Valve bank (directional spool valve) type CWS

Product documentation

Series connection

Operating pressure p_{max}:	315 bar
Flow rate Q_{max}:	80 lpm

D 7951 CWS
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HAWE HYDRAULIK

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Table of Contents

1 Overview Valve bank (directional spool valve) type CWS

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 type CWS is directly actuated and has binary (open/closed) activation. Multiple directional valves can be combined in series in the valve bank type CWS. A range of connection blocks and mounted blocks offer additional options for a wide range of applications.

The valve bank CWS is used mainly in mobile hydraulics. In stationary hydraulics, the direct mounting on the compact hydraulic power pack results in an extremely compact system solution.

Valve bank (directional spool valve) type CWS

Features and advantages

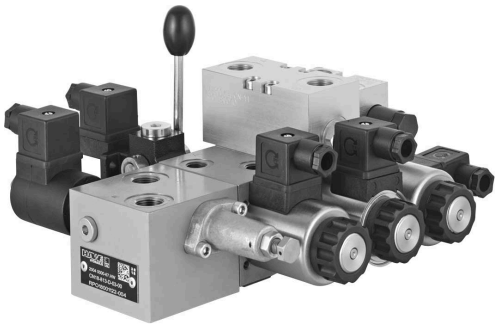
- One valve for different control functions
- Modular system with numerous variants and combination possibilities
- Compact and robust design
- Robust and long-lasting design

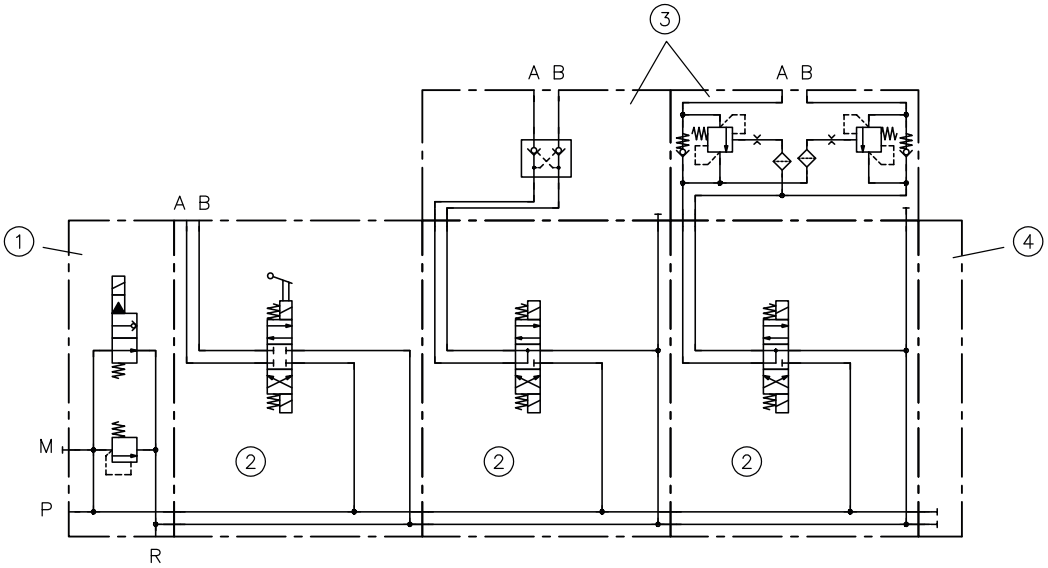
Intended applications

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

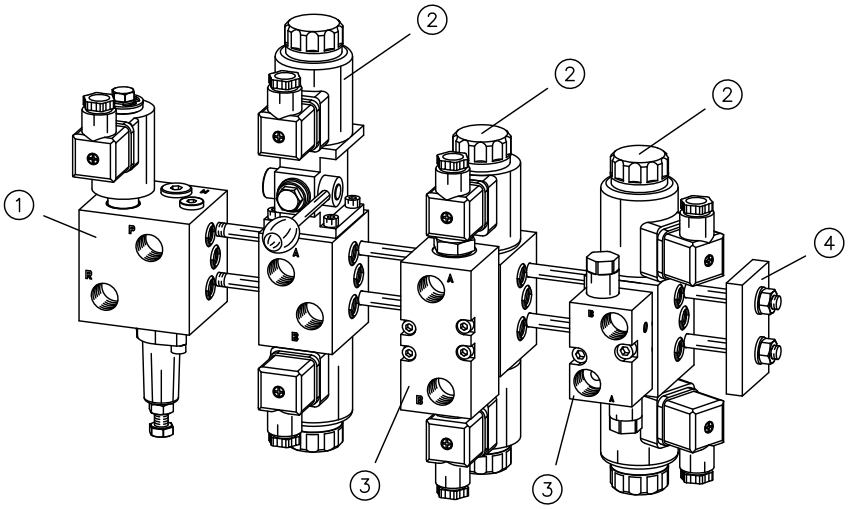
1.1 Configuration example

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

Ordering example

CWS 22 A6/H 200	-G/M/0/02	-1	-X 24

2.5 "Solenoid version"

2.4 "End plate"

2.2 "Directional valve section"

2.1 "Connection block"

NOTICE

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

2.1 Connection block

Ordering example

CWS 2	2	A6	
CWS 2	UNF2	A5	/H 200
CWS 2	L JIS3	SP6	/100

2.1.4 "Pressure-limiting valve"

2.1.3 "Connection block basic types"

2.1.2 "Material and ports"

2.1.1 "Basic type and size"

2.1.1 Basic type and size

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

2.1.2 Material and ports

Coding	Material of connection block	Ports	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)
		P, R		
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	

NOTICE

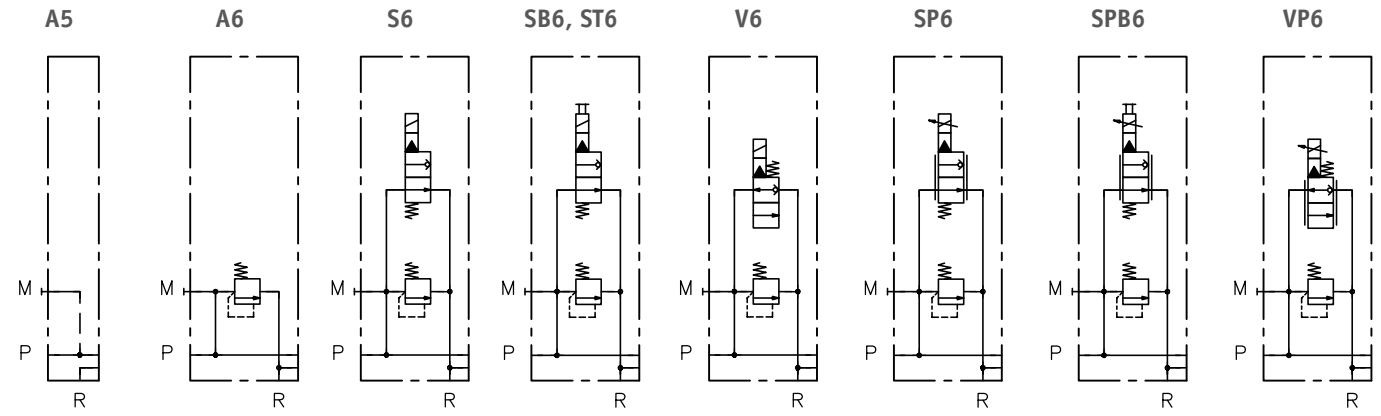
- Thread as per ISO 228-1, SAE J 514 (UNF) or JIS B 2351 (JIS)
- Depending on the circuit symbol, the individual flow rate permitted may be smaller.

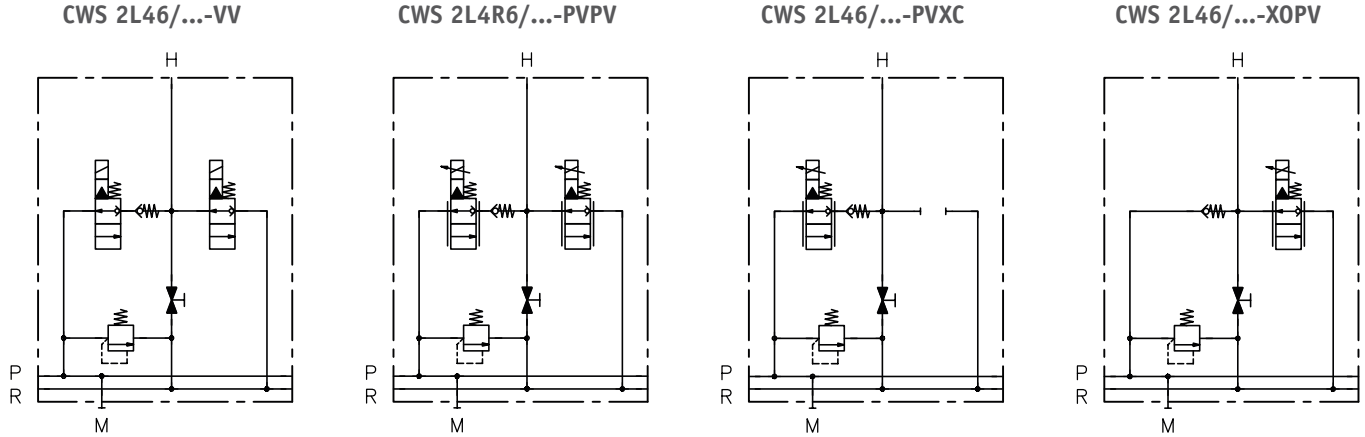
2.1.3 Connection block basic types

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 according to 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). ▪ **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). ▪ **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). ▪ **SP6:** EMP 21 S as per D 7490/1 ▪ **SPB6:** EMP 21 S with additional detented manual override
CWS 2(L)2 VP6/...	Connection block with pressure-limiting valve 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

