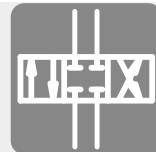


# Directional spool valves type CWS

## Product documentation



Series connection

Operating pressure  $p_{\max}$ :

315 bar

Flow rate  $Q_{\max}$ :

40 lpm



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# Contents

<b>1</b>	<b>Overview directional spool valve type CWS.....</b>	<b>4</b>
<b>2</b>	<b>Available versions, main data.....</b>	<b>5</b>
2.1	Order coding valve bank, overview.....	5
2.2	Connection block.....	5
2.3	End plate.....	8
2.4	Segment.....	9
2.4.1	Spool block.....	9
2.4.2	Consumer port, ancillary block.....	11
<b>3</b>	<b>Parameters.....</b>	<b>13</b>
3.1	General and hydraulic.....	13
3.2	Characteristics.....	15
3.3	Electrical data.....	16
<b>4</b>	<b>Dimensions.....</b>	<b>17</b>
4.1	Connection block.....	17
4.2	End plate.....	18
4.3	Segment.....	19
4.3.1	Spool block.....	19
4.3.2	Ancillary block.....	21
<b>5</b>	<b>Assembly, operation and maintenance recommendations.....</b>	<b>22</b>
5.1	Intended use.....	22
5.2	Assembly information.....	22
5.3	Operating instructions.....	23
5.4	Maintenance information.....	23
<b>6</b>	<b>Other information.....</b>	<b>24</b>
6.1	Circuit examples.....	24

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 mounted blocks offer a wide range of applications.

**Features and benefits:**

- One valve for different control functions and small flow quantities
- Compact and robust design

**Intended applications:**

- Construction machines and construction material machines
- Cranes and lifting equipment
- Agricultural machinery and machines for forestry purposes
- Municipal trucks
- System solutions for compact construction methods in industrial hydraulics (by direct attachment to compact hydraulic power packs)



*Directional spool valves type CWS*

## 2 Available versions, main data

### 2.1 Order coding valve bank, overview

Order coding example:

CWS 22 A 6/H 200	- G/M/0/02	- 1	- X 24
		Solenoid version	<a href="#">See Chapter 2.4, "Segment"</a>
		End plate	<a href="#">See Chapter 2.3, "End plate"</a>
	Segments	<a href="#">See Chapter 2.4, "Segment"</a>	
Connection block	<a href="#">See Chapter 2.2, "Connection block"</a>		



#### Note

A maximum of 10 segments can be installed.

### 2.2 Connection block

Order coding example:

CWS 2	2 A 6	/H 200	- ... - X 24
		Pressure-limiting valve in connection block	Table 3 Pressure-limiting valve in connection block
	Connection block	Table 2 Connection block	
Basic type and size	Table 1 Basic type and size		

**Table 1 Basic type and size**

Basic type and size	Description	Flow rate $Q_{\max}$ (lpm)	Pressure $p_{\max}$ (bar)
CWS 2	Directional spool valve bank	40	315

**Table 2 Connection block**

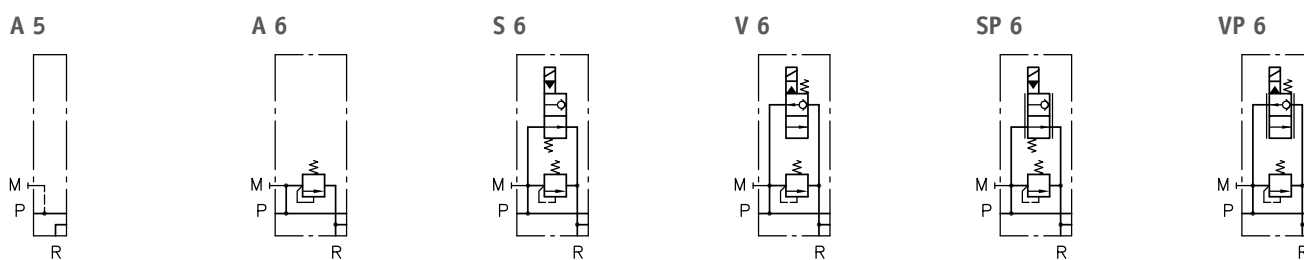
Coding	Description	Flow rate $Q_{\max}$ (lpm)	Ports P, R
2 A 5	No additional function	25	G 3/8 (BSPP)
3 A 5		40	G 1/2 (BSPP)
2 A 6	With pressure-limiting valve	25	G 3/8 (BSPP)
3 A 6		40	G 1/2 (BSPP)
2 S 6	With pressure-limiting valve and idle circulation valve	25	G 3/8 (BSPP)
2 V 6	S – N/O contact		
2 SP 6	V – N/C contact		
2 VP 6	SP – N/O contact proportional		
	VP – N/C contact proportional		
3 S 6		40	G 1/2 (BSPP)
3 V 6			
3 SP 6			
3 VP 6			
UNF 3 A 5	No additional function	40	7/8-14 UNF
UNF 3 A 6	With pressure-limiting valve		
UNF 3 S 6	With pressure-limiting valve and idle circulation valve		
UNF 3 V 6	S – N/O contact		
UNF 3 SP 6	V – N/C contact		
UNF 3 VP 6	SP – N/O contact proportional		
	VP – N/C contact proportional		
JIS 3 A 5	No additional function	40	G 1/2 JIS (BSPP)
JIS 3 A 6	With pressure-limiting valve		
JIS 3 S 6	With pressure-limiting valve and idle circulation valve		
JIS 3 V 6	S – N/O contact		
JIS 3 SP 6	V – N/C contact		
JIS 3 VP 6	SP – N/O contact proportional		
	VP – N/C contact proportional		


