# Proportional directional spool valve type PSLF, PSVF, and SLF according to the Load-Sensing principle size 3 and 5 (manifold mounting)

## 1. General information

The directional spool valves types PSLF and PSVF as well as the individual sections type SLF serve to control both, the direction of movement and the load-independent, stepless velocity of the hydraulic consumers. In this way several consumers may be moved simultaneously, independently from each other at different velocity and pressure ratings, as long as the sum of the partial flows needed for this is within the total delivery supplied by the pump.
The proportional spool valves of this pamphlet are designed as manifold mounting valves. They may be also combined as valve banks via the sub-plates available from HAWE.
They consist of three functional groups.

**Basic data**

| | | |
|---|---|---|
| Design | Prop. directional spool valve according to the Load-Sensing principle | |
| Versions | Individual valves and valve banks (manifold mounting) | |
| Operating pressure | $p_{max}$ | 420 bar |
| Flow | $Q_{max}$ | 80 (120) lpm (size 3) |
| | $Q_{max}$ | 160 (240) lpm (size 5) |

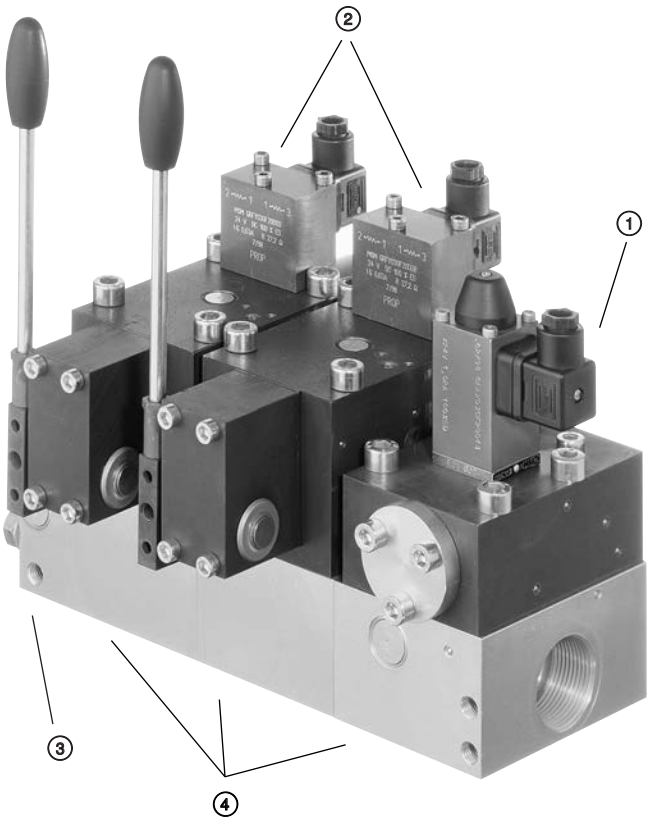


**Table of contents**



**Further technical information:**

| Size | Design | Pamphlet |
|---|---|---|
| 2 | Manifold mounting design | D 7700-2 |
| 2 | Valve bank design (CAN onboard) | D 7700 CAN |
| 3 | Valve bank design | D 7700-3 |
| 5 | Valve bank design | D 7700-5 |
| 7 | Manifold mounting design | D 7700-7 F |

**Mounting**

① Inlet section(control section)
② Size 5 (valve bank design)
③ End plate
④ Sub-plates




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**D 7700-F**
Prop. directional spool valve PSLF, PSVF and SLF





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# 2. Type coding, overview

Order examples:

Valve section (for individual orders, without sub-plate)

**SLF 3 - A2 J 25/16 C300 / EA - G 24**

① + ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑯

Inlet section (for individual order, without sub-plate)

**PSLF A H1 F80 / 400 - 3 - G 24**

① ② ③ ④ ⑤ ⑦ ⑯

Valve bank

**PSLF A H1 F80 / 400 /4 - 3 - A2 J 25/16 C300 /EA /3 AN320 BN320**
**- A2 O 80/63 F1 /EA /3 - E4 - G 24**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯

① Basic type coding for the valve bank or inlet section (see table 1 and 4 in sect. 3.1.1 and 3.1.2) as well as valve sections (see sect. 3.2.1)

| | |
|---|---|
| **PSLF A** | Supply with pressurized oil by means of fixed pump (open center) |
| **PSVF A** | Supply with pressurized oil by means of variable displacement pump (closed center) with a delivery flow controller, or as a second, separate unit if both valve banks are connected to a constant pressure system |
| **SLF** | Individual valve section, without sub-plate |

② Additional elements (acc. to table 2 and 5 in sect. 3.1.1)

| | |
|---|---|
| (no coding) | Basic version |
| **S, W** | Additional damping device in gallery LS (only with PSVF, standard with PSLF) |
| **B, B 4 ... B 7** | Orifice in gallery LS (PSVF only) |
| **G** | Restrictor check valve (type PSLF) |
| **H** | Raised circulation pressure of the 3-way flow controller (approx. 14 bar with type PSLF) |

③ Control oil supply (acc. to table 7, sect. 3.1.3)

| | |
|---|---|
| (no coding) | Without pressure reducing valve in case of an external control oil supply (min. 20 bar up to max. 40 bar) |
| **1** | With integrated pressure reducing valve for the internal supply of control oil (control pressure approx. 20 bar) |
| **2** | With integrated pressure reducing valve for the internal supply of control oil (control pressure approx. 40 bar) |

④ Optional 2/2-way solenoid valve for arbitrary idle pump circulation (acc. to table 8, sect. 3.1.3)

| | |
|---|---|
| (no coding) | Without directional valve, but prepared for retrofitting |
| **F, Z, ZM** | De-energized = idle pump circulation when open valve is de-energized |
| **D, V** | De-energized = idle pump circulation when closed valve is energized |
| **F.** or **D..** | When a pressure is specified, with pressure limiting valve which can be activated as a second pressure stage (e.g. F 50) |
| **PA, PB, PD** | Prop. pressure limiting valve, with various pressure ranges |

⑤ Pressure limiting valve (main pressure limitation) in the inlet section (acc. to table 9, sect. 3.1.3)

| | |
|---|---|
| (no coding) | Without pressure limiting valve (type PSVF only) |
| **/ ...** | Pressure limiting valve factory set to ... bar |

⑥ Sub-plate for the inlet section (acc. to table 3, sect. 3.1.1 )

| | |
|---|---|
| **/4, /UNF 4** | Size 3, standard (tapped ports for P and R G 3/4 ISO 228/1 (BSPP) or 1 1/16-12 UN-2B SAE J 514) |
| **/6** | Size 5, standard (tapped ports for P and R G 1 1/4 ISO 228/1 (BSPP)) |
| **/UNF 6** | Size 5, standard (ports P and R 1 5/8-12 UN-2B SAE J 514) |
| **/7 SAE** | Size 5 (flange SAE 1 1/2” 6000 psi) |

⑦ Size (acc. to table 1 and 5, sect. 3.1)

| | |
|---|---|
| **3** or **5** | Various connection hole pattern (adapter plates enabling direct mounting between size 5 and 3 with type ZPL 53 acc. to table 10, sect. 3.1.4) |

⑧ Valve section - Basic function (acc. to table 13, section 3.2.1)

| | |
|---|---|
| **A 2** (standard) | Spool valve with inflow controller for each consumer |
| **A 1** | Spool valve without inflow controller, suitable for consumers, which are actuated individually and successively but not simultaneously (no additional functions possible) |
| **A 5, A 7, AA 9** | Inflow controller with enforced spring for higher flow |
| **A 8** | 4/3-way directional spool valve (pre-selector valve) |
| **AR 2, AR 5, AR 7** | like A 2, A 5, A 7 but with check valve function |
| **AX** | Blanking plate |

⑨ Coding for the flow-pattern (acc. to table 14, sect. 3.2.1 and 6 c)
**L, M, F, H, J, B, R, O, P, A, Q, K, T, I, Y, Z, V, G, W, X**

⑩ Flow coding for port A and B (acc. to table 15, sect. 3.2.1)

| | |
|---|---|
| **.../...** | Coding for port A or B (independently selectable) |
| | **3, 6, 10, 16, 25, 40, 63, 80** (size 3) |
| | **16, 25, 40, 63, 80, 120, 160** (size 5) |

⑪ LS-pressure limitation (deviating from the main pressure setting, lower pressure for the connected consumer) no shock valves (acc. to table 16 and 18, section 3.2.1) (doesn't apply to spool valve types without inflow controller, coding A 1 ⑧ or table 12)

| | |
|---|---|
| (no coding) | No secondary pressure limitation |
| **A..., B...** | Only for consumer port or B |
| **A...B...** | For consumer ports A and B |
| **C...** | Joint for consumer port A and B (not in conjunction with coding **F..** or **S.** ⑫ ) |

⑫ Functional cut-off (acc. to table 17 and 18, sect. 3.2.1)
(doesn't apply to spool valve types without inflow controller, coding A1 ⑧ or table 13)

| | |
|---|---|
| (no coding) | No functional cut-off |
| **F 1** | Electrical cut-off, consumer port A |
| **F 2** | Electrical cut-off, consumer port B |
| **F 3** | Electrical cut-off, consumer port A and B |
| **FP 1(2, 3)** | Like F 1(2,3), however with electro-proportional pressure limitation |
| **FPH 1(2, 3)** | Like FP 1(2,3), however with additional push-button for manual emergency actuation |
| **S, S 1** | External hydraulic load signal pick-up from the control signal port U (consumer port A) and W (consumer port B) |

⑬ Types of actuation (acc. to table 19 and 20, sect. 3.2.1)

| | |
|---|---|
| **/A** | Manual actuation |
| **/E** | Electro-hydraulic actuation |
| **/EI** | Like /E however without stroke limitation |
| **/EA** | Electro-hydraulic and manual actuation |
| **/E0A** | Like /EA, however without actuation solenoid (prepared for retrofitting) |
| **/H, /F** | Hydraulic actuation |
| **/H UNF, /F UNF** | Like /H, /F however with port thread 7/16-20 UNF-2B SAE-4 (conf. SAE J 514) |
| **/HA, /FA** | Hydraulic, (solenoid) and manual actuation |
| **/HA UNF, /FA UNF** | Like /HA, /FA however with port thread 7/16-20 UNF-2B SAE-4 (conf. SAE J 514) |
| **/HEA, /FEA** | Hydraulic and electric actuation |
| **/HEA UNF, /FEA UNF** | Like /HEA, /FEA however with port thread 7/16-20 UNF-2B SAE-4 (conf. SAE J 514) |
| **/C, /AR** | Detent (stepless), 3-step detent |
| **/E0C, /E0AR** | Like /C, /AR however without actuation solenoid (prepared for retrofitting) |
| **/ER, /EAR** | Electrical , 3-step detent |
| **/P** | Pneumatic actuation |
| **/PA** | Pneumatic and manual actuation |

**/...** Suffix

| | |
|---|---|
| **1** | without hand lever |
| **2** | short lever |
| **G** | Reinforced version (size 3) |
| **N, N1** | Proximity switch |
| **V, VA, VB, VC, VCHO, VCHC** | Contact switch monitoring the spool elevation |
| **WA, WA-EX** | Position sensor |
| **U** | Lift monitoring (side indication) |

⑭ Sub-plate for the individual valve section (acc. to table 21, section 3.2.2)

| | |
|---|---|
| **/3, /4, /UNF 3, /UNF 4** | Size 3 |
| **/3 X, /4 X, /UNF 3 X, /UNF 4 W** | Size3, joint load signal pick-up via port X |
| **/38** | Sub-plate size 3 for preselector function |
| **/3 AN.. BN..** | Size 3, shock and suction valves at A |
| **/UNF 3 AN.. BN..** | and B together with pressure specification |
| **/3 AN.., /3 BN.., /UNF 3 AN.., /UNF 3 BN..** | Size 3, shock and suction valves at A or B together with pressure specification |
| **/3 A..B..** | Size 3, shock valve at A and B together with pressure specification |
| **/3 A.., /3 B..** | Size 3, shock valve at A or B together with pressure specification |
| **/U 3** | Sub-plate size 3, for mounting of ancillary blocks or for valve bank design acc. to D 7700-3 |
| **/5, /UNF 5** | Size 5 |
| **/5 S** | Size 5, with load signal pick-up from control signal port U (consumer port A) and W (consumer port B) |
| **/53, 533, 534, /UNF 534** | Sub-plate size 5, prepared to accept valve sections size 3 |
| **/58** | Sub-plate size 5, for preselector function |
| **/5 X, /UNF 5 X** | Size 5, joint load signal pick-up via port X |
| **/U 5, /U 53** | Sub-plate size 5, for mounting of ancillary blocks for valve bank design acc. to D 7700-5 or D 7700-3 |
| **/5 SAE** | Sub-plate size 5, ports A and B with flange SAE 1" (6000 psi) |
| **/5 SAE S, /5 SAE 8** | Size 5, see /5 S or /58, ports A, B with flange SAE 1" (6000 psi) |
| **/6 D SAE** | Size 5, double sub-plate, ports A, B with flange SAE 1 1/4" (6000 psi) |
| **/Z AN..BN..** | Size 5, intermediate plate with shock and suction valves |

⑮ End plates (acc. to table 11, section 3.1.4)

| | |
|---|---|
| **E 1, E 1 SAE** | With T-port for control oil return externally to the tank (basic type) |
| **E 2, E 2 SAE** | Like E 1, with additional port Y for connection to the LS-port of a further, separately located PSV spool valve (total number of the sequential add-on valves 12) |
| **E 3** | Like E 1, with additional 3/2-way directional solenoid valve for arbitrary shut-off of pump circulation during idle position of the valve spools |
| **E 4, E 4 SAE** | Like E 1, however internal control oil return, max. pressure 10 bar! |
| **E 5, E 5 SAE** | Like E 2, however internal control oil return, max. pressure 10 bar! |
| **E 6** | Like E 3, however internal control oil return, max. pressure 10 bar! |
| **E 7, E 8, E 9, E 10** | Like E 1, E 2, E 4 or E 5 but with additional return port |
| **ZPL 53, ZPL 5 SAE 3** | Adapter plates enabling direct mounting of directional spool valves size 5 and 3 |

⑯ Solenoid voltage and version (acc. to table 10, sect. 3.1.3)

| | |
|---|---|
| **G 12..** | 12V DC, connection conf. EN 175 301-803 A |
| **G 24..** | 24V DC, connection conf. EN 175 301-803 A |
| **G 24 EX** | 24V DC, explosion-proof version, acc. to ATEX |
| **G 24 EX 70** | 24V DC, explosion-proof version, acc. to ATEX (ambient temperature 70°C) |
| **G 24 MSHA** | 24V DC, explosion-proof version, acc. to MSHA |
| **G 24 EX** | 24V DC, explosion-proof version |
| **G 24 TEX 70** | 24V DC, explosion-proof version (ambient temperature 70°C) |
| **G 24 MSHA** | 24V DC, fire-damp protected (mining) |
| **G 24 M2FP** | 24V DC, fire-damp protected (mining) (Australia) |
| **G 12 IS** | 12V DC, explosion-proof version, fire-damp protected (mining), intrinsically safe acc. to ATEX (I M2 Ex d ib I) |
| **AMP 12 K 4** | 12V DC, connection via AMP Junior Timer |
| **AMP 24 K 4** | 24V DC, connection via AMP Junior Timer |
| **S 12..** | 12V DC, electr. connection via quarter turn plug |
| **S 24..** | 24V DC, electr. connection via quarter turn plug |
| **DT 12** | 12V DC electr. connection via plug Co. DEUTSCH |
| **DT 24** | 24V DC electr. connection via plug Co. DEUTSCH |

# 3. Available versions, main data

## 3.1 Inlet section (control section)

There are two basic variations of connection blocks:

- Connection blocks with integrated 3-way flow controller, suitable for a fixed pump system (open-center) -type PSLF (see sect. 3.1.1)
- Connection blocks suited for a variable displacement pump system (closed center), a constant pressure systems, or if a second or more separately located directional spool valve banks are fed in parallel - type PSVF (see sect. 3.1.2).

Order coding for an inlet section as individual section (examples): **PSLF A1 F/250 - 3 - G 24**
(**Attention:** Size specification absolutely necessary **- 3** or **-5**) **PSVF A2/300 - 5**

### 3.1.1 Inlet sections for fixed pump systems (with integrated 3-way flow controller) type PSLF

Order examples:

**PSLF A** 1F/300 **/4** - **3** -...-E1 - **G 24** (valve bank))
**PSLF A H** 1F/300 - **3** - **G 24** (individual section)

Table 2 | Table 1 | Table 10

**Table 1:** Basic type and size

| Coding and size | Description | Max. pump delivery flow (lpm) |
|---|---|---|
| **PSLF A ..-3** | Individual section | approx. 100 |
| **PSLF A ..-5** | | approx. 350 |
| Type PSLF...-5 can be converted any time for use with variable displacement pumps (similar to type PSVF AS..-5), see sect. 6.3.3. | | |

**Table 2:** Coding for additional elements for notes and descriptions, see sect. 6.1 a)

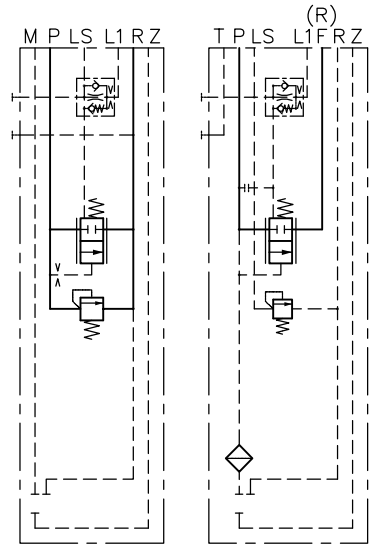
| Coding | Description |
|---|---|
| no coding | **Standard** Integrated combination of orifice, check valve, pre-load valve (pre-load pressure approx. 25 bar). |
| **W** | Like standard, but with increased throttle effect |
| **G** | Restrictor check valve (without sequence valve), increased throttling effect |
| **H** | Coding for 3-way flow controller with increased circulation pressure (see sect. 4.2). Intended for valve spools with increased flow (coding A 5 acc. to table 15), pre-selector spool valve (coding A 8 table 13). |
| **T** | Only available for type PSLF A..-3<br>Provision for locking the 3-way flow controller to enable use with variable pump systems. |

**Table 3:** Coding of the sub-plate for the inlet sections

| Coding | Size | Ports ISO 228/1 (BSPP) or SAE 514 J | |
|---|---|---|---|
| | | P and R | LS, M, T and Z |
| **/4** | 3 | G 3/4 | G 1/4 |
| **/UNF 4** | 3 | 1 1/16-12 UN-2B | 7/16-20 UNF-2B |
| **/6** | 5 | G 1 1/4 | G 1/4 |
| **/UNF 6** | 5 | 1 5/8-12 UN-2B | 7/16-20 UNF-2B |
| **/7 SAE** | 5 | SAE 1 1/2" (6000 psi) | G 1/4 |
| **Note:** | Sub-plates with SAE-flange must not be combined with sub-plates featuring tapped ports (e.g. /5 S) | | |

**Symbols**

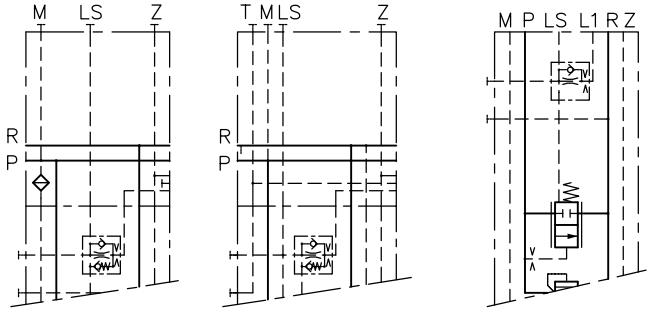
Basic type and additional elements (acc. to table 1 and 2)




PSLF A(H)../..-3
PSLF A(H)W../..-3

PSLF A(H)../..-5
PSLF A(H)W../..-5

Sub-plates (acc. to table 3)




PSLF A../../4-3
PSLF A../../UNF 4-3

PSLF A../../6-5
PSLF A../../7 SAE-5

PSLF AG../..-3
PSLF AG../..-5

Additional elements (acc. to table 2)
These additional elements are illustrated in flow pattern symbols of size 3, they do apply to size 5 in the same way.

### 3.1.2 Inlet sections for variable displacement pump systems / constant pressure system or for a second and all other separately parallel connected directional spool valve banks type PSVF

Order examples:

**PSVF A 1F/300 /6 - 5 -...-E1 - G 24** (valve bank)
**PSVF A B/250 - 3** (individual section)
Nom. voltage acc. to table 10
Sub-plate acc. to table 3, sect. 3.1.1

**Table 4:** Basic type and size

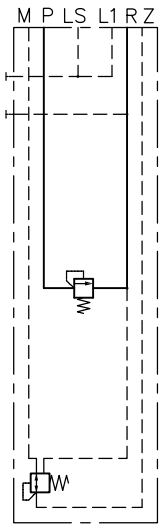
| Coding and size | Descrip-tion | Max. pump delivery flow (lpm) |
|---|---|---|
| **PSVF A ..-3** | Individual section | approx. 100 |
| **PSVF A ..-5** | | approx. 350 |
| Type PSLF...-5 can be converted any time for use with variable displacement pumps (similar to type PSVF AS..-5), see sect. 6.3.3. | | |

**Table 5:** Code letter for features within the LS-signal duct for the damping of pump flow controllers (for notes and explanation, see sect. 6.1 a)
Additional features only suitable where variable displacement pumps are used (limitation of the control oil flow). Observe note at table 8!

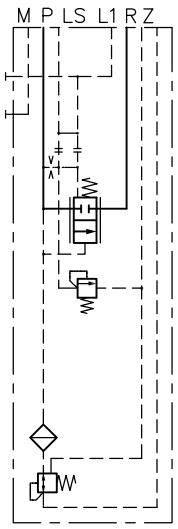
| Coding | Description |
|---|---|
| no coding | **Standard,** without additional element |
| **S** | With integrated combination of orifice, check valve, pre-load valve (pre-load pressure approx. 25 bar) like standard element of type PSLF |
| **W** | Like S, but with increased throttle effect |
| **B** | With orifice ∅ 0.8 mm within LS-duct (limiting the control oil flow) |
| **B 4, B 5, B 6, B 7** | With orifice ∅ 0.4 mm, 0.5 mm, 0.6 mm or 0.7 mm within LS-duct |

**Symbols**

Basic type (acc. to table 5)

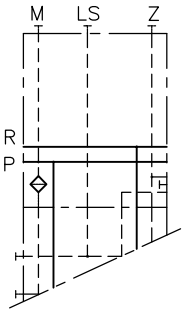



PSVF A../..-3

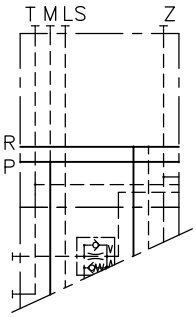



PSVF A../..-5

Sub-plates (acc. to table 3)



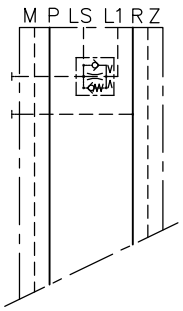

PSVF A../4-3
PSVF A../UNF 4-3



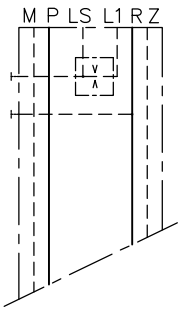

PSVF A../6-5
PSVF A../7 SAE-5

Additional elements (acc. to table 5)

These additional elements are illustrated in flow pattern symbols of size 3, they do apply to size 5 in the same way.




PSVF AS...-3
PSVF AS...-5




PSVF AB...-3
PSVF AB...-5

### 3.1.3 Additional elements for the inlet sections

Order examples: PSLF A. **1F100 /380**/4 - 3 -...- E1 - G24
PSVF A.**1F /350** -5 - G24

Table 8

**Table 7:** Coding for control oil supply (for symbol, see sect. 3.1.1 and 3.1.2)

| Coding | Description |
|---|---|
| no coding | Without pressure reducing valve for actuation coding A, C or P acc. to sect. 3.2, table 18 or in the case of external control oil supply (20-40 bar) for other actuations |
| **1** | With integrated pressure reducing valve for internal control oil supply for actuations coding H (HA, HEA, F, FA, FEA).. and E(EA).. or as pick-up for other control valves (max. permissible control oil flow approx. 2 lpm)<br>Control pressure:<br>Coding 1: approx. 20 bar (+ return pressure at R)<br>Coding 2: approx. 40 bar (+ return pressure at R) |
| **2** | |

**Table 8:** Arbitrary idle pump circulation of all consumers by means of 2/2-way solenoid valve type WN 1 acc. to D 7470 A/1.
2/2-way solenoid valve type EM 21 DE (DSE) acc. to D 7490/1 E for prop. pressure limitation only.

| Coding | Description |
|---|---|
| no coding | If not required |
| **F** | With WN 1 F, idle pump circulation if valve is de-energized (emergency stop) |
| **D** | With WN 1 D, idle pump circulation if valve is energized |
| **F...** or **D...** | With pressure limiting valve, which can be activated as a second pressure stage (specify pressure in bar) (pre-set pressure, tool adjustable from 50 to 400 bar). Example:<br>PSLF A 1 F100/350-3..<br>De-energized $p_{max}$ = 100 bar<br>Energized $p_{max}$ = 350 bar |

**Table 9:** Tool adjustable pressure limiting valve for the main pressure. Adjustable from 50 up to 400 bar, after loosening the lock-nut (for symbol, see sect. 3.1.1 and 3.1.2).

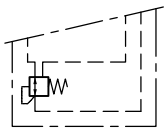
| Coding | Description |
|---|---|
| no coding | Version without pressure limiting valve (only type PSVF) |
| **/...** | With pressure limiting valve at PSLF and PSVF (pressure specification in bar)<br>Non piloted: PSL(V)F ...- 3<br>Piloted: PSL(V)F ...- 5 |

**Note:** To limit the control oil flow, when using the idle pump circulation with type PSV an additional element coding S, W or B 4, B 5, B 6 acc. to table 5 is required.
**Attention:** Observe note in sect. 6.1 a !

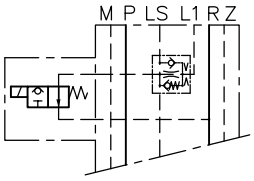
| Coding | Description |
|---|---|
| **PA, PB, PD** | Prop. pressure limiting valve enabling variable adjustment of the system pressure; Pressure range: PA 100...320 bar, PB 15...250 bar, PD 18...400 bar |
| **Z** | Prop. pressure limiting valve type EM 21 DSE, open when deenergized |
| **ZM** | Like Z, but with lead sealed wing screw for emergency operation |
| **V** | Prop. pressure limiting valve type EM 21 DE, closed when deenergized |
| **X...** | Additional LS pressure limitation (50...400 bar) Not suited to compensate pressure peaks on the consumer side. |

**Symbols**

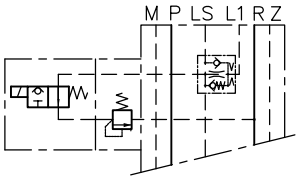
These additional elements are illustrated in flow pattern symbols of size 3, they do apply to size 5 in the same way.



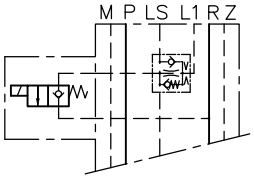
PSLF A 1(2)./...-3(5)
PSVF A 1(2)./...-3(5)



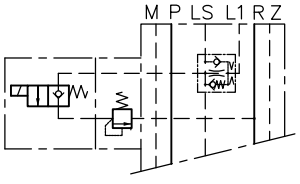

PSL(V)F A..F, Z, ZM



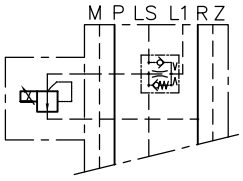

PSL(V)F A..F..



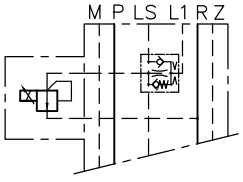

PSL(V)F A..D, V




PSL(V)F A..D..




PSL(V)F..PA (PB,PD)




PSL(V)F A..X

**Table 10:** Solenoid voltage and version

| Coding | Description |
|---|---|
| **G 12 .**<br>**G 24T**<br>└ without<br>**T**<br>**TH**<br>**H 4** | Electr. connection conf. EN 175 301-803 A, via plug (MSD 3-309)<br>Suffix: Applies only to the solenoid actuation coding E, EA, HEA, FEA (table 20) and the functional cut-off (coding F, FP, table 17), see also sect. 4.3<br><br>Actuation solenoid 3-pin (standard)<br>Manual emergancy actuation (standard with functional cut-off F., FP., acc. to table 17)<br>Manual emergancy actuation with pushbutton (standard with functional cut-off FPH.., FP., acc. to table 17)<br>4-pin actuation solenoid (only 24V DC) |
| **G 24 C 4** | Electr. connection conf. EN 175 301-803 C, via plug (MSD 6-209), 4-pin actuation solenoid |
| **X 12 .**<br>**X 24 .** | Electr. connection conf. EN 175 301-803 A, without plug. For options, see coding G... |
| **S 12 .**<br>**S 24 T**<br>└ without<br>**T** | Electr. connection via quarter turn type plug (Bayonet PA 6 ®, Co. SCHLEMMER D-85586 Poing, suited for taper with bayonet 10 SL), 3-pin actuation solenoid<br>Suffix:<br>Manual emergency actuation (standard with functional cut-off FP., table 17) |
| **AMP 12 K 4**<br>**AMP 24 K 4** | Vertical connection via plug AMP Junior Timer, solenoid features 4 terminals |
| **AMP 24 H 4 T** | Lateral connection via plug AMP Junior Timer, solenoid features 4 terminals and manual emergency actuation |
| **DT 12**<br>**DT 24** | Connection via plug Co. DEUTSCH DT 04-4P, suited for socket DT 06-4S |
| **G 24 EX**<br>**G 24 EX-10 m**<br>**EX**<br>**TEX**<br>**EX4**<br>**TEX4** | For use in areas with explosion hazardous atmosphere. Suited for category 2 and 3, zone 1, 21, 2, 22.<br>Protection class EEx m II 120° (T4),<br>with cable length 3 m (no coding) or 10 m<br><br>3-pin actuation solenoid<br>3-pin actuation solenoid with manual emergency actuation<br>4-pin actuation solenoid<br>4-pin actuation solenoid with manual emergency actuation |
| **G 24 TEX 70**<br>**G 24 TEX 70-10 m** | Like G 24 EX .. , but for ambient temperature < 70°C |
| **G 12 IS**<br>**G 12 IS-10 m** | For use in mines and its on-surface systems, which can be endangered by fire damp and/or combustible dust.<br>Protection class I M2 Ex d ib I (fire-damp protected), with cable length 5 m (no coding) or 10 m |
| **G 24 MSHA**<br>**G 24 MSHA-10 m** | For use in mines and its on-surface systems, where a ATEX (EU), IEC, MSHA (USA) or MA (China) approval is mandatory.<br>Protection class I M2 Ex d I (fire-damp protected), with cable length 5 m (no coding) or 10 m |
| **G 24 M2FP**<br>**G 24 M2FP-10 m** | For use in mines and its on-surface systems, where a IEC or ANZE (Australia) approval is mandatory.<br>Protection class I M2 Ex d I (fire-damp protected), with cable length 5 m (no coding) or 10 m |

**Note:**
- Solenoids of explosion-proof design are only available for actuation E, EA or HE (A) (table 20).
- Coding G 24 C4 (X 24 C4) is only available for solenoids of the electrical actuation (table 20) emergency actuation.
- Coding AMP..., DT not available for idle circulation valves coding D, F, PA, PB, PD (table 8), end plates E 3, E 6 (table 11), intermediate plates /ZDS, /ZDR (table 19a), functional cut-off coding F. (table 17)
- Coding S.: Not available for functional cut-off coding F. (table 17) and comparator coding U (table 21)

### 3.1.4 End plates of valve bank

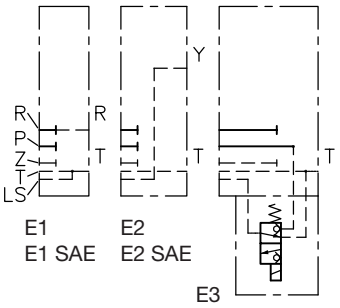
Order example: PSLF A1 F100/380/6 - 5 -... - **E1** - G 24

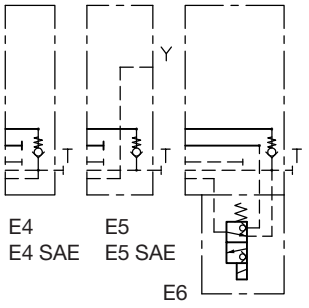
**Table 11:** End plates

| End plate | | Description |
|---|---|---|
| External port T (separate return pipe to the tank) | Internal control oil return gallery | Order coding of an end plate as separate part (example): **SLF 5 - E 1** **SLF 3 - E 6 - G 24** (State the size: SLF**3**- or -SLF**5-** !) |
| **E 1** **E 1 SAE** | **E 4** **E 4 SAE** | Standard end plate |
| **E 2** **E 2 SAE** | **E 5** **E 5 SAE** | With additional inlet port Y e.g. for connecting the LS-control pipe of a subsequent PSVF spool valve bank. |
| **E 3** | **E 6** | Possibility for arbitrary shut-off of the idle pump circulation by means of a directly mounted 3/2-way direct. seated valve WN 1 H acc. to D 7470 A/1 (only size 3) |
| **E 7** | **E 9** | Like E 1/E 4, but with additional return port R (only size 3) |
| **E 8** | **E10** | Like E 2/E 5, but with additional return port R (only size 3) |
| **ZPL 53** **ZPL 5 SAE 3** | | Adapter plate to continue a prop. directional valve bank size 5 with sections of size 3. As separate part: **SLF 5-ZPL 53** |