Coding	Description
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). ▪ **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. ▪ **Without coding:** tool adjustable manual emergency release ▪ **H:** rotary knob adjustable manual emergency release ▪ **R:** with check valve at P (type RB 2 as per D 7445) The two 2/2-directional seated valves are available in the following versions: ▪ **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) The first coding describes the valve in the inlet (P → H). The second coding describes the valve in the outlet (H → R). **Ordering example:** CWS 2L4HR6/200-PVPV

Circuit symbols





2.1.4 Pressure-limiting valve

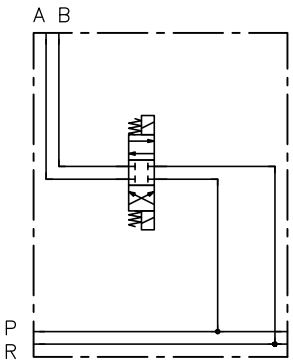
Coding	Description
/...	Standard pressure-limiting valve (type MVF 5 C or MVF 6 C as per D 7000 E/1) Max. permissible return pressure p_R = 20 bar (adjustment range 50 to 315 bar)
H/...	Pressure-limiting valve for increased return pressure (type MVF 5 C or MVB 6 C as per D 7000 E/1) Max. permissible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

2.2 Directional valve section

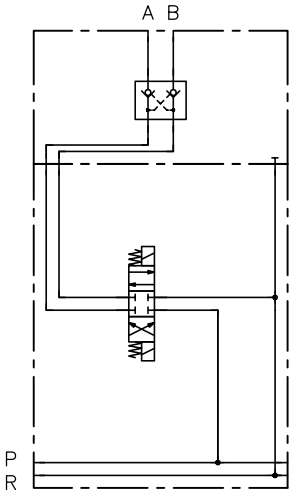
The directional valve section is available either with integrated threads for the consumer ports A and B, or with a flange surface for mounting an ancillary block (see Chapter 2.2.7, "Ancillary block") or an intermediate plate (see Chapter 2.2.8, "Intermediate plate").

Valve section

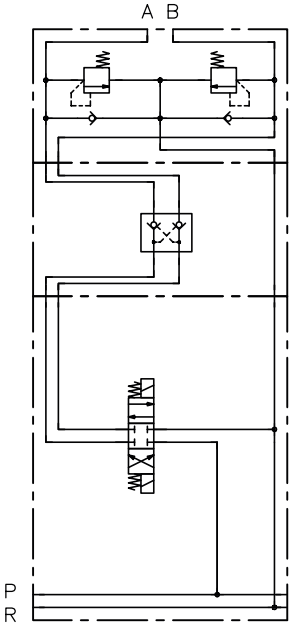
with integrated threads



with ancillary block



with intermediate plate and ancillary block



Ordering example

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

- 2.5 "Solenoid version"
- 3.5 "Electrical data"

2.4 "End plate"

2.2.6 "Seal of consumer ports"

2.2.7 "Ancillary block"

2.2.5 "Additional functions"

2.2.4 "Hand lever"

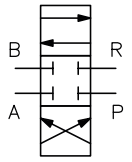
2.2.3 "Actuation"

2.2.1 "Circuit symbol"

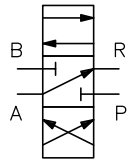
2.2.1 Circuit symbol

4/3 directional spool valve

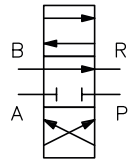
G



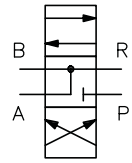
O



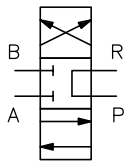
E



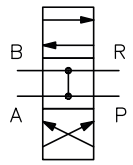
D



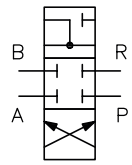
L



H

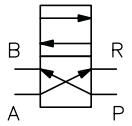


C

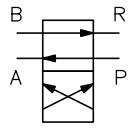


4/2 directional spool valve

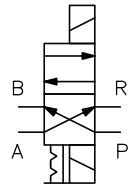
W



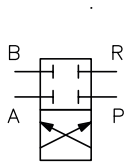
B



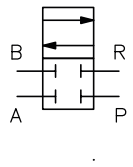
K



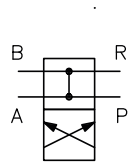
GW



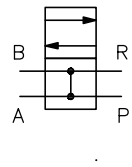
GB



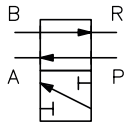
HW



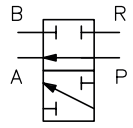
HB



R

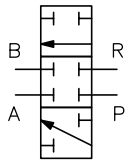


V



3/3 directional spool valve

X



NOTICE

Circuit symbol X is only possible in conjunction with electrical and manual actuation, e.g. MHA (see Chapter 2.2.3, "Actuation" and Chapter 2.2.4, "Hand lever")

2.2.2 Flow rate

For CWS sections with proportional actuation (see Chapter 2.2.3, "Actuation"), the spools' meter-in edges are available in the four nominal sizes listed below:

Coding	Flow rate $Q_{A/B}$ (lpm) at maximum spool valve elevation and at pressure difference of 9 bar
10	10
20	20
30	30
40	40

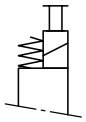
NOTICE

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.

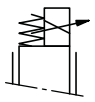
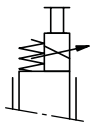
2.2.3 Actuation

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 2.5, "Solenoid version") and ▪ the ancillary blocks coding /(L)2CH, /(L)2CHA, /(L)CHB (see Chapter 2.2.7) two additional spacer plates with coding /ZC11 (see Chapter 2.2.8, "Intermediate plate") are necessary to prevent a collision between the magnetic plug and the ancillary block.	M, M1, M2  MT, MT1, MT2 
MT	Electrical actuation with manual override. Plug position inside on the spool block and upwards in the direction of the consumer ports (standard version).		
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 2.5, "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 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 2.4.1, "Mounting bracket"	
MT2	Electrical actuation with manual override. Plug position inside on the spool block and downwards.		

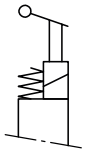
NOTICE
The manual override with coding MT, MT1, MT2 cannot be combined with manual actuation with coding H as per see Chapter 2.2.4, "Hand lever".

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 2.5, "Solenoid version") and b) the ancillary blocks with coding /(L)2CH, /(L)2CHA and /(L)CHB, (see Chapter 2.2.7) requires two additional spacer plates with coding /ZC11 (see Chapter 2.2.8, "Intermediate plate") to prevent collision of magnetic plug with ancillary block.	MP, MP1, MP2  MPT, MPT1, MPT2 
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)		
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 2.5, "Solenoid version")	
MPT1	Electro-proportional actuation with manual override Plug position outside and upwards in the direction of the consumer ports		
MP2	Electro-proportional 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 2.4.1, "Mounting bracket"	
MPT2	Electro-proportional actuation with manual override Plug position inside on the spool block and downwards		

NOTICE
The manual override with coding MPT, MPT1, MPT2 cannot be combined with manual actuation with coding H, see Chapter 2.2.4, "Hand lever"

2.2.4 Hand lever

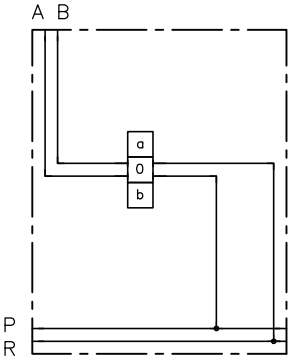
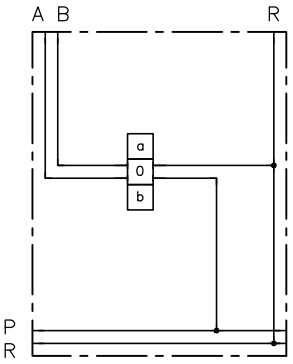
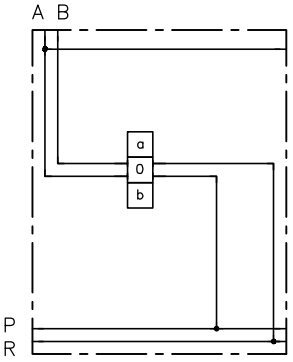
Coding	Description	Combination options	Circuit symbol
Without coding	Without manual actuation (standard version)	--	
HA	Manual actuation on the A-side	**Only in conjunction with** ▪ the ancillary blocks /2F and /2C	
H1A	Manual actuation on the A-side Hand lever mounted at 30° angle to the outside	**Only in conjunction with** ▪ the ancillary blocks /2F, /2C and /(L)2CHB When using the intermediate plate /(L)ZCH or ancillary blocks /(L)2CH or /(L)2CHA an additional spacer plate with coding /ZC11 (see Chapter 2.2.8, "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.	
H3A	Manual actuation on the A-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)	**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
For circuit symbols W, GB, HB and K, manual actuation is not possible.

