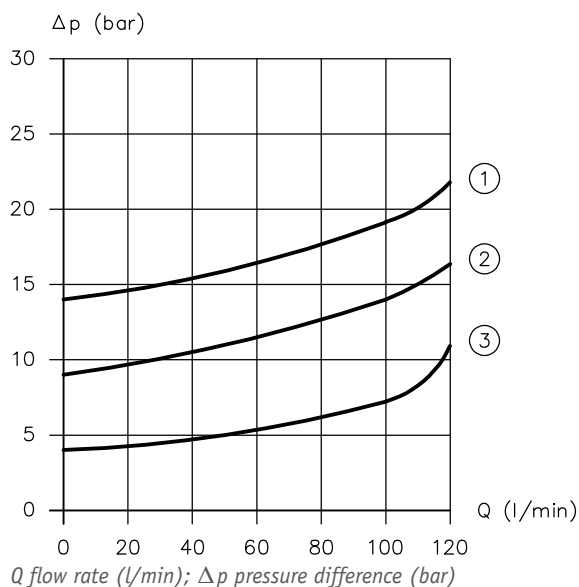
Pressure-limiting valve (P → R)

PSL 3../D...-2
PSL UNF 2../D...-2
PSV 3../D...-2
PSV UNF 2../D...-2
PSV 4 N...

PSL 3 U.../...-2
PSL UNF 2 U.../...-2



Circulation pressure ($P \rightarrow R$) in PSL connection blocks

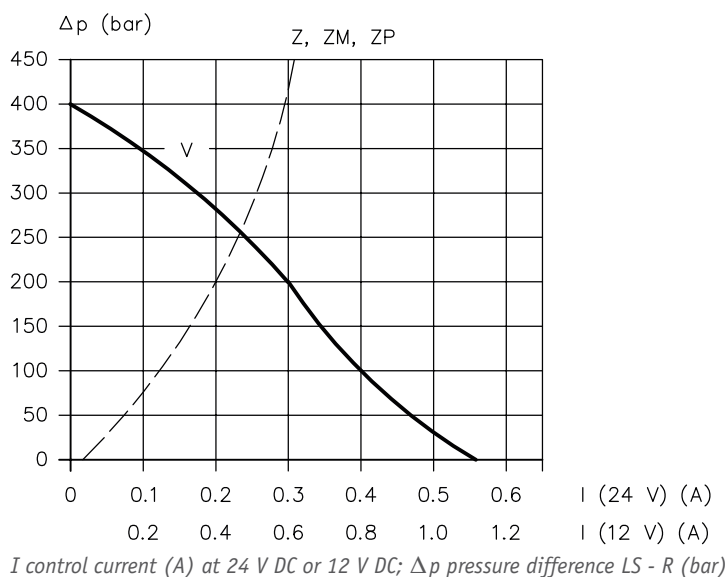


- 1 PSL 3H/..., PSL UNF 2H...
- 2 PSL 3..., PSL UNF 2...
- 3 PSL 3U/..., PSL UNF 2U...

Electro-proportional LS pressure limitation

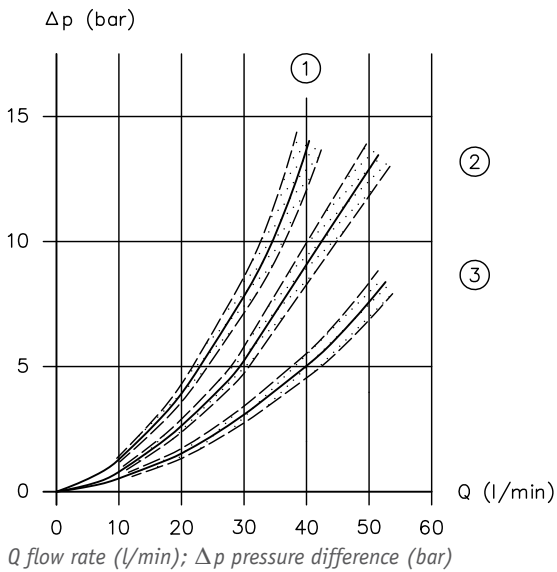
see Chapter 2.1.7, "LS relief or LS pressure limitation"

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



3.4.2 Directional valve section PSL/PSV

Pressure difference $P \rightarrow A/B$ and $A/B \rightarrow R$

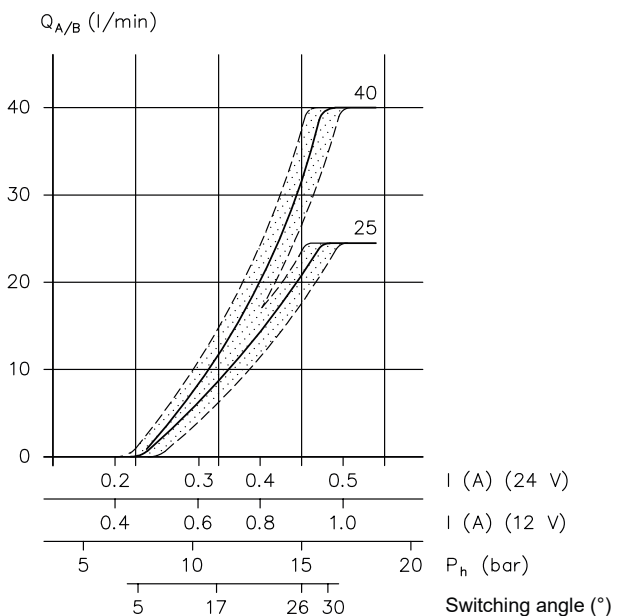
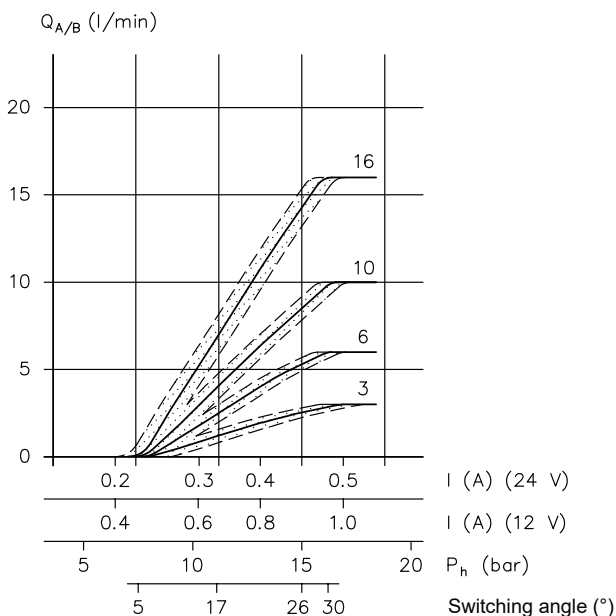


- 1 $P \rightarrow A/B$ in valve section with 2-way controller, see Chapter 2.3.1.2, "2-way controller", without coding)
- 2 $P \rightarrow A/B$ in valve section without 2-way controller, see Chapter 2.3.1.2, "2-way controller", coding 1)
- 3 $A/B \rightarrow R$ in spool valve coding L, M, F, H, see Chapter 2.3.1.5, "Circuit symbol")

Control characteristic line for consumer flow rate

see Chapter 2.3.1.6, "Flow rate"

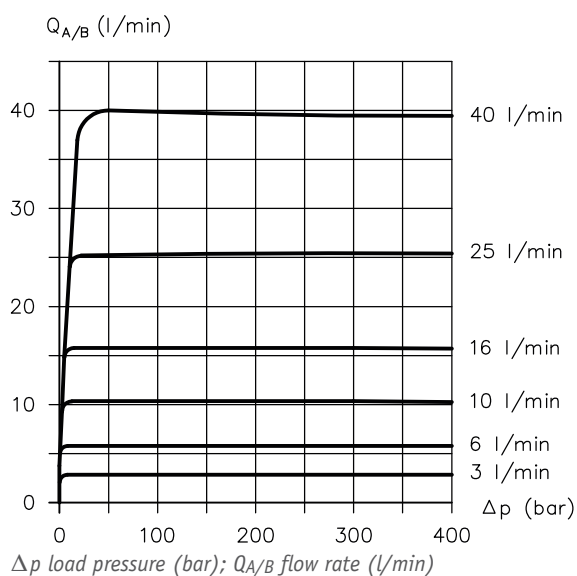
(reference values measured with 2-way controller and standard 2-way controller spring)



p_{hydr} . Pilot pressure (bar) for hydraulic actuation
Switching angle (°) for manual actuation with hand lever
 $Q_{A/B}$ flow rate (l/min)

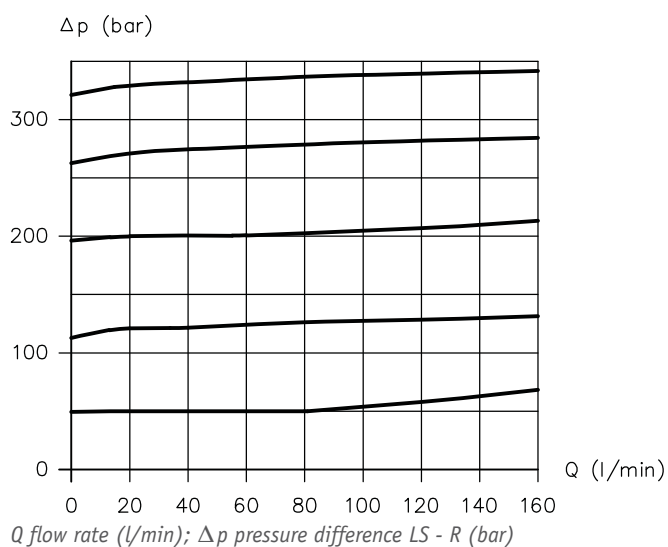
2-way controller

see Chapter 2.3.1.2, "2-way controller"



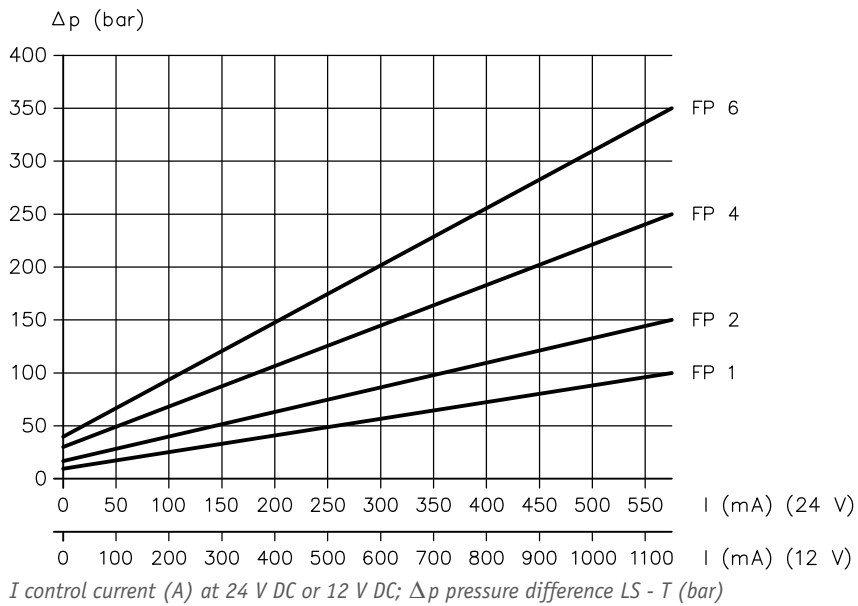
LS pressure-limiting valves

see Chapter 2.3.1.7, "LS pressure limitation"



Electro-proportional LS pressure limitation

see Chapter 2.3.1.8, "Electric LS relief or LS pressure limitation"



3.5 Electrical data

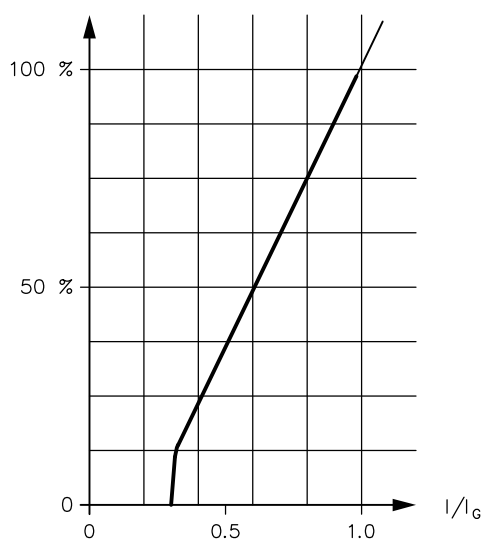
3.5.1 PSL/PSV Electro-hydraulic actuation with standard solenoid

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

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

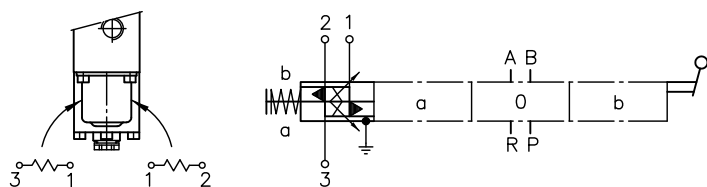
Nominal voltage U_N	12 V DC	24 V DC
Resistance R_{20}	6.3 Ω	27.0 Ω
Current, cold I_{20}	1.9 A	0.9 A
Limit current I_G	1.26 A	0.63 A
Limit power P_G	15.1 W	15.1 W
Duty cycle	S1 (100%)	
Dither frequency	40 - 70 Hz (recommended value 55 Hz)	
Dither amplitude $A_D(\%) = \frac{I_{Peak-Peak}}{I_G} \cdot 100$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

I stroke characteristic curve

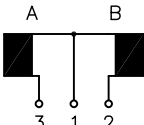
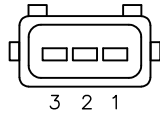
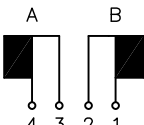
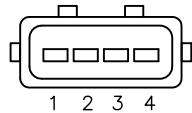
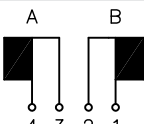
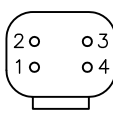
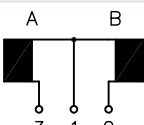
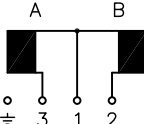
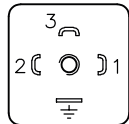
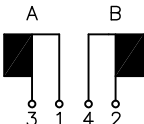
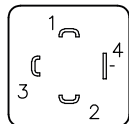
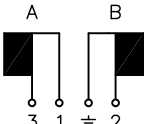
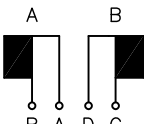
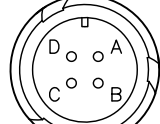
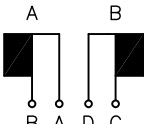
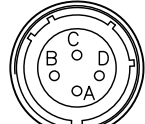


I/I_G control current; spool stroke (%)

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) 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 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.

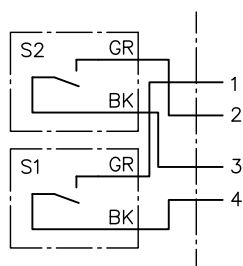
Coding	Operating instructions with declaration of conformity
G 24 TEX 4 55 FM	▪ B ATEX
G 24 TEX 4 55 FM-10 m	▪ B 28/2012 (EX04)

3.5.3 Switching position monitoring, displacement transducer

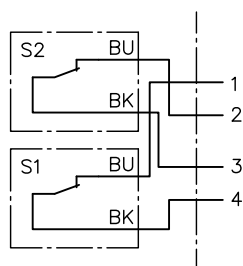
Coding VCHO, VCHC, VCHOC

Connection socket	G 4 A 5 M ® Hirschmann
compatible 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 ▪ VCHOC: NOC

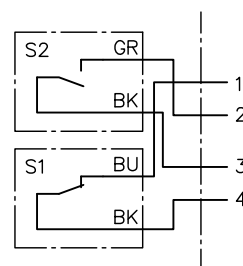
VCHO



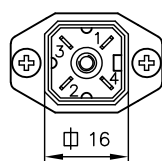
VCHC



VCHOC



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



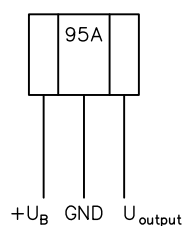
Coding WA

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

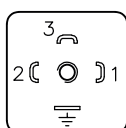
Pin assignment:

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

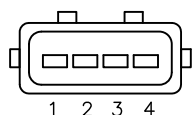
Sensor assignment:



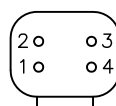
WA



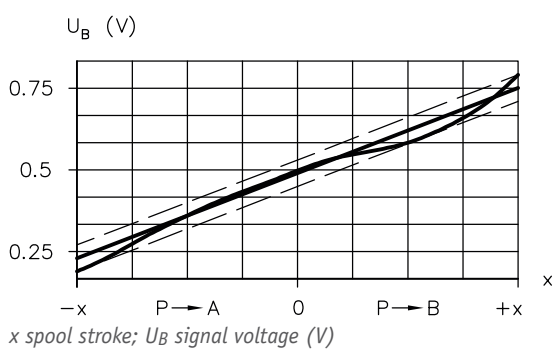
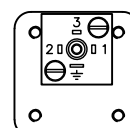
WA-AMP



WA-DT



WA-C



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

Use stabilised, smoothed DC voltage only.

NOTICE

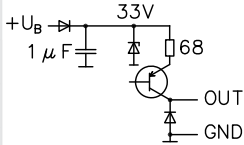
The displacement transducer will be destroyed by strong magnetic fields.

