

# Proportional directional spool valve type PSVF, and SLF according to the Load-Sensing principle size 7 (manifold mounting)

## 1. General information

The directional spool valves types 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.

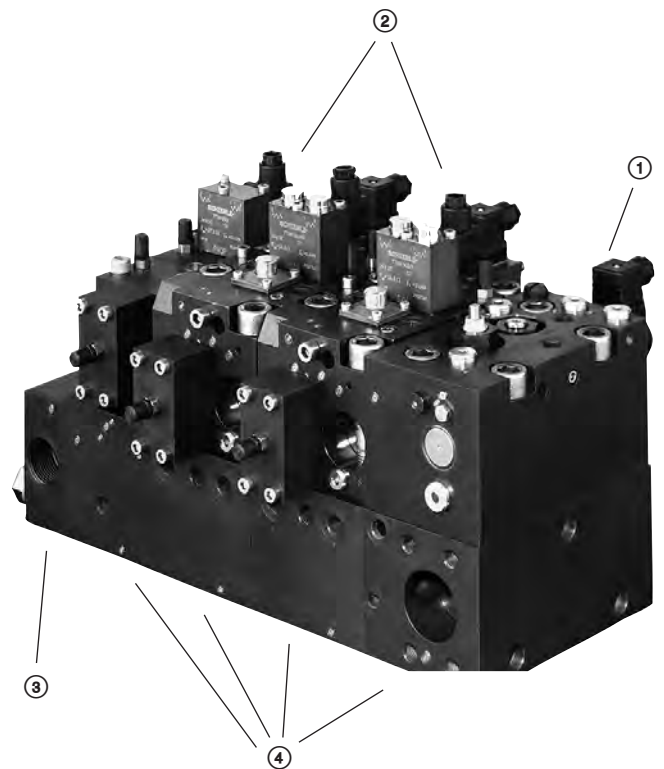
They consist of three functional groups.

### Basic data

Design	Prop. directional spool valve according to the Load-Sensing principle
Versions	Individual valves and valve banks (manifold mounting)
Operating pressure	$p_{max}$ 400 bar
Flow	$Q_{max}$ 400 lpm

### Table of contents

<b>1. General information</b>	<b>1</b>
<b>2. Type coding, overview</b>	<b>2</b>
<b>3. Available version, main data</b>	<b>4</b>
3.1 Inlet section (control section)	4
3.2 Add-on spool valves	7
<b>4. Characteristic data</b>	<b>12</b>
4.1 General and hydraulic	12
4.2 Curves	13
4.3 Actuators	15
4.4 Functional cut-off, prop. pressure limitation	19
4.5 Other solenoid valves	19
<b>5. Unit dimensions</b>	<b>20</b>
5.1 Size 7	20
<b>6. Appendix</b>	<b>29</b>
6.1 Notes for selection and lay-out	27
6.2 Circuit examples	31
6.3 Notes regarding assembly, installation and conversion	30



### 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
3, 5	Manifold mounting design	D 7700-F

### Mounting

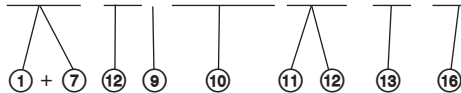
- ① Inlet section (control section)
- ② Valve bank design
- ③ End plate
- ④ Sub-plates

## 2. Type coding, overview

Order examples:

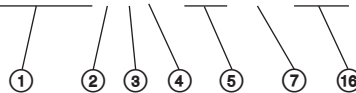
Valve section (for individual orders, without sub-plate)

**SLF 7 - A 2 J 320/250 A 300/EA - G 24**



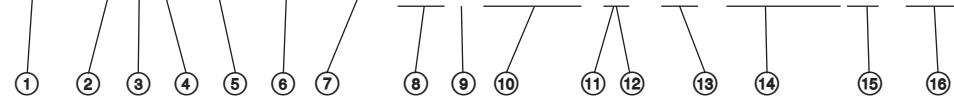
Inlet section with controller (for individual order, without sub-plate)

**PSVF A B1 F / 400 - 7 - G 24**



Valve bank

**PSVF A S 1 F / 400 /7 SAE-7 - A2 J 320/250 /EA/ 6 SAE  
- A2 H 320/320 F1 /EA/ 6 SAE - E4 - G 24**



- |  |   |
|--|---|
| <p>① Basic type coding for the valve bank or inlet section (see table 1 and 5 in sect. 3.1) as well as valve sections (see sect. 3.2)</p> <p><b>PSVF A</b> 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</p> <p><b>SLF</b> Individual valve section, without sub-plate</p> <p>② Additional elements (see table 2 and 4 in sect. 3.1) (no coding) Basic version</p> <p><b>S, W</b> Additional damping device in gallery LS (only with PSVF, standard with PSLF)</p> <p><b>B, B 4 ... B 7</b> Orifice in gallery LS (PSVF only)</p> <p><b>G</b> Restrictor check valve (type PSLF)</p> <p>③ Control oil supply (see 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)</p> <p><b>1</b> With integrated pressure reducing valve for the internal supply of control oil (control pressure approx. 20 bar)</p> <p><b>2</b> With integrated pressure reducing valve for the internal supply of control oil (control pressure approx. 40 bar)</p> <p>④ Optional 2/2-way solenoid valve for arbitrary idle pump circulation (see table 8, sect. 3.1.3) (no coding) Without directional valve, but prepared for retrofitting</p> <p><b>F, Z, ZM</b> De-energized open = Idle pump circulation when valve is de-energized</p> <p><b>D, V</b> De-energized closed = Idle pump circulation when valve is energized</p> <p><b>F.. or D..</b> When a pressure is specified, with pressure limiting valve which can be activated as a second pressure stage (e.g. F 80)</p> <p><b>PA, PB, PD</b> Prop. pressure limiting valve, with various pressure ranges</p> <p>⑤ Pressure limiting valve (main pressure limitation) in the inlet section (see table 9, sect. 3.1.3) (no coding) Without pressure limiting valve (type PSVF only)</p> <p><b>/ ...</b> Pressure limiting valve factory set to ... bar</p> | <p>⑥ Sub-plate for the inlet section (see table 3, sect. 3.1)</p> <p><b>/7</b> Size 7, standard (tapped ports for P and R G 1 1/2 ISO 228/1 (BSPP))</p> <p><b>/7 SAE</b> Size SAE (flange SAE 1 1/2" 6000 psi)</p> <p>⑦ Size (see table 1 and 5, sect. 3.1)</p> <p><b>7</b> Size 7</p> <p>⑧ Valve section - Basic function (see table 13, section 3.2.1)</p> <p><b>A 2 (standard)</b> Spool valve with inflow controller for each consumer</p> <p><b>A 1</b> Spool valve without inflow controller, suitable for consumers, which are actuated individually and successively but not simultaneously (no additional functions possible)</p> <p><b>A 5</b> Inflow controller with enforced spring for higher flow</p> <p><b>AX</b> Blanking plate</p> <p>⑨ Coding for the flow-pattern (see table 14, sect. 3.2.1 and 6 c)</p> <p><b>L, H, J, O</b></p> <p>⑩ Flow coding for port A and B (see table 15, sect. 3.2.1)</p> <p><b>.../...</b> Coding for port A or B (independently selectable)</p> <p><b>120, 180, 250, 320</b></p> <p>⑪ LS-pressure limitation (deviating from the main pressure setting, lower pressure for the connected consumer) no shock valves (see table 16 and 18, section 3.2.1) (no coding) No LS-pressure limitation</p> <p><b>AB</b> Prep. for retrofitting (standard)</p> <p><b>A..., B...</b> Only for consumer port or B</p> <p><b>A...B...</b> For consumer ports A and B</p> |
|--|---|

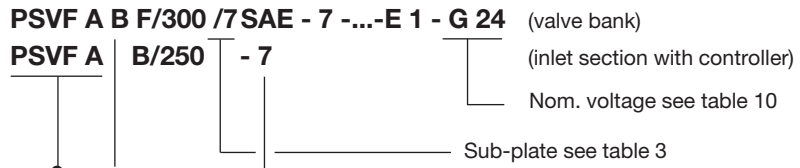
- ⑫ Functional cut-off (see table 17 and 18, sect. 3.2.1)  
(no coding) No functional cut-off  
**F0** Prep. for retrofitting (standard)  
**F 1** Electrical cut-off, consumer port A  
**F 2** Electrical cut-off, consumer port B  
**F 3** Electrical cut-off, consumer port A and B  
**FP 1(2, 3)** Like F1(2,3), however with electro-proportional pressure limitation  
**FPH 1(2, 3)** Like FP1(2,3), however with additional push-button for manual emergency actuation  
**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 (see table 19 and 20, sect. 3.2.1)  
**/E** Electro-hydraulic actuation  
**/EA** Electro-hydraulic and manual actuation  
**/EOA** Like /EA, however without actuation solenoid (prepared for retrofitting)  
**/EOH** Hydraulic actuation  
**/EOH UNF** Like /EOH, however with connection 7/16-20 UNF-2B SAE-4 (SAE J 514)  
**/EOHA** Hydraulic, solenoid and manual actuation  
**/EOHA UNF** Like /EOHA, however with connection 7/16-20 UNF-2B SAE-4 (SAE J 514)  
**/HEA** Hydraulic, solenoid and manual actuation  
**/HEA UNF** Like /HEA, however with connection 7/16-20 UNF-2B SAE-4 (SAE J 514)  
**/... Suffix** **1** without hand lever  
**WA, WA-EX** Position sensor  
**U** Lift monitoring (side indication)
- ⑭ Sub-plate for the individual valve section (see table 21, section 3.2.2)  
**/6 SAE** Sub-plate size 7, ports A and B with flange SAE 1 1/4" (6000 psi)  
**/55 SAE** Sub-plate size 7, prepared to accept valve sections size 5, ports A, B with flange SAE 1" (6000 psi)
- ⑮ End plates (see table 11, section 3.1.3)  
**E 1** With T-port for control oil return externally to the tank (basic type)  
**E 4** Like E 1, however with internal drain connection, max. pressure 10 bar!
- ⑯ Solenoid voltage and version (see 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  
**G 24 EX 70** 24V DC, explosion-proof version (ambient temperature 70°C)  
**G 24 MSHA** 24V DC, explosion-proof version (fire-damp protection (mining))  
**G 24 M2 FP** 24V DC, explosion-proof version (fire-damp protection (mining))  
**G 12 IS** 12V DC, explosion-proof version, fire-damp protection (mining), intrinsically safe  
**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)

##### 3.1.1 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:



**Table 4:** Basic type and size

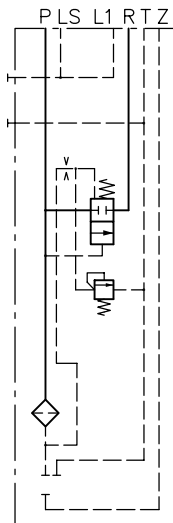
Coding and size	Description	Max. pump delivery flow (lpm)
<b>PSVF A ...-7</b>	Individual section	approx. 1000

**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 9!

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

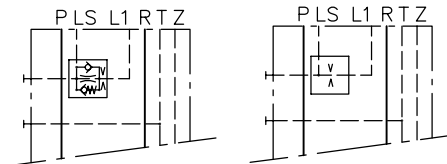
#### Symbols

Basic type (see table 4)



PSVF A...-7

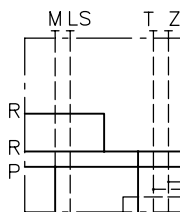
Additional elements (see table 5)



PSVF AS...-7

PSVF AB...-7

Sub-plates (see table 3)



PSVF A.../7 SAE-7

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

Coding	Ports ISO 228/1 (BSPP) or SAE 514 J P and R	LS, M, T and Z
<b>/7 SAE</b>	SAE 1 1/2" (6000 psi, P) (3000 psi, R)	G 1/4

**3.1.2 Additional elements for the inlet sections**

Order examples: PSVF A. **1 F** /380 / 7SAE - 7 -...- E1 - G 24  
 PSVF A. **1 F120 /350** - 7 - G 24

Table 8

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

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
<b>1</b>	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)
<b>2</b>	Control pressure: Coding 1: approx. 20 bar (+ return pressure at R) Coding 2: approx. 40 bar (+ return pressure at R)

**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)

Coding	Description
no coding	Version without pressure limiting valve (only type PSVF)
<b>/...</b>	With pressure limiting valve at PSVF (pressure specification in bar)

**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

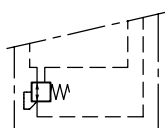
Coding	Description
no coding	If not required
<b>F</b>	With WN 1 F, idle pump circulation if valve is deenergized (emergency stop)
<b>D</b>	With WN 1 D, idle pump circulation if valve is energized
<b>F...</b> or <b>D...</b>	With pressure limiting valve, which can be activated as a second pressure stage (specify pressure in bar) (pre-set pressure, tool adjustable from 50 to 400 bar). Example: type PSVF A1 F100/350/7-7.. deenergized $p_{max}$ 100 bar energized $p_{max}$ 350 bar

**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 4 is required.

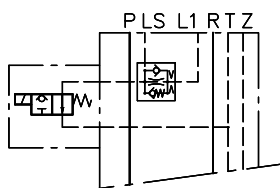
**Attention:** Observe note in sect. 6.1 a!