2.2.5 Additional functions

Coding	Description	Circuit symbol
/0	Standard valve section without integrated thread for combining with an ancillary block (see Chapter 2.2.7, "Ancillary block") or an intermediate plate (see Chapter 2.2.8, "Intermediate plate")	
/0/02 **/0/0UNF12** **/0/0JIS2**	Standard valve section with consumer ports in A and B. ▪ **/0/02:** G 3/8 (ISO 228-1) ▪ **/0/0UNF12:** SAE-6 or 9/16-18 UNF-2B (SAE J 514) ▪ **/0/0JIS2:** G 3/8 JIS (JIS B 2351)	
/8/02 **/8/0JIS 2**	Valve section with pre-selector valve and consumer ports in A and B ▪ **/8/02:** G 3/8 (ISO 228-1) ▪ **/8/0JIS2:** G 3/8 JIS (JIS B 2351) 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). Only in conjunction with intermediate plate ZPL AP (see Chapter 2.3, "Series intermediate plate") Port A can be sealed with a tapped plug when necessary (see Chapter 2.2.6, "Seal of consumer ports"). **Ordering example:** CWS 2-D/M/8/02A	

2.2.6 Seal of consumer ports

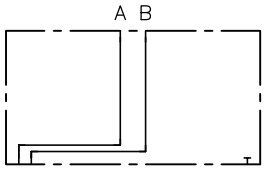
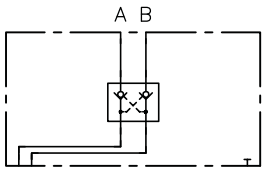
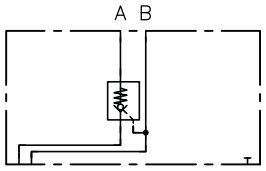
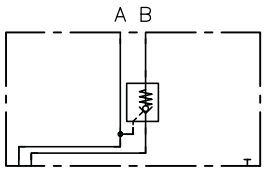
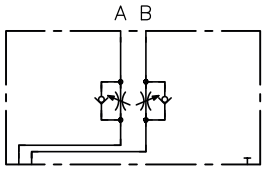
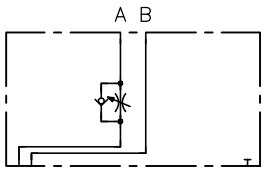
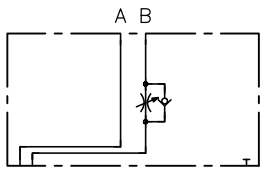
Coding	Description
Without coding	Standard version without tapped plug
A	Port A sealed
B	Port B sealed
C	Port A and B sealed Typical usage is as an idle circulation valve in conjunction with circuit symbol HW. This is a cost-effective alternative to an idle circulation valve in the connection block. **Ordering example:** CWS 2-HW/M/0/02C

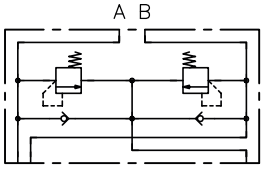
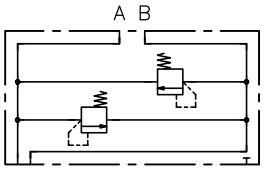
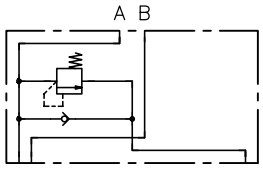
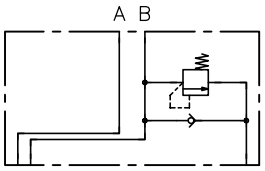
2.2.7 Ancillary block

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 (coding /0, see Chapter 2.2.5, "Additional functions", Chapter 2.2.6, "Seal of consumer ports" or on an intermediate plate (see Chapter 2.2.8, "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	Material	Description	Circuit symbol
/2C **/UNF12C** **/JIS2C**	steel	Without additional function (height: 45 mm)	
/2F **/UNF12F** **/JIS2F**	steel	Without additional function (height: 25 mm)	
/2CH **/UNF12CH** **/JIS2CH**	steel	Double pilot ratio 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	
/L2CHB **/LUNF12CHB** **/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... BN...	steel	Shock and anti-cavitation valves in A and B Q_{max} = 40 lpm	
/2CAS... BS... /UNF12CAS... BS... /JIS2CAS... BS...	steel	Shock valves in A and B Q_{max} = 40 lpm	
/2CAN... /UNF12CAN... /JIS2CAN...	steel	Shock and anti-cavitation valves in A Q_{max} = 40 lpm	
/2CBN... /UNF12CBN... /JIS2CBN...	steel	Shock and anti-cavitation valves in B Q_{max} = 40 lpm	

Ancillary block type SWS

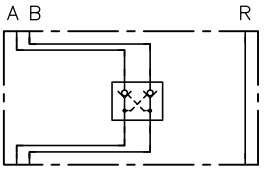
SWS ancillary blocks can also be installed alongside CWS ancillary blocks.
For further information, see D 7951.

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

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

2.2.8 Intermediate plate

The intermediate plates are mounted between a valve section with a flange surface (coding /0, see Chapter 2.2.5, "Additional functions") and an ancillary block (see Chapter 2.2.7, "Ancillary block") 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 with 11 mm height to avoid collisions between the magnetic plug and ancillary block or the hand lever and ancillary block	
/ZCH	steel	Intermediate plate with double piloted check valve (pilot ratio 1:4,5)	

NOTICE
The intermediate plate /ZCH cannot be combined with SWS ancillary blocks.

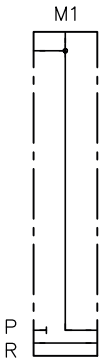
2.3 Series intermediate plate

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).

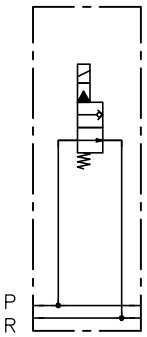
Coding	Description
ZPL AP	Intermediate plate for combination with a pre-selector valve (coding /8, see Chapter 2.2.5, "Additional functions")
ZPL 20-... **ZPL 20 LI-...**	Intermediate plate with idle circulation valve. ▪ **ZPL 20:** Steel intermediate plate (p_{max} = 315 bar) ▪ **ZPL 20 LI:** Aluminium intermediate plate (p_{max} = 210 bar) The following versions are possible as idle circulation valves as per D 7490/1: ▪ **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

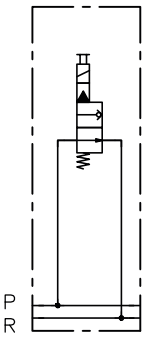
ZPL AP



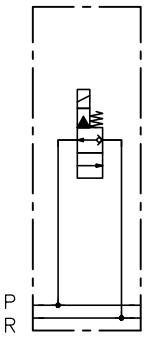
ZPL 20 (LI)-EM 31 S



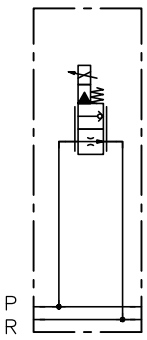
ZPL 20 (LI)-EM 31 SB
ZPL 20 (LI)-EM 31 ST



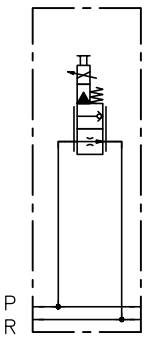
ZPL 20 (LI)-EM 31 V



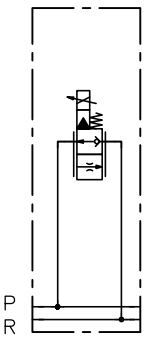
ZPL 20 (LI)-EMP 31 S



ZPL 20 (LI)-EMP 31 SB



ZPL 20 (LI)-EMP 31 V



2.4 End plate

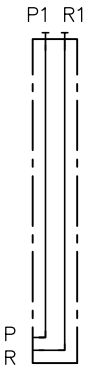
End plates are the final element in a manifold and close off the valve bank. Depending on the version, they may have additional ports (e.g. a P1 port for supplying a downstream manifold).

Coding	Material of end plate	Description	Port P1, R1 as per ISO 228-1, SAE J 514 (UNF) or JIS B 2351	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

1

22, UNF22, JIS22
L22, LUNF22, LJIS22



2.4.1 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, there is sufficient space for the plugs see Chapter 2.2.3, "Actuation".

NOTICE
Assembly fixtures cannot be combined with connection block CWS 2L4.

