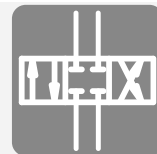


Directional spool valve type CWL

Product documentation



Operating pressure $p_{\max}$:

315 bar

Flow rate $Q_{\max}$:

60 l/min



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1**Overview of the directional spool valve type CWL**

Directional spool valves are a type of directional valve. They control the direction of movement and the velocity of single and double-acting hydraulic consumers.

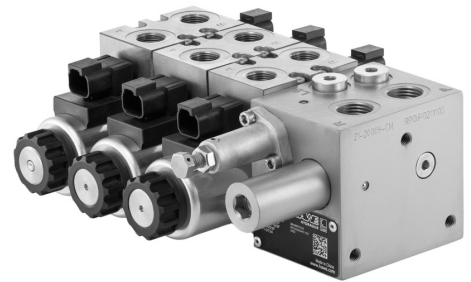
The directional spool valve bank type CWL with series connection is actuated directly. The consumers can be operated with on-off or proportional control. The type CWL has one integral LS output and thanks to the various connection blocks and ancillary blocks offers a broad spectrum of applications.

Features and advantages

- Low-cost load-sensing valve without any individual pressure compensators
- Modular system with many variants and combination options
- One valve for a range of different control functions and small flow quantities
- Compact and robust design
- Robust long-life design

Intended applications

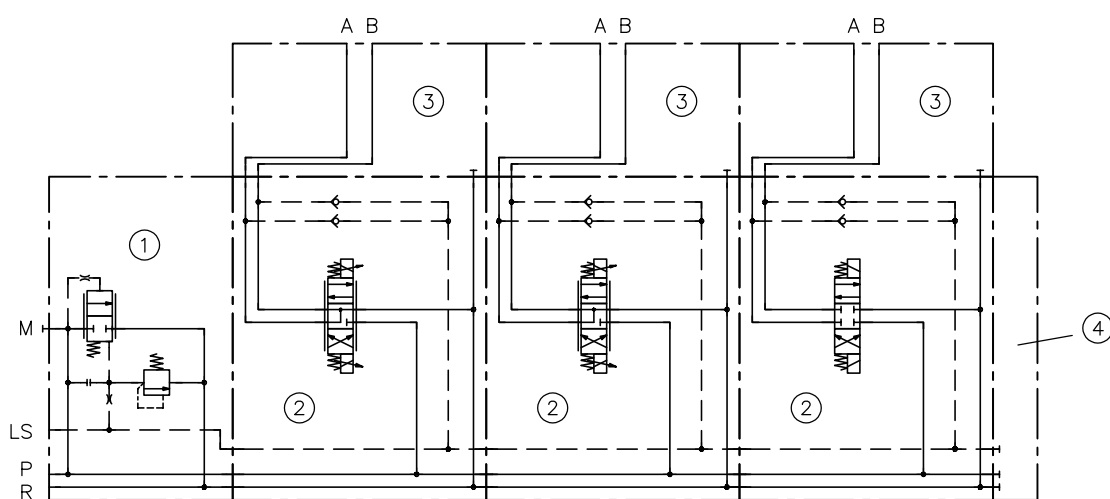
- Municipal trucks
- Machines for forestry and agricultural purposes
- Lifting platforms
- Construction machines



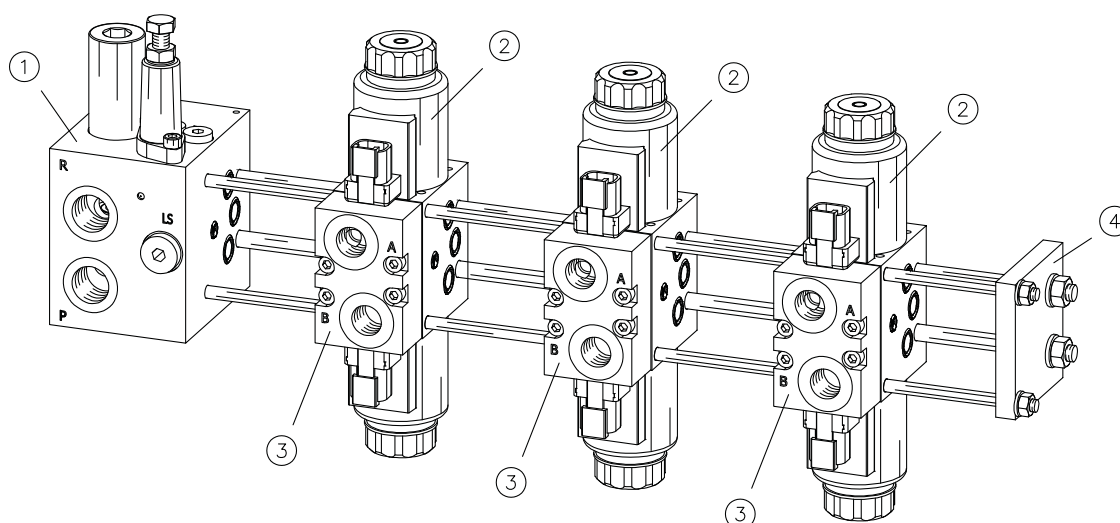
Directional spool valve type CWL

1.1 Configuration example

CWL 23 CL6/250
-D40/MP/0/2F
-D20/MP/0/2F
-G/M/0/2F
-1-DT 24



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



2 Available versions

2.1 Order coding, overview

Ordering example

CWL 23 A61/H 200	-D/M/O/2C	-1	-DT 24
		Chapter 2.7, "Solenoid version"	
		Chapter 2.6, "End plate"	
	Chapter 2.3, "Directional valve section"		
Chapter 2.2, "Connection block"			



NOTICE

A maximum of 10 valve sections can be combined in one valve bank.

2.2 Connection block

Ordering example

CWL 2	3	A61	/H 200
		2.2.4 "Pressure-limiting valve"	
		2.2.3 "Connection block basic types"	
	2.2.2 "Connections"		
2.2.1 "Basic type and size"			

2.2.1 Basic type and size

Type	Description	Flow rate Q _{max} (l/min)	Pressure p _{max} (bar)
CWL 2	Directional spool valve	60	315



NOTICE

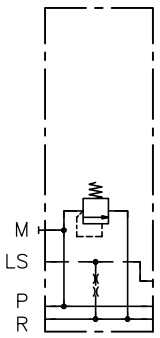
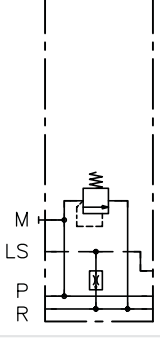
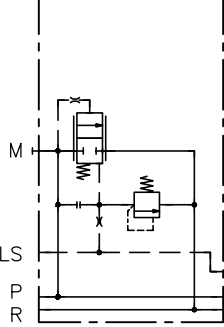
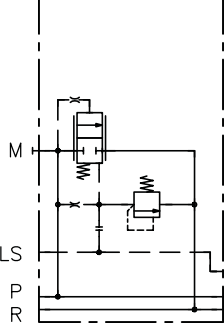
Depending on the circuit symbol and actuation, the individual flow rate permitted may be smaller.

2.2.2 Connections

Coding	Connections	
	P, R	LS, M
CWL 23	G 1/2 (ISO 228-1)	G 1/4 (ISO 228-1)
CWL 2 UNF3	SAE-10 or 7/8-14 UNF-2B (SAE J 514)	SAE-4 or 7/16-20 UNF-2B (SAE J 514)
CWL 2 JIS3	G 1/2 JIS (B 2351)	G 1/4 JIS (B 2351)

2.2.3 Connection block basic types

Coding	Description	Circuit symbol
A50	Connection block without additional valves and without relief of the LS signal	
A51	Connection block without additional valves, with two 0.5 mm orifices in series for relief of the LS signal	
A52	Connection block without additional valves, with flow control valve for relief of the LS signal	
A60	Connection block with pressure-limiting valves type MVF 6C or MVB 6 C according to D 7000 E/1 and without relief of the LS signal	

Coding	Description	Circuit symbol
A61	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C according to D 7000 E/1 and two 0.5 mm orifices in series for relief of the LS signal	
A62	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C to D 7000 E/1 and flow control valve for relief of the LS signal	
CL6	Connection block with integral 3-way controller for use in open centre systems with constant pumps. Circulation pressure: approx. 9 bar	
CV6	Connection block with pilot-controlled pressure-limiting valve for use in closed centre systems with variable pumps or for simultaneous supply of two or more manifolds with a shared constant pump	

! NOTICE

Instructions for converting the connection block from CL6 to CV6 [see Chapter 5.2.1.](#)

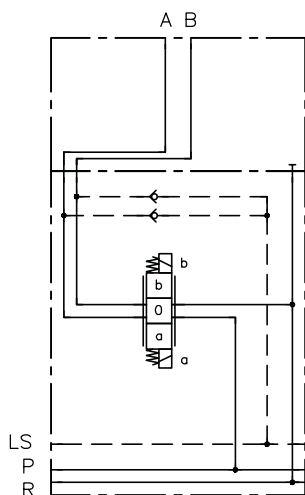
2.2.4 Pressure-limiting valve

Coding	Description
/...	Standard pressure-limiting valve (type MVF 4 C / MVF 6 C according to D 7000 E/1) Max. permissible return pressure $p_R = 20$ bar (adjustment range 50 to 315 bar)
/H...	Pressure-limiting valve for increased return pressure (type MVB 4 C / MVB 6 C according to D 7000 E/1) Max. permissible return pressure $p_R = 200$ bar (adjustment range 50 to 315 bar)

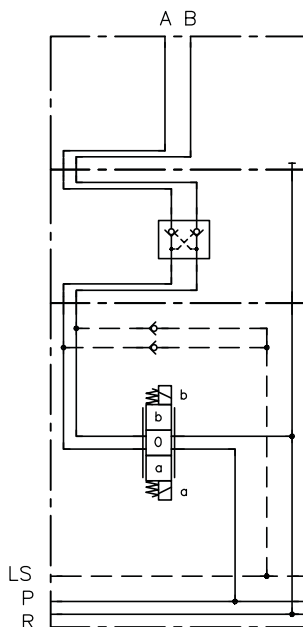
2.3 Directional valve section

The directional valve section contains a flange surface for mounting an ancillary block (Chapter 2.4) or an intermediate plate (Chapter 2.5).

**Directional valve section
with ancillary block**



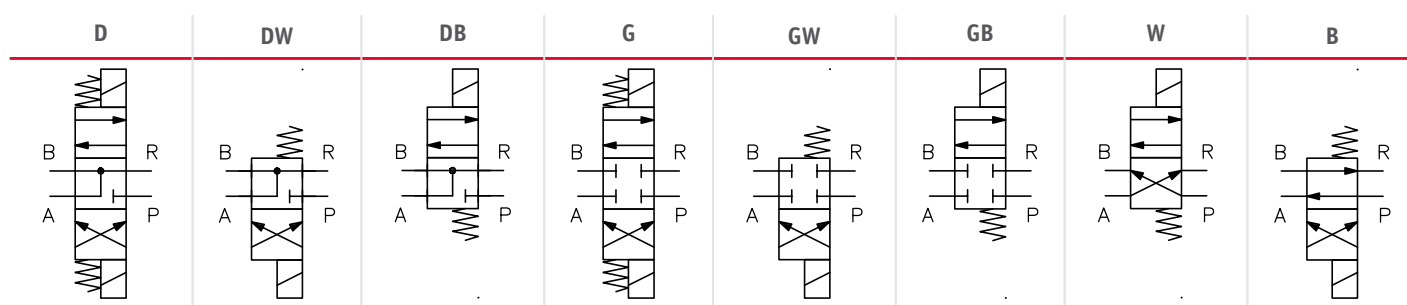
**Directional valve section
with intermediate plate and ancillary block**



Ordering example

CWL 2	-D	/M	HA	/0	/2C	A
						2.4.1 "Seal of consumer ports"
						2.4 "Ancillary block"
						2.3.5 "Additional functions"
						2.3.4 "Hand lever"
						2.3.3 "Actuation"
						2.3.1 "Circuit symbol"

2.3.1 Circuit symbol



! NOTICE

The maximum permissible flow rate varies depending on the circuit symbol (see switchable flow rates in [Chapter 3.4, "Characteristic lines"](#)) and actuation ([Chapter 2.3.3](#)).

2.3.2 Flow rate

For CWL sections with proportional actuation (see [Chapter 2.3.3, "Actuation"](#)), the spools' meter-in edges are available in the four nominal sizes listed below:

Coding	Flow rate $Q_{A/B}$ (l/min) at maximum spool valve elevation and in combination with connection block CWL 23 CL6 with 9 bar spring (see Chapter 2.2, "Connection block")
10	10
20	20
30	30
40	40

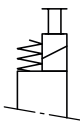
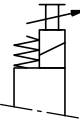
! NOTICE

The valve spool sizes are designed so that in practice the actual flow rate is slightly higher.

Depending on the position of the valve section in the manifold, and especially at high flow rates and resulting pressure losses in the manifold, the flow rate may fall below the nominal value.

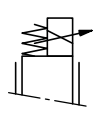
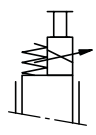
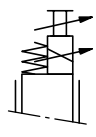
2.3.3 Actuation

On-off actuation

Coding	Description	Combination options	Circuit symbol
M	Electrical actuation. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).	In conjunction with - the solenoid version DT (see Chapter 2.7, "Solenoid version") and - the ancillary blocks coding /2CH, /2CHA, /CHB (see Chapter 2.4) two additional spacer plates with coding /ZC11 (see Chapter 2.5, "Intermediate plate") are necessary to prevent a collision between the magnetic plug and the ancillary block.	M, M1, M2 
MT	Electrical actuation with manual override. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).		MT, MT1, MT2 
MD	Electric actuation with manual override and locking function. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).		MD, MD1, MD2 
M1	Electrical actuation. Plug position outside and upwards in the direction of the consumer ports.	Only in conjunction with the solenoid version X, G or AMP (see Chapter 2.7, "Solenoid version")	
MT1	Electrical actuation with manual override. Plug position outside and upwards in the direction of the consumer ports.		
MD1	Electric actuation with manual override and locking function. Plug position outside on the spool block and upwards in the direction of the consumer ports.		
M2	Electrical actuation. Plug position inside on the spool block and downwards.	Two retaining plates are optionally available to be able to mount the manifold in the vehicle easily despite the plugs facing downwards. The retaining plates are attached to the mounting points on the connection block and the end plate respectively. This means the manifold gains some height and there is sufficient space for the plugs. see Chapter 2.6.2, "Mounting bracket"	
MT2	Electrical actuation with manual override. Plug position inside on the spool block and downwards.		
MD2	Electric actuation with manual override and locking function. Plug position inside on spool block and downwards.		