Coding U

Protection class

Coding	Electrical connection	Protection class (IEC 60529)
U	EN 175 301-803 A	IP 65 (plugged in)
U-DT	Deutsch (DT 04-4P)	IP 67 (plugged in) IP 66 (plugged in)
U-M	M12x1.5	IP 67 (plugged in) IP 66 (plugged in)

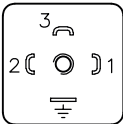
Pin assignment

Signal	Description	Pin assignment			
		U	U-DT	U-M	
GND	0 V DC	PE (⊕)	2	3	 Open-Collector: I_{max} = 10 mA short-circuit-proof
A_Out	PNP positive-switching	1	3	2	
B_Out	PNP positive-switching	2	4	4	
+UB	10 ... 32 V DC	3	1	1	

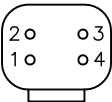
Status table

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

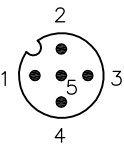
U



U-DT



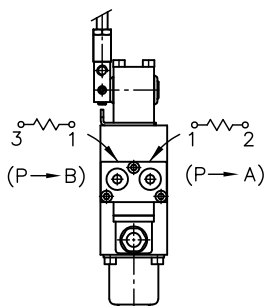
U-M



3.5.4 Electric LS relief or LS pressure limitation

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
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	20% ≤ A _D ≤ 50%	
$A_D(\%) = \frac{I_{Peak-Peak}}{I_G} \cdot 100$		



Electrical connection

Coding	Specification	Connection	Plug
DT 12 (24) T	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)		
DTL 12 (24) T	MIL-DTL 38999 series III 4-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.

3.5.5 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
G 24 TEX 4 55 FM G 24 TEX 4 55 FM-10 m	▪ B ATEX ▪ B 22/2011 (EX11)
G 24 M2FP G 24 M2FP-10 m	▪ B ATEX ▪ B 04/2005 (EX05)

3.5.6 Additional valves

The types of plugs available are described in [Chapter 2.5, "Solenoid voltage and solenoid version"](#). Refer to the respective additional valve's data sheet for electrical parameters.

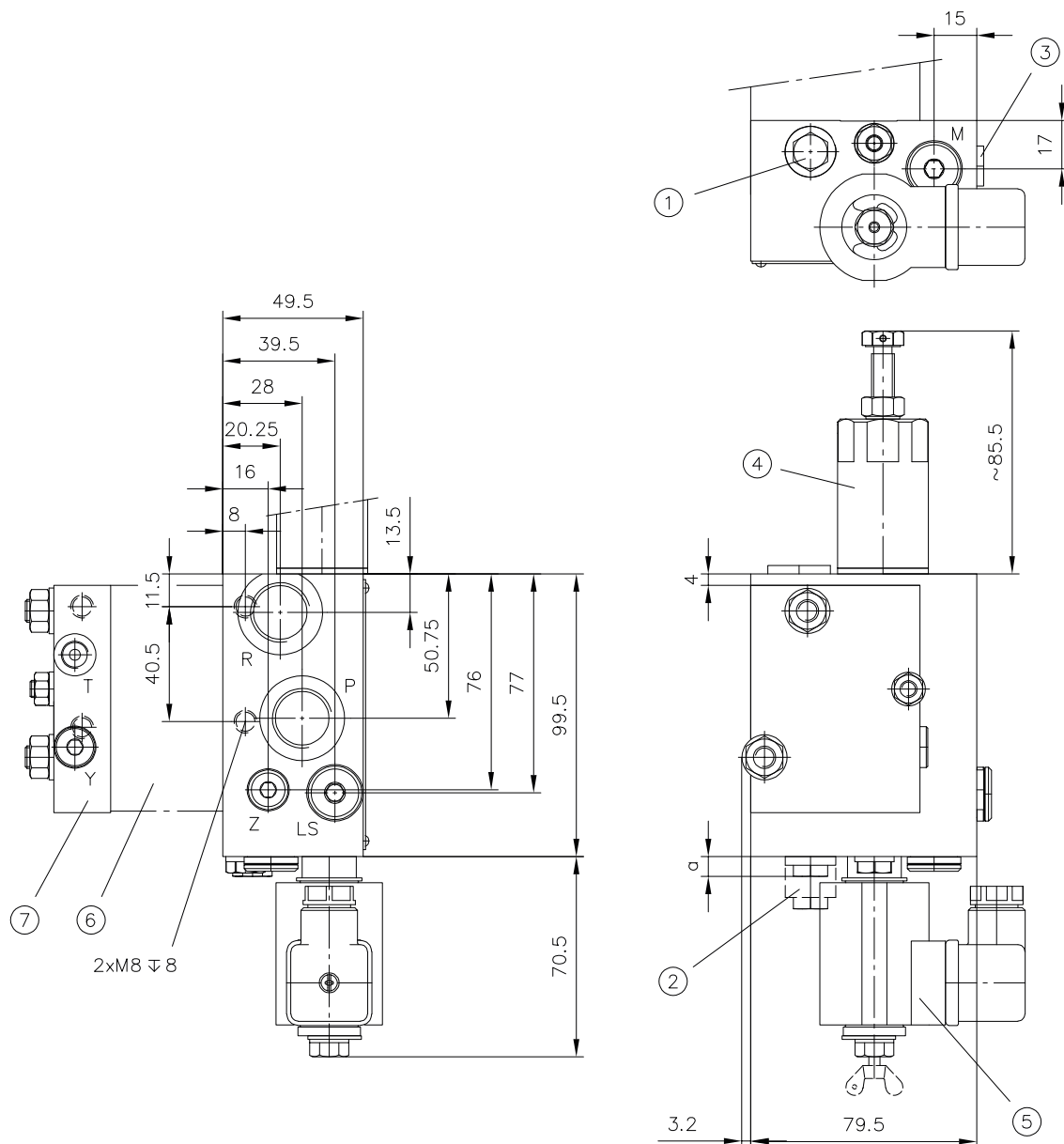
4 Dimensions

All dimensions in mm, subject to change.

4.1 Connection block

see Chapter 2.1.3, "Connection block basic types"

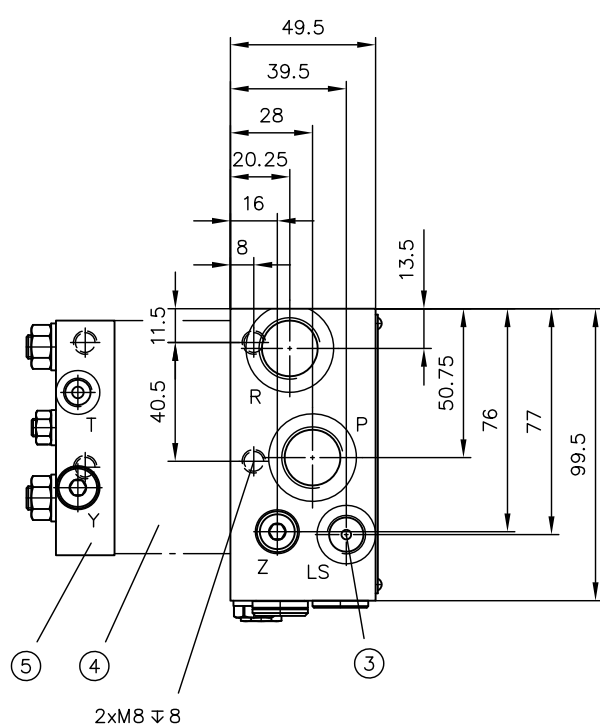
PSL 3.../D...-2, PSV 3.../D...-2, PSL UNF 2.../D...-2, PSV UNF 2.../D...-2



- 1 Internal control oil supply coding 1 or without coding
- 2 1 Internal control oil supply coding 2
- 3 LS damping
- 4 Pressure-limiting valve
- 5 optional ZM
- 6 Valve section
- 7 End plate

Coding	a
without coding	6.5
1	6.5
2	18.4

PSV 3...-2
PSV UNF 2...-2

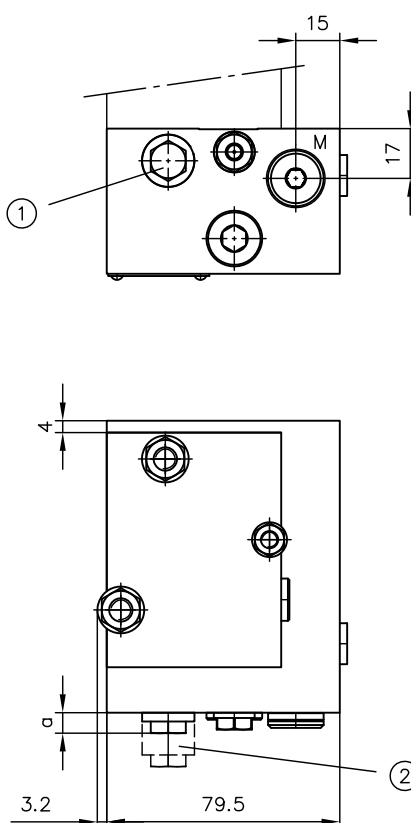


- 1 Internal control oil supply coding 1 or without coding
- 2 Internal control oil supply coding 2
- 3 LS damping
- 4 Valve section
- 5 End plate

Coding	a
without coding	6.5
1	6.5
2	18.4

Ports (ISO 228-1 or SAE J 514)

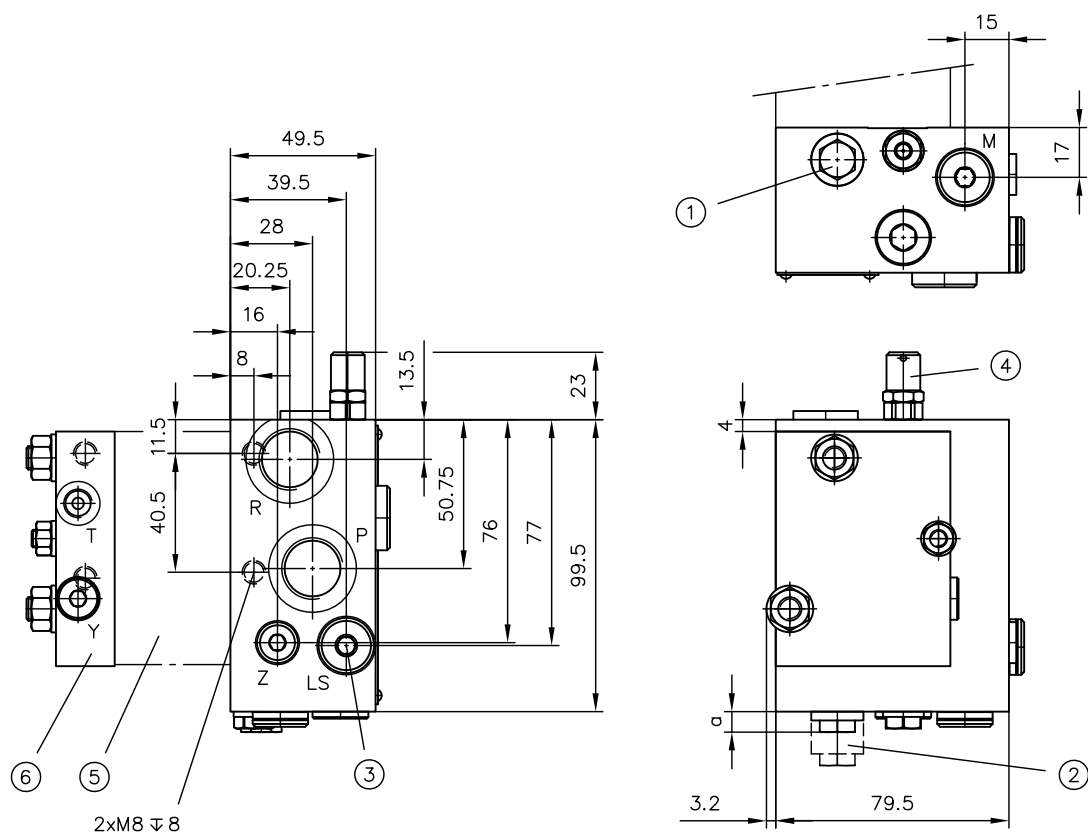
Type	P, R	LS, M	Z
PSL 3../D...-2 PSV 3../D...-2	G 1/2	G 1/4	G 1/8
PSL UNF 2../D...-2 PSV UNF 2../D...-2	3/4-16 UNF-2B	7/16-20 UNF-2B	7/16-20 UNF-2B



Ports (ISO 228-1 or SAE J 514)

Type	P, R	LS, M	Z
PSV 3...-2	G 1/2	G 1/4	G 1/8
PSV UNF 2...-2	3/4-16 UNF-2B	7/16-20 UNF-2B	7/16-20 UNF-2B

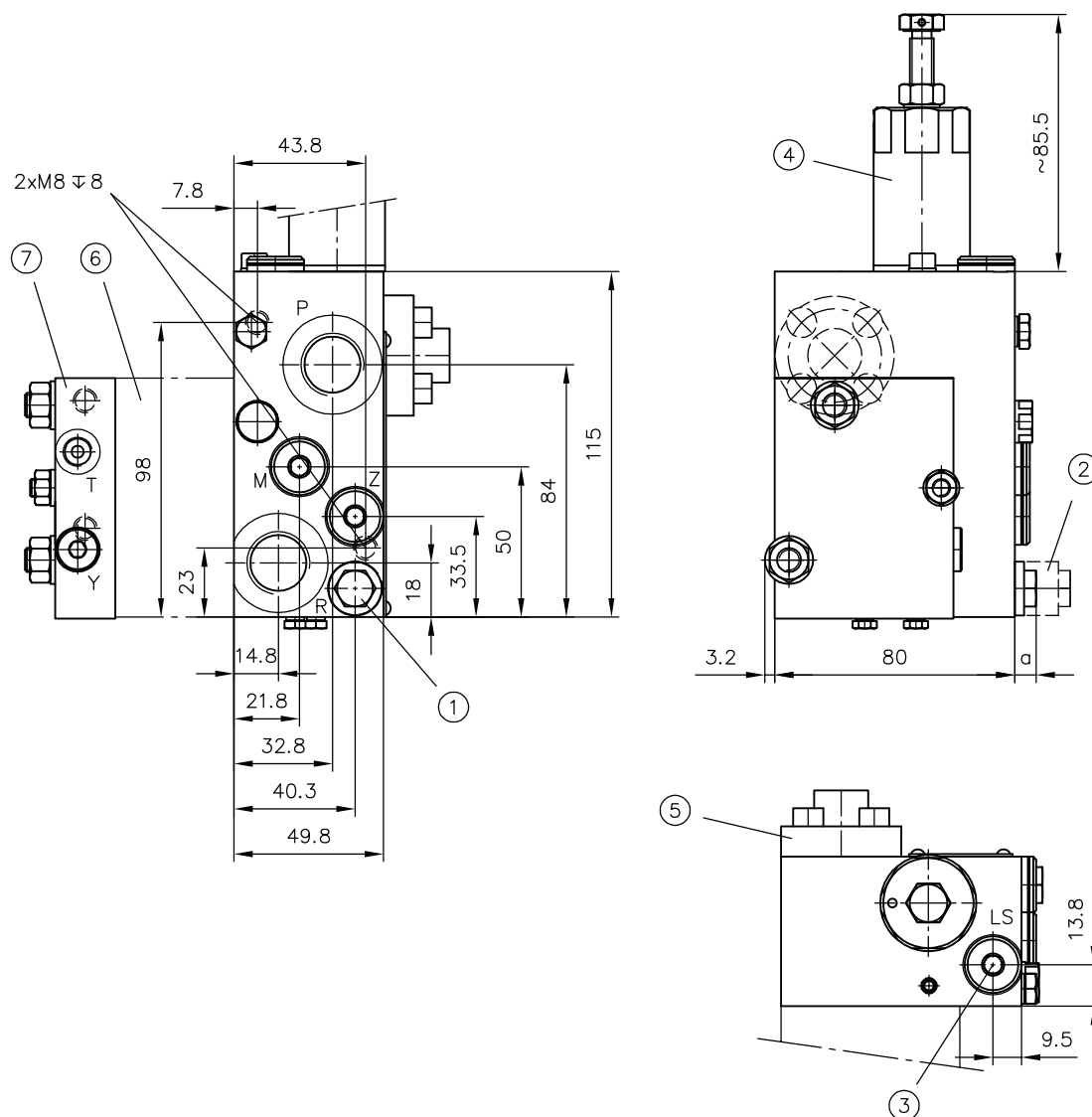
PSL 3U.../...-2
PSL UNF 2U.../...-2



- 1 Internal control oil supply coding 1 or without coding
- 2 Internal control oil supply coding 2
- 3 LS damping
- 4 Pressure-limiting valve
- 5 Valve section
- 6 End plate

Coding	a
without coding	6.5
1	6.5
2	18.4

Type	Ports (ISO 228-1 or SAE J 514)		
	P, R	LS, M	Z
PSL 3U.../...-2	G 1/2	G 1/4	G 1/8
PSL UNF 2U.../...-2	3/4-16 UNF-2B	7/16-20 UNF-2B	7/16-20 UNF-2B

PSL 3 Z.../D...-2


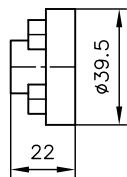
- 1 Internal control oil supply coding 1 or without coding
- 2 Internal control oil supply coding 2
- 3 LS damping
- 4 Pressure-limiting valve
- 5 3-way controller's spring housing
- 6 Valve section
- 7 End plate

Coding	a
without coding	6.5
1	6.5
2	18.4

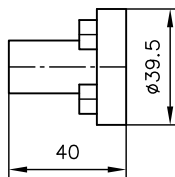
Type	Ports (ISO 228-1)	
	P, R	LS, M, Z
PSL 3 Z.../D...-2	G 1/2	G 1/4