**Note**

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

When there is limited pressure, higher flow rates are also possible for codes 3, UNF 3 and JIS 3 (see [Chapter 3.2, "Characteristics"](#)).

### Circuit symbols



For the circulation function, valve types EM or EMP pursuant to [D 7490/1](#) are used.

**Table 3 Pressure-limiting valve in connection block**

Coding	Description
No designation	Max. return pressure $p_R = 20$ bar
H	Max. return pressure $p_R = 200$ bar

Pressure-limiting valve fixed  
With tool adjustable (50 to 315 bar)

For the pressure-limiting valve, valve types MVF (or MVB) pursuant to [D 7000 E/1](#) are used.

## 2.3 End plate

Order coding example:

CWS 22 A 6/H 200 - G/M/0/02 - 1 - G 24

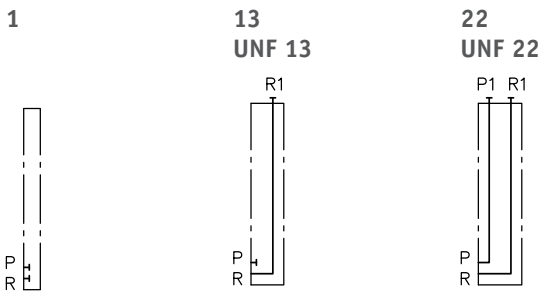
End plate Table 4 End plate

Order coding example single end plate: **CWS 2-1**

### Table 4 End plate

Coding	Description	Port P1, R1
1	Standard	--
13	Additional port: R1	G 1/2 (BSPP)
22	Additional port: P1, R1	G 3/8 (BSPP)
UNF 13	Additional port: R1	7/8-14 UNF
UNF 22	Additional port: P1, R1	3/4-16 UNF

### Circuit symbols



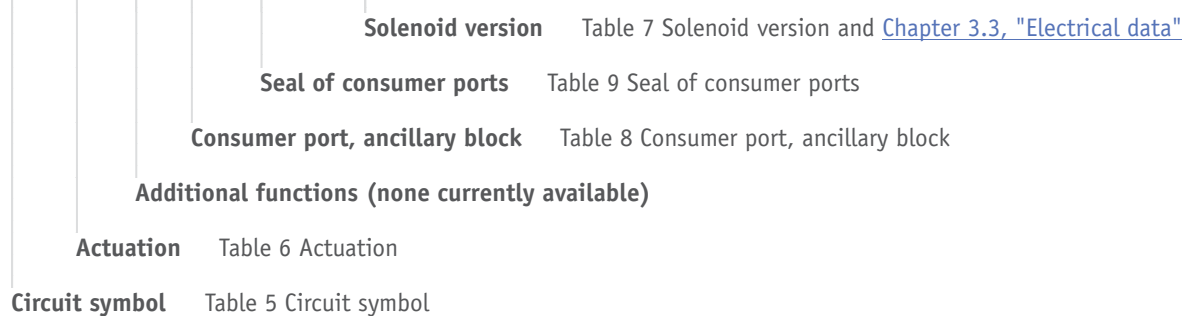


## 2.4 Segment

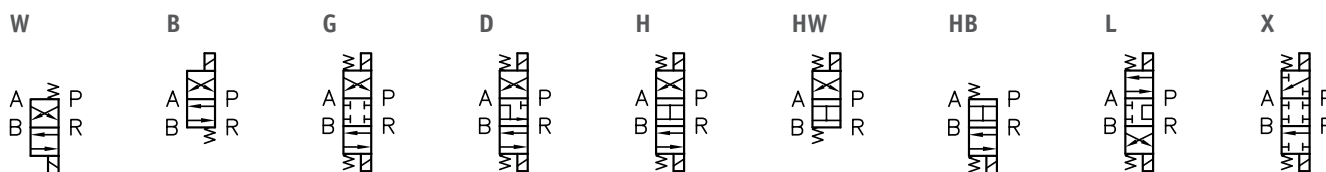
### 2.4.1 Spool block

Order coding example:

CWS 2... - D /M /0 /01 A - 1 - X 24



**Table 5 Circuit symbol**



**Table 6 Actuation**

Coding	Description
M	Electrical
MHA	Electrical and manual actuation A-side
MHB	Electrical and manual actuation B-side

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

MHA or MHB is available for all 4/3 directional spool valves or for 4/2 directional spool valves, if there is a switching position in a or b respectively.

**Table 7 Solenoid version**

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)
X 12 X 24	DIN EN 175 301-803 A (Coding G... with line connector, coding L... with LED plug)	12 V DC 24 V DC	IP 65
DT	DEUTSCH (DT 04-2P)	12 V DC 24 V DC	IP 69 K

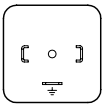
Further information on the line connectors used in [D 7163](#).

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

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

**Electrical connection for actuating solenoid**

G .., X.., L ..



DT ..



## 2.4.2 Consumer port, ancillary block

Order coding example:

CWS 2... - D/M/O /2 CH A - 1 - G 24

Seal of consumer port Table 9 Seal of consumer port  
 Consumer port, ancillary block Table 8 Consumer port, ancillary block

Order coding example single ancillary block: CWS 2-/2 CH



**Note**

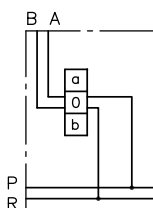
Valve section "No additional function" cannot be retrofitted with an ancillary block.

**Table 8 Consumer port, ancillary block**

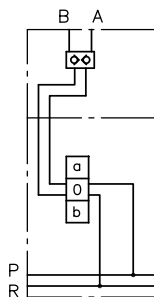
Coding	Description	Port
01	Consumer port in the valve block	G 1/4 (BSPP)
02	Consumer port in the valve block	G 3/8 (BSPP)
UNF 12	Consumer port in the valve block	9/16-18 UNF
2 CH	With double-piloted check valve in ancillary block (control behaviour 1:2.5)	G 3/8 (BSPP)

**Circuit symbols**

01  
02  
UNF 12



2 CH



**Table 9 Seal of consumer ports**

Coding	Description
None	None, series
A	Port A sealed
B	Port B sealed
C	Port A and B sealed



**Note**

Seal "C": possible instead of an idle circulation valve in the connection block.

## 3 Parameters

### 3.1 General and hydraulic

#### General information

<b>Designation</b>	Valve bank	
<b>Design</b>	Spool valve; up to 10 valve sections	
<b>Installation position</b>	As desired	
<b>Flow direction</b>	According to arrow direction in circuit symbols Swapping not permitted!	
<b>Port</b>	P	Hydraulic oil inlets (pump) or lead-on
	R	return line
	A, B	Consumer ports
<b>Material</b>	Blocks: ZnNi magnet: electrogalvanised solenoid	
<b>Hydraulic fluid</b>	Hydraulic oil: according to DIN 51524-1 part 1 to 3; ISO VG 10 to 68 according to ISO 3448 Viscosity range: min. approx. 4; max. approx. 400 mm <sup>2</sup> /s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester).	
<b>Cleanliness level</b>	<b>ISO 4406</b> <u>21/18/15...19/17/13</u>	
<b>Temperatures</b>	Environment: approx. -20 to +70°C, oil: -20 to +60°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 for subsequent operation. Biologically degradable hydraulic fluids: Note manufacturer specifications.	

**Pressure and flow rate**

**Operating pressure**

**Connection block**

P, A, B	315 bar
R	20 bar, standard
R	200 bar, with code "H"

**Valve section**

P, A, B	315 bar
R	200 bar

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

**Flow rate**

Max. consumer flow rate, see [Chapter 2.2, "Connection block"](#), Table 1 This applies to connection blocks, end plates and segments.