Coding	Description
<b>PA, PB, PD</b>	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
<b>Z</b>	Prop. pressure limiting valve type EM 21 DSE, open when deenergized
<b>ZM</b>	Like Z, but with lead sealed wing screw for emergency operation
<b>V</b>	Prop. pressure limiting valve type EM 21 DE, closed when deenergized
<b>X...</b>	Additional LS pressure limitation (50...400 bar) Not suited to compensate pressure peaks on the consumer side.

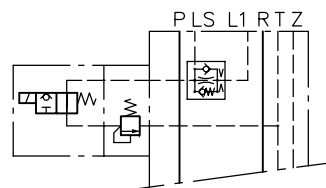
**Symbols**



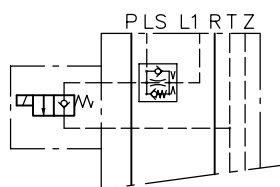
PSVF A 1(2)/...-7



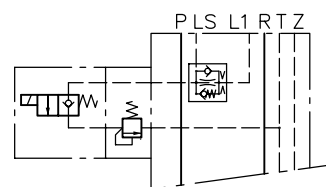
PSVF A..F, Z, ZM



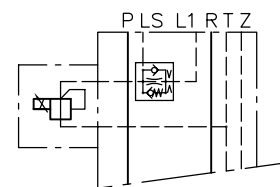
PSVF A..F...



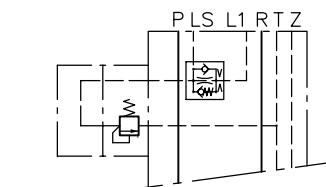
PSVF A..D, V5



PSVF A..D...



PSVF..PA (PB,PD)



PSVF A..X...

**Table 10:** Solenoid voltage and version

Coding	Description
<b>G 12 .</b> <b>G 24 T</b>  └ without <b>T</b> <b>TH</b> <b>H 4</b>	Electr. connection conf. EN 175 301-803 A, via plug (MSD 3-309) 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  Actuation solenoid 3-pin (standard) Manual emergency actuation (standard with functional cut-off F., FP., see table 17) Manual emergency actuation with pushbutton (standard with functional cut-off FPH., FP., see table 17) 4-pin actuation solenoid (only 24VDC)
<b>G 24 C 4</b>	Electr. connection conf. EN 175 301-803 C, via plug (MSD 6-209), 4-pin actuation solenoid
<b>X 12 .</b> <b>X 24 .</b>	Electr. connection conf. EN 175 301-803 A, without plug. For options, see coding G...
<b>S 12 .</b> <b>S 24 T</b>  └ without <b>T</b>	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 Suffix: Manual emergency actuation (standard with functional cut-off FP., table 17)
<b>AMP 12 K 4</b> <b>AMP 24 K 4</b>	Vertical connection via plug AMP Junior Timer, solenoid features 4 terminals
<b>AMP 24 H 4 T</b>	Lateral connection via plug AMP Junior Timer, solenoid features 4 terminals and manual emergency actuation
<b>DT 12</b> <b>DT 24</b>	Connection via plug Co. DEUTSCH DT 04-4P, suited for socket DT 06-4S
<b>G 24 EX</b> <b>G 24 EX-10 m</b>  └ <b>EX</b> <b>TEX</b> <b>EX4</b> <b>TEX4</b>	For use in areas with explosion hazardous atmosphere. Suited for category 2 and 3, zone 1, 21, 2, 22. Protection class EEx m II 120° (T4), with cable length 3 m (no coding) or 10 m  3-pin actuation solenoid 3-pin actuation solenoid with manual emergency actuation 4-pin actuation solenoid 4-pin actuation solenoid with manual emergency actuation
<b>G 24 TEX 70</b> <b>G 24 TEX 70-10 m</b>	Like G 24 EX .. , but for ambient temperature < 70°C
<b>G 12 IS</b> <b>G 12 IS-10 m</b>	For use in mines and its on-surface systems, which can be endangered by fire damp and/or combustible dust. Protection class I M2 Ex d I (fire-damp protection, intrinsic safe), with cable length 5 m (no coding) or 10 m
<b>G 24 MSHA</b> <b>G 24 MSHA-10 m</b>	For use in mines and its on-surface systems, where a ATEX (EU), IEC, MSHA (USA) or MA (China) approval is mandatory. Protection class I M2 Ex d I (fire-damp protection, intrinsic safe), with cable length 5 m (no coding) or 10 m
<b>G 24 M2 FP</b> <b>G 24 M2 FP-10 m</b>	For use in mines and its on-surface systems, where a IEC or ANZE (Australia) approval is mandatory. Protection class I M2 Ex d I (fire-damp protection, intrinsic safe), with cable length 5 m (no coding) or 10 m
<b>Note:</b>	<ul style="list-style-type: none"> <li>● Solenoids of explosion-proof design are only available for actuation E, EA or HE (A) (table 20).</li> <li>● Coding G 24 C4 (X 24 C4) is only available for solenoids of the electrical actuation (table 20) emergency actuation.</li> <li>● Coding AMP 24... not available for idle circulation valves coding D, F, PA, PB, PD (table 8), functional cut-off coding F., FP. (table 17)</li> <li>● Coding S.: Not available for functional cut-off coding F. (table 17) and position comparator coding U (table 20)</li> </ul>

**3.1.3 End plates of valve bank**

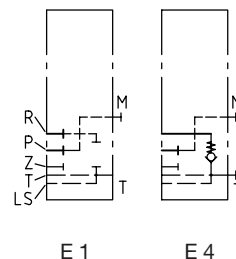
Order example: PSLF A1 F100/380/7 - 7 - ... - **E1** - G 24

**Table 11:** End plates

End plate		Description
With T-port at the inlet section for control oil return externally to the tank (basic type)	Like E 1, however with internal drain connection	Order coding of an end plate as separate part (example): <b>SLF 7 - E 1</b> (State the size: 7 !)
<b>E 1</b>	<b>E 4</b>	Standard end plate

**Note:** ● The internal control oil return gallery is to be used only in systems where the return pressure is below 10 bar.

**Symbols**



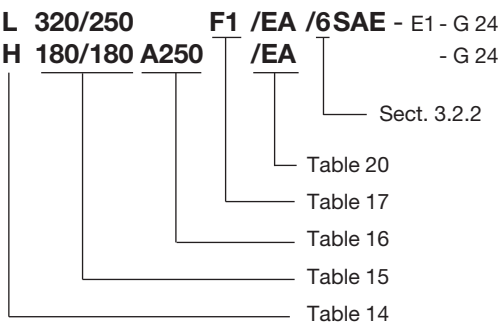
**3.2 Valve sections**

**3.2.1 Directional spool valve (individual valve)**

Order examples: (valve bank) PSVF A1 F/320/7SAE - **7 - A2 L 320/250 F1 /EA /6SAE** - E1 - G 24  
 (individual section) SLF **7 - A2 H 180/180 A250 /EA** - G 24

Size

**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)

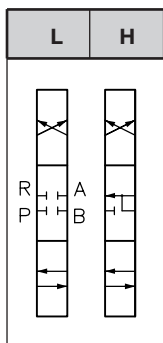


**Table 13:** Spool valve, basic version

Coding	Description	Symbol
<b>A 2</b>	<b>Standard</b> , with inflow controller, for simultaneous load compensated moving of several consumers (standard type)	
<b>AX</b>	Blanking plate	$\begin{matrix} T & W & U & R & P & X & L & S & L & 1 & & A & B \\ \hline \text{III} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} & \text{I} \end{matrix}$

**Note:** Beside the listed versions also valve sections size 5 (SLF 5...) acc. to D 7700-F can be mounted on sub-plates listed in table 21.

**Table 14:** Symbols



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

Valve spool coding acc. to table 12		Flow coding Q <sub>A, B</sub> (lpm) at consumer port A and B				
Coding	Size	120	180	250	320	400
<b>A 2</b>	7	120	180	250	320	400

The flow rate for the consumer ports A and B can be individually selected, e.g. 250/180, 250/400. 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 (acc. to table 13!). These are no shock valves!

Coding	Description
<b>AB</b>	Without pressure limitation
<b>A...</b>	Pressure limitation at A with pressure specification
<b>B...</b>	Pressure limitation at B with pressure specification
<b>A...B...</b>	Pressure limitation at A and B with pressure specification

Pressure limitation p<sub>min</sub> = 50 bar; p<sub>max</sub> = 400 bar  
 Example: SLF 7-A2 H320/320 **A250 B200**/EA

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

Coding	Description
<b>F0.</b>	Without functional cut-off
<b>F1, F2</b>	Electric functional cut-off at A or B
<b>F3</b>	Electric functional cut-off at A and B
<b>FP1, FP2, FP3 FPH1, FPH2, FPH3</b>	Prop. pressure limitation for A or B resp. A and B, version FPH. with additional emergency actuation (no tools needed)
<b>S1</b>	Load signal ports U and W (G 1/8 (BSPP)) for external piping; tapped ports at valve section

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

Pressure limitation	Functional cut-off	
	<b>F0</b>	<b>F1, F2, F3, S1 FP1, FP2, FP3 FPH1, FPH2, FPH3</b>
<b>AB</b>	●	●
<b>A or B A and B</b>	●	●

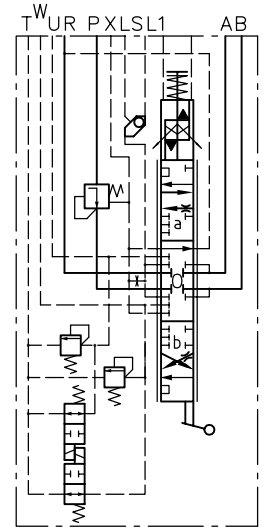
- There remains a residual pressure when the LS gallery is relieved. When the return line is depressurized the residual pressure will be: p<sub>relieved</sub> = Δp<sub>block</sub> + Δp<sub>controller</sub> (Δp<sub>controller</sub> = control pressure of the inflow controller acc. to table 13)
- Coding F., FP. : Δp<sub>block</sub> = 10 bar  
 Coding S 1 : Δp<sub>block</sub> = 5 bar  
 Δp<sub>controller</sub> = 12 bar
- Coding F., FP.. not available with solenoids G 24 TEX 70 and G 12 IS



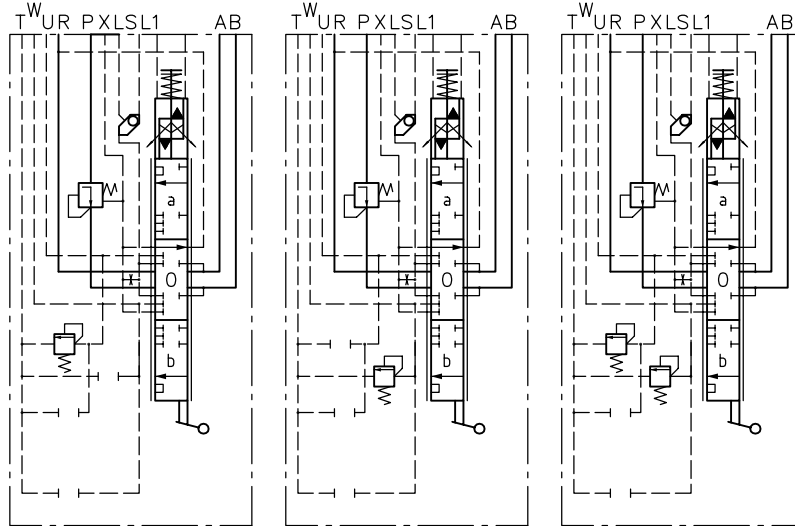
**Basic version  
(individual section  
acc. to table 13)**