**Note:**
- The internal control oil return gallery is to be used only in systems where the return pressure is below 10 bar.
- End plates E.SAE in combination with sub-plates /..SAE (only size 5) or adapter plate ZPL 5 SAE 3 as conversion from sub-plates /.SAE size 5 to size 3

**Symbols**



## 3.2 Valve sections

### 3.2.1 Directional spool valve (individual valve)

Order examples:

(valve bank) PSLF A1 F/320/4 - **3 - A2 L 63/40 F1 /EA /3 AN320 BN320** - E1 - G 24

(individual section) SLF **5 - A5 J 160/160 C250 /EA** - G 24

Size

Table 19

Sect. 3.2.2

Table 17

Table 16

Table 15

Table 14

**Note:** Size specification is absolutely necessary! The valve spools are subsequently interchangeable, e.g. if a different flow rating than initially planned becomes necessary (see sect. 6.3.4)

**Table 13:** Spool valve, basic version

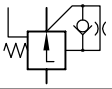
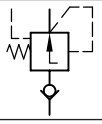
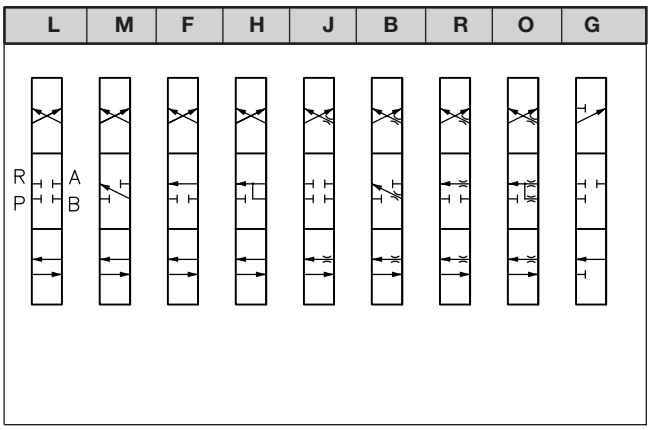
| Coding | Description |
|---|---|
| **A 2** | **Standard,** with inflow controller, for simultaneous load compensated moving of several consumers (3/3-, 4/3-way spool valve, standard type) |
| **A 1** | Without inflow controller intended for singly / successively actuated functions. Additional functions on the consumer side are not possible. For the max. consumer flow of the individual section, acc. to table 15 and sect. 6.1 b) |
| **A 5** | With inflow controller (for symbol, see coding A 2) but with reinforced spring at the 2-way flow controller (control pressure approx. 9 bar). Only usable in conjunction with connection block type PSLF AH../...-3- or type PSVF with variable displacement pump / constant pressure system. (See note sect. 6.1 a and b) |
| **A 7** | With inflow controller (like coding A 2) but enforced 2-way controller spring (control pressure approx. 13 bar). Only avail-able in combination with connection block type PSVF and variable displacement pump/constant pressure system. (See note in sect. 6.1 b) |
| **A 26**<br>**A 56** | Only size 3: With inflow controller coding A 2 or A 5, and additional rebound damping;<br>Especially suited for oscillation inducing consumers (e.g. hydraulic motors with a low number of pistons)  |
| **A 8** | 4/3-way directional spool valve, Makes only sense with flow pattern symbol L and H and maximum flow. Only usable in conjunction with connection block type PSLF.H./... or type PSVF with variable displacement pump / constant pressure system. (see note sect. 6.1 b) |
| **AR 2,**<br>**AR 5,**<br>**AR 7** | Like coding A 2, A 5, A 7, but with additional check valve functionality (spool valve = slight leakage), (see note sect. 6.1 b)<br>Only usable in conjunction with connection block type PSLF.H./... or type PSVF with variable displacement pump / constant pressure system.  |
| **AX** | Blanking plate |
| **AA 9** | With inflow controller (for symbol, see coding A 2), but with enforced spring for the 2-way flow controller (increased circulation pressure approx. 18 bar).<br>Only suited for connection block type PSLF in combination with varaible pump / constant pressure systems.<br>Attention: Observe note in sect. 6.1 b!<br>Only available for size 5, cannot be retrofitted!<br>Available as individual valve coding SLF 5-AA9 or in combination with sub-plate coding /5 SAE, 5 SAES |

**Table 14:** Symbols




| | |
|---|---|
| **J, B, R, O, I, Y, Z, V** | Valve spool with return throttling to assist oscillation dampening, see sect. 6.1 c |
| **G** | 3/3-way spool valve, observe note in sect. 6.1 c |
| **W** | 4/2-way spool valve, observe note in sect. 6.1 c |
| **A, K, P, Q, T** | Valve spool with positive overlapping, see sect. 6.1 c, only size 3 |
| **HW, OW** | Valve spool with wider fitting to prevent spool sticking - intended for contamination prone systems |
| **X** | 2/2-way directional spool valve for hydraulic motors, see sect. 6.1 e, only size 3 |

**Table 15:** Max. flow P → A(B) acc. to the coding

| Valve spool coding acc. to table 12 | | Flow coding $Q_{A, B}$ (lpm) at consumer port A and B | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coding | Size | **3** | **6** | **10** | **16** | **25** | **40** | **63** | **80** | **120** | **160** |
| **A 2** | 3 | 3 | 6 | 10 | 16 | 25 | 40 | 63 | 80 | -- | -- |
| | 5 | -- | -- | -- | 16 | 25 | 40 | 63 | 80 | 120 | 160 |
| **A 1, A 8** | 3 | 4 | 9 | 14 | 22 | 34 | 54 | 85 | 107 | -- | -- |
| | 5 | -- | -- | -- | 20 | 32 | 51 | 80 | 110 | 150 | 210 |
| | | Valid for PSLF (integrated 3-way flow controller: $\Delta p \sim 10$ bar), otherwise as guide line $Q_{A, B} \approx Q_{nom} \cdot \sqrt{0.2 \cdot \Delta p_{controller}}$<br>$Q_{rating}$ - flow for coding A 2;<br>$\Delta p_{controller}$ stand-by pressure of the flow controller of the pump<br>Example (size 3): $Q_{rating}$ = 25 lpm, $\Delta p_{controller}$ = 14 bar; $Q_{A;B}$ ≈ 42 lpm | | | | | | | | | |
| **A 5** | 3 | 4 | 9 | 14 | 22 | 34 | 54 | 85 | 107 | -- | -- |
| | 5 | -- | -- | -- | 20 | 32 | 51 | 80 | 110 | 150 | 210 |
| **A 7** | 3 | 5 | 10 | 14 | 24 | 37 | 59 | 93 | 118 | -- | -- |
| | 5 | -- | -- | -- | 23 | 37 | 60 | 95 | 130 | 175 | 240 |
| **AA 9** | 5 | -- | -- | -- | (30) | (47) | (75) | (118) | 150 | 225 | 300 |

**Note:** The flow rate for the consumer ports A and B can be individually selected, e.g. 63/40, 40/80. This provides optimal adaptation to the respective consumer while exploiting the full functional spool lift. In addition there is the possibility of mechanical stroke limitation.

**Table 16:** LS-pressure limiting valves, only available with spool valves featuring an inflow controller, coding A 2, A 5 and A 7 (acc. to table 13!). These are no shock valves!

| Coding | Description |
|---|---|
| no coding | Without pressure limitation |
| **A...** | Pressure limitation at A with pressure specification |
| **B...** | Pressure limitation at B with pressure specification |
| **A...B...** | Pressure limitation at A and B with pressure specification |
| **C...** | Common pressure limitation for A and B with pressure specification |

Pressure limitation $p_{min}$ = 50 bar; $p_{max}$ = 420 bar
Example: SLF 3-A 2 H63/40 **A250 B200**/A

**Table 17:** Functional cut-off or prop. pressure limitation (only available with spool valves with inflow controller coding A 2, A 5 and A 7 acc. to table 13!)

| Coding | Description |
|---|---|
| no coding | Without functional cut-off |
| **F 1, F 2** | Electric functional cut-off at A or B |
| **F 3** | Electric functional cut-off at A and B |
| **FP 1, FP 2, FP 3<br>FPH 1, FPH 2, FPH 3** | Prop. pressure limitation for A and/or B<br>Version FPH. with additional emergency actuation (no tools needed) |
| **S** | Only size 5: flange sided load signal ports U and W (G 1/8 (BSPP)) for external piping, e.g. in combination with sub-plate /5 S, see sect. 3.2.2 table 21;<br>Example: SLF 5-A 2 H 160/80 S/5 S<br>The signal ports are apparent as standard (see flow pattern symbols on page 11) in combination with coding A.., B.., A..B.. (acc. to table 15 and 17) and F.1(2, 3), S1 (table 16 and 17) |
| **S 1** | Load signal ports U and W (G 1/8 (BSPP)) for external piping; tapped ports at valve section |

- There remains a residual pressure when the LS gallery is relieved. When the return line is depressurized the residual pressure will be: $p_{relieved} = \Delta p_{block} + \Delta p_{controller}$ ($\Delta p_{controller}$= control pressure of the inflow controller acc. to table 13)
  Coding F., FP. : $\Delta p_{block}$ = 10 bar
  Coding S, S 1, (X) : $\Delta p_{block}$ = 5 bar
- One joint LS-port X is standard on the flange side (see dimensional drawings, sect. 5)
- Size 5: combinations of coding F..1, FP.. or S 1 and solenoids G 24 MSHA or G 12 IS are not available!
- Coding F.., FP.. not available with solenoids G 24 EX 70 and G 12 IS

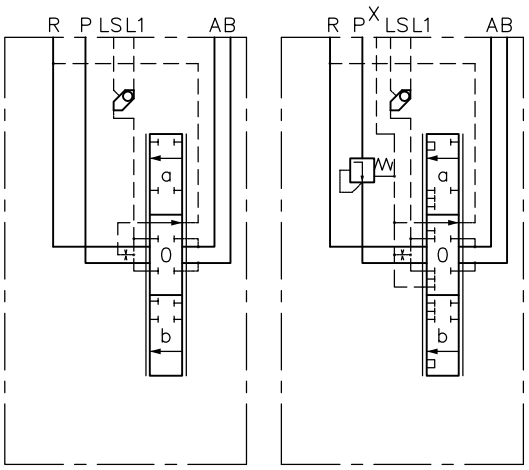
**Table 18:** Combination possibilities for additional functions

| Pressure limitation | Functional cut-off | | |
|---|---|---|---|
| | no coding | **S 1** | **F 1, F 2, F 3, S 1<br>FP 1, FP 2, FP 3<br>FPH 1, FPH 2, FPH 3** |
| no coding | ● | ● | ● |
| **A or B<br>A and B** | ● | ● | ● |
| **C** | ● | -- | -- |

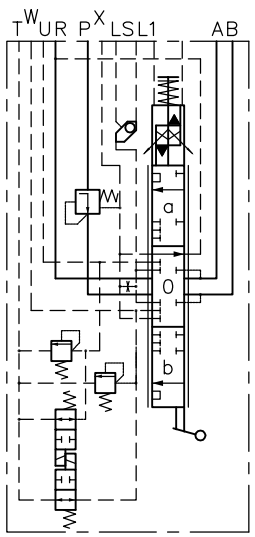
The signal ports are apparent as standard (see flow pattern symbols on page 11) in combination with coding A.., B.., A..B.. (acc. to table 16) and F.1 (2,3), S1 (table 17)

**Basic version (individual section acc. to table 13)**

With respect to flow configuration and actuation, these symbols are neutral and must be supplemented by the corresponding flow pattern symbols illustrated in table 14, see also example in sect. 6.2



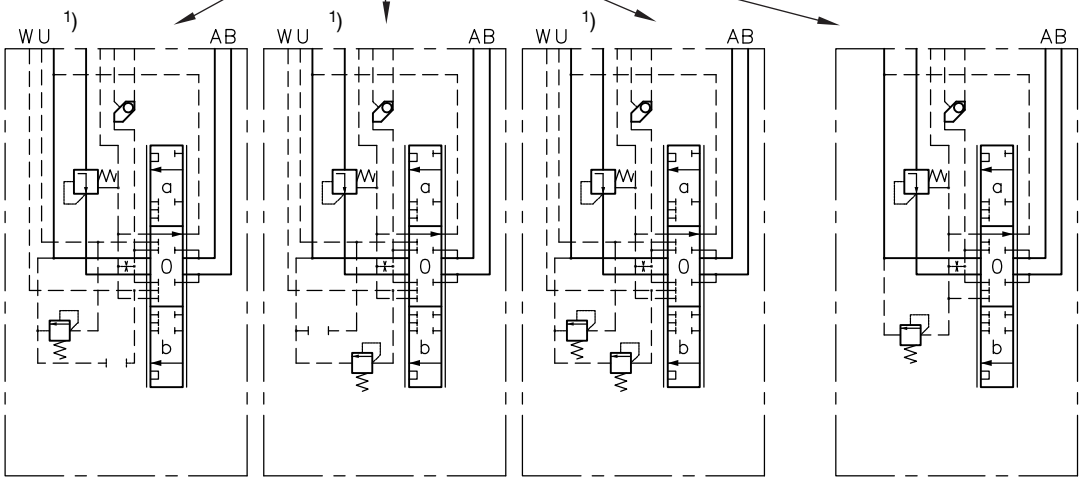

Example:
SLF 5-A 2 J63/40
A 250 B 310
F 3/EA-G 24




4/3-way directional spool valve without inflow controller A 1... (A 8...)

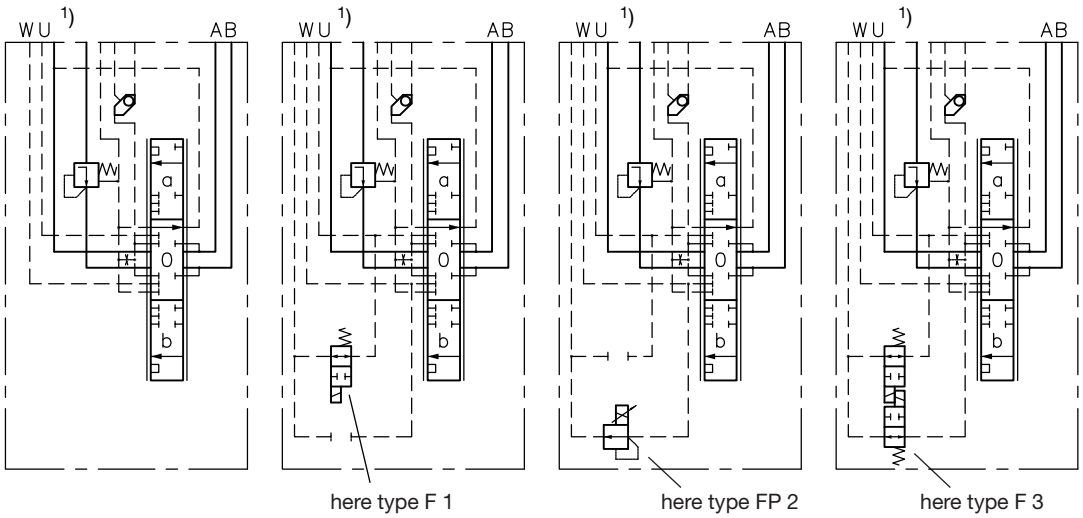
4/3-way directional spool valve with inflow controller A 2... (A 5...)

Additional function: Secondary pressure limitation acc. to table 16 for spool valves with inflow controller (no shock valve!)




..A... ..B... ..A...B... ..C...

Functional cut-off, acc. to table 17, for spool valves with inflow controller

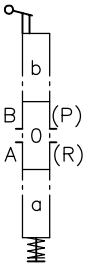
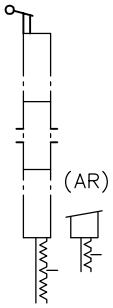
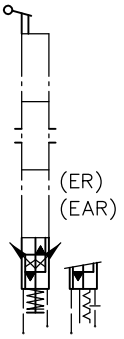
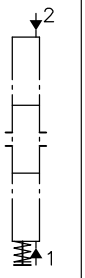
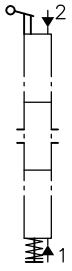
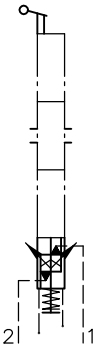



Combination possibilities:

| ..S (only size 5) | ..F(FP, FPH)1 | ..F(FP, FPH)2 | ..F(FP, FPH)3 |
|---|---|---|---|
| | A..F(FP, FPH)1 | A..F(FP, FPH)2 | A..F(FP, FPH)3 |
| | B..F(FP, FPH)1 | B..F(FP, FPH)2 | B..F(FP, FPH)3 |
| | A..B..F(FP, FPH)1 | A..B..F(FP, FPH)2 | A..B..F(FP, FPH)3 |

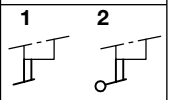
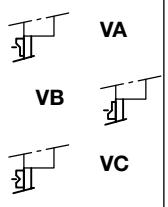
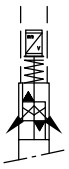
1) Ports U and W on the flange side only with size 5, see description in table 17, coding S

**Table 19:** Types of actuation (for further explanations, see sect. 4.3)

| Nomenclature | | Manual actuation | | Electro-hydraulic actuation | | Hydraulic actuation | | | Pneumatic actuation |
|---|---|---|---|---|---|---|---|---|---|
| | | Spring return | Detent | electro-hydraulic | Combination with manual actuation | hydraulic | Combination with manual actuation | Combination with solenoid and manual actuation | |
| Coding | BG 3 | **A<br>E0A** | **C<br>E0C<br>AR<br>E0AR** | **E<br>EI<br>ER** | **EA<br>EAR** | **F<br>F UNF** | **FA<br>FA UNF** | **FEA<br>FEA UNF** | **P<br>PA** |
| | BG 5 | | | | | **H<br>H UNF** | **HA<br>HA UNF** | **HEA<br>HEA UNF** | |
| Symbol | |  |  |  |  |  |  |  |  |
| Manipulated variables | | Actuation angle<br>min. approx. 5°<br>max. approx. 30° | | Control current ratio<br>$I/I_N$<br>min. approx. 0.2<br>max. approx. 1 | | Control pressure<br>min. approx. 5 bar<br>max. approx. 18 bar<br>max. perm. 50 bar | | | Control press.<br>min. approx.<br>2.5 bar<br>max. approx. 7 bar |

**Note:**
- Approximate values for start of flow at A or B (= min) up to max. consumer flow according to the flow coding table 15, see curves sect. 4.2.
- Difference between actuation H.. and F.. is the position of the control line ports.
  With actuations HE(A) or FE(A) observe also notes and circuit examples in sect. 6.1 i
- Type E0A, E0C, E0AR prepared for retrofitting of a solenoid actuation
- Type AR, ER, and EAR with detent in end position, stroke limitation not possible
- Type EI - Version without stroke limitation
- Type E**M** and EA**M**: Version with pressure gauge ports at the actuation heads
- Type A **8**: Actuation torque like with EA. Type E **9**, E **9** A: Actuation torque like with H, HA

**Table 20:** Additional features for actuations

| Type of actuation / coding | Suffix | Description | Example | Symbols |
|---|---|---|---|---|
| A, EA, HA, PA, C | **1** | Manual actuation without hand lever. For dimensions, see sect. 5.1.3 and 5.2.3 | EA 1, C 1 |  |
| A, EA, HA, PA, C | **2** | Manual actuation with short hand lever. For dimensions, see sect. 5.1.3 and 5.2.3 | EA 2, A 2 | |
| A, EA, HA, C | **V**<br>**VA**<br>**VB**<br>**VC**<br><br>**VCHO**<br>**VCHC** | Mechanical micro switch (size 3 only), for monitoring the spool's idle position, (for data of the switch, see page 22)<br>V - Signal with start of movement, direction A or B (no side indication)<br>VA - Signal with start of movement, direction A<br>VB - Signal with start of movement, direction B<br>VC - Signal with start of movement, direction A and B (separate side indication)<br>VCHO - Signal with start of movement, direction A and B separate (2xNO-contact)<br>VCHC - Signal with start of movement, direction A and B separate (2xNC-contact) | EA VA,<br>A 1 VB,<br>C VC |  |
| A, EA, C | **N, N1** | Proximity switch (size 3 only), for monitoring the spool's idle position (no side indication), for data, see page 23<br>Type N1- only mechanical setup: Proximity switch is customer furnished (8x8x33 mm central sensor area). | EA N,<br>A 1 N 1 |  |
| A, EA, C, PA, H, HA, F, FA | **WA**<br>**WA-EX**<br><br>**WA-M2FP** | Integrated position sensor (Hall-sensor) with analogous signal output (lift monitoring)<br>Coding WA-EX, version for explosion hazardous areas<br>Coding WA-M2 FP, version with fire-damp protection (mining) | EA WA,<br>A 1 WA | |
| A, EA, C, PA, H, HA, F, FA | **U** | Integrated spool monitoring for side indication (comparator, triggered signal: ON / OFF) | EA U | |
| A, C, E, E0A | **G** | Only size 3: Reinforced version of the spring cover, suitable if high pressure surges are expected in the gallery T. | E 1 G,<br>CG,<br>A 1 G | |

### 3.2.2 Sub-plates

Order example: PSLF A1 F/320/4-3-A2 L 63/40 A300 F1/EA **/3 AN320 BN320** - E1 - G 24

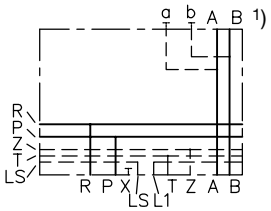
PSVF A2/300/5-5-A2 J 160/120/EA **/Z AN300 BN280/5** - E4 - G 24

**Table 21:** Sub-plates

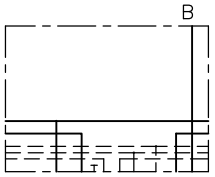
| Coding | Port size for A and B | | Size | Description |
|---|---|---|---|---|
| | ISO 228/1 (BSPP) | SAE J 514 | | |
| **/3, /UNF 3** | G 1/2 | 7/8-14 UNF-2B | 3 | Standard |
| **/38** | G 1/2 | -- | 3 | Sub-plate for pre-selector valve type SLF 3-A 8 |
| **/4, /UNF 4** | G 3/4 | 7/8-14 UNF-2B | 3 | Standard |
| **/5** | G 1 | -- | 5 | Standard |
| **/3 AN... BN...<br>/3 AN...<br>/3 BN...<br>/UNF 3 AN... BN...<br>/UNF 3 AN...<br>/UNF 3 BN...** | G 1/2 | 7/8-14 UNF-2B | 3 | Shock and suction valves at A and B or A or B (state pressure in bar) |
| **/3 A... B...<br>/3 A...<br>/3 B...** | G 1 | -- | 3 | Shock valves at A and B or A or B (state pressure in bar) |
| **/5 S** | G 1/2 | -- | 5 | Load signal pick-up ports U and W (G 1/4 (BSPP)) for external circuitry |
| **/53, /533** | G 1/2 | | 5 | Sub-plate for valve section size 3 in a valve bank size 5 (saving an intermediate plate) |
| **/534, /UNF 534** | G 3/4 | 7/8-14 UNF-2B | | |
| **/58** | G 1 | -- | 5 | Sub-plate for pre-selector valve type SLF 5-A 8 |
| **/3 X, /UNF 3 X, /UNF 4 W** | G 1/2 | 7/8-14 UNF-2B (1 1/16-12UNF-2B) | 3 | Joint load signal pick-up port X for external circuitry |
| **/4 X** | G 3/4 | -- | 3 | |
| **/5 X, /UNF 5 X** | G 1 | 1 5/16-12 UNF-2B | 5 | |
| **/5 SAE, /5 SAE S, /5 SAE 8** | SAE 1" (6000 psi) | | 5 | Sub-plate with SAE-flange, analogue /5, /5 S and /58 |
| **/6D SAE** | SAE 1 1/4" (6000 psi) | | 5 | Sub-plate with SAE-flange for combination of two valve sections, to achieve a load compensated consumer flow of max. 400 lpm |
| **/U 3** | -- | -- | 3 | Sub-plate for mounting ancillary blocks with additional functions, acc. to table 21a (size 3) and table 21 b (size 5) |
| **/U 5** | -- | -- | 5 | |
| **/U 53** | -- | -- | 5 | Like /533, but prepared for mounting ancillary blocks with additional functions, acc. to table 21a (size 3) |
| **/Z AN..BN..** | -- | | 5 | Intermediate plate with shock and suction valves |

**Note:** Sub-plate with SAE-flange must not be combined with sub-plates (tapped ports) e.g. /5 S.

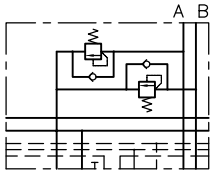
**Symbols**



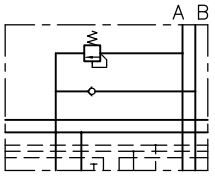

/3, /4 und /5, /53
/5 SAE, /U 3, /U 5, U 53
/UNF 3, /UNF 4, /UNF 5,
/UNF 534



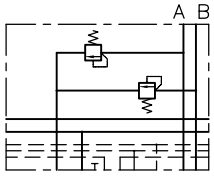

/38
/58



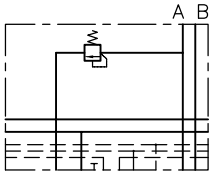

/3 AN... BN...
/UNF 3 AN... BN...



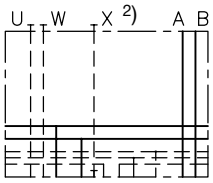

/3 AN..., /UNF 3 AN
/3 BN.... (analog)



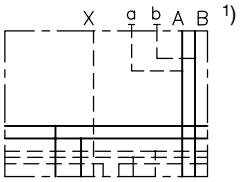

/3 A... B...



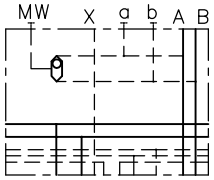

/3 A...
/3 B... (analog)



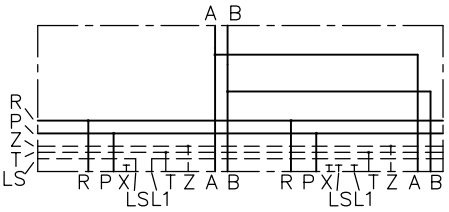

/5 S, /5 SAE S



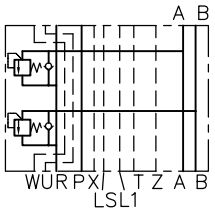

/3 X, /4 X, /5 X und /UNF 3 X




/UNF 4 W




/6 D SAE

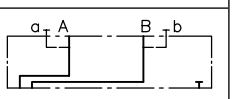
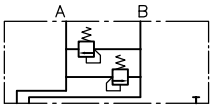
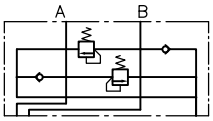
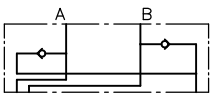
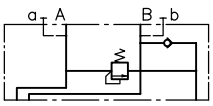
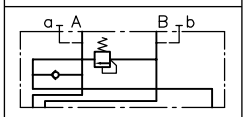
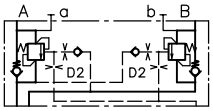
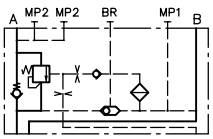
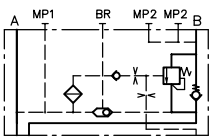


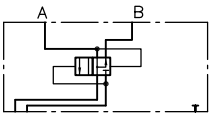
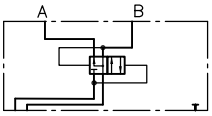
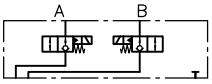
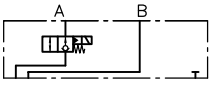
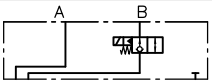
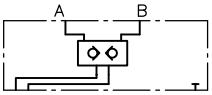

/Z AN..BN..

1) Gauge ports a and b only with coding /4, /4X and /5
2) Port X only with /5 SAE S

**Table 21a:** Ancillary blocks size 3
Port size: **/3..** = G 1/2 (BSPP), **/4..** = G 3/4 (BSPP), **/UNF 3..** = 7/8-14 UNF-2B (SAE-10), **/UNF 4..** = 1 1/16 UNF/2B (SAE/12)

Order example: PSLF A1 F/320/4-3-A2 L 63/40 A300 F1/EA/**U3/3 AL-6-A 7/200** - E1 - G 24

| Coding | Brief description | Symbols |
|---|---|---|
| **/3**<br>**/UNF 3**<br>**/4** | Without additional functions |  |
| **/3 AS... BS...**<br>**/31 AS... BS...**<br>**/UNF 3 AS... BS...**<br>**/4 AS... BS...** | With shock valves at A and B (routed to the opposing side), with pressure specification (bar) |  |
| **/3 AN... BN...**<br>**/31 AN... BN...**<br>**/UNF 3 AN... BN...**<br>**/4 AN... BN...** | With shock and suction valves at A and B, with pressure specification (bar) |  |
| **/4 AN BN**<br>**/UNF 3 AN BN** | With shock and suction valves at A or B |  |
| **/4 AN...** | With shock and suction valves at A or B, with pressure specification (bar) |  |
| **/4 BN...** | |  |
| **/3 AL...**<br>**/3 BL...**<br>**/3 AL... BL...**<br>**/3 AC... BC...** | With over-center valves at A and/or B. Type /3 AC... BC... load independent version (for data, see D 7918, type LHT 3) (For more details, see D 7918 type LHT 3) |  <br>  <br>  |

| Coding | Brief description | Symbols |
|---|---|---|
| **/43 DFA** | For regenerative circuit piston side connected at A (type /43 DFA) or piston side connected at B (type /43 DFB)<br>**Note:**<br>Not suitable for the use with dragging loads! |  |
| **/43 DFB** | |  |
| **/3 VV**<br>**/UNF 3 VV** | With shut-off valves EM 32 V acc. to D 7490/1 (one or both sides) blocking the consumer with zero leakage ($Q_{max}$ approx. 80 lpm) |  |
| **/3 VX**<br>**/UNF 3 VX** | |  |
| **/3 XV**<br>**/UNF 3 XV** | |  |
| **/3 DRH**<br>**/UNF 3 DRH** | Releasable check valves in A and B (release ratio 1: 2.5)<br>For additional version with pre-relieve coding /3 DRH VV, see D 6110 type DRH 3 |  |

**- 6 - A 7** - 250

Pressure setting (bar)

Flow (lpm) / Release ration

| Coding | **A 7** | **B 7** | **C 7** | **D 7** | **E 7** | **F 7** |
|---|---|---|---|---|---|---|
| (lpm) | 130 | 85 | 55 | 35 | 20 | 10 |

Bypass-throttle D2

| Coding | **0** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|
| (∅ mm) | plugged | 0.4 | 0.5 | 0.6 (std.) | 0.7 | 0.8 |
| Release ratio | 1:7 | 1:4.96 | 1:3.5 | 1:2.28 | 1:1.28 | 1:0.93 |

to table 21 a

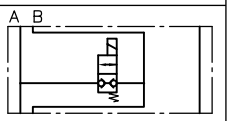
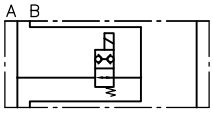
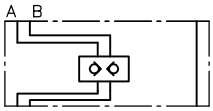
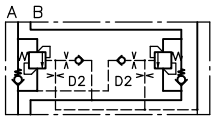
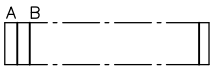
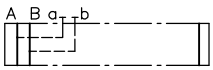
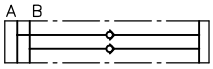
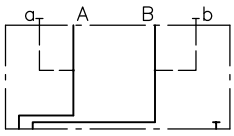
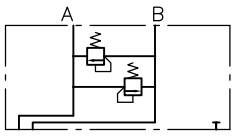
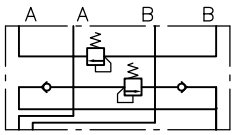
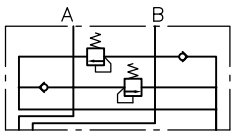
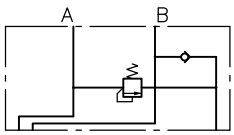
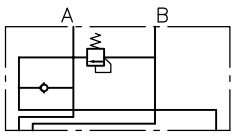
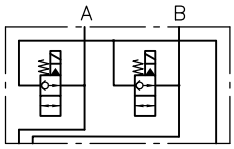
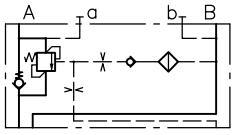
| Intermediate plates for parallel connection | | |
|---|---|---|
| **/ZDR** | Intermediate plate with short-circuit valve between A and B (floating function) for volumetric interchange $Q_{max}$ = 20 lpm |  |
| **/ZDS** | |  |
| **/ZDRH** | Releasable check valves in A and B (release ratio 1:2.5)<br>For additional version with pre-relieve coding /ZDRH VV, see D 6110 type DRH 3 |  |
| **/ZAL... BL...** | With over-center valves at A and B. For codings, see /3 AL.. BL.. or pamphlet D 7918 type LHT 3) |  |
| **/Z 40**<br>**/Z 40 M**<br>**/Z 40 M UNF** | Spacer plate 40 mm to compensate height differences between differing ancillary blocks or to prevent collisions of neighboring ancillary blocks when combined with other intermediate plates |  <br>/Z 40 M<br>/Z 40 M UNF<br>  |
| **/Z AN BN** | With suction valves at A and B |  |

**Table 21b:** Ancillary blocks size 5
Port size: **/5..** = G 1, **/.4..** = G 3/4, **/UNF 5..** = 1 5/16-12 UNF-2B (SAE-16)

Order example: PSVF A2/300/5-5-A2 J 160/120/EA**/U 5/5 VV**- E4 - G 24

| Coding | Brief description | Symbols |
|---|---|---|
| **/5**<br>**/UNF 5** | Without additional functions |  |
| **/5 AS... BS...**<br>**/UNF 5 AS... BS...** | With shock and suction valves at A and B, with pressure specification (bar) |  |
| **/4 ASN.. BSN..** | With shock valves at A and B (routed to the opposing side), with pressure specification (bar) |  |
| **/5 AN.. BN..**<br>**/UNF 5 AN... BN...** | With shock and suction valves at A or B, with pressure specification (bar) |  |
| **/5 AN..** | With shock and suction valves at A and B, with pressure specification (bar) |  |
| **/5 BN..** | |  |
| **/5 R VV** | With by-pass valves type EM 22 V acc. to D 7490/1 for arbitrary customer relieve.<br>**Note:** $Q_{max}$ = 40 lpm |  |
| **/5 AL..**<br>**/5 BL..** | With over-center valves at A and/or B.<br>(For more details, see D 7918 type LHT 5) |  |

**- 6 - A 6** - 250 -

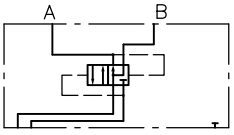
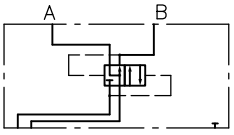
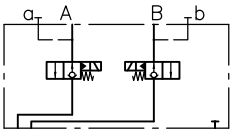
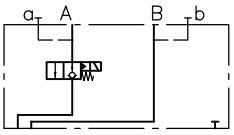
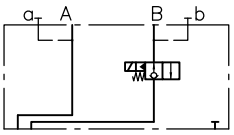
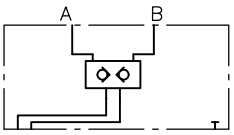
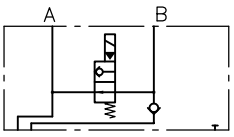
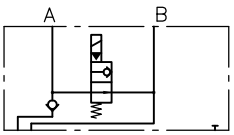
Pressure setting (bar)

Flow (lpm) / Release ration

| Coding | **A 6** | **B 6** | **C 6** | **D 6** | **E 6** | **F 6** |
|---|---|---|---|---|---|---|
| (lpm) | 250 | 200 | 150 | 100 | 50 | 25 |

Bypass-throttle D2

| Coding | **0** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|
| (∅ mm) | Plugged | 0.4 | 0.5 | 0.6 (std.) | 0.7 | 0.8 |
| Release ratio | 1:6 | 1:4.26 | 1:3 | 1:1.95 | 1:1.56 | 1:0.79 |

| Coding | Brief description | Symbols |
|---|---|---|
| **/54 DFA** | For regenerative circuit piston side connected at A (type /54 DFA) or piston side connected at B (type /54 DFB)<br>**Note**:<br>Not suitable for the use with dragging loads! |  |
| **/54 DFB** | |  |
| **/5 VV**<br>**/UNF 5 VV** | With shut-off valves EM 42 V acc. to D 7490/1 (one or both sides) blocking the consumer with zero leakage ($Q_{max}$ approx. 160 lpm) |  |
| **/5 VX**<br>**/UNF 5 VX** | |  |
| **/5 XV**<br>**/UNF 5 XV** | |  |
| **/5 DRH**<br>**/UNF 5 DRH** | Releasable check valves in A and B (release ratio 1: 2.5)<br>For additional version with pre-relieve coding /5 DRH VV, see D 6110 type DRH 5 |  |
| **/54 DEA** | With switch able regenerative circuit functionality via 2/2-way valve type EM 41 S |  |
| **/54 DEB** | |  |
| **Intermediate plates for parallel connection** | | |
| **/Z 30** | Spacer plate 30 mm to compensate height differences between differing ancillary blocks or to prevent collisions of neighboring ancillary blocks when combined with other intermediate plates |  |

Additionally all intermediate plates for parallel connection acc. to D 7700-5 can be used.