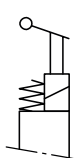
! NOTICE
The manual override with coding MT, MT1, MT2 cannot be combined with manual actuation with coding H as per Chapter 2.3.4, "Hand lever" see Chapter 2.3.4, "Hand lever".

Electro-proportional actuation

Coding	Description	Combination options	Circuit symbol
MP	Electro-proportional actuation. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).	In conjunction with a) the solenoid version DT (see Chapter 2.7, "Solenoid version") and b) the ancillary blocks coding /2CH, /2CHA and /CHB, (see Chapter 2.4) two additional spacer plates with coding /ZC11 (see Chapter 2.5, "Intermediate plate") are necessary to prevent a collision between the magnetic plug and the ancillary block.	MP, MP1, MP2 
MPT	Electro-proportional actuation with manual override. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).		MPT, MPT1, MPT2 
MPD	Electro-proportional actuation with manual override and locking function. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).		MPD, MPD1, MPD2 
MP1	Electro-proportional actuation. Plug position outside and upwards in the direction of the consumer ports.	Only in conjunction with the solenoid version X, G or AMP (see Chapter 2.7, "Solenoid version")	
MPT1	Electro-proportional actuation with manual override. Plug position outside and upwards in the direction of the consumer ports.		
MPD1	Electro-proportional actuation with manual override and locking function. Plug position outside and upwards in the direction of the consumer ports.		
MP2	Electro-proportional actuation. Plug position inside on spool block and downwards.	Two retaining plates are optionally available to be able to mount the manifold in the vehicle easily despite the plugs facing downwards. The retaining plates are attached to the mounting points on the connection block and the end plate respectively. This means the manifold gains some height and there is sufficient space for the plugs. see Chapter 2.6.2, "Mounting bracket"	
MPT2	Electro-proportional actuation with manual override. Plug position inside on spool block and downwards.		
MPD2	Electro-proportional actuation with manual override and locking function. Plug position inside on spool block and downwards.		

! NOTICE
 The manual override with coding MPT, MPT1, MPT2 cannot be combined with manual actuation with coding H, see Chapter 2.3.4, "Hand lever"

2.3.4 Hand lever

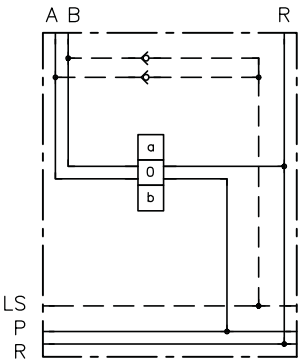
Coding	Description	Combination options	Circuit symbol
Without coding	Without manual actuation (standard version)	--	-
HA	Manual actuation on the A-side	Only in conjunction with the ancillary blocks /2F	
HB	Manual actuation on B-side		
H1A	Manual actuation on the A-side Hand lever mounted at 30° angle to the outside	Only in conjunction with the ancillary blocks /2F, /2C, /2CAN...BN..., /2CAN..., /2CBN and /2CAS...BS..., /2CHB, /2CBL... When using the intermediate plate /ZCH or ancillary blocks /2CH or /2CHA an additional spacer plate with coding /ZC11 (see Chapter 2.5, "Intermediate plate") is necessary to prevent a collision between the hand lever and intermediate plate/ancillary block.	
H2A	Manual actuation on the A-side Lever housing rotated through 180°	Can be combined with all valve sections, ancillary blocks and intermediate plates.	
H2B	Manual actuation on B-side Lever housing rotated through 180°		
H3A	Manual actuation on the A-side Lever housing rotated through 180° and hand lever mounted at 30° angle to outside		
H3B	Manual actuation on B-side Lever housing rotated through 180° and hand lever mounted at 30° angle to outside		
H4A	Manual actuation on the A-side Hand lever on opposite side (on side of the connection block)		
H4B	Manual actuation on B-side Hand lever on opposite side (on side of the connection block)	Only in conjunction with the ancillary blocks /2F and /2C	

Manual actuation with lever, without notch. Actuation force: 5 Nm.

NOTICE
 Manual actuations with coding HA, H1A, H2A, H3A and H4A cannot be combined with a manual override with coding MT, MT1, MT2, MPT, MPT1 or MPT2.

NOTICE
 When combined with PSL, the hand lever is mounted on the B side, meaning all hand levers are mounted on the same side.

2.3.5 Additional functions

Coding	Description	Circuit symbol
/0	Standard valve section without integrated thread for combining with an ancillary block (see Chapter 2.4, "Ancillary block") or an intermediate plate (see Chapter 2.5, "Intermediate plate")	

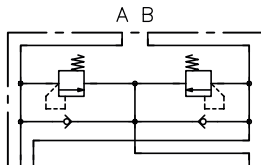
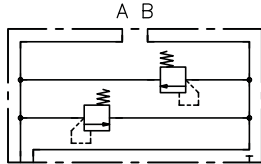
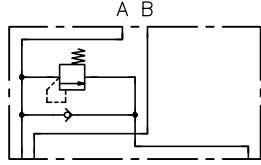
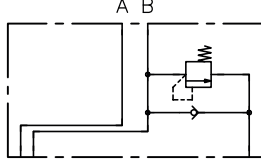
2.4 Ancillary block

Depending on their version, the ancillary blocks contain different kinds of additional valves (e.g. releasable check valves, shock valves or restrictor check valves). They can be flange-mounted either on a valve section with flange surface or on an intermediate plate (see Chapter 2.5, "Intermediate plate").

Ports A and B to ISO 228-1 or SAE J 514 or JIS B 2351:

- /2: G 3/8
- /UNF12: SAE-6 (9/16-18 UNF-2B)
- /JIS2: G 3/8 JIS

Coding	Description	Circuit symbol
/2C /UNF12C /JIS2C	Without additional function (height: 45 mm)	
/2F /UNF12F /JIS2F	Without additional function (height: 25 mm)	
/2CH /UNF12CH /JIS2CH	Double pilot ratio check valve (pilot ratio 1:4.5) $Q_{max} = 50 \text{ l/min}$	
/2CHA /UNF12CHA /JIS2CHA	Releasable check valve in A (pilot ratio 1:4.5) $Q_{max} = 50 \text{ l/min}$	
/2CHB /UNF12CHB /JIS2CHB	Releasable check valve in B (pilot ratio 1:4.5) $Q_{max} = 50 \text{ l/min}$	
/2CQ /UNF12CQ /JIS2CQ	Restrictor check valves in A and B $Q_{max} = 36 \text{ l/min}$	
/2CQA /UNF12CQA /JIS2CQA	Restrictor check valve in A $Q_{max} = 36 \text{ l/min}$	
/2CQB /UNF12CQB /JIS2CQB	Restrictor check valve in B $Q_{max} = 36 \text{ l/min}$	

Coding	Description	Circuit symbol
/2CAN... BN... /UNF12CAN... BN... /JIS2CAN... BN...	Shock and anti-cavitation valves in A and B $Q_{\max} = 40 \text{ l/min}$	
/2CAS... BS... /UNF12CAS... BS... /JIS2CAS... BS...	Shock valves in A and B $Q_{\max} = 40 \text{ l/min}$	
/2CAN... /UNF12CAN... /JIS2CAN...	Shock and anti-cavitation valves in A $Q_{\max} = 40 \text{ l/min}$	
/2CBN... /UNF12CBN... /JIS2CBN...	Shock and anti-cavitation valves in B $Q_{\max} = 40 \text{ l/min}$	

Coding

Description

/2CAL... BL...
/UNF12CAL... BL...
/JIS2CAL... BL...

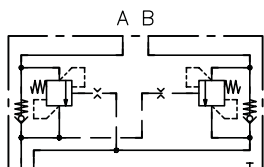
/2CAL...
/UNF12CAL...
/JIS2CAL...

/JIS2CBL...
/UNF12CBL...
/2CBL...

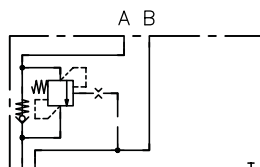
Load-holding valves (type CLHV as per D 7918-VI-C)

- /2CAL... BL...: Load-holding valves in A and B
- /2CAL...: Load-holding valve in A
- /2CBL...: Load-holding valve in B

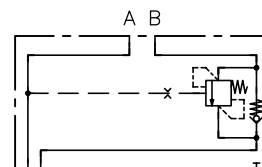
/2CAL... BL...



/2CAL...



/2CBL...



Ordering example:

/2CAL -0 B 4 N T /200 V

Flow rate
Geometric pilot ratio
Return pressure dependence
Pressure setting range
Pressure setting in bar
Pressure setting

Flow rate

- Coding **B**: $Q_{\max} = 30 \text{ l/min}$

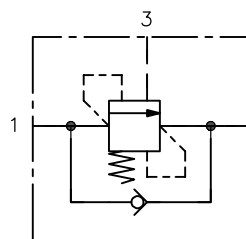
Geometric pilot ratio

- Coding **4**: 4:1
- Coding **8**: 8:1

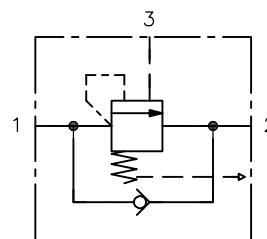
Return pressure dependence

- Coding **N**:
 - Normal (not relieved)
 - Available pilot ratios: all
- Coding **V**:
 - Relieved (atmospheric)
 - Available sizes 2 and 3
 - Available pilot ratios:
 - Size 2 = 4:1

Coding **N**



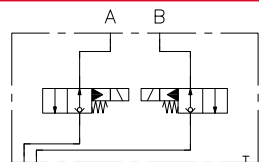
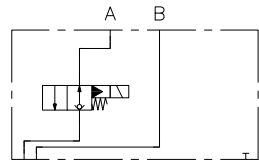
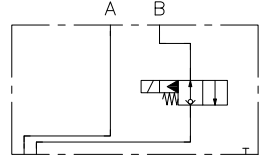
Coding **V**



NOTICE

For coding **N**, the return pressure at port 2 is added to the pressure setting with $(1 + \text{pilot ratio}) \times \text{return pressure}$!

Coding	Description
	Pressure setting range ▪ Coding T: – Pressure setting: 70 - 150 bar – Adjustment: 73 bar/revolution – Pilot ratio 4:1 ▪ Coding M: – Pressure setting: 100 - 210 bar – Adjustment: 109 bar/revolution – Pilot ratio 4:1 ▪ Coding D: – Pressure setting: 140 - 350 bar – Adjustment: 136 bar/revolution – Pilot ratio: all Pressure setting ▪ without coding: fixed ▪ Coding V: Adjustable within the selected pressure range

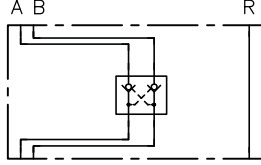
Coding	Description	Circuit symbol
/2 CVV /UNF12 CVV	Electrically actuated 2/2-way directional seated valve closed in neutral position as check valve in A or B $Q_{max} = 40 \text{ l/min}$; $p_{max} = 350 \text{ bar}$	
/2 CVX /UNF12 CVX	▪ /2 CVV, /UNF12 CVV: Check valves in A and B ▪ /2 CVX, /UNF12 CVX: Check valve in A ▪ /2 CXV, /UNF12 CXV: Check valve in B Common applications: Seat-tight sealing of consumers.	
/2 CXV /UNF12 CXV		

2.4.1 Seal of consumer ports

Coding	Description
Without coding	Standard version without tapped plug
A	Port A sealed
B	Port B sealed
C	Port A and B sealed

2.5 Intermediate plate

The intermediate plates are mounted between a valve section and an ancillary block (see Chapter 2.4, "Ancillary block") and are intended as either a spacer plate or to combine two additional valves with each other.

Coding	Description	Circuit symbol
/ZC11	Spacer plate with 11 mm height to avoid collisions between the magnetic plug and ancillary block or the hand lever and ancillary block	
/ZCH	Intermediate plate with double releasable check valve (pilot ratio 1:4.5)	

2.6 End plate

End plates are the final element in a manifold and close off the valve bank. Depending on the version, they may have additional ports (e.g. a P1 port for supplying a downstream manifold).

2.6.1 End plate

Coding	Description	Ports P1, R1	Circuit symbol
1	Standard version	--	
11	Additional LS relief via 2x 0.5 mm orifice	--	
22	Additional port: P1, R1	G 3/8 (ISO 228-1)	
UNF22		SAE-8 or 3/4-16 UNF-2B (SAE J 514)	
JIS22		G 3/8 JIS (B 2351)	

2.6.2 Mounting bracket

Coding	Description
without coding	Without mounting bracket (standard version)
K	Including mounting bracket consisting of two retaining plates which are attached to the metric mounting threads on the connection block and the end plate respectively. This means the manifold gains some height and, when actuation is by coding M2, MT2, MP2, MPT2, there is sufficient space for the plugs see Chapter 2.3.3, "Actuation".

