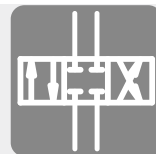


Directional spool valves type CWS

Product documentation



Series connection

Operating pressure p_{\max} :

315 bar

Flow rate Q_{\max} :

80 lpm



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Printing date / document generated on: 29.10.2020

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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 CWS with series connection is actuated directly. The consumers are black/white controlled. A range of connection blocks and ancillary blocks offer a wide range of applications.

Features and benefits:

- One valve for different control functions
- Modular system with numerous variants and combination possibilities
- Compact and robust design
- Robust and long-lasting design

Intended applications:

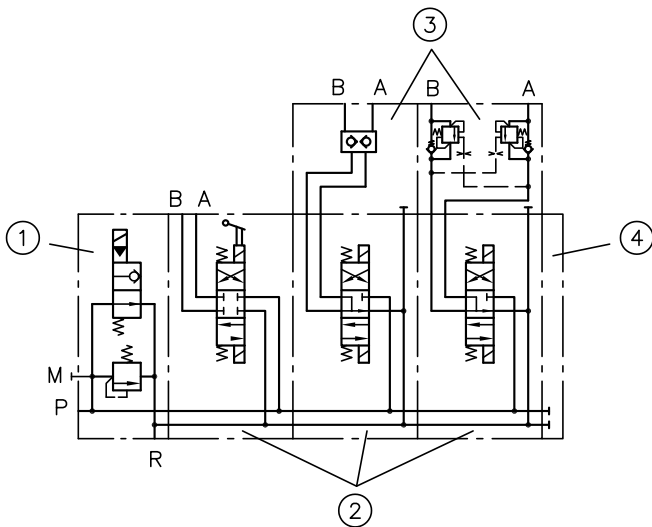
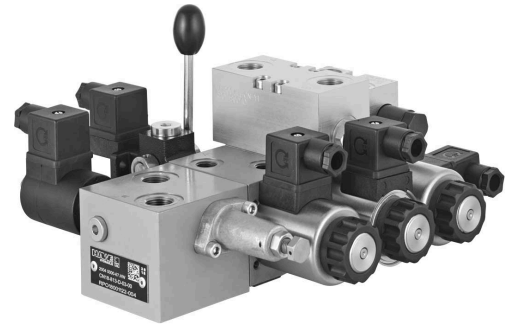
- Municipal trucks
- Machines for forestry and agricultural purposes
- Elevating work platforms
- Industrial vehicles
- Construction machines



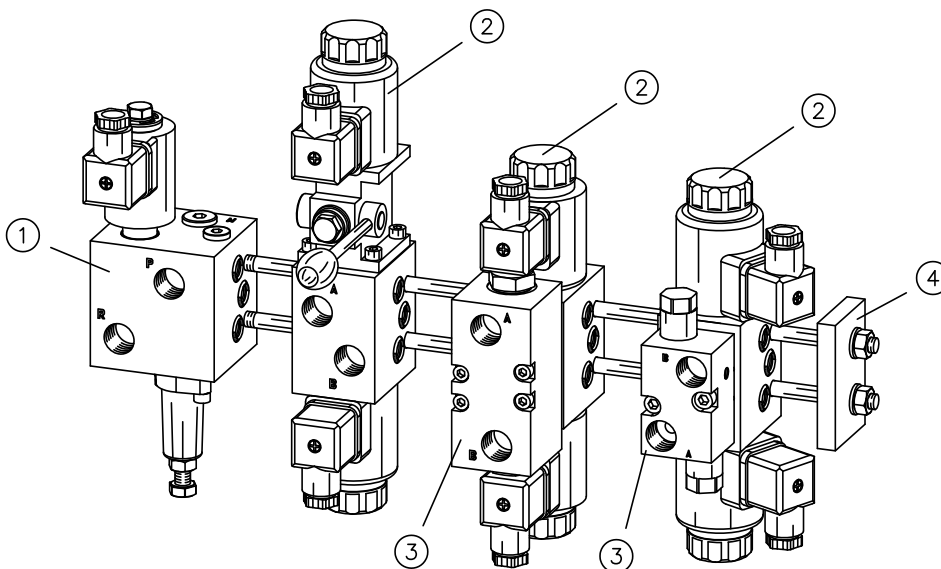
Directional spool valves type CWS

1.1 Configuration example

CWS 22 S6/300
 - G/MHA/0/02
 - D/M1/0/2CH
 - D/M/0/2AL A4-250-BL A4-250
 - 1 - G 24



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



2 Available versions, main data

2.1 Order coding valve bank, overview

Order coding example:

CWS 22 A6/H 200	- G/M/0/02	- 1	- X 24
			Solenoid voltage and solenoid version 2.6 "Solenoid voltage and solenoid version", Page 19
		End plate	2.5 "End plate", Page 18
	Valve section		2.3 "Valve section", Page 10
Connection block			2.2 "Connection block", Page 6

NOTE

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

2.2 Connection block

Order coding example:

CWS 2	2	A6	
CWS 2	UNF2	A5	/H 200
CWS 2	L JIS3	SP6	/100
			Pressure-limiting valve "Table 4"
		Connection block basic types	"Table 3"
	Material and ports		"Table 2"
Basic version and size			"Table 1"

Table 1 Basic version and size

Type	Description	Flow rate Q _{max} (lpm)
CWS 2	Directional spool valve type CWS 2, size 2	80

Table 2 Material and ports

Coding	Material of connection block	Ports P, R	Flow rate Q _{max} (lpm)	Pressure p _{max} (bar)
2	Steel	G 3/8	40	315
3		G 1/2	80	
UNF3		SAE-10 (7/8-14 UN-2B)	80	
JIS3		G 1/2 JIS	80	
L2	Aluminium	G 3/8	40	210
L3		G 1/2	80	
L4		G 3/4	100	
L UNF3		SAE-10 (7/8-14 UN-2B)	80	
L JIS3		G 1/2 JIS	80	

i NOTE

- Thread in accordance with ISO 228-1 (BSPP), SAE J 514 (UNF) or B 2351 (JIS)
- Depending on the circuit symbol, the individual flow rate permitted may be smaller.

Table 3 Connection block basic types

Coding	Description
CWS 2(L)2 A5 CWS 2(L)3 A5 CWS 2(L) UNF3 A5 CWS 2(L) JIS3 A5	Connection block without additional valves
CWS 2(L)2 A6/...	Connection block with pressure-limiting valve type MVF 5 C or MVB 5 C as per D 7000 E/1
CWS 2(L)3 A6/... CWS 2(L) UNF3 A6/... CWS 2(L) JIS3 A6/...	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C as per D 7000 E/1
CWS 2(L)2 S6/...	Connection block with pressure-limiting valve type MVF 5 C or MVB 5 C as per D 7000 E/1 and idle circulation valve (normally open). <ul style="list-style-type: none"> ▪ S6: EM 21 S as per D 7490/1 ▪ SB6: EM 21 S with additional detented manual override ▪ ST6: EM 21 ST as per D 7490/1
CWS 2(L)2 V6/...	Connection block with pressure-limiting valve type MVF 5 C or MVB 5 C as per D 7000 E/1 and idle circulation valve (normally closed) type EM 21 V as per D 7490/1
CWS 2(L)3 S6/... CWS 2(L) UNF3 S6/... CWS 2(L) JIS3 S6/...	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C as per D 7000 E/1 and idle circulation valve (normally open). <ul style="list-style-type: none"> ▪ S6: EM 31 S as per D 7490/1 ▪ SB6: EM 31 S with additional detented manual override ▪ ST6: EM 31 ST as per D 7490/1
CWS 2(L)3 V6/... CWS 2(L) UNF3 V6/... CWS 2(L) JIS3 V6/...	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C as per D 7000 E/1 and idle circulation valve (normally closed) type EM 31 V as per D 7490/1
CWS 2(L)2 SP6/...	Connection block with pressure-limiting valve type MVF 5 C or MVB 5 C as per D 7000 E/1 and electro-proportional idle circulation valve (normally open). <ul style="list-style-type: none"> ▪ SP6: EMP 21 S as per D 7490/1 ▪ SPB6: EMP 21 S with additional detented manual override