**Note**

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

**Weight**

**Connection block**

**Coding**

CWS 22 A 5	= 1.00 kg
CWS 22 A 6	= 2.25 kg
CWS 22 S(P) 6	= 2.42 kg
CWS 22 V(P) 6	= 2.42 kg
CWS 23 A 5	= 1.00 kg
CWS 23 A 6	= 2.27 kg
CWS 23 S(P) 6	= 2.77 kg
CWS 23 V(P) 6	= 2.77 kg

**End plate**

1	= 0.25 kg
13	= 1.06 kg
22	= 1.04 kg

**Segment**

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	= + 0.80 kg

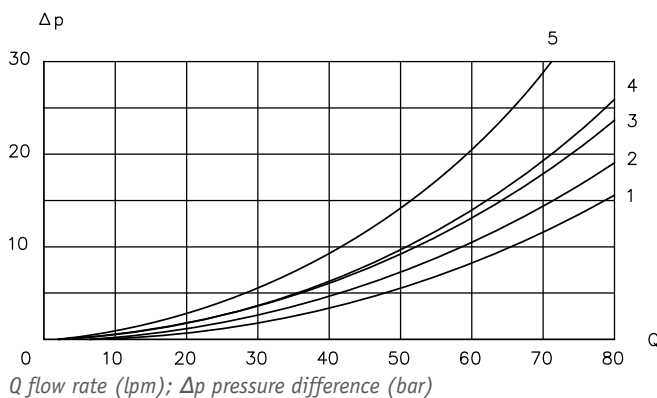
**Ancillary block**

2 CH	= 1.43 kg
------	-----------

## 3.2 Characteristics

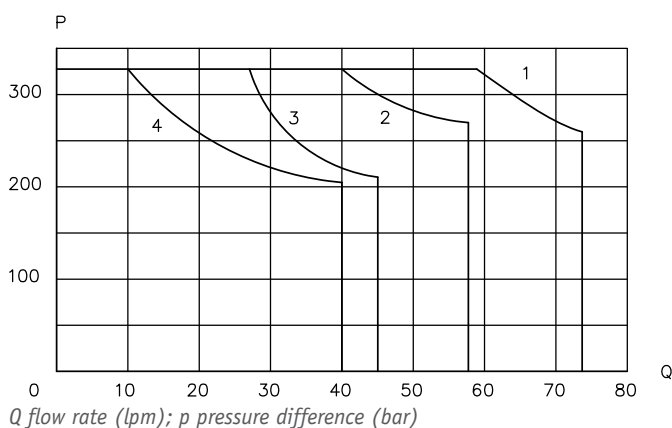
Oil viscosity approx. 60 mm<sup>2</sup>/s

### Flow resistance $\Delta p$ -Q characteristics



Circuit symbol	Middle position	Switching position a		Switching position b	
	P → R	P → B	A → R	P → A	B → R
G	-	3	1	3	1
D	-	3	2	3	2
H	3	1	2	1	2
L	5	5	2	5	2
X	-	3	-	3	-
W	-	4	1	4	1
B	-	4	1	4	1

### Switchable flow p-Q characteristics

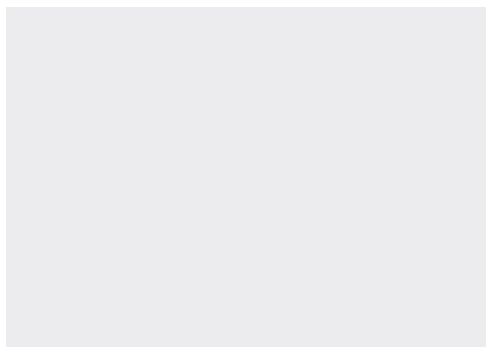


Circuit symbol	Curve
G, B, W, X	1
H, HW, HB	2
D	3
L	4

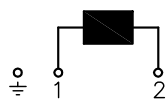
### 3.3 Electrical data

Nominal voltage	<b>Coding</b>	<b>12</b>	<b>24</b>
	U <sub>N</sub> (V)	12 V DC	24 V DC
Nominal power	P <sub>N</sub> (W)	30 (25)	30 (25)
Nominal current	I <sub>20</sub> (A)	2.5 (2.08)	1.25 (1.04)
	Values in brackets for coding DT (line connector German)		
actuated time	100 %		
Switching frequency	approx. 3600 per hour		
Protection class	IP65 , coding DT: IP67		
Insulation material class	H		
Assembly	In the case of an electrical defect, after loosening a knurled screw, the magnet can simply be removed axially and replaced with a new one.		