2.7 Solenoid version

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)
X 12 X 24	EN 175 301-803 A ▪ X: without male connector	12 V DC 24 V DC	IP 65
G 12 G 24	▪ G: with male connector (MSD 3-309 as per D 7163)	12 V DC 24 V DC	IP 65
L 12 L 24	▪ L: with male connector with LED (SVS 296365 to D 7163)	12 V DC 24 V DC	IP 65
AMP 12 AMP 24	AMP Junior Timer	12 V DC 24 V DC	IP 67
DT 12 DT 24	German (DT 04-2P)	12 V DC 24 V DC	IP 69k

For electrical parameters see [Chapter 3.5, "Electrical data"](#)



NOTICE

The specifications regarding the IP protection class apply for versions featuring a properly assembled male connector.

3 Parameters

3.1 General data

Designation	Directional spool valve
Design	Spool valve
Model	Valve bank
Material	Steel or cast iron, black galvanised or zinc-nickel plated
Attachment	M6 mounting thread
Installation position	As desired
Ports/connections	▪ P = Pump ▪ R = Reflux ▪ A, B = Consumers ▪ LS = Load pressure signal ▪ M = Pressure gauge connection for pump pressure
Flow direction	▪ according to the arrow directions in the circuit symbols ▪ Interchange not permitted!
Hydraulic fluid	Hydraulic fluid, according to DIN 51524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 500 mm²/s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C. Not suitable for water-based fluids and native oils (HETG). Not suitable for HETG such as rapeseed oil and water-glycol solutions, e.g. HFA and HFC.
Cleanliness level	ISO 4406 20/17/14
Temperatures	Environment: approx. -40 to +80 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

3.2 Pressure and volumetric flow

Operating pressure	$p_{\max} = 315 \text{ bar}$ (ports P, A, B, LS) Return pressure $\leq 20 \text{ bar}$ (port R). For coding H $\leq 200 \text{ bar}$ (see Chapter 2.2.4, "Pressure-limiting valve")
Flow rate	$Q_{\max} = 60 \text{ l/min}$  NOTICE Comply with the restrictions for the valve sections, see switchable flow rates in Chapter 3.4, "Characteristic lines" and the "Actuation" section

3.3 Weight

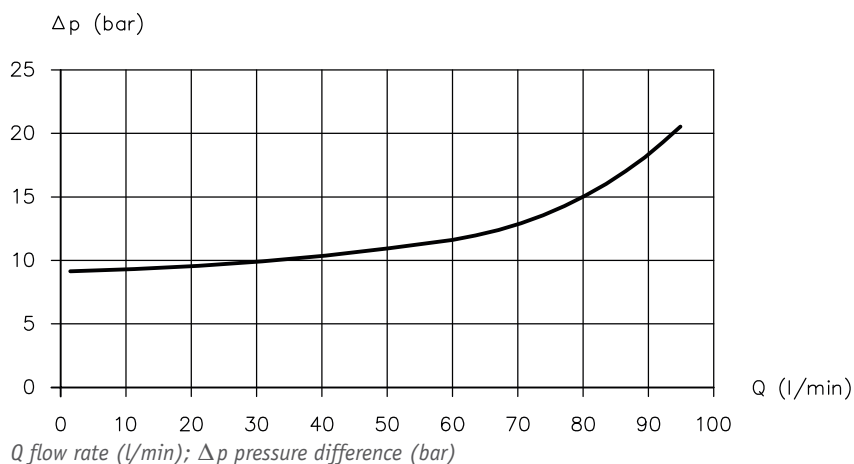
Connection block	Type	
	CWL 23 A51	= 1.85 kg
	CWL 23 A52	= 1.90 kg
	CWL 23 A61	= 1.79 kg
	CWL 23 A62	= 2.10 kg
	CWL 23 CL6, CWL 23 CV6	= 4.50 kg
	Also applies to ports in UNF and JIS.	
Directional valve section	Valve section with a magnet (4/2 symbol, example coding "B")	= 1.78 kg
	Valve section with two magnets (4/3 symbol, example coding "D")	= 2.30 kg
	Manual actuation	= + 0.80 kg
Ancillary block	Coding	
	/2C, /2F	= 0.5 kg
	/2CH, /2CHA, /2CHB	= 1.4 kg
	/2CQ, /2CQA, /2CQB	= 0.7 kg
	/2CAN... BN..., /2CAS... BS..., /2CAN..., /2CBN...	= 1.0 kg
	Also applies to ports in UNF and JIS.	
End plate	Coding	
	1, 11	= 0.3 kg
	22	= 1.0 kg
	Also applies to ports in UNF and JIS.	

3.4 Characteristic lines

Viscosity of the hydraulic fluid approx. 60 mm²/s

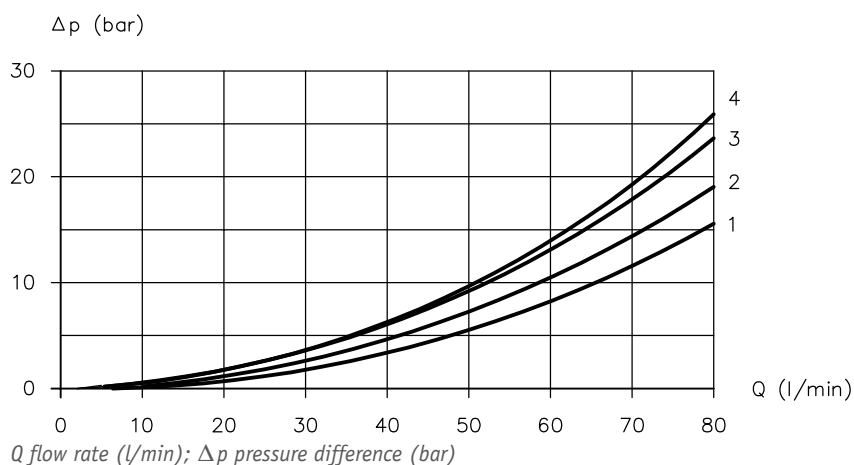
3-way controller

Circulation pressure (P → R) for CWL 23 CL6/...



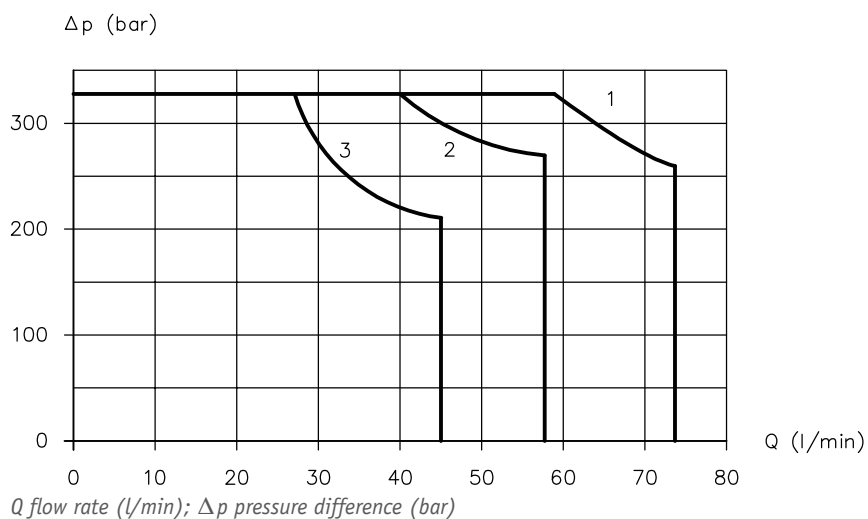
Directional valve section with on-off actuation

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



Circuit symbol	Central position	Switching position a		Switching position b	
	P → R	P → B	A → R	P → A	B → R
G, GW, GB	--	3	1	3	1
D, DW, DB	--	3	2	3	2
H, HW, HB	3	1	2	1	2
W, B	--	4	1	4	1

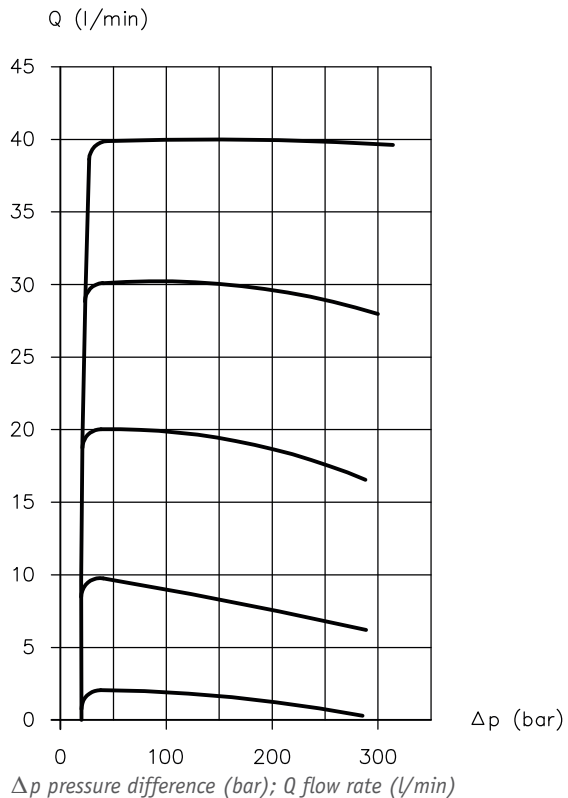
Switchable flow rates



Circuit symbol	Curve
G, B, W	1
H, HW, HB	2
D, DW, DB	3

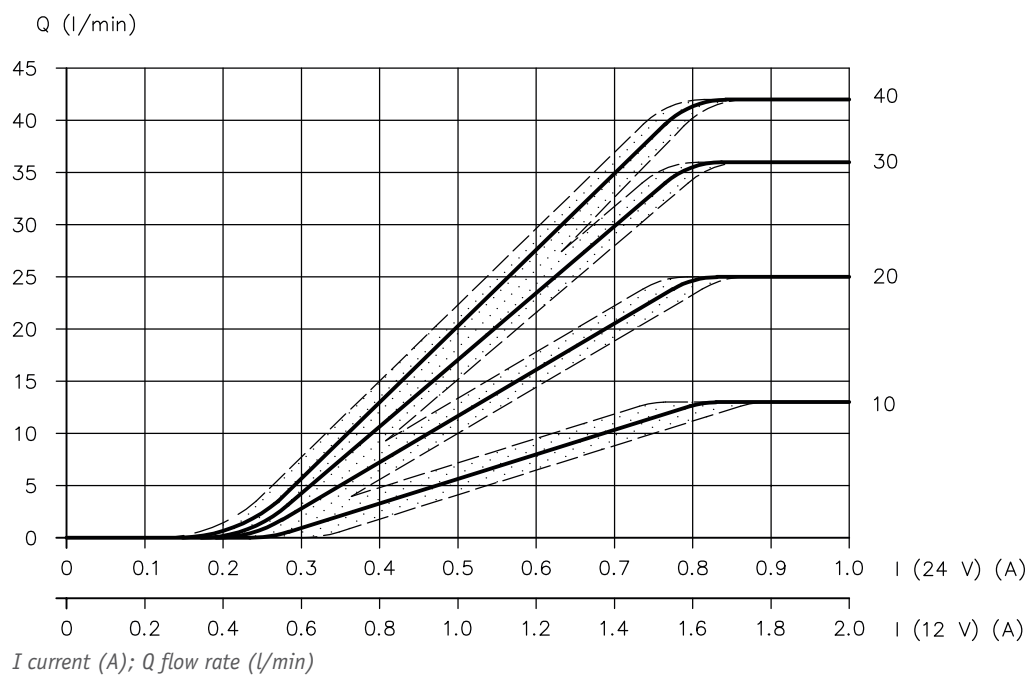
Directional valve section with electro-proportional actuation

control characteristic line for consumer flow rate to [Chapter 2.3.2, "Flow rate"](#) (reference values measured with 3-way controller)



I-Q characteristic line

(Reference values measured with CL6 connection block and Δp of 9 bar)



3.5 Electrical data

On-off actuation

Coding	X 12, G 12, L 12, AMP 12, DT 12	X 24, G 24, L 24, AMP 24, DT 24
Nominal voltage U_N	12 V DC	24 V DC
Permissible voltage deviation	10 %	10 %
Nominal current I_N	2.50 A	1.25 A
Nominal power P_N	30 W	30 W
Duty cycle	S1 (100 %)	
Switching times	Circuit symbol G: approx. 50 ms and off = approx. 80 ms	
Switching frequency	approx. 15,000 switching/h	
Insulation material class	H	
Contact temperature	max. 100°C at 20°C ambient temperature	

Electro-proportional actuation

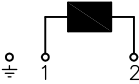
Coding	X 12, G 12, L 12, AMP 12, DT 12	X 24, G 24, L 24, AMP 24, DT 24
Nominal voltage U_N	12 V DC	24 V DC
Coil resistance R_{20}	5 Ω	20 Ω
Current, cold I_{20}	2.30 A	1.15 A
Limit current I_G (I_{lim})	1.70 A	0.85 A
Power, cold $P_{20} = U_N \times I_{20}$	28 W	28 W
Limit power $P_G = U_N \times I_G$	21 W	21 W
Duty cycle	S1 (100 %)	
Dither frequency	40 - 70 Hz	
Dither amplitude $A_D(\%) = \frac{I_{Peak-Peak}}{I_G} \cdot 100$	$20 \% \leq A_D \leq 50 \%$	

Ancillary block CVV, CVX, CXV

Nominal voltage	12 V DC	24 V DC
Resistance R20	7.06 Ω	28.23 Ω
Current, cold I20	1.7 A	0.85 A
Nominal power P _N	20.5 W	20.5 W
Duty cycle	S1 (100%)	S1 (100%)
Insulation material class	H	H

Electrical connection

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



X 12, X 24

EN 175 301-803 A
2-pin
IP 65 (IEC 60529)



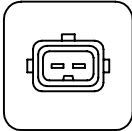
DT 12, DT 24

German (DT 04-2P)
2-pin
IP 69k (IEC 60529)



AMP 12, AMP 24

AMP Junior Timer
2-pin
IP 67 (IEC 60529)