2.5 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 to 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

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 bank
Design	Manifold with up to 10 valve sections
Model	Valve bank
Material	• Valve blocks made from steel/cast Zn-Ni coated • Valve block with coding L made from aluminium
Installation position	Any
Ports/connections	▪ **P** = Pump ▪ **R** = Reflux ▪ **A, B, H** = consumers ▪ **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 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 4 - 1500 mm²/s Viscosity range: 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, 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	▪ see Chapter 2.1.2, "Material and ports" ▪ see Chapter 2.1.4, "Pressure-limiting valve"
Flow rate	Max. flow rates, see Chapter 2.1.1, "Basic type and size", see Chapter 2.1.2, "Material and ports". This applies to the connection blocks, valve sections and end plates. **NOTICE** Note restrictions for the valve sections, see switchable flow rates in Chapter 3.4, "Characteristic lines"

3.3 Weight

Connection block

Coding	Aluminium	Steel
	Coding L	
2 A5	= 0.38 kg	= 1.00 kg
2 A6	= 0.86 kg	= 2.25 kg
2 S6, 2 SP6	= 1.24 kg	= 2.42 kg
2 V6, 2 VP6	= 1.24 kg	= 2.42 kg
3 A5	= 0.38 kg	= 1.00 kg
3 A6	= 0.86 kg	= 2.27 kg
3 S6, 3 SP6	= 1.31 kg	= 2.77 kg
3 V6, 3 VP6	= 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

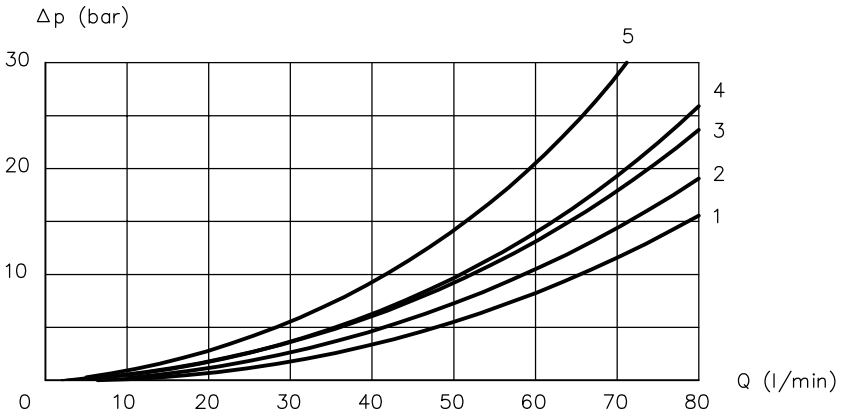
Also applies to ports in UNF and JIS.

3.4 Characteristic lines

Viscosity of the hydraulic fluid approx. 60 mm²/s

Directional valve section

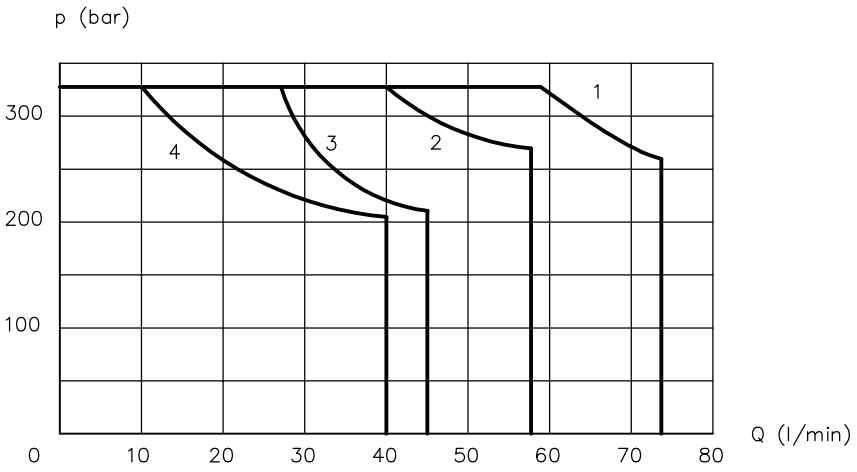
Pressure difference P → A/B and A/B → R



Q flow rate (lpm); Δp pressure difference (bar)

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	--	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



Q flow rate (lpm); p pressure difference (bar)

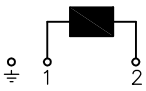
Circuit symbol	Curve
G, B, W, X	1
H, HW, HB	2
D	3
L	4

3.5 Electrical data

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
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

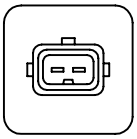
EN 175 301-803 A
2-pin
IP 65 (IEC 60529)

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)

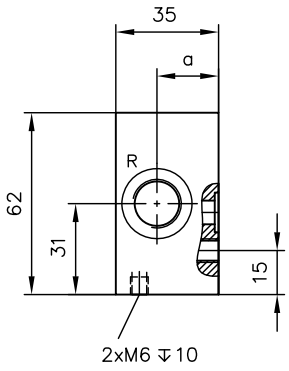


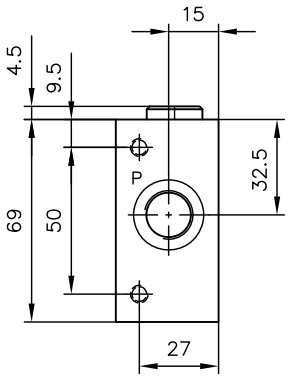
4 Dimensions

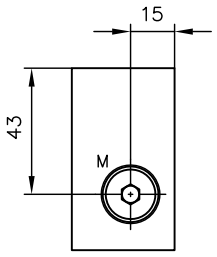
All dimensions in mm, subject to change.

4.1 Connection block

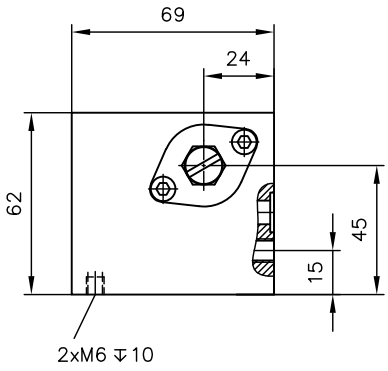
CWS 2. A5

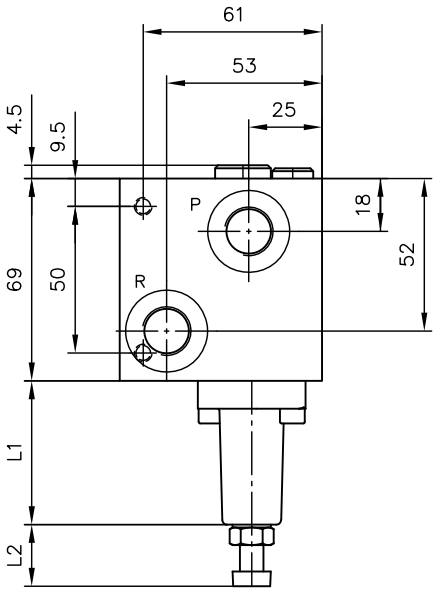


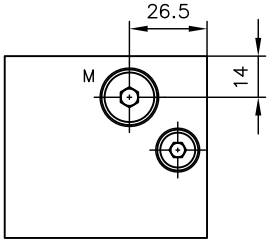




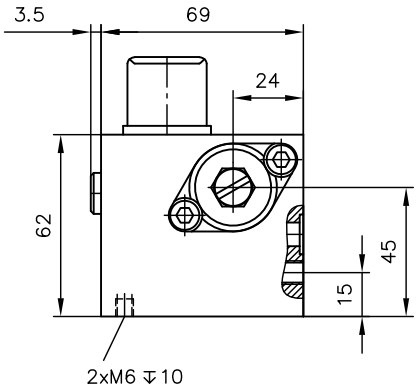
CWS 2. A6

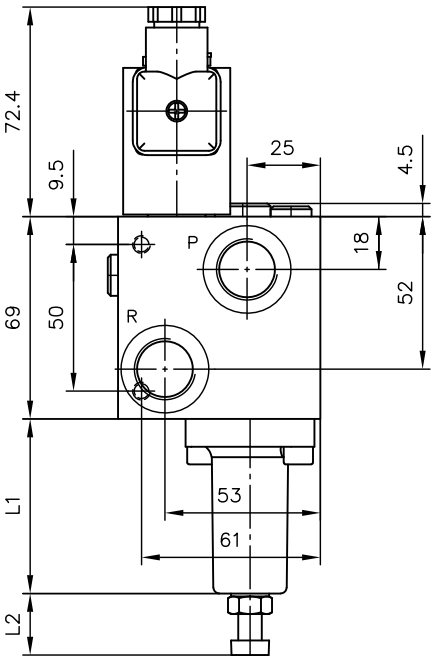


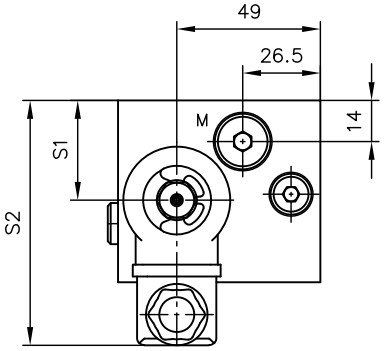




CWS 2. S(P)6, CWS 2. V(P)6



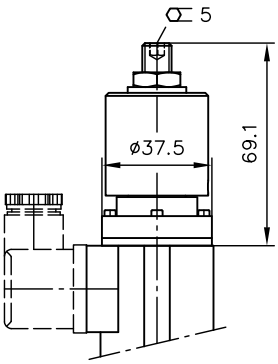




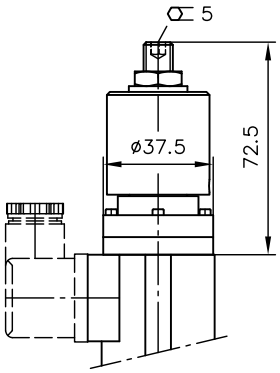
Coding	a	S1	S2	L1	≤ L2	Ports		
						P, R	M	
2	21	42	92	49	29	G 3/8	G 1/4	ISO 228-1
3	21	34	84	59,5	29	G 1/2	G 1/4	ISO 228-1
UNF 3	21	34	84	59,5	29	7/8-14 UNF	7/16-20 UNF	SAE J 514
JIS 3	21	34	84	59,5	29	G 1/2 JIS	G 1/4 JIS	ISO 228-1