3-way controller's spring housing

without coding

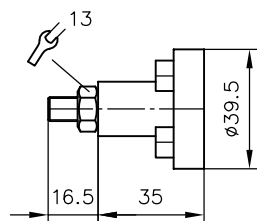


Coding H

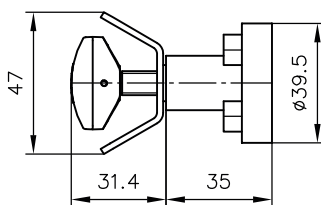


3-way controller's spring housing with locking tapped plug

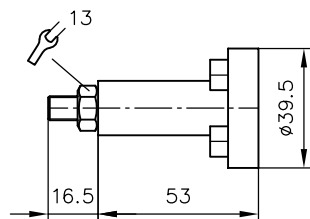
Coding T



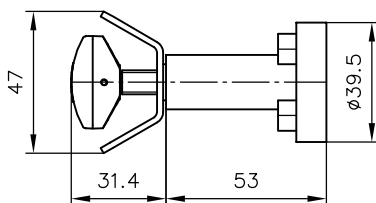
Coding TR

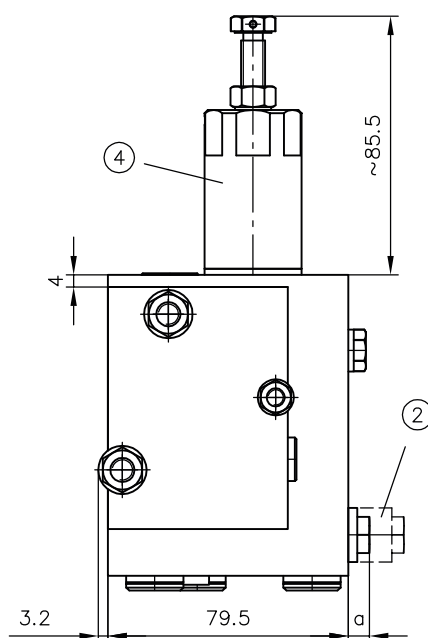
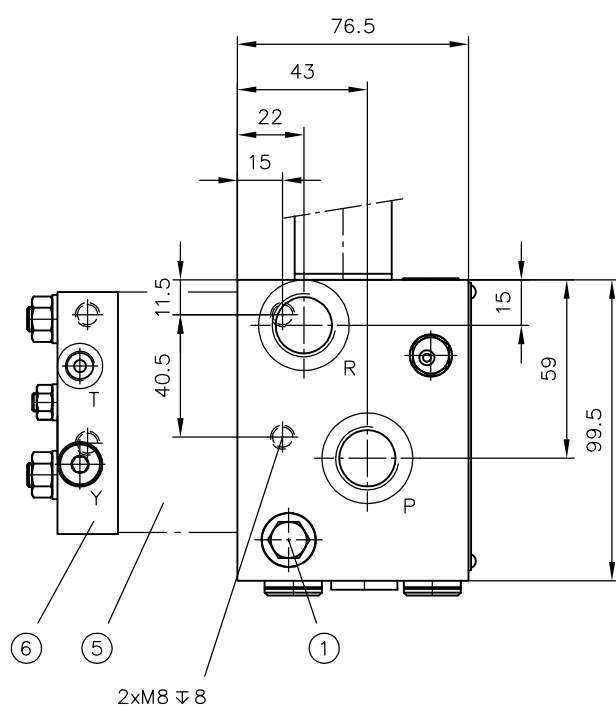
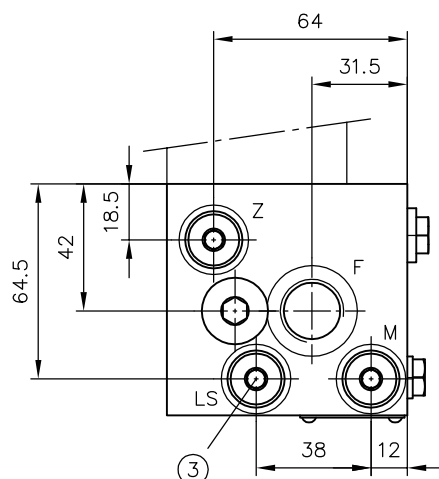


Coding HT



Coding HTR



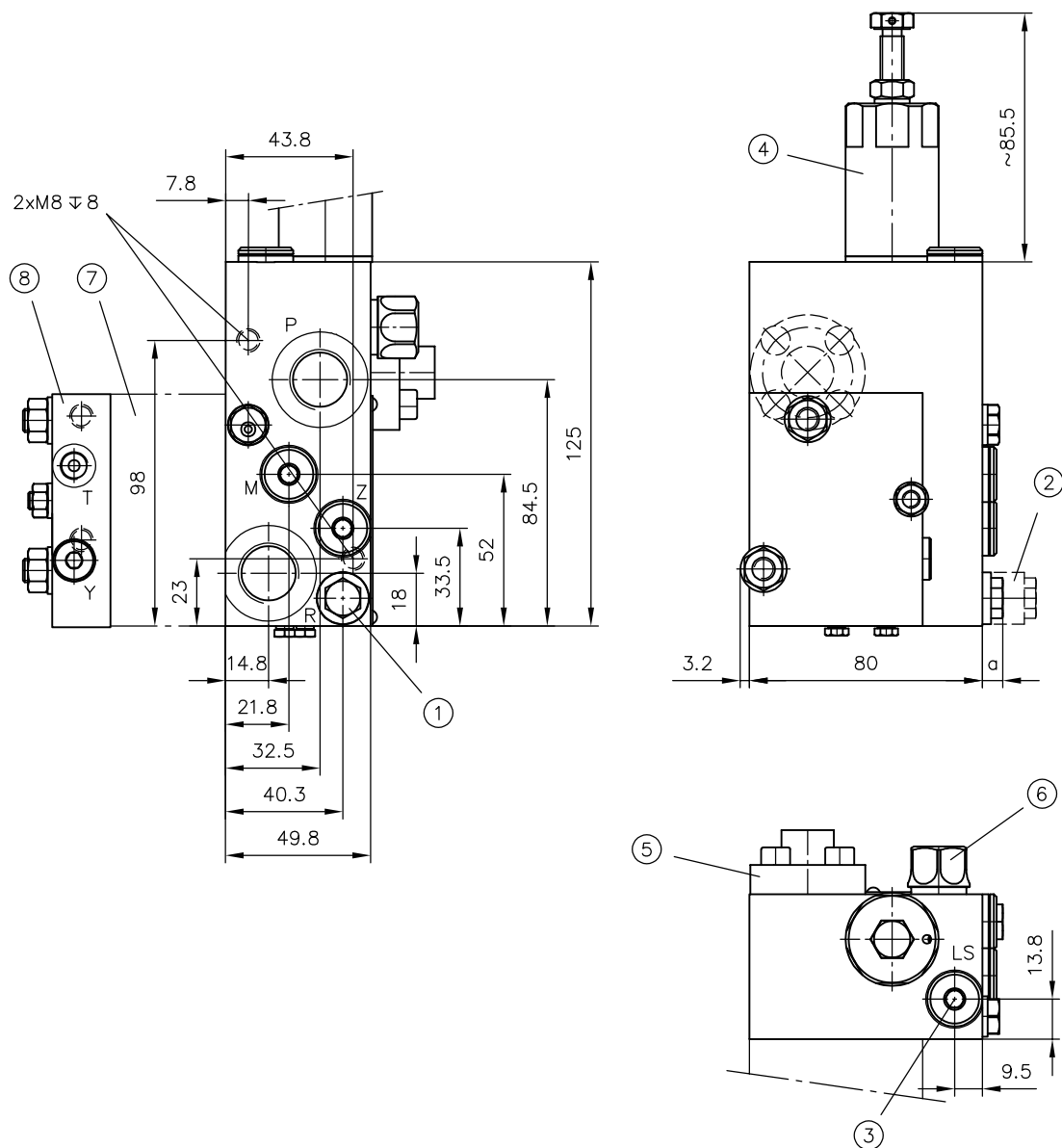
PSL 3Y.../D...-2


- 1 Internal control oil supply coding 1 or without coding
- 2 Internal control oil supply coding 2
- 3 LS damping
- 4 Pressure-limiting valve
- 5 Valve section
- 6 End plate

Coding	a
without coding	6.5
1	6.5
2	18.4

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

PSL 3 C... D/...-2
PSL 3 CR... D/...-2

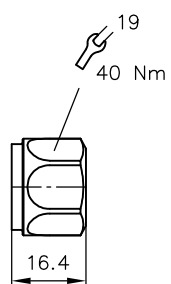


- 1 Internal control oil supply coding 1 or without coding
- 2 Internal control oil supply coding 2
- 3 LS damping
- 4 Pressure-limiting valve
- 5 3-way controller's spring housing
- 6 Version
- 7 Valve section
- 8 End plate

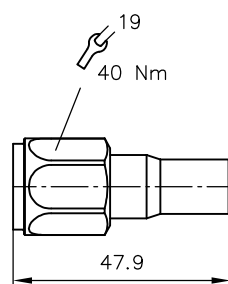
Coding	a
without coding	6.5
1	6.5
2	18.4

Adjustment

fixed

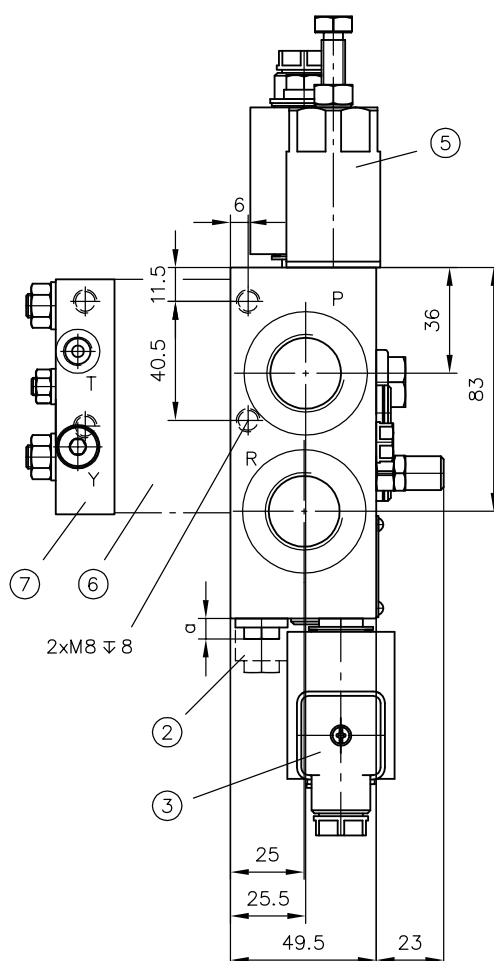
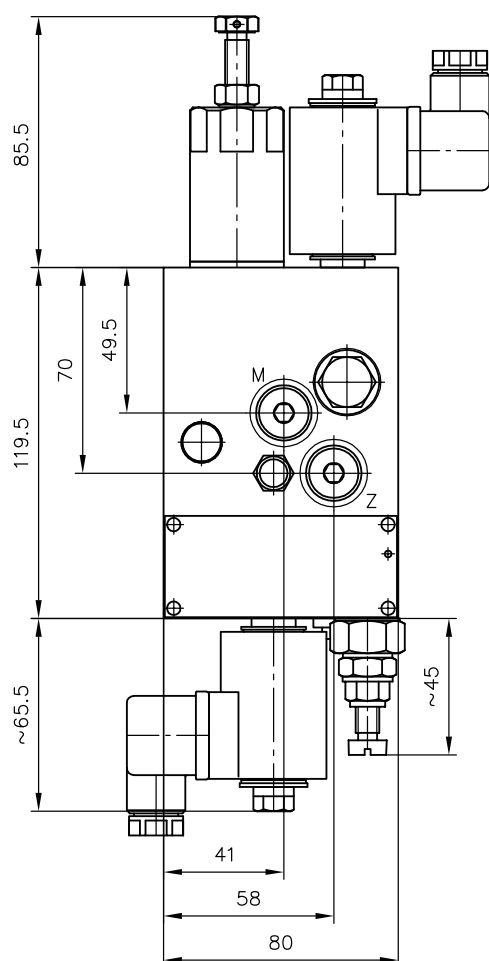
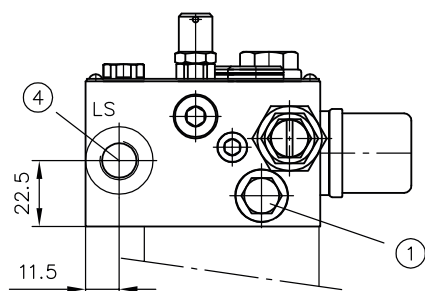


Manually adjustable



PSV 4N.../.../...-2

PSV UNF 4N.../.../...-2

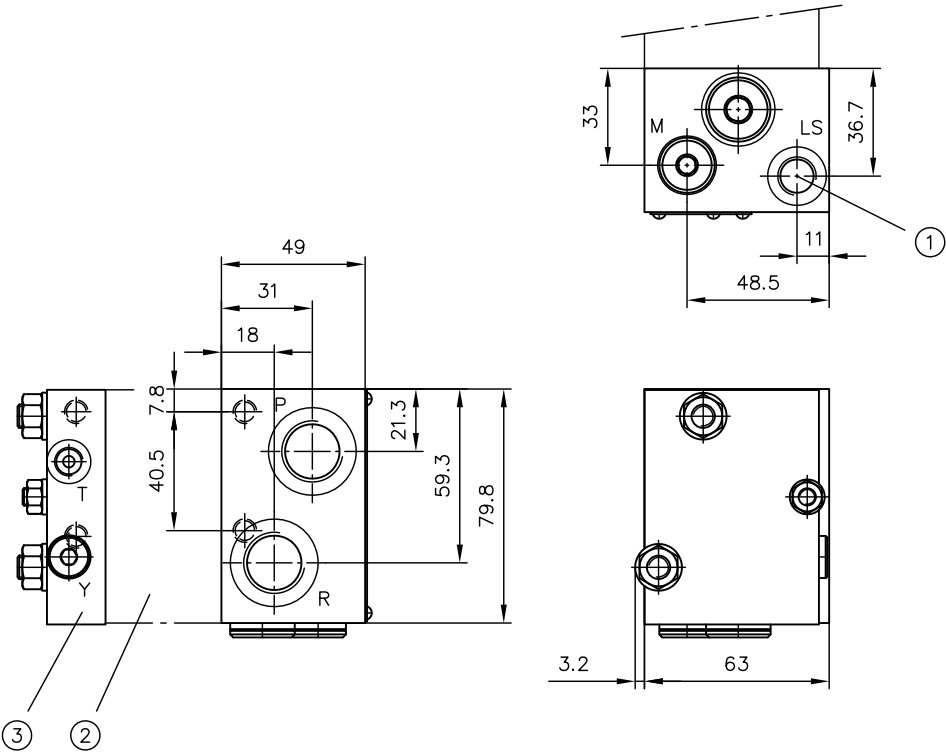


- 1 Internal control oil supply coding 1 or without coding
- 2 Internal control oil supply coding 2
- 3 Only included with optional variant V or Z
- 4 LS damping
- 5 Pressure-limiting valve
- 6 Valve section
- 7 End plate

Coding	a
without coding	6.5
1	6.5
2	18.4

Type	Ports (ISO 228-1 or SAE J 514)		
	P, R	LS, M	Z
PSV 4N.../.../...-2	G 3/4	G 1/4	G 1/8
PSV UNF 4N.../.../...-2	11/16-12 UNF-2B	7/16-20 UNF-2B	7/16-20 UNF-2B

PSV 3X...-2



- 1 LS damping
- 2 Valve section
- 3 End plate

Type	Ports (ISO 228-1)	
	P, R	LS, M
PSV 3X...-2	G 1/2	G 1/4

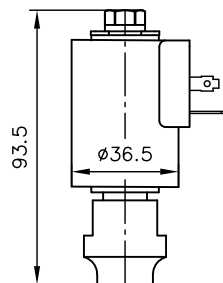
Additional valves for LS relief or LS pressure limitation on connection block