Coding	Description
CWS 2(L)2 VP6/...	Connection block with pressure-limiting valve type MVF 5 C or MVB 5 C as per D 7000 E/1 and electro-proportional idle circulation valve (normally closed) type EMP 21 V as per D 7490/1
CWS 2(L)3 SP6/... CWS 2(L) UNF3 SP6/... CWS 2(L) JIS3 SP6/...	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C as per D 7000 E/1 and electro-proportional idle circulation valve (normally open). <ul style="list-style-type: none"> ▪ SP6: EMP 31 S as per D 7490/1 ▪ SPB6: EMP 31 S with additional detented manual override
CWS 2(L)3 VP6/... CWS 2(L) UNF3 VP6/... CWS 2(L) JIS3 VP6/...	Connection block with pressure-limiting valve type MVF 6 C or MVB 6 C as per D 7000 E/1 and electro-proportional idle circulation valve (normally closed) type EMP 31 V as per D 7490/1
CWS 2L4(H)(R)6/....	Connection block with pressure-limiting valve and two 2/2-directional seated valves. Typical usage is lifting and lowering a single-acting cylinder. <ul style="list-style-type: none"> ▪ Without coding: Manual emergency drain adjustable using tool ▪ H: Manual emergency drain adjustable using rotary knob ▪ R: with check valve in P (type RB 2 as per D 7445) <p>The two 2/2-directional seated valves are available in the following versions:</p> <ul style="list-style-type: none"> ▪ V: EM 31 V as per D 7490/1 ▪ PV: EMP 31 V 80 as per D 7490/1 ▪ PV100: EMP 31 V 100 as per D 7490/1 ▪ XC: locking tapped plug (passage sealed) ▪ XO: tapped plug (passage open) <p>The first coding describes the valve in the inlet (P → H). The second coding describes the valve in the outlet (P → H).</p> <p>Example order coding: CWS 2L4HR6/200-PVPV</p>

Circuit symbols

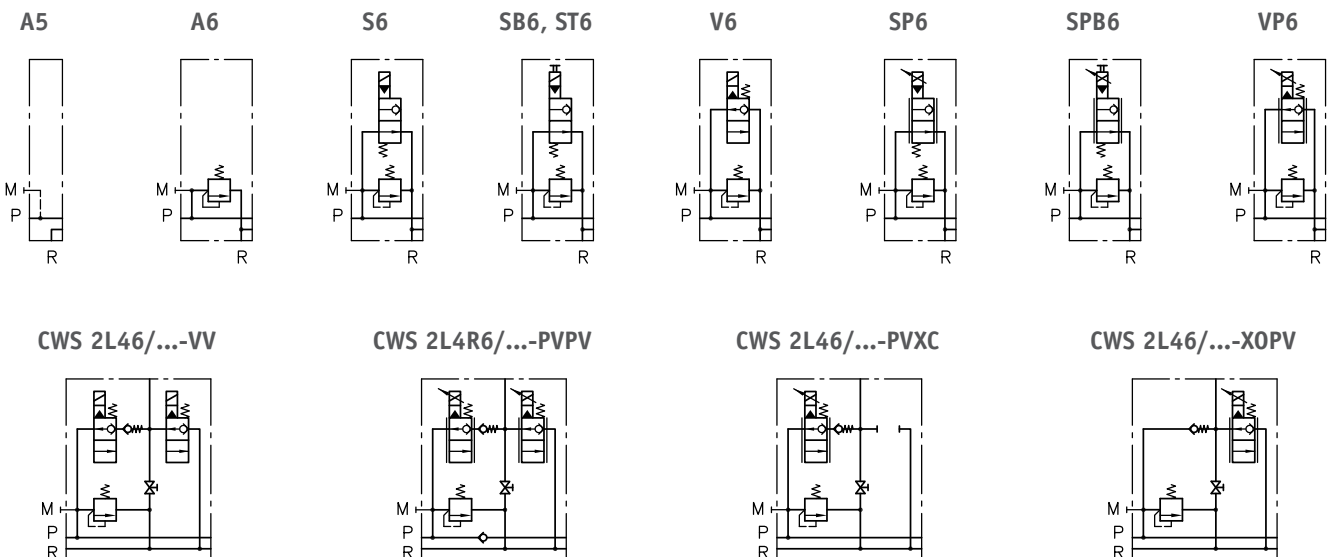


Table 4 Pressure-limiting valve

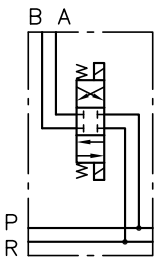
Coding	Description
/...	Standard pressure-limiting valve (type MVF 5 C or MVF 6 C as per D 7000 E/1) Max. permissible return pressure $p_R = 20$ bar (adjustment range 50 to 315 bar)
H/...	Pressure-limiting valve for increased return pressure (type MVB 5 C or MVB 6 C as per D 7000 E/1) Max. permissible return pressure $p_R = 200$ bar (adjustment range 50 to 315 bar)

2.3 Valve section

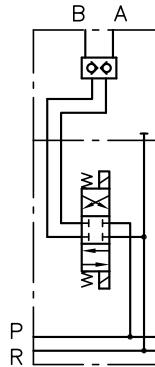
The directional valve section ([Chapter 2.3.1](#)) is either available with integrated threads for the consumer ports A and B, or with a flange surface for mounting an ancillary block ([Chapter 2.3.2](#)) or an intermediate plate ([Chapter 2.3.3](#)).

Valve section

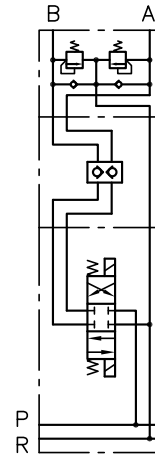
with integrated threads



with ancillary block



with intermediate plate and ancillary block



2.3.1 Directional valve section

Order coding example:

CWS 2...	- D	/M	HA	/0/02	/2 CH	A	- 1	- X 24
CWS 2...	- D	/M	HA	/0	/2 CH	A	- 1	- DT 12

Solenoid voltage and solenoid version

- [Chapter 2.6, "Solenoid voltage and solenoid version"](#)
- [Chapter 3.3, "Electrical parameters"](#)

Seal of consumer ports ["Table 9"](#)

Ancillary block [Chapter 2.3.2, "Ancillary block"](#)

Additional functions and consumer ports ["Table 8"](#)

Hand lever ["Table 7"](#)

Actuation ["Table 6"](#)

Circuit symbol ["Table 5"](#)

Table 5 Circuit symbol

W	B	G	D	H	HW	HB	GW	GB	L	X

NOTE

Circuit symbol X is only possible in conjunction with electrical and manual actuation, e.g. MHA (see ["Table 6 Actuation"](#) and ["Table 7 Hand lever"](#))

Table 6 Actuation


Coding	Description	Combination options	Circuit symbol
M	Electrical actuation. Plug position inside on spool block and upwards in the direction of the consumer ports (standard version)	In conjunction with a) the solenoid version DT (see Chapter 2.6, "Solenoid voltage and solenoid version") and b) ancillary blocks with coding /(L)2CH, /(L)2CHA, /(L2)CHB, /2 AL... BL..., /2 AL... and /2 BL... (see 2.3.2 "Ancillary block") two additional spacer plates with coding /ZC11 (see 2.3.3 "Intermediate plate") are necessary to prevent a collision between the magnetic plug and ancillary block.	M, M1, M2
MT	Electrical actuation with manual override. Plug position inside on spool block and upwards in the direction of the consumer ports (standard version)		MT, MT1, MT2
M1	Electrical actuation. Plug position outside and upwards in the direction of the consumer ports	Only in conjunction with <ul style="list-style-type: none"> solenoid version X, G or AMP (see Chapter 2.6, "Solenoid voltage and solenoid version") 	
MT1	Electrical actuation with manual override. Plug position outside and upwards in the direction of the consumer ports		
M2	Electrical 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 "Table 12 Mounting bracket"	
MT2	Electrical actuation with manual override. Plug position inside on spool block and downwards.		