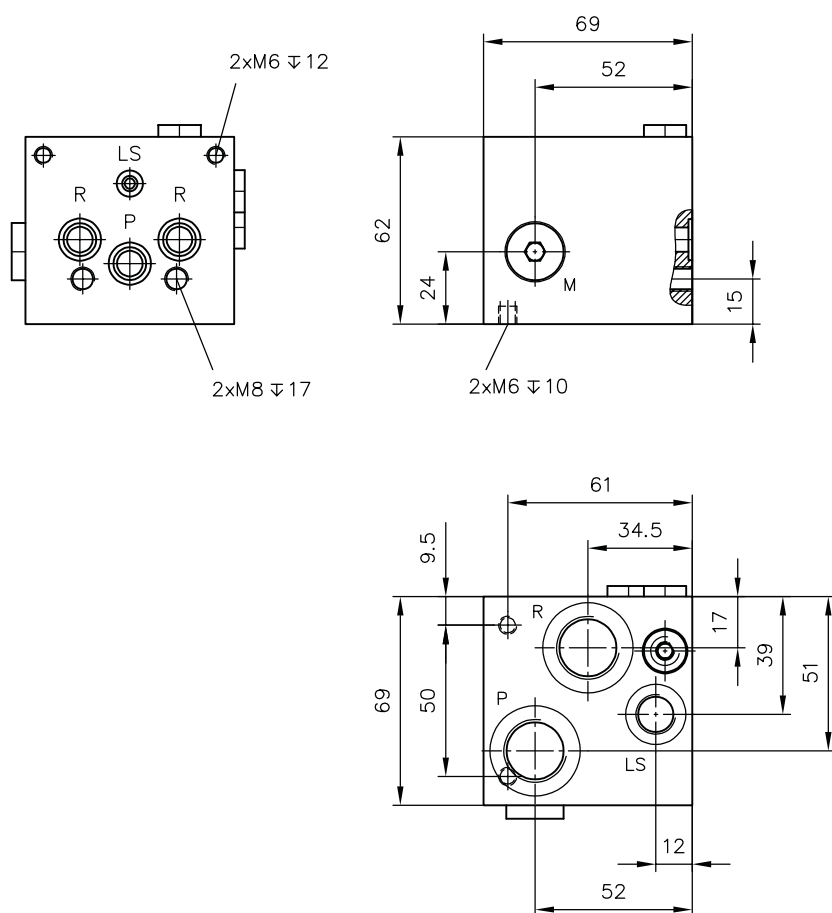


4 Dimensions

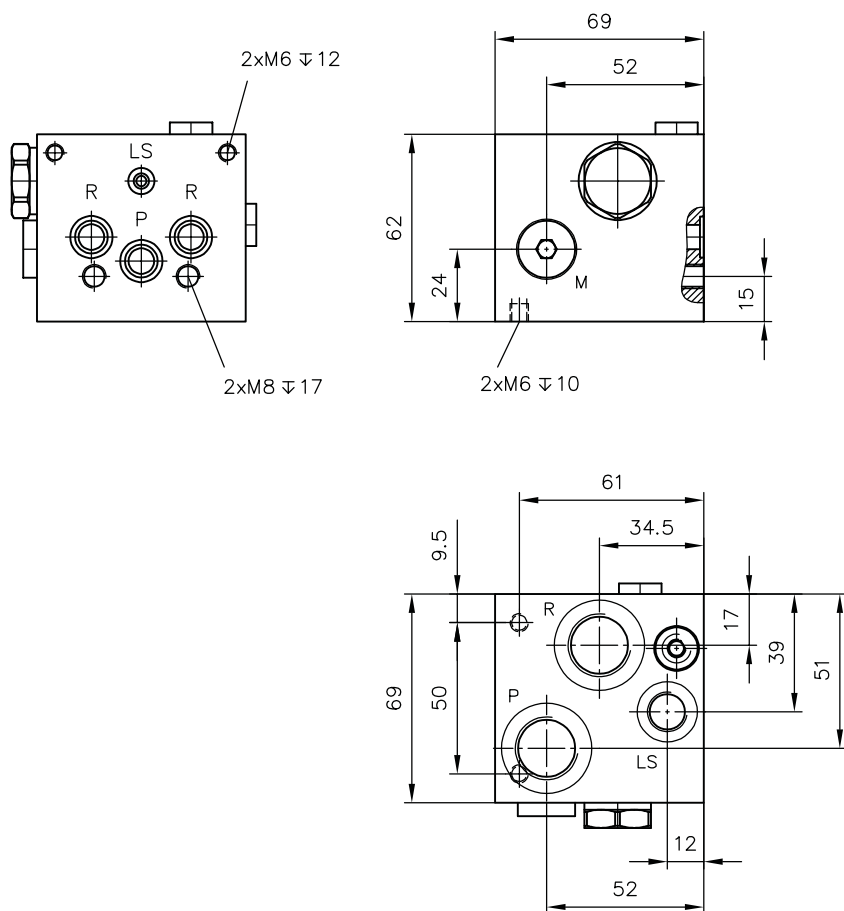
All dimensions in mm, subject to change.

4.1 Connection block

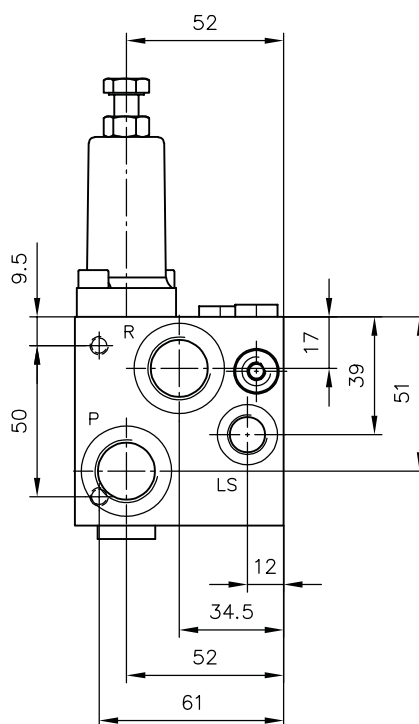
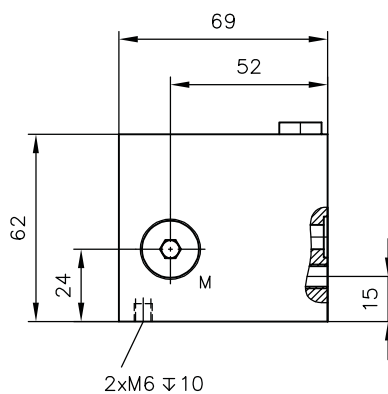
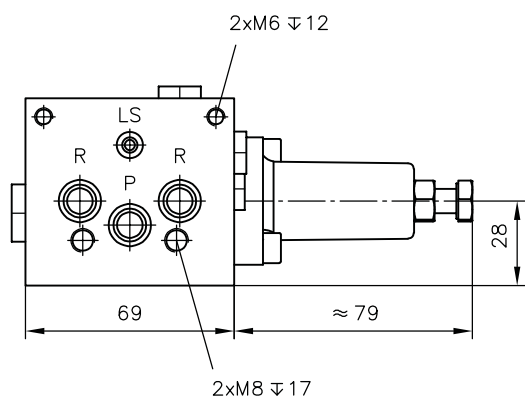
CWL 2..A50/A51