Idle circulation valve with emergency actuation

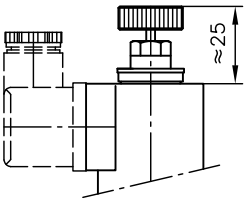
Coding **SB6**



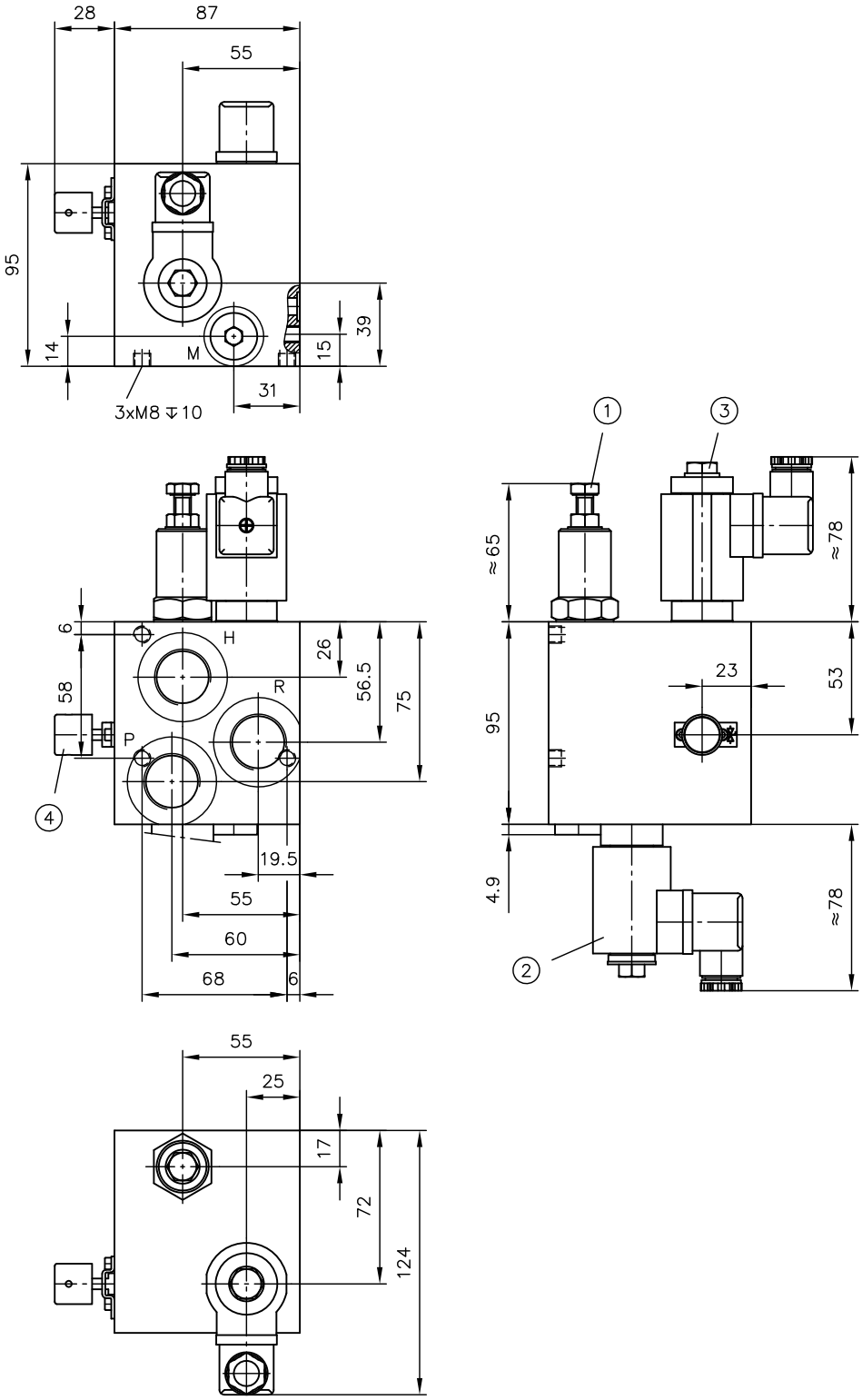
Coding **SPB6**



Coding **EM .. ST** (button for emergency actuation)



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



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

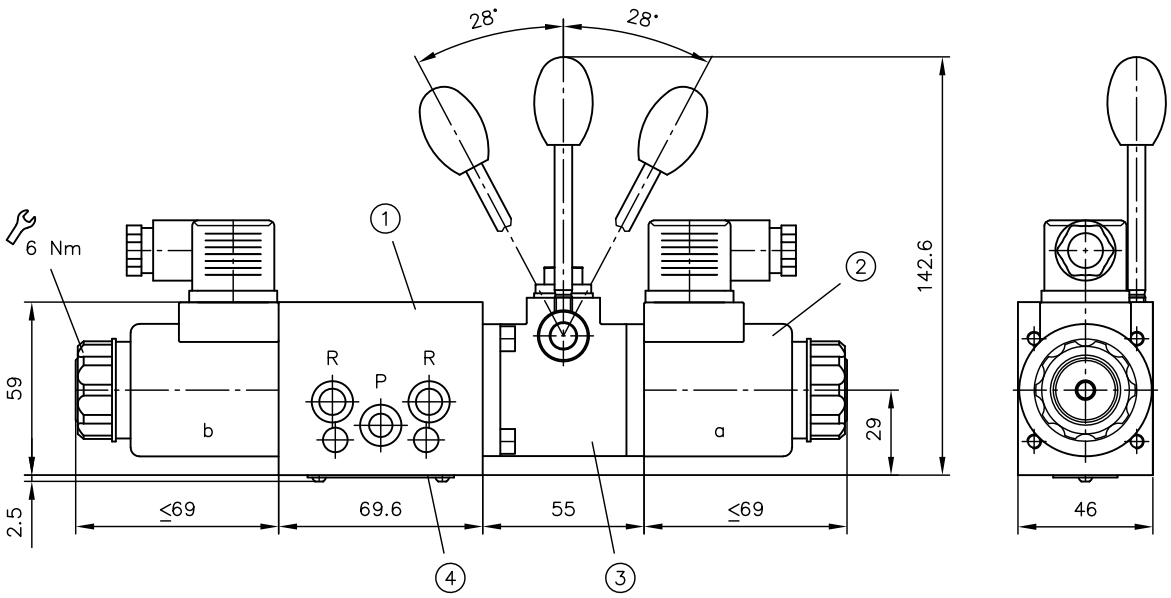
1 Pressure-limiting valve
2 2/2-directional seated valve in inlet (P → H)
3 2/2-directional seated valve in outlet (H → R)
4 Manual emergency drain coding H

4.2 Valve section

4.2.1 Directional valve section

4/3-way directional valve

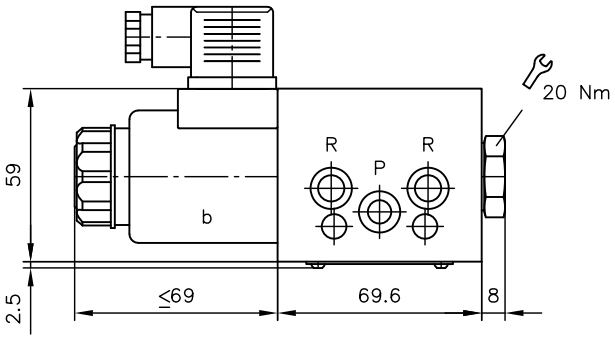
Circuit symbol **G, D, H, L, X**



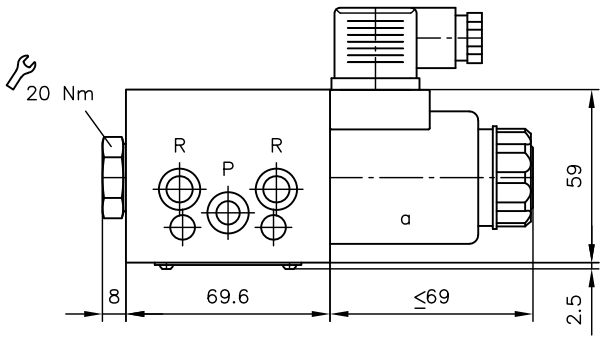
1 Directional valve section
2 Actuation
3 Hand lever
4 Type plate

4/2-way directional valve (function in switching position 0 and a)