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

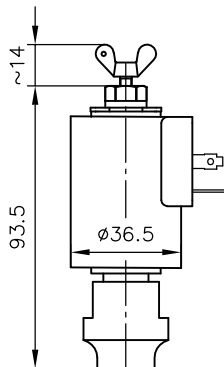
without coding



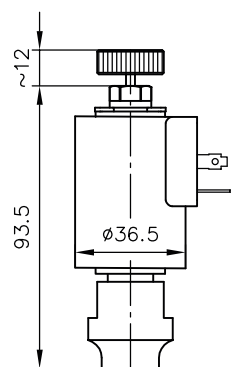
Coding **VA, ZA**



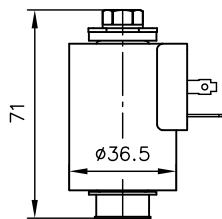
Coding **ZAM**



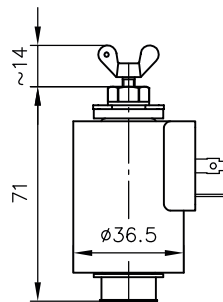
Coding **ZAP**



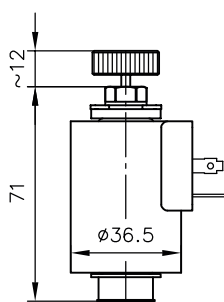
Coding **V, Z**



Coding **ZM**



Coding **ZP**

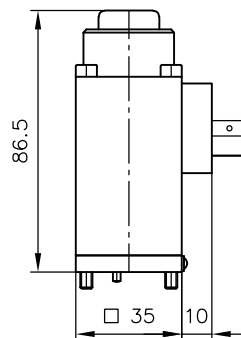


Only for PSL 3 Z.../D...-2:

without coding



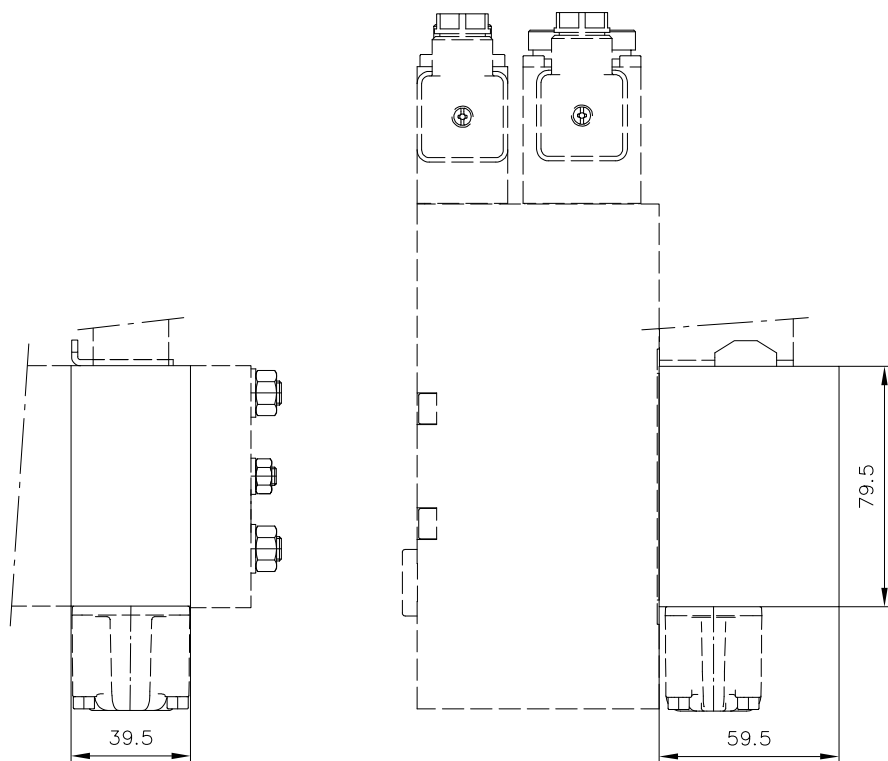
Coding **F, D**



4.2 Intermediate plate

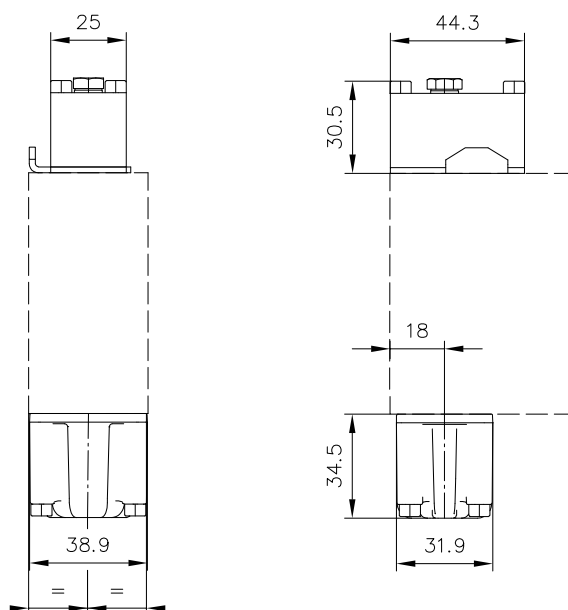
4.2.1 Base plate

ZPL 2 H

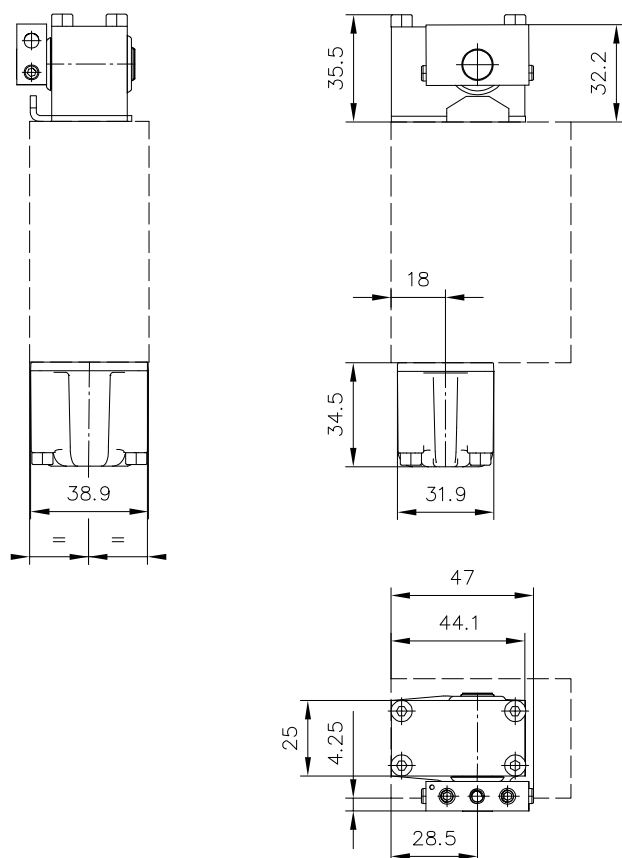


4.2.2 Housing and spring housing

Housing and spring housing I

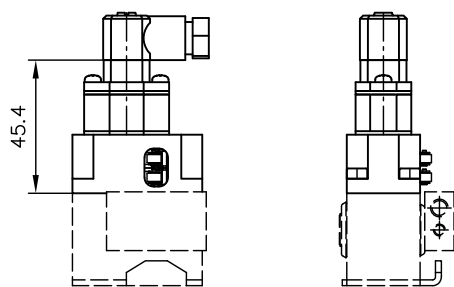


Housing and spring housing A

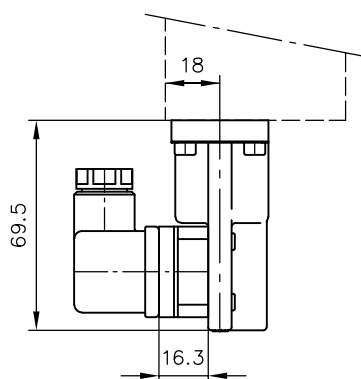


Switching position monitoring, displacement transducer

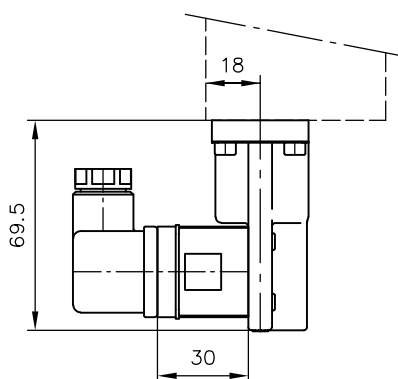
Coding VC



Coding WA

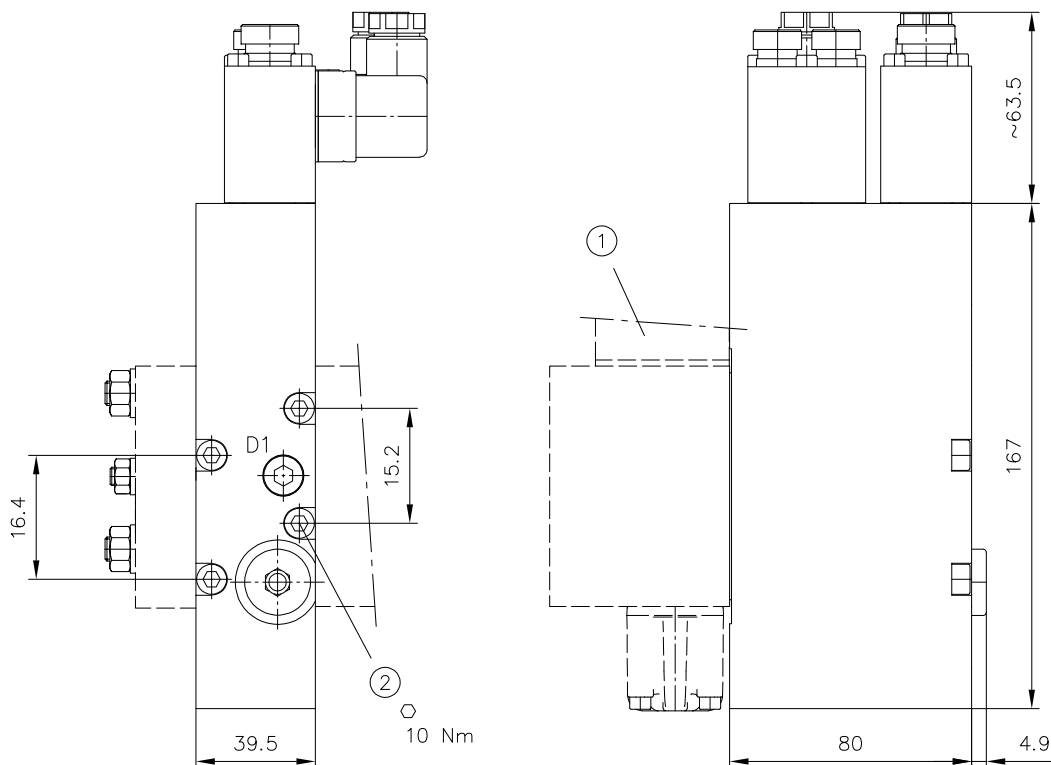


Coding U



4.2.3 Ancillary block

PM 1-14



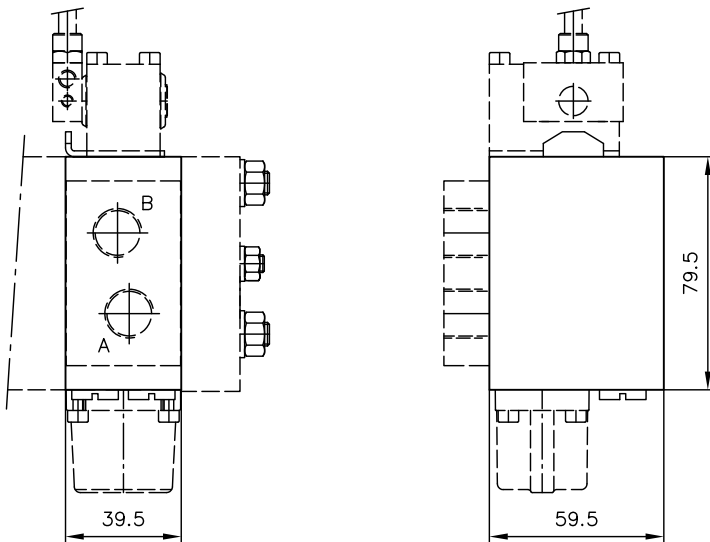
- 1 Directional valve section
- 2 Cylinder screws ISO 4762-M6x80-A2-70

4.3 Valve section

4.3.1 directional valve section

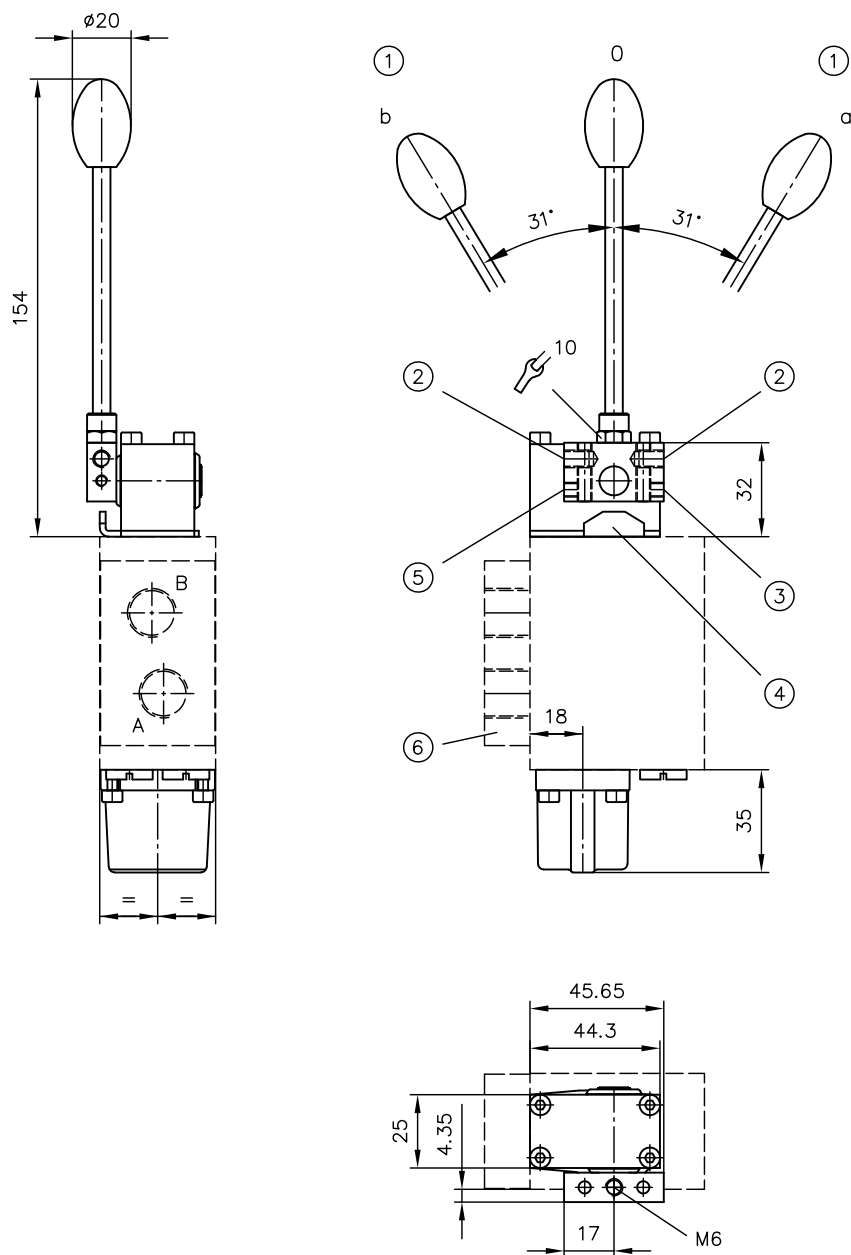
Directional valve section without integrated threads for combining with an ancillary block

Coding **A...** see Chapter 2.3.1.1, "Consumer ports"



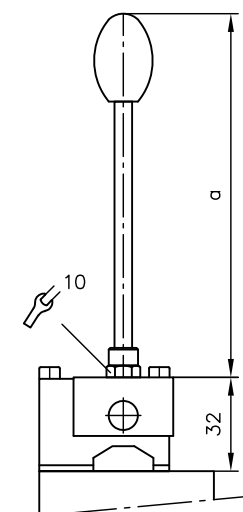
Directional valve section with manual actuation

Actuation **E0A, E0C**



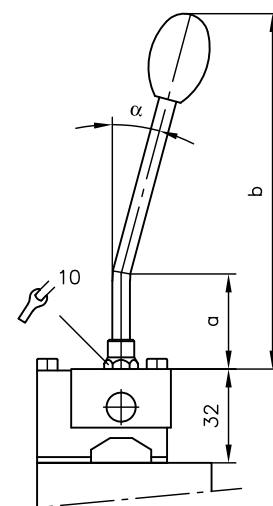
- 1 Switching position 0, a and b
- 2 Alternative mounting position for hand lever (thread M6, 8.5 mm deep)
- 3 Travel stop for flow limitation at A (adjustable via grub screw M5)
- 4 Intermediate sheet to act as stop for stroke limitation
- 5 Travel stop for flow limitation at B (adjustable via grub screw M5)
- 6 Ancillary blocks