# 4. Characteristic data

## 4.1 General and hydraulic

Type coding: PSLF, PSVF and SLF

Design: Directional spool valve for manifold mounting, up to 12 spool valves (size 3) or 10 spool valves (size 5) may be combined in a valve bank by means of sub-plates, all-steel design

Mounting:

| | Size 3 | Size 5 |
|---|---|---|
| Indiv. section | 4 x M8 | 4 x M10 |
| Valve bank | M8 | M10 |

See dimensional drawings in sect. 5 ++

Installation position: Any

Ports:

P = Pressure inlet (pump)
R = Return
A ,B = Consumer ports
U, W, X = Load-signal outlet at the indiv. spool valve section
LS = Load-signal outlet e.g. connection of pump metering valve at PSVF.
**Attention:** No pressure input!
M = Pressure gauge connection (pump side)
Z = Pilot pressure connection (20...40 bar inlet, 20 or 40 bar outlet)
T = Control oil return port
Y = Load-signal inlet port (end plate E 2 and E 5)

Port size:

P, R, A, B = Acc. to dimensional drawings (see sect. 5.1)
M, LS, Z, T, Y = G 1/4 conform. ISO 228/1 (BSPP)
U, W, X = Acc. to dimensional drawings (see sect. 5.1 and 5.2)

Surface coating: Indiv. valve section and sub-plates: All surfaces corrosion-inhibiting, gas nitrided (Solenoid at actuation E... and additional functions F1...F 3, FP 1...FP 3, FPH 1...FPH 3 inc galvanized and olive-green anodized)

Mass (weight) approx. (kg)

| Size | | | 3 | 5 |
|---|---|---|---|---|
| Inlet section | PSLF, PSVF../.., PSVF..- | | 3.8 [1] | 3.3 [1] |
| Valve section | Actuation | A, E, F, H, P | 4.4 [2] | 6.6 [2] |
| | | EA, PA | 4.8 [2] | 7.0 [2] |
| | | FA, HA | 4.7 [2] | 6.6 [2] |
| | | FEA, HEA | 5.1 [2] | 7.1 [2] |
| Blanking plate | AX | | 0.9 | -- |
| Intermediate plate | /Z AN..BN.. | | -- | 3.1 |
| Sub-plates | /3, /38, /4, /5, /53, /533, /534, /5 S, /3 X, /5 X, /6 | | 2.2 | 4.3 |
| | /3 AN... BN..., /3 A..B.. | | 2.5 | -- |
| | /5 SAE, /5 SAE S, /5 SAE 8 | | -- | 9.2 |
| | /6 D SAE | | -- | 17.0 |
| End plates | E 1, E 2, E 4, E 5 | | 0.8 | 1.8 |
| | E 3 and E 6 | | 2.1 | 3.1 |
| | E 7, E 8, E 9, E 10 | | 2.0 | -- |
| | E 1 SAE ... E 5 SAE | | -- | 2.9 |
| Adapter plate | ZPL 53, ZPL 5 SAE 3 | | 5.0 | |

[1] + 0.6 kg at version with solenoid valve WN 1 F(D), PA...PD acc. to table 8

[2] + 0.4 kg at version with functional cut-off (coding F.., FP.., FPH.. acc. to table 16)

Pressure fluid: Hydraulic fluid (DIN 51524 table 1 to 3); ISO VG 10 to 68 (DIN 51519)
Viscosity range: min. 4; max. 1500 $mm^2/sec$; Optimal operation range: 10...500 $mm^2/sec$
Also suitable are biodegradable pressure fluids of the type HEPG (Polyalkylenglycol) and HEES (synth. Ester) at operation temperatures up to +70°C. HETG (e.g. rape seed oil) or water based fluids e.g. HFA or HFC must not be used!

Temperature: Ambient: approx. -40 ... +80°C; Fluid: -25 ... +80°C, pay attention to the viscosity range!
Start temperature down to -40°C are allowable (Pay attention to the viscosity range during start!), as long as the operation temperature during consequent running is at least 20K (Kelvin) higher.
Biodegradable pressure fluids: Pay attention to manufacturer's information. With regard to the compatibility with sealing materials do not exceed +70°C.
**Observe restrictions for versions with ex-proof solenoid!**

Rec. contamination class: ISO 4406 20/18/15

Operating pressure: $p_{max}$ = 400 bar; Ports P, P1, A, B, LS, M, Y
The max. pressure achievable at the consumer side of the spool valves is lowered by the amount equivalent to the internal control pressure drop at the 3-way flow regulator of the PSLF (see curves) or at the pump flow regulator (PSVF)..
Return port R(R1) ≤ 50 bar; port T pressure less with separate pipe (e.g. 8x1) to the tank. It is recommended to employ end plate E 1, E 2, E 3, etc. with an additional leakage port, in case higher return pressure is anticipated. Port Z approx. 20 or 40 bar (acc. to coding, acc. to table 7) (outlet); ≤ 40 bar (inlet)

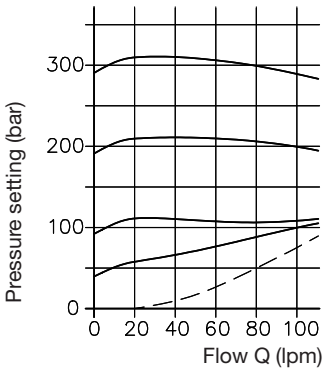
Control circuit: For control pressure, see Q-I-characteristics. The internal control oil circuit is sufficiently protected against malfunctions caused by contamination by means of a disk filter.

Flow: Acc. to the specifications in table 14, in sect. 3.2.1

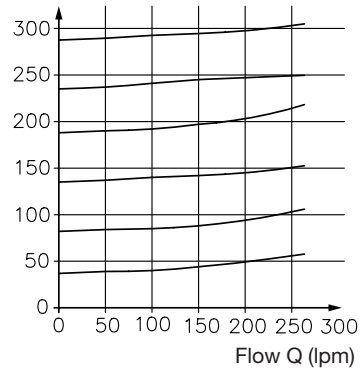
## 4.2 Curves

Main pressure limiting valve in the inlet section

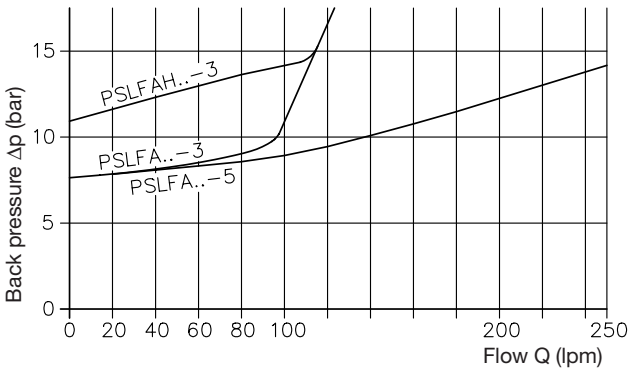
PSL(V)F A../..-3




PSL(V)F A../..-5

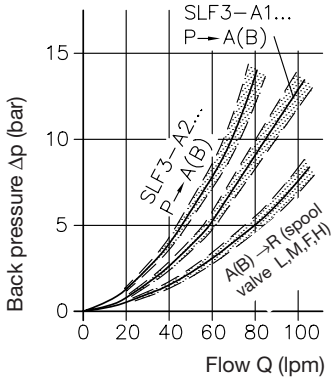



Inlet section PSLF A..
Circulation pressure P→R

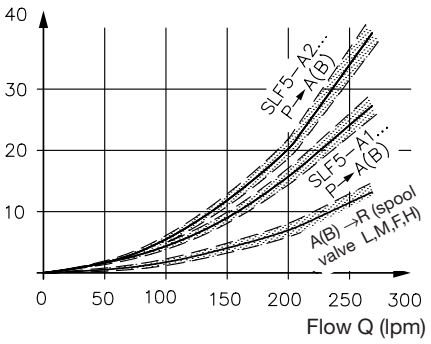



Directional spool valve section P→A(B), A(B)→R

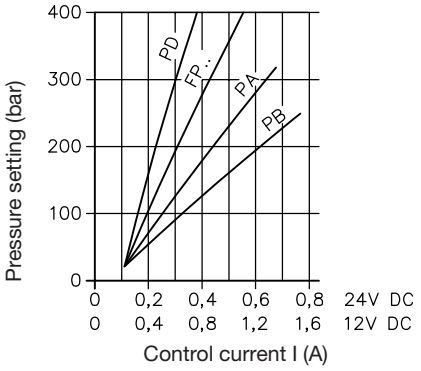
Size 3



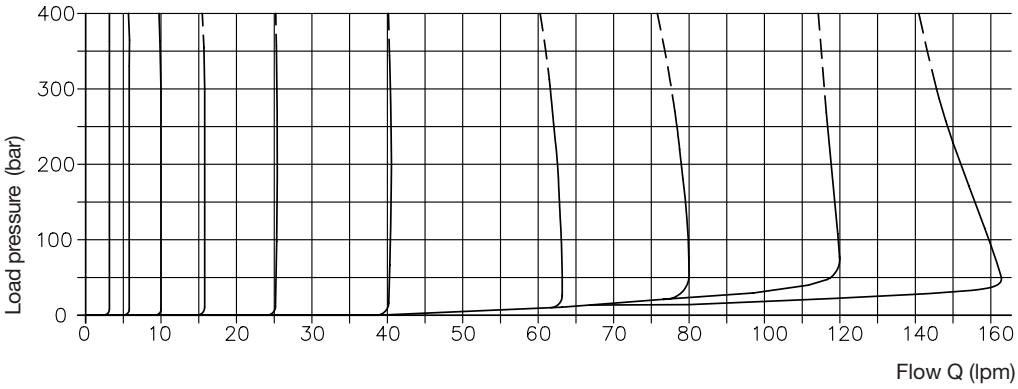

Size 5




Prop. pressure limitation
Coding PA ... PD acc. to table 8, sect. 3.1.3
Coding FP(H) 1, FP(H) 2, FP(H) 3
acc. to table 16, sect. 3.2.1

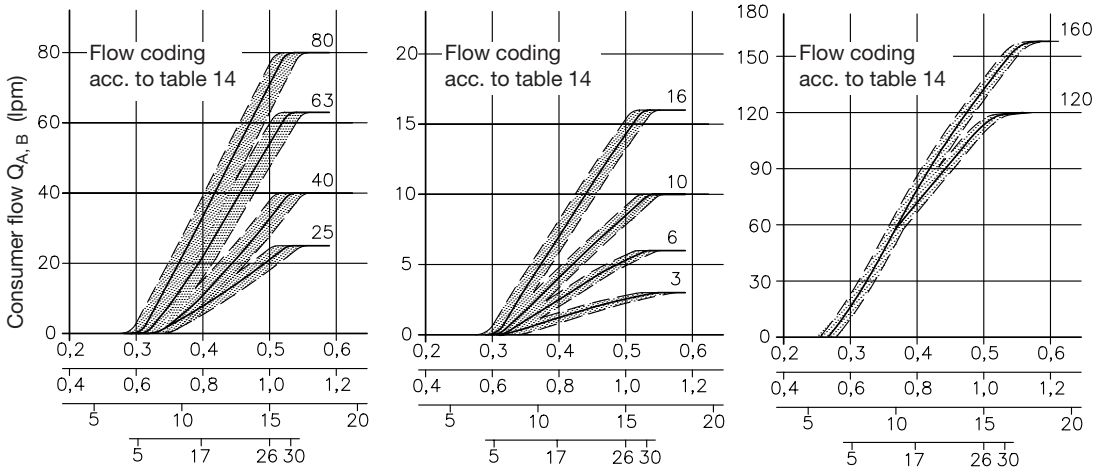



2-way inflow controller




Oil viscosity during measurement approx. 60 mm²/sec

Consumer flow curves (guide line, example is valve section with inflow controller type SLF. - A2 ../..)




← Control current I (A) 24V DC
← Control current I (A) 12V DC
← Control pressure (bar) hydr. actuation H, F
← Angle at hand lever (°) manual actuation A, C

## 4.3 Actuations

For other data, such as codings, symbols etc., acc. to table 19 sect. 3.2

Actuation A

| | Actuating moment (Nm) size 3 / 5 Idle position | End position |
|---|---|---|
| Version A | approx. 2.3 / 3.0 | approx. 3.4 / 7.5 |
| Version FA, FEA, HA, HEA, PA | approx. 2.9 / 5.0 | approx. 8.0 / 16.5 |
| Version EA, E0A | approx. 2.4 / 3.0 | approx. 6.0 / 12.0 |

Actuation C

Version with detent, fixation of the valve spools at any desired position (idle position with special notch)
Version with detent, fixation of the valve spool at idle and both end positions
AR, ER, EAR — Required pulse duration for switching: approx. 1 sec

Actuation E, EA, HE, HEA, FE, FEA

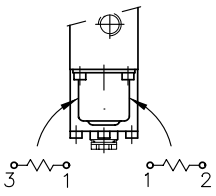
Prop.-Solenoid, manufactured and tested acc. to VDE 0580
Twin solenoids are of wet armature design. The hydraulic fluid provides lubrication and protection against corrosion.

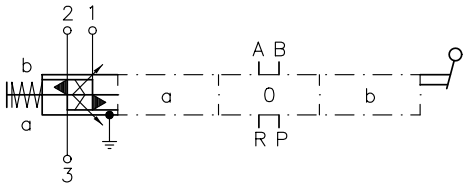
**Additional notes:**
See also Sk 7814, as well as for additional components sect. 6.1 j !

Specifications apply to all solenoid versions if not stated otherwise.

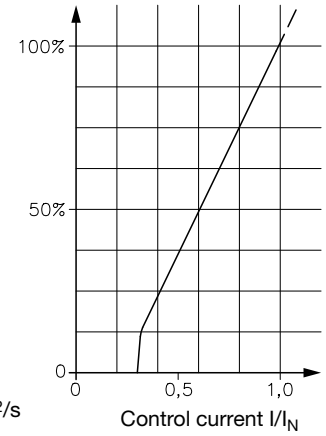
| | | |
|---|---|---|
| Nom. voltage $U_N$ | 24V DC | 12V DC |
| Coil resistance $R_{20}$ | 26.6 Ω | 6.3 Ω |
| Current, cold $I_{20}$ | 0.9 A | 1.9 A |
| Lim. current $I_G$ ($I_{lim}$) | 0.63 A | 1.26 A |
| Cut-off energy $W_A$ | ≤ 0.3 Ws | ≤ 0.3 Ws |
| Rel. duty cycle (reference temp. $\vartheta_{11}$ = 50°C) | S 1 | S 1 |
| Required dither frequency | 40...70 Hz (best 55 Hz) | |
| Dither amplitude $A_D$ 1) | 20% ≤ $A_D$ ≤ 35% | |

1) $A_D\,(\%) = \dfrac{I_{peak\,-\,peak}}{I_G} \cdot 100$



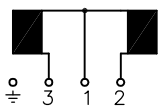

I - stroke- curve



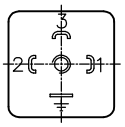

Oil viscosity during measurement approx. 60 mm²/s

**Electrical connection**

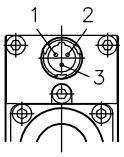
Circuitry for coding -G 12, -G 24, -X 12, -X 24
EN 175 301-803 A
3-pin
Coil a Coil b



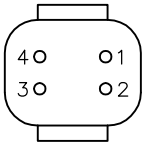

3-pin
IP 65 (IEC 60529)



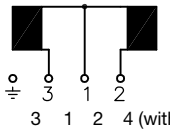

Circuitry for coding -S 12, -S 24
3-pin
IP 67 (IEC 60529)




Circuitry for coding -DT 12, -DT 24
4-pin
IP 67 (IEC 60529)

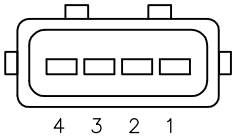



Circuitry for coding -AMP 12 K 4, -AMP 24 K 4
AMP Junior Timer,
4-pin
Coil a Coil b

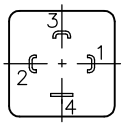



3 1 2 4 (with coding ...H 4 and ...C 4)

4-pin
IP 65 (IEC 60529)




Circuitry for coding -G 24 H 4
4-pin
IP 65 (IEC 60529)




Circuitry for coding -G 24 C 4
EN 175 301-803 C
4-pin
IP 65 (IEC 60529)

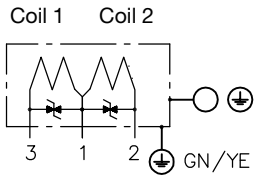

The IP-specification only applies when the plug is mounted as specified.

Explosion-proof version of actuation E, EA, HE(A)
Voltage specification **G 24 EX, G 24 TEX**

**Attention:**
Additionally observe operating manuals
B 01/2002 and B ATEX

Protect against direct sun light !

Not in to combination with functional cut-off F(FP).. (table 17) or all other solenoids mounted on connection blocks (table 3 a, 8), ancillary blocks (table 19), intermediate plates (table 22) and end plates (table 11)




| | |
|---|---|
| Letter of conformity ATEX | TÜV-A 02ATEX 0007 X |
| Ex-proof level | ⟨Ex⟩ II 2 G Ex mb II 120°C (T4)<br>⟨Ex⟩ II 2 D Ex mbD 21 T120°C |
| Duty cycle | S 1, one coil energized per solenoid housing |
| Protection class | IP 67 (IEC 60529) |
| Nom. voltage $U_N$ | 24V DC |
| Coil resistance $R_{20}$ | 26.6 Ω |
| Current, cold $I_{20}$ | 0.88 A |
| Lim. current $I_G$ | 0.63 A |
| Max. residual ripple of the | 15% supply voltage |
| Conditions of use: | |
| Ambient temperature | -35 ... +40°C |
| Max. fluid temperature | +70°C |
| Fuse | $I_F$ < 1.8 A each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127 medium |
| Surface coating | Housing zinc galvanized<br>Coil and connection cavity are molded |
| Electrical design and testing | conforming EN 60079-0, VDE 0170/0171 T1 and T9 |
| Electrical connection | 4 x 0.5 mm² |
| Cable length | 3 m or 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart) |

For connection scheme. see “Actuation E, EA” (standard version)

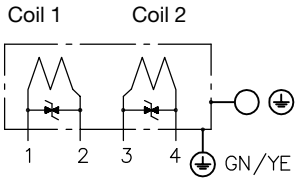
---

Explosion-proof version of actuation E, EA, HE(A)
Voltage specification **G 24 EX 4, G 24 TEX 4**

**Attention:**
Additionally observe operating manuals
B 01/2002 and B ATEX

Protect against direct sun light !

Not in to combination with functional cut-off F(FP).. (table 17) or all other solenoids mounted on connection blocks (table 3 a, 8), ancillary blocks (table 19), intermediate plates (table 22) and end plates (table 11)




| | |
|---|---|
| Letter of conformity ATEX | TÜV-A 02 ATEX 0007 X |
| Ex-proof level | ⟨Ex⟩ II 2 G Ex mb II 120°C (T4)<br>⟨Ex⟩ II 2 D Ex mbD 21 T120°C |
| Duty cycle | S 1, one coil energized per solenoid housing |
| Protection class | IP 67 (IEC 60529) |
| Nom. voltage $U_N$ | 24V DC |
| Coil resistance $R_{20}$ | 26.6 Ω |
| Current, cold $I_{20}$ | 0.88 A |
| Lim. current $I_G$ | 0.63 A |
| Max. residual ripple of the | 15% supply voltage |
| Conditions of use: | |
| Ambient temperature | -35 ... +40°C |
| Max. fluid temperature | +70°C |
| Fuse | $I_F$ < 1.8 A each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127 medium |
| Surface coating | Housing zinc galvanized<br>Coil and connection cavity are molded |
| Electrical design and testing | conforming EN 60079-0, VDE 0170/0171 T1 and T9 |
| Electrical connection | 4 x 0.5 mm² |
| Cable length | 3 m or 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart) |

For connection scheme. see “Actuation E, EA” (standard version)

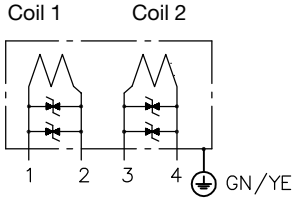
---

Explosion-proof version of actuation E, EA, HE(A)
Voltage specification **G 24 TEX 70**

**Attention:**
Additionally observe operating manuals
B 09/2006 und B ATEX

Protect against direct sun light !

Not in to combination with functional cut-off F(FP).. (table 17) or all other solenoids mounted on connection blocks (table 3 a, 8), ancillary blocks (table 19), intermediate plates (table 22) and end plates (table 11)



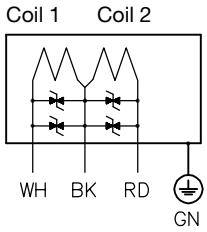

| | |
|---|---|
| Letter of conformity IEC | IEC Ex IBE 09.0005 X |
| Letter of conformity ATEX | IBExU07 ATEX 1089 X |
| Ex-proof level | ⟨Ex⟩ II 2 G Ex d IIB T4<br>⟨Ex⟩ II 2 D Ex tD A21 T135°C |
| Duty cycle | S 1, one coil energized per solenoid housing |
| Protection class | IP 67 (IEC 60529) |
| Nom. voltage $U_N$ | 24V DC |
| Coil resistance $R_{20}$ | 80 Ω |
| Lim. current $I_G$ | 0.24 A |
| Max. residual ripple of the | 15% supply voltage |
| Conditions of use: | |
| Ambient temperature | -20 ... +70°C |
| Max. fluid temperature | +70°C |
| Fuse | $I_F$ < 0.5 A each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127 medium |
| Surface coating | Housing zinc galvanized<br>Coil and connection cavity are molded |
| Electrical design and testing | conforming, EN 60079-0, VDE 0170/0171 T1 and T9 |
| Electrical connection | 4+1 x 0.5 mm² |
| Cable length | 3 m or 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart) |

For connection scheme. see “Actuation E, EA” (standard version)

Explosion-proof version of actuation E, EA
(fire-damp protected (mining))
Voltage specification **G 24 MSHA**

**Attention:**
Additionally observe operating manuals
B 05/2006 and B ATEX

Not in to combination with functional cut-off F(FP).. (table 17) or all other solenoids mounted on connection blocks (table 3 a and 8), ancillary blocks (table 19), intermediate plates (table 22) and end plates (table 11)

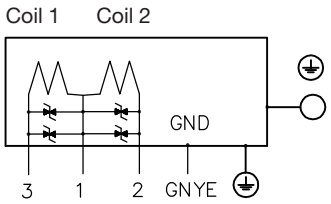



| | | |
|---|---|---|
| MSHA-approval (USA) | 18-NXA 05 0003-0 | |
| MA-approval (China) | J2007101 | |
| Letter of conformity IEC | IEC Ex IBE 09.0004 X | |
| Letter of conformity ATEX | IBExU05 ATEX 1115 X | |
| Ex-proof level | Ⓔx I M2 Ex d I | |
| Duty cycle | S 1, one coil energized per solenoid housing | |
| Protection class | IP 67 (IEC 60529) | |
| Nom. voltage $U_N$ | 12V DC | 24V DC |
| Coil resistance $R_{20}$ | 6.3 Ω | 26.6 Ω |
| Lim. current $I_G$ | 1.33 A | 0.63 A |
| Current. cold $I_{20}$ | 1.9 A | 0.9 A |
| Conditions of use: | | |
| Ambient temperature | -20 ... +40°C | |
| Max. fluid temperature | +70°C | |
| Fuse | I = max. 3x $I_G$, each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127-2 UL 248 | |
| Surface coating | Housing zinc galvanized | |
| Electrical design and testing | Coil and connection cavity are molded conforming EN 60079-0 (general requests), EN 60079-1 (pressure resistant encapsulation “d”) | |
| Electrical connection | 4 x 18 AWG (approx. 0.8 mm²) | |
| Cable length | 3 m or 10 m | |
| Leads | BK, WH, RD, GN; Item-Nr. 40003, General Cable | |

For connection scheme. see “Actuation E, EA” (standard version)

---

Explosion-proof version of actuation E, EA, HE(A)
(fire-damp protected (mining))
Voltage specification **G 24 M2FP**




| | |
|---|---|
| Letter of conformity ATEX | IBEx U05 ATEX 1115 X |
| Letter of conformity ANZEx | ANZEx 10.3019X |
| Electrical connection | 4 x 0.75 mm², shielded connection line |
| For additional information | see coding G 24 MSHA |

---

Actuation H, HA, HEA, F, FA, FEA

Control pressure approx. 5 bar (start of movement)
approx. 18 bar (max. movement) max. perm. pressure 50 bar

The remote control pipes to the control ports 1 and 2 must be externally piped.
Supply is via proportional pressure reducing valve e.g. type FB2/18 etc. or KFB2/18 (both acc. to D 6600)

---

Actuation P, PA

Control pressure approx. 2.5 bar (start of movement);
approx. 7 bar (max. movement)

---

Actuation suffix V, VA, VB, VC
(only size 3)

The idle position of the valve spool is monitored by a contact switch from Co. BURGESS type V 4 NS ® with lever AR 1
Switch engaged at idle position

| | |
|---|---|
| Protection class | IP 67 (IEC 60529) |
| Circuit-breaking capacity | |
| up to 30V DC | = 5 A |
| Inductive load | = 3 A |
| Cables | 3 x 0.5 mm² leads PVC coated; length; 50 mm |
| | black = inlet |
| | blue = NO-contact |
| | green = NC-contact |

The switch is highly protected by a sheet cover against exterior physical damage

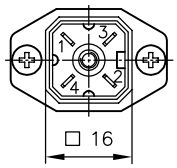
---

Actuation suffix VCHO, VCHC
(only size 3)

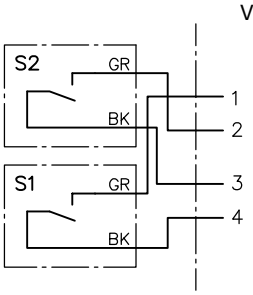
The idle position of the valve spool is monitored by a contact switch from Co. BURGESS type V 4 N 4 Sk 2 ® with lever AR 1
Switch engaged at idle position

| | |
|---|---|
| Electr. connection | via plug, e.g. type G 4 W 1 F ® Co. HIRSCHMANN, www.hirschmann.com, (not scope of delivery) |
| Protection class | IP 65 (IEC 60529) |
| Circuit-breaking capacity | |
| up to 30V DC | = 5 A |
| Inductive load | = 3 A |

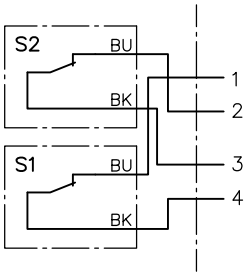
Circuitry




VCHO




VCHC




Switch function
S 1 - direction A
S 2 - direction B

---

Actuation suffix N
(only size 3)

Supervision of the idle position of the valve spool via a transducer

| | |
|---|---|
| Design | 8x8x40 mm, with LED<br>NC-contact, conducting to plus type IFFM 08P/37O1/02L<br>Manuf.: Co. BAUMER Electric GmbH D-61169 Friedberg |
| Input power | ∅3 mm, 3 leads PVC coated, length 2 m |
| Operating voltage | 10 up to 30V DC |
| Current consumption without load | up to 10 mA |
| Max. load current | 200 mA |
| Operating temperature | -25°C up to 80°C |
| Protection class | IP 67 (IEC 60529) |

The switch is highly protected by a sheet cover against exterior physical damage.

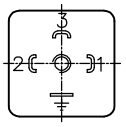
---

Actuation suffix WA, WA-EX

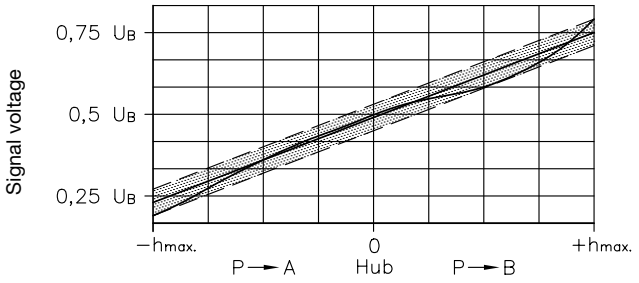
Position sensor, supervision of the valve spool stroke via a Hall-sensor

Circuitry

Coding G...

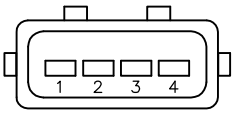



2 = +$U_B$ operating voltage (5 up to 10V)
1 = $U_{output}$
3 = GND




$U_B$ = Supply voltage
$U_{B\,max}$ = 76%
$U_{B\,min}$ = 24%
Accuracy ± 9% ($U_B$)

Coding AMP...




The DC supply voltage must be stabilized and smoothened.
**Attention:** The will be permanently damaged, when exposed to a strong magnetic field!

Actuation suffix WA
Electrical connection acc. to coding, acc. to table 10

Coding S...

Actuation suffix WA-EX

| | |
|---|---|
| Letter of conformity ATEX | IBEx U09 ATEX 1001X |
| Ex-proof level | ⟨Ex⟩ II 2 G Ex d IIB T4<br>⟨Ex⟩ II 2 D Ex td A21 IP 6x T 135°C<br>⟨Ex⟩ I M2 Ex d I |
| Ambient temperature | -30 ... +40°C |
| Electrical connection | 3 m or 10 m (cable ÖLFLEX-440 ® with shielding and YE/GN ground (protectne conductor) Co. LAPP, D-70565 Stuttgart) |

**Attention:** Operating manual B ATEX and B 10/2008 have to be additionally observed!

Actuation suffix WA-M2 FP

| | |
|---|---|
| Letter of conformity ATEX | IBEx U05 ATEX 1115 X |
| Letter of conformity ANZEx | ANZEx 10.3019X |
| Electrical connection | 4 x 0.75 mm², shielded connection line |
| For additional information | see coding G 24 MSHA |
| Ex-proof level | see WA-EX |
| Ambient temperature | -30 ... +40°C |
| Electrical connection | 3 m or 10 m |

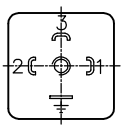
---

Actuation suffix U

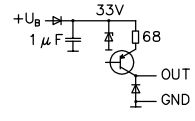
Comparator
(lift monitoring / side indication)

Circuitry

Coding G...

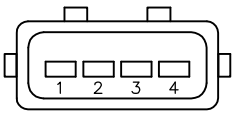



| Pin | Signal | Description | |
|---|---|---|---|
| 1 | $OUT_A$ | PNP-transistor (conducting to plus) | Open-Collector:<br>$I_{max}$ = 10 mA<br>short-circuit proof |
| 2 | $OUT_B$ | PNP-transistor (conducting to plus) | |
| 3 | +$U_B$ | 10 ... 32V DC | Residual ripple ≤ 10% |
| 4/GND | GND | 0V DC | |




Electrical connection acc. to coding, acc. to table 10

Coding AMP...



