

# Directional seated valves Type WN and WH

Zero leakage

(Type WN also as directional spool valve)

Individual valves for manifold mounting  
Valves with individual connection sub-plates  
Directional valve banks

Section 2  
Section 3  
D 7470 B/1

Pressure  $p_{\max}$  = 350 ... 450 bar  
Flow  $Q_{\max}$  = 5 ... 60 lpm

Individual valve for manifold mounting  
(see section 2)



Size 1



Size 2



Size 3



Size 4

Valve with indiv. connection sub-plate for pipe connection  
(see section 3)  
Example as size 3



## 1. General information

- The directional seated valves type WN and WH are of compact design and feature 2/2-, 3/2-way functions. 2/2-, 3/2-way functions are possible by combining two individual valves on one joint sub-plate (see sect 3).
- All functionally important components, from the solenoid armature to the valve elements, are lubricated by the hydraulic fluid, therefore no maintenance is required.
- Type WN is only available as size 1. The armature cavity is pressure resistant up to 300 bar and directly connected to port R. This means that between the solenoid armature and the valve elements only a simple pin (with no seal) is required. This results in a very long service life (no seal wear).  
The solenoid force is largely dependent on the respective pressures to be switched. This often enables operation with reduced supply voltage (see sect. 2.2.1) thereby reducing the solenoid temperature and increasing its service life.
- Additionally to the directional seated valve versions of type WN, there is also a 4/2-way directional spool valve available ( $p_{\max} = 300$  bar).
- Type WH features an actuation pin between solenoid armature and valve elements which is sealed and shaped in such a way, that the solenoid force is supported by an additional hydraulic force. This enables pressure up to 450 bar (WH 1) or 350 bar (WH 2, 3 and 4) to be achieved.  
For lubrication purposes and to equalize the volume, the armature cavity is either connected internally to the return port, or in case of 2/2-way valves connected externally to the return pipe (depending on application).  
Type WH 1 features larger valve elements and more stroke resulting in a reduced flow resistance than with WN 1.

## 2. Individual valve for manifold mounting

For valves with individual sub-plate suited for pipe connection, see section 3.

### 2.1 Type coding, main data

For complete type overview see section 6.1, page 19

Coding example:

**WH 1 M - G 24**

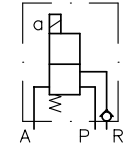
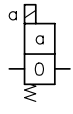
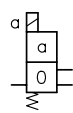
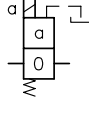
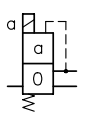
**Table 1:** Basic type and size

Type	Pressure $p_{max}$ (bar)		Flow (lpm)	
	Directional seated valve	Directional spool valve	Directional seated valve	Directional spool valve
<b>WN 1</b>	... 350 <sup>1)</sup>	300	5	6
<b>WH 1</b>	450	X	8	X
<b>WH 2</b>	350		15	
<b>WH 3</b>	350		30	
<b>WH 4</b>	350		60	

**Table 2:** Actuation solenoid <sup>5)</sup>

Standard with plug	Without plug	With plug featuring LED's	Nom. voltage
<b>G 12</b> <sup>4)</sup>	<b>X 12</b> <sup>4)</sup>	<b>L 12</b> <sup>4)</sup>	12 V DC
<b>G 24</b>	<b>X 24</b>	<b>L 24</b>	24 V DC
<b>G 98</b> <sup>4)</sup>	<b>X 98</b> <sup>4)</sup>	---	98 V DC
<b>G 205</b>	<b>X 205</b>	---	205 V DC
<b>WG 110</b> <sup>4)</sup>	---	---	110 V AC <sup>50 /</sup>
<b>WG 230</b>	---	---	230 V AC 60 Hz