NOTE

The manual override with coding MT, MT1, MT2 cannot be combined with manual actuation with coding H as per ["Table 7"](#).

See dimension diagram [30](#)

Table 7 Hand lever

Coding	Description	Combination options	Circuit symbol
No designation	Without manual actuation (standard version).	--	--
HA	Manual actuation on A-side.	Only in conjunction with <ul style="list-style-type: none"> Valve sections without ancillary blocks (coding 02, 0UNF12 or 0JIS2 as per "Table 8 Additional functions and consumer ports") 	
H1A	Manual actuation on A-side. Hand lever mounted at 30° angle to outside.	Only in conjunction with <ul style="list-style-type: none"> Valve sections without ancillary blocks (coding 02, 0UNF12 or 0JIS2 as per "Table 8 Additional functions and consumer ports") or The ancillary blocks /2C and /(L)2CHB <p>When using the intermediate plate /(L)ZCH or ancillary blocks /(L)2CH or /(L)2CHA an additional spacer plate with coding /ZC11 (see 2.3.3 "Intermediate plate") is necessary to prevent a collision between the hand lever and intermediate plate/ancillary block.</p>	
H2A	Manual actuation on A-side. Lever housing rotated through 180°.	Can be combined with all valve sections, ancillary blocks and intermediate plates.	
H3A	Manual actuation on A-side. Lever housing rotated through 180° and hand lever mounted at 30° angle to outside.	Can be combined with all valve sections, ancillary blocks and intermediate plates.	
H4A	Manual actuation on A-side. Hand lever on opposite side (on side of the connection block)	Only in conjunction with <ul style="list-style-type: none"> Valve sections without ancillary blocks (coding 02, 0UNF12 or 0JIS2 as per "Table 8 Additional functions and consumer ports") 	

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

NOTE
Manual actuations with coding HA, H1A, H2A, H3A and H4A cannot be combined with a manual override with coding MT, MT1 or MT2 as per ["Table 6 Actuation"](#).

See dimension diagram [29](#).

Table 8 Additional functions and consumer ports

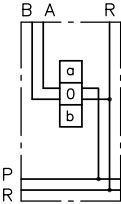
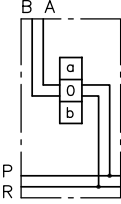
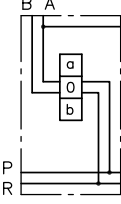
Coding	Description	Circuit symbol
/0	Standard valve section without integrated thread for combining with an ancillary block (Chapter 2.3.2) or an intermediate plate (Chapter 2.3.3)	
/0/02 /0/OUNF12 /0/OJIS2	Standard valve section with consumer ports in A and B. <ul style="list-style-type: none"> ▪ /0/02: G 3/8 (ISO 228-1) (BSPP) ▪ /0/OUNF12: SAE-6 or 9/16-18 UNF-2B (SAE J 514) ▪ /0/OJIS2: G 3/8 JIS (B 2351) (BSPP) 	
/8/02 /8/OJIS 2	Valve section with pre-selector valve and consumer ports in A and B <ul style="list-style-type: none"> ▪ /8/02: G 3/8 (ISO 228-1) (BSPP) ▪ /8/OJIS2: G 3/8 JIS (B 2351) <p>The pre-selector valve shuts off the P gallery in neutral position. Once activated, it supplies either the downstream valve sections (switching position a) or a second manifold connected to port B (switching position b).</p> <p>Only in conjunction with intermediate plate ZPL AP (see Chapter 2.4, "Series intermediate plate")</p> <p>If required, port A can be sealed with a tapped plug (see "Table 9 Seal of consumer ports").</p> <p>Example order coding: CWS 2-D/M/8/02A</p>	

Table 9 Seal of consumer ports

Coding	Description
No designation	Standard version without tapped plug
A	Port A sealed
B	Port B sealed
C	Port A and B sealed.
	Typical usage is as an idle circulation valve in conjunction with circuit symbol HW. This is a cost-effective alternative to an idle circulation valve in the connection block.
	Example order coding: CWS 2-HW/M/0/02C

2.3.2 Ancillary block

Depending on their version, the ancillary blocks have 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 (coding /0 as per "[Table 8 Additional functions and consumer ports](#)") or on an intermediate plate ([Chapter 2.3.3](#)).

Ports A and B as per ISO 228-1 (BSPP) 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	Material	Description	Circuit symbol
/2C	Steel	No additional function	
/2CH /UNF12CH /JIS2CH	Steel	Doubly releasable check valve (pilot ratio 1:4.5) $Q_{max} = 50$ lpm	
/L2CH /LUNF12CH /LJIS2CH	Aluminium		
/2CHA /UNF12CHA /JIS2CHA	Steel	Releasable check valve in A (pilot ratio 1:4.5) $Q_{max} = 50$ lpm	
/L2CHA /LUNF12CHA /LJIS2CHA	Aluminium		
/2CHB /UNF12CHB /JIS2CHB	Steel	Releasable check valve in B (pilot ratio 1:4.5) $Q_{max} = 50$ lpm	
/L2CQ /LUNF12CQ /LJIS2CHB	Aluminium		
/2CQ /UNF12CQ /JIS2CQ	Steel	Restrictor check valves in A and B $Q_{max} = 36$ lpm	
/L2CQ /LUNF12CQ /LJIS2CQ	Aluminium		
/2CQA /UNF12CQA /JIS2CQA	Steel	Restrictor check valve in A $Q_{max} = 36$ lpm	
/L2CQA /LUNF12CQA /LJIS2CQA	Aluminium		
/2CQB /UNF12CQB /JIS2CQB	Steel	Restrictor check valve in B $Q_{max} = 36$ lpm	
/L2CQB /LUNF12CQB /LJIS2CQB	Aluminium		

Coding	Material	Description	Circuit symbol
/2CAN... BN... /UNF12CAN... BN... /JIS2CAN...	Steel	Shock and anti-cavitation valves in A and B $Q_{max} = 40 \text{ lpm}$	
/L2CAN... BN... /LUNF12CAN... BN... /LJIS2CAN... BN...	Aluminium		
/2CAS... BS... /UNF12CAS... BS... /JIS2CAS... BS...	Steel	Shock valves in A and B $Q_{max} = 40 \text{ lpm}$	
/L2CAS... BS... /LUNF12CAS... BS... /LJIS2CAS... BS...	Aluminium		
/2CAN... /UNF12CAN... /JIS2CAN...	Steel	Shock and anti-cavitation valve in A $Q_{max} = 40 \text{ lpm}$	
/L2CAN... /LUNF12CAN... /LJIS2CAN...	Aluminium		
/2CBN... /UNF12CBN... /JIS2CBN...	Steel	Shock and anti-cavitation valve in B $Q_{max} = 40 \text{ lpm}$	
/L2CBN... /LUNF12CBN... /LJIS2CBN...	Aluminium		

Table 10 Ancillary block type SWS

SWS ancillary blocks can also be installed alongside CWS ancillary blocks.
For further information, see [D 7951](#).