Example:  
SLF 7-A2 H 320/250 A 250 B 310 F3/EA-G 24

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



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

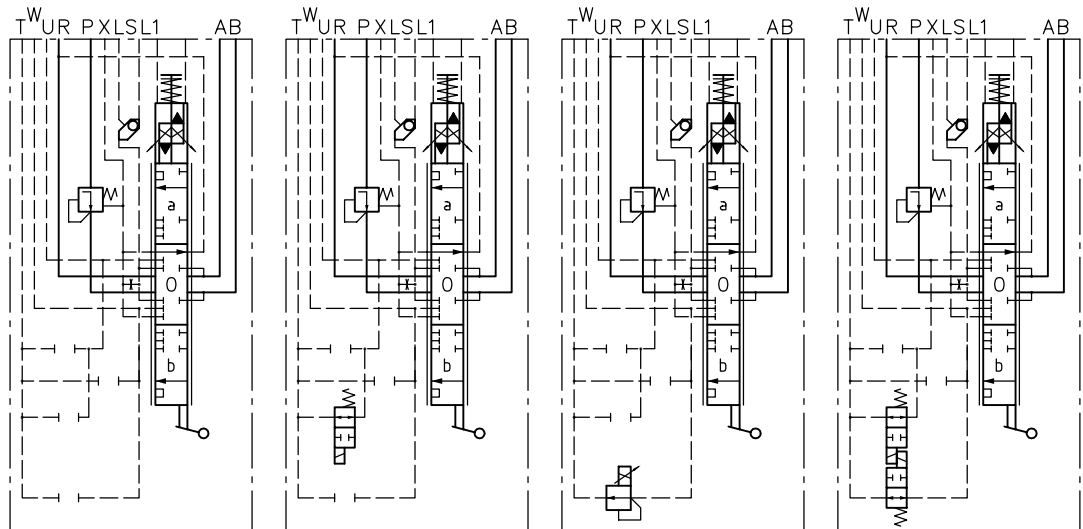


..A... F0

..B...F0

..A..B...F0

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



ABF0

ABF0

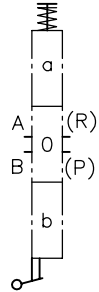


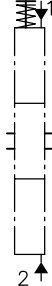
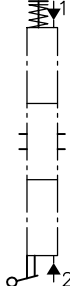
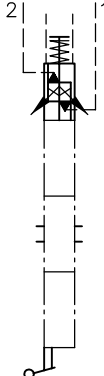
ABFP2

ABF3

Combination possibilities:  
(see table 18)


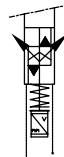

ABS 1	ABF0	AB..F(FP, FPH)1	AB..F(FP, FPH)2	AB..F(FP, FPH)3
A..S 1	A..F0	A..F(FP, FPH)1	A..F(FP, FPH)2	A..F(FP, FPH)3
B..S 1	B..F0	B..F(FP, FPH)1	B..F(FP, FPH)2	B..F(FP, FPH)3
A..B..S 1	A..B..F0	A..B..F(FP, FPH)1	A..B..F(FP, FPH)2	A..B..F(FP, FPH)3

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

Nomenclature	Manual actuation	Electro-hydraulic actuation		Hydraulic actuation		
	Spring return	electro-hydraulic	Combination with manual actuation	hydraulic	Combination with manual actuation	Combination with solenoid and manual actuation
Coding	<b>E0A</b>	<b>E</b>	<b>EA</b>	<b>E0H</b> <b>E0H UNF</b>	<b>E0HA</b> <b>E0HA UNF</b>	<b>HEA</b> <b>HEA UNF</b> <b>(HE, HE UNF)</b>
Symbol						
Manipulated variables	Actuation angle min. approx. 5° max. approx. 30°	Control current ratio $I/I_N$ min. approx. 0.2 max. approx. 1		Control pressure min. approx. 5 bar max. approx. 18 bar max. perm. 40 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.
  - With actuations HE(A) observe also notes and circuit examples in sect. 6.1 i !
  - Type E0... prepared for retrofitting of a solenoid actuation
  - Type AR, ER, and EAR with detent in end position, stroke limitation not possible
  - Type EM and EAM: 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
<b>E0A, EA, HA, PA</b>	<b>1</b>	Manual actuation without hand lever. For dimensions see sect. 5.1.3.	EA 1	<b>1</b> 
<b>E0A, EA, H, HA</b>	<b>WA</b> <b>WA-EX</b> <b>WA-M2 FP</b>	Integrated position sensor (Hall-sensor) with analogous signal output (lift monitoring) Coding WA-EX, version for explosion hazardous areas Coding WA-M2 FP, intrinsic safe version (mining)	EA WA, E0A 1 WA	<b>WA</b> <b>U</b> 
<b>E0A, EA, HA, HEA, FA, FEH</b>	<b>U</b>	Integrated spool monitoring for side indication (Comparator, triggered signal: on/off)	EA U	

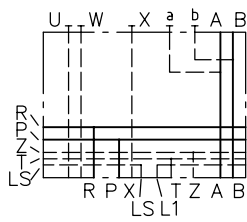
**3.2.2 Sub-plates**

Order example: PSVF A2 F/320/7 SAE-3-A2 L 250/180 A300 F1/EA **/6 SAE** - E1 - G 24  
 PSVF A2/300/7-5-A2 H 320/250/EA **/55 SAE** - E4 - G 24

**Table 21:** Sub-plates

Coding	Port size for A and B ISO 228/1 (BSPP)	Size	Description
<b>/6 SAE</b>	SAE 1 1/4" (6000 psi)	7	Sub-plate with SAE-flange
<b>/55 SAE</b>	SAE 1" (6000 psi)	7	Sub-plate with SAE-flange for valve section size 5 acc. to D 7700-F

**Symbol**



/6 SAE  
 /55 SAE

## 4. Characteristic data

### 4.1 General and hydraulic

Type coding

Design

Mounting

	Size 5	See dimensional drawings in sect. 5 ++
Indiv. section	4 x M14	
Valve bank	M10	

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. 5.1.10)  
 M, LS, Z, T, Y = G 1/4 conform. ISO 228/1 (BSPP) (see sect. 5.1.10)  
 U, W, X = Acc. to dimensional drawings (see sect. 5.1.10)

Surface coating

Indiv. valve section and sub-plates: All surfaces corrosion-inhibiting, gas nitrided (Solenoid at actuation E... and additional functions F1...F3, FP1...FP3, FPH1...FPH3 inc galvanized and olive-green anodized)

Mass (weight) approx. (kg)

Size		7
Inlet section	PSLF, PSVF	12.0
Valve section	SLF with actuation E0C, E0A, E, FE0, HE0, EOP EA, EOPA FE0A, HE0A FEA, HEA	12.6 <sup>1)</sup> 13.0 <sup>1)</sup> 12.6 <sup>1)</sup> 13.0 <sup>1)</sup>
Sub-plates	/6 SAE, /55 SAE	12.0
End plates	E 1, E 4	3.0

Pressure fluid

Hydraulic fluid (DIN 51524 table 1 to 3); ISO VG 10 to 68 (DIN 51519)  
 Viscosity range: min. 4; max. 1500 mm<sup>2</sup>/sec; Optimal operation range: 10...500 mm<sup>2</sup>/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)  $\leq 50$  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, see table 7) (outlet);  $\leq 40$  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

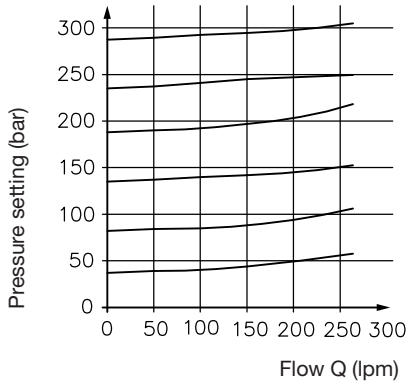
Acc. to the specifications in table 14, in sect. 3.2.1

1) + 0.4 kg at version with functional cut-off(coding F.., FP.., FPH.. acc. to table 16)

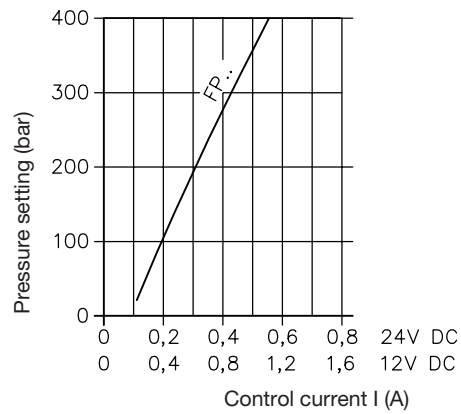
### 4.2 Curves

Main pressure limiting valve in the inlet section

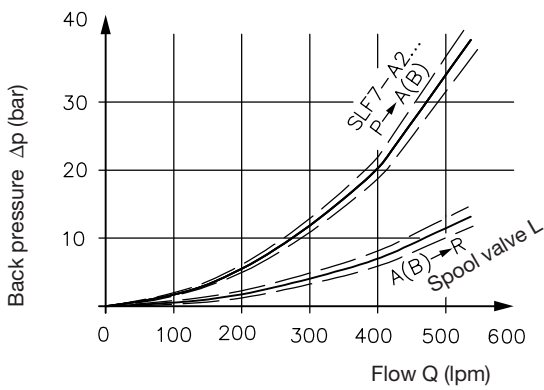
PSL(V)F A../...- 7



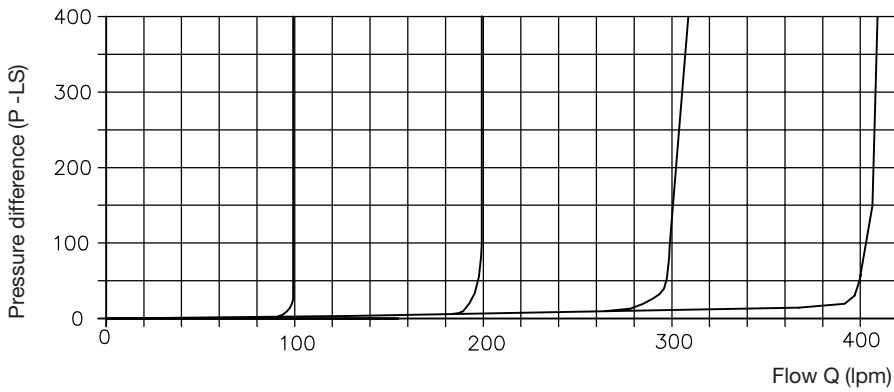
Prop. pressure limitation  
Coding FP(H)1, FP(H)2, FP(H)3  
acc. to table 16, sect. 3.2.1



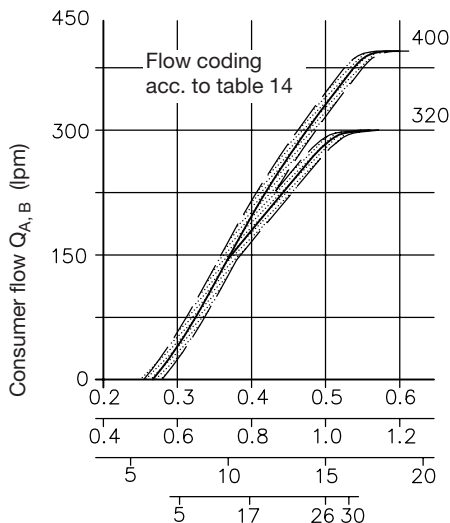
Size 7



2-way inflow controller



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



Oil viscosity during measurement  
approx. 60 mm<sup>2</sup>/sec

- ← 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 Actuators

For other data, such as codings, symbols etc., see table 18 sect. 3.2

Actuation E0A	Actuating moment (Nm)	
	Idle position	End position
Version E0HA, HEA	approx. 5.0	approx. 16.5
Version EA, E0A	approx. 3.0	approx. 12.0

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

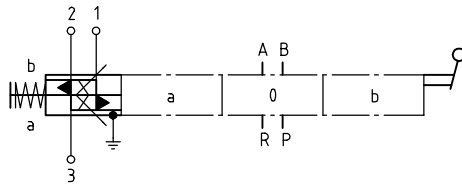
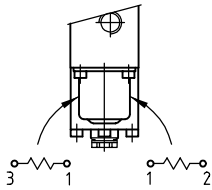
**Additional notes:**

See also Sk 7814, as well as for additional components sect. 6.1 j!