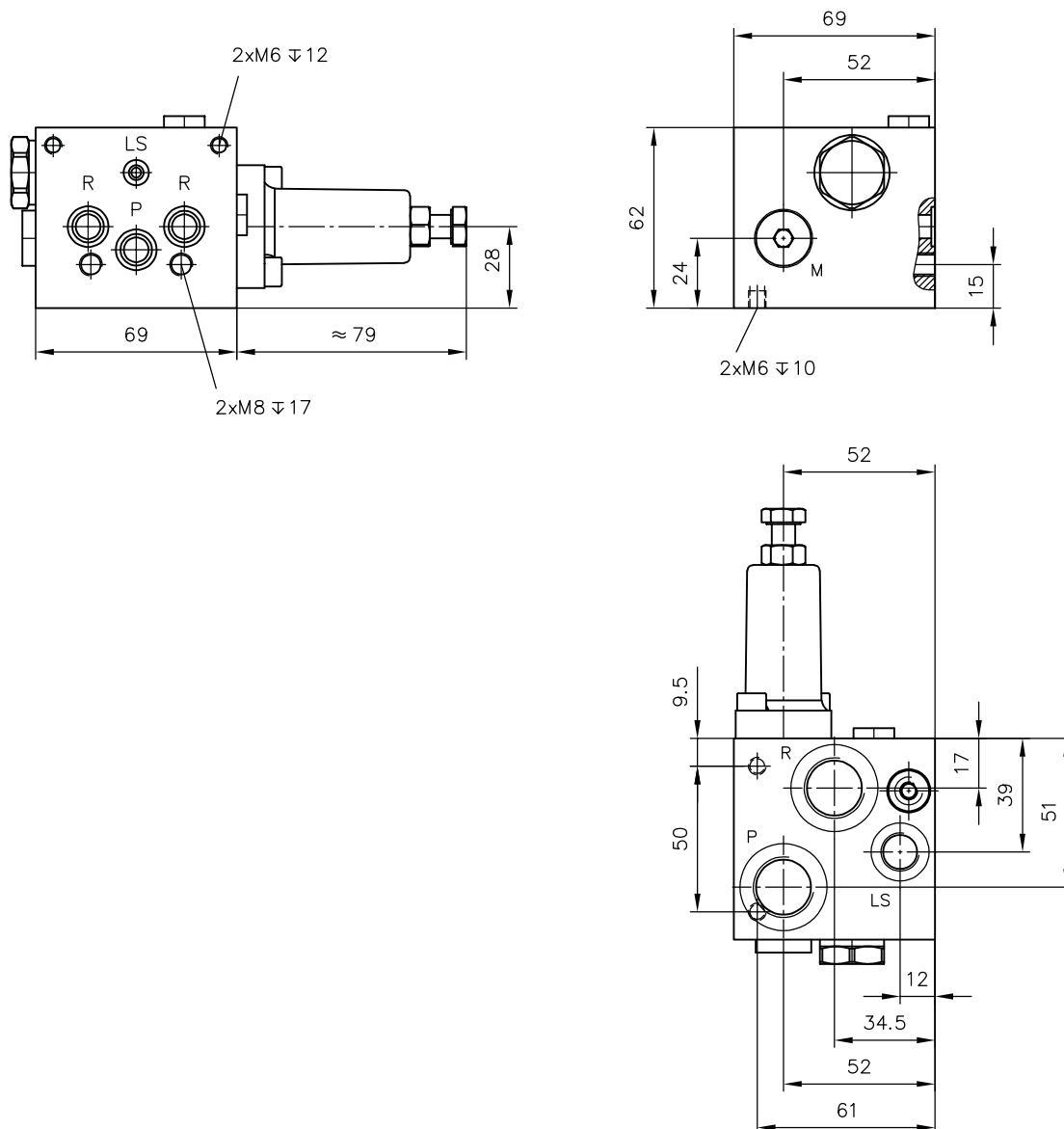
CWL 2..A52



CWL 2..A60/A61

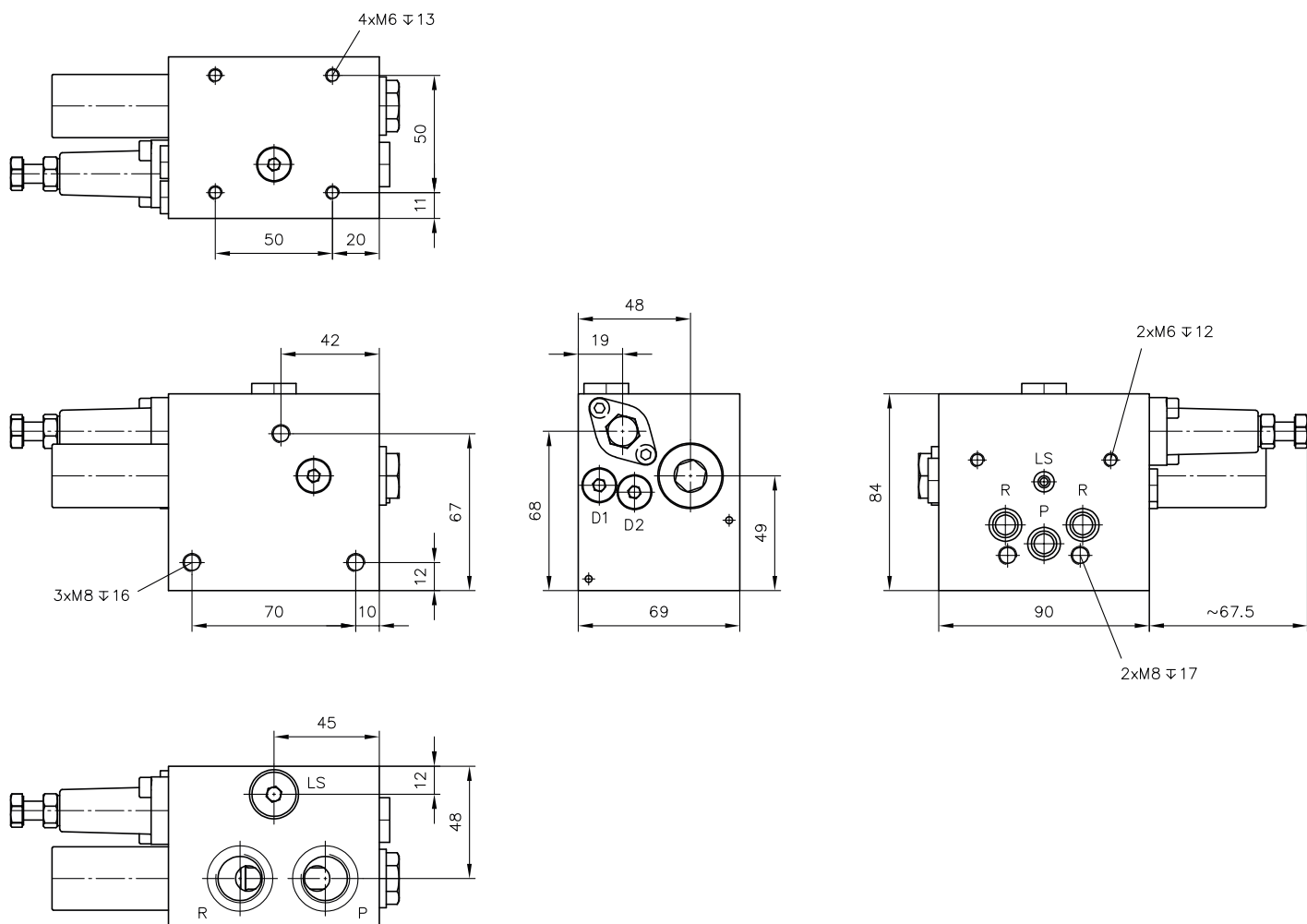


CWL 2..A62



CWL 2..CL6

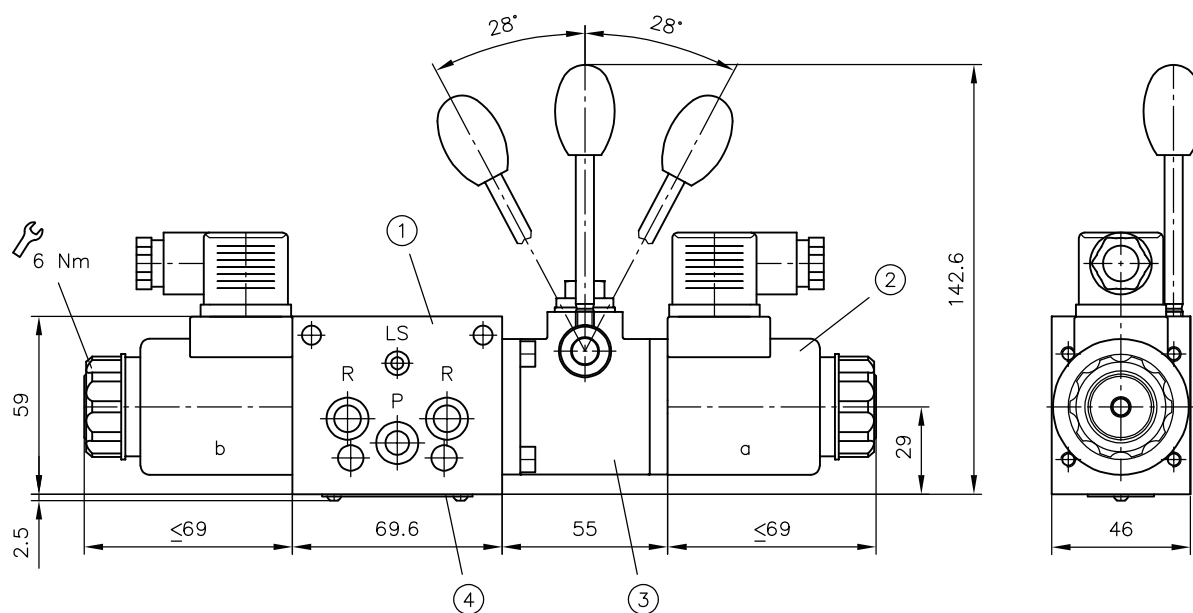
CWL 2..CV6



Connections		
P, R	G 1/2	ISO 228-1
	7/8-14 UNF-2B	SAE J 514
	G 1/2 JIS	JIS B 2351-1
LS, M	G 1/4	ISO 228-1
	7/16-20 UNF-2B	SAE J 514
	G 1/4 JIS	JIS B 2351-1

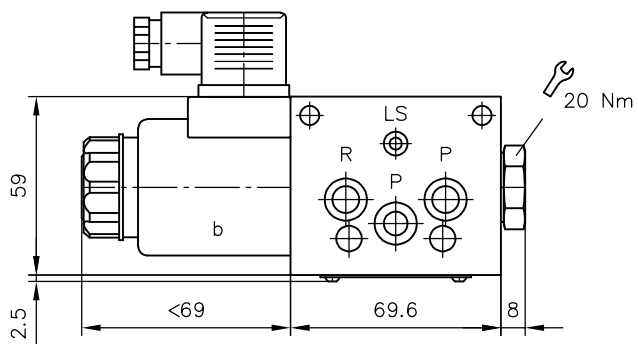
4.2 Directional valve section

4/3-way directional valve with circuit symbol G, D

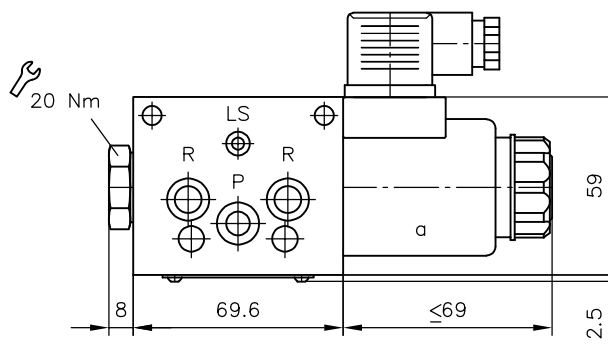


- 1 Directional valve section
- 2 Actuation
- 3 Hand lever
- 4 Type plate

4/2-way directional valve with circuit symbol W, DB, GB (function in switching positions 0 and b)

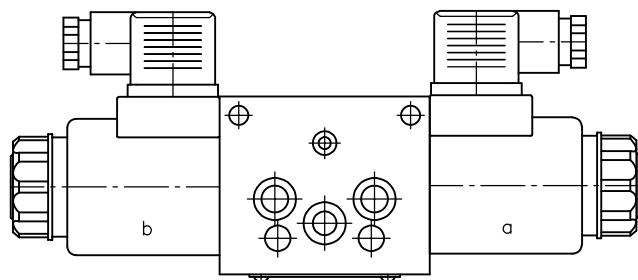


4/2-way directional valve with circuit symbol B, DW, GW (function in switching positions 0 and a)

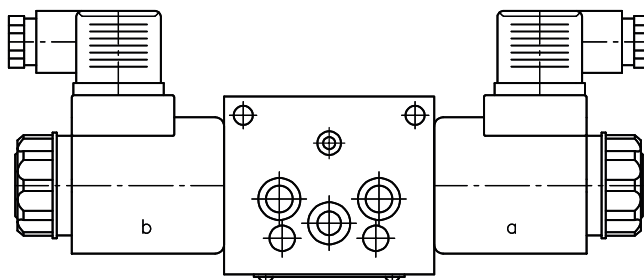


4.2.1 Actuation

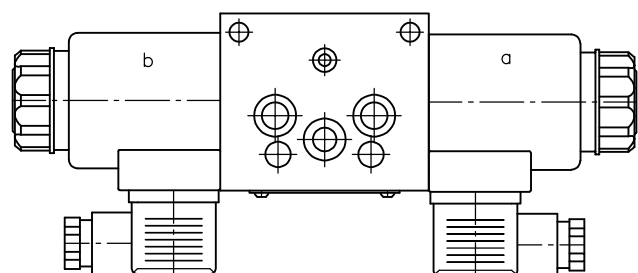
Coding **M(P)-G 12(24)**



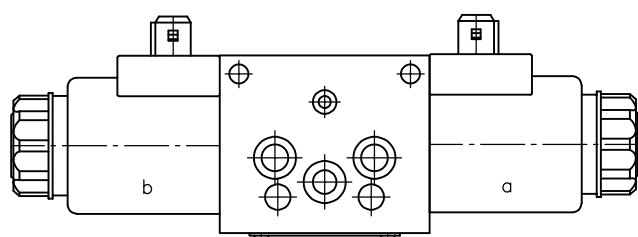
Coding **M(P)1-G 12(24)**



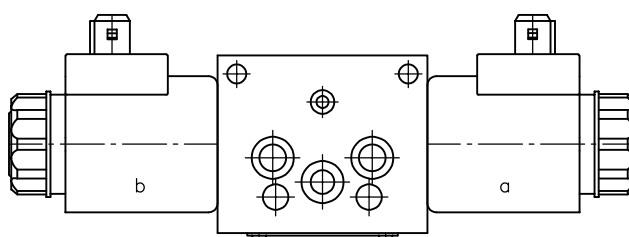
Coding **M(P)2-G 12(24)**



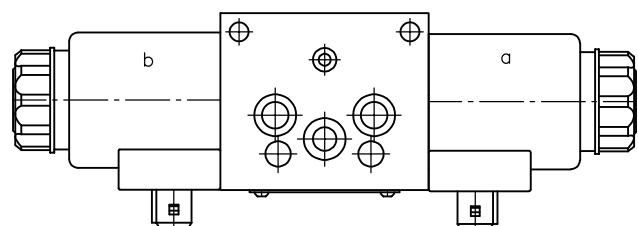
Coding **M(P)-AMP 12(24)**



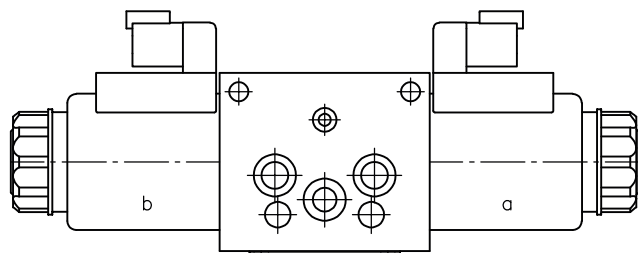
Coding **M(P)1-AMP 12(24)**



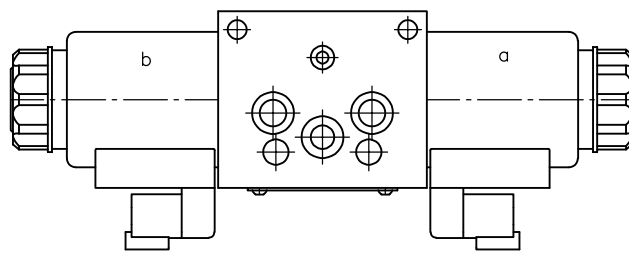
Coding **M(P)2-AMP 12(24)**



Coding **M(P)-DT 12(24)**



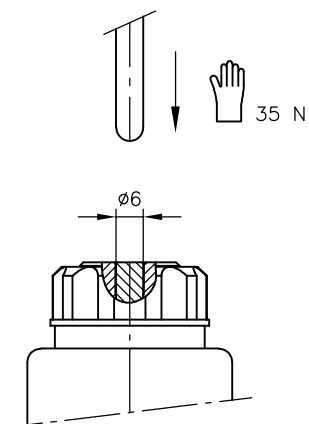
Coding **M(P)2-DT 12(24)**



Emergency actuation

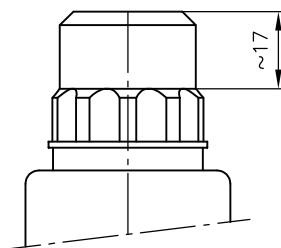
M

Auxiliary tool for actuation
 (do not use any parts with sharp edges)