Coding	Description
/2 AL... BL...	Load-holding valve at A and B
/2 AL...	Load-holding valve at A
/2 BL...	Load-holding valve at B
/2 AN... BN...	Shock and resuction valve, with pressure specification at A and B
/2 AS... BS...	Shock valves at A and B

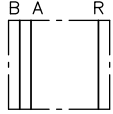
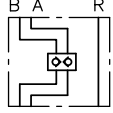
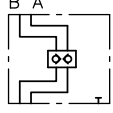


NOTE

When mounting an SWS ancillary block on a CWS section, both roll pins must be removed on the ancillary block.

2.3.3 Intermediate plate

The intermediate plates are mounted between a valve section with flange surface (coding /0 as per "[Table 8 Additional functions and consumer ports](#)") and an ancillary block ([Chapter 2.3.2](#)) and are intended as either a spacer plate or to combine two additional valves with each other.

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

2.4 Series intermediate plate

Series intermediate plates can be placed into a manifold in any position instead of a regular valve section. They are either used in conjunction with a pre-selector valve or have additional valves (e.g. idle circulation valves).

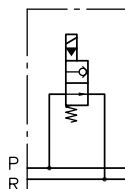
Coding	Description
ZPL AP	Intermediate plate for combining with a pre-selector valve (coding /8 as per "Table 8 Additional functions and consumer ports")
ZPL 20-... ZPL 20 LI-...	<p>Intermediate plate with idle circulation valve.</p> <ul style="list-style-type: none"> ▪ ZPL 20: Steel intermediate plate ($p_{max} = 315$ bar) ▪ ZPL 20 LI: Aluminium intermediate plate ($p_{max} = 210$ bar) <p>The following versions are possible as idle circulation valves as per D 7490/1:</p> <ul style="list-style-type: none"> ▪ EM 31 S: normally open ▪ EM 31 SB: normally open, with detented manual override ▪ EM 31 ST: normally open, with button ▪ EM 31 V: normally closed ▪ EMP 31 S: electro-proportional, normally open ▪ EMP 31 SB: electro-proportional, normally open, with detented manual override ▪ EMP 31 V: electro-proportional, normally closed

Circuit symbols

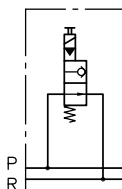
ZPL AP



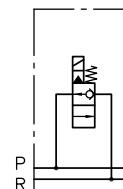
ZPL 20 (LI)-EM 31 S



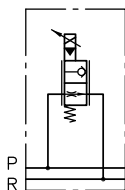
ZPL 20 (LI)-EM 31 SB
ZPL 20 (LI)-EM 31 ST



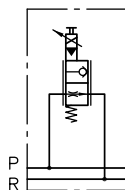
ZPL 20 (LI)-EM 31 V



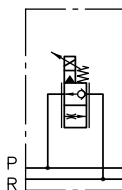
ZPL 20 (LI)-EMP 31 S



ZPL 20 (LI)-EMP 31 SB



ZPL 20 (LI)-EMP 31 V



2.5 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).

Table 11 End plate

Coding	Material of end plate	Description	Port P1, R1 as per ISO 228-1 (BSPP), SAE J 514 (UNF) or B 2351 (JIS)	Pressure p _{max} (bar)
1	Steel	Standard version	--	315
22		Additional port: P1, R1	G 3/8	
UNF22			SAE-8 (3/4-16 UNF-2B)	
JIS22			G 3/8 JIS	
L22	Aluminium	Additional port: P1, R1	G 3/8	210
LUNF22			SAE-8 (3/4-16 UNF-2B)	
LJIS22			G 3/8 JIS	

Circuit symbols

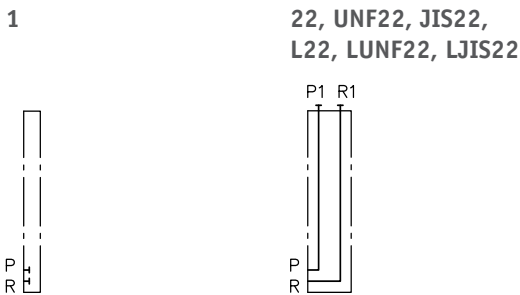


Table 12 Mounting bracket

Coding	Description
No designation	Without mounting bracket (standard version).
K	<p>Including mounting bracket consisting of two retaining plates which are attached to the metric attachment threads on the connection block and the end plate respectively.</p> <p>This means the manifold gains some height and, with actuation with coding M2, MT2, there is sufficient space for the plug (see "Table 6 Actuation").</p>

2.6 Solenoid voltage and solenoid version

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)
X 12 X 24	DIN EN 175 301-803 A	12 V DC 24 V DC	IP 65
G 12 G 24	<ul style="list-style-type: none"> ▪ X: without male connector ▪ G: with male connector (MSD 3-309 as per D 7163) ▪ L: with male connector with LED (SVS 296365 as per D 7163) 		
L 12 L 24			
AMP 12 AMP 24	AMP Junior Timer	12 V DC 24 V DC	IP 67
DT 12 DT 24	Deutsch (DT 04-2P)	12 V DC 24 V DC	IP 69k

Electrical values, see [Chapter 3.3, "Electrical parameters"](#)

i NOTE

The specifications regarding the IP protection class apply to versions featuring a properly assembled line connector.

3 Parameters

3.1 General and hydraulic

General information

Designation	Directional spool valve CWS
Design	Manifold with up to 10 valve sections
Installation position	As desired
Flow direction	<ul style="list-style-type: none"> ▪ As per direction of arrow in circuit symbols ▪ Reversal not permitted!
Port	<p>P = Pump</p> <p>R = Reflux</p> <p>A, B, H = Consumers</p> <p>M = Pressure gauge connection for pump pressure</p>
Material	<ul style="list-style-type: none"> ▪ Steel/cast iron valve blocks, Zn-Ni coated ▪ Valve blocks with coding L made from aluminium
Hydraulic fluid	<p>Hydraulic oil: according to part 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity limits: min. approx. 4, max. approx. 1500 mm²/s opt. operation approx. 10... 500 mm²/s. Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C. Not suitable for HETG such as rapeseed oil and water-glycol solutions such as HFA or HFC.</p>
Cleanliness level	<p>ISO 4406</p> <hr style="width: 50%; margin-left: 0;"/> <p>20/17/14</p>
Temperatures	<p>Environment: approx. -40 to +80°C, oil: -25 ... +80°C, pay attention to the viscosity range. Start temperature: down to -40°C is permissible (observe start viscosities!), as long as the steady-state temperature is at least 20K higher during subsequent operation. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.</p>

Pressure and flow rate

Operating pressure	See Chapter 2.2, "Connection block" , "Table 2" and "Table 4" .
Flow rate	Max. flow rate, see Chapter 2.2, "Connection block" , "Table 2" . This applies to the connection blocks, valve sections and end plates.

i NOTE

Take note of the limitation with the valve sections, see [Chapter 3.2, "Characteristics"](#)

Weight

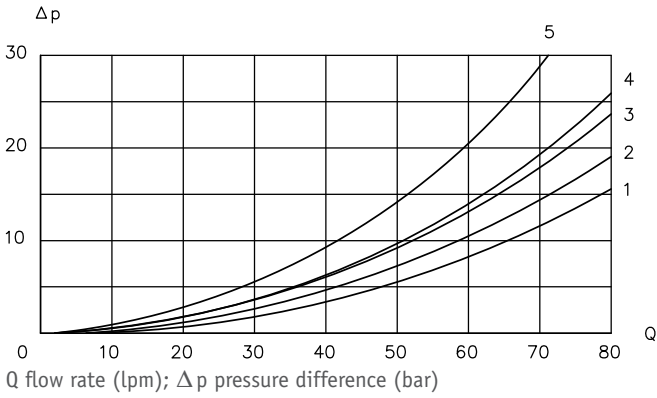
Connection block	Coding	Aluminium	Steel
		Coding L	
	2 A 5	= 0.38 kg	= 1.00 kg
	2 A 6	= 0.86 kg	= 2.25 kg
	2 S 6, 2 SP 6	= 1.24 kg	= 2.42 kg
	2 V 6, 2 VP 6	= 1.24 kg	= 2.42 kg
	3 A 5	= 0.38 kg	= 1.00 kg
	3 A 6	= 0.86 kg	= 2.27 kg
	3 S 6, 3 SP 6	= 1.31 kg	= 2.77 kg
	3 V 6, 3 VP 6	= 1.31 kg	= 2.77 kg
Also 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 "G")		= 2.30 kg
	Manual actuation		= + 0.65 kg
Ancillary block	Coding		
	/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.			
Intermediate plate	Coding		
	/ZC11	= 0.2 kg	
	/ZCH	= 1.2 kg	
Series intermediate plate	Coding		
	ZPL AP	= 0.6 kg	
	ZPL 20-...	= 1.0 kg	
End plate	Coding	Aluminium	Steel
		Coding L	
	1	--	= 0.25 kg
	22	= 0.36 kg	= 1.04 kg
Also applies to ports in UNF and JIS.			