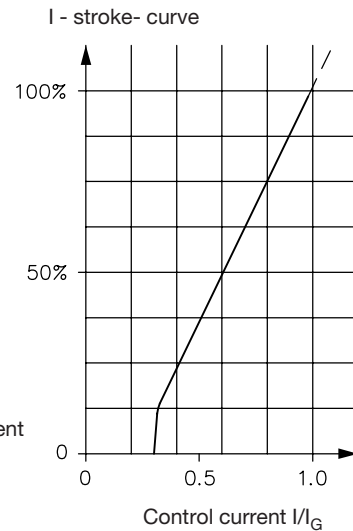
Specifications apply to all solenoid versions if not stated otherwise.

Nom. voltage $U_N$	24V DC	12V DC
Coil resistance $R_{20}$	26.6 $\Omega$	6.3 $\Omega$
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 $W_A$	$\leq 0.3$ Ws	$\leq 0.3$ Ws
Rel. duty cycle (reference temp. $\vartheta_{11} = 50^\circ\text{C}$ )	S 1	S 1
Required dither frequency	40...70 Hz (best 55 Hz)	
Dither amplitude $A_D$ <sup>1)</sup>	$20\% \leq A_D \leq 50\%$	

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

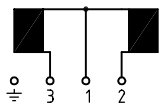


Oil viscosity during measurement approx. 60 mm<sup>2</sup>/s

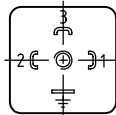


**Electrical connection**

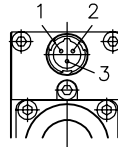
3-pin  
Coil a (1) Coil b (2)



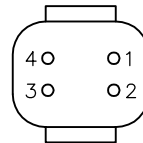
Circuitry for coding -G 12, -G 24  
-X 12, -X 24  
EN 175 301-803 A  
3-pin  
IP 65 (IEC 60529)



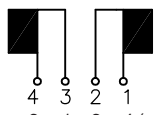
Circuitry for coding -S 12  
-S 24  
3-pin  
IP 67 (IEC 60529)



Circuitry for coding -DT 12  
-DT 24  
4-pin  
IP 69 K (IEC 60529)

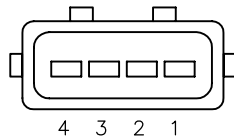


4-pin  
Coil a (1) Coil b (2)

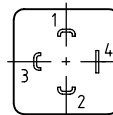


3 1 2 4 (with coding ...H 4 and ...C 4)

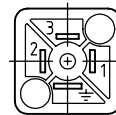
Circuitry for coding -AMP 12 K 4  
-AMP 24 K 4  
AMP Junior Timer,  
4-pin  
IP 67 (IEC 60529)



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



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



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

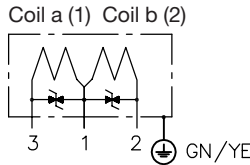
Explosion-proof version of actuation E, EA, HE(A)  
Voltage specification **G 24 EX, G 24 TEX**

**Attention:**

Additionally observe operating manuals  
B 01/2002 and B ATEX

Protect against direct sun light !

Not available in combination with other solenoids at the connection block (table 3a and 8), ancillary blocks (table 19), intermediate plates (table 22), end plates (table 11) and functional cut-off F.. (table 17).



Letter of conformity ATEX  
Ex-proof level

Duty cycle  
Protection class  
Nom. voltage  $U_N$   
Coil resistance  $R_{20}$   
Current, cold  $I_{20}$   
Lim. current  $I_G$   
Max. residual ripple of the  
Conditions of use:  
Ambient temperature  
Max. fluid temperature  
Fuse

TÜV-A 02ATEX 0007 X  
⊕ II 2 G Ex mb II 120°C (T4)  
⊕ II 2 D Ex mbD 21 T120°C  
S 1, one coil energized per solenoid housing  
IP 67 (IEC 60529)  
24V DC  
26.6 Ω  
0.88 A  
0.63 A  
15% supply voltage  
-35 ... +40°C  
+70°C  
 $I_F < 1.8$  A each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127 medium  
Housing zinc galvanized  
Coil and connection cavity are molded conforming EN 60079-0, VDE 0170/0171 T1 and T9  
4 x 0.5 mm<sup>2</sup>  
3 m or 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart)

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

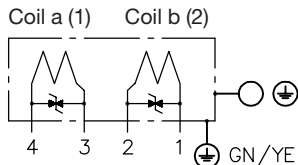
Explosion-proof version of actuation E, EA, HE(A)  
Voltage specification **G 24 EX 4, G 24 TEX 4**

**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  
Ex-proof level

Duty cycle  
Protection class  
Nom. voltage  $U_N$   
Coil resistance  $R_{20}$   
Current, cold  $I_{20}$   
Lim. current  $I_G$   
Max. residual ripple of the  
Conditions of use:  
Max. ambient temperature  
Max. fluid temperature  
Fuse

TÜV-A 02 ATEX 0007 X  
⊕ II 2 G Ex mb II 120°C (T4)  
⊕ II 2 D Ex mbD 21 T120°C  
S 1, one coil energized per solenoid housing  
IP 67 (IEC 60529)  
24V DC  
26.6 Ω  
0.88 A  
0.63 A  
15% supply voltage  
-35 ... +40°C  
+70°C  
 $I_F < 1.8$  A each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127 medium  
Housing zinc galvanized  
Coil and connection cavity are molded

conforming EN 60079-0, VDE 0170/0171 T1 and T9  
4 x 0.5 mm<sup>2</sup>  
3 m or 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart)  
For connection scheme. see "Actuation E, EA" (standard version)

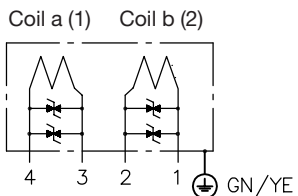
Explosion-proof version of actuation E, EA, HE(A)  
Voltage specification **G 24 TEX 70**

**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  
Letter of conformity ATEX  
Ex-proof level

Duty cycle  
Protection class  
Nom. voltage  $U_N$   
Coil resistance  $R_{20}$   
Lim. current  $I_G$   
Max. residual ripple of the  
Conditions of use:  
Max. ambient temperature  
Max. fluid temperature  
Fuse

IEC Ex IBE 09.0005 X  
IBExU07 ATEX 1089 X  
⊕ II 2 G Ex d IIB T4  
⊕ II 2 D Ex tD A21 T135°C  
S 1, one coil energized per solenoid housing  
IP 67 (IEC 60529)  
24V DC  
80 Ω  
0.24 A  
15% supply voltage  
-20 ... +70°C  
+70°C  
 $I_F < 0.5$  A each solenoid must be safe guarded against overload and short-cut by fuse conforming IEC 60127 medium  
Housing zinc galvanized  
Coil and connection cavity are molded conforming, EN 60079-β, VDE 0170/0171 T1 and T9  
4+1 x 0.5 mm<sup>2</sup>  
3 m or 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart)

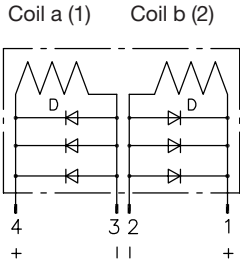
For connection scheme. see "Actuation E, EA" (standard version)

Explosion-proof version of actuation E, EA  
(intrinsic safe, flame proof)  
Voltage specification **G 12 IS**

**Attention:**

Additionally observe operating manuals  
B 04/2005 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, 8), ancillary blocks  
(table 19), intermediate plates (table 22) and end  
plates (table 11)



**Attention:** Observe polarity!

Letter of conformity IEC  
Letter of conformity ATEX  
Ex-proof level

Duty cycle (ED)  
Protection class  
Nom. voltage  $U_N$   
 $I_l$   
Lim. current  $I_G$   
Power, cold  $R_{20}$

Conditions of use:  
max. ambient temperature  
max. fluid temperature  
Surface coating

Electrical design and testing

Electrical connection  
Cable length

The complete circuit has to be designed and get approved acc. to EN 60079-25.

IEC Ex IBE 09.0006 X  
IBExU05ATEX 1116 X  
Ⓢ I M1 Ex d ia I  
Ⓢ I M2 Ex d ib I

S 1, one coil energized per solenoid housing  
IP 67 (IEC 60529)

12V DC  
1.7 A  
0.4 A  
22  $\Omega$

-20 ... +40°C  
+70°C

Housing galvanically zinc coated  
Coil and connection cavity are moulded  
conforming EN 60079-0 (general requests),  
EN 60079-25 (intrinsic safe "i"),  
EN 60079-1 (pressure resistant encapsulation "d")  
4 x 0.5 mm<sup>2</sup>  
3 m or 10 m (cable ÖLFLEX-EB ® Co. LAPP,  
D-70565 Stuttgart) Coded leads: 1-4, insulation  
color: fair blue)

**Note:** Due to the utilized clamp diodes at the pulsed prop. amplifier PWM it is not possible to measure the coil current during operation. Readings will usually be too low and are additionally dependent on the supply voltage and the coil resistance.

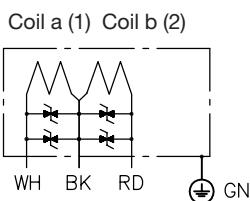
Explosion-proof version of actuation E, EA  
(flame proof)  
Voltage specification **G 24 MSHA**

**Attention:**

Additionally observe operating manuals  
B 05/2006 and B ATEX

Not available in combination with other  
solenoids at the connection block (table 3a  
and 8), ancillary blocks (table 19), intermedi-  
ate plates (table 22), end plates (table 11) and  
functional cut-off F(FP) .. (table 17).

Exception: A combination with functional  
cut-off FP.. (table 17) together  
with intermediate plate 7709 090  
is available.



MSHA-approval (USA)  
MA-approval (China)  
Letter of conformity IEC  
Letter of conformity ATEX  
Ex-proof level

Duty cycle  
Protection class  
Nom. voltage  $U_N$   
Coil resistance  $R_{20}$   
Lim. current  $I_G$   
Current, cold  $I_{20}$

Conditions of use:  
Max. ambient temperature  
Max. fluid temperature  
Fuse

Surface coating

Electrical design and testing

Electrical connection  
Cable length  
Leads

The complete circuit has to be designed and get approved acc. to EN 60079-25.