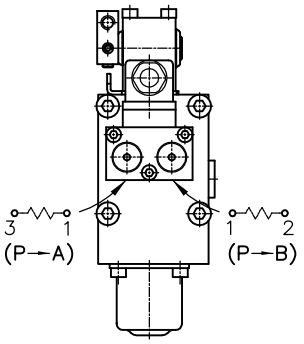

| Signal table | | | |
|---|---|---|---|
| Ident. No. | Spool movement | $OUT_A$ | $OUT_B$ |
| 1 | Idle position middle | ON | ON |
| 2 | P → B | OFF | ON |
| 3 | P → A | ON | OFF |

## 4.4 Functional cut-off, prop. pressure limitation

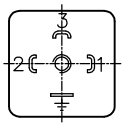
Functional cut-off

On/Off solenoid with manual emergency actuation

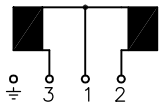
| | | |
|---|---|---|
| Nom. voltage $U_N$ | 24V DC | 12V DC |
| Coil resistance $R_{20}$ | 34.8 Ω | 8.7 Ω |
| Current, cold $I_{20}$ | 0.69 A | 1.38 A |
| Current, warm $I_{70}$ | 0.48 A | 0.97 A |
| Cut-off energy $W_A$ | ≤ 0.3 Ws | ≤ 0.3 Ws |
| Rel. duty cycle [1] | S 1 | S 1 |
| (reference temp. $\vartheta 11$ = 50°C) | | |
| Electrical connection | EN 175 301-803 A | |
| Protection type (assembled) | IP 65 (IEC 60529) | |




Circuitry




Coil a Coil b




[1] **Note:** The duty cycle refers to one coil only of each twin solenoid.
The perm. duty cycle is only 50%, when both coils are energized simultaneously

Prop. pressure limitation

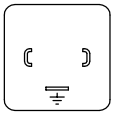
Prop. solenoid, with manual emergency actuation. For connection pattern, see functional cut-off. For electrical data, see actuation E, EA.

## 4.5 Other solenoid valves

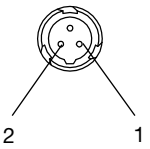
| Additional documentation | - Connection blocks coding Z, ZM, V | | - Connection blocks coding F, D<br>- End plates coding E 3, E 6 | | - Connection blocks coding PA, PB, PD | |
|---|---|---|---|---|---|---|
| weitere Dokumentation | D 7490/1 E (type EM) | | D 7470 A/1 (type WN 1, WH 1) | | | |
| Nom. voltage $U_N$ | 24V DC | 12V DC | 24V DC | 12V DC | 24V DC | 12V DC |
| Nom. power $P_N$ | 21 W | 21 W | 24.4 W | 24.4 W | 21 W | 21 W |
| Nom. current $I_N$ | 0.63 A | 1.2 A | 1 A | 2 A | 0.63 A | 1.26 A |

Electr. connection

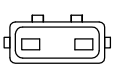
Circuitry
with coding -G 12, -G 24,
-X 12, -X 24
EN 175 301-803 A
IP 65 (IEC 60529)



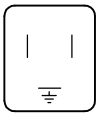
Circuitry
with coding -S 24
Plug Co. SCHLEMMER
Type SL-10
IP 67 (IEC 60529)




Circuitry
with coding -AMP 12 K 4
-AMP 24 K 4
AMP Junior Timer
2-pin
IP 65 (IEC 60529)



Circuitry
with coding
with PA, PB, PD
with coding -G 12, -G 24,
-X 12, -X 24
Slim design industrial
standard contact
clearance 11 mm
IP 65 (IEC 60529)

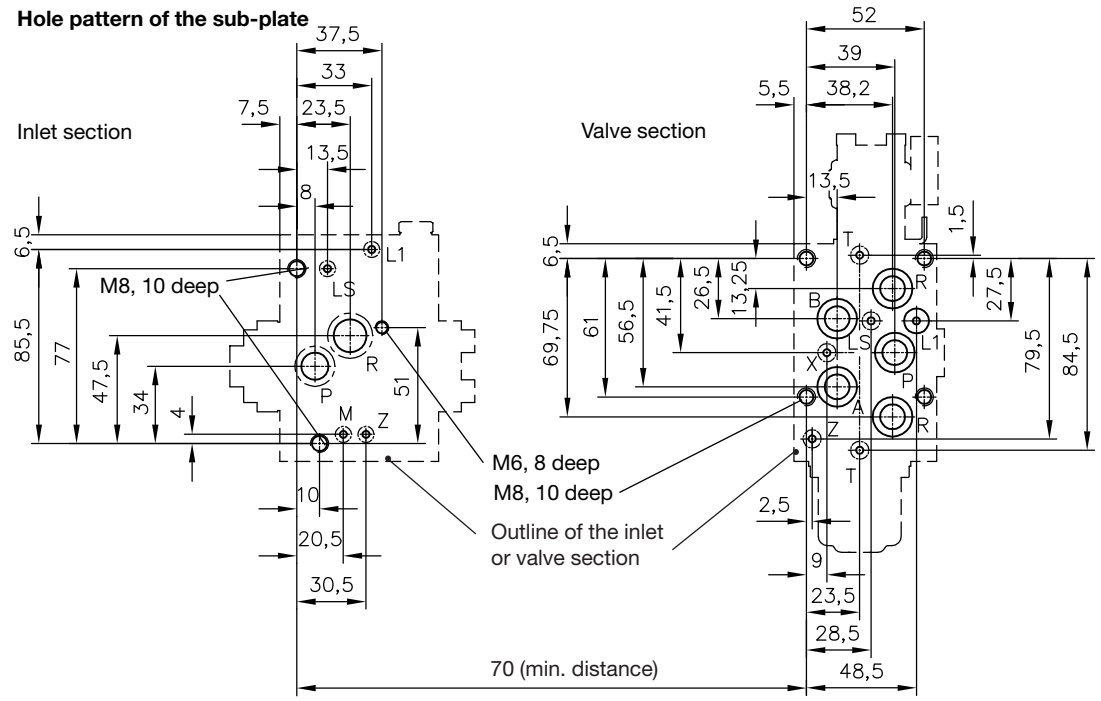


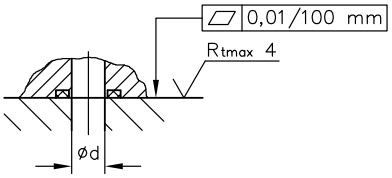
# 5. Dimensions

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

## 5.1 Size 3

### 5.1.1 Hole pattern of the sub-plate




Inlet section:

| Ports | Ød | O-ring [1] PUR 90 Sh |
|---|---|---|
| P | 12 | 13.94x2.62 |
| F(R) | 14.5 | 15.6x1.78 |
| M, LS, L1, Z | 3.2 | 4.47x1.78 |

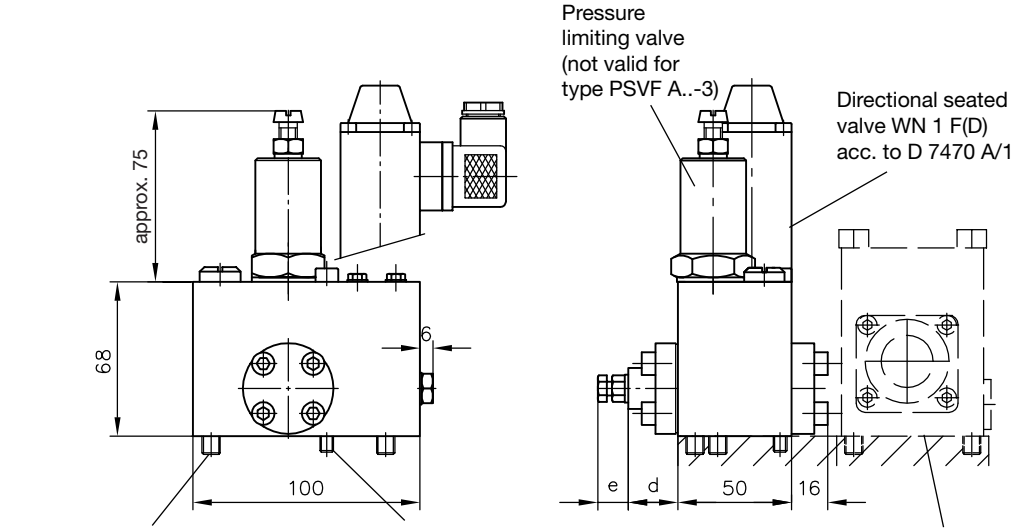
Valve section:

| Ports | Ød | O-ring [1] PUR 90 Sh |
|---|---|---|
| A, B | 10.8 | 12.37x2.62 |
| LS, T, U, W, X, Z | 3.2 | 4.47x1.78 |
| L1 | 3.2 | 7.65x1.78 |

[1] These O-rings are also available as complete seal kits, see also sect. 6.3.5
Inlet section: DS 7700-F 31 Valve section: DS 7700-F 32

### 5.1.2 Inlet section

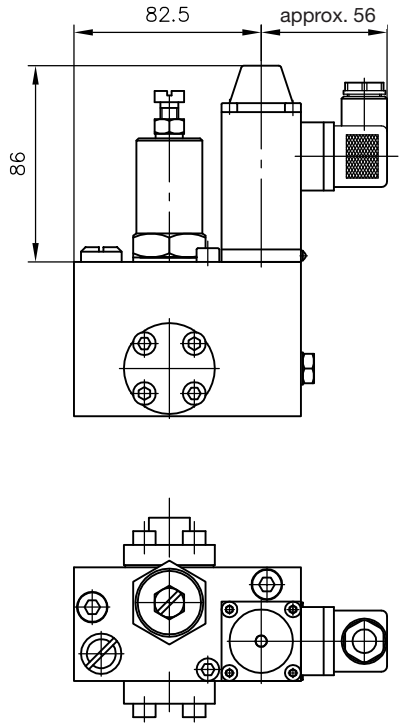
**Type PSLF(V) A../..-3 and PSVF A..-3**



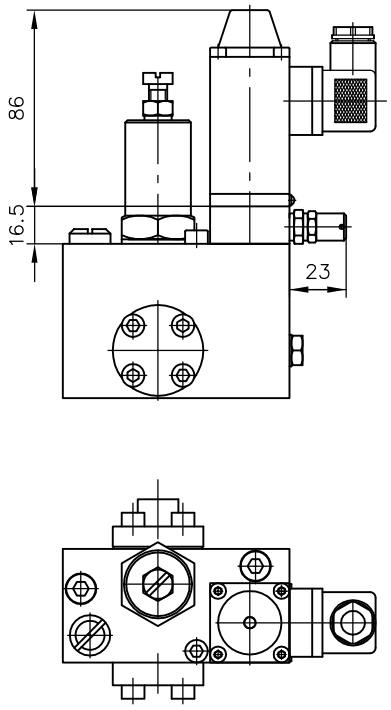

e ≈ 12 at PSL
> 15 at PSV

| | d |
|---|---|
| PSLF 3(4) | 22 |
| PSLF 3(4) T | 27 |
| PSLF 3(4) H | 40 |
| PSLF 3(4) HT | 45 |

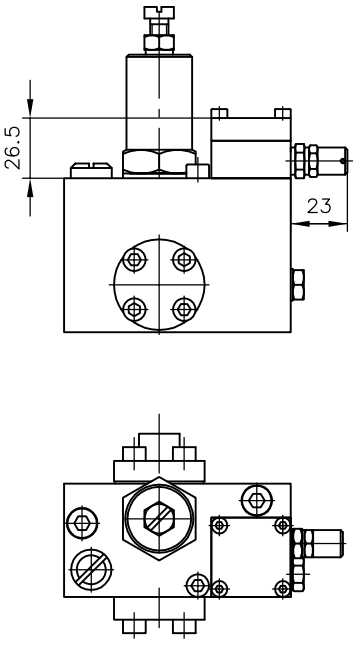
**Type PSL..F(D)/...**
**PSV..F(D)**
**PSV..F(D)/...**



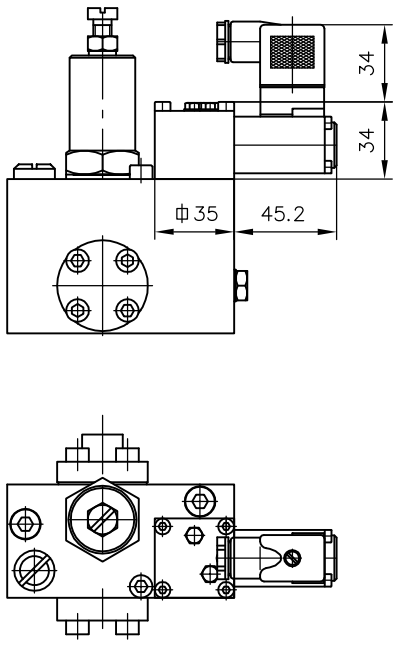

**Type PSL..F(D).../...**
**PSV..F(D).../...**



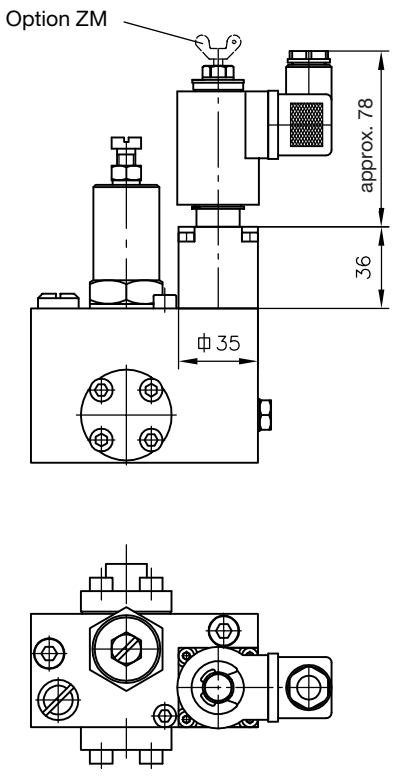

**Type PSV...X...**



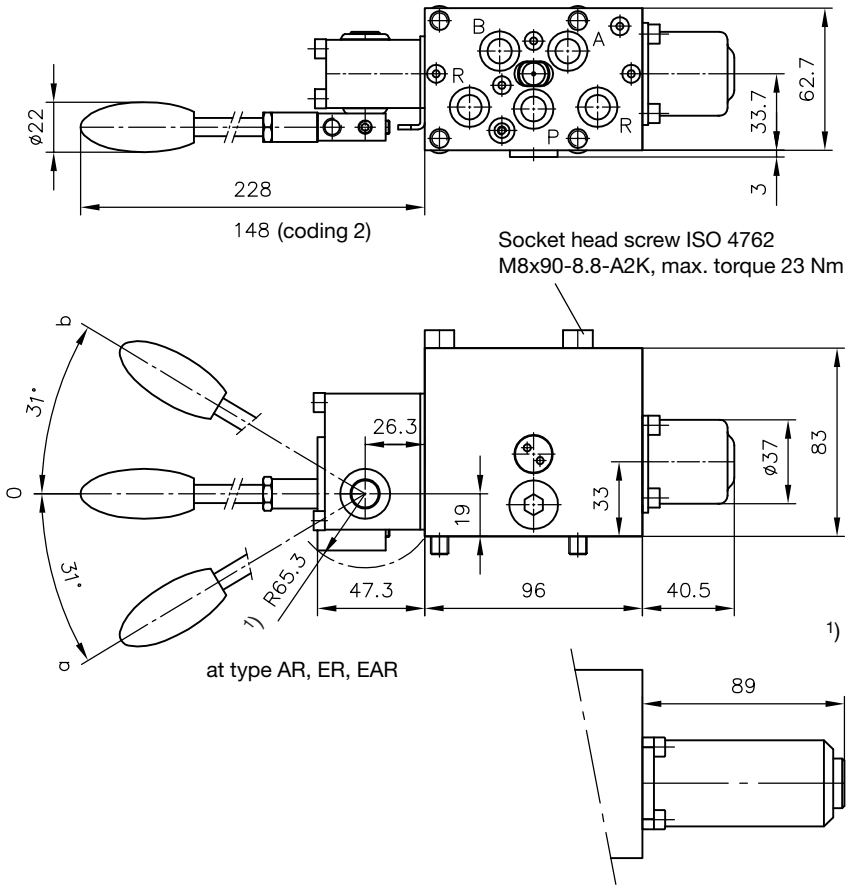

**Type PSL..PA(PB, PD)/...**
**PSV..PA(PB, PD)**




**Type PSL..Z(V).../...**
**PSV..Z(V).../...**



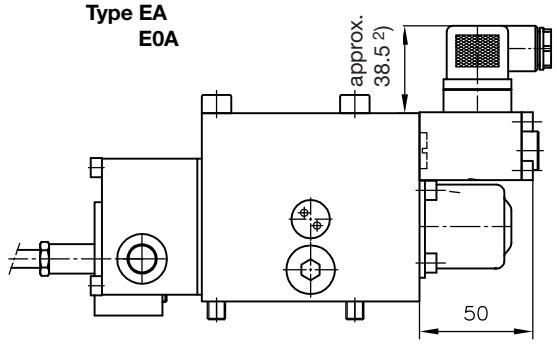
### 5.1.3 Individual valve with manual actuation type A, C



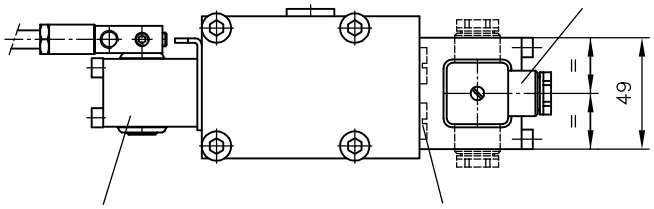

1) Observe this operation area for the hand lever with customer furnished manifolds!

### 5.1.4 Individual valves with actuation type EA, E0A

**Type EA**
**E0A**



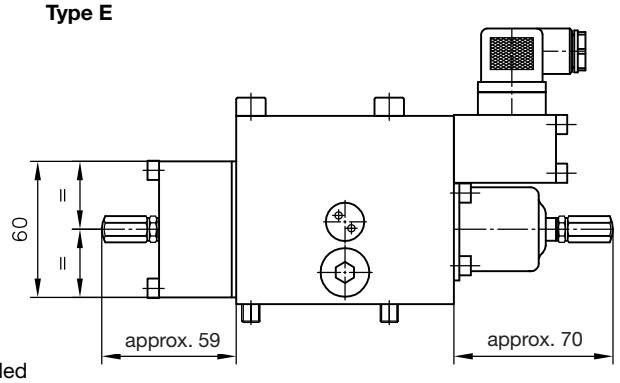

Plug may be installed rotated by 4x90°, with cable gland

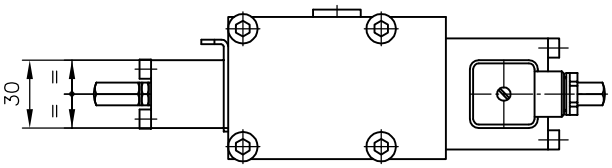



Lever housing at EA and HA (FA) can be angled at 180° in the same manner as described at sect. 6.3.4

Tapped plugs with actuation type E0A

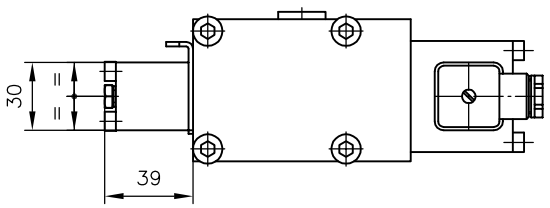
**Type E**



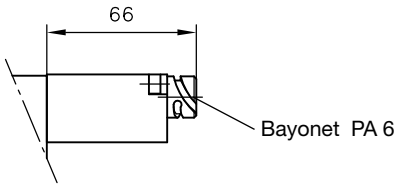

2) This dimension depends on the manufacturer and can be up to 50 mm depending on the max. permissible size according to EN 175 301-803 A

**Type EI**

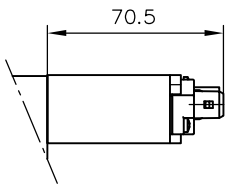


Additional solenoid versions

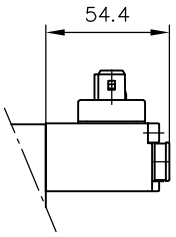
Coding **-S 12**
**-S 24**
**-S 12 T**
**-S 24 T**



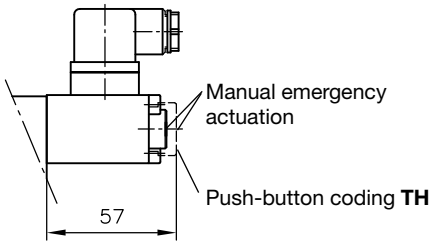

Coding **-AMP 12 K 4**
**-AMP 24 K 4**



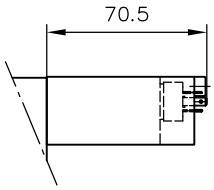

Coding **-AMP 24 H 4 T**



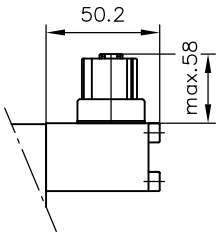

Coding **-G(X) 12 T**
**-G(X) 24 T**



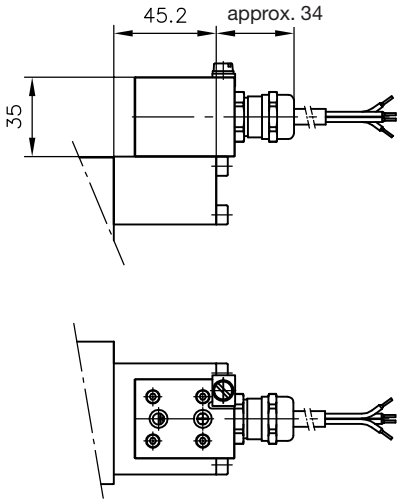

Coding **-G(X) 24 C 4**



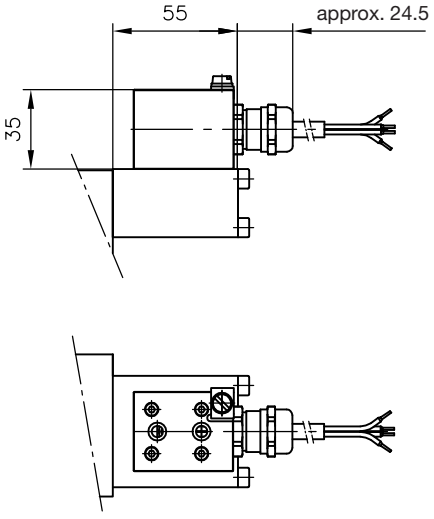

Coding **-DT 12**
**-DT 24**



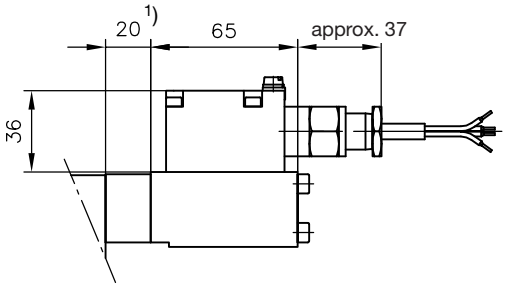

Coding **-G 24 EX**
**-G 24 EX 4**



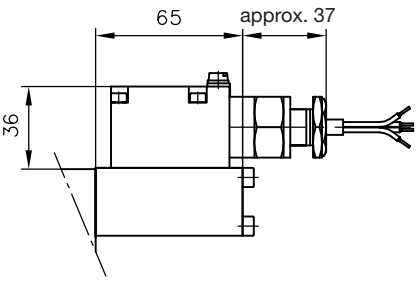

Coding **-G 24 TEX**
**-G 24 TEX 4**



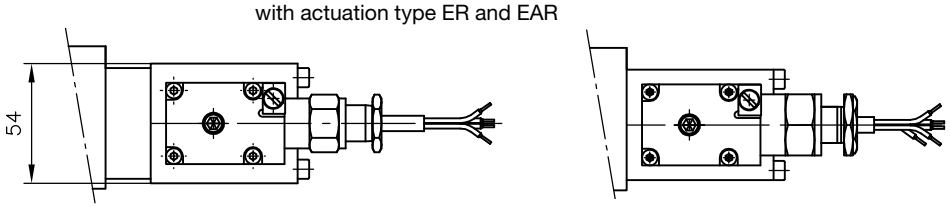

Coding **-G 12 IS**
**-G 24 MSHA**
**-G 24 M2 FP**




Coding **-G 24 TEX 70**

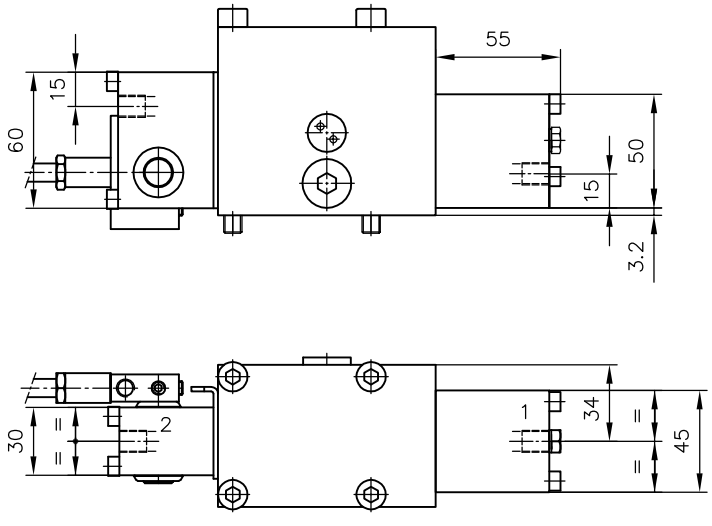



1) Intermediate plate only in combination with actuation type ER and EAR

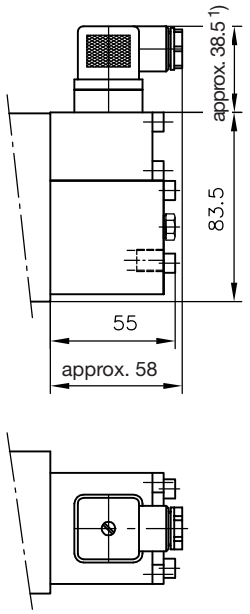


### 5.1.5 Individual valves with hydraulic actuation type FA, FEA, F

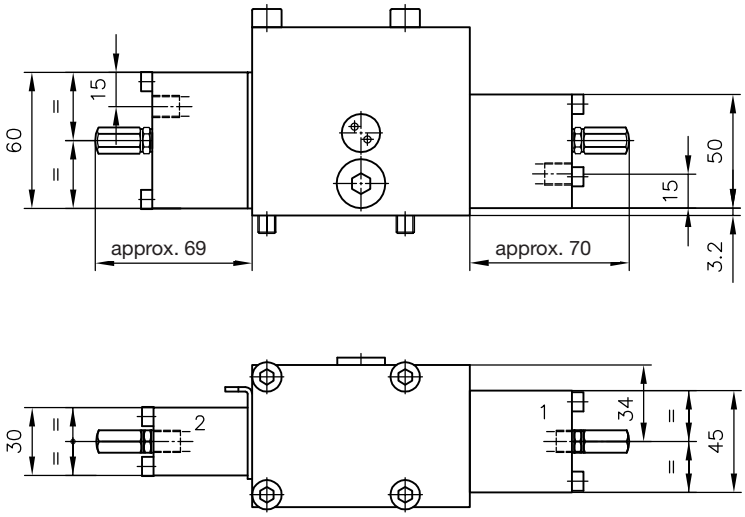
**Type FA**




**Type FEA, FEA 1(2)**



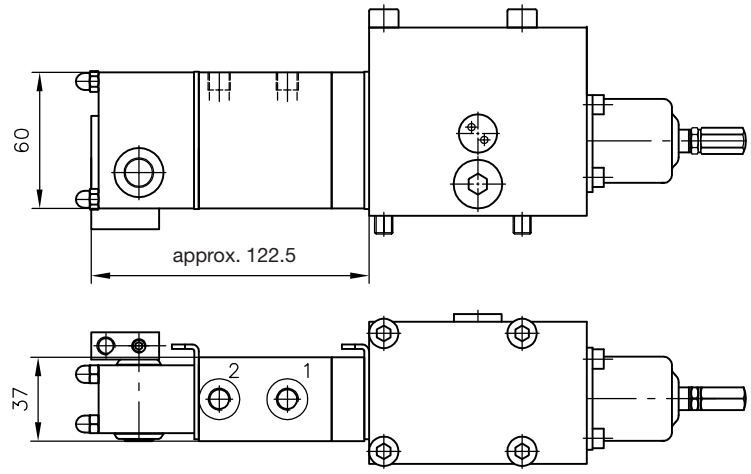

**Type F**



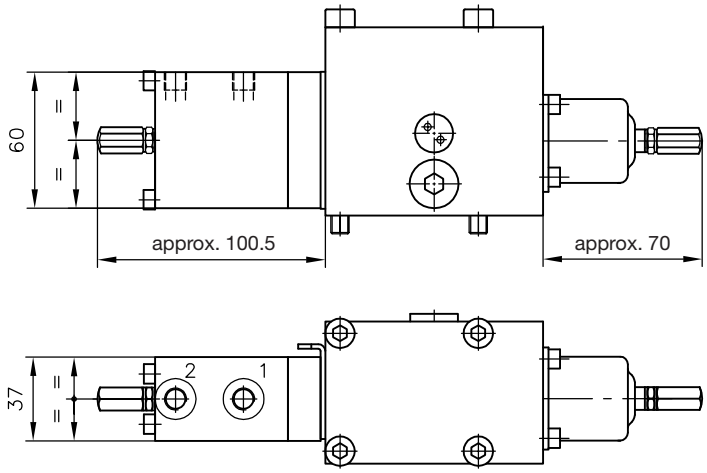

Ports conf. ISO 228/1 (BSPP) or
(SAE-4, SAE J 514):
1 and 2 = G 1/8 or 7/16-20 UNF-2B

1) This dimension depends on the manufacturer and can be up to 50 mm depending on the max. permissible size according to EN 175 301-803 A
Plug may be installed rotated by 4x90°, with cable gland

### 5.1.6 Individual valves with pneumatic actuation type PA and P




Ports conf. ISO 228/1 (BSPP):
1 and 2 = G 1/8

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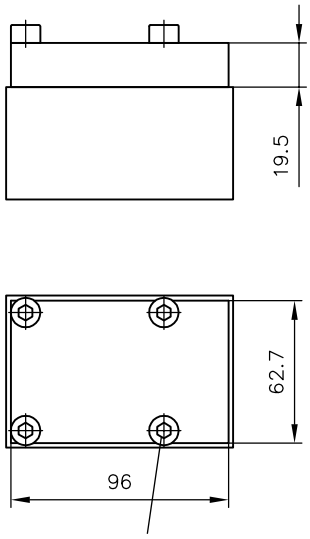
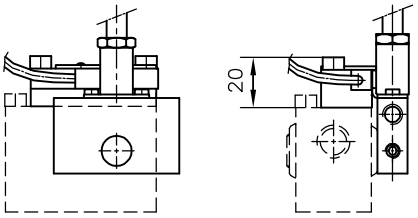
### 5.1.7 Blanking plate type AX