3.2 Characteristics

Oil viscosity approx. 60 mm²/s

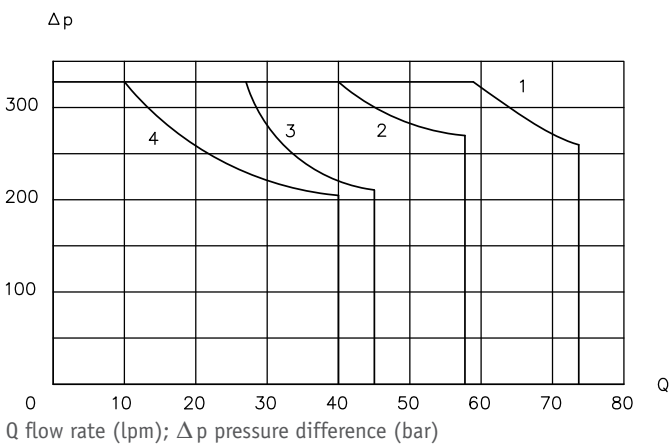
Directional valve section

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



Circuit symbol	Middle 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	--	3	2	3	2
H, HW, HB	3	1	2	1	2
L	5	5	2	5	2
X	--	3	--	3	--
W, B	--	4	1	4	1

Switchable flow rates



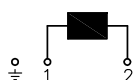
Circuit symbol	Curve
G, B, W, X	1
H, HW, HB	2
D	3
L	4

3.3 Electrical parameters

Nominal voltage	12 V DC	24 V DC
Resistance R_{20}	4.8 Ω	19.2 Ω
Current, cold I_{20}	2.5 A	1.25 A
Nominal power P_N	30 W	30 W
Actuated time	S1 (100%)	
Insulation material class	H	

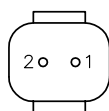
Electrical connection

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



DT 12, DT 24

Deutsch (DT 04-2P)
2-pole
IP 69k (IEC 60529)



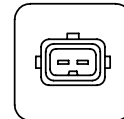
X 12, X 24

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



AMP 12, AMP 24

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

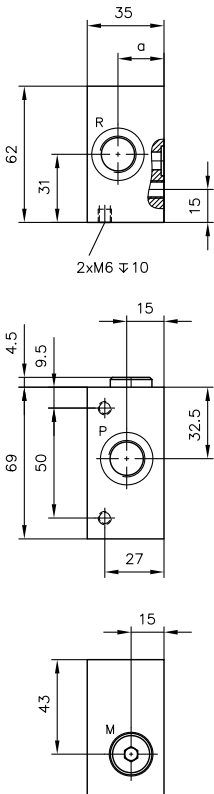


4 Dimensions

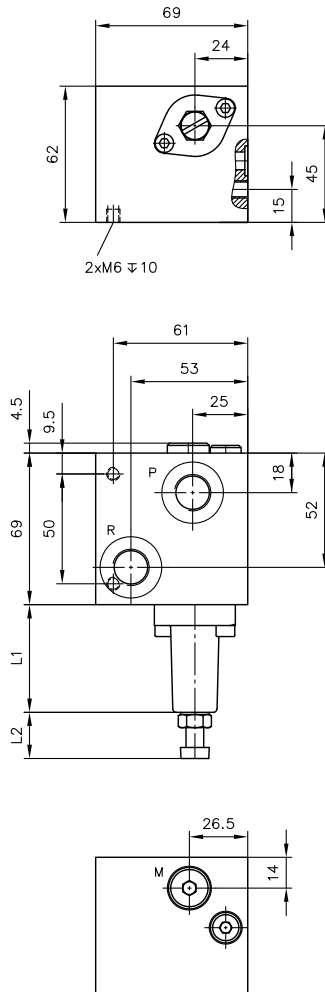
All dimensions in mm, subject to change.

4.1 Connection block

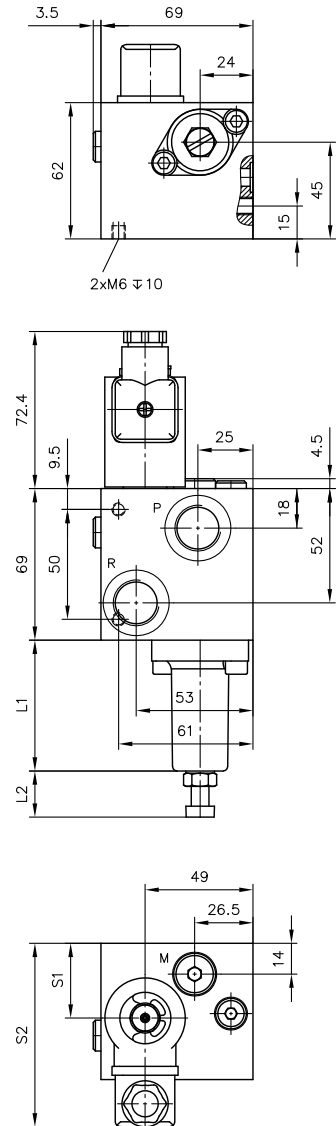
CWS 2. A 5



CWS 2. A 6



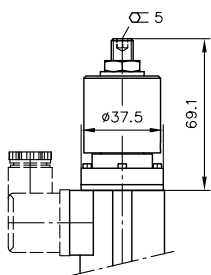
CWS 2. S(P) 6, CWS 2. SP 6
CWS 2. V(P) 6, CWS 2. VP 6



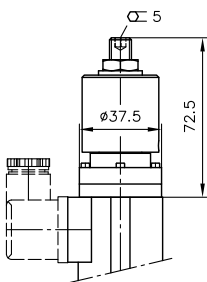
Coding	a	S1	S2	L1	≤ L2	Ports		
						P, R	M	
2	21	42	92	49	29	G 3/8	G 1/4	ISO 228-1 (BSPP)
3	21	34	84	59.5	29	G 1/2	G 1/4	ISO 228-1 (BSPP)
UNF 3	21	34	84	59.5	29	7/8-14 UNF	7/16-20 UNF	SAE J 514
JIS 3	21	34	84	59.5	29	G 1/2 JIS	G 1/4 JIS	JIS B2351-1