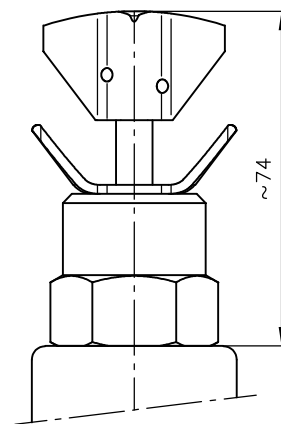
MT

Manual operation with push-button



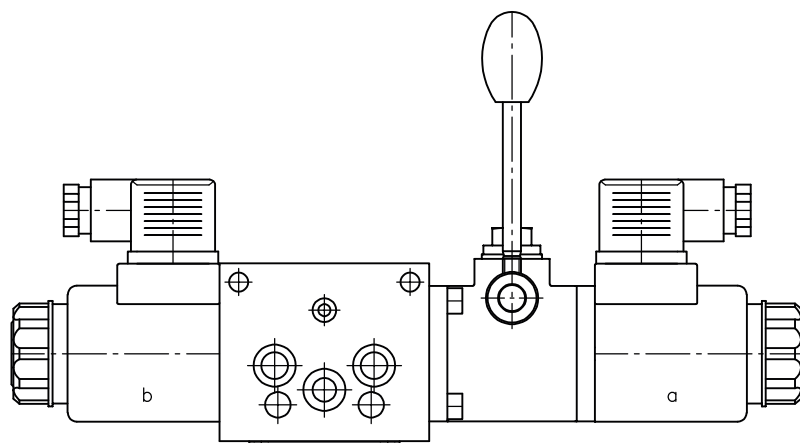
MD

Manual operation with locking function

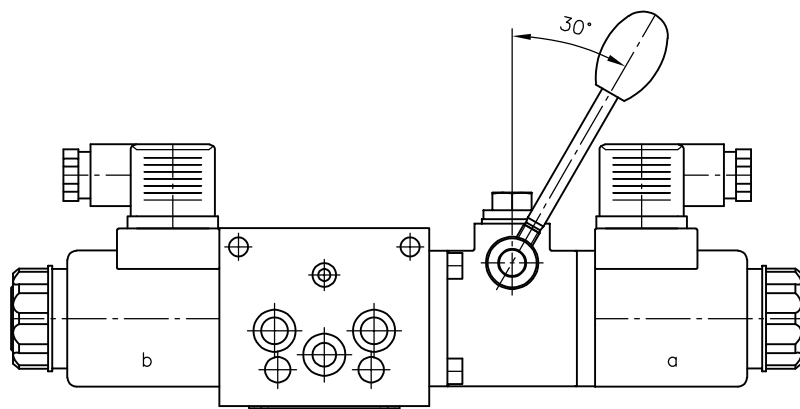


4.2.2 Hand lever

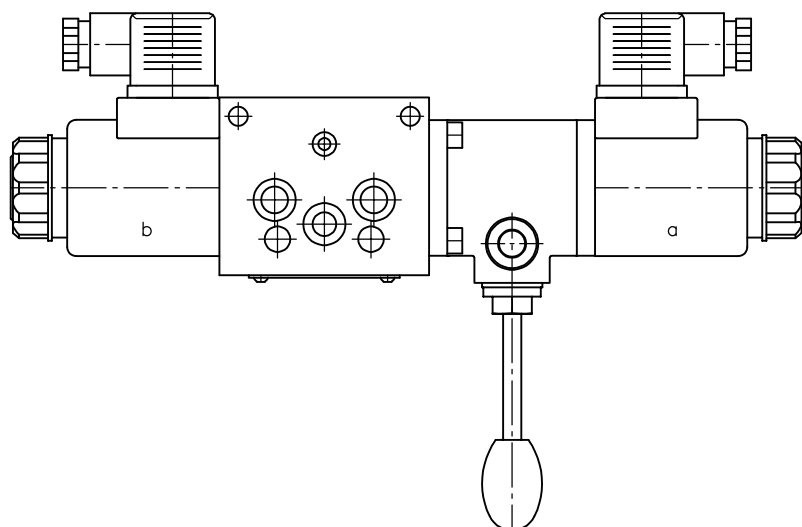
MHA



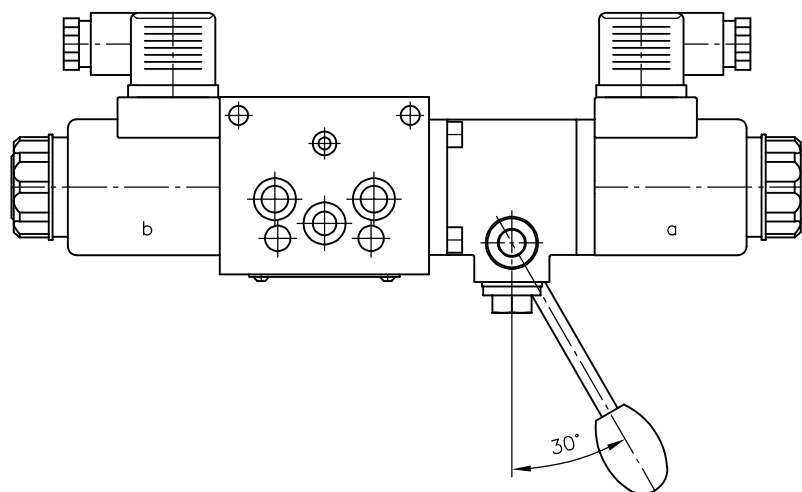
MH1A



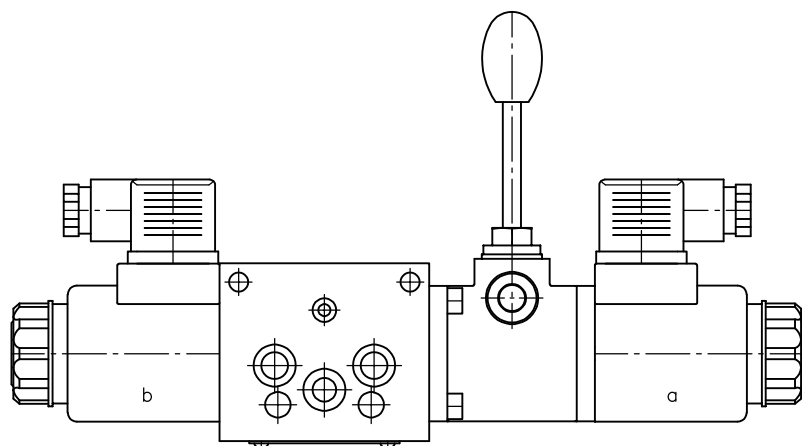
MH2A



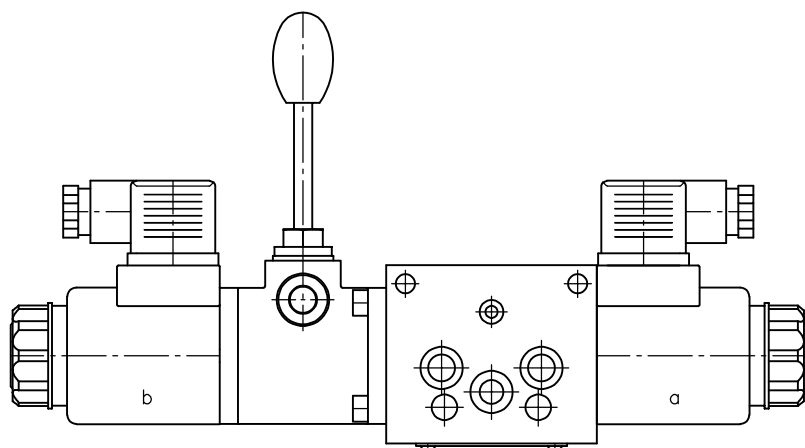
MH3A



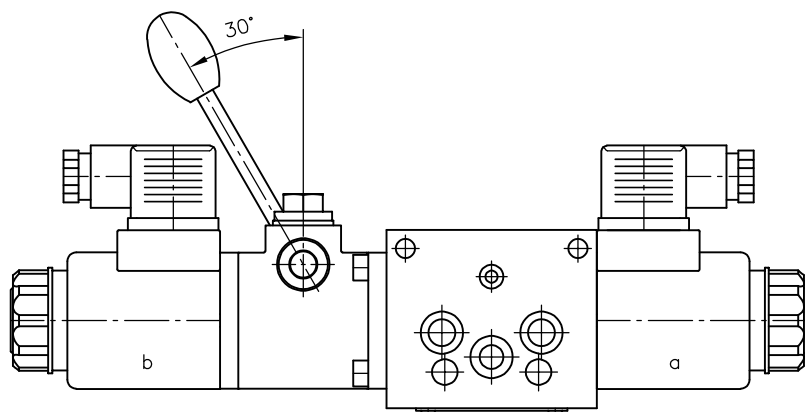
MH4A



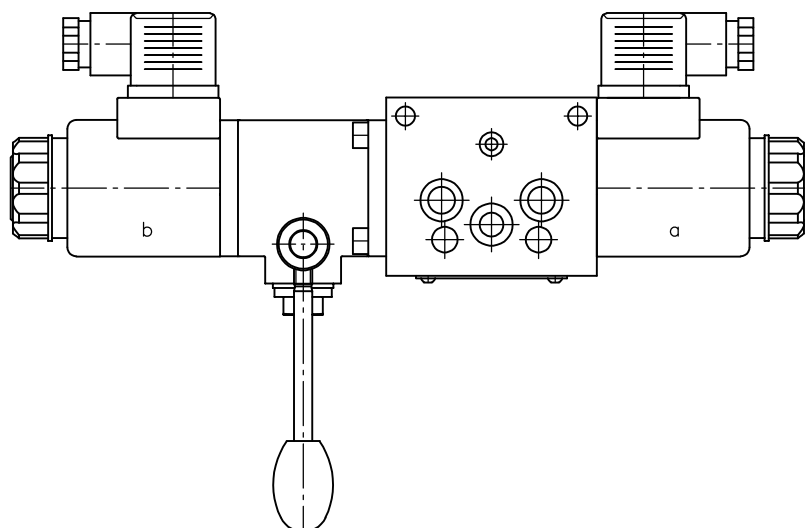
MHB



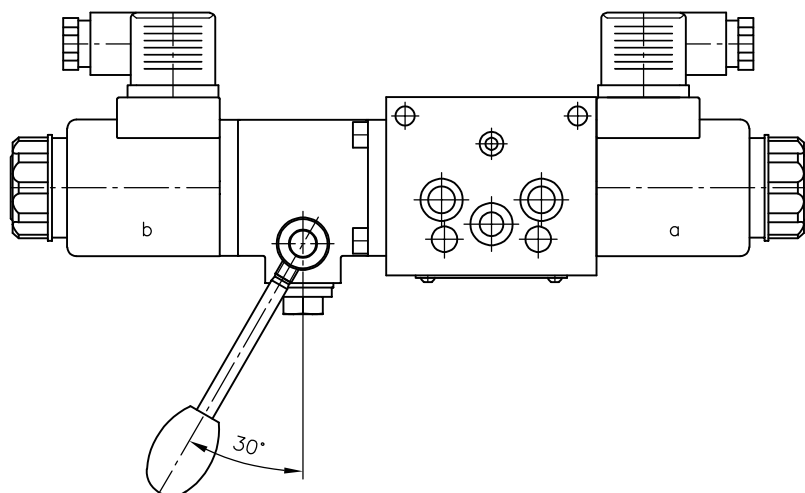
MH1B



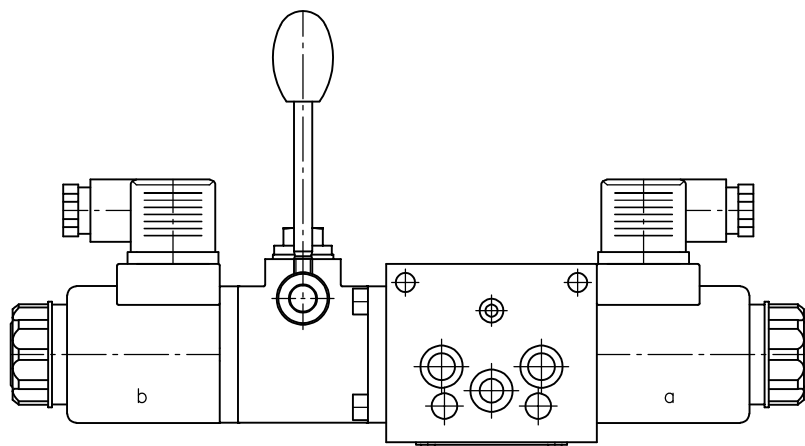
MH2B



MH3B



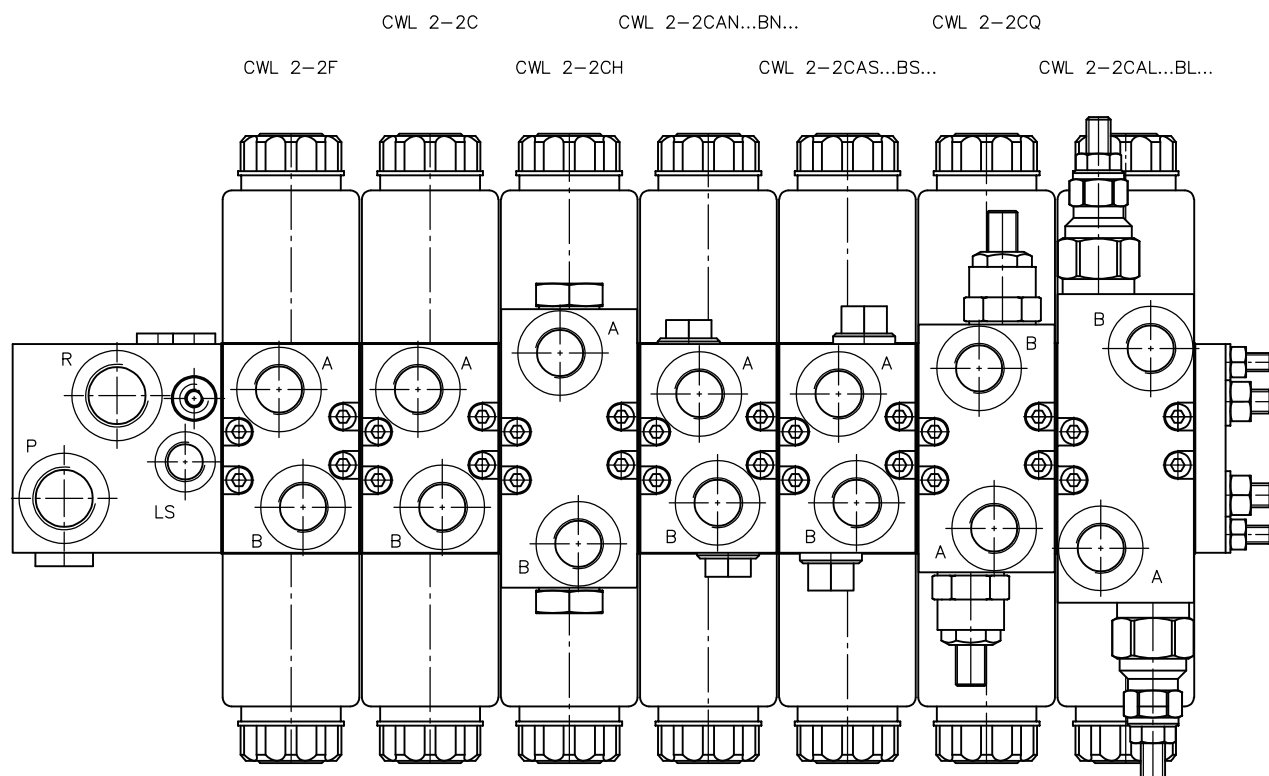
MH4B



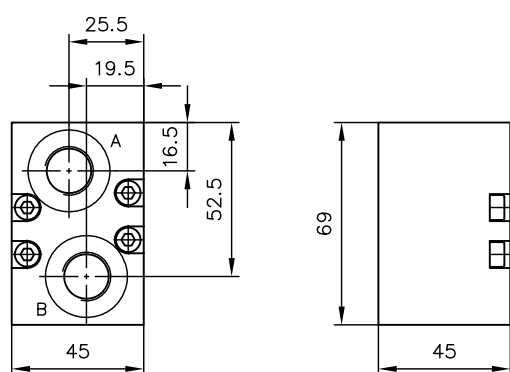
4.3 Ancillary block

see Chapter 2.4, "Ancillary block"