18-NXA 05 0003-0  
J2007101  
IEC Ex IBE 09.0004 X  
IBEx U05 ATEX 1115 X  
Ⓢ I M2 Ex d I

S 1, one coil energized per solenoid housing  
IP 67 (IEC 60529)

24V DC  
26.6  $\Omega$   
0.63 A  
0.9 A

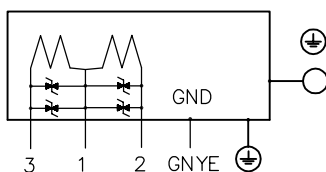
-20 ... +40°C  
+70°C

I = max. 3x  $I_G$ , each solenoid must be safe  
guarded against overload and short-cut by fuse  
conforming IEC 60127-2 UL 248  
Housing zinc galvanized  
Coil and connection cavity are molded  
conforming EN 60079-0 (general requests),  
EN 60079-1 (pressure resistant encapsulation "d")

4 x 18 AWG (approx. 0.8 mm<sup>2</sup>)  
3 m or 10 m  
BK, WH, RD, GN; Item-No. 40003, General Cable

Explosion-proof version of actuation E, EA, HE(A)  
(flame proof)  
Voltage specification **G 24 M2 FP**

Coil a (1) Coil b (2)



Letter of conformity ATEX  
Letter of conformity ANZEx  
Electrical connection

For additional information

IBEx U05 ATEX 1115 X  
ANZEx 10.3019X  
4 x 0.75 mm<sup>2</sup>, shielded connection line.

see coding G 24 MSHA

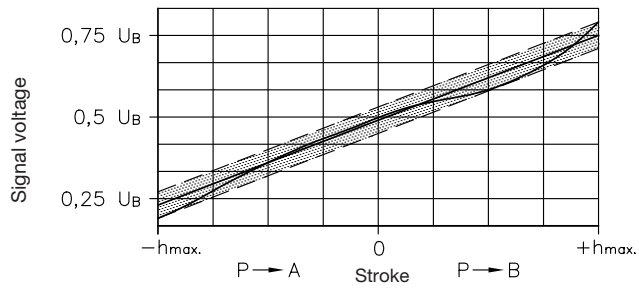
Actuation E0H, E0HA, HEA, E0F, E0FA, FEA

Control pressure approx. 5 bar (start of movement)  
approx. 18 bar (max. movement) max. perm. pressure 40 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 suffix WA, WA-EX

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



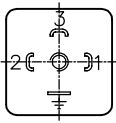
$U_B$  = Supply voltage  
 $U_{B \max}$  = 76%  
 $U_{B \min}$  = 24%  
 Accuracy  $\pm 9\%$  ( $U_B$ )

Circuitry

The DC supply voltage must be stabilized and smoothened.

**Attention:** The transducer will be permanently damaged, when exposed to a strong magnetic field !

Coding G...



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

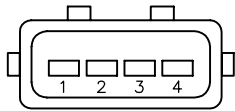
Actuation suffix WA

Electrical connection acc. to coding, see table 10

Actuation suffix WA-EX

ATEX-Certificate of conformity IBEx U09 ATEX 1001X  
 Ex-proof level Ⓜ II 2 G Ex d IIB T4  
 Ⓜ II 2 D Ex td A21 IP 6x T 135°C  
 Ⓜ I M2 Ex d I  
 Ambient temperature -30 ... +40°C

Coding AMP...



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

Ex-proof level IECEx IBE 11.0004X  
 Ambient temperature see WA-EX  
 Electrical connection -30 ... +40°C  
 3 m or 10 m

Coding S...

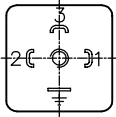


Actuation suffix U

Comparator (lift monitoring / side indication)

Circuitry

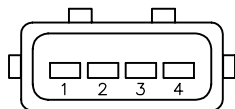
Coding G...



Pin	Signal	Description	
1	OUT <sub>A</sub>	PNP-transistor conducting to plus)	Open-Collector: $I_{\max} = 10 \text{ mA}$ short-circuit proof
2	OUT <sub>B</sub>	PNP-transistor conducting to plus)	
3	+ $U_B$	10 ... 32V DC	Residual ripple $\leq 10\%$
4/GND	GND	0V DC	

Coding AMP...

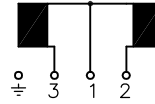
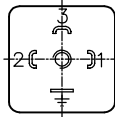
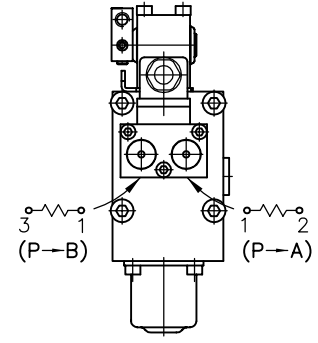
Electrical connection acc. to coding, see table 10



Signal table			
Ident. No.	Spool movement	OUT <sub>A</sub>	OUT <sub>B</sub>
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 $\Omega$	8.7 $\Omega$
Current, cold $I_{20}$	0.69 A	1.38 A
Current, warm $I_{70}$	0.48 A	0.97 A
Cut-off energy $W_A$	$\leq 0.3$ Ws	$\leq 0.3$ Ws
Rel. duty cycle <sup>1)</sup>	S 1	S 1
(reference temp. $\vartheta_{11} = 50^\circ\text{C}$ )		
Electrical connection	EN 175 301-803 A	
Protection type (assembled)	IP 65 (IEC 60529)	
Circuitry	Coil a	Coil b



<sup>1)</sup> **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

Electrical data	- Connection blocks coding Z, ZM, V		- Connection blocks coding F, D - End plates coding E 3, E 6		- Connection blocks coding PA, PB, PD	
Additional documentation	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

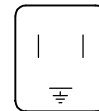
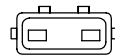
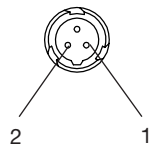
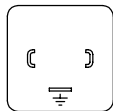
Electr. connection

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 24 K 4  
AMP Junior Timer  
2-pin  
IP 65 (IEC 60529)

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

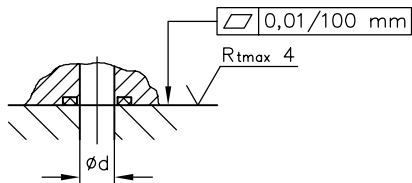
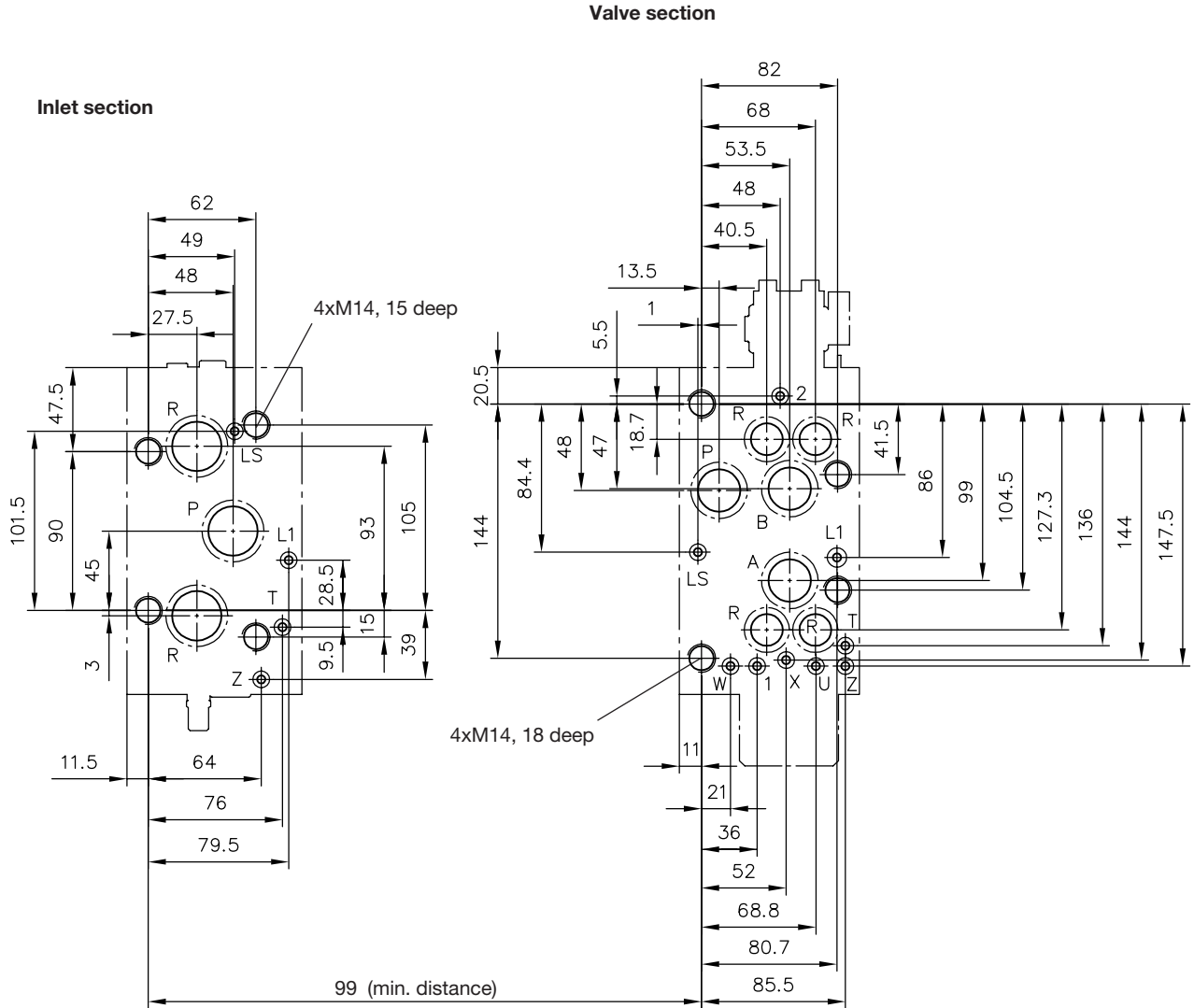


## 5. Dimensions

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

### 5.1 Size 7

#### 5.1.1 Hole pattern of the sub-plate



Inlet section:

Ports	Ød	O-ring 1) PUR 90 Sh
P	20	29.82x2.62
F(R)	20	29.82x2.62
M, LS, L1, Z	4.7	6.07x1.78

Valve section:

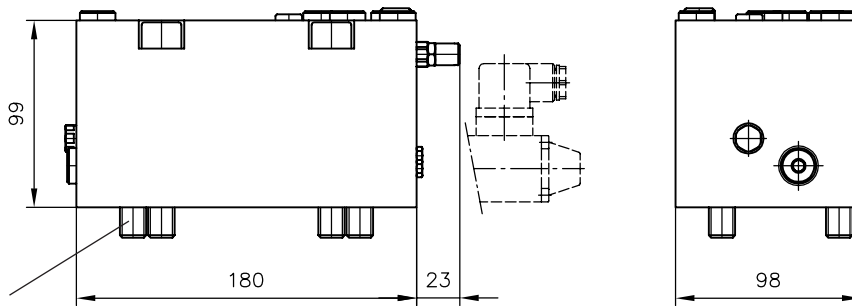
Ports	Ød	O-ring 1) PUR 90 Sh
P, A, B	24	26.64x2.62
R	18	20.29x2.62
LS, T, U, W, X, Z	4.7	6.07x1.78
L1	4.7	7.65x1.78

1) These O-rings are also available as complete seal kits, see also sect. 6.3.2  
Inlet section: DS 7700-F 71

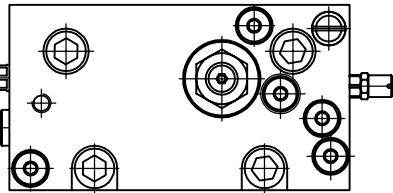
Valve section: DS 7700-F 72

5.1.2 Inlet section

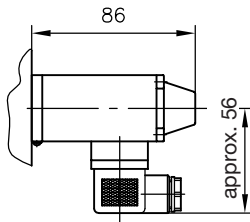
Type PSVF A.../.../...-7



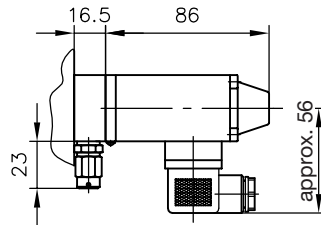
Socket head screw  
ISO 4762 M14x100-A2-70  
Max. torque 120 Nm



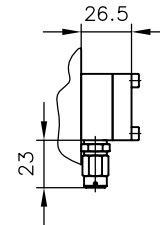
Type PSV..F(D)  
PSV..F(D)/...



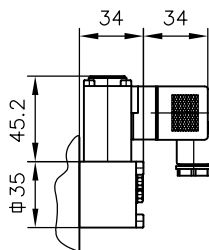
Type PSV..F(D)/.../...



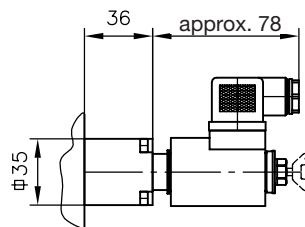
Type PSV...X...