Circuit symbol **W, HB, GB**

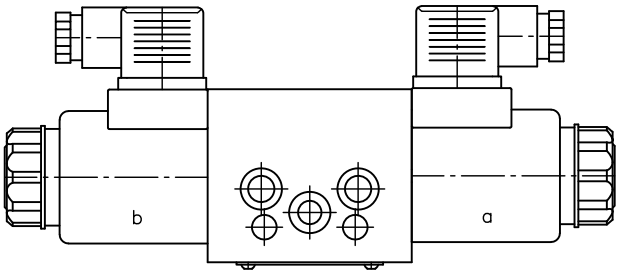


Circuit symbol **B, HW, GW**

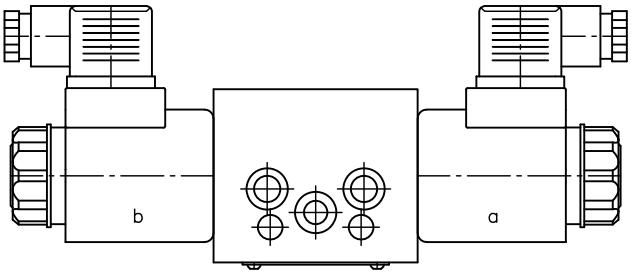


Actuation

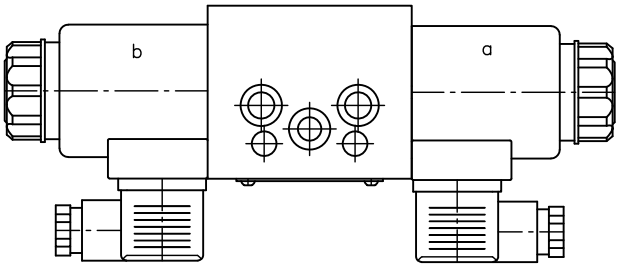
Coding **M-G 12(24)**



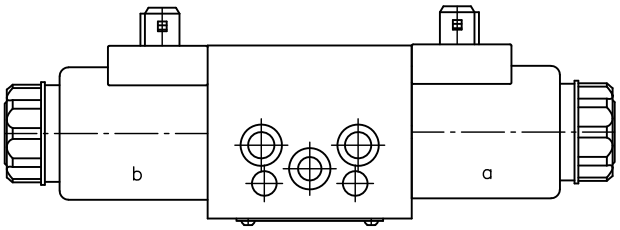
Coding **M1-G 12(24)**



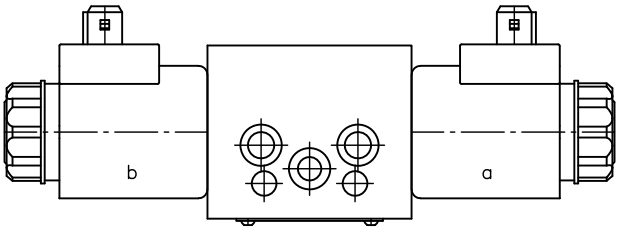
Coding **M2-G 12(24)**



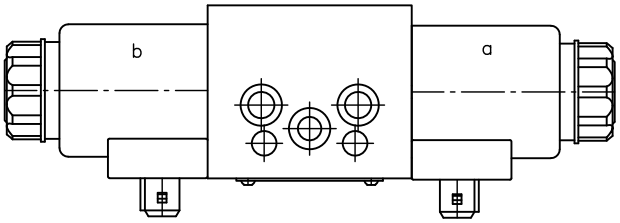
Coding **M-AMP 12(24)**



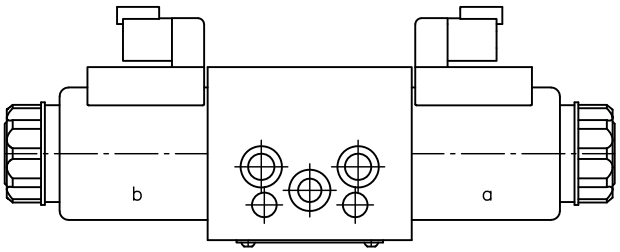
Coding **M1-AMP 12(24)**



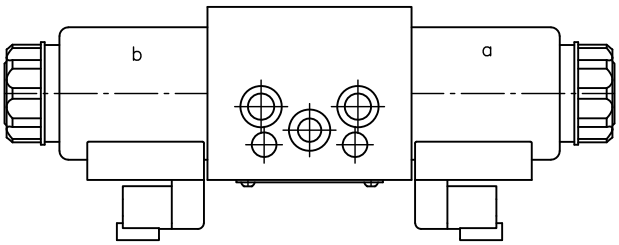
Coding **M2-AMP 12(24)**



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

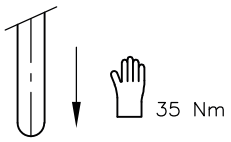


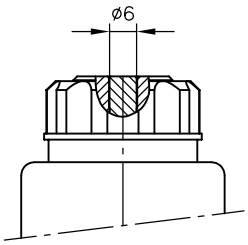
Coding **M2-DT 12(24)**



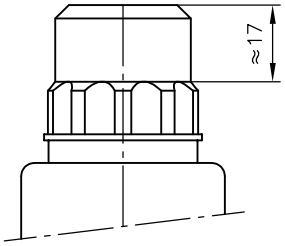
Emergency actuation

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



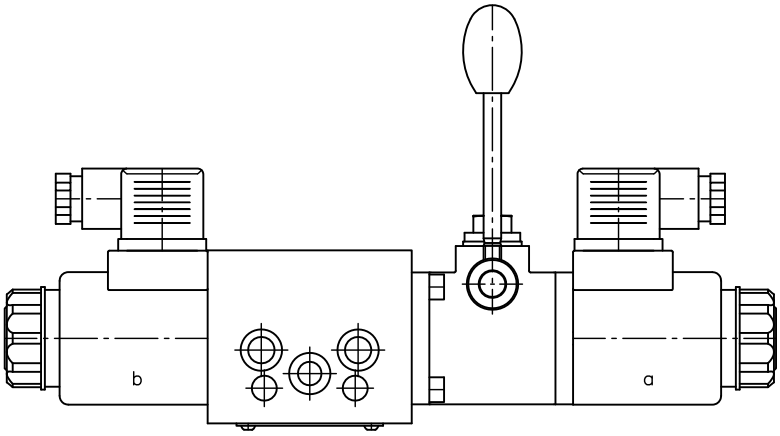


MT
Manual operation with push-button

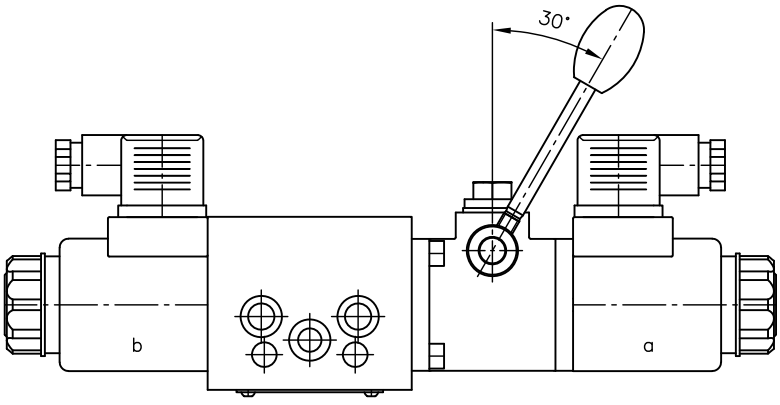


Hand lever

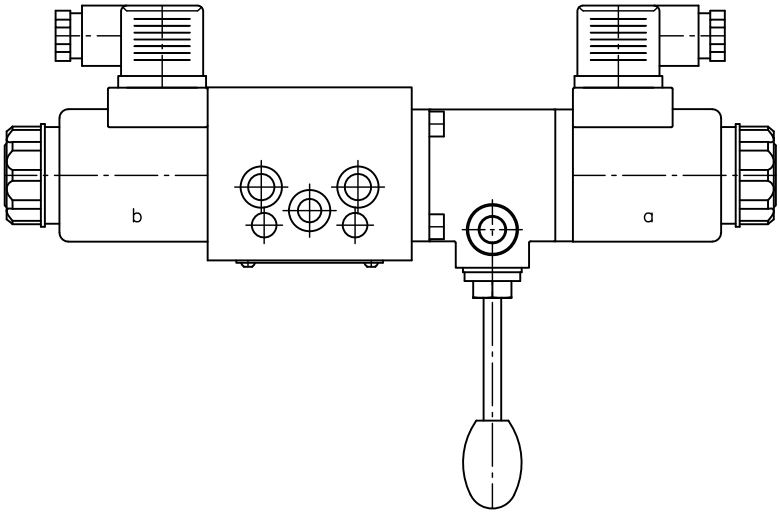
MHA



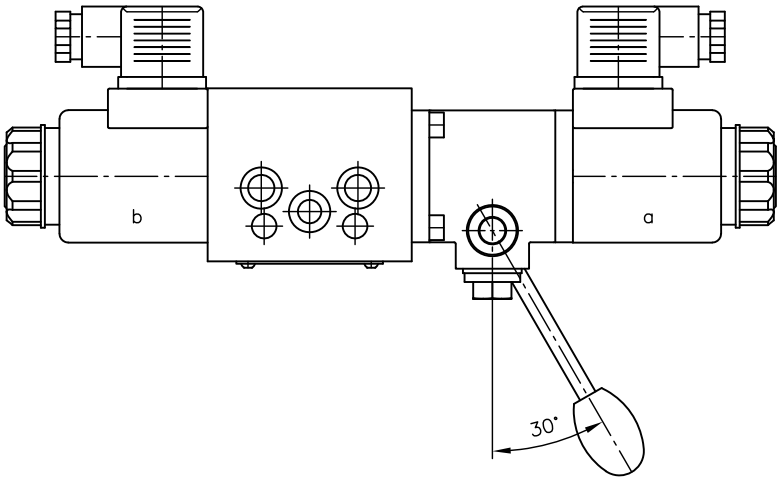
MH1A