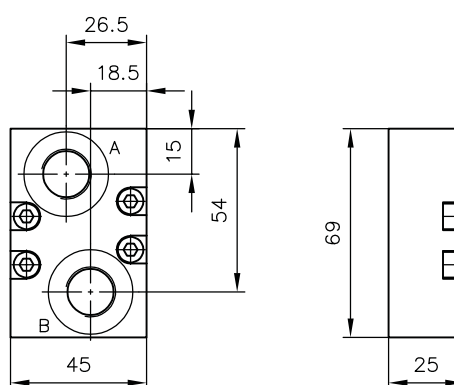
Overview drawing of the ancillary blocks



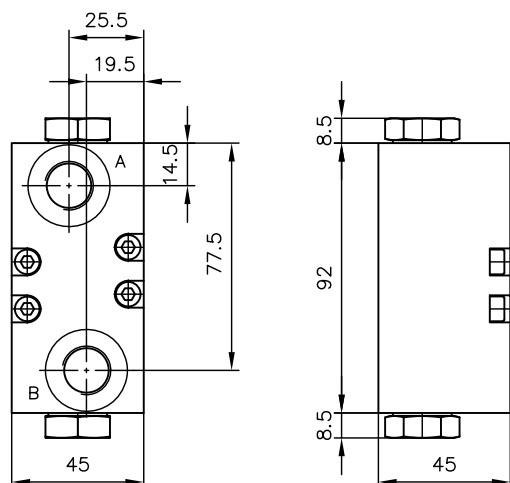
Coding **2C, UNF12C, JIS2C**



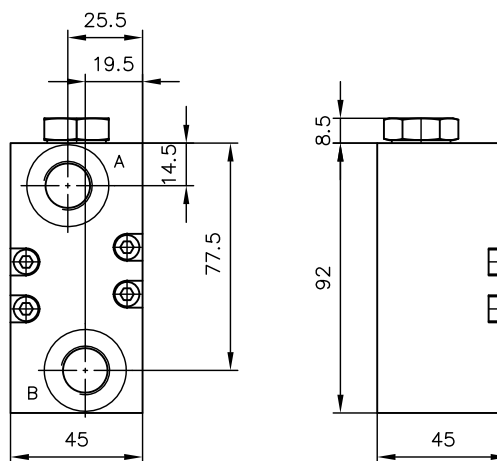
Coding **2F, UNF12F, JIS2F**



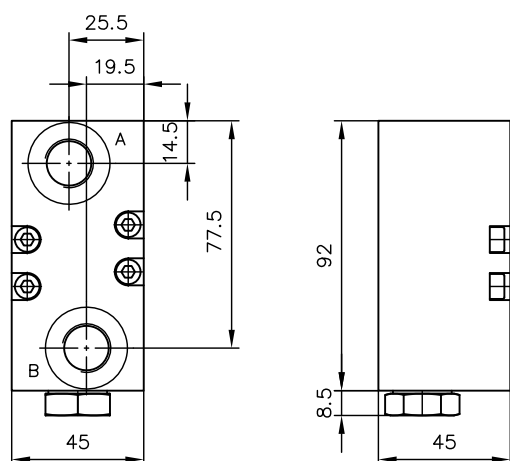
Coding **2CH, UNF12CH, JIS2CH**



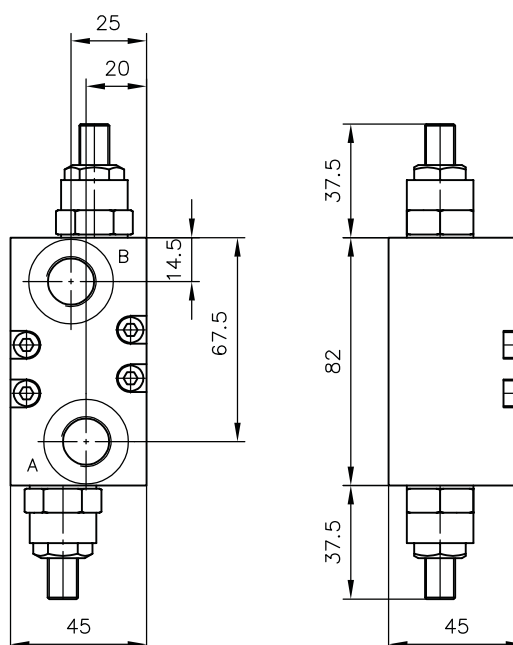
Coding **2CHA, UNF12CHA, JIS2CHA**



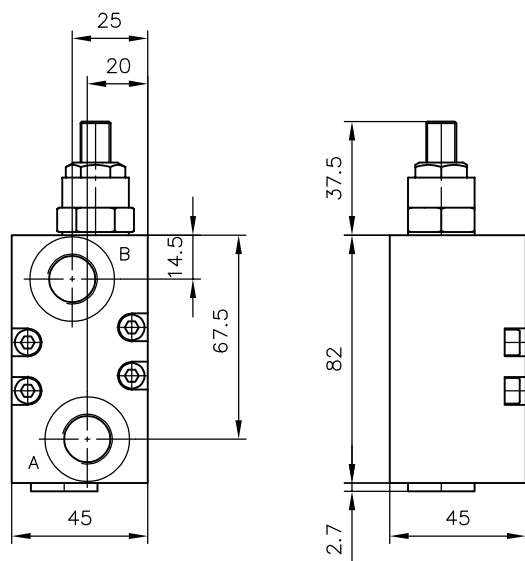
Coding **2CHB, UNF12CHB, JIS2CHB**



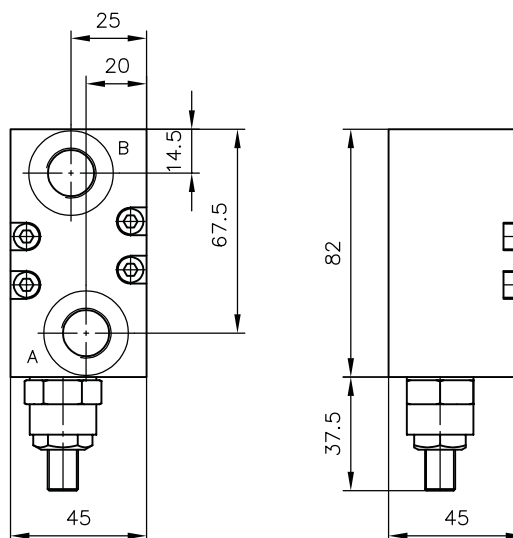
Coding **2CQ, UNF12CQ, JIS2CQ**



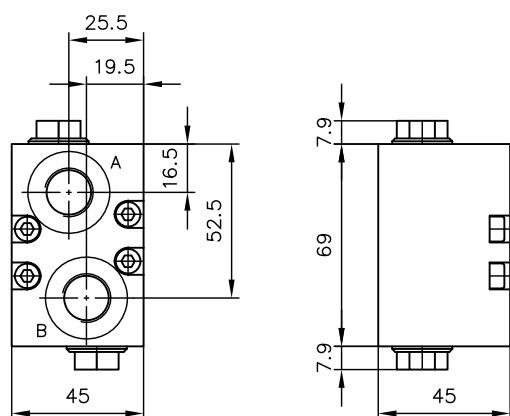
Coding **2CQB, UNF12CQB, JIS2CQB**



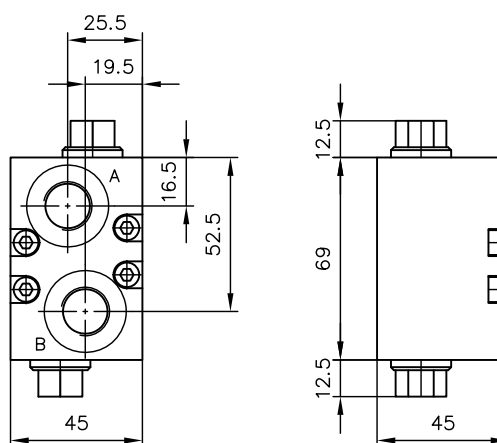
Coding **2CQA, UNF12CQA, JIS2CQA**



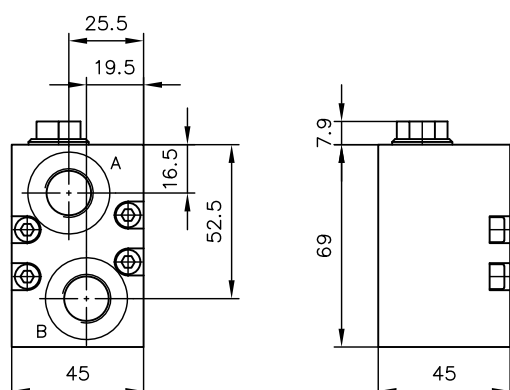
Coding **2CAN.. BN., UNF12CAN.. BN., JIS2CAN.. BN..**



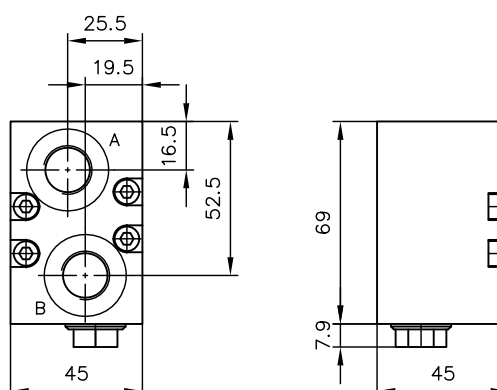
Coding **2CAS.. BS., UNF12CAS.. BS., JIS2CAS.. BS..**