### Electrical connection



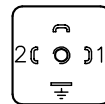
2-pole  
Coil a (1) coil b (2)



-X 12, -X 24

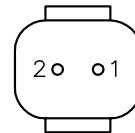
DIN EN 175 301-803 A

2-pole  
DIN EN 60529 IP 65



-DT 12, -DT 24

2-pole  
DIN EN 60529 IP 67



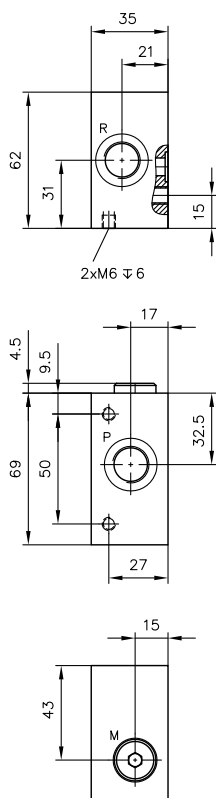


## 4 Dimensions

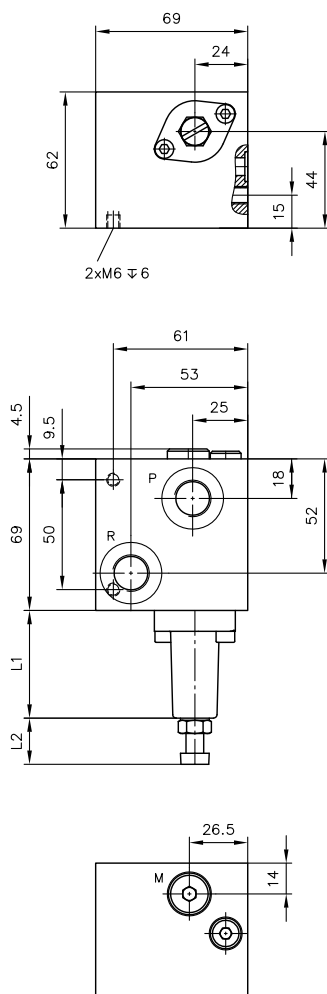
All dimensions in mm, subject to change.

### 4.1 Connection block

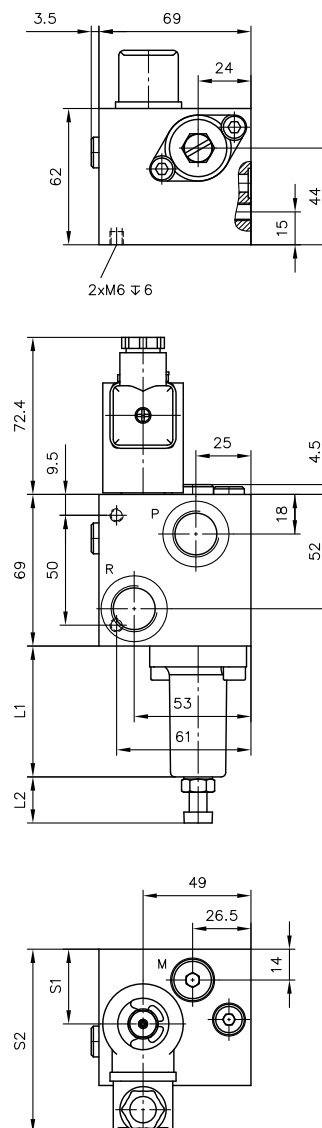
CWS 2. A 5



CWS 2. A 6



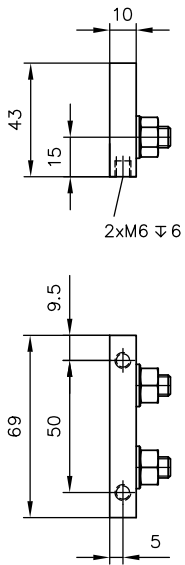
CWS 2. S(P) 6  
CWS 2. V(P) 6



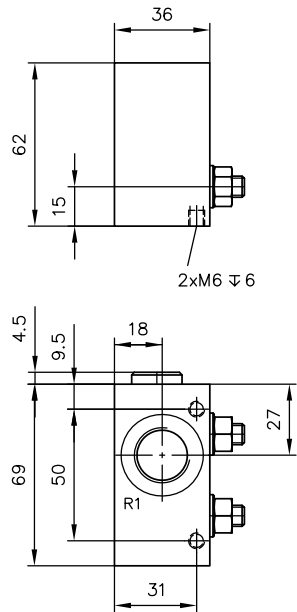
Coding	S1	S2	L1	≤L2	Ports		
					P, R	M	
2	42	92	49	29	G 3/8 (BSPP)	G 1/4 (BSPP)	ISO 228-1
3	34	84	59.5	29	G 1/2 (BSPP)	G 1/4 (BSPP)	ISO 228-1
UNF 2	42	92	49	29	3/4-16 UNF	7/16-20 UNF	SAE J 514
UNF 3	34	84	59.5	29	7/8-14 UNF	7/16-20 UNF	SAE J 514