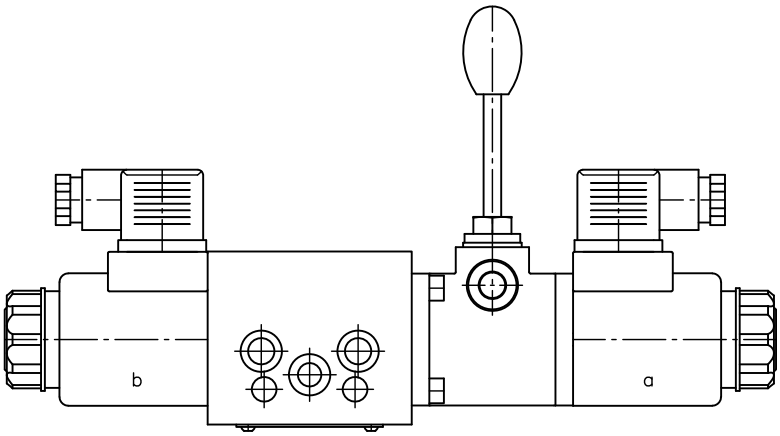
MH2A



MH3A

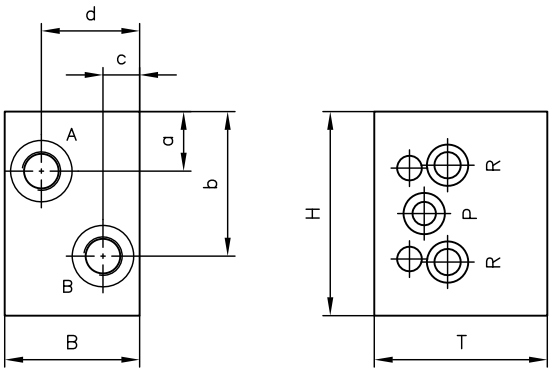


MH4A



Directional valve section with integrated consumer ports

(Coding 02, 0UNF12 and 0JIS2, see Chapter 2.2.5, "Additional functions")



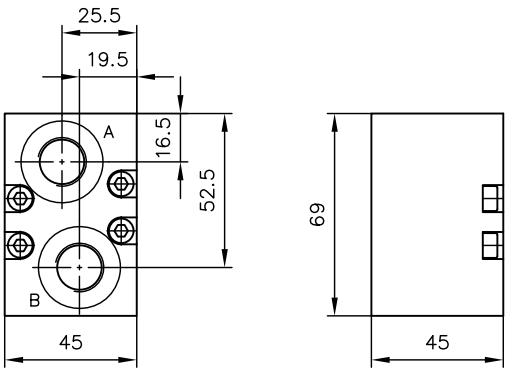
Coding	a	b	c	d	B	H	T
02	22,3	47,3	14	32	46	69,6	59
0UNF12	20,3	49,3	12,5	33,5	46	69,6	59
0JIS2	22,3	47,3	14	32	46	69,6	59

	Ports A, B	
02	G 3/8	ISO 228-1
0UNF12	9/16-18 UNF	SAE J 514
0JIS2	G 3/8 JIS	JIS B 2351

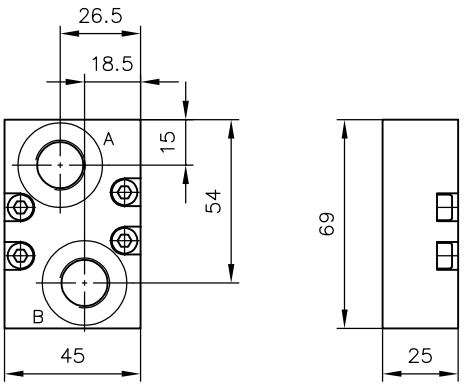
4.2.2 Ancillary block

see Chapter 2.2.7, "Ancillary block"

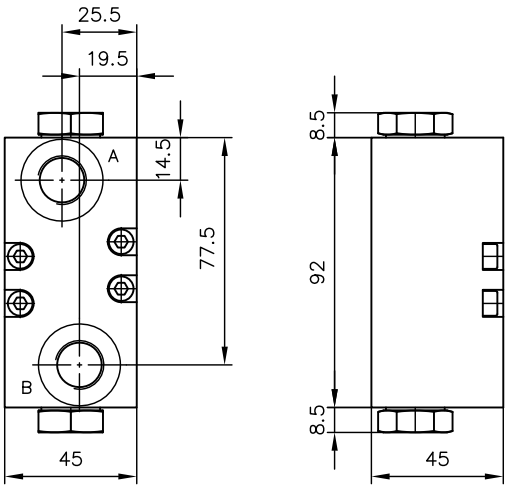
Coding **2C, UNF12C, JIS2C**



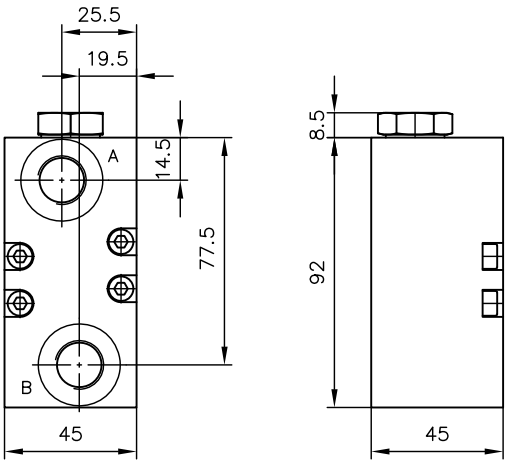
Coding **2F, UNF12F, JIS2F**



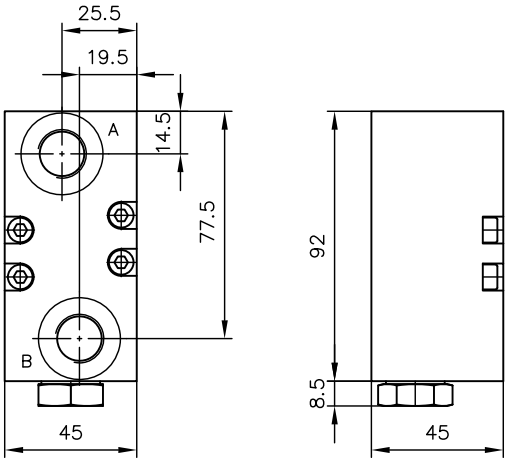
Coding **(L)2CH, (L)UNF12CH, (L)JIS2CH**



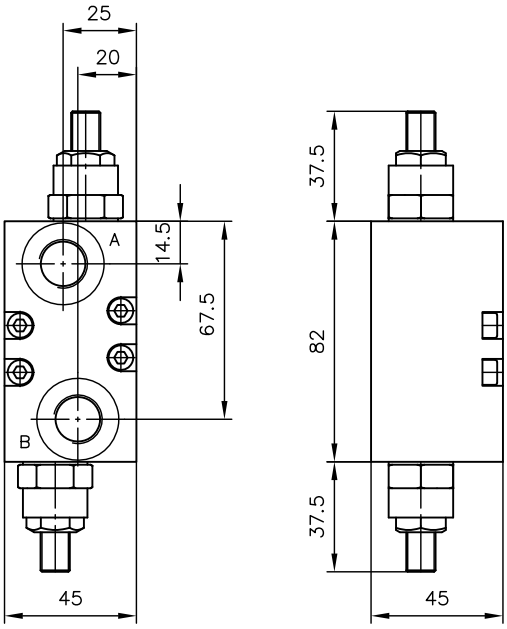
Coding **(L)2CHA, (L)UNF12CHA, (L)JIS2CHA**



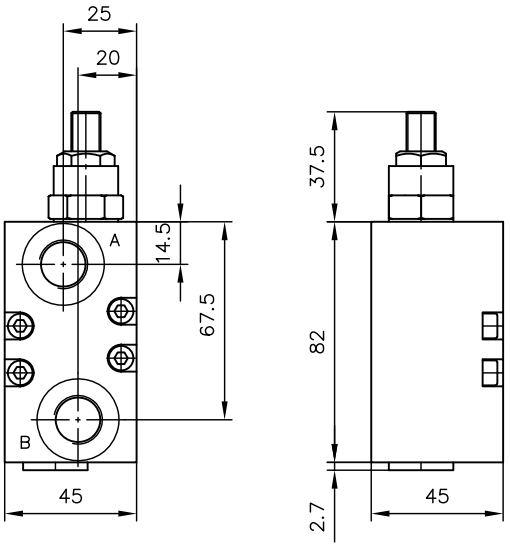
Coding **(L)2CHB, (L)UNF12CHB, (L)JIS2CHB**



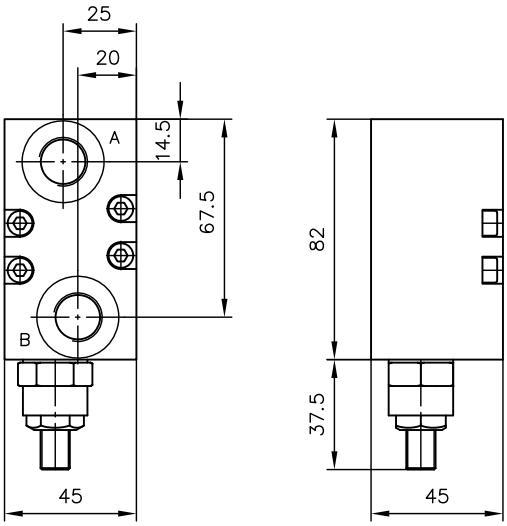
Coding **(L)2CQ, (L)UNF12CQ, (L)JIS2CQ**