Lever straight

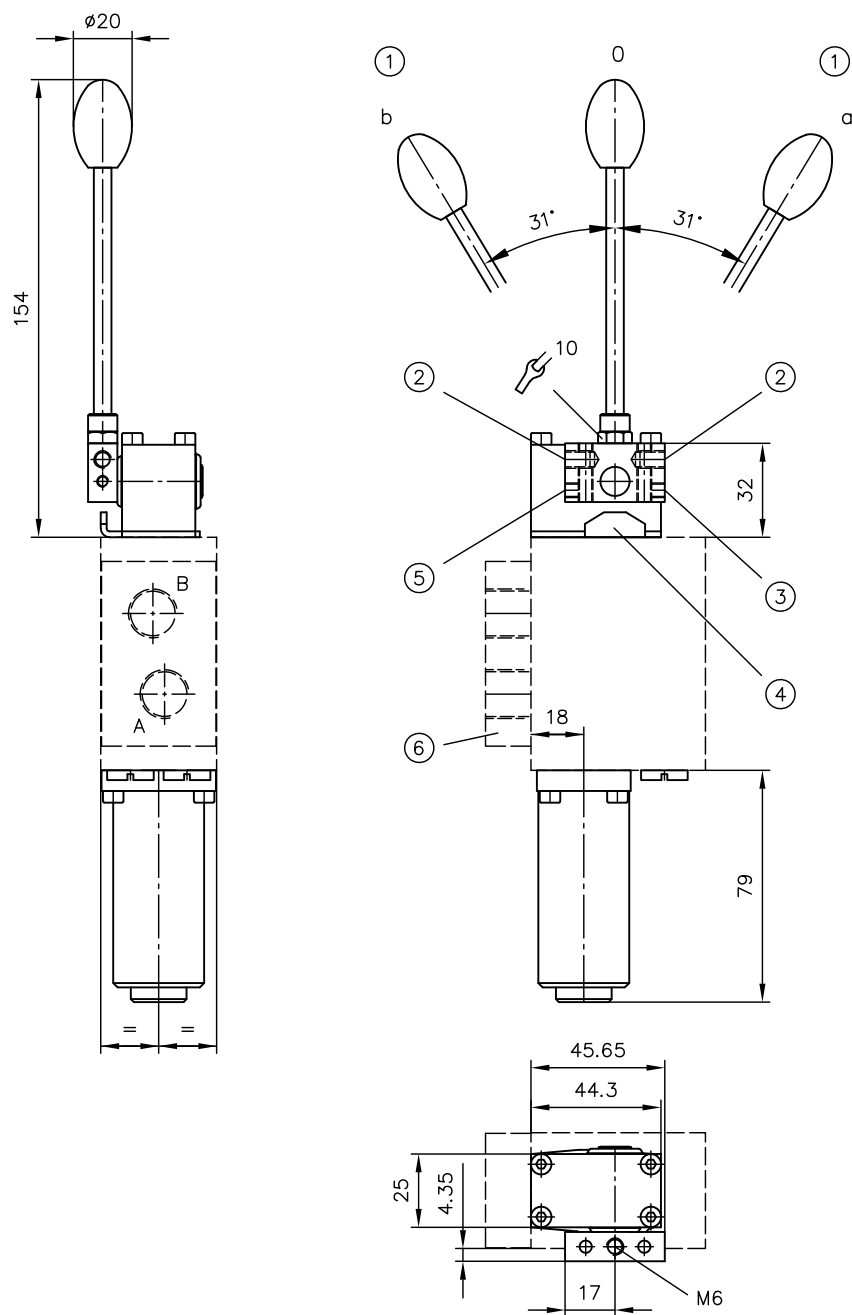


Coding	a
without coding	122
1	--
2	78
3	174
4	92

Lever for angle

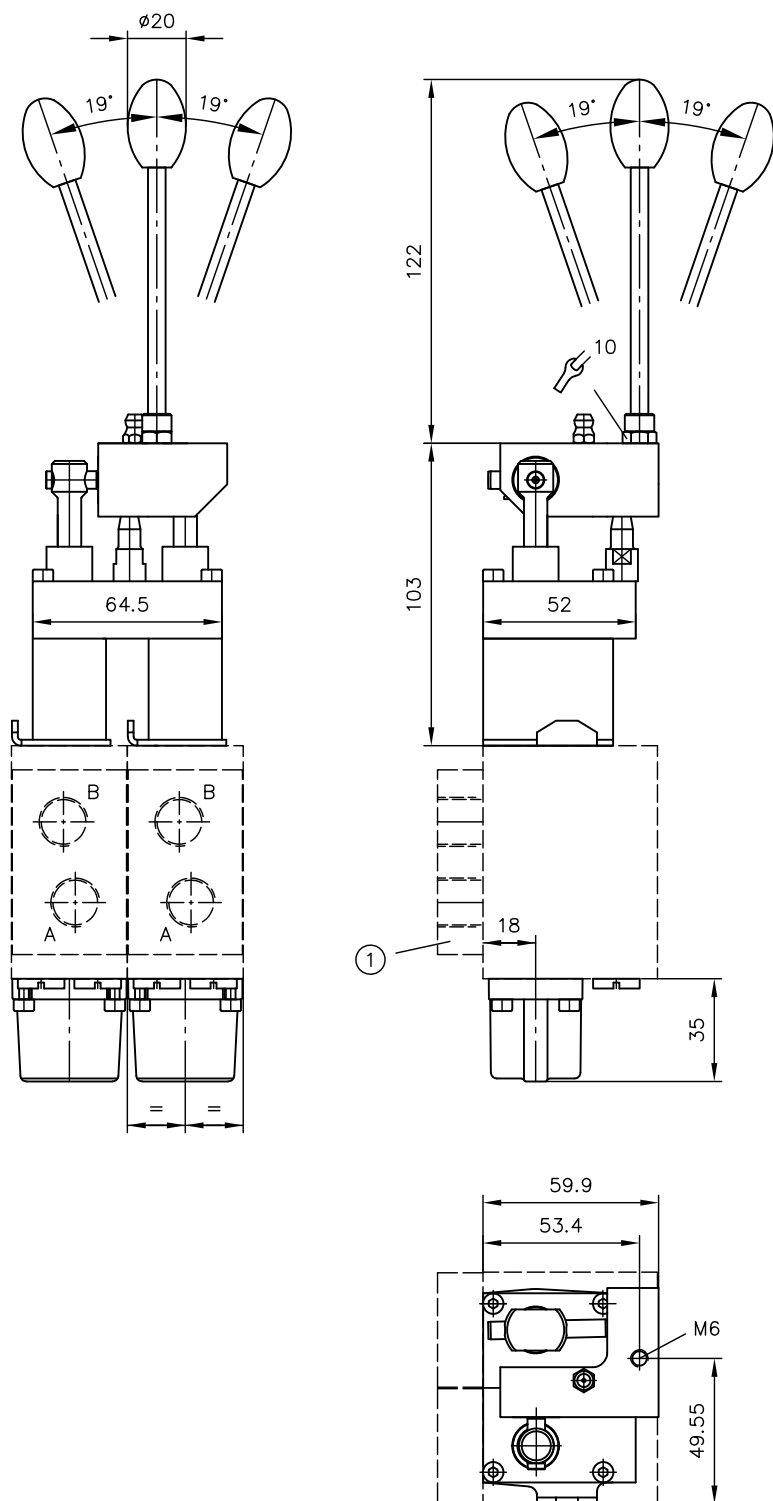


Coding	a	b	α
005	31	122	5°
015	31	120	15°
025	31	115	25°
030	49	114	30°

Actuation **EOAR**


- 1 Switching position 0, a and b
- 2 Alternative mounting position for hand lever (thread M6, 8.5 mm deep)
- 3 Travel stop for flow limitation at A (adjustable via grub screw M5)
- 4 Intermediate sheet to act as stop for stroke limitation
- 5 Travel stop for flow limitation at B (adjustable via grub screw M5)
- 6 Ancillary blocks

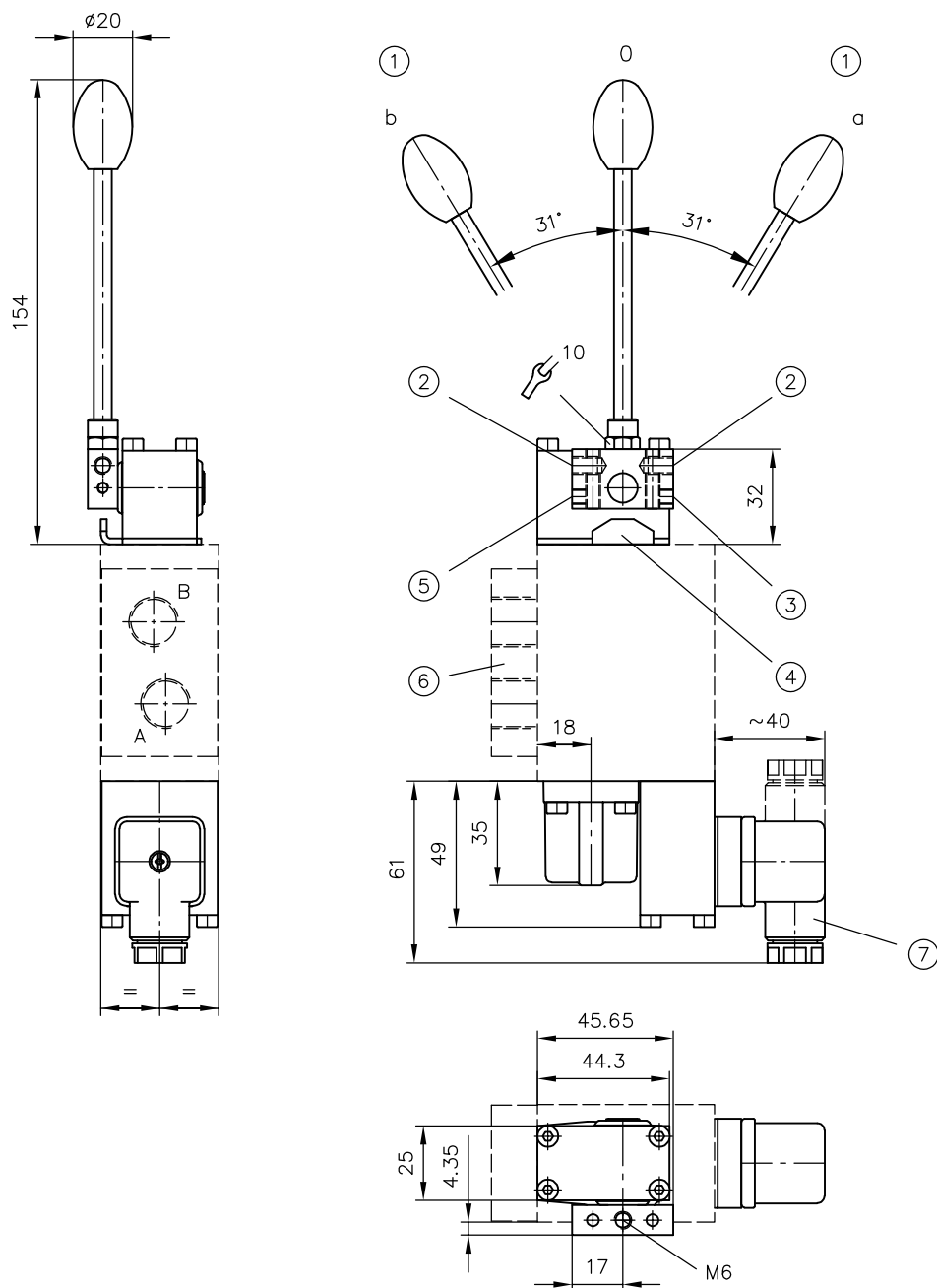
Actuation **EOK**



1 Ancillary blocks

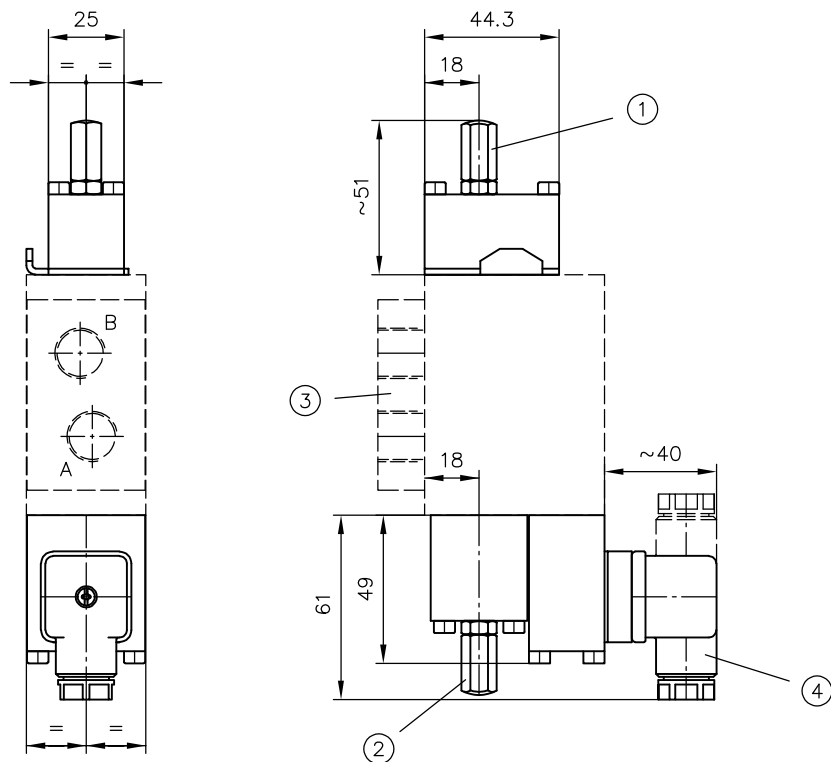
Directional valve section with electro-hydraulic actuation

Actuation EA



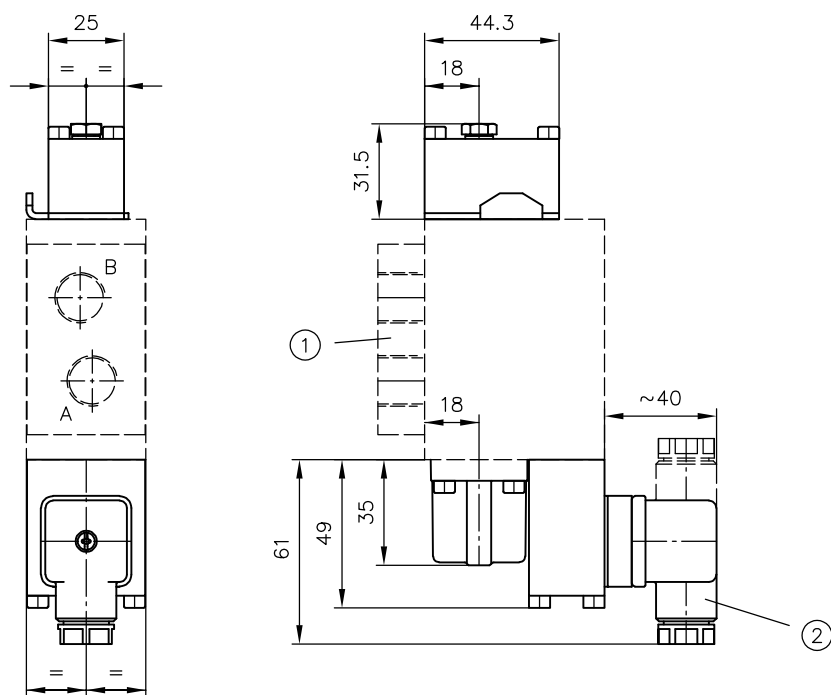
- 1 Switching position 0, a and b
- 2 Alternative mounting position for hand lever (thread M6, 8.5 mm deep)
- 3 Travel stop for flow limitation at A (adjustable via grub screw M5)
- 4 Intermediate sheet to act as stop for stroke limitation
- 5 Travel stop for flow limitation at B (adjustable via grub screw M5)
- 6 Ancillary blocks
- 7 Male connector can be mounted offset by 180°

Actuation E



- 1 Travel stop for flow limitation at A
- 2 Travel stop for flow limitation at B
- 3 Ancillary blocks
- 4 Male connector can be mounted offset by 180°

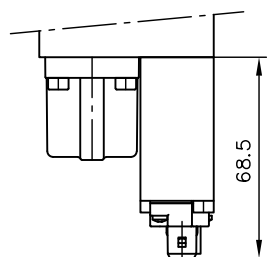
Actuation EI



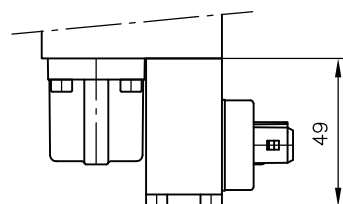
- 1 Ancillary blocks
- 2 Male connector can be mounted offset by 180°

Solenoid versions

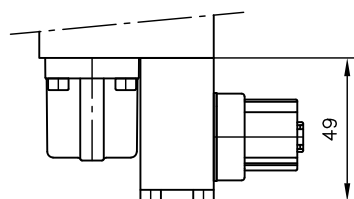
Coding
AMP 12(24) K4



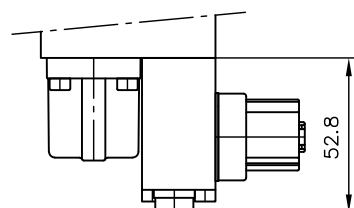
Coding
AMP 12 H 4



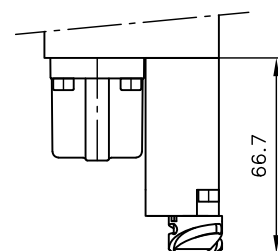
Coding
DT 12(24)



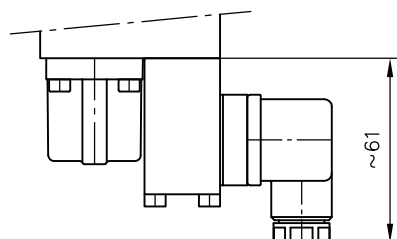
Coding
DT 12(24) T



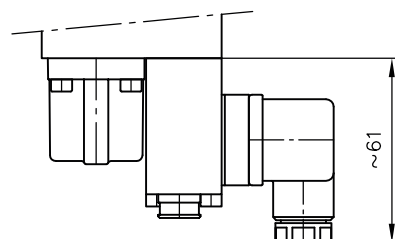
Coding
S 12(24)



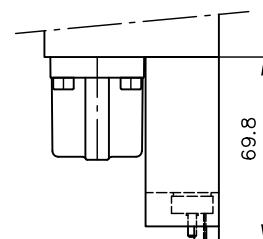
Coding
G(X) 12(24)



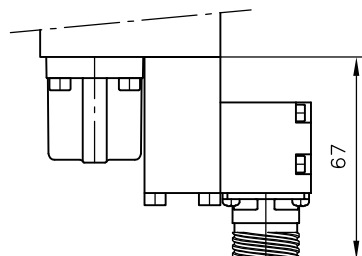
Coding
G(X) 12(24) T



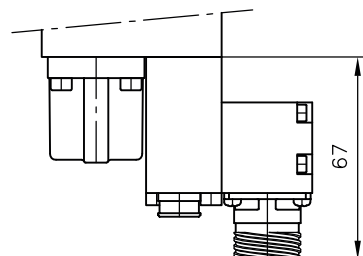
Coding
G(X) 24 C4



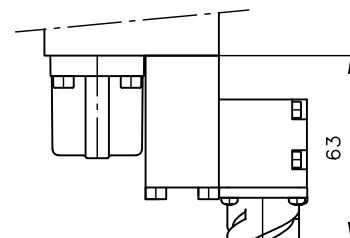
Coding
DTL 12(24)