Idle circulation valve with emergency actuation

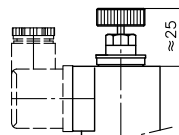
Coding SB6



Coding SPB6

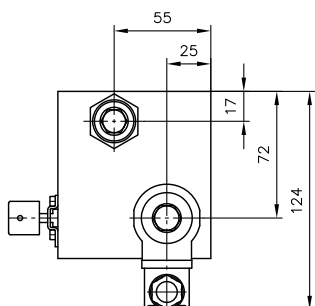
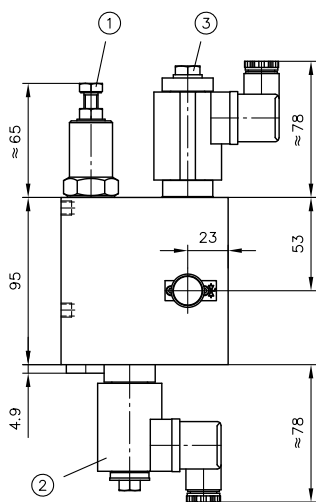
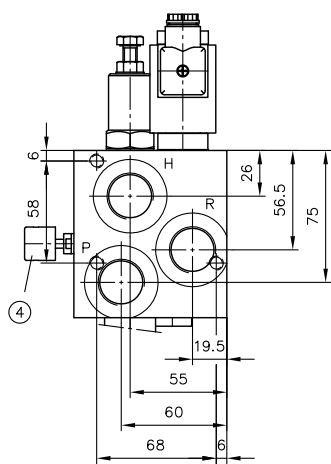
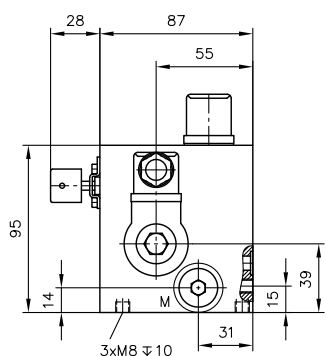


Coding ST6



EM .. ST (button for emergency actuation)

CWS 2L4(H, R)6/...-...



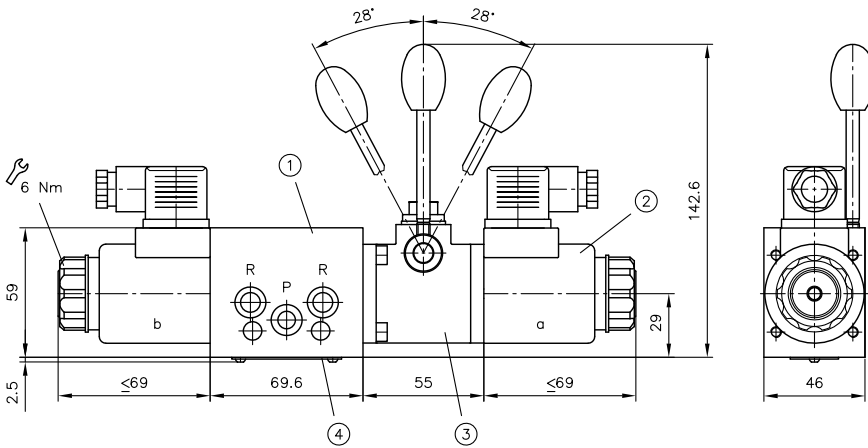
- 1 Pressure-limiting valve
- 2 2/2-directional seated valve in inlet (P → H)
- 3 2/2-directional seated valve in outlet (H → R)
- 4 Manual emergency drain coding H

	Ports (ISO 228-1) (BSPP)
H, R, P	G 3/4
M	G 3/8

4.2 Valve section

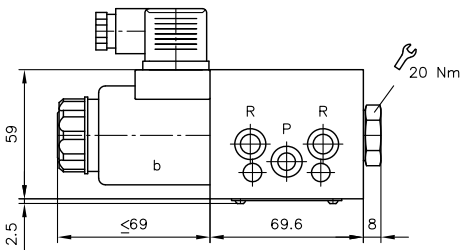
4.2.1 Directional valve section

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

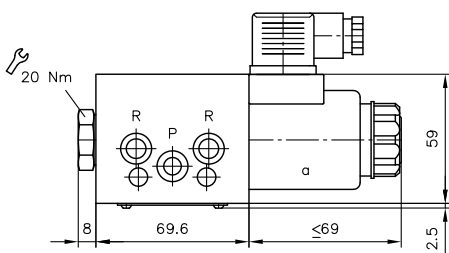


- 1 Directional valve section
- 2 Actuation
- 3 Hand lever
- 4 Type plate

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

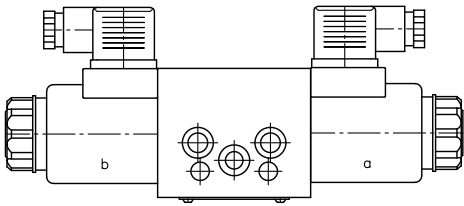


4/2-way directional valve with circuit symbol B, HW, GW (function in switching position 0 and a)

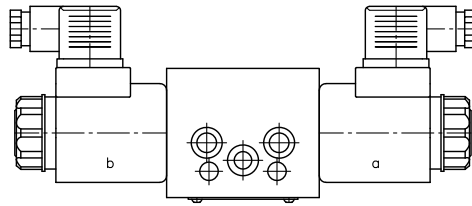


Actuation

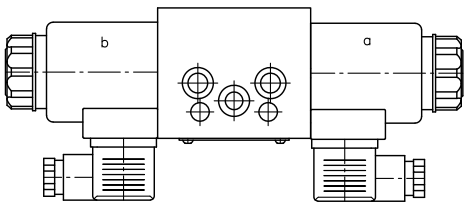
Coding **M-G 12(24)**



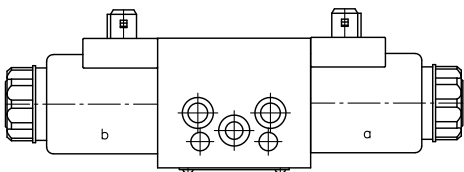
Coding **M1-G 12(24)**



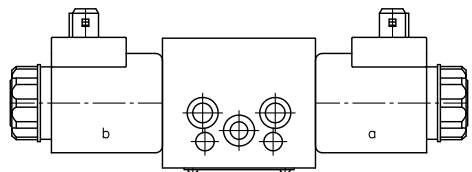
Coding **M2-G 12(24)**



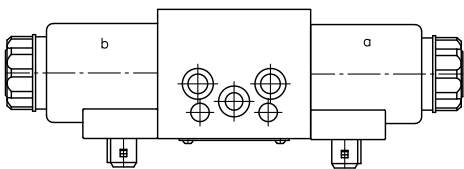
Coding **M-AMP 12(24)**



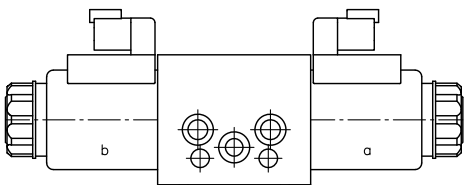
Coding **M1-AMP 12(24)**



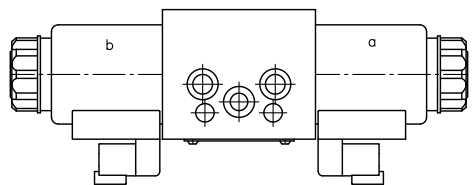
Coding **M2-AMP 12(24)**



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

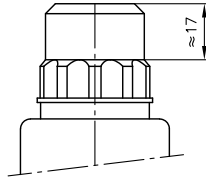
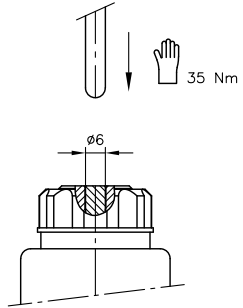


Coding **M2-DT 12(24)**



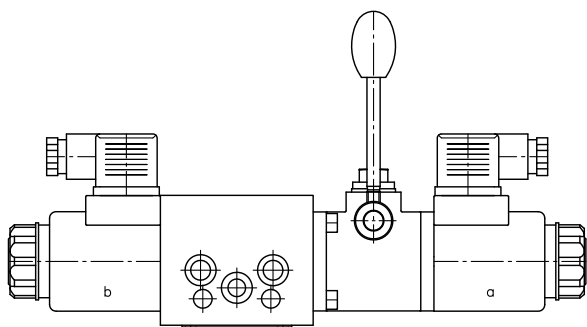
Emergency actuation

- M**
Auxiliary tool for actuation
(do not use any parts with sharp edges)
- MT**
Manual operation with push-button