## 4.2 End plate

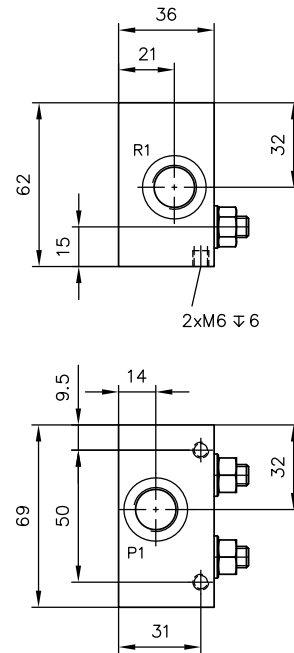
1



13  
UNF 13



22  
UNF 22



Coding

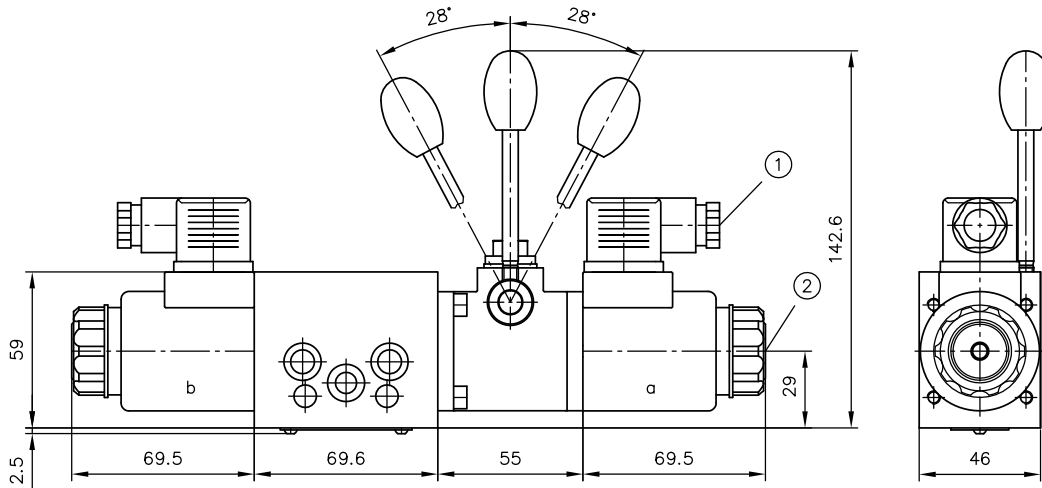
Ports

	Ports		
	P1	R1	
1	--	--	--
13	--	G 1/2 (BSPP)	ISO 228-1
22	G 3/8 (BSPP)	G 3/8 (BSPP)	ISO 228-1
UNF 13	--	7/8-14 UNF	SAE J 514
UNF 22	3/4-16 UNF	3/4-16 UNF	SAE J 514

## 4.3 Segment

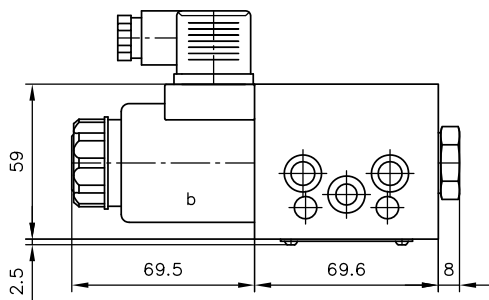
### 4.3.1 Spool block

Valve with circuit symbol G, D, H, L, X

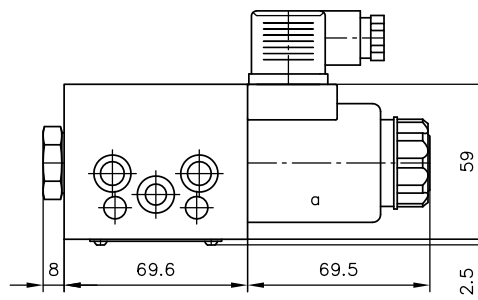


- 1 Cable fitting Pg 9
- 2 Manual override

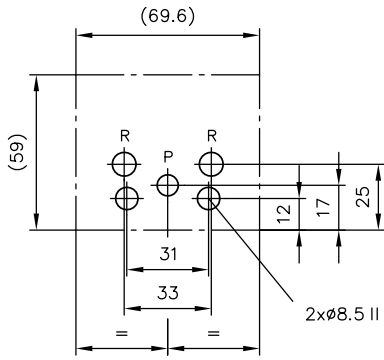
Valve with circuit symbol W, HB



Valve with circuit symbol B, HW



**Side connection pattern**

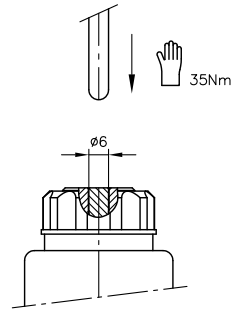


Sealing of the ports:

	O-ring
P, R	10.78x1.78

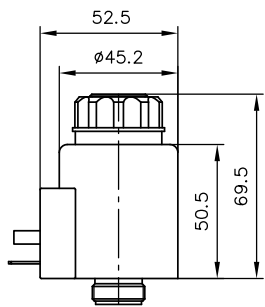
**Manual override**

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

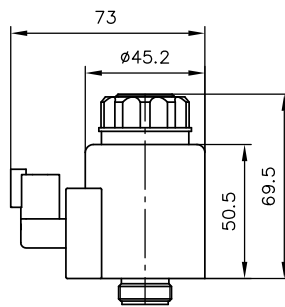


**Solenoid**

Coding **G, X, L**

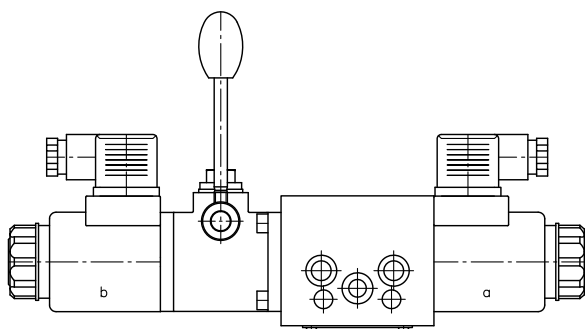


Coding **DT**

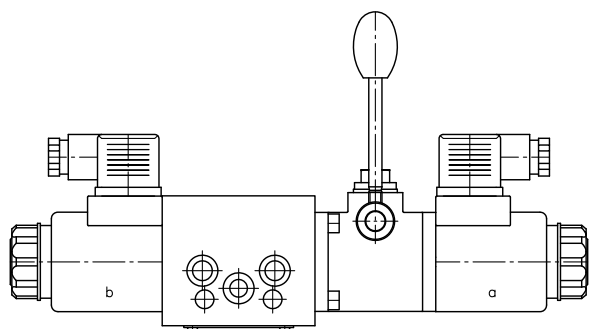


**Hand lever**

**MHB**



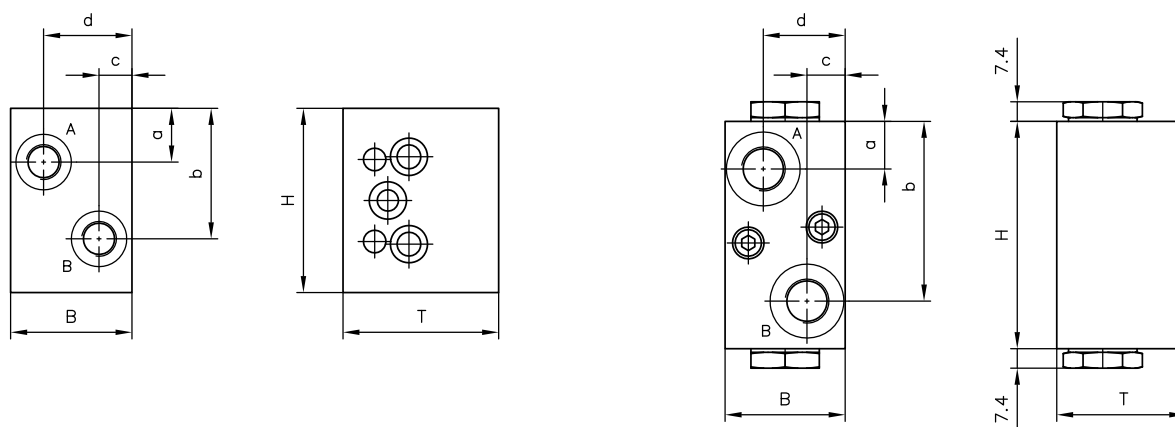
**MHA**



### 4.3.2 Ancillary block

01  
02  
UNF12

2 CH



Coding	a	b	c	d	B	H	T
01	20.3	49.3	12.5	33.5	46	69.6	59
02	22.3	47.3	14	32	46	69.6	59
UNF 12	20.3	49.3	12.5	33.5	46	69.6	59
2 CH	18	68	14.5	31.1	45.6	93.4	49

Coding	Ports A, B	
01	G 1/4 (BSPP)	ISO 228-1
02	G 3/8 (BSPP)	ISO 228-1
UNF 12	9/16-18 UNF	SAE J 514
2 CH	G 3/8 (BSPP)	SAE J 514

### 5.1 Intended use

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

The valve demands high technical safety standards and regulations for fluid engineering and electrical 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.
- The operating and maintenance manual of 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 permissible 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, etc.).