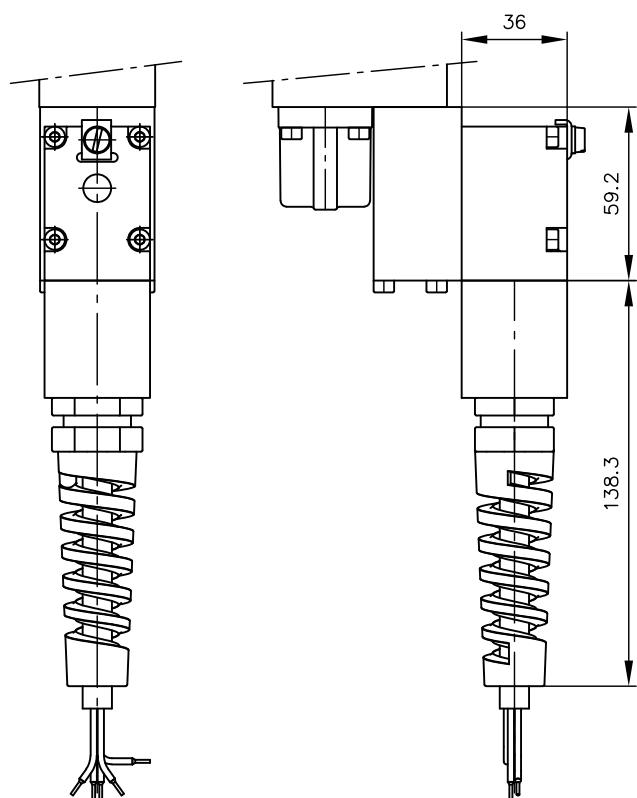
Coding
DTL 12(24) T



Coding
ITT 12(24)

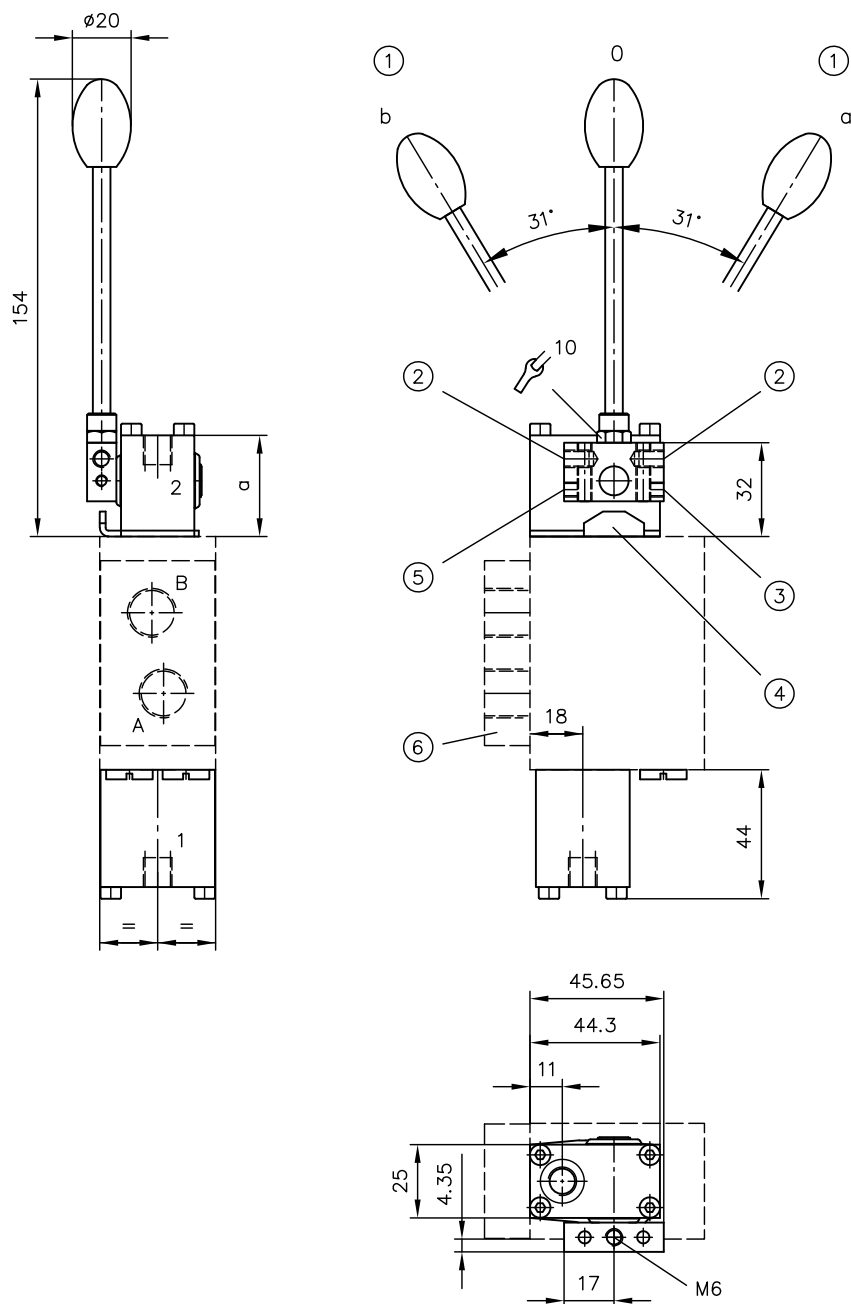


Coding
G 24 TEX 4 55FM



Directional valve section with hydraulic actuation

Actuation **EOHA (UNF)**

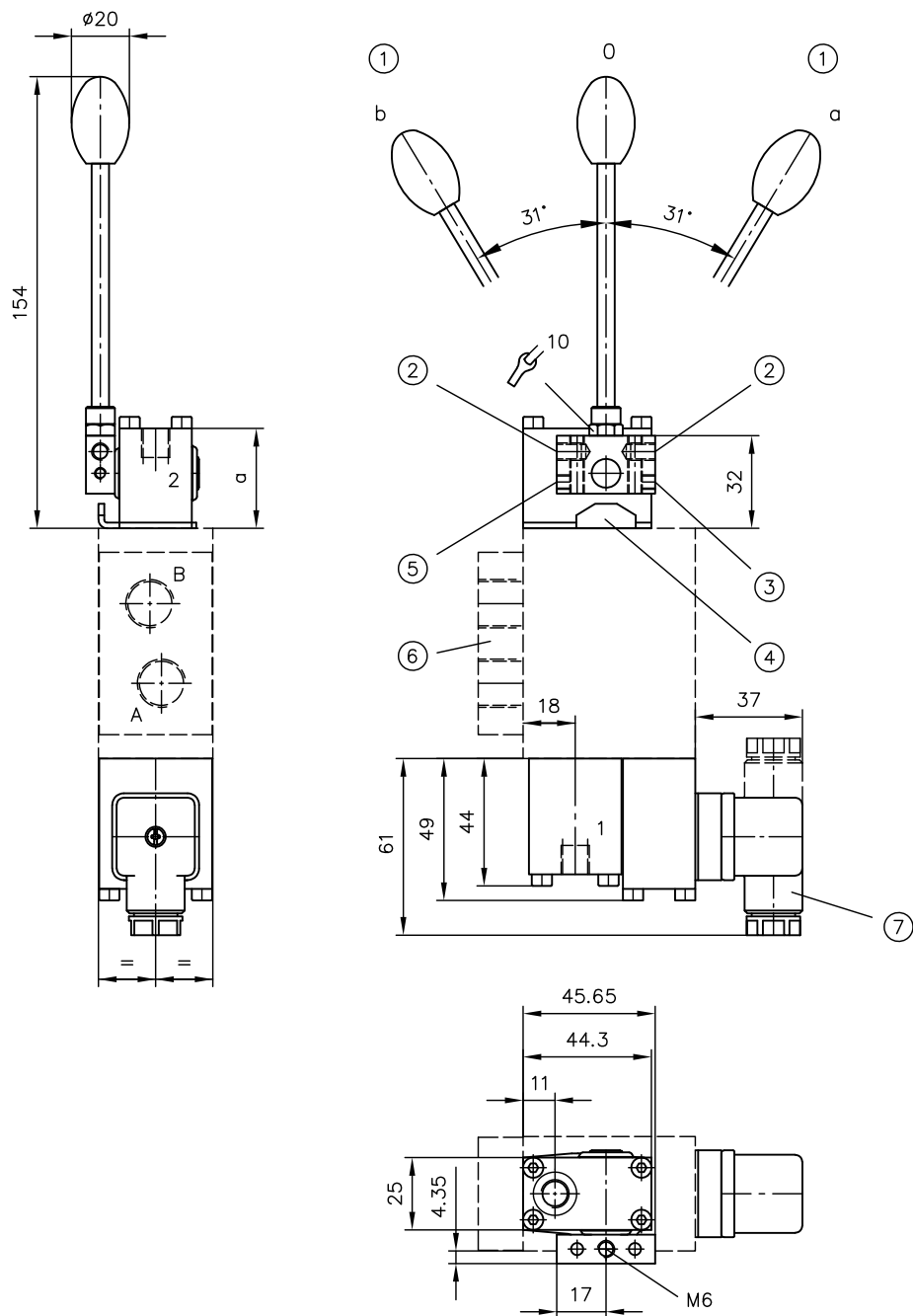


- 1 Switching position 0, a and b
- 2 Alternative mounting position for hand lever (thread M6, 8.5 mm deep)
- 3 Travel stop for flow limitation at A (adjustable via grub screw M5)
- 4 Intermediate sheet to act as stop for stroke limitation
- 5 Travel stop for flow limitation at B (adjustable via grub screw M5)
- 6 Ancillary blocks

Coding	a
EOHA	34.5
EOHA UNF	39.5

Coding	Ports (ISO 228-1 or SAE J 514)
	1, 2
EOHA	G 1/8
EOHA UNF	SAE-2 (5/16-24 UNF-2B)

Actuation EHA (UNF)

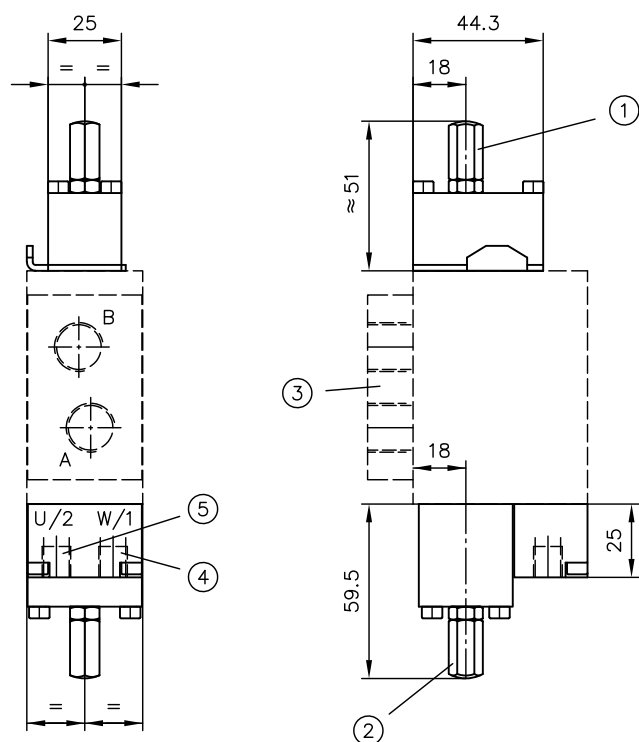


- 1 Switching position 0, a and b
- 2 Alternative mounting position for hand lever (thread M6, 8.5 mm deep)
- 3 Travel stop for flow limitation at A (adjustable via grub screw M5)
- 4 Intermediate sheet to act as stop for stroke limitation
- 5 Travel stop for flow limitation at B (adjustable via grub screw M5)
- 6 Ancillary blocks

Coding	a
EHA	34.5
EHA UNF	39.5

Coding	Ports (ISO 228-1 or SAE J 514)
EHA	1, 2
EHA UNF	G 1/8
EHA UNF	SAE-2 (5/16-24 UNF-2B)

Actuation **EOZ (UNF)**

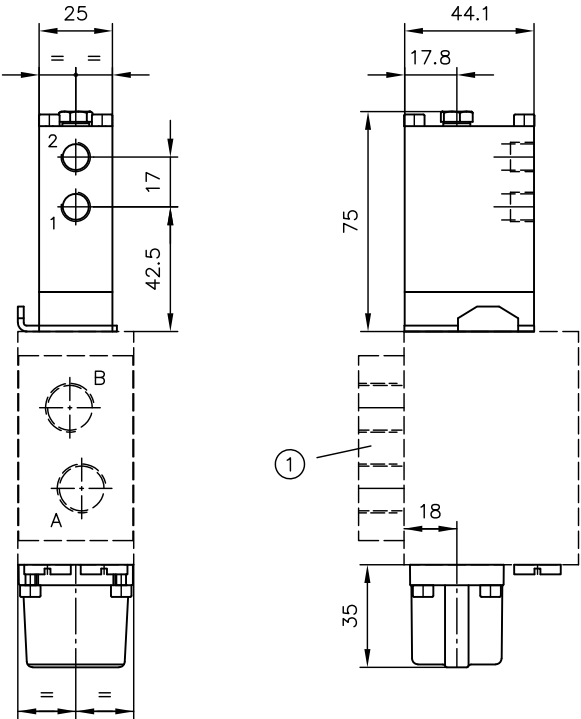


- 1 Travel stop for flow limitation at A
- 2 Travel stop for flow limitation at B
- 3 Ancillary blocks
- 4 Port W/1
- 5 Port U/2

Coding	Ports (ISO 228-1 or SAE J 514)
	W/1, U/2
EOZ	G 1/8
EOZ UNF	SAE-2 (5/16-24 UNF-2B)

Directional valve section with pneumatic actuation

Actuation P

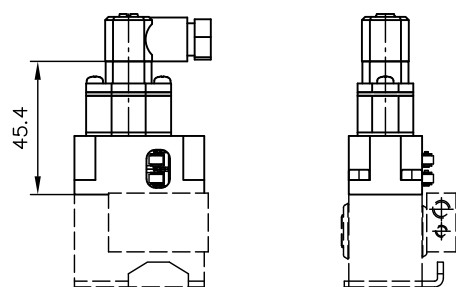


1 Ancillary blocks

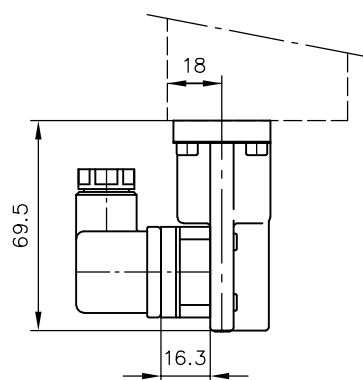
Coding	Ports (ISO 228-1)
	1, 2
P	G 1/8

Switching position monitoring, displacement transducer

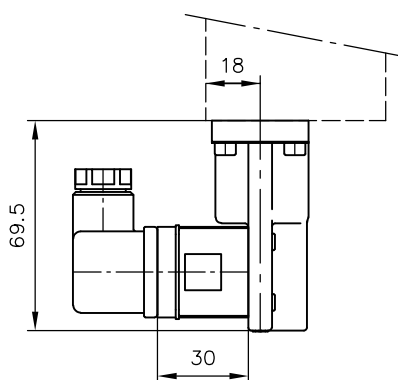
Coding **VC**



Coding **WA**

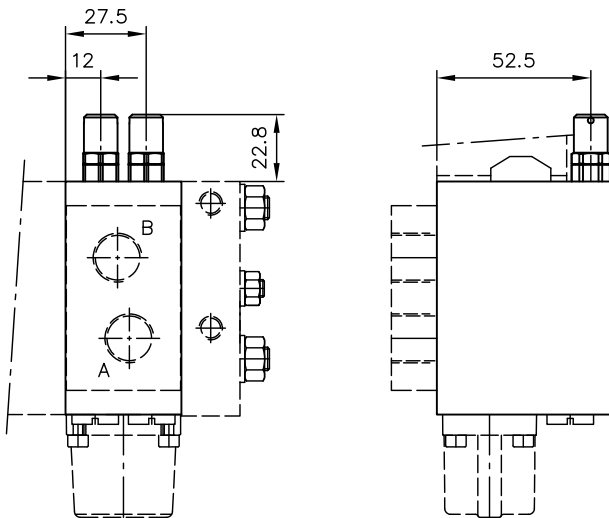


Coding **U**



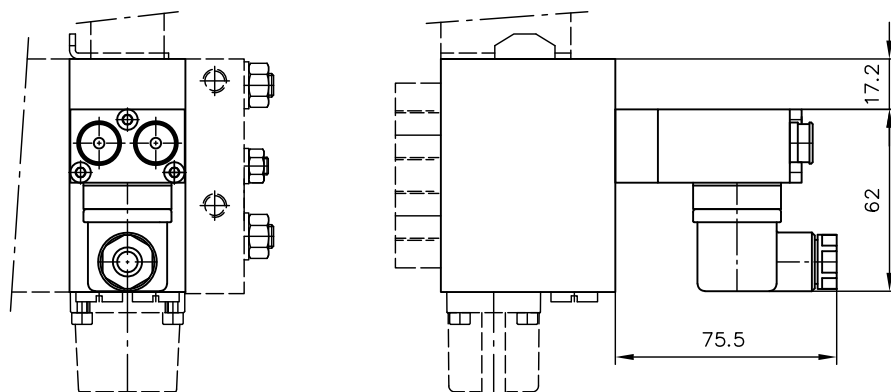
Directional valve section with LS pressure limitation

Coding A.., B.., A.. B..