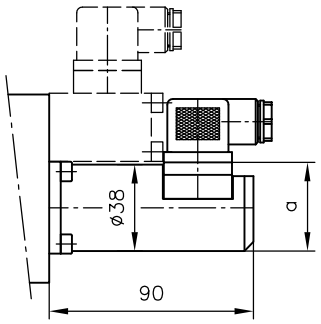

Mounting screw
4 x socket head screw
ISO 4762-M8x25 - 8.8-A2K, 23 Nm

### 5.1.8 Lift monitoring

**Type ... N(1)**

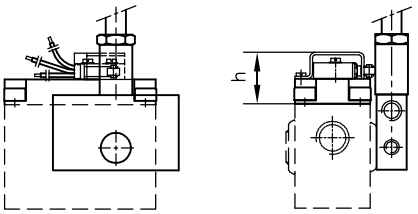



**Type ... WA, U**



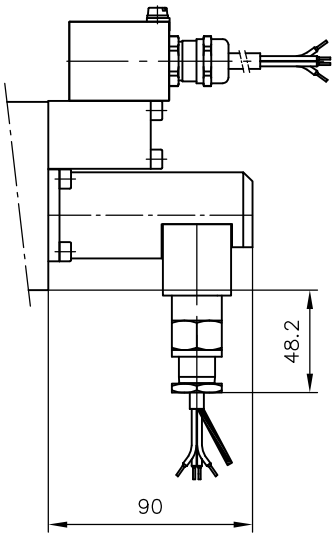

| Type | a |
|---|---|
| WA | 39 |
| U | 53 |

**Type ... V (VA, VB, VC)**

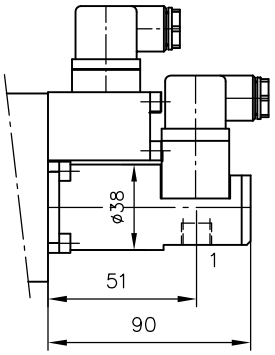



| Type | h |
|---|---|
| ... V (VA, VB) | 20.5 |
| ... VC | 27 |

**Type WA-EX**
**WA-M2 FP**



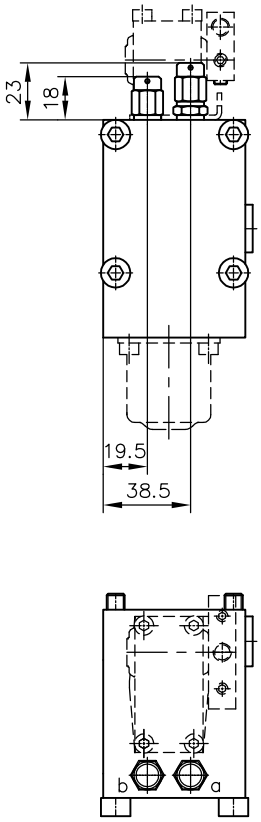

**Type H.WA**



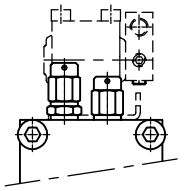

Port conf. ISO 288/1 (BSPP)
1 = G 1/4

### 5.1.9 Valve sections with LS-pressure limitation, functional cut-off and prop. pressure limitation

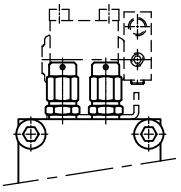
**Type A..**



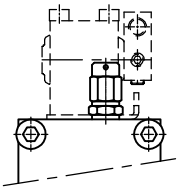

**Type B..**



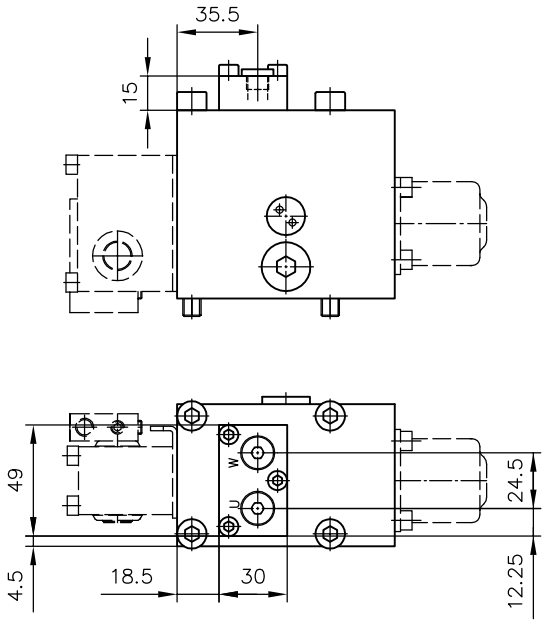
**Type A..B..**



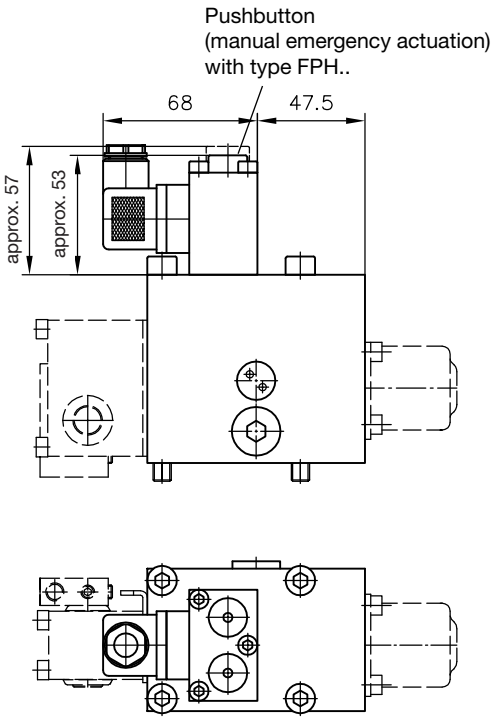
**Type C..**



**Type S 1 up to A..B..S 1**




**Type F 1 up to A..B.. F 3**
**FP 1 up to A..B.. FP 3**
**FPH 1 up to A..B.. FPH 3**

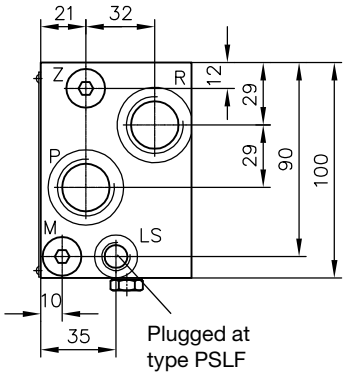


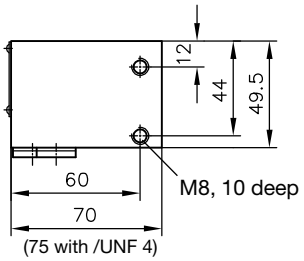

Ports conf. ISO 228/1 (BSPP):
W, U = G 1/8

### 5.1.10 Sub-plate

**For inlet section**

**Type /4**
**/UNF 4**



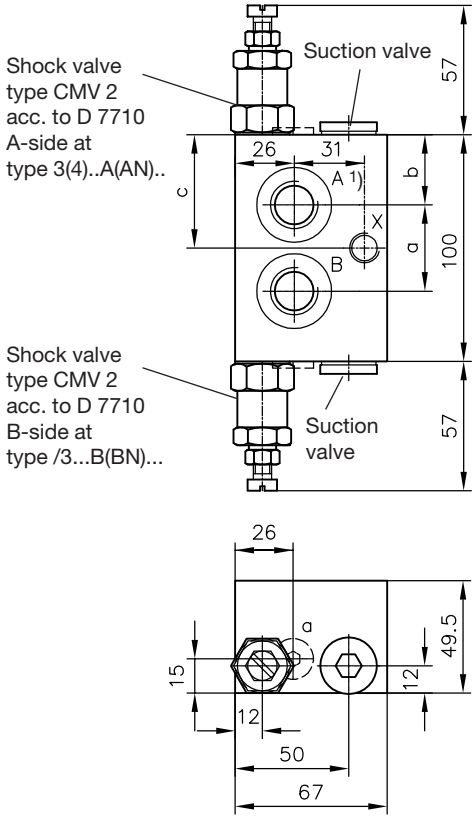




Tapped ports conf. ISO 228/1 (BSPP) or SAE J 514

| Coding | Port P, R | M, LS, Z, T |
|---|---|---|
| /4 | G 3/4 | G 1/4 |
| /UNF 4 | 1 1/16-20 UNF-2B | 7/16-20 UNF-2B |

**For valve sections**

**Type /3.., / 38, /4..**
**/UNF 3.., /U 3**

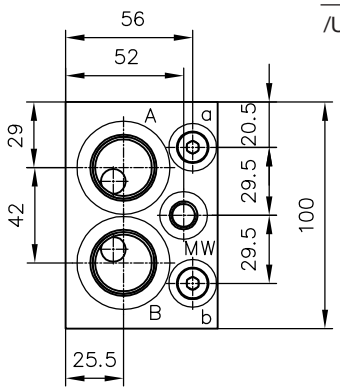






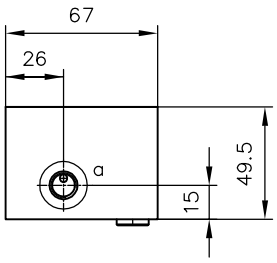
**Type /UNF 4 W**

| Coding | a | b | c |
|---|---|---|---|
| /3, /UNF 3, /U 3 | 38 | 31 | 30 |
| /4, /UNF 4 | 42 | 29 | 30 |
| /UNF 3X | 38 | 31 | 38 |




[1]) Port A is omitted with /38

Ports A and B omitted with sub-plate /U 3

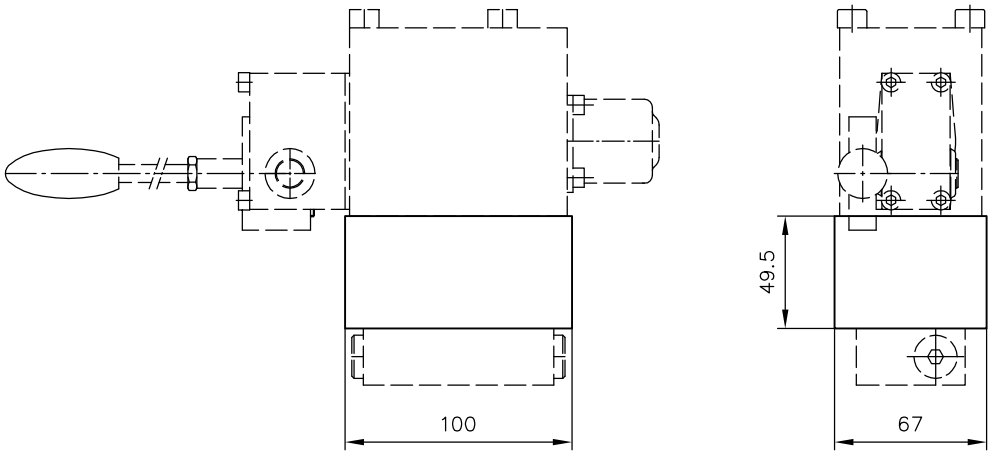



Tapped ports conf. ISO 228/1 (BSPP) or SAE J 514

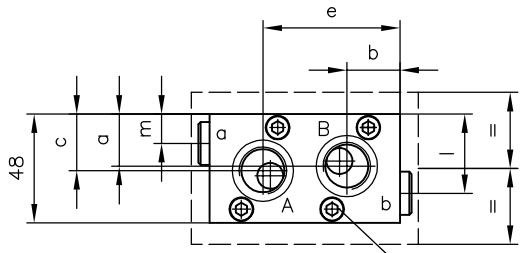
| Coding | A, B | W, U, X, MW, a, b |
|---|---|---|
| /3.. | G 1/2 | G 1/4 |
| /4.. | G 3/4 | |
| /UNF 3.. | 7/8-14 UNF-2B | 7/16-20 UNF-2B |
| /UNF 4.. | 1 1/16-12 UNF-2B | |

**also sect. 5.1.10 Ancillary blocks sub-plates /U 3, /U 53**

**Type /U 3**

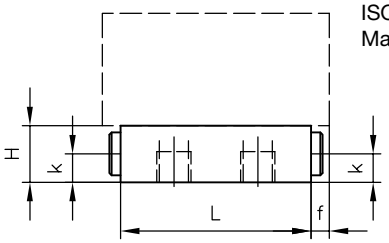



**Type /3**
**/UNF 3**
**/4**
**/4 AN BN**




| Type | H | L | a | b | c | e | f | g | k | l | m |
|---|---|---|---|---|---|---|---|---|---|---|---|
| /3 | 25 | 84 | 23 | 23.5 | 25 | 60.5 | 8 | 25 | 12.5 | 35 | 13 |
| /UNF 3 | 30 | 96 | 26.25 | 23.75 | 21.75 | 72.25 | 2 | 30 | 17 | 13.5 | 34.5 |
| /4 | 30 | 105 | 27.25 | 25.25 | 20.75 | 79.75 | 2.5 | 30 | 16 | 12 | 36 |
| /4 AN BN | 30 | 105 | 27.25 | 25.25 | 20.75 | 79.75 | 2.5 | 30 | 16 | 12 | 36 |

Socket head screws
ISO 4762-M6x15-A2-70
Max. torque 9.5 Nm




Ports A and B (all types)::

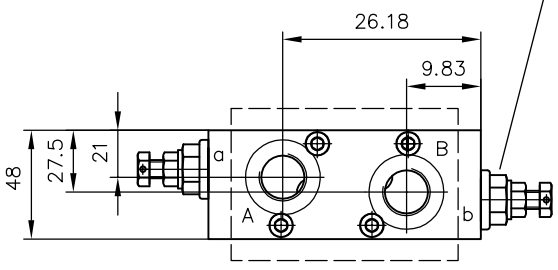
| | ISO 228/1 (BSPP) | SAE J 514 (SAE-10) |
|---|---|---|
| /3.., /31.. | G 1/2 | --- |
| /UNF 3.. | --- | 7/8-14 UN-2B |
| /4.. | G 3/4 | --- |

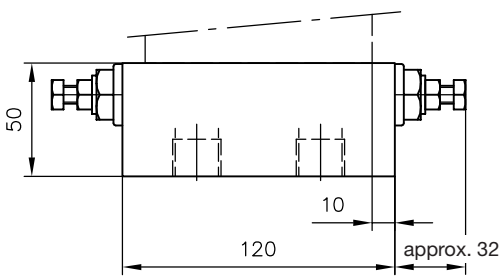
Ports ISO 228/1 (BSPP) a and b:

| | | |
|---|---|---|
| /3, /4 | G 1/4 | --- |
| /4 AN..,<br>/4 BN.. | G 1/8 | --- |

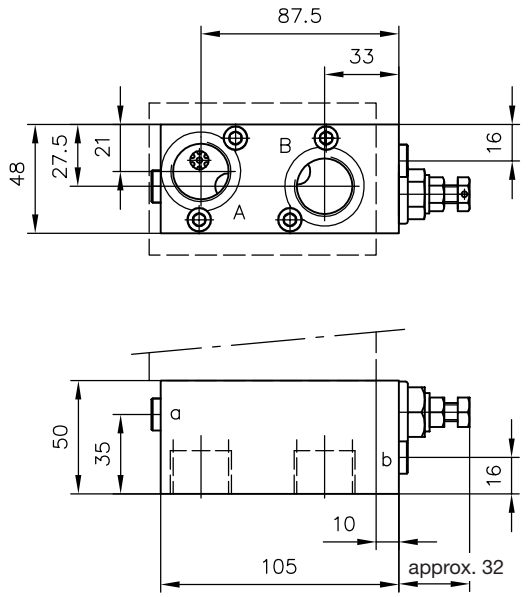
**Type /3 AS.. BS..**
**/3 AN.. BN..**
**/4 AS.. BS..**
**/4 AN.. BN..**
**/UNF 3 AS.. BS**
**/UNF 3 AN.. BN..**

Pressure adjustment:
Side B with type ..AS.. BS
Side A with type ..AN.. BN

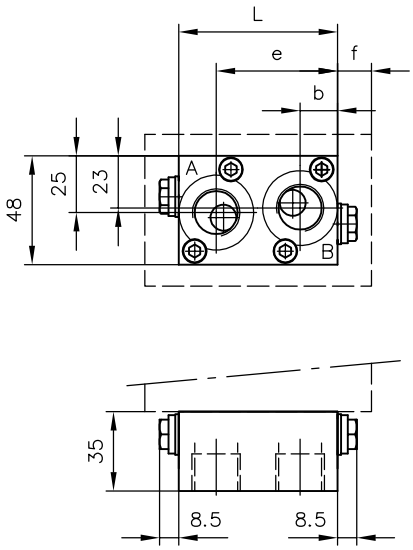


**Type /4 AN..**
**/4 BN..**

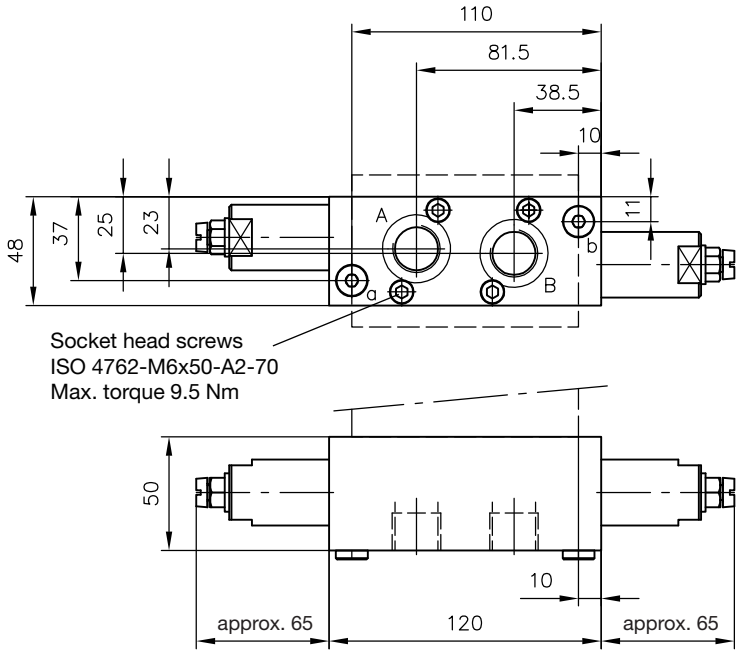



**Type /31 AS.. BS..**
**/31 AN.. BN..**




| Type | L | b | e | f |
|---|---|---|---|---|
| /31 AS.. BS.. | 70 | 16.5 | 53.5 | 15 |
| /31 AN.. BN.. | 100 | 31.5 | 68.5 | -- |

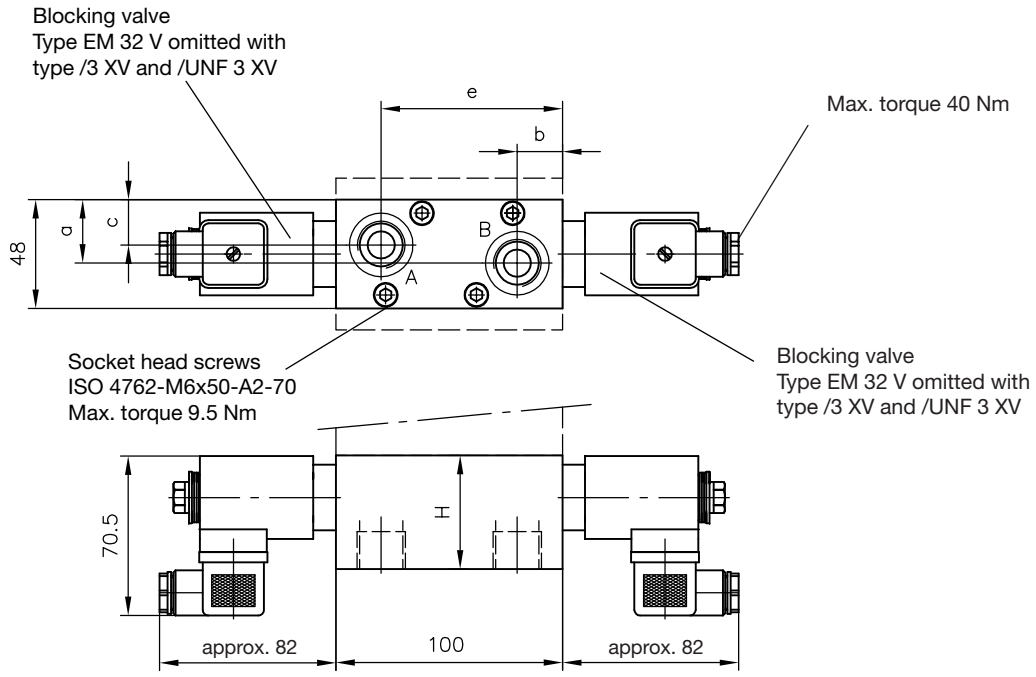
**Type /3 AL.. BL..**




Ports A and B:
/3.. = G 1/2 (ISO 228/1) (BSPP)
/UNF 3.. = 7/8-14 UN-2B (SAE J 514, SAE-10)

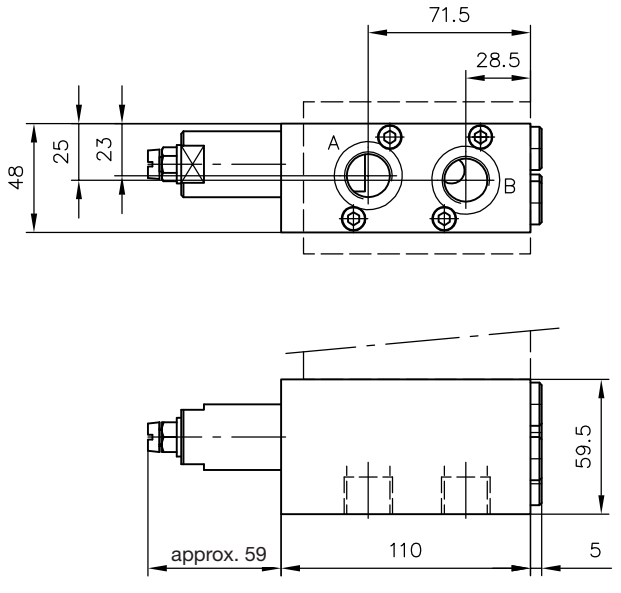
Ports a and b:
/3.. = G 1/8 (ISO 228/1) (BSPP)

**Type /3 VV(VX, XV)**
**UNF 3 VV(VX, XV)**

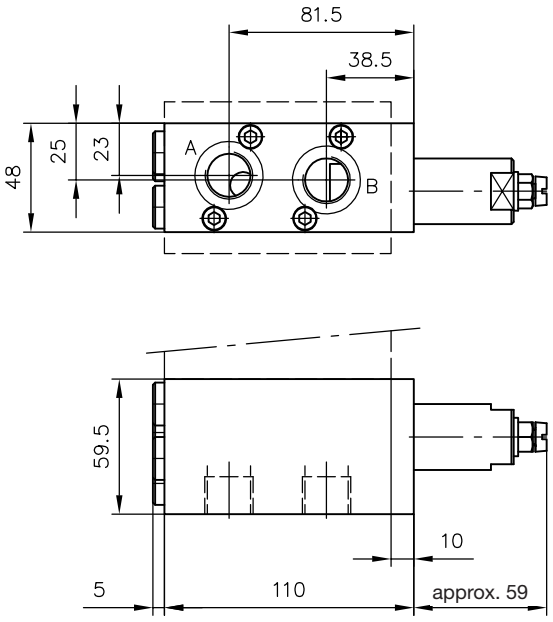



| Type | H | a | b | c | e | g |
|---|---|---|---|---|---|---|
| /3 VV(VX, XV) | 50 | 25 | 20 | 23 | 80 | 50 |
| /UNF 3 VV<br>/UNF 3 VX<br>/UNF 3 XV | 55 | 27.5 | 22.5 | 21 | 78 | 55 |

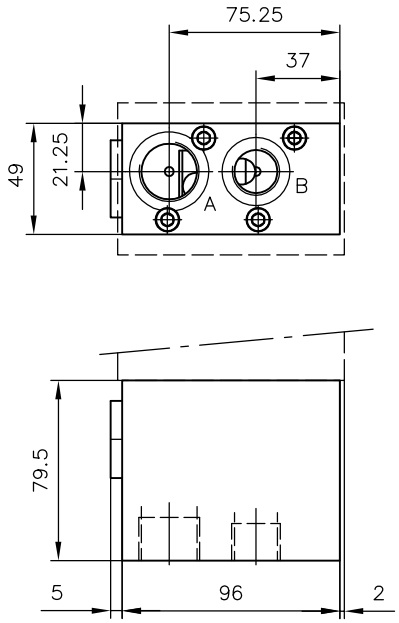
**Type /3 AL**



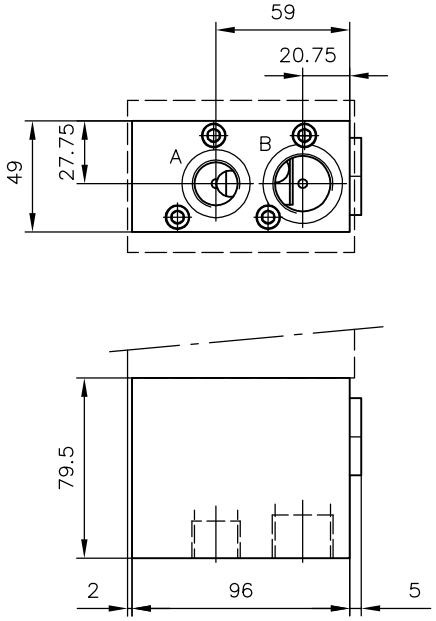

**Type /3 BL**



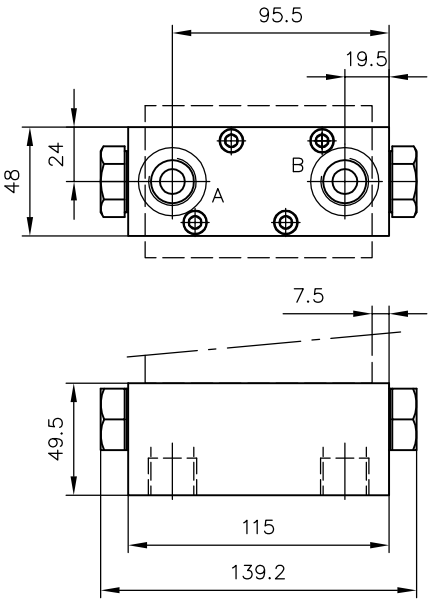
**Type /43 DFA**




**Type /43 DFB**



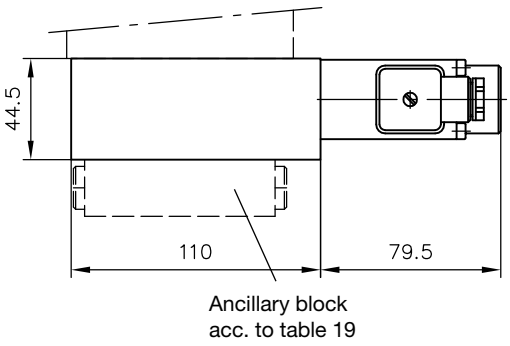

**Type /3 DRH**
**/UNF 3 DRH**



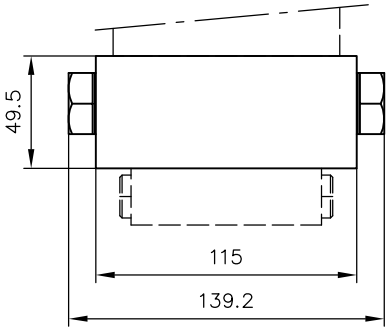

Ports A and B:
/.3.. = G 1/2 (ISO 228/1) (BSPP)
/.4.. = G 3/4 (ISO 228/1) (BSPP)
/UNF 3.. = 7/8-14 UN-2B (SAE J 514, SAE-10)
/UNF 4.. = 1 1/16-12 UNF-2B (SAE J 514, SAE-12)

**Ancillary blocks for sub-plates /U 3**
**Intermediate plate for parallel connection**

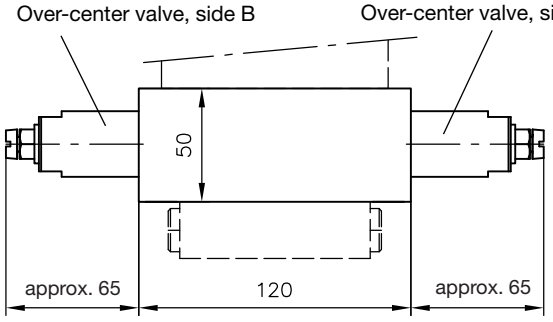
**Type /ZDR**
**/ZDS**



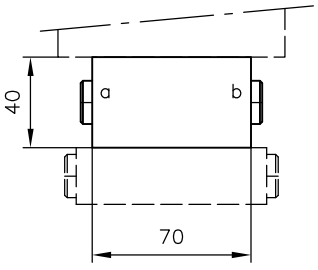

**Type /ZDRH**



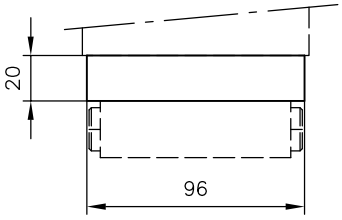

**Type /ZAL..BL..**




**Type /Z 40**
**/Z 40 M**
**/Z 40 M UNF**




**Type /Z AN BN**

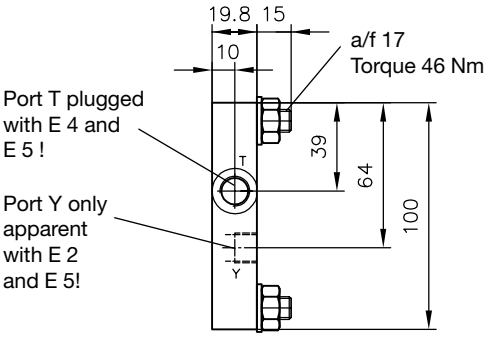


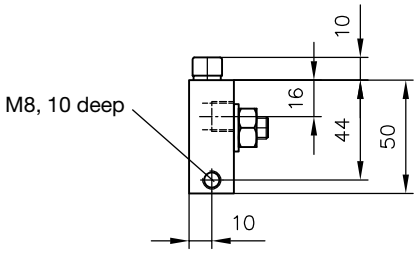

Ports a and b:

| | ISO 228 (BSPP) | SAE J 514 |
|---|---|---|
| /Z 40 M | G 1/4 | --- |
| /UNF 3.. | --- | 7/16 - 20 UNF - 2B |

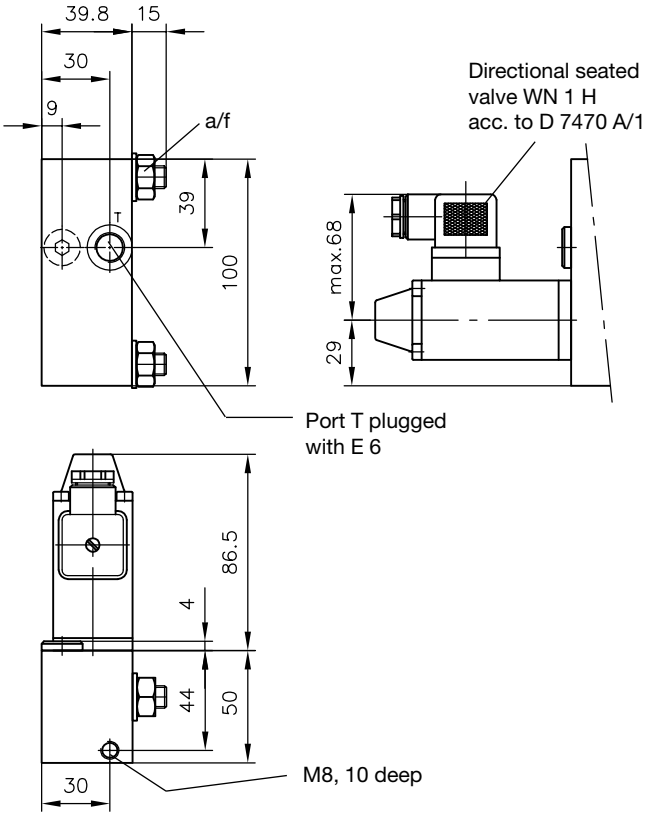
**End plates of the valve bank**

**Type E 1, E 2, E 4, E 5**

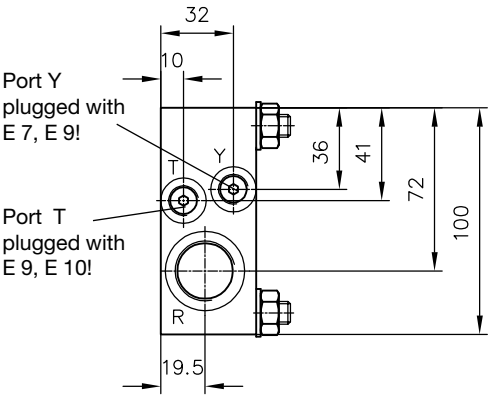


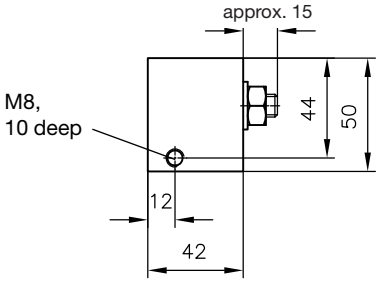




**Type E 3, E 6**




**Type E 7, E 8, E 9, E 10**

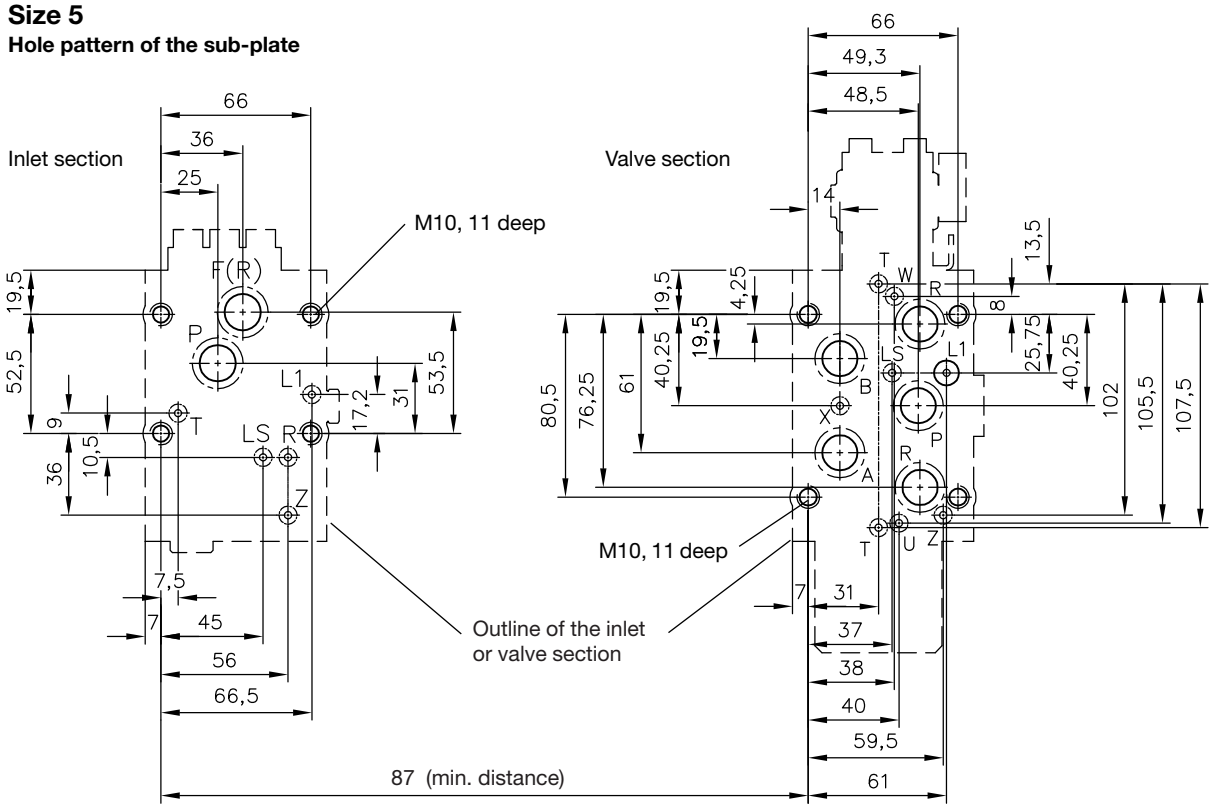


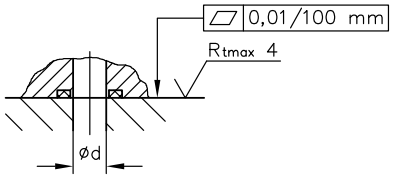




Ports conf. ISO 228/1 (BSPP):
R = G 3/4
T and Y = G 1/4

## 5.2 Size 5

### 5.2.1 Hole pattern of the sub-plate




Inlet section:

| Ports | Ød | O-ring [1] PUR 90 Sh |
|---|---|---|
| P, F(R) | 16 | 17.12x2.62 |
| R, L1, LS, T, Z | 3.2 | 4.47x1.78 |