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

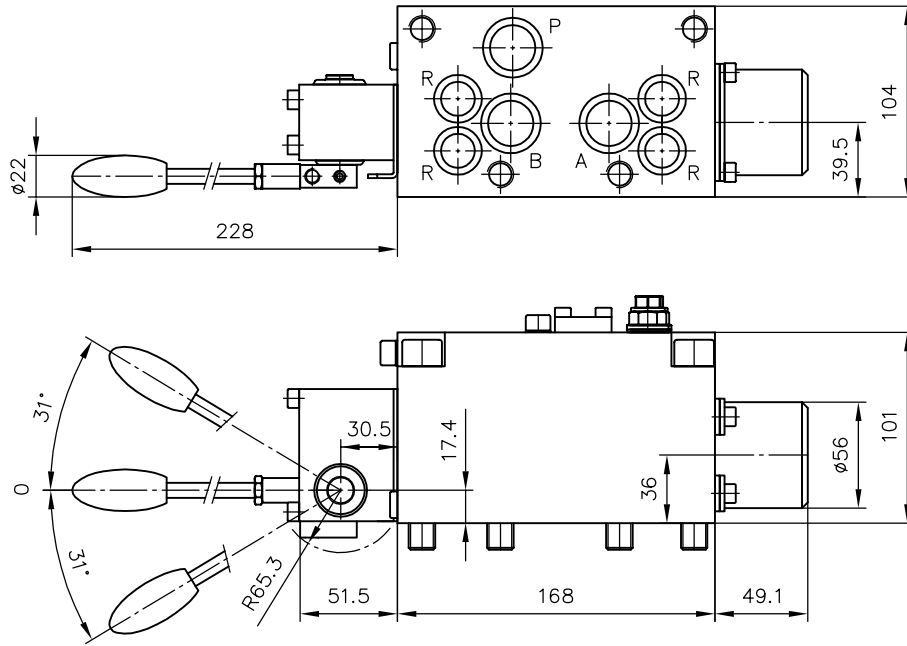


Type PSV..Z(V)/.../...



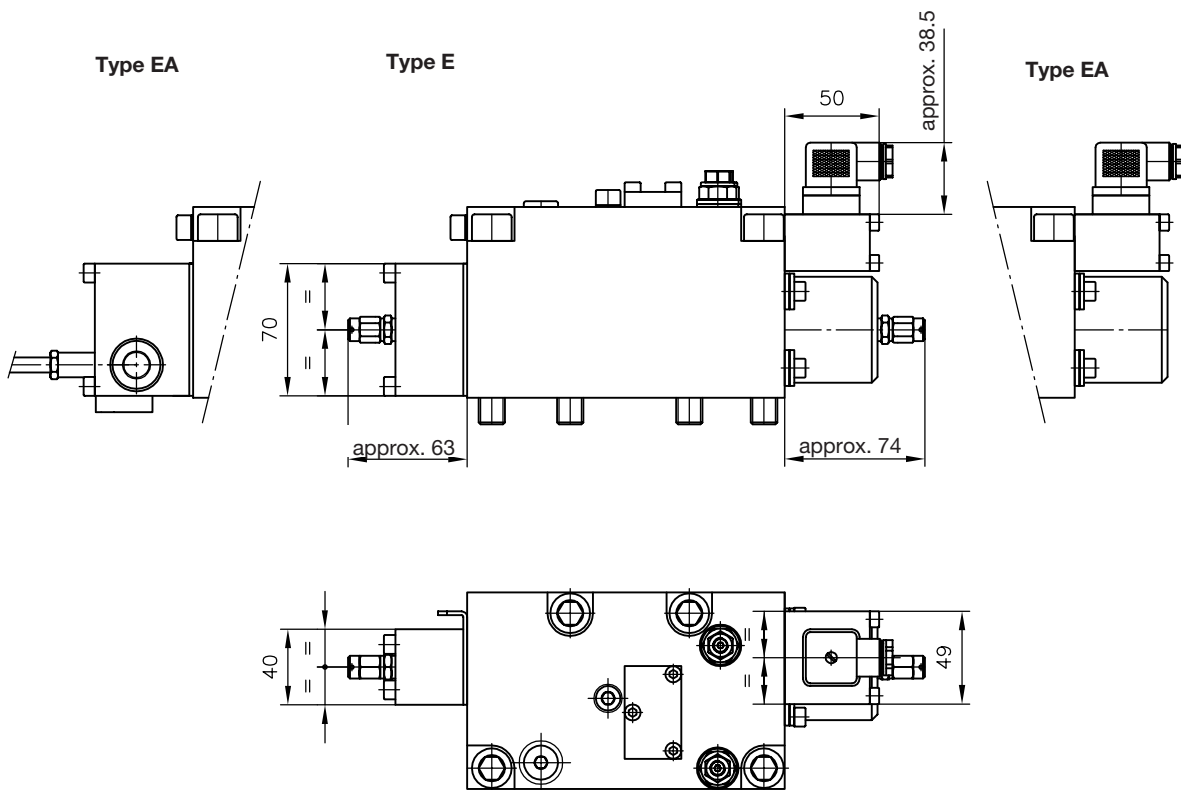
5.1.3 Individual valve with manual actuation type E0A

Type E0A



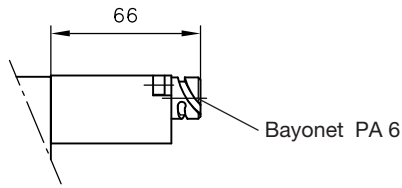
Socket head screw  
ISO 4762 M14x100-A2-70  
Max. torque 120 Nm

5.1.4 Individual valves with actuation type E, EA

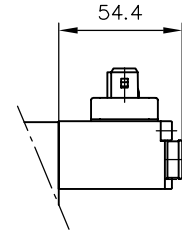
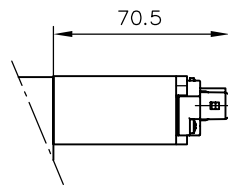


Additional solenoid versions

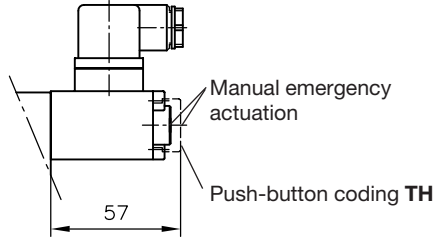
Coding -S 12  
 -S 24  
 -S 12 T  
 -S 24 T



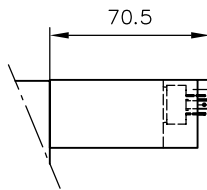
Coding -AMP 12 K 4  
 -AMP 24 K 4



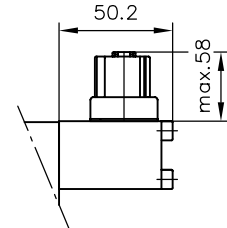
Coding -G(X) 12 T  
 -G(X) 24 T



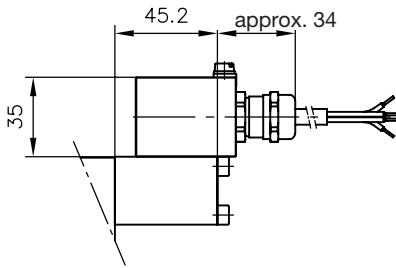
Coding -G(X) 24 C 4



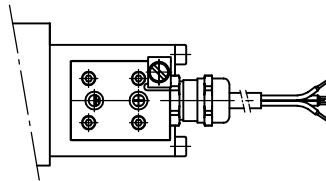
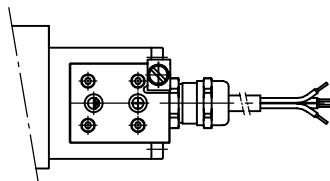
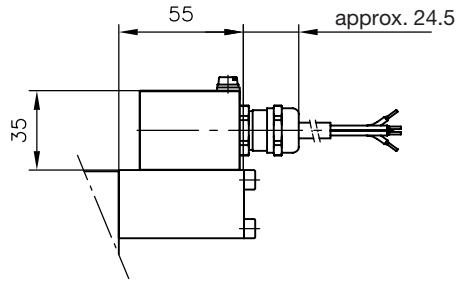
Coding -DT 12  
 -DT 24



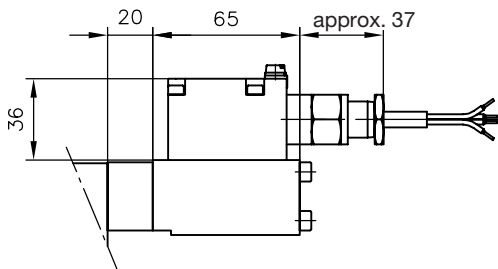
Coding -G 24 EX  
 -G 24 EX 4



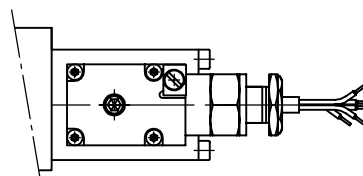
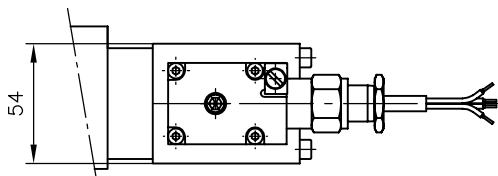
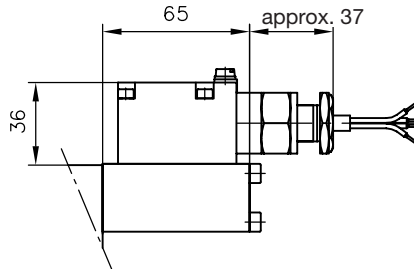
Coding -G 24 TEX  
 -G 24 TEX 4