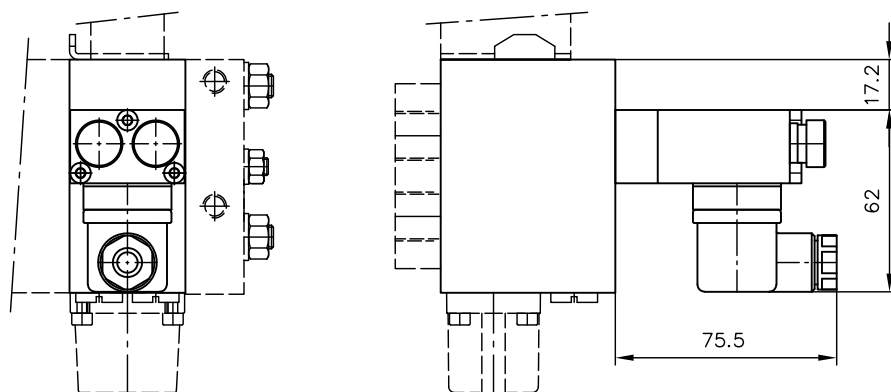


Directional valve section with electric LS relief or LS pressure limitation

Coding **FP**

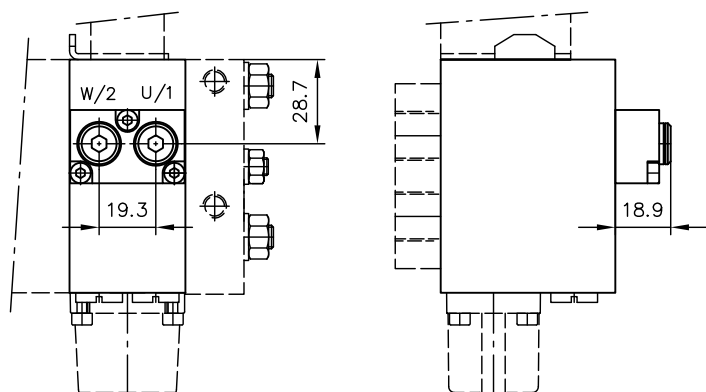


Coding **FPH**



Directional valve section with LS port for external limitation

Coding **S1**



Coding

Ports (ISO 228-1)

U/1, W/2

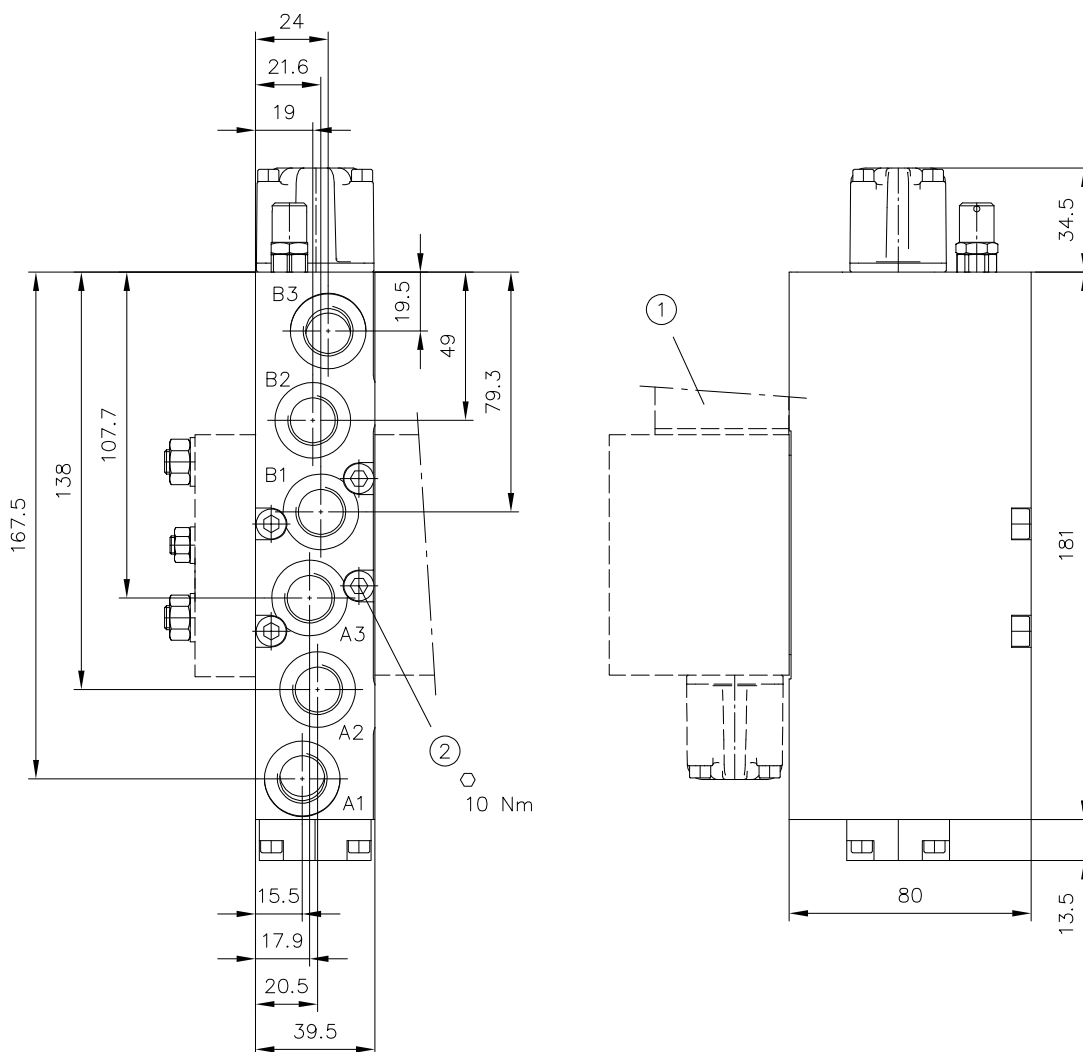
S1

G 1/8

4.3.2 Ancillary block with diverter

/222/I
/UNF 222/I

/222 C.../I
/UNF 222 C.../I



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

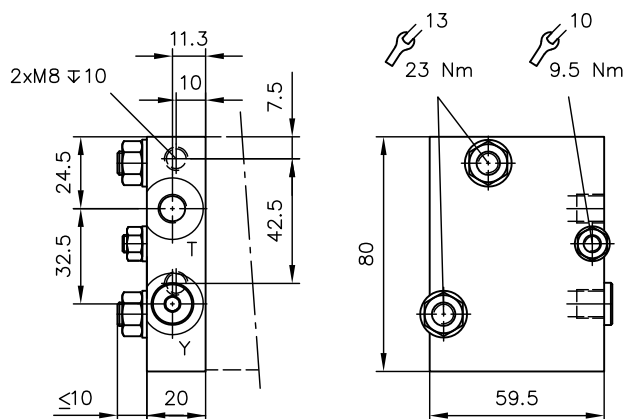
/020/I
/UNF 020/I

Coding	Ports (ISO 228-1 or SAE J 514)	
	A1, A2, A3, B1, A3, B3	A2, B2
/222/I /222 C.../I	G 3/8	--
/020/I	--	G 3/8
/UNF 222/I /UNF 222 C.../I	SAE-8 (3/4-16 UNF-2B)	--
/UNF 020/I	--	SAE-8 (3/4-16 UNF-2B)

4.4 End plate for valve section

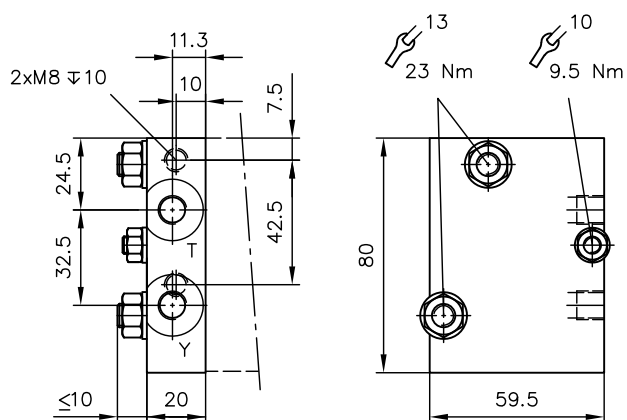
see Chapter 2.4, "End plate"

E 1, E 1 UNF



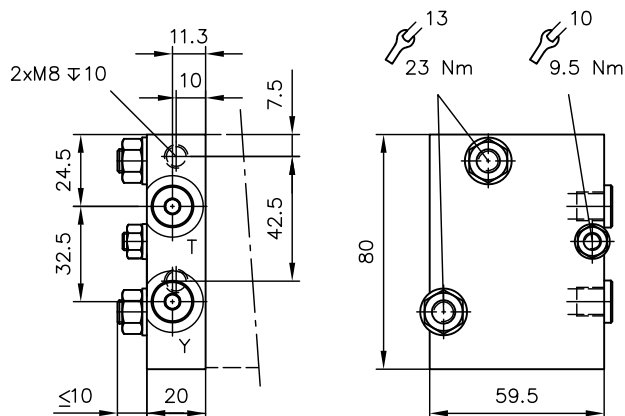
- T - open, Y - sealed

E 2, E 2 UNF



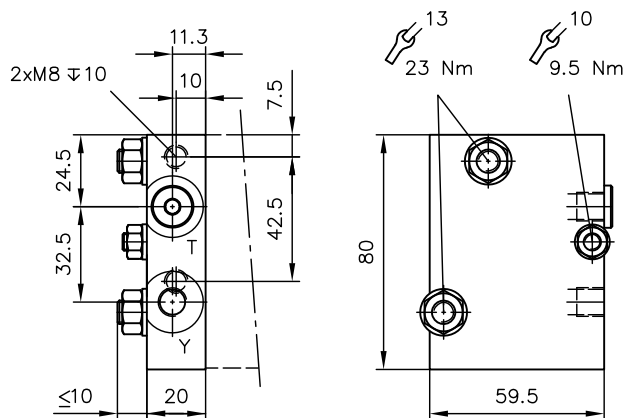
- T - open, Y - open

E 4, E 4 UNF



- T - sealed, Y - sealed

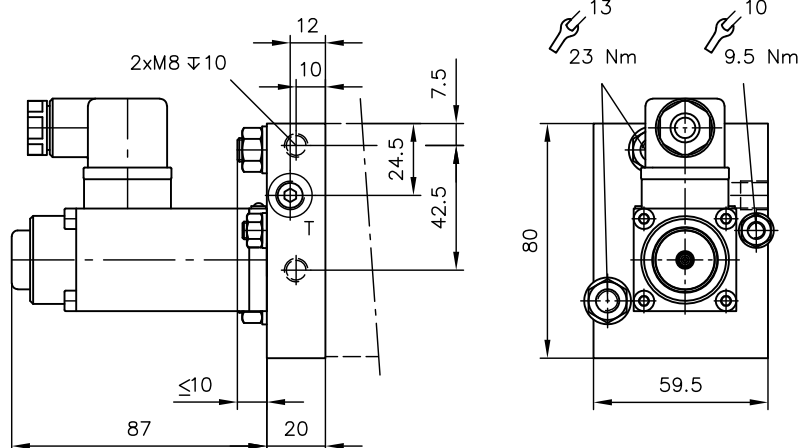
E 5, E 5 UNF



- T - sealed, Y - open

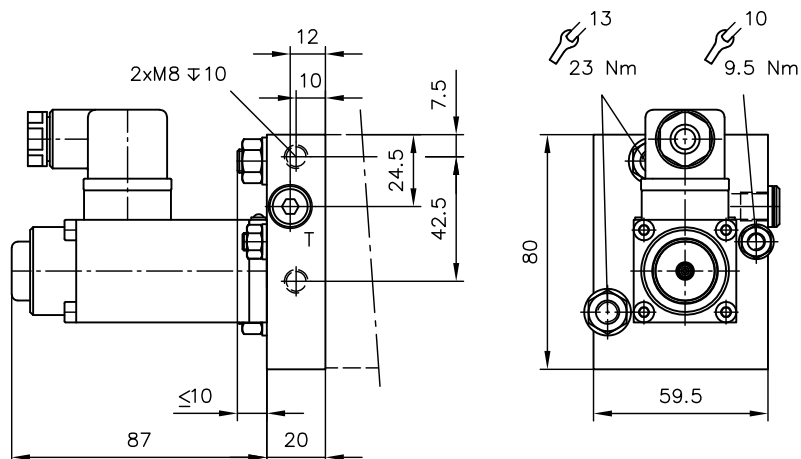
Coding	Connections (ISO 228-1 or SAE J 514)
	T, Y
E 1, E 2, E 4, E 5	G 1/8
E 1 UNF, E 2 UNF, E 4 UNF, E 5 UNF	SAE-4 (7/16-UNF-2B)

E 3



- T - open

E 6



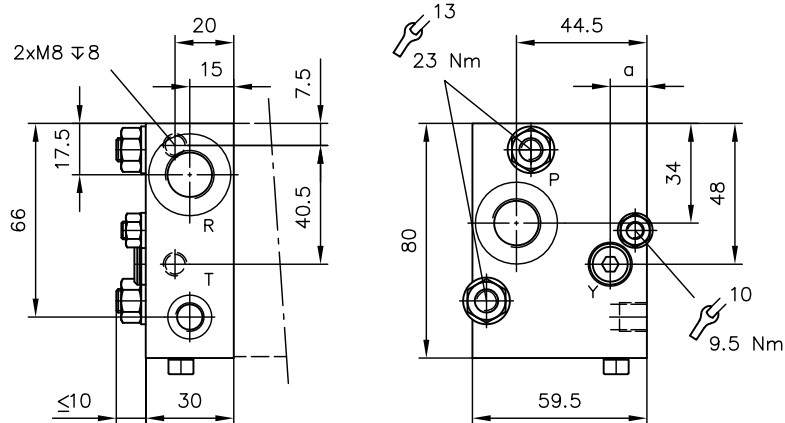
- T - sealed

Coding

Connections (ISO 228-1)

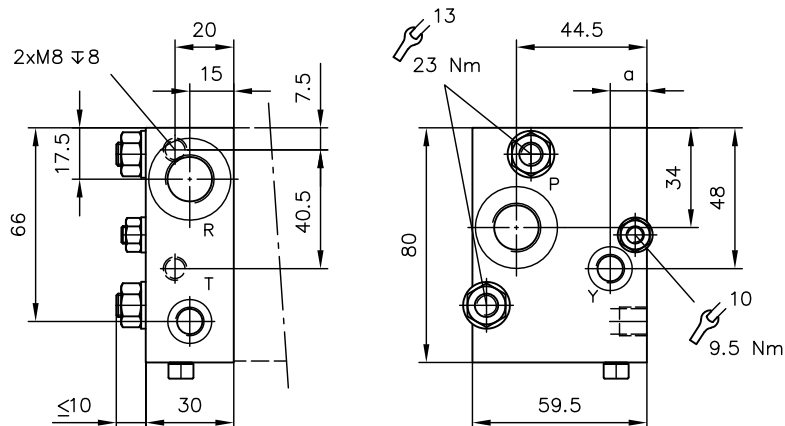
	T
E 3, E 6	G 1/8

E 17, E 17 UNF



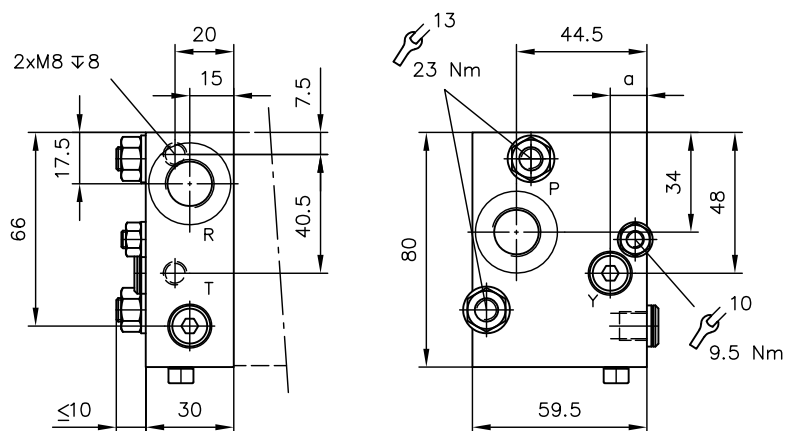
- T - open, Y - sealed, P - open, R - open

E 18, E 18 UNF



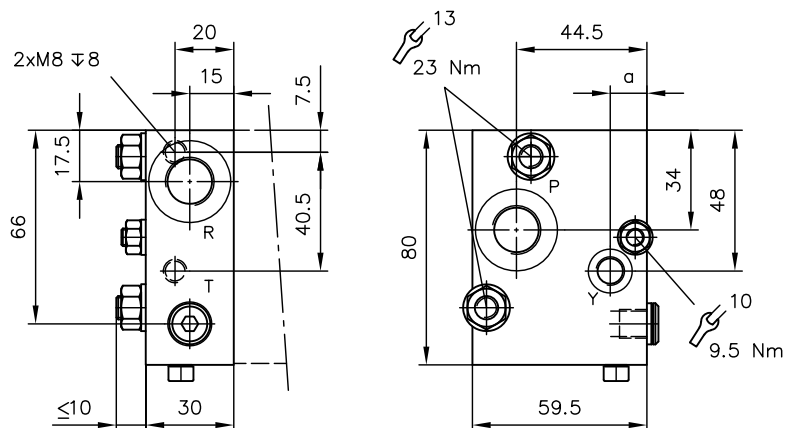
- T - open, Y - open, P - open, R - open