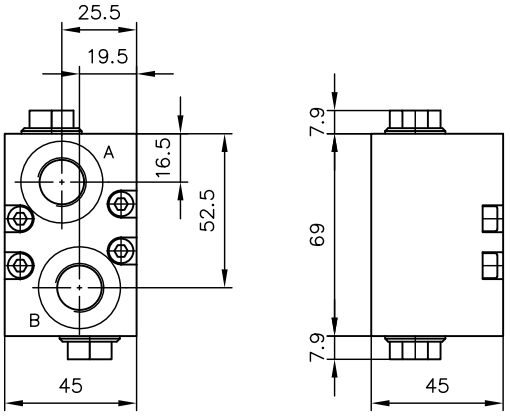
Coding **(L)2CQA, (L)UNF12CQA, (L)JIS2CQA**



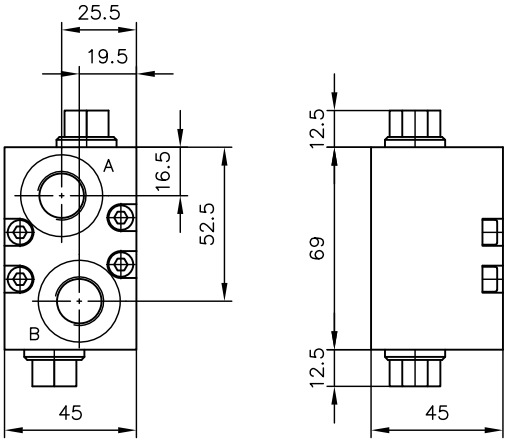
Coding **(L)2CQB, (L)UNF12CQB, (L)JIS2CQB**



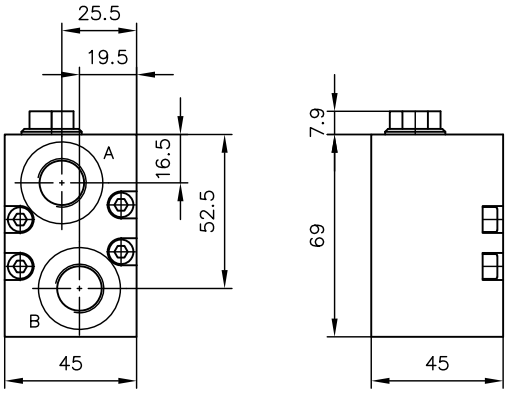
Coding **2CAN.. BN.., UNF12CAN.. BN.., JIS2CAN.. BN..**



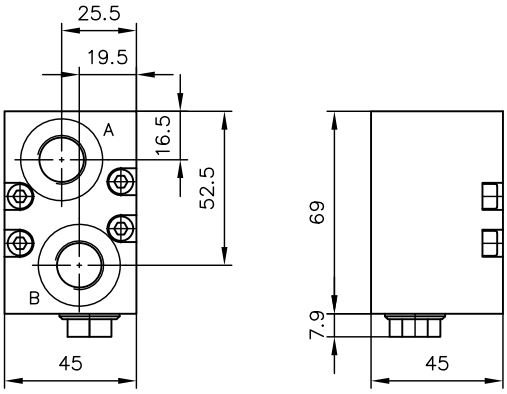
Coding **2CAS.. BS.., UNF12CAS.. BS.., JIS2CAS.. BS..**



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



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

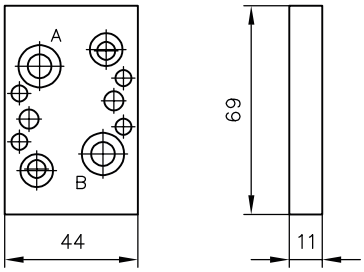


	Ports A, B	
/2	G 3/8	ISO 228-1
/UNF12	SAE-6 (9/16-18 UNF-2B)	SAE J 514
/JIS2	G 3/8	JIS B 2351

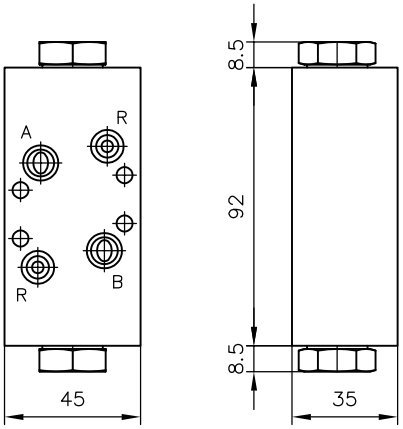
4.2.3 Intermediate plate

see Chapter 2.2.8, "Intermediate plate"

Coding **ZC11**



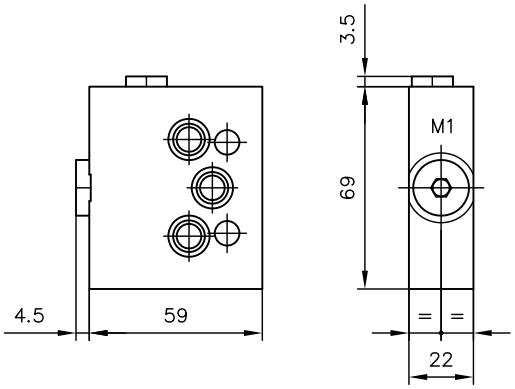
Coding **ZCH**



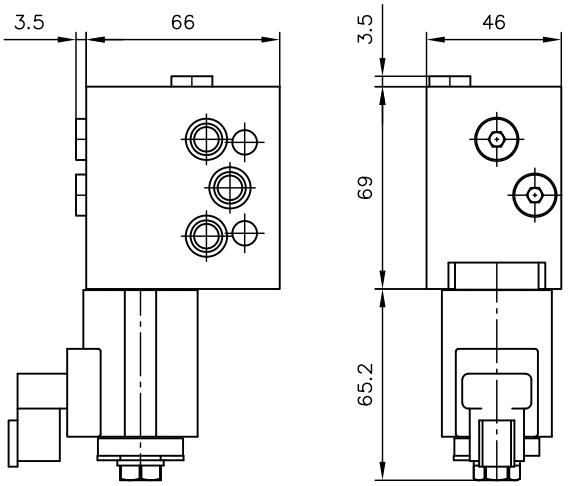
4.3 Series intermediate plate

see Chapter 2.3, "Series intermediate plate"

Coding **ZPL AP**



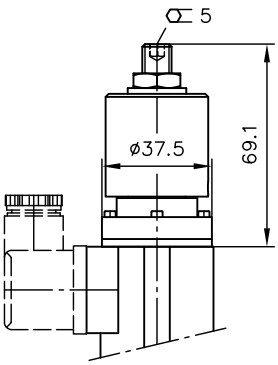
Coding **ZPL 20 (LI)-...**



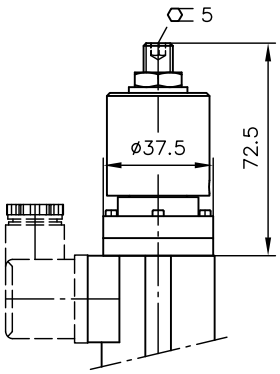
	Ports (ISO 228-1)
M1	G 1/4

Idle circulation valve with emergency actuation

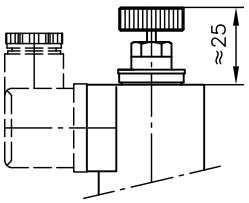
Coding **SB6**



Coding **SPB6**

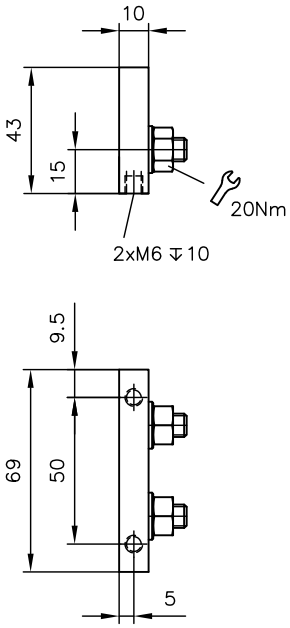


Coding **ST6**

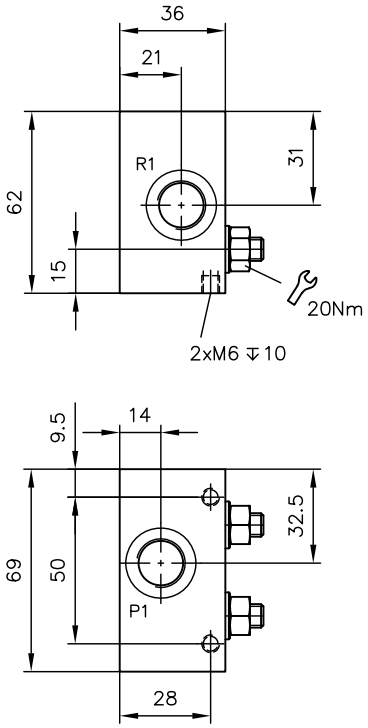


4.4 End plate

Coding **1**



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



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

5 Installation, operation and maintenance information

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

5.1 Intended use

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

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

Essential requirements for the product to function correctly and safely:

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

If the product can no longer be operated safely:

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

5.2 Assembly information

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

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

⚠ **DANGER**
Sudden movement of the hydraulic drives when disassembled incorrectly
Risk of serious injury or death

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

5.2.1 Attachment

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

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

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.

- 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 type CWL: D 7953
- Directional spool valve bank type SWS: D 7951
- 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
- Connection block type HMPL and HMPV for proportional directional spool valve: D 7700 H
- Directional seated valve type EM and EMP: D 7490/1

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