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

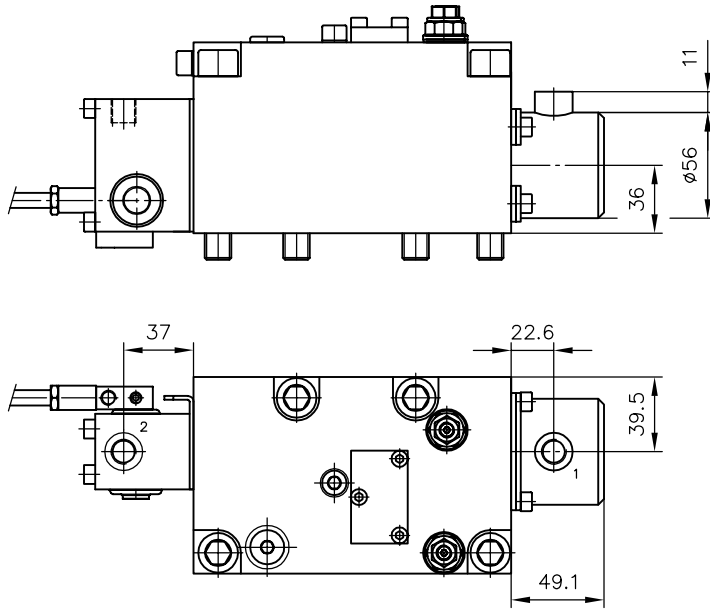


Coding -G 24 TEX 70

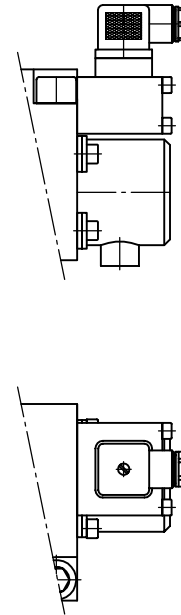


5.1.5 Individual valves with hydraulic actuation type E0HA, E0H, HEA, HE

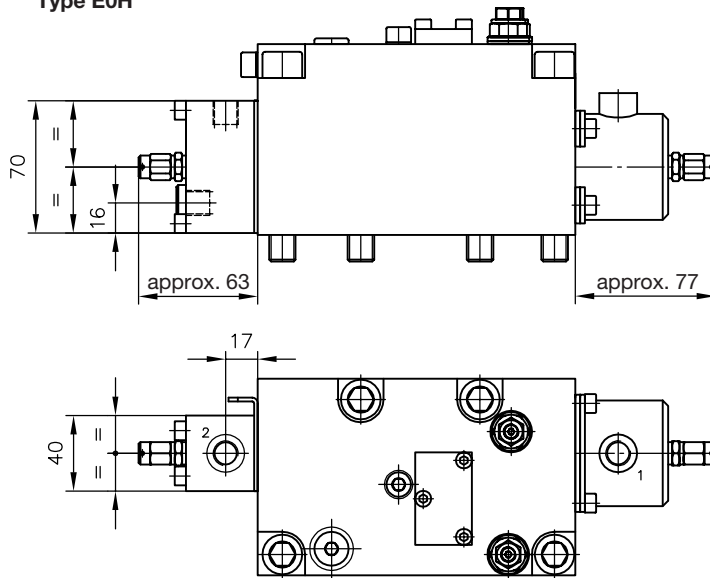
Type E0HA



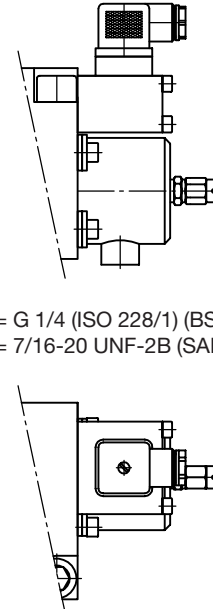
Type HEA



Type E0H

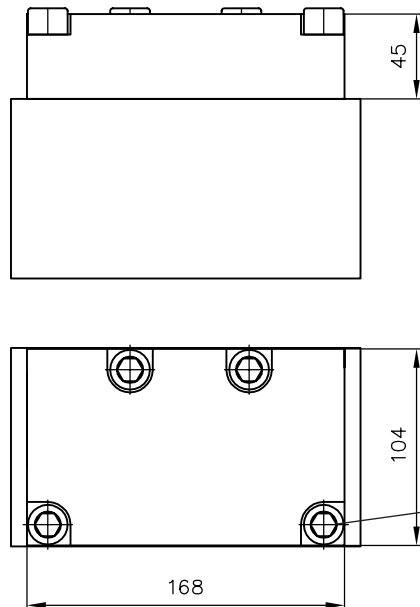


Type HE



Ports  
 1 and 2 = G 1/4 (ISO 228/1) (BSPP)  
 1 and 2 = 7/16-20 UNF-2B (SAE-4)

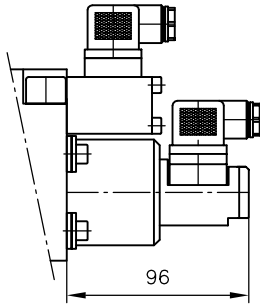
5.1.6 Blanking plate type AX



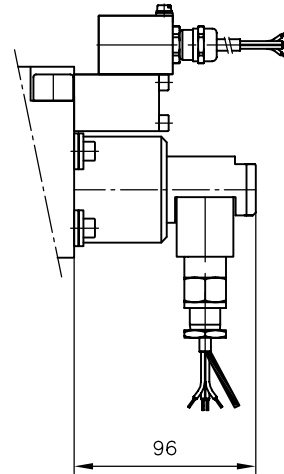
Socket head screw  
 ISO 4762 M14x50-A2-70  
 Max. torque 120 Nm

5.1.7 Lift monitoring

Type ... WA, U

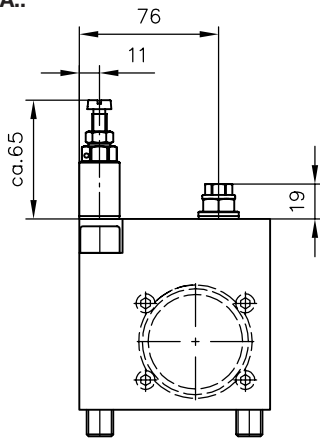


Type WA-EX  
WA-M2 FP

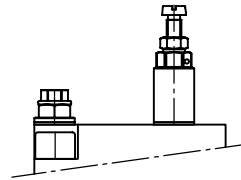


5.1.8 Valve sections with LS-pressure limitation, functional cut-off and prop. pressure limitation

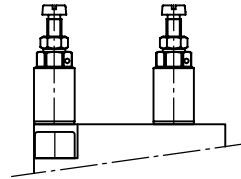
Type A..



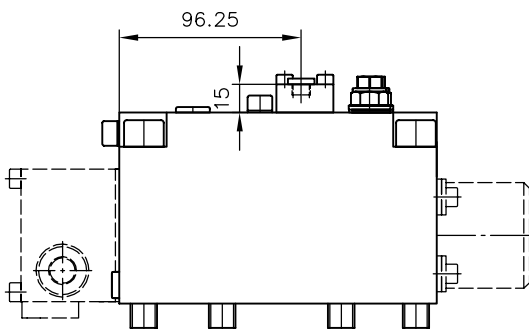
Type B..



Type A..B..

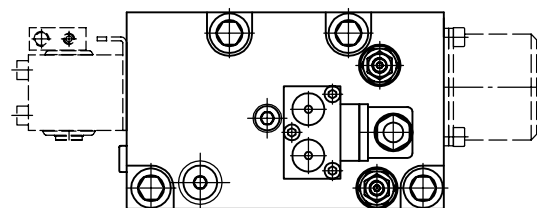
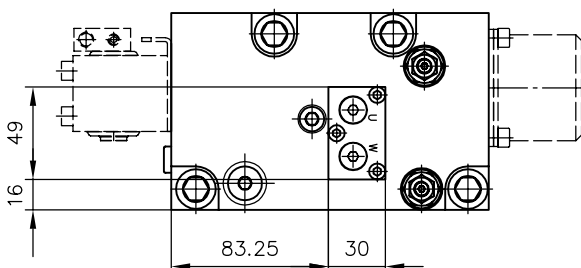
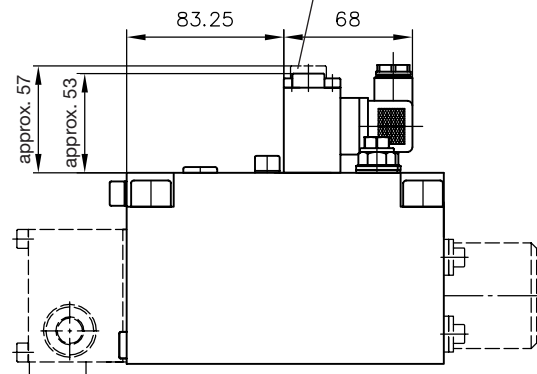


Type S1 to A..B..S1



Type A..B.. F1 to A..B.. F3  
A..B.. FP1 to A..B.. FP3  
A..B.. FPH1 to A..B.. FPH 3

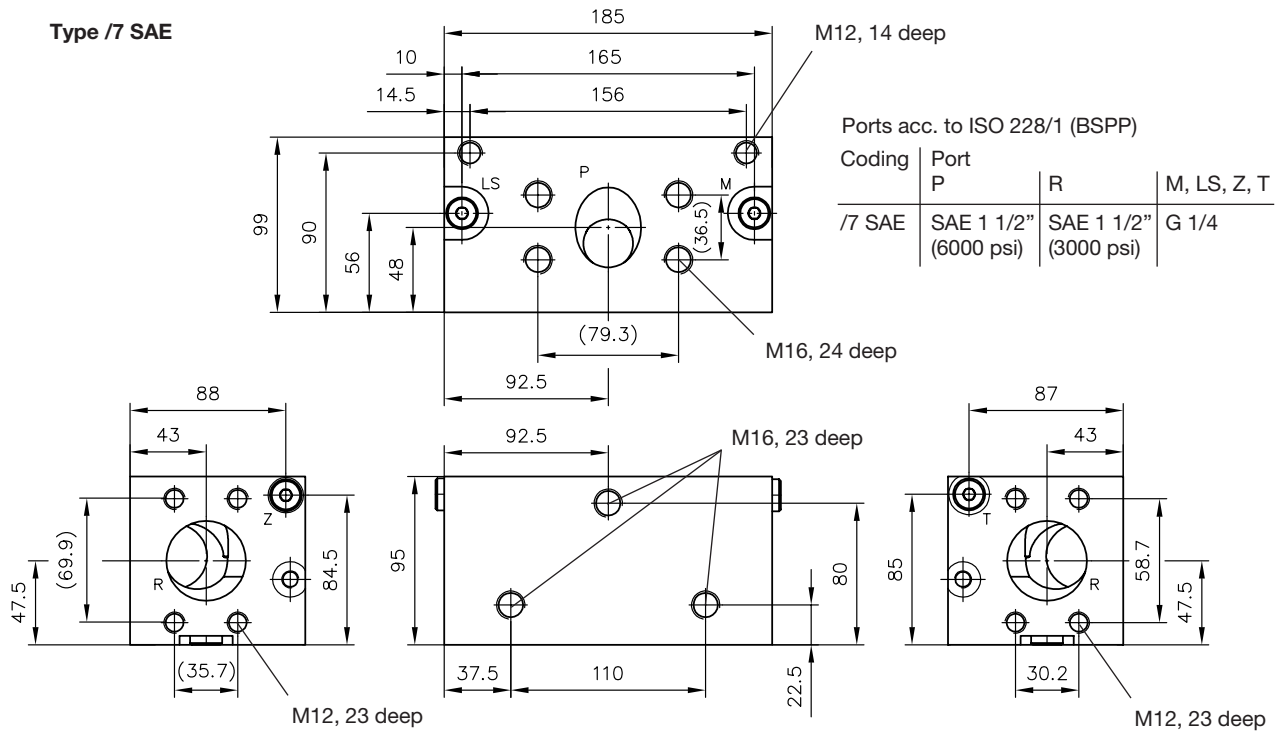
Pushbutton  
(manual emergency  
actuation) with type FPH..





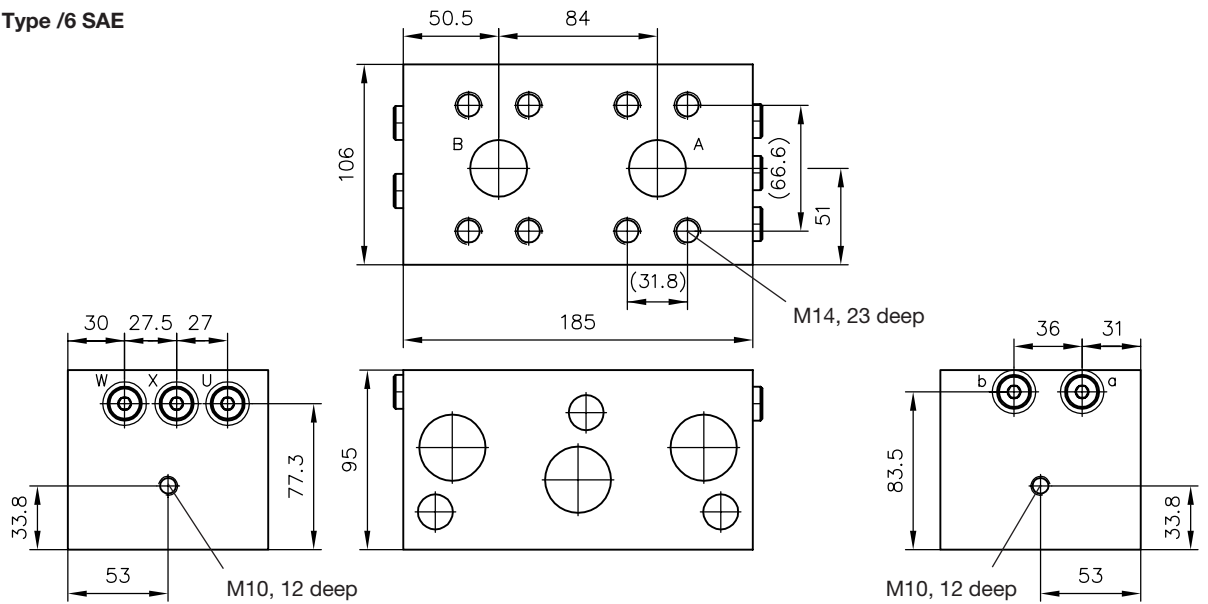
**5.1.9 Sub-plate**  
**For inlet section**