E 19, E 19 UNF



- T - sealed, Y - sealed, P - open, R - open

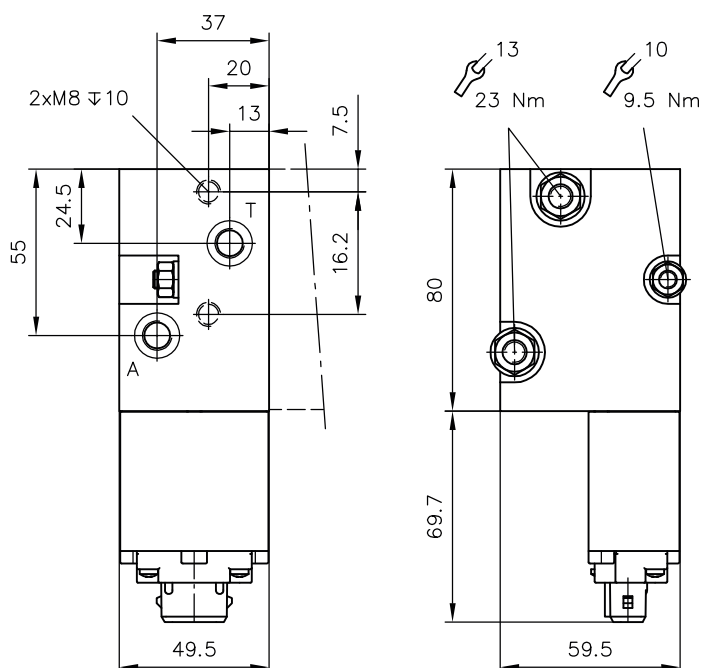
E 20, E 20 UNF



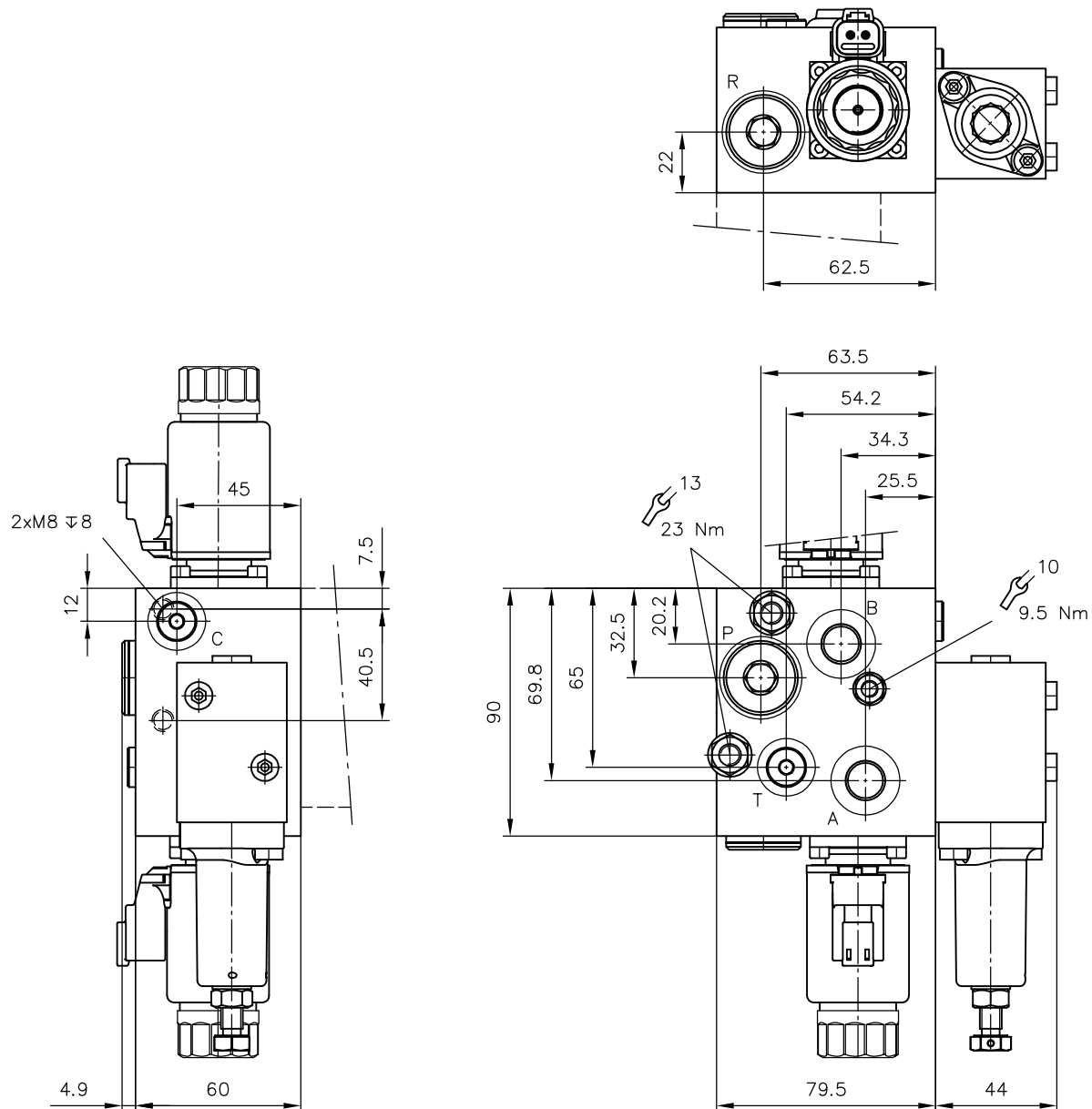
- T - sealed, Y - open, P - open, R - open

Coding	a	Connections (ISO 228-1 or SAE J 514)	
		T, Y	P, R
E 17, E 18, E 19, E 20	12.5	G 1/8	G 3/8
E 17 UNF, E 18 UNF, E 19 UNF, E 20 UNF	16	SAE-4 (7/16 UNF-2B)	SAE-8 (3/4-16 UNF-2B)

E 4 PMZ1-...



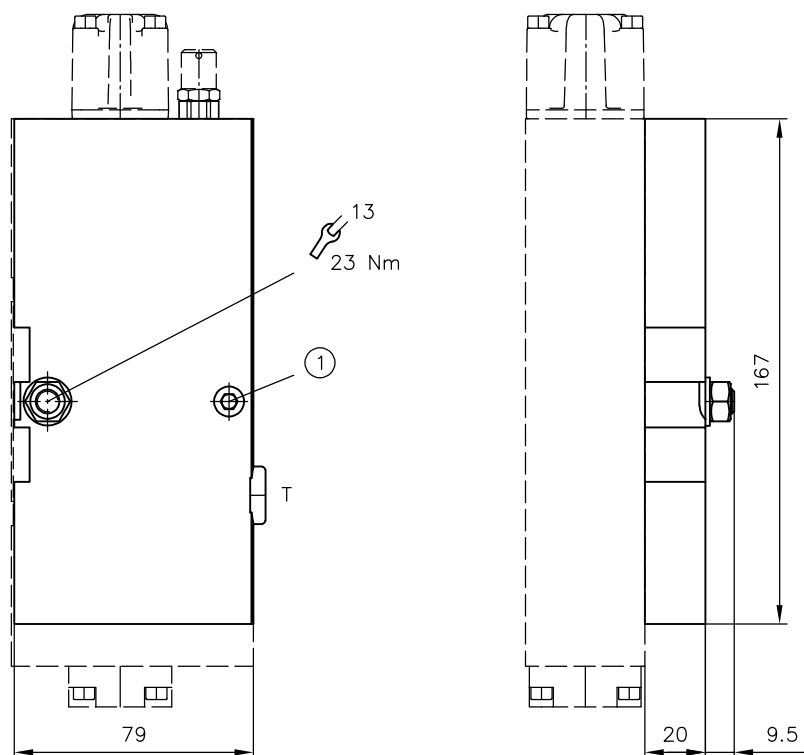
Coding	Connections (ISO 228-1)
A, T	G 1/8



Coding	Connections (SAE J 514)
C, T	SAE-4 (7/16-20 UNF-2B)
A, B	SAE-6 (9/16-18 UNF-2B)
P, R	SAE-8 (3/4-16 UNF-2B)

4.4.1 End plate for ancillary blocks

E0



1 Cylinder screw ISO 4762-M6x30-8.8 A2K

Coding

T

Connections (ISO 228-1)

G 1/4

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

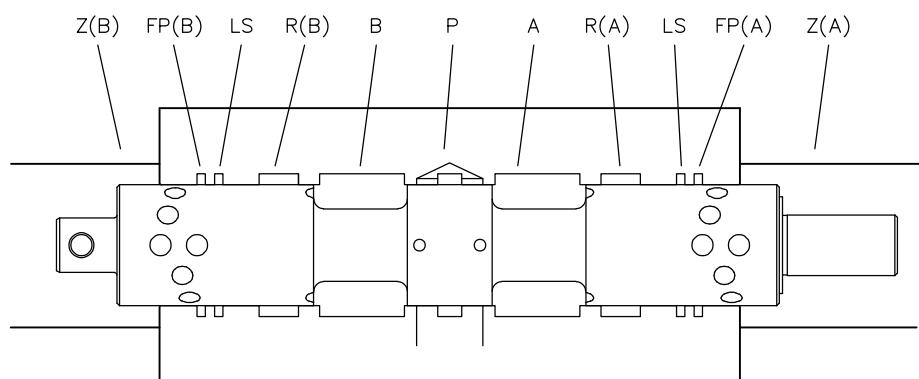
The valve bank must be mounted to the frame or base of the machine in such a way that no stress is induced. Three screws and elastic washers between the bank and the frame are recommended for attachment.

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 2.3.1.7](#))
 - ▶ without LS relief or LS pressure limitation coding ([Chapter 2.3.1.8](#))
 - ▶ without LS port for external limitation ([Chapter 2.3.1.9](#))

Recommendation for improving the lubrication in this case:

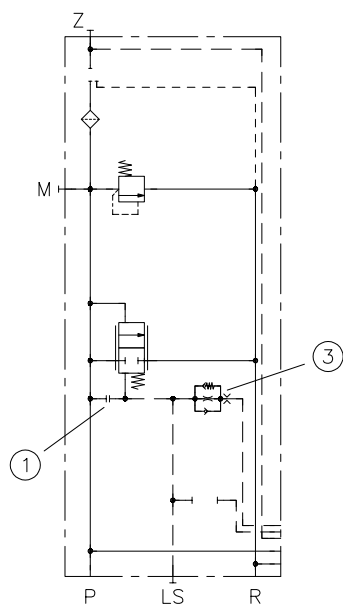
- Pre-load the reflux in PSL/PSV(max. 5 bar)
- Valve section with one of these three functions
 - ▶ LS pressure limitation
 - AB
 - A..B..
 - B..
 - ▶ LS relief or LS pressure limitation
 - F0
 - F..
 - ▶ LS port for external limitation
 - S
 - S1
 - X
- On valve sections ([Chapter 2.3.1.3](#)) with code 8 and code 81, do not use dither.

5.2.3 Converting the connection block from PSL to PSV

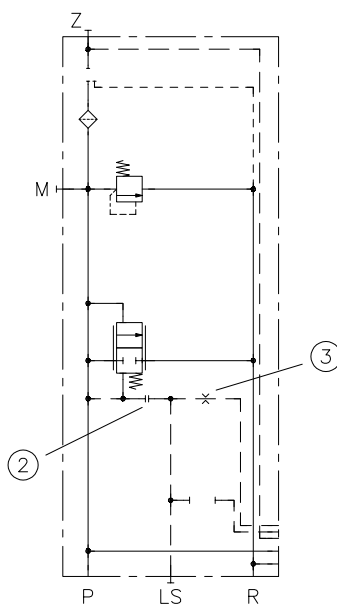
The connection blocks of type PSL 3.../D...-2 or PSL UNF 3.../D...-2 can be converted into a connection block for a control pump system (Closed Center). For this purpose, the components listed below must be installed as shown.

The connection blocks of type PSV 3.../D...-2 or PSV UNF 3.../...-2 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.

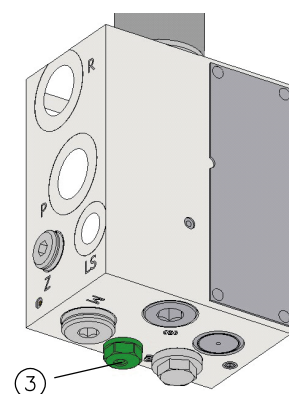
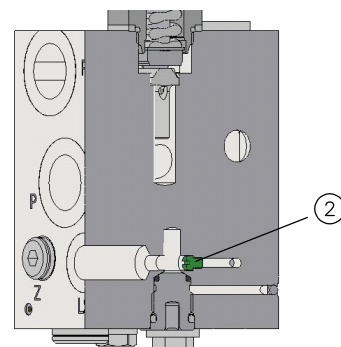
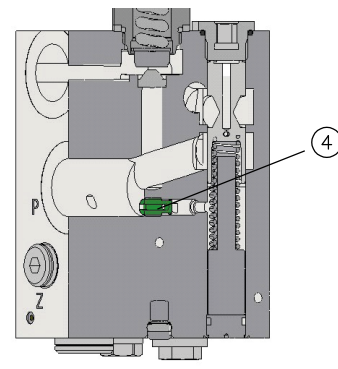
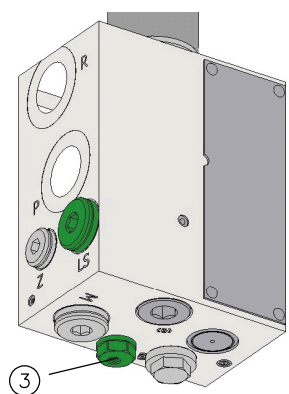
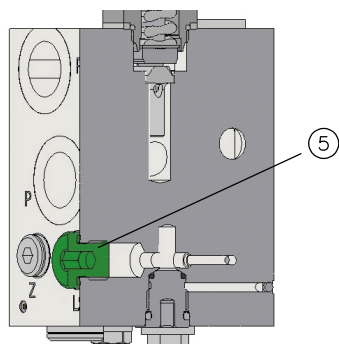
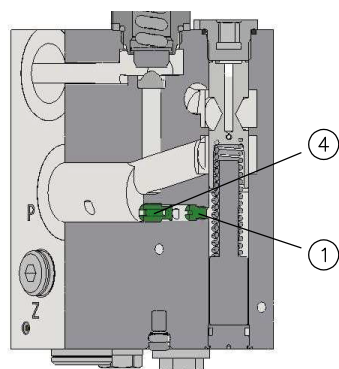
PSL 3.../D...-2
PSL UNF 3.../D...-2



PSV 3.../D...-2
PSV UNF 3.../...-2



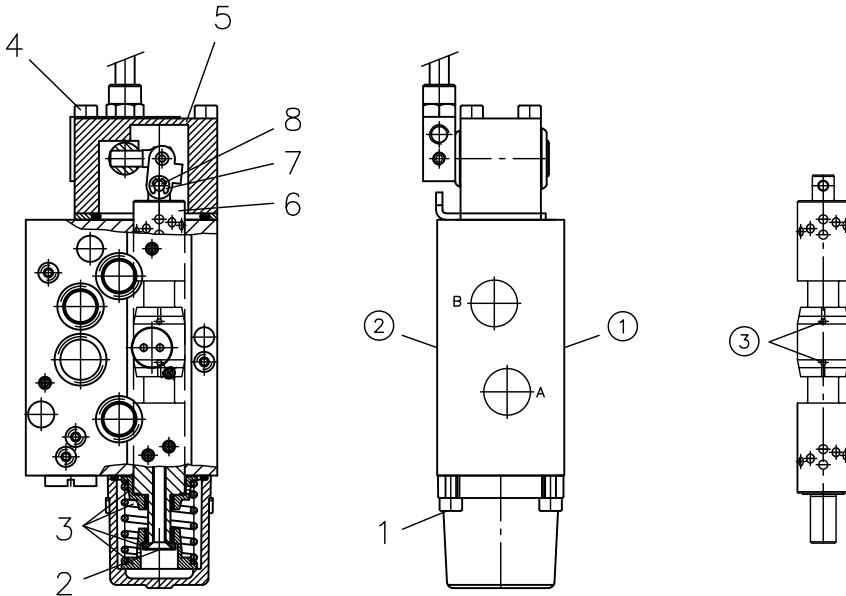
Position	PSL 3.../D...-2	PSV 3.../D...-2
1	Screw 7997 019	--
2	--	Screw 7997 019
3	Dampening screw S	Dampening screw B
4	Filter screw 7700 794	Filter screw 7700 794
5	Tapped plug	--



5.2.4 Changing the valve spool

The valve spools are not specially adapted to a spool block. This means that spool valves can be exchanged at any time to bring them in line with any changes in consumer requirements.

In doing so, the following must be observed:



- 1 End plate side
- 2 Connection block side
- 3 Metering ports

Changing the valve spool

1. Unscrew screws **1** (ISO 4762--M4x12-8.8-A2-70)), remove spring housing
2. Unscrew screw **2** M4x30
3. Take off spring package with spring plates **3**
4. Screws **4** (ISO 4762-M4x35-8.8-A2-70) 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

i INFORMATION

When assembled, the valve spool's metering ports must always face towards the end plate!

Exception: Valve spools with coding 40 do not have metering ports and can be installed any way around.

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

Note on ancillary block with diverter

NOTICE

- Ancillary blocks with a diverter are designed for use with consumers with load-holding valves or releasable check valves.
- They are only allowed to be switched in the unpressurised state. In other words, before switching the 8/3-way diverter valves, the 4/3-way spool valves from the base section first need to be switched back to the neutral position in order to relieve the pressure in A, B and LS.

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

To purchase spare parts, please see [HAWE Hydraulik interactive contact map](#).

Seal kits

Connection block	DS 7700-21
Valve section	DS 7700-22

References

Additional versions

- Proportional directional spool valve type MICK 3: D 8126
- Proportional directional spool valve type PSL, PSV size 2 and EDL: D 7700-2
- Proportional directional spool valves types PSL/PSV/PSM, size 3: D 7700-3
- 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, PSVF size 5: D 7700-5F
- 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
- Directional spool valve type CWL: D 7953 CWL