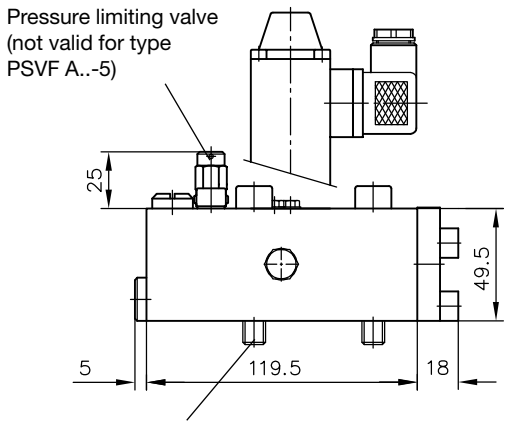
Valve section:

| Ports | Ød | O-ring [1] PUR 90 Sh |
|---|---|---|
| P, R | 15.5 | 17.12x2.62 |
| LS, T, U, W, X, Z | 3.2 | 4.47x1.78 |
| L1 | 3.2 | 7.65x1.78 |

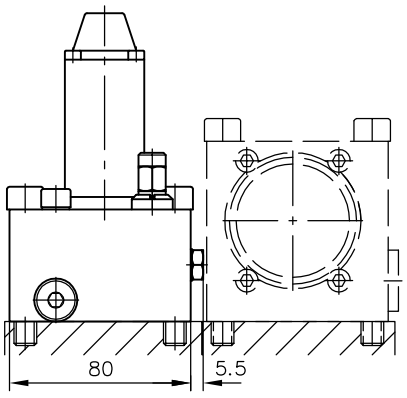
[1] These O-rings are also available as complete seal kits, see also sect. 6.3.5
Inlet section: DS 7700-F 51 Valve section: DS 7700-F 52

### 5.2.2 Inlet section

**Type PSLF(V) A../..-5 and PSVF A..-5**

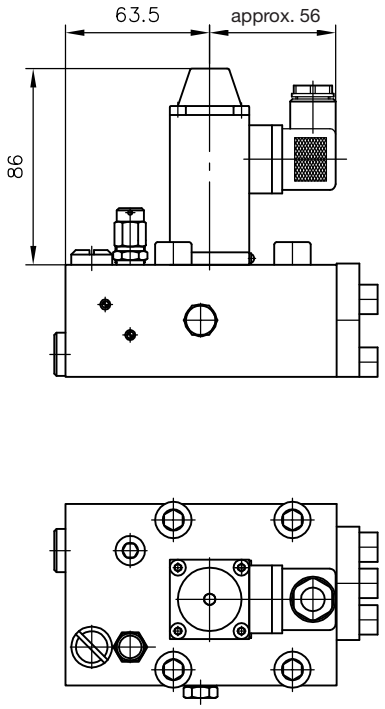



Socket head screw
ISO 4762 M10x60-8.8-A2K
Max. torque 40 Nm

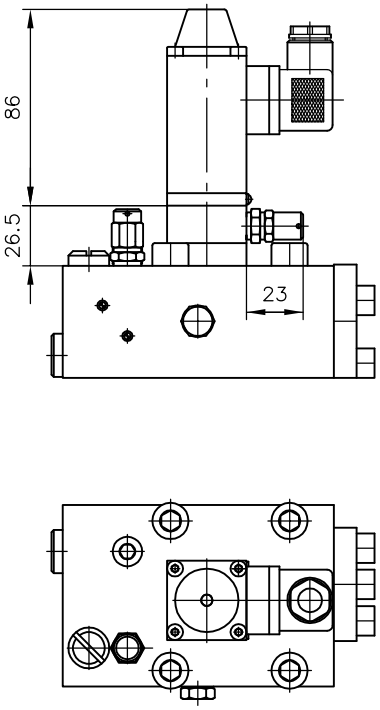



Valve section
acc. to sect. 5.2

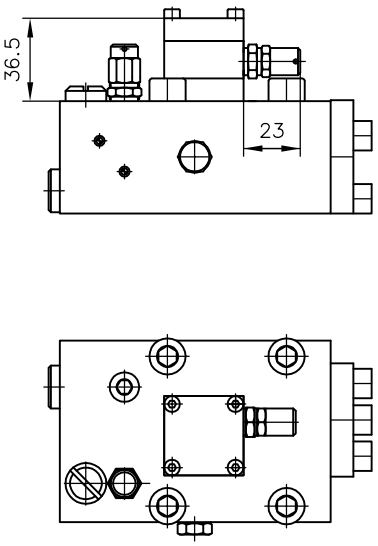
**Type PSL..F(D)/...**
**PSV..F(D)**
**PSV..F(D)/...**



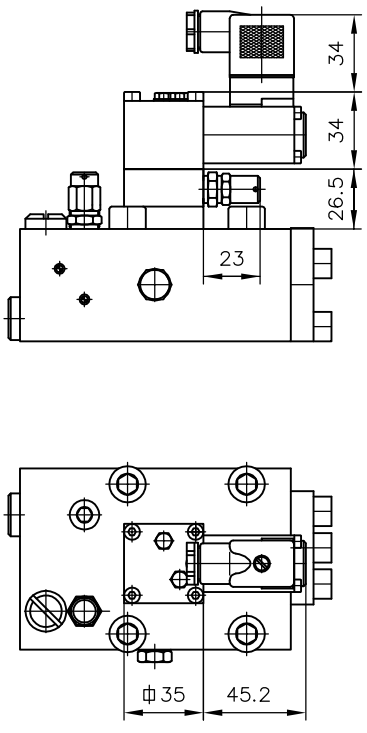

**Type PSL..F(D).../...**
**PSV..F(D).../...**



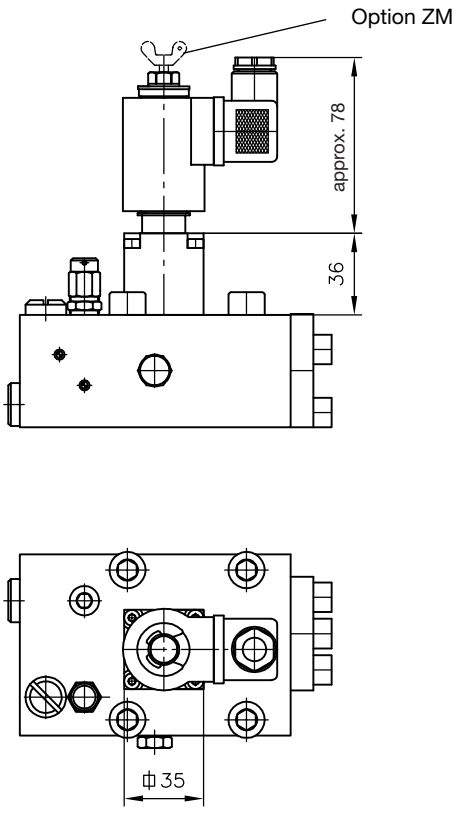

**Type PSV...X...**



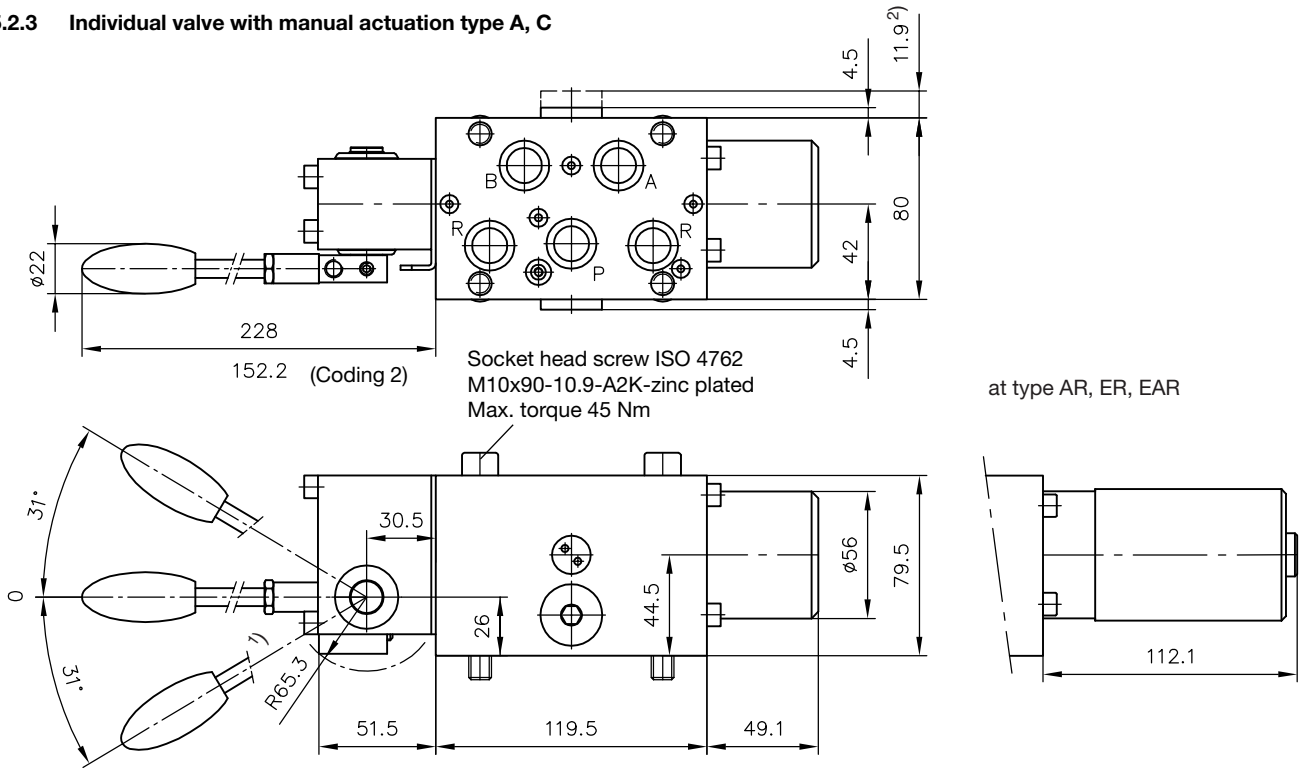

**Type PSL..PA(PB, PD)/...**
**PSV..PA(PB, PD)**




**Type PSL..Z(V).../...**
**PSV..Z(V).../...**



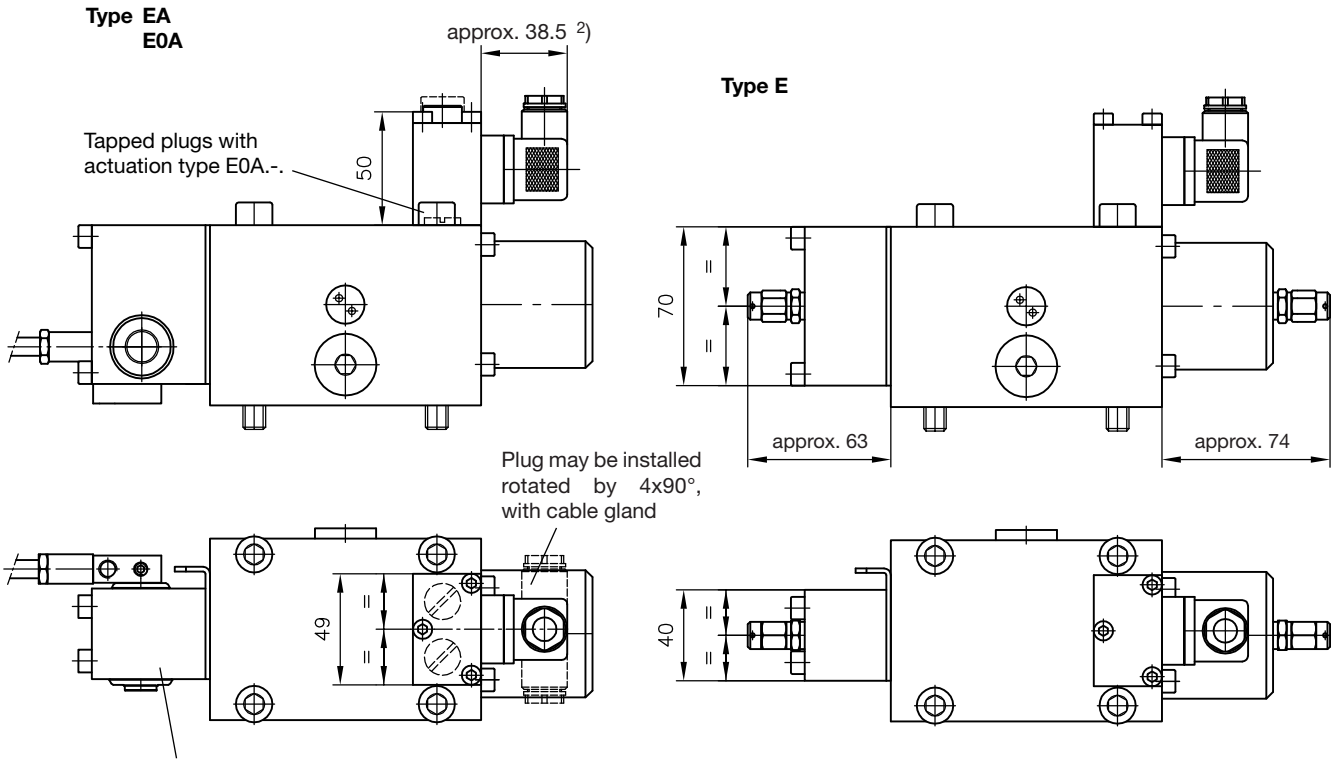
### 5.2.3 Individual valve with manual actuation type A, C




1) Observe this operation area for the hand lever with customer furnished manifolds!

2) in type AA9...

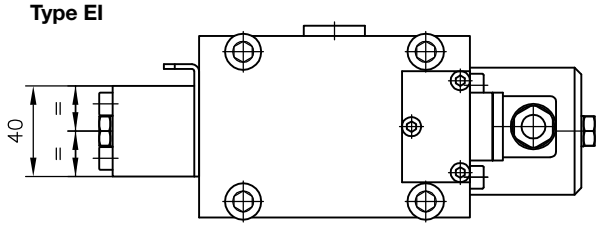
### 5.2.4 Individual valves with actuation type EA, E0A




Lever housing at EA and HA (FA) can be angled at 180° in the same manner as described at sect. 6.3.4

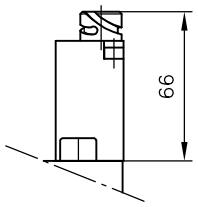
2) This dimension depends on the manufacturer and can be up to 50 mm depending on the max. permissible size according to EN 175 301-803 A

**Type EI**

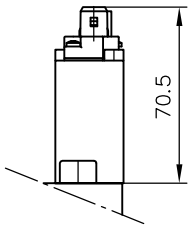


Additional solenoid versions

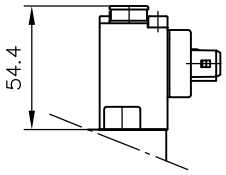
Coding **-S 12**
**-S 24**
**-S 12 T**
**-S 24 T**



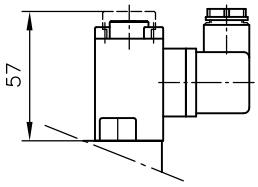

Coding **-AMP 12 K 4**
**-AMP 24 K 4**



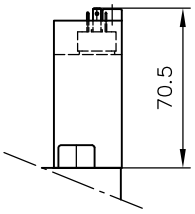

Coding **-AMP 24 H 4 T**



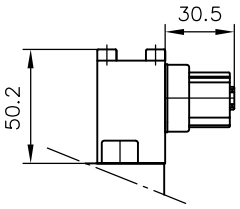

Coding **-G(X) 12 T**
**-G(X) 24 T**



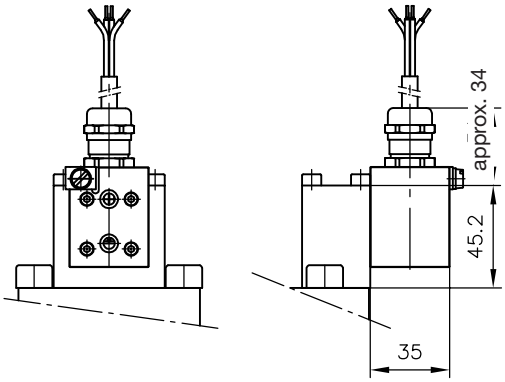

Coding **-G(X) 24 C 4**



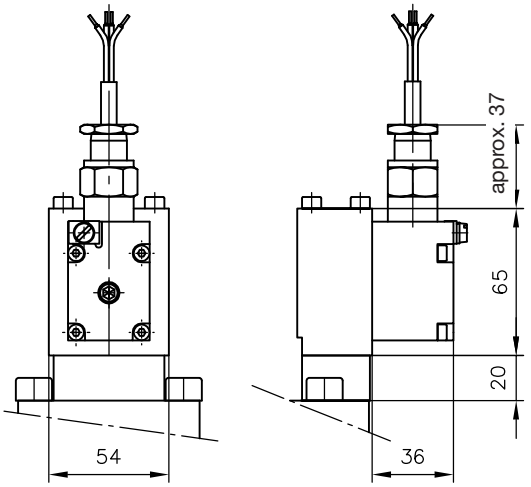

Coding **-DT 12**
**-DT 24**



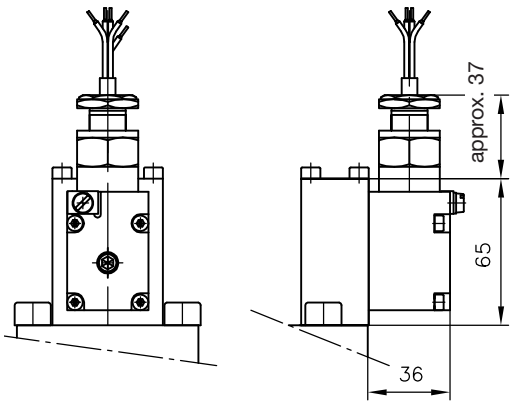

Coding **-G 24 EX**
**-G 24 EX 4**



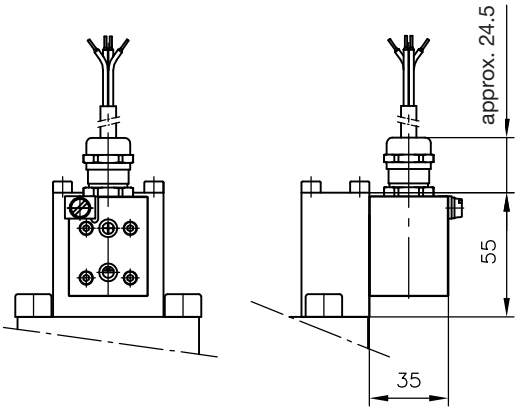

Coding **-G 12 IS**
**-G 24 MSHA**
**-G 24 M2 FP**




Coding **-G 24 EX 70**

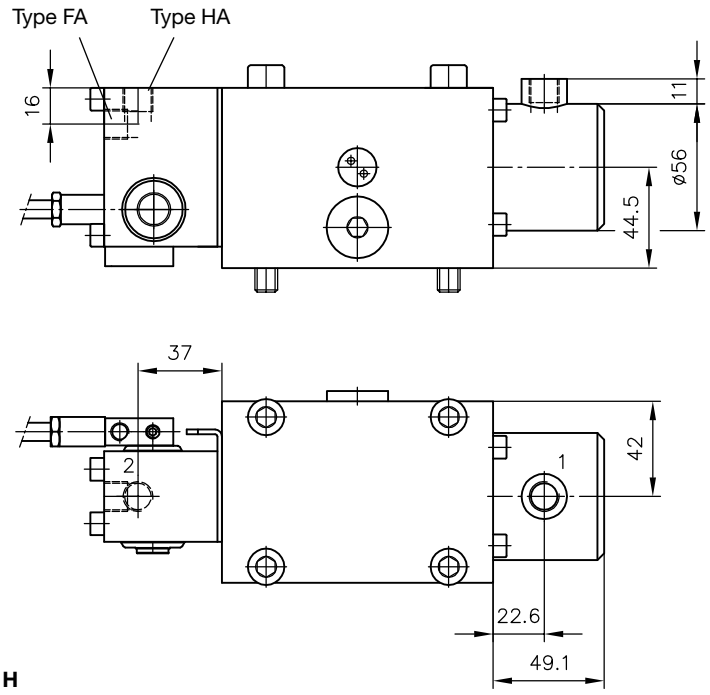



Coding **-G 24 TEX**
**-G 24 TEX 4**

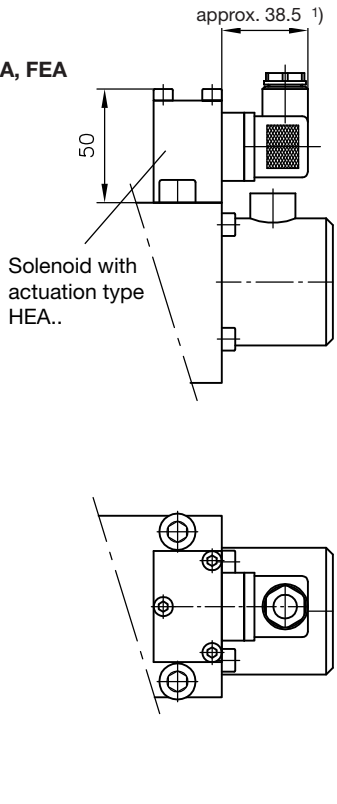


### 5.2.5 Individual valves with hydraulic actuation type F or HA, FA, HEA, FEA and H

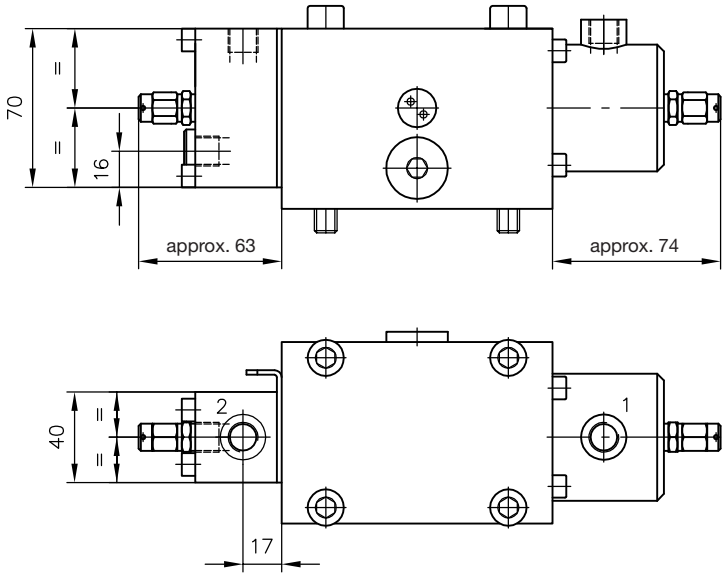
**Type HA, FA**




**Type HEA, FEA**




**Type H**

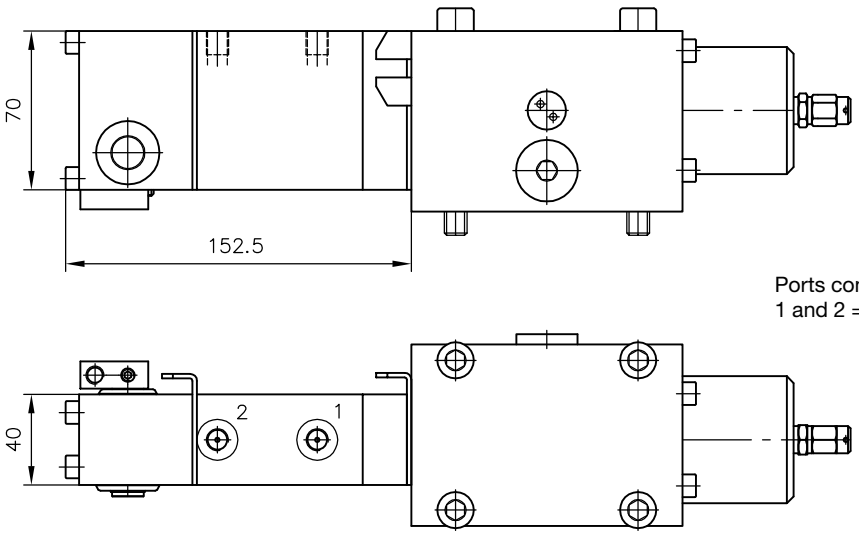



Ports conf. ISO 228/1 (BSPP) or
(SAE-4, SAE J 514):
1 and 2 = G 1/4 or 7/16-20 UNF-2B

1) This dimension (plug) depends on the make and may be up to 50 mm acc. EN 175 301-803 A
Plug may be installed rotated by 4x90°, with cable gland

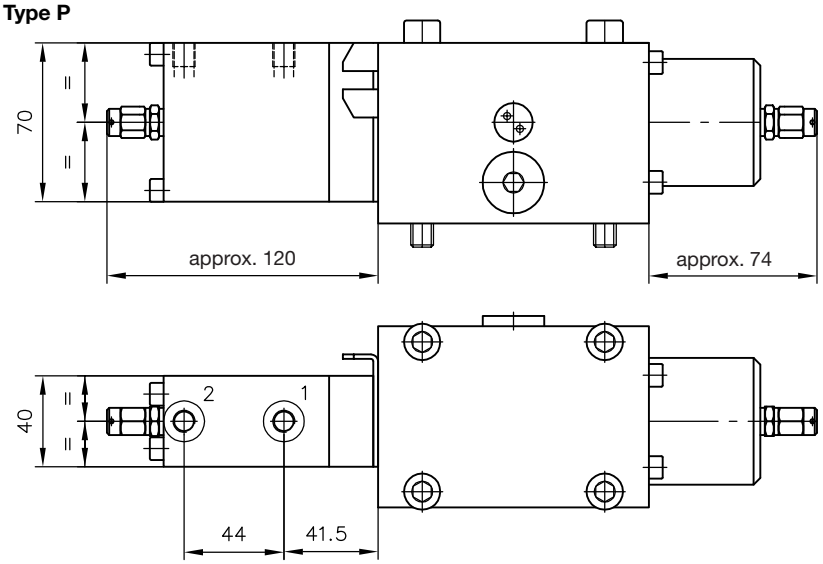
### 5.2.6 Individual valves with pneumatic actuation type PA and P

**Type PA**



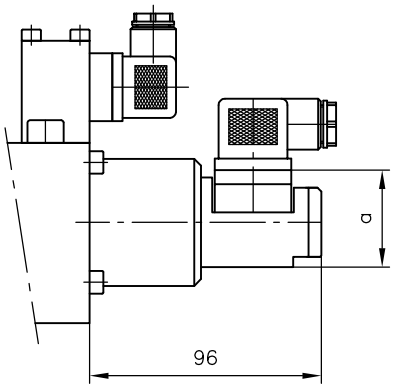

Ports conf. ISO 228/1 (BSPP):
1 and 2 = G 1/8

**Type P**



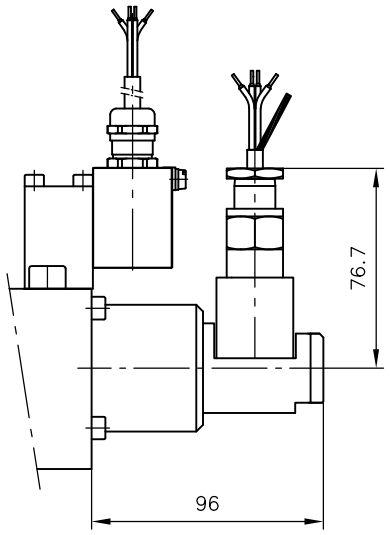

### 5.2.7 Lift monitoring

**Type WA, U**



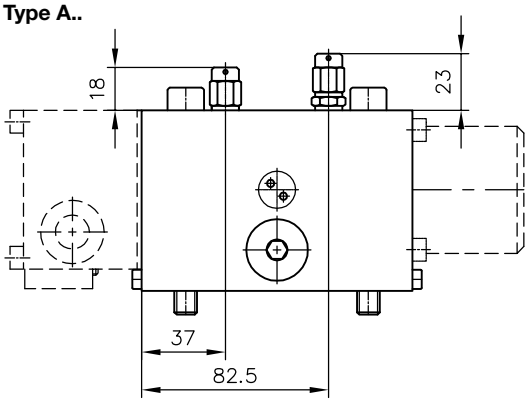

| Type | a |
|---|---|
| WA | 36.4 |
| U | 49.5 |

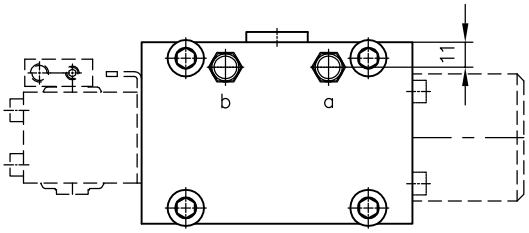
**Type WA-EX**
**WA-M2FP**



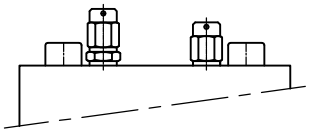

### 5.2.8 Valve sections with LS-pressure limitation, functional cut-off and prop. pressure limitation

**Type A..**

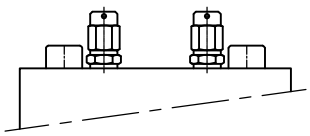


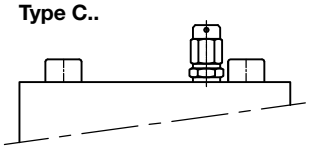

**Type B..**



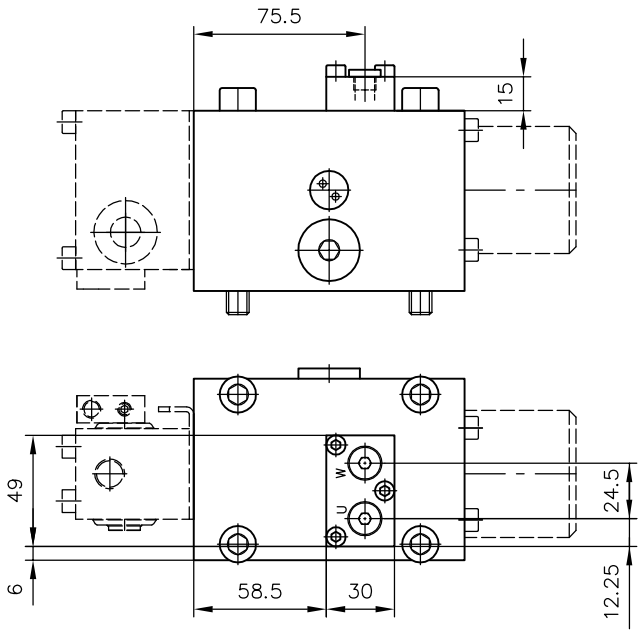
**Type A..B..**



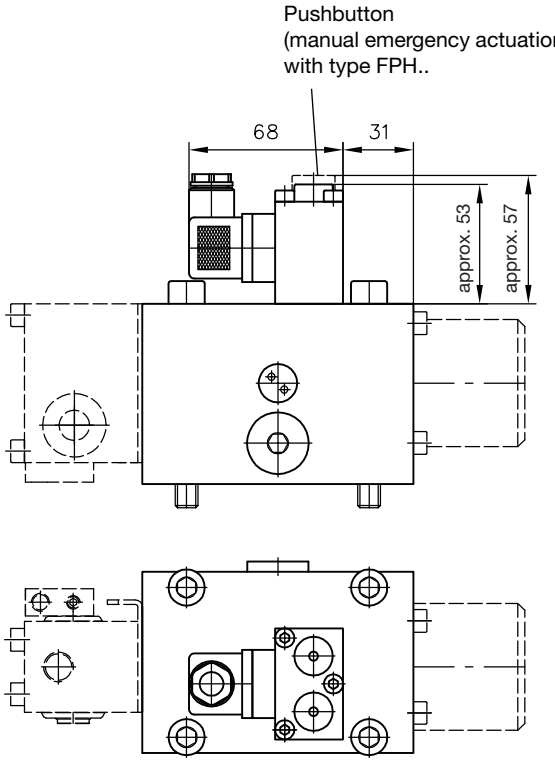
**Type C..**



**Type S 1 up to A..B..S 1**

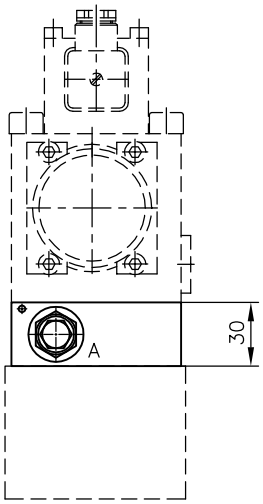


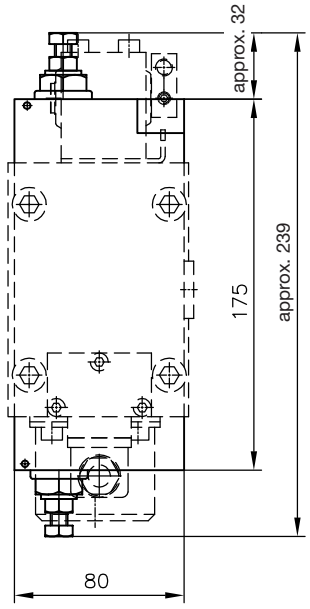

**Type F 1 up to A..B.. F 3**
**FP 1 up to A..B.. FP 3**
**FPH 1 up to A..B.. FPH 3**



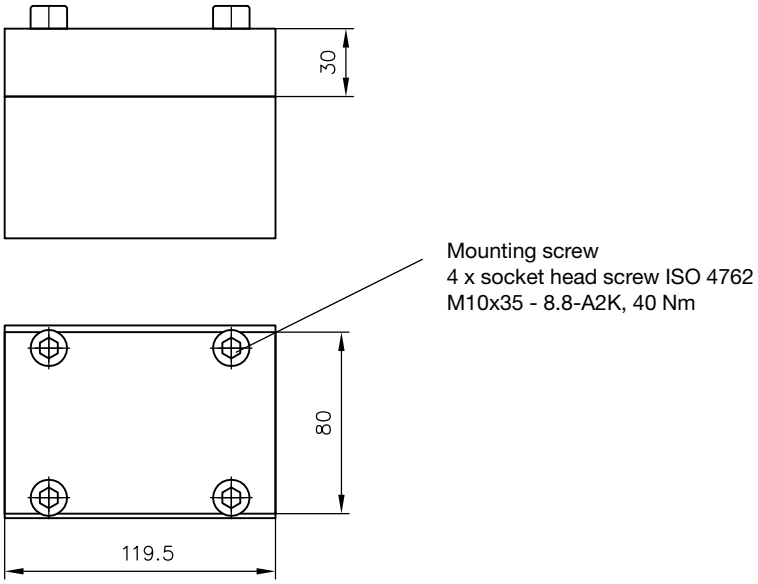

Ports conf. ISO 228/1 (BSPP):
W, U = G 1/8

**5.2.9 Sub-plate**
**Type /Z AN... BN...**



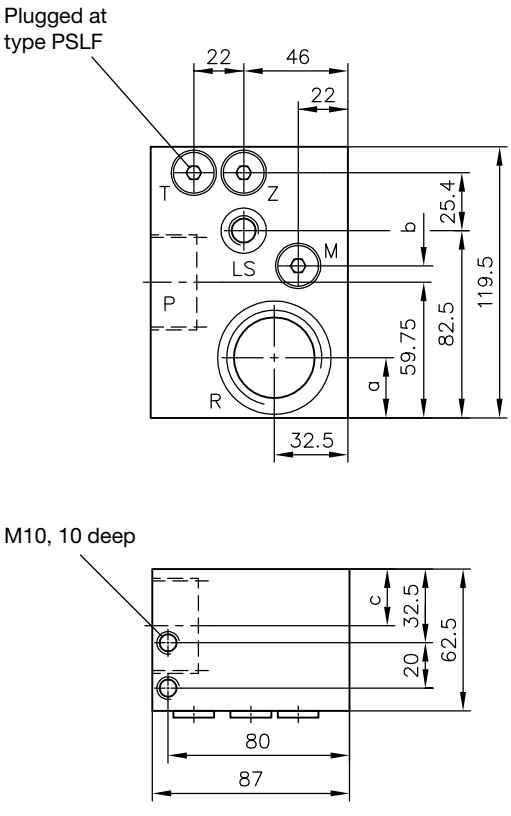
### 5.2.10 Blanking plate type AX




### 5.2.11 Sub-plate

**For inlet section**

**Type /6, /UNF 6**





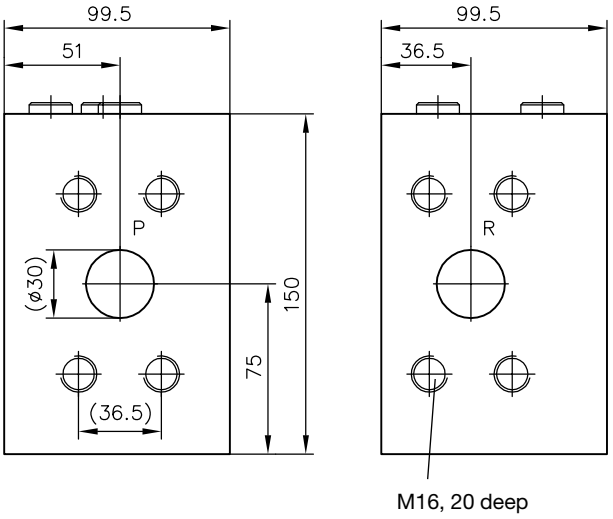


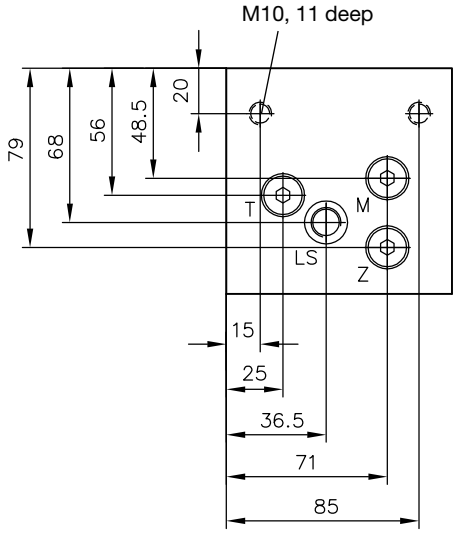
| | a | b | c |
|---|---|---|---|
| /6 | 26.5 | 7.25 | 25 |
| /UNF 6 | 29 | 8.25 | 28.25 |