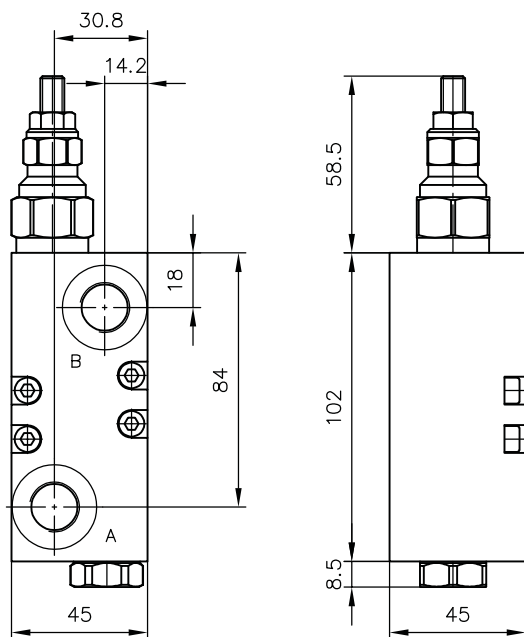
Coding **2CAN., UNF12CAN., JIS2CAN..**



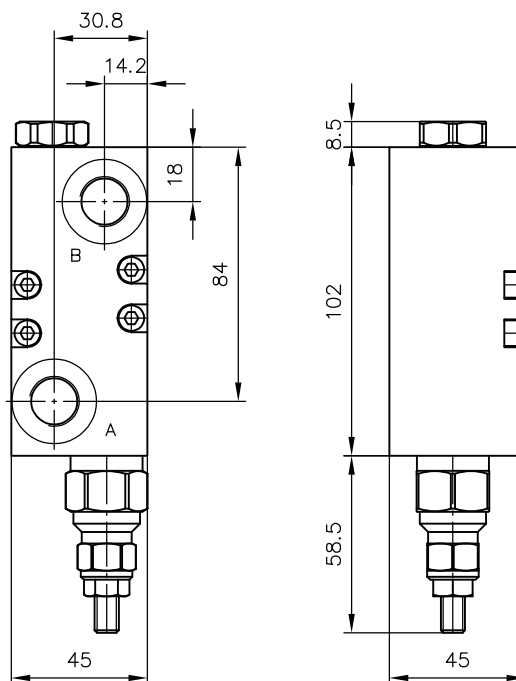
Coding **2CBN., UNF12CBN., JIS2CBN..**



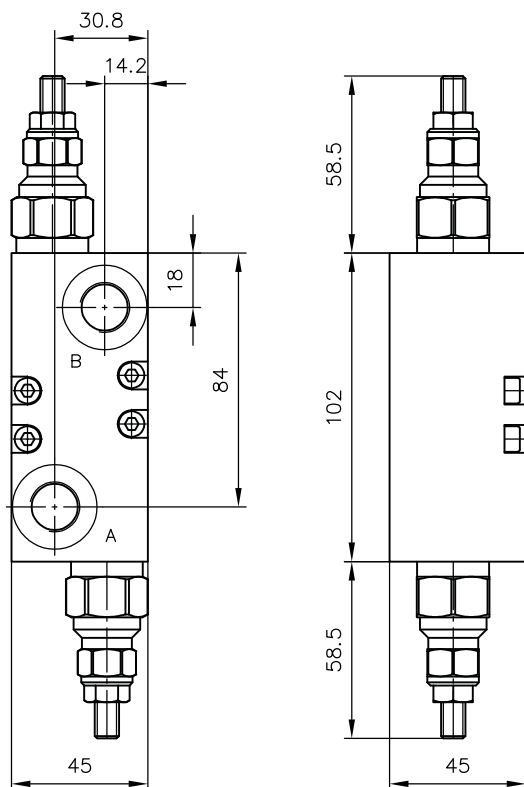
Coding **2CAL..**



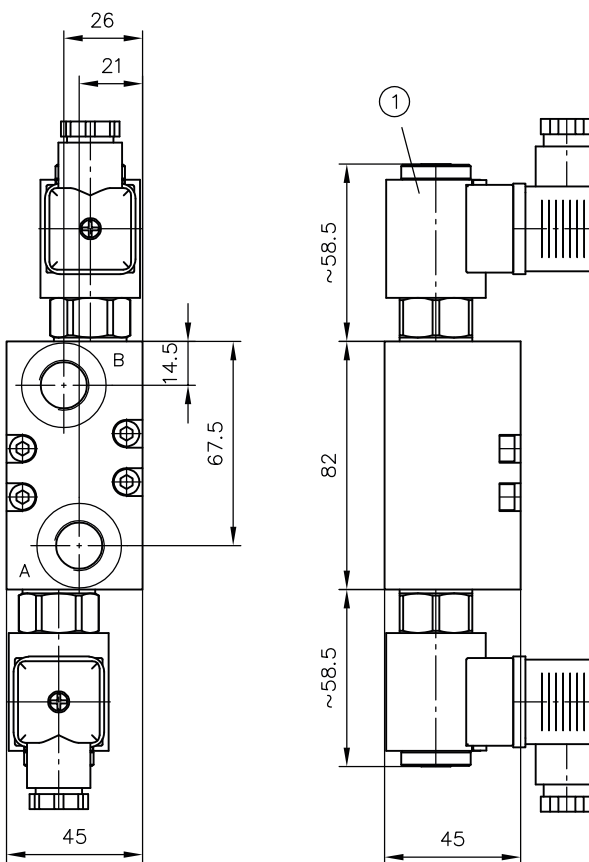
Coding **2CBL..**



Coding **2CAL..BL.., 2CAL.., 2CBL..**

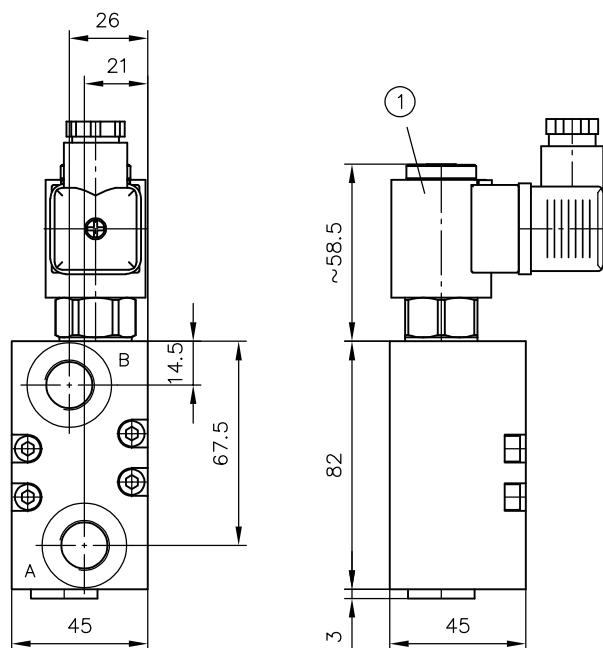


Coding **2 CVV**



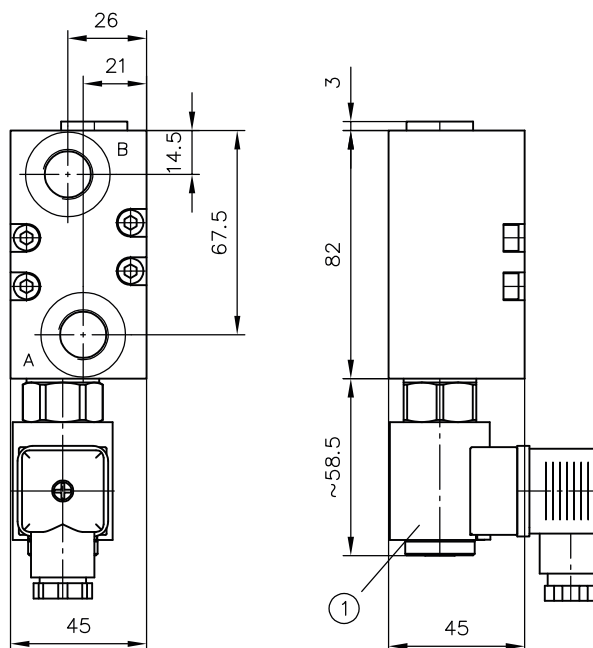
1 Actuation

Coding 2 **CVX**



1 Actuation

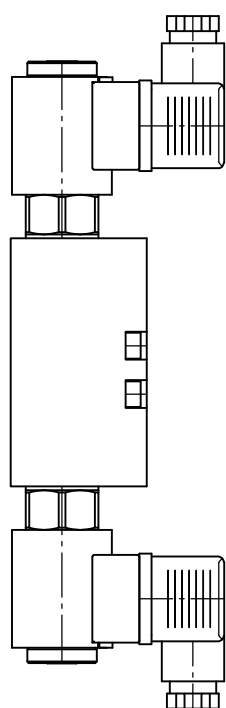
Coding 2 **CXV**



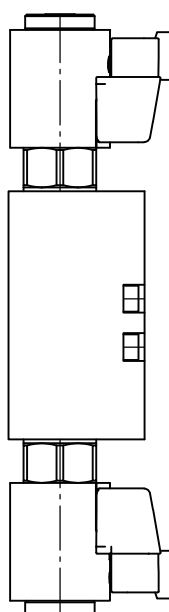
1 Actuation

	Ports A, B	
/2	G 3/8	ISO 228-1
/UNF12	SAE-6 (9/16-18 UNF-2B)	SAE J 514
/JIS2	G 3/8	JIS B 2351

Solenoid version **G**

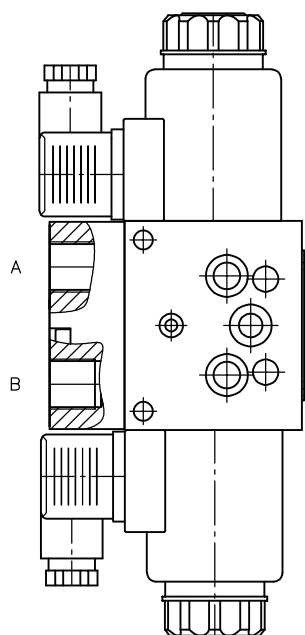


Solenoid version **DT**

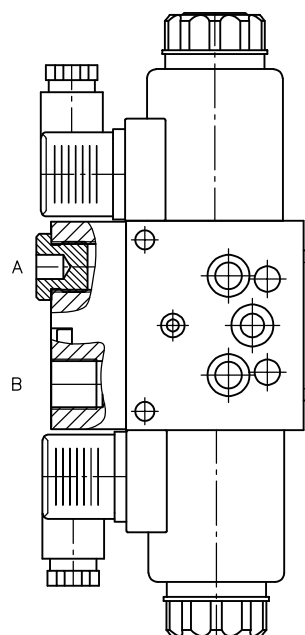


4.3.1 Seal of consumer ports

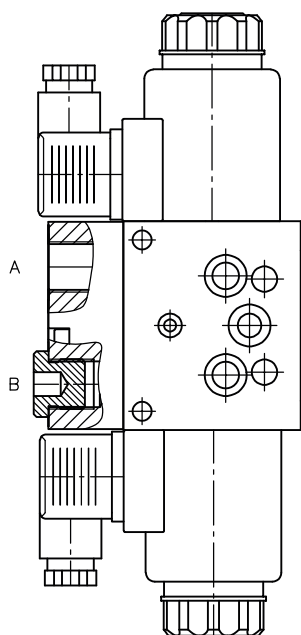
Without coding



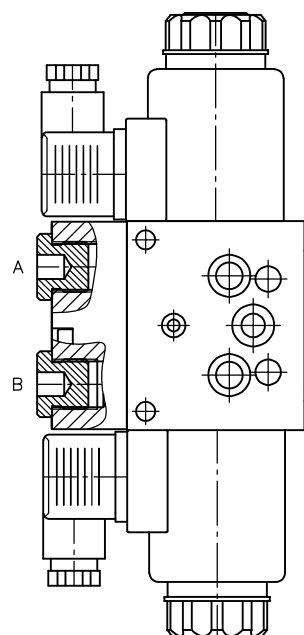
Coding A



Coding B



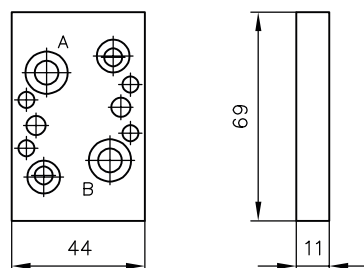
Coding C



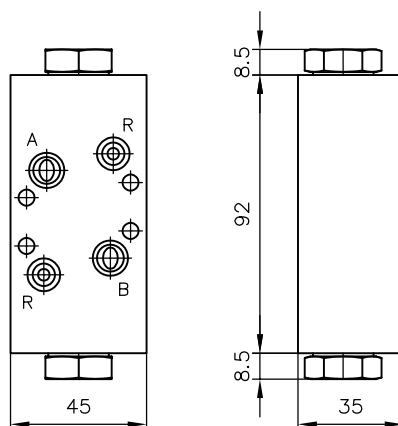
4.4 Intermediate plate

see Chapter 2.5, "Intermediate plate"

Coding **ZC11**

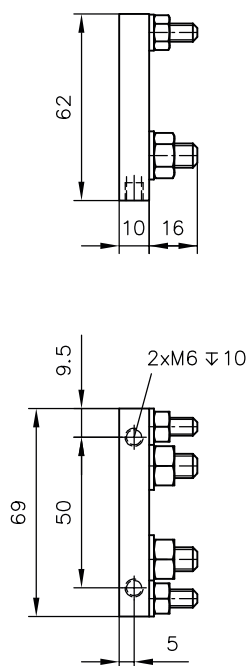


Coding **ZCH**

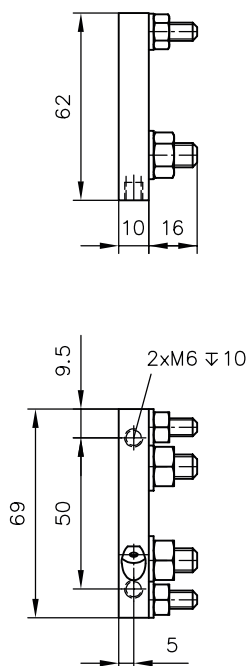


4.5 End plate

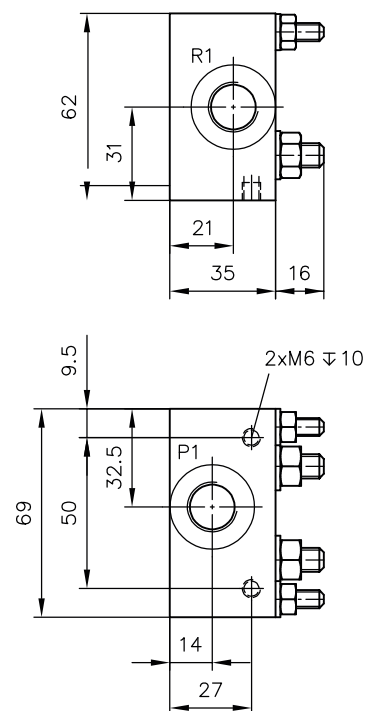
Coding **1**



Coding **11**



Coding **22, UNF 22, JIS 22**



Coding	Ports		
	P1, R1	LS	
22	G 3/8	G 1/4	ISO 228-1
UNF 22	SAE-8 (3/4-16 UNF-2B)	SAE-4 (7/16-20)	SAE J 514
JIS 22	G 3/8 JIS	G 1/4 JIS	JIS B 2351-1

5**Installation, operation and maintenance information**

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

5.1 Intended use

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

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

Essential requirements for the product to function correctly and safely:

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

If the product can no longer be operated safely:

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

5.2 Assembly information

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

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

**DANGER****Sudden movement of the hydraulic drives when disassembled incorrectly**

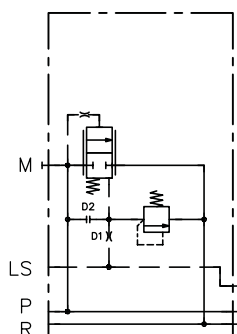
Risk of serious injury or death

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

5.2.1 Conversion of the connection block of CL6 and CV6

The connection block type CWL 23 CL6 and CWL 2UNF3 CL6 or CWL 2JIS3 CL6 can be converted at any time into a connection block for variable pump systems (correct type then type CWL 23 CV6 and CWL 2UNF3 CV6 or CWL 2JIS3 CV6). To do so, change or swap the parts listed below.

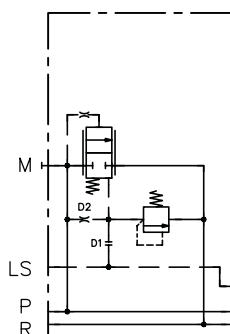
CWL 23 CL6



D1: Orifice M6x0.8

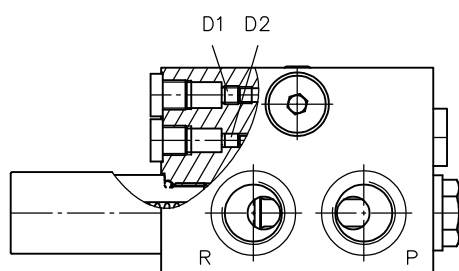
D2: sealed

CWL 23 CV6



D1: sealed

D2: Orifice M6x0.8



5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.

The instructions for the complete technical system must also always be followed.

NOTICE

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

CAUTION

Overloading components due to incorrect pressure settings.

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

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

Purity and filtering of the hydraulic fluid

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

Examples of fine contamination include:

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

! NOTICE

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

Damage to the product is possible.

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

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

Additionally applicable document: [D 5488/1](#) oil recommendations

5.4 Maintenance information

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

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

References

Additional versions

- Directional spool valve banks type CWS: D 7951 CWS
- Proportional directional spool valve type EDL: D 8086
- Proportional directional spool valves types PSL, PSV size 2: D 7700-2
- Proportional directional spool valves types PSL/PSV/PSM, size 3: D 7700-3
- Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5
- Proportional directional spool valve type PSLF, PSVF and SLF size 3: D 7700-3F
- Proportional directional spool valve type PSLF, PSVF and SLF size 5: D 7700-5F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F
- Pressure-limiting valve (installation kit) type MV: D 7000 E/1