The hydraulic power pack must be shut down correctly prior to dismantling; this applies in particular to power packs 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.

## 5.3 Operating instructions

### Product configuration and setting the pressure and 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.



#### 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.

- 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



#### Note

Fresh hydraulic fluid from the drum does not always have the highest degree of purity. Under some circumstances the fresh hydraulic fluid must be filtered before use.

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

## 5.4 Maintenance information

This product is largely maintenance-free.

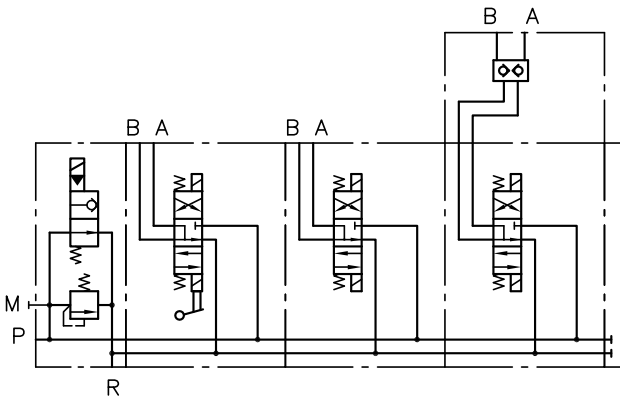
Conduct a visual inspection at regular intervals, but at least once per year, to check if the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

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

## 6 Other information

### 6.1 Circuit examples

CWS 22 S6/200	- D/MHB/0/02 - D/M/0/02 - D/M/0/2CH	- 1 - G 24
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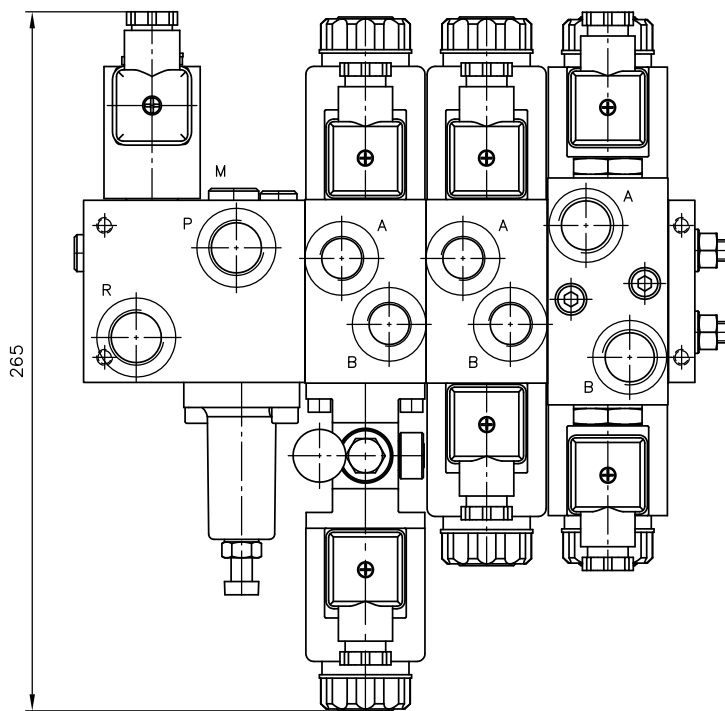
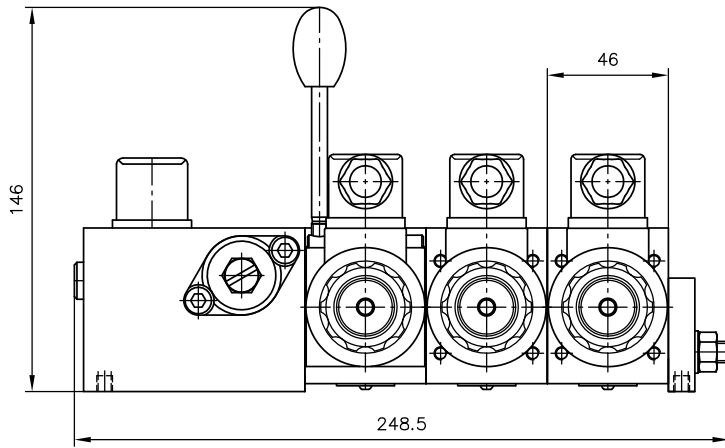
#### Technical data

P	200 bar
Q	25 lpm

#### Ports

Coding	Connections (ISO 228-1) (BSPP)
A, B, P, R	G 3/8
M	G 1/4





## Further information

### Additional versions

- Directional spool valve bank type SWS: D 7951
- Directional spool valve type NSWP 2: D 7451 N
- 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