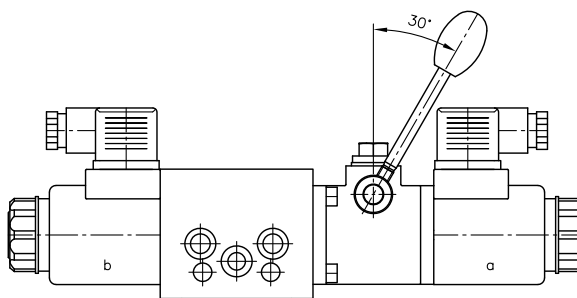


Hand lever

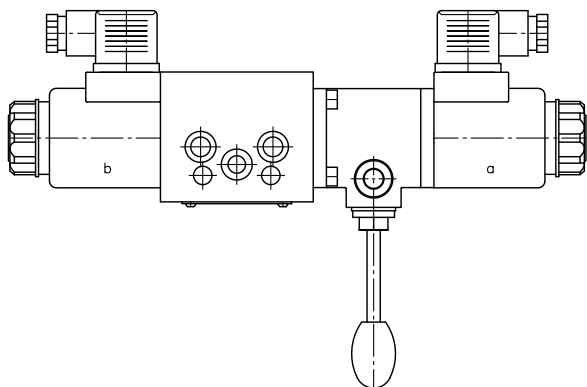
MHA



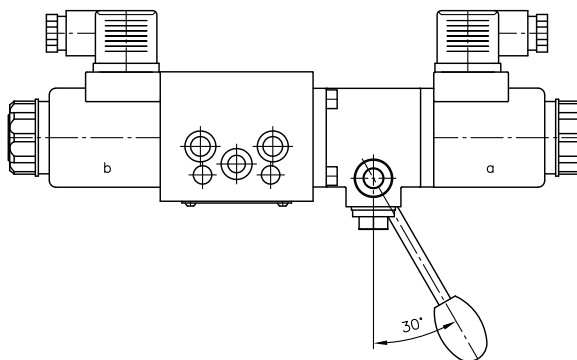
MH1A



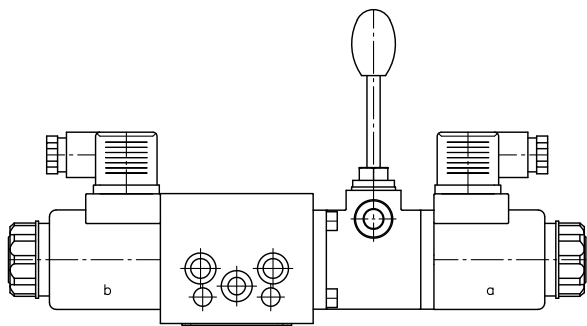
MH2A



MH3A

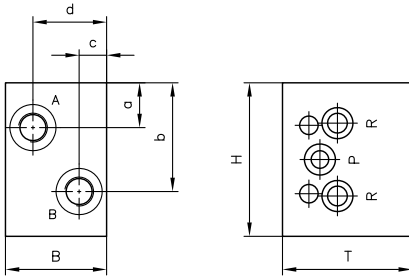


MH4A



Directional valve section with integrated consumer ports

(coding 02, 0UNF12 and 0JIS2 as per ["Table 8 Additional functions and consumer ports"](#))



Coding	a	b	c	d	B	H	T
02	22.3	47.3	14	32	46	69.6	59
0UNF12	20.3	49.3	12.5	33.5	46	69.6	59
0JIS2	22.3	47.3	14	32	46	69.6	59

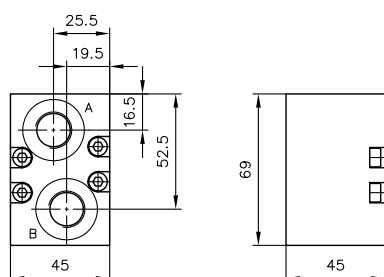
Ports A, B

02	G 3/8	ISO 228-1 (BSPP)
0UNF12	9/16-18 UNF	SAE J 514
0JIS2	G 3/8 JIS	B 2351

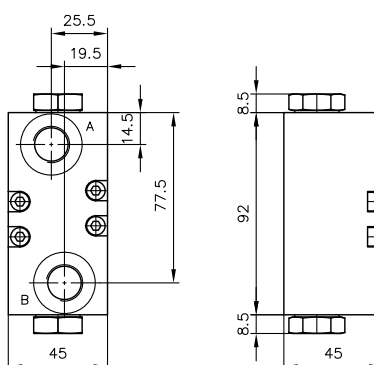
4.2.2 Ancillary block

as per [Chapter 2.3.2, "Ancillary block"](#)

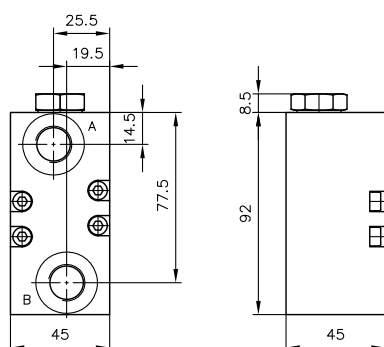
Coding
2C



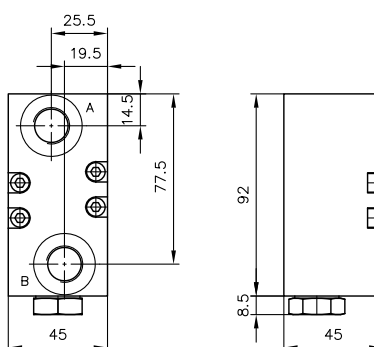
Coding
(L)2CH, (L)UNF12CH, (L)JIS2CH



Coding
(L)2CHA, (L)UNF12CHA, (L)JIS2CHA



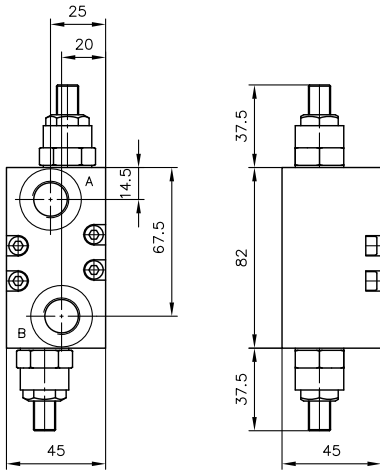
Coding
(L)2CHB, (L)UNF12CHB, (L)JIS2CHB



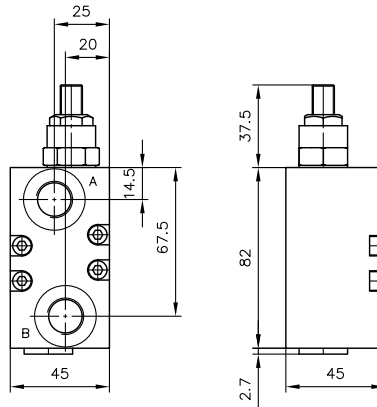
Ports A, B

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

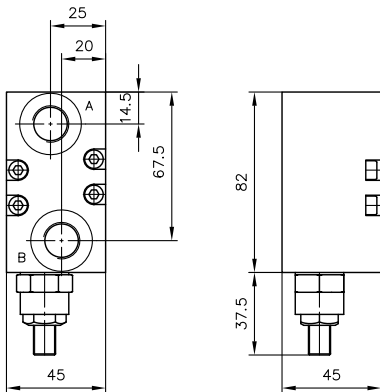
Coding
(L)2CQ, (L)UNF12CQ, (L)JIS2CQ



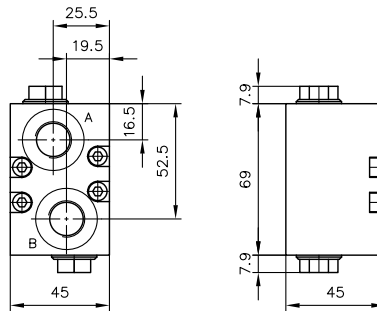
Coding
(L)2CQA, (L)UNF12CQA, (L)JIS2CQA



Coding
(L)2CQB, (L)UNF12CQB, (L)JIS2CQB



Coding
(L)2CAN... BN..., (L)UNF12CAN... BN..., (L)JIS2CAN... BN...