Ports conf. ISO 228/1 (BSPP) or SAE J 514

| Coding | Ports P and R | M, LS, Z, T |
|---|---|---|
| /6 | G 1 1/4 | G 1/4 |
| /UNF 6 | 1 5/8-12 UN-2B | 7/16-20 UNF-2B |
| /7 SAE | SAE 1 1/2" (6000 psi) | G 1/4 |

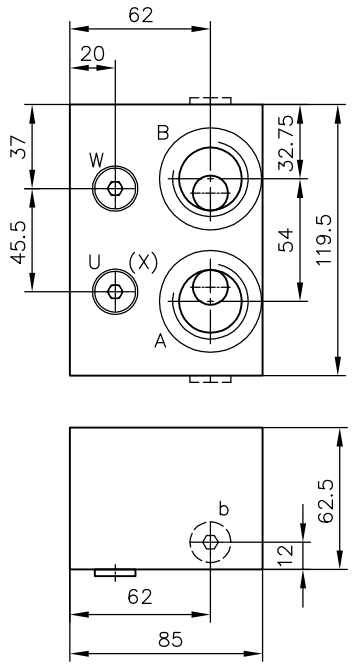
**Type /7 SAE**



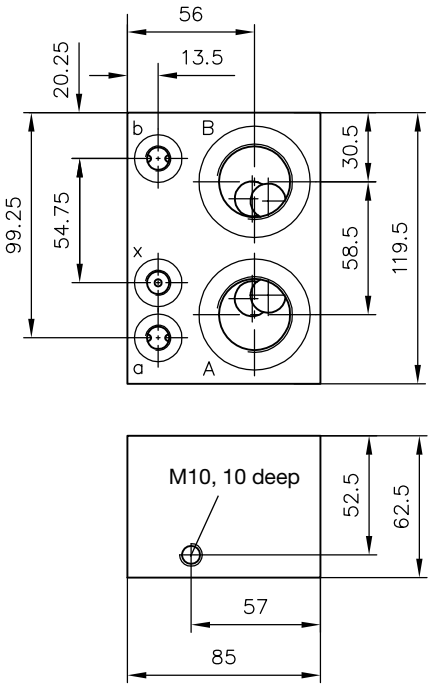



**For valve sections**

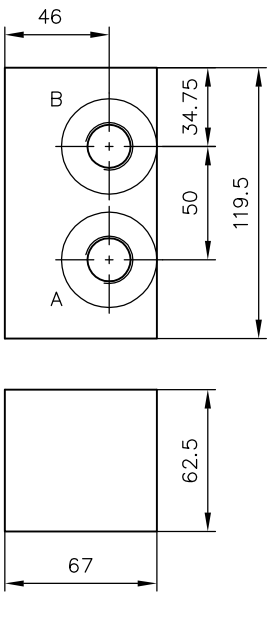
**Type /5, /58, /53, /5 S, /5 X, /U 5** [1)]




**Type /UNF 5 X**




**Type /533, /534, /U 53** [1)]

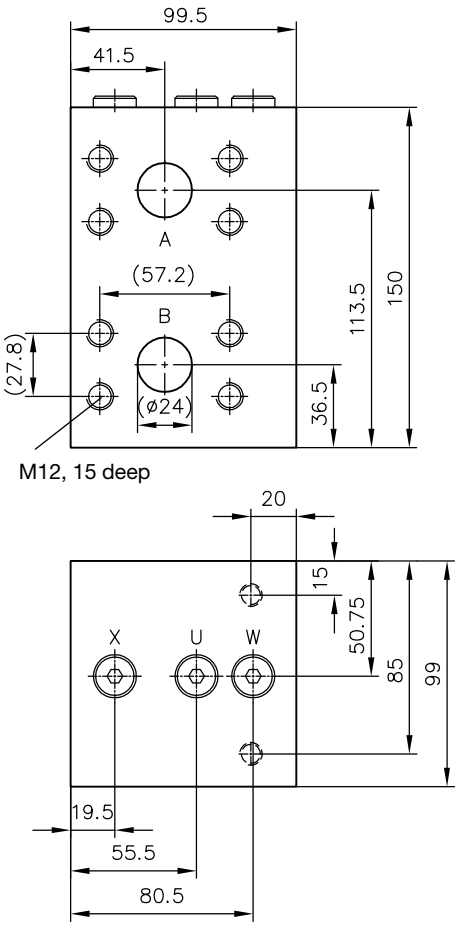



[1)] Port A is omitted with /58
Ports A and B omitted with sub-plate /U 3 and /U 53
Ports conf. ISO 228/1 (BSPP) or SAE J 514

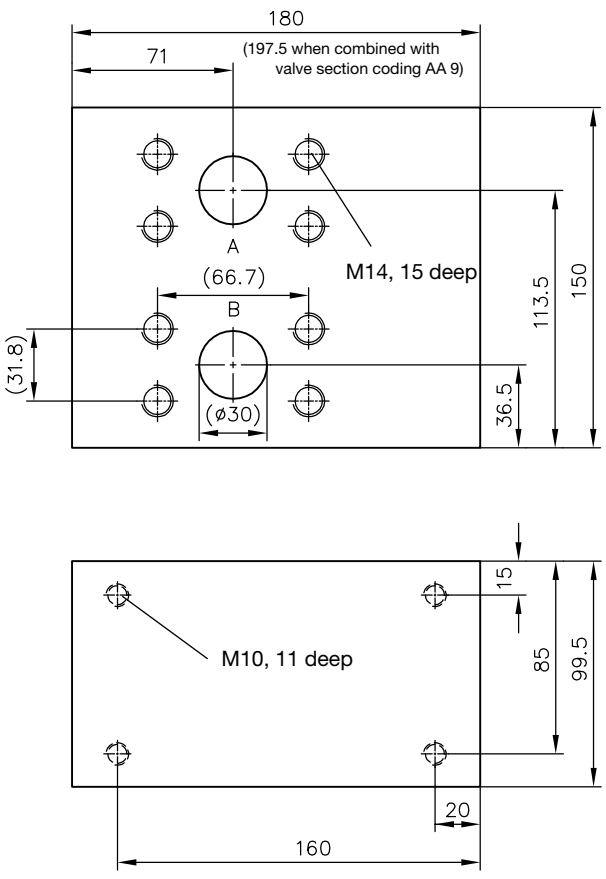
| Coding | Ports A, B | W, U, X |
|---|---|---|
| /5, /5 S, /58, 5 X | G 1 | G 1/4 |
| /53 | G 1/2 | --- |
| /533 | G 1/2 | --- |
| /UNF 5 X | 1 5/16-12 UNF-2B | 7/16-20 UNF-2B |

| Coding | Ports A, B | W, U, X |
|---|---|---|
| /534 | G 3/4 | --- |
| /UNF 534 | 7/8-14 UNF-2B | --- |
| /5 SAE, /5 SAE S | SAE 1” (6000 psi) | G 1/4 |
| /6 D SAE | SAE 1 1/4” (6000 psi) | --- |

**Type /5 SAE, /5 SAE S, /5 SAE 8** [1)]

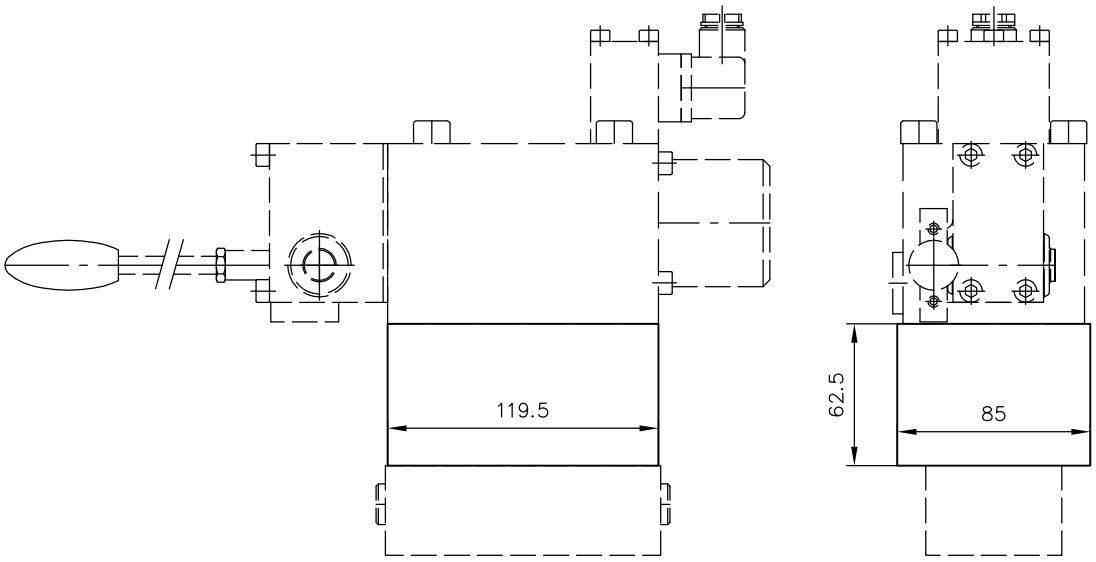



**Type /6 D SAE**

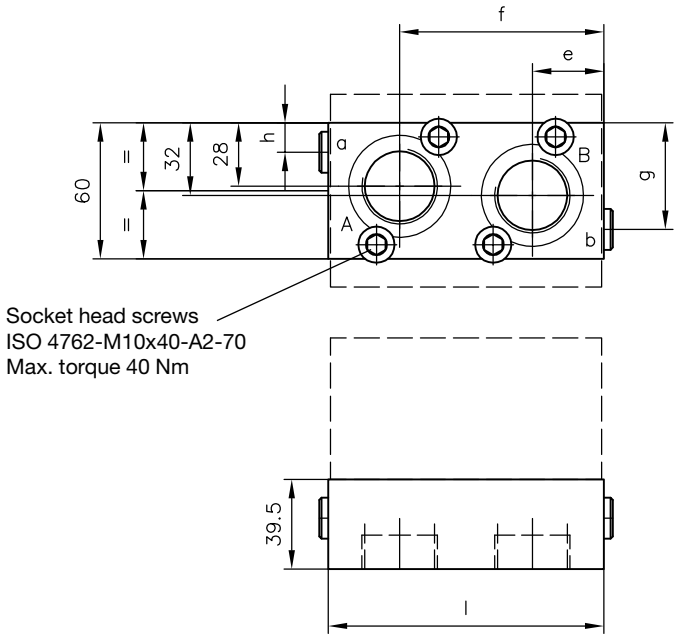


**also sect.. 5.2.11 Ancillary blocks for sub-plate /U 5**

**Type /U 5**
**/U 53**




**Type /5**
**/UNF 5**



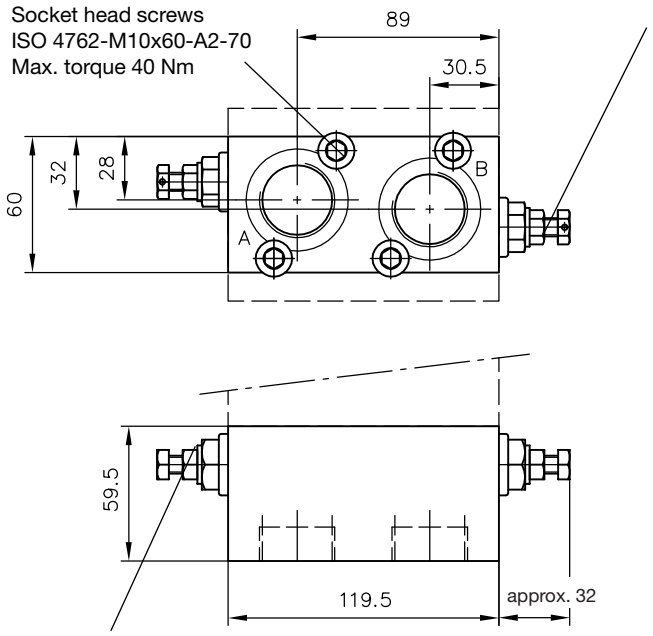

Socket head screws
ISO 4762-M10x40-A2-70
Max. torque 40 Nm

Port A and B :
/5.. = G 1 (ISO 228/1) (BSPP)
/UNF 5.. = 1 5/16-12 UN-2B (SAE-16, SAE J 514)

Port a and b :
/5.. = G 1/4 (ISO 228/1) (BSPP)
/UNF 5.. = 7/16-20 UNF-2B (SAE-4)

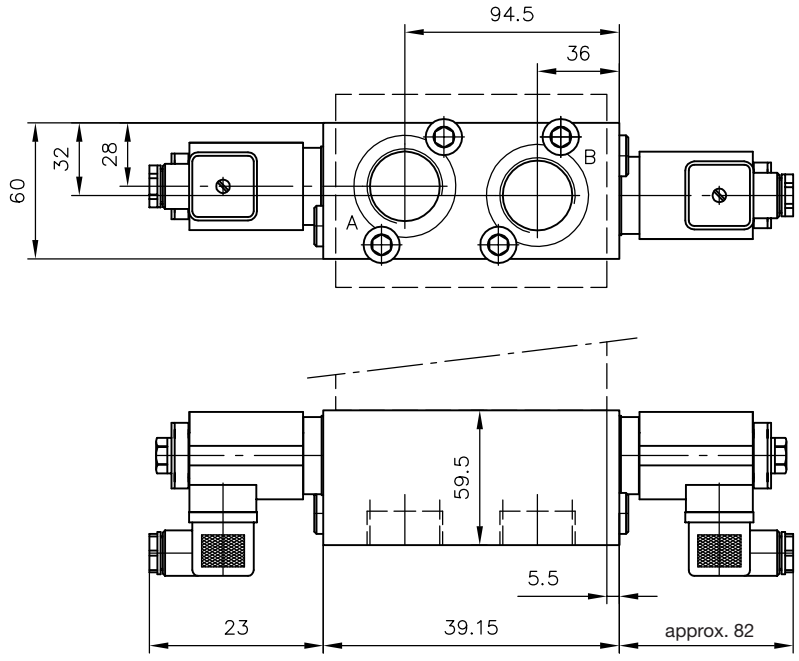
| | l | e | f | g | h |
|---|---|---|---|---|---|
| /5 | 121.5 | 31.5 | 90 | 47 | 13 |
| /UNF 5 | 119.5 | 30.5 | 89 | 19.5 | 40.5 |

**Type /5 AS.. BS..**
**/UNF 5 AS.. BS..**
**/5 AN.. BN..**
**/UNF 5 AN.. BN..**

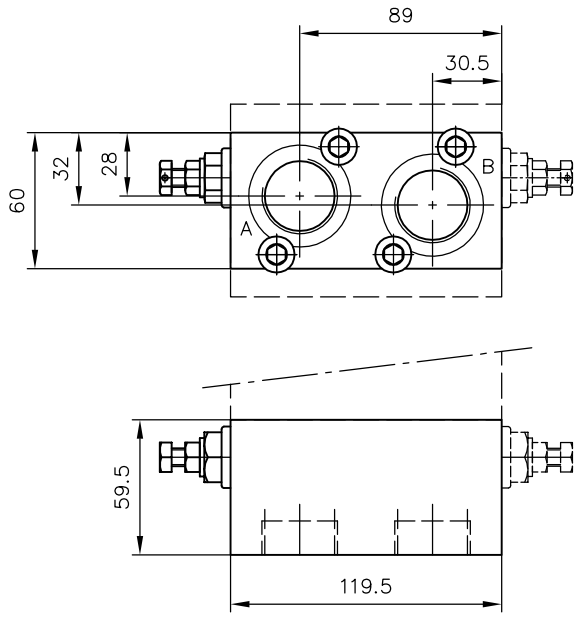



Port A and B :
/5.. = G 1 (ISO 228/1) (BSPP)
/UNF 5.. = 1 5/16-12 UN-2B (SAE-16, SAE J 514)

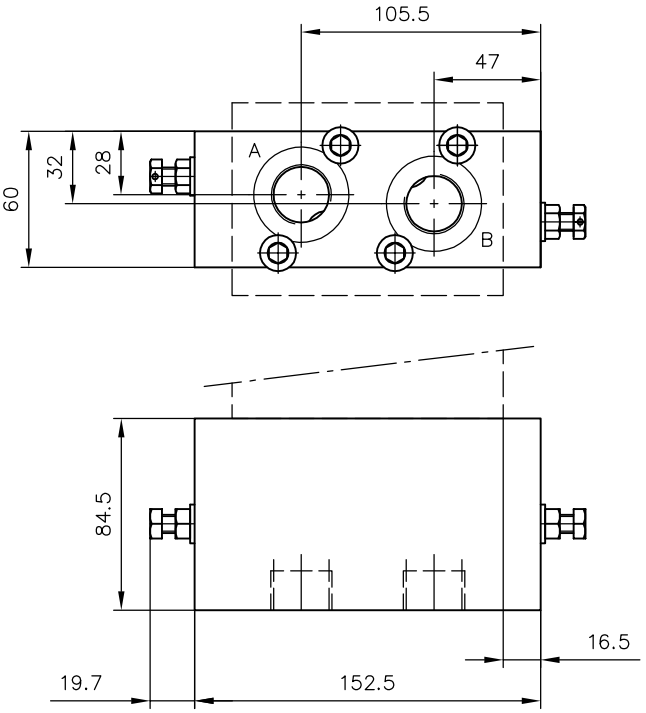
**Type /5 VV(VX, XV)**



**Type /5 AN..**
**/5 BN..**

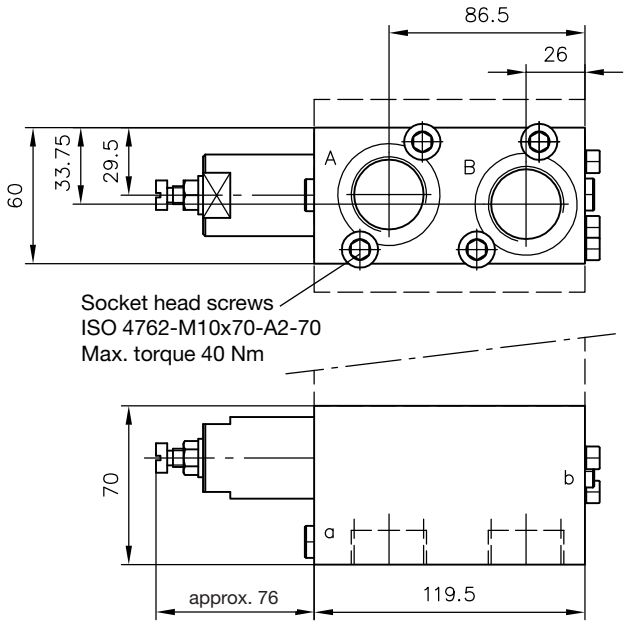



**Type /4 ASN..**
**/4 BSN..**

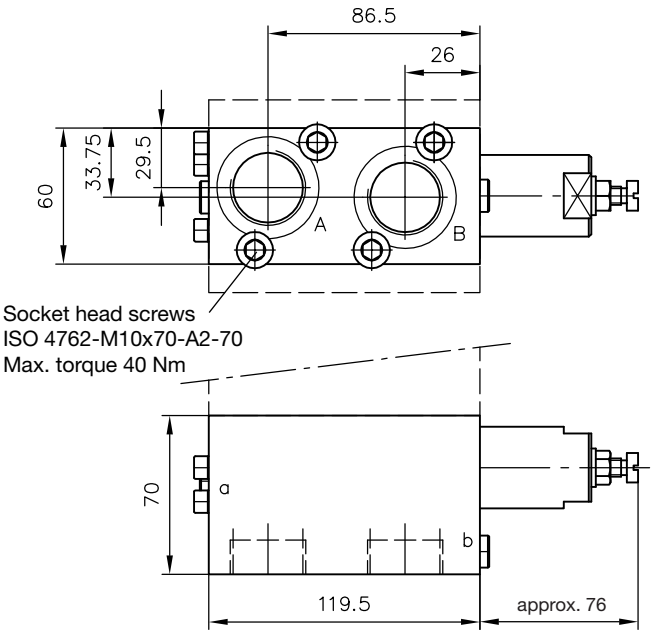



Port A and B (BSPP)
/4.. = G 3/4 (ISO 228/1)
/5.. = G 1 (ISO 228/1)

**Type /5 AL..**



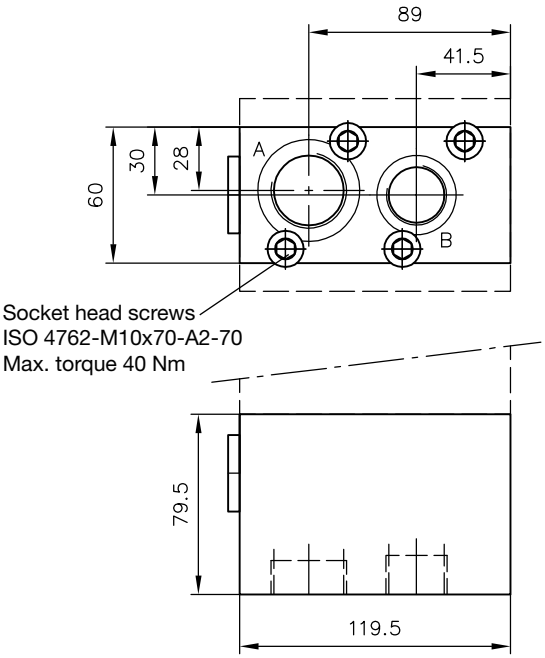

**Type /5 BL..**



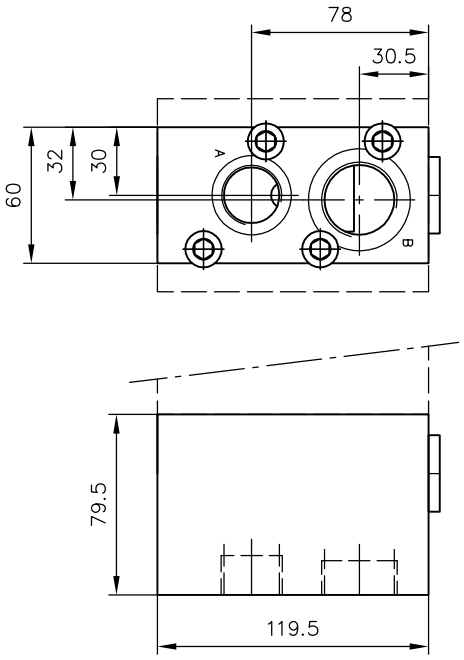

Ports a and b (ISO 228/1) (BSPP):
/5 AL.. = G 1/8
/5 BL.. = G 1/8

**also sect. 5.8 Ancillary blocks**

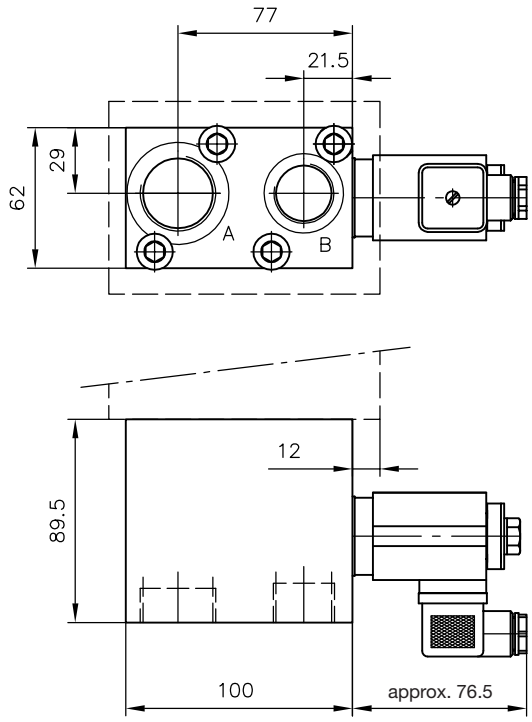
**Type /54 DFA**



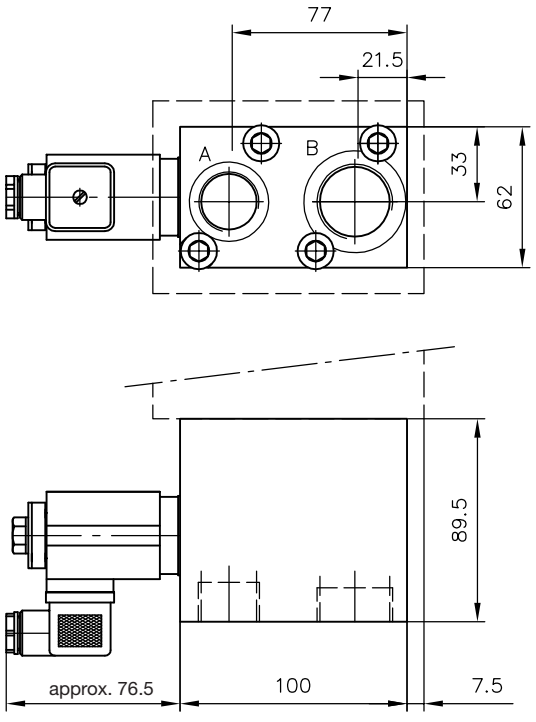

**Type /54 DFB**




**Type /54 DEA**

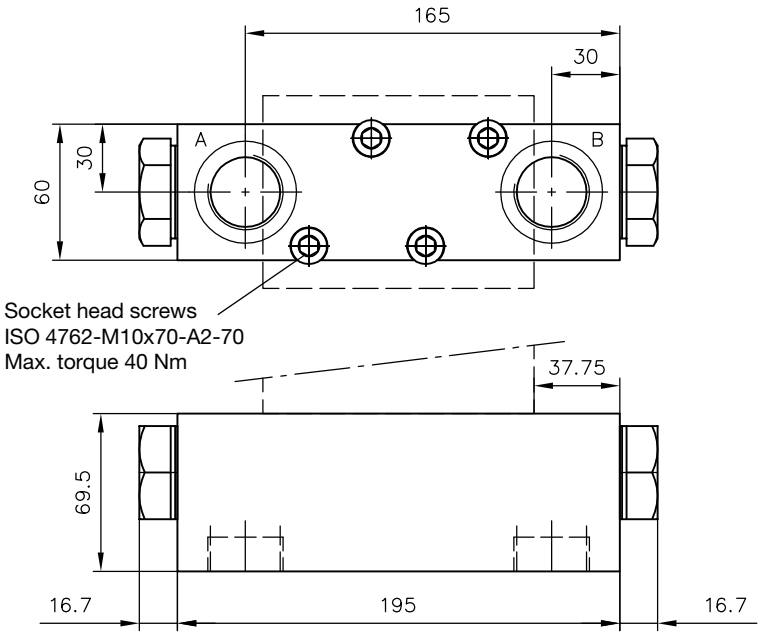



**Type /54 DEB**



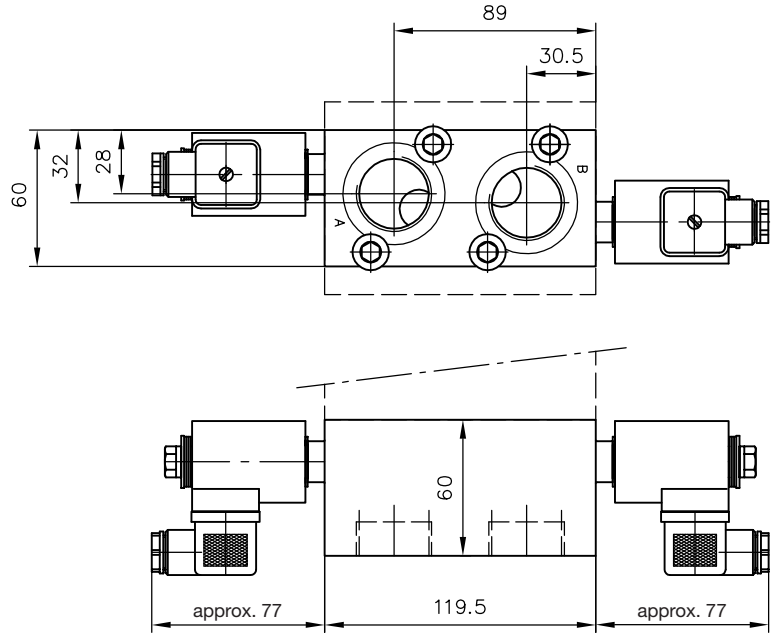

Port A and B acc. to (ISO 228/1) (BSPP):
/4.. = G 3/4
/5.. = G 1

**Type /5 DRH**
**/UNF 5 DRH**

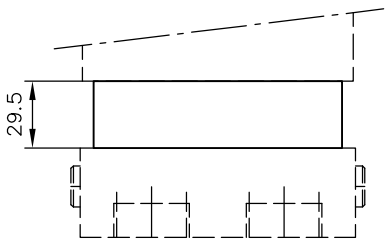



Ports A and B:
/5.. = G 1 (ISO 228/1) (BSPP)
/UNF 5.. = 1 5/16-12 UN-2B (SAE-16)