**Type /7 SAE**

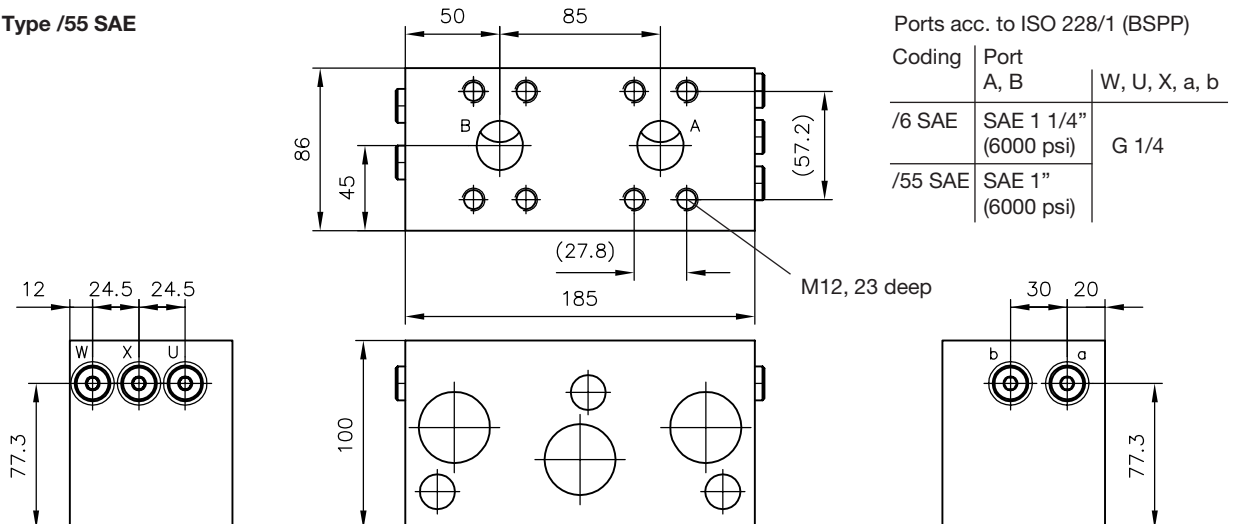


**For valve sections**

**Type /6 SAE**

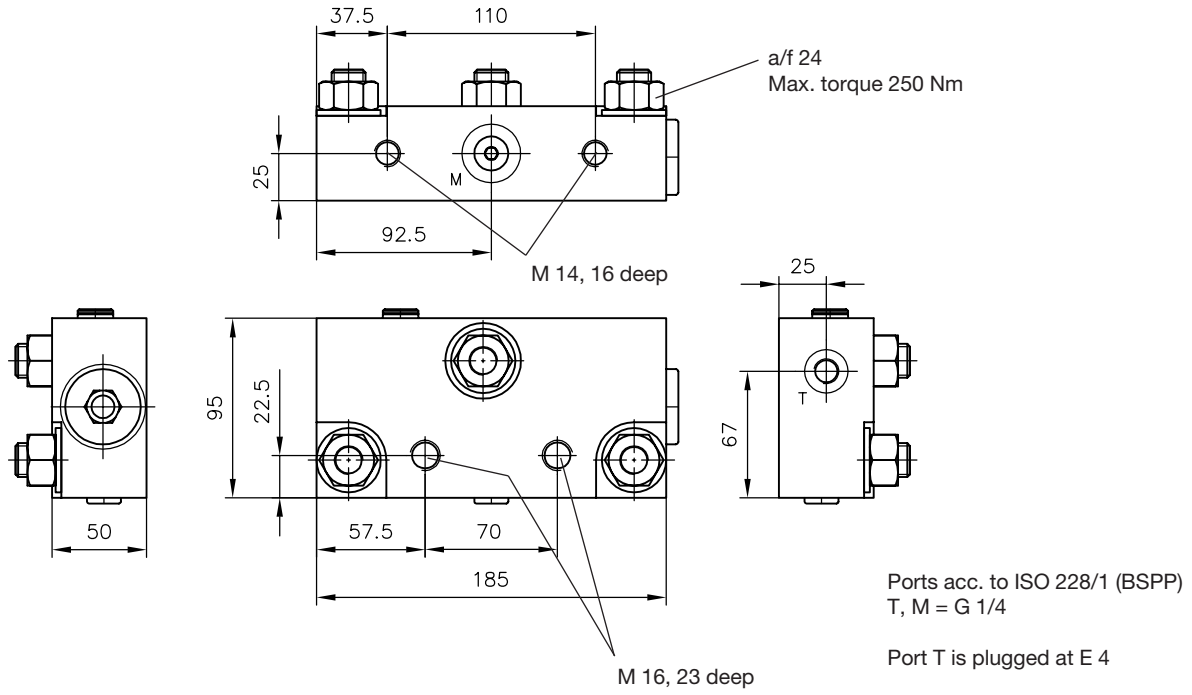


**Type /55 SAE**



**End plates of the valve bank**

**Type E 1, E 4**



## 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 PSVF (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. 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 Z, ZM, V and PA, PB, PD (see 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 Coding	Residual pressure at load induced pressure of	
	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  $\leq 60 \text{ mm}^2/\text{s}$

#### b) Spool valve sections

##### Coding A 2 (example SLF 7-H 2 O 320/250)

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

#### 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. 3.1.3 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.

#### 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).

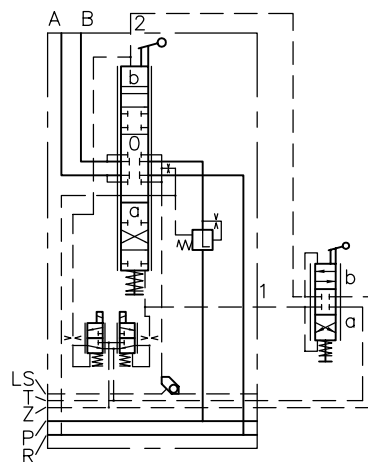
**Note:** Care must therefore be taken, to ensure that a possible bypass orifice in the pressure-flow regulator is plugged!

#### 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)

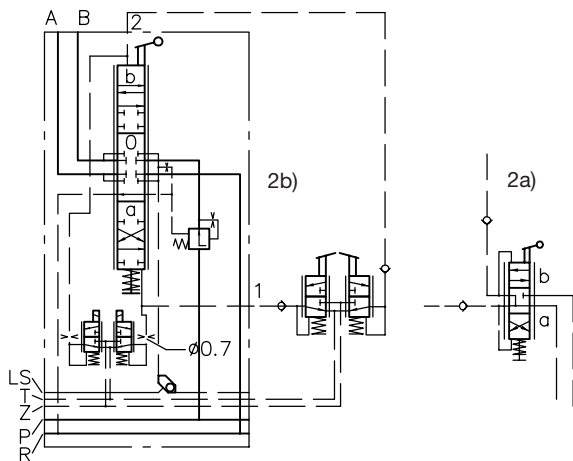
##### Example 1



**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 joysticks 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 ( $> 1.1$  lpm per actuated valve section plus the internal leakage of the hydraulic joy-stick).

**Example 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. Joystick 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)

**Other valves**

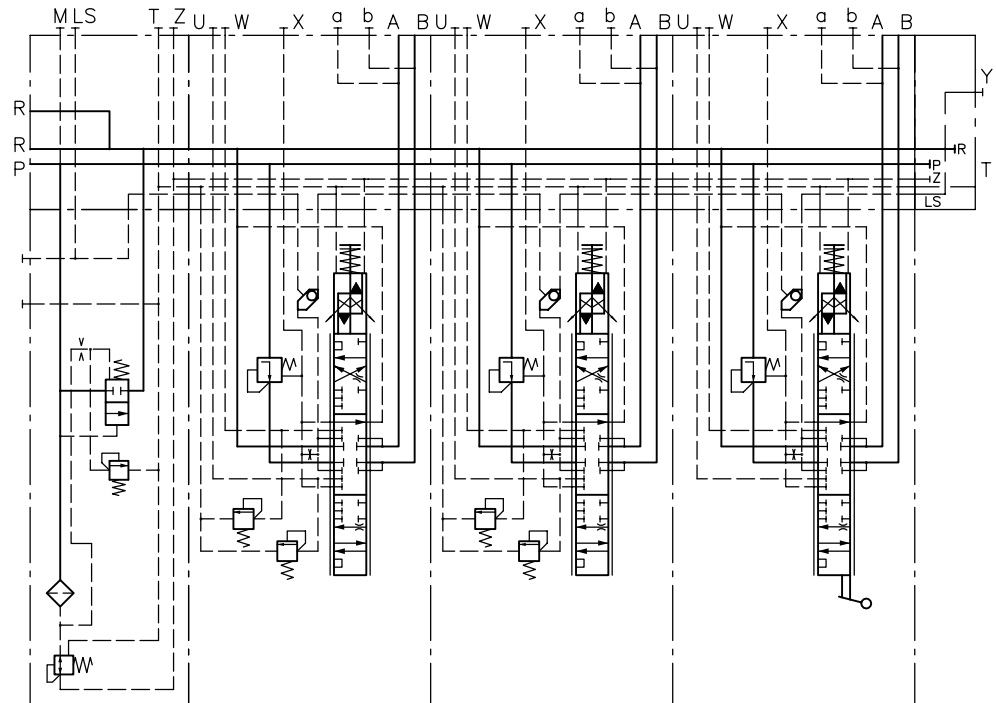
- Proportional spool valve type PSLF (PSVF)  
Size 5 (manifold mounting) acc. to D 7700-F
- Proportional pressure reducing valve type PMZ acc. to D 7625
- Hydraulic joy-stick type KFB01 acc. to D 6600-01

## 6.2 Example circuit

Control system with PSVF, and variable displacement pump

Flow pattern symbol  
acc. to the order  
example

**PSVF A1/380/7SAE - 7 - A2 L 400/320 A200 B200 /E /7**  
**- A2 H 320/320 A280 B130 /E /7**  
**- A2 H 250/180 /EA/7**  
**- E1 - G 24**



### 6.3 Notes regarding assembly, installation and conversion

#### 6.3.1 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:

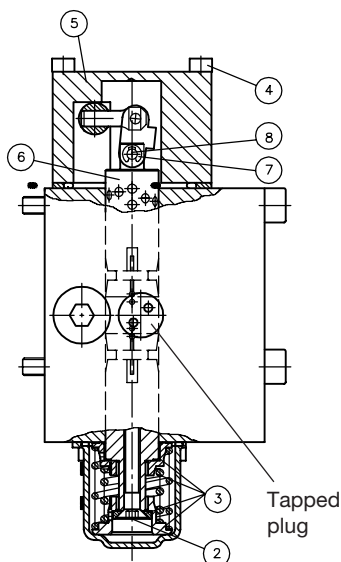
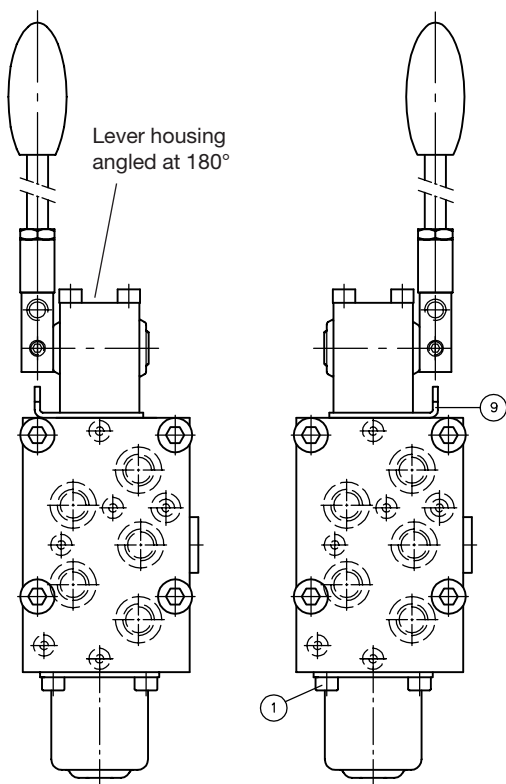
#### Advice on changing the valve spool

1. Slacken screws ① (M6x8 ISO 4762), remove spring cover
2. Remove screw ② M8x40 DIN 7991
3. Remove spring assembly including spring cap ③
4. Slacken screws ④ (M6x60 ISO 4762)
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

#### 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!



#### 6.3.2 Seal kits

	Size 7
Inlet section (control section)	DS 7700-F 71
Valve section	DS 7700-F 72
Sub-plate	DS 7700-F 74