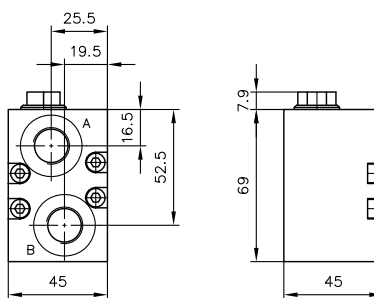
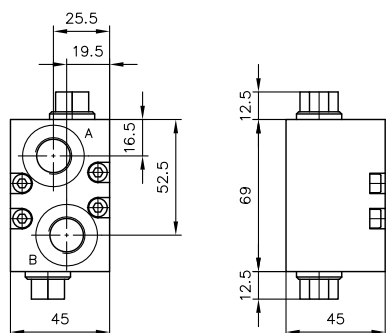


Ports A, B

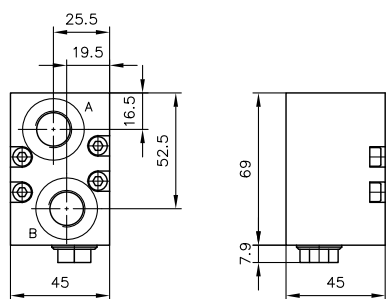
/2	G 3/8	ISO 228-1 (BSPP)
/UNF12	SAE-6 (9/16-18 UNF-2B)	SAE J 514
/JIS2	G 3/8 JIS	JIS B 2351

Coding
 (L)2CAS... BS..., (L)UNF12CAS... BS..., (L)JIS2CAS... BS...

Coding
 (L)2CAN..., (L)UNF12CAN..., (L)JIS2CAN...



Coding
 (L)2CBN..., (L)UNF12CBN..., (L)JIS2CBN...



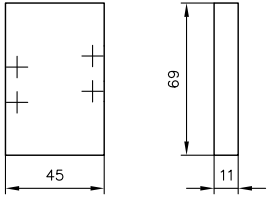
Ports A, B

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

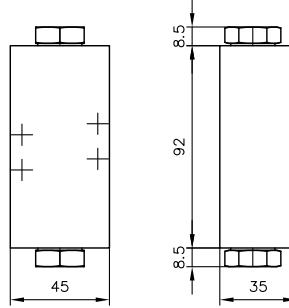
4.2.3 Intermediate plate

as per [Chapter 2.3.3, "Intermediate plate"](#)

Coding **ZC11**



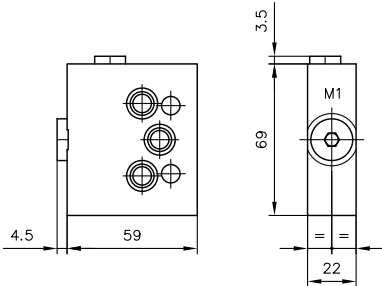
Coding **(L)ZCH**



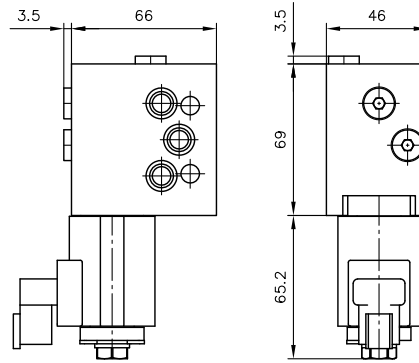
4.3 Series intermediate plate

as per [Chapter 2.4, "Series intermediate plate"](#)

Coding **ZPL AP**



Coding **ZPL 20 (LI)-...**



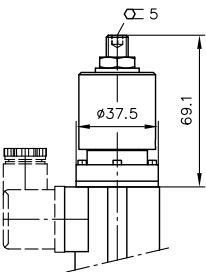
Ports (ISO 228-1) (BSPP)

M1

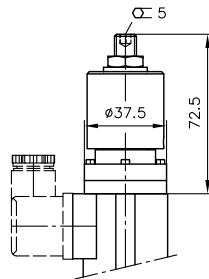
G 3/8

Idle circulation valve with emergency actuation

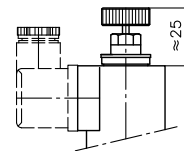
Coding **SB6**



Coding **SPB6**



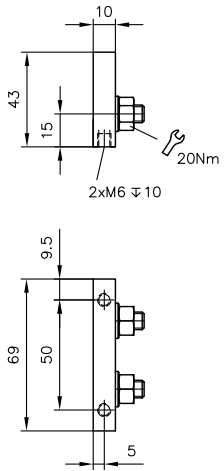
Coding **ST6**



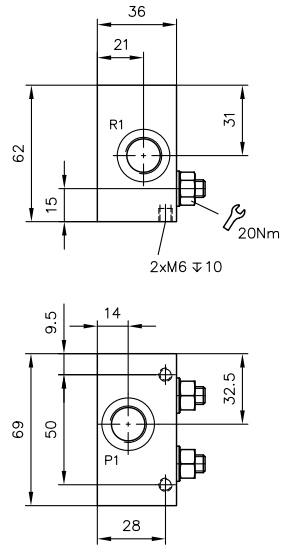
EM .. ST (button for emergency actuation)

4.4 End plate

Coding 1



Coding 22, UNF 22, JIS 22



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

5 Assembly, operation and maintenance recommendations

5.1 Intended use

This valve is exclusively intended for hydraulic applications (fluid engineering).

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

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 qualified personnel.
- The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
- All components must be suitable for the operating conditions in the event of application in an assembly.
- The operating and maintenance manual of 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 dismantling (in particular in combination with hydraulic accumulators).



DANGER

Risk to life caused by sudden movement of the hydraulic drives when dismantled incorrectly!

Risk of serious injury or death.

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

5.2.1 Attachment

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

Round bearing A 2510 55WR (M8x20), manufacturer ® Co. FREUDENBERG Germany, item no. 509067

5.2.2 Piping

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

5.3 Operating instructions

Note product configuration and pressure / flow rate

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

i NOTE

- 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

Risk of injury on overloading components due to incorrect pressure settings!

Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump and the valves.
- 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 hydraulic component. Contamination can cause irreparable damage.

Examples of fine contamination include:

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

i NOTE

New hydraulic fluid from the manufacturer does not necessarily have the required level of purity.
The hydraulic fluid must be filtered during filling.

Pay attention to the cleanliness level of the hydraulic fluid to maintain faultless operation.
(Also see cleanliness level in [Chapter 3, "Parameters"](#)).

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

5.4 Maintenance information

Conduct a visual inspection at regular intervals, but at least once per year, to check if the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the device surface of dust deposits and dirt at regular intervals, but at least once per year.

Further information

Additional versions

- Directional spool valve bank type SWS: D 7951
- Proportional directional spool valve type EDL: D 8086
- Proportional directional spool valve, type PSL and PSV size 2: D 7700-2
- Proportional directional spool valve, type PSL, PSM and PSV 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
- Connection block type HMPL and HMPV for proportional directional spool valve: D 7700 H
- Pressure-limiting valve (installation kit) type MV: D 7000 E/1
- Directional seated valve type EM and EMP: D 7490/1