**Type /5 R VV**

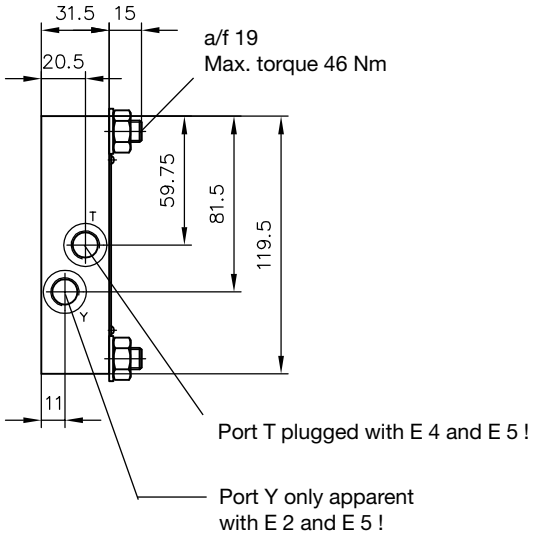



**Type /Z 30**

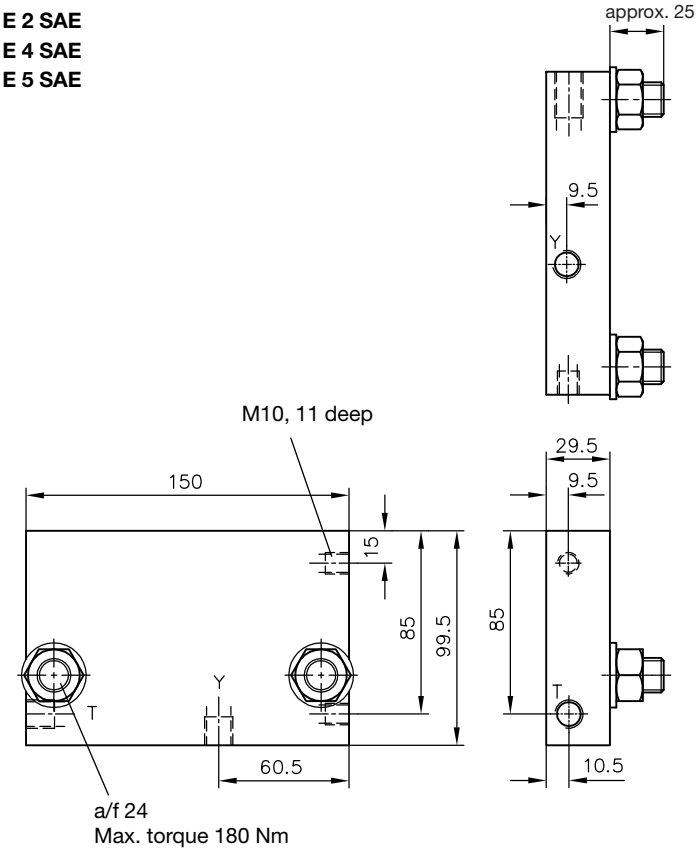


**End plates of the valve bank**

**Type E 1, E 2, E 4, E 5**




**Type E 1 SAE**
**E 2 SAE**
**E 4 SAE**
**E 5 SAE**

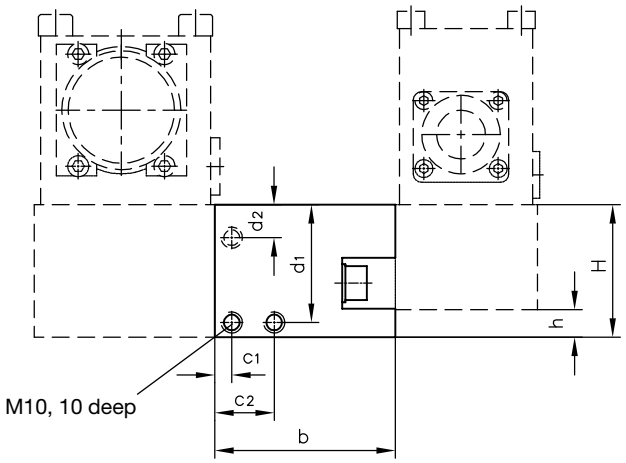


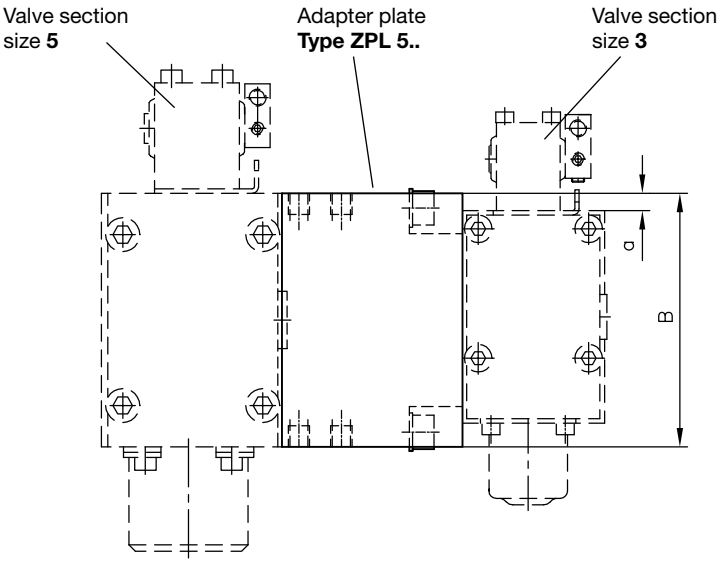

Ports conf. ISO 228/1 (BSPP):
T and Y = G 1/4

Port Y plugged with E 1 SAE
Port T plugged with E 5 SAE
Port T and Y plugged with E 2 SAE and E 4 SAE

### 5.2.12 Adapter plate

**Type ZPL 53**
**ZPL 5 SAE 3**




| | B | H | a | b | $c_1$ | $c_2$ | $d_1$ | $d_2$ | h |
|---|---|---|---|---|---|---|---|---|---|
| ZPL 53 | 119.5 | 62.5 | 8.25 | 85 | 8 | 28 | 55.5 | -- | 13 |
| ZPL 5 SAE 3 | 150 | 99.5 | 25 | 62.7 | 18 | -- | 85 | 15 | 50 |

# 6. Appendix

## 6.1 Notes for selection and lay-out

**a) Connection block**

There are, apart from the standard versions acc. to sect. 3.1.1 and 3.1.2. additional damping variations for the LS-signal type PSV (coding S or B) duct listed in tables 2 or 4. These are required, if strong (load-) oscillations are externally induced on the control circuit. A general rule concerning the use of one or other variation can however not given.

**Coding G**

This version lacks the sequence valve at the damping element which is apparent at the standard version to enable quick depressurization down to the pre-load pressure during idle position of the valve spool. This results in a stronger damping effect than with the standard version, as all fluid from the spring cavity of the 3-way flow controller must pass the thread type throttle. Main application is with consumers prone to low frequent oscillations - drawback is the delayed depressurization down to the pre-load pressure during idle position of the valve spool (pro-longed run-down).

**Coding H**

If on account of the required consumer velocity at least one spool valve with reference coding A 5 (raised circulation pressure) is utilized, then, in order to maintain the necessary pressure difference between 2- and 3-way flow controller, the circulation pressure of the 3-way flow controller must be raised to approx. 14 bar. This means, of course, greater power dissipation.

**Coding Z, ZM, V and PA, PB, PD** (acc. to table 8)

When using these valves for an emergency stop function, it has to be taken into account that there will be a certain min. residual pressure during pushing load while a valve spool is elevated!

| Dampening screw acc. to table 2 and 5 | Residual pressure at load induced pressure of | |
|---|---|---|
| Coding | 250 bar | 350 bar |
| S, G, W, B | 125 | 150 |
| B 4 | 60 | 70 |
| B 5 | 75 | 80 |
| B 6 | 85 | 95 |
| B 7 | 100 | 120 |

Viscosity ≦ 60 $mm^2/s$

**b) Spool valve sections**

**Coding A 1** (example SLF 5-A **1** L 120/63...)

On the one hand, there is a higher consumer flow with directional spool valves without an inflow controller (coding A 1) in comparison with one having a 2-way flow controller (coding A 2, A 5), as the flow is then directly dependent on the control pressure of either the connection block's 3-way flow controller (approx. 10 bar) in type PSLF, or the metering valve of a variable displacement pump (approx. 14 to 20 bar), in type PSVF. On the other hand, the load-independence is lost, if several consumers are actuated simultaneously, because the consumer with the highest load pressure rules the pressure level of the LS-signal given to the 3-way flow controller and so defines the available oil flow in the system.

When another valve with lower pressure is actuated now, the flow can only be regulated by throttling, which means if the highest load pressure varies, the spool elevation (= throttling) of the second consumer has to be reset to maintain a constant delivery flow to the consumer. This consumer flow can be calculated approx. by ($Q_{A;B}$ = expected consumer flow, $Q_{nom}$ = rated consumer flow for a valve with inflow controller coding A 2, $\Delta p_{controller}$ = pressure difference at the flow controller of the connection block or pump). $Q_{A,\,B} \approx Q_{nom} \cdot \sqrt{0.2 \cdot \Delta p_{controller}}$

**Coding A 2** (example SLF 5-A **2** 0 63/80)

The standard version of the spool valve comes with load compensation. Due to the control pressure of the inflow controller (approx. 6 bar), it regulates a constant flow related only to the spool elevation, making its delivery independent of other consumers or system pressure $Q \approx \sqrt{\Delta p_{controller} \cdot A_{valve\ spool}}$

**Coding A 26 and A 56** (example SLF A-3**26** J 40/25...)

Symptoms of resonance (audible knocking of the 2-way flow controllers) can be sometimes caused if pulsating consumers e.g. radial or axial piston motors with a low number of pistons) are connected.

This is prevented by use of a restrictor check valve combination which delays the closing of the inflow controller. This doesn't harm the characteristic of the functional cut-off or the pressure limiting valves.

**Coding A 5** (example SLF 5-A **5** J 160/160)

This version has an increased control pressure enabling higher consumer flows (see also above coding A 1 and A 2). The pressure of the flow controller is 10 bar resulting in a 1.3 higher flow compared to the standard version (coding A 2).

**Coding A 7** (example SLF 5-A **7** H 160/160)

Like coding A 5, due to the necessary pressure drop only in combination variable displacement pump / constant pressure system i.e. basically type PSVF.

**Coding A 8** (example SLF 3-A 8 L 80/63...)

To ensure max. flow for all subsequent valve sections, the highest flow rating (80/... or 160/...) must be selected for the A side (continuation of P).

**Coding AR 2, AR 5 and AR 7**

The flow controller acts additionally like a check valve. Thus preventing a reversal of the flow direction in case of starving pump delivery.

**Coding AA 9** (example SLF 5-AA 9 H 160/160)

Like coding A 5. This version has an increased control pressure enabling higher consumer flows. Only suited for variable displacement pump / constant presusre systems i.e. only suited for PSVF.

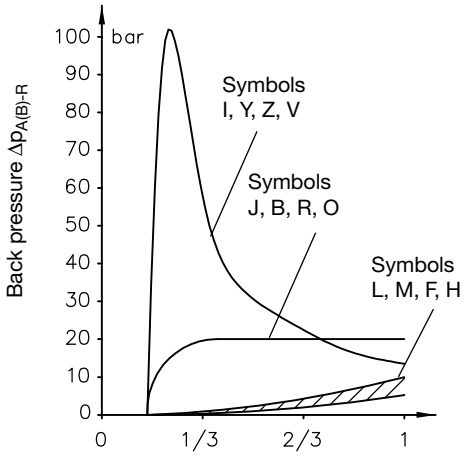
The valve body is optimized for higher flow i.e. this controller cannot be used with standard valve bodies.

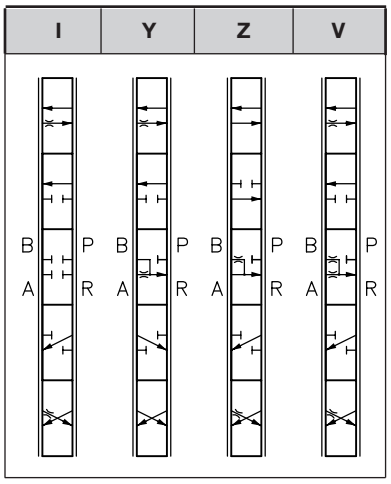
**c) Flow-pattern variations**

**Flow pattern symbol J, B, R, O and I, Y, Z, V**

Oscillations may occur depending on application during start (e.g. winches) or during normal operation (e.g. crane booms). They can be caused by the natural frequency of the hydraulic motors or external load variations e.g. swinging load. The flow coding (table 15) of the respective spool should correspond to the cylinder ratio as far as possible.

| Symbols | Description | Application |
|---|---|---|
| J, B, R, O | Creation of a back pressure of approx. 20 bar at 1/3 spool lift and more. | When combined with over-center valves e.g. for boom controls |
| I, Y, Z, V | Creation of a back pressure of approx. 100 bar for up to 1/3 spool lift | Hydraulic motors (because of pressure rise due to area ratio 1:1), e.g. with cabin slewing |




Available versions:

| | | |
|---|---|---|
| SLF 3 - I 6/6 | SLF 3 - Y 45/45 | SLF 5 - I 25/25 |
| I 10/10 | Y 60/60 | I 120/120 |
| I 16/16 | | I 140/140 |
| I 25/25 | SLF 3 - Z 25/25 | I 160/160 |
| I 30/30 | Z 45/45 | |
| I 40/40 | Z 60/60 | SLF 5 - Y 150/150 |
| I 63/63 | | |
| I 80/80 | | SLF 5 - Z 80/80 |
| SLF 3 - V 6/6 | | SLF 5 - V 25/25 |
| V 10/10 | | V 120/120 |
| V 16/16 | | V 140/140 |
| V 25/25 | | |
| V 40/40 | | |
| V 63/63 | | |
| V 80/80 | | |

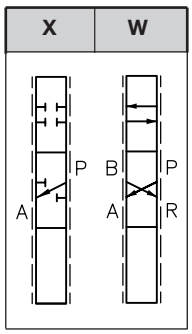
**Flow pattern symbol W**

This 4/2-way directional spool valve is intended for applications where a constant velocity is required e.g. blower or generator drives. The ability of prop. speed control is restricted, but load independency is ensured via the inflow controller (table 13).

**Flow pattern symbol X**

This 2/2-way directional spool valve is intended for hydraulic motors (e.g. fan drives) and features maximum speed in idle position. The speed can be reduced proportionally down to dead-halt by energizing the side "b". The load-independence is provided when combined with an inflow controller (table 13).

Symbols




Available versions:

SLF 3-W 50/50
SLF 5-W 120/120

| Coding acc. to table 13 | $Q_{max\ A,\ B}$ (lpm) | |
|---|---|---|
| 2 | 50 | 120 |
| (1) | (67) | (150) |
| 5 | 67 | 150 |

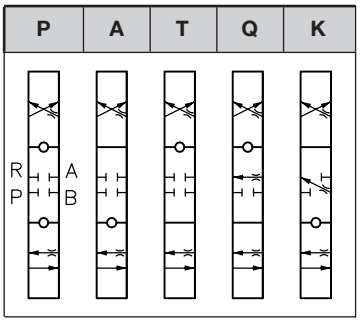
SLF 3-X 80

| Coding acc. to table 13 | $Q_{max\ A,\ B}$ (lpm) |
|---|---|
| 2 | 80 |
| (1) | (107) |
| 5 | 107 |

**Flow pattern symbol P, A, T, Q, K** (only size 3)

These spools show positive overlap. Type P overlaps in both switching directions, i.e. during elevation of the spool the connection P → A(B) is opened before of connection B(A) → R. This results in an undesired pressure intensification at cylinders (area ration ≠ 1), therefore we recommend type A, T, Q or K as these have a one-sided overlapping only. They are intended for consumers such as hydro-motors / double acting cylinders (area ratio 1:1) with righting moments / -forces, as well as at cylinders with drawing loads (area ratio ≠ 1). A short-term preloading prevents "lowering jolts" and "running empty". These valve spools can substitute load-holding valves to a limited extent. It should be taken into account, that a short-term working against the max. system pressure takes place.
The flow coding for A should be selected higher than for B with spool codings A and T to prevent unintended pressure intensifications (for spool codings Q and K $Q_{nom\ A} < Q_{nom\ B}$ )

Symbols

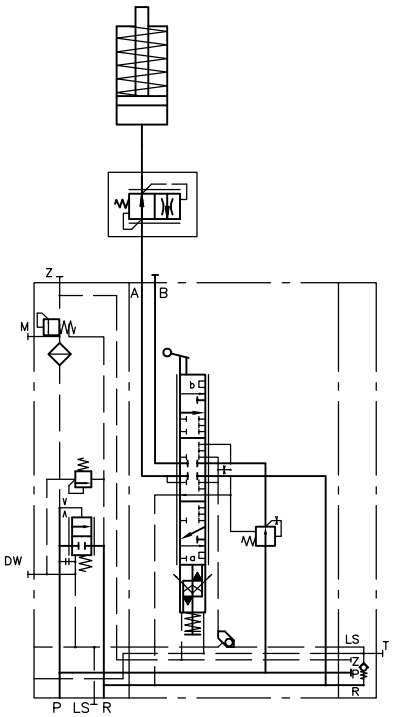



| Cylinder area ratio $A_{piston}/A_{rod}$ | Valve spool coding Piston side | | Example |
|---|---|---|---|
| = 1 | | P... | P 40/40 |
| ≠ 1 | connection A | A, T | T 25/16 |
| | connection B | Q, K | Q 40/63 |

**Flow pattern symbol G**
3/3-way directional spool valve for single acting cylinders
Restrictions:

- there is no load signal triggered via the LS-line
- Therefore only usable at open center systems (type PSLF) and electric actuation with restrictions – idle pump circulation pressure approx. 11 bar
- The flow while lowering is only throttled (no flow control functionality) and therefore load-dependent. It is therefore necessary (safety!) to limit the drop rate by a drop rate braking valve e.g. type SB acc. to D 6920

- Available version - to symbol G ($Q_A = Q_B$)
  SLF 3 - G 3/3 ... G 80/40
  SLF 5 - G 160/160




**d) Variations for special operation conditions or -requirements**
**Operation at potentially explosive areas**
Electro-hydraulic actuation (type E or EA) version G 24 EX..., see sect. 3.1.4 table 10 and sect. 4.3

**Monitoring of the spool elevation (safety- / switching function)**
With contact- or proximity switch for monitoring the idle position of the valve spool (suffix to the types A, C, EA, HA, HEA, PA acc. to sect. 3.2.1 tables 20 and 21 and sect. 4.3)

**Maritime ambient climate**
The aggressive sea atmosphere requires sufficient corrosion protection of all moving part of the actuations with hand lever. The actuation shaft in the hand lever housing is therefore made of stainless steel as standard. All other parts are either corrosion inhibiting gas nitrided or made of stainless steel.
Exception: Housing of pneumatic actuation P or PA which is made of anodized light alloy.

**Pressure surges in the return line**
Minor leakage may appear at the spring domes of actuations type AS, CS, E, EAS and E0AS when excessive pressure peaks (>150 bar) do occur in the return line. This can be prevented by use of enforcement flanges (suffix **G** acc. to table 21 in sect. 3.2.1).

**Note:** The perm. pressure in the return line is limited to approx. 50 bar (see sect. 4.1). The functionality of the actuation solenoids could be harmed in case of excessive pressure.

**e) Use of variable displacement pumps**
With Load-sensing controls in alliance with variable displacement pumps, the LS-signal duct for the pump pressure-flow controller (Load-Sensing metering valve) is relieved, to minimize circulation losses during idle position (no consumer flow ). This limiting takes place via the proportional spool valves. Without this decompression the pump would have to work during no-lift position with all the remaining flow against the pressure set at the safety valve of the pressure regulator.
As there exist spool valves without this limiting possibility, some brands of pressure-flow controllers have a internal bypass orifice or throttle between LS-signal entrance and decompressed leakage outlet.
In case of the prop. spool valves type PSVF this is not necessary and can even cause malfunctions due to lost control oil. The control oil flow is for functional reasons consciously limited (approx. 2 lpm) (slow-motion of the consumer).
**Note:** Care must therefore be taken, to ensure that a possible bypass orifice in the pressure-flow regulator is plugged!

**f) Combination with load-holding valves**
It can happen due to exterior variations of load and resonance that the control system starts to oscillate, if three regulation devices, the 3-way flow controller in the pump or the connection block, the 2-way flow controller at the spool valve section plus load holding insert are connected in series. This can be effectively suppressed by systematic use of a bypass orifice and throttle-, check-, pre-load valve combination within the control oil circuit at the load-holding valve type LHDV acc. to D 7770. A similar behavior can be achieved with use of the over-center valves type LHT acc. to D 7918.

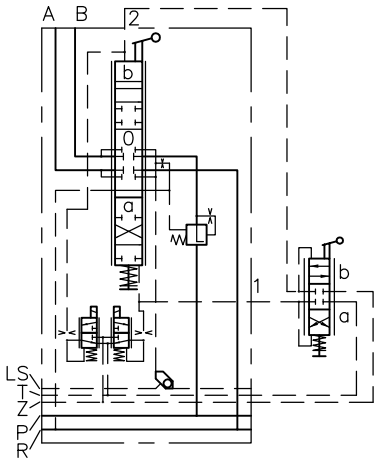
**g) Combination of more than 12 spool valves**
Through the consecutive connection of the LS-signal duct, a total of max. 12 spool valves can be linked. Whether the spool valves are arranged in one or more valve banks is irrelevant. This restriction results from the only limited available oil flow (ensuring slow-motion movements). If more than 12 spool valves in separated directional spool valve banks are to be coupled via the LS-signal, a chaining via external shuttle valves is to be used.

**i) Indications of actuation HEA**

The following notes to the connection of the valve bank have to be observed to ensure a flawless function of the electric and hydraulic actuation.

**Combination with hydraulic control devices similar (circuitry acc. to example 1)**

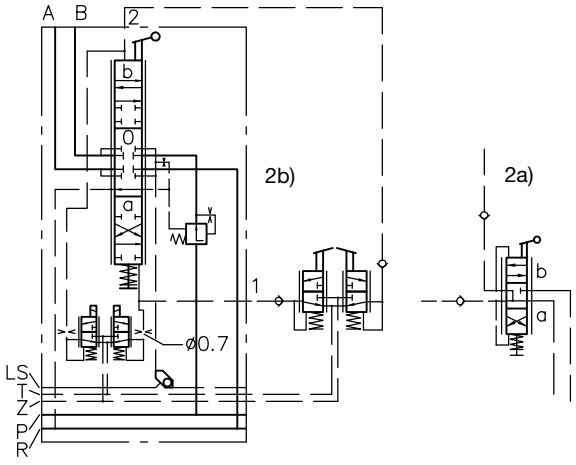
**Examples 1**




**Combination with common hydraulic joy-sticks or hydraulic control devices type FB and KFB acc. to D 6600 and D 6600-01 (circuitry acc. to example 2)**

The pressure reducing valves integrated in the joy-sticks open the consumer line to the tank during idle position. The control oil flow would escape via this bypass when a valve is simultaneously solenoid actuated. Therefore it is a must to provide check valves for the control lines at this kind of circuitry. The same applies to hydraulic actuations. The used throttles however limit the bypass leakage. The control oil supply must be dimensioned so that this leakage can be compensated (> 0.7 lpm per actuated valve section plus the internal leakage of the hydraulic joy-stick).

**Examples 2**




**j) Optional components**

**For electro-hydraulic actuations**

1. Plugs MSD 3-309 standard, belongs to the scope of delivery
   SVS 296107 Plug with LED's for functional cut-off acc. to sect. 3.2 table 17 (for more details, see D 7163)
2. Electric amplifier EV 22 K2-12(24) acc. to D 7817/1
   One board can control two directional valves.
3. Electric amplifier EV 1 M2 acc. to D 7831/1
   EV 1 D acc. to D 7831 D
   A remote control potentiometer with direction switches is required additionally (see detailed information in D 7831/1 sect. 5.2).
4. Logic valve control type PLVC acc. to D 7845 ++
5. Joy-stick type EJ 1, EJ 2 and EJ 3 acc. to D 7844
6. Radio controls are accepted, if they fulfill the requirements of SK 7814.
   (Approved brands:
   Co. HBC-ELEKTRONIK in D-74564 Crailsheim,
   Co. HETRONIK Steuer-Systeme in D-84085 Langquaid,
   Co. NBB-Nachrichtentechnik in D-75248 Ölbronn-Dürrn,
   Co. SCANRECO Industrieelektronik AB, Box 19144,
   S-5227 Södertälje)

**Load-holding valves**

Load-holding valves type LHT acc. to D 7918 or type LHDV acc. to D 7770 and note sect. 6.1 f, type LHK acc. to D 7100 only with "very stiff" systems and directional spool valves without inflow controller (coding 1 acc. to table 15, sect. 3.2.1)

**Other valves**

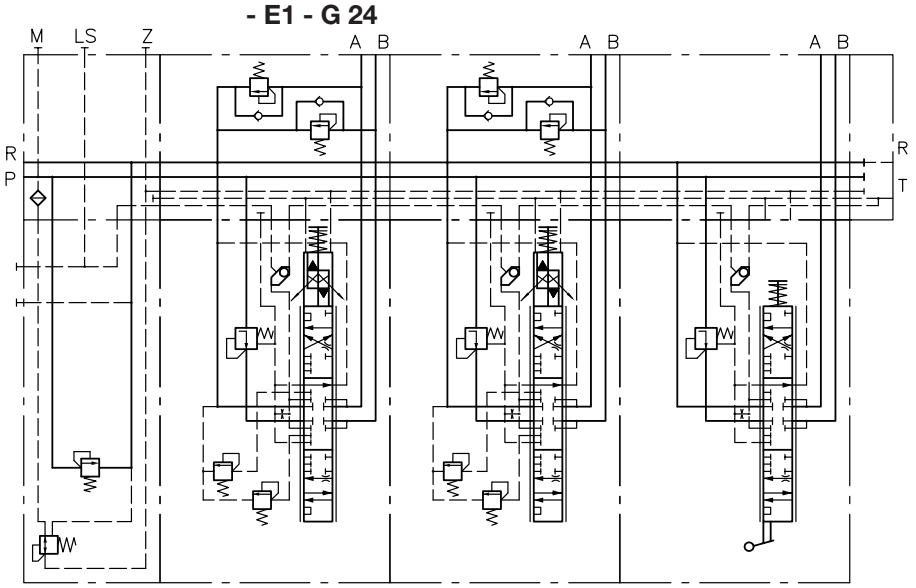
Proportional spool valve type PSL(V) size 2 acc. to D 7700-2 (can be combined via intermediate plate ZPL 32 with size 3)
Proportional spool valve type PSL(V) size 3 acc. to D 7700-3 (can be combined via intermediate plate ZPL 32 with size 2 or via intermediate plate ZPL 53 with size 5)
Proportional spool valve type PSL(V) size 5 acc. to D 7700-5 (can be combined via intermediate plate ZPL 53 with size 3 and via intermediate plate ZPL 52 with size 2)
Proportional pressure reducing valve type PMZ acc. to D 7625
Hydraulic joy-stick type KFB01 acc. to D 6600 -01

## 6.2 Example circuit

Control system with PSVF, and variable displacement pump

**Flow pattern symbol acc. to the order example**

**PSVF A1/380/4 - 3 - A2 J 40/40 A200 B200 /E /3 AN210 BN210**
**- A2 J 80/40 A280 B130 /E /3 AN290 BN140**
**- A2 J 25/16 /EA /3**
**- E1 - G 24**




## 6.3 Notes regarding assembly, installation and conversion

All installation, set-up, maintenance and repairs must be performed by authorized and trained staff.
The use of this product beyond the specified performance limits, use of non specified fluids and/or use of not genuine spares will cause the expiration of the guarantee.

### 6.3.1 Mounting

The mounting of the valve bank must be performed in such a way that no stress is induced.
Three screws and elastic washers between valve assembly and frame are recommended for fastening.

### 6.3.2 Piping

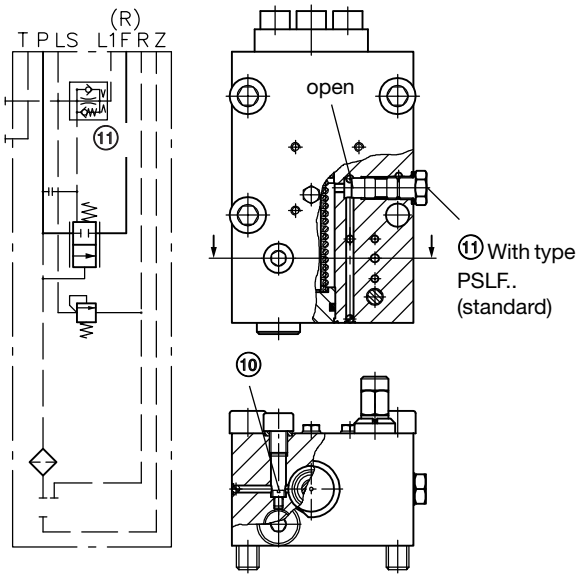
All fittings used must utilize deformable seal materials.
Do not exceed the specified torque!

### 6.3.3 Notes for converting the inlet section type PSL(V)F A../..-5

The inlet section type PSLF A../..-5 can be converted any time into a connection block for variable displacement pump systems (correct type now PSVF AS../..-5) and vice versa. This requires replacing the parts listed below.

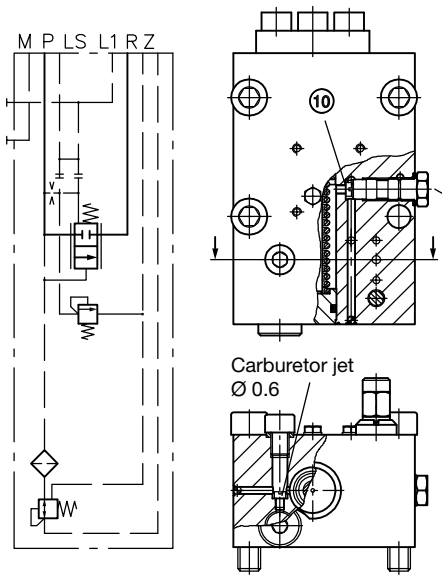
**Attention:** The screw (part No. 6380 013) ⑩ or carburetor jet M4x0.6 are secured with liquid screw lock, which must be applied again during reinstallation of these parts.
When converting type PSVF..-5 into PSLF..-5 an additional damping screw (part No. 7778 301) ⑪ is required.

**Type PSLF A../..-5**




⑪ With type PSLF.. (standard)

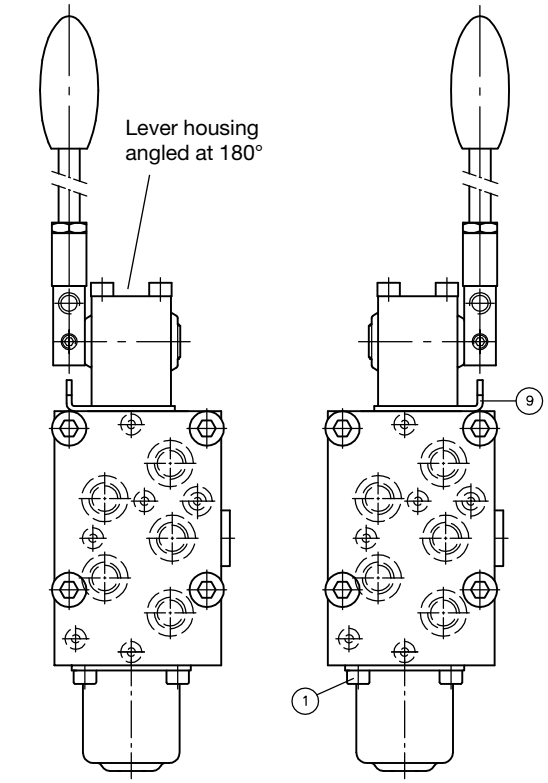
**Type PSVF A../..-5**

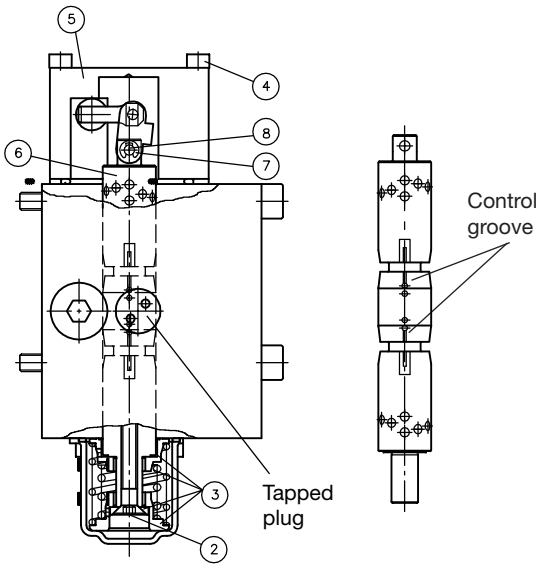



- ⑪ With type PSVF AS..-5
- Tapped plug (7778 036) with type PSVF A..-5 (standard)
- Screw (7778 062) with type PSVF AB..-5

### 6.3.4 Notes on changing the spool

The valve spools are not mated to one spool housing. Therefore valve spools can be changed at any time to adapt to changing consumer consumption.
The following routine is to be followed particularly:




**Advice on changing the valve spool**

1. Slacken screws ① (ISO 4762-M5x8-8.8-A2K), remove spring cover
2. Remove screw ② (M 6x40, machined flat head screw drawing No. 7709 042)
3. Remove spring assembly including spring cap ③
4. Slacken screws ④ (ISO 4762-M5x50-8.8-A2K)
5. Lift lever housing including spool out of spool housing, drawing ⑤ ⑥
6. Remove circlip DIN 6799 3,2 and remove bolt ⑦ ⑧
7. Assemble with (new) spool in reverse sequence

**Attention:** The control grooves of the valve spool should always be installed towards the end plate!
Exception: Valve spools with flow coding 80 (size 3) and 160 (size 5) do not show control grooves.

**Indications for angling the lever housing by 180° (inversion of the shifting mode)**

As set out in 1. - 7. above, however instead of a new valve spool the existing one has to be disconnected, angled at 180° and remounted (see above mentioned note). The intermediate plate ⑨ together with the lever housing, have to be angled at 180°.
All lever housings of the valve bank have to be rotated!

### 6.3.5 Seal kits

| | Size 3 | Size 5 |
|---|---|---|
| Inlet section | DS 7700-F 31 | DS 7700-F 51 |
| Valve section | DS 7700-F 32 | DS 7700-F 52 |
| Sub-plate | DS 7700-F 34 | DS 7700-F 54 |