**Table 3:** Flow pattern symbols (also see section 3 for combinations of individual valves)

Suited for	Directional seated valves				Directional spool valves	<b>Only for WN 1, WH 1 and WH 2:</b> 3/2-way valves with additional return pressure stop 				
WN 1  2/2-way	<b>D</b>	<b>Q</b> <sup>2) 3)</sup>	<b>F</b>	<b>E</b> <sup>2)</sup>	<b>W</b>		When several valves are operating in parallel, the return pressure stop prevents pressure surges out of the common return pipe from entering unoperated, unloaded or easily moving consumers, where there is a connection A→R. Thus preventing uncontrolled movements. Such pressure surges can arise as a result of switching operations. Occasionally the return pressure stop may be required for WN 1 or WN 2 valves, as the resetting spring has a lower force than in WH 1. These check valves are not suitable for stopping pressurized oil, which may be apparent at R, depending on the combination of valves. A circuit with an external check valve would have to be installed in this case.  The following parts are required for retrofitting: <table border="1" style="width: 100%;"> <tr> <td>WN(H) 1</td> <td>Valve shim 7470 021</td> </tr> <tr> <td>WH 2</td> <td>Ball 3/16" DIN 5401 and housing 7545 019</td> </tr> </table>	WN(H) 1	Valve shim 7470 021	WH 2
WN(H) 1	Valve shim 7470 021									
WH 2	Ball 3/16" DIN 5401 and housing 7545 019									
WN 1  3/2-way	<b>H</b>	<b>N</b> <sup>2) 3)</sup>	<b>M</b>	<b>R</b> <sup>2)</sup>	<b>WX</b>					
WH 1 to WH 4  2/2-way	<b>D</b>	<b>Q</b> <sup>2)</sup>	<b>F</b>	<b>E</b> <sup>2)</sup>						
WH 1 to WH 4  3/2-way	<b>H</b>	<b>N</b> <sup>2)</sup>	<b>M</b>	<b>R</b> <sup>2)</sup>						

1) See sect. 2.2

2) The additional check valve on the P-side in types Q, E, N, R, and WX prevents an equalization of pressure when the passage is open, or a change in direction of flow when due to other switching operations the pressure at P becomes lower than at A (B, R). See also section 3, table 4 a footnote <sup>3)</sup>. The check valve insert can be retrofitted and is therefore separately available. Order coding EK 01.

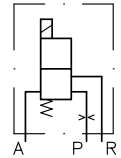
3) See also installation instruction in sect. 5.4

4) Not available for WH 4

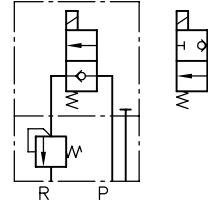
5) For further special voltage see section 2.2.2 "Special voltages"

**Only for WN 1, WH 1:**

2/2- and 3/2-way directional seated valves feature an additional orifice in port P, flow pattern symbols D, F, H and M (see also sect. 5.2).



2/2-way directional seated valves featuring a pressure limiting valve in the intermediate plate, flow pattern symbols D and F (see also sect. 5.1).



**2.2 Further characteristic data**

**2.2.1 General and hydraulic**

Nomenclature, design	Seated ball valve or spool valve in 2/2-, 3/2- or 4/2-way versions, depending on type	
Pipe connection	Basic valve (sect. 2.1):	Via manifold
	Sub-plates (sect. 3):	Via tapped ports
Ports	P = Inlet (pump side); A, B = Consumers; R = Return L = Relief port, connect pressureless to the tank (return) always For pressure rating, see below	
Installed position	Any	
Flow resistance	Seated valves:	Only in arrow direction in accordance with symbol
	Spool valves:	Preferably in arrow direction (see symbol W/WX in sect. 2.1). Contrary to the arrow direction is permissible; Note pressure rating of R (see below)
Overlapping	3/2-way seated valves	Negative. Transition from one to the other flow direction is only completed when end position is achieved i.e. all passages are interconnected during the switching operation. The switching operation is unhampered by this, due to their quick response.
	Spool valves:	None
Flow (lpm)	See table 1 in section 2.1	

Operation pressure  
Ports P, A and B

Basic type	Flow pattern	Switchable pressure (bar)				Ambient temperature
		Applied voltage	100	50	<10	
WN 1 Directional seated valves	D, Q, R, H, N, M, J	$U_N$	230	250	350	Guideline for 20°C at 40°C reduced by approx. 10 to 15%
		$0.75 U_N$	110	160	200	
		$0.5 U_N$	100	100	120	
	F, E	$U_N \dots 0.5 U_N$	350			Guideline for 40°C (For restrictions see also section 2.2.2)
Directional spool valves	W, WX	$U_N$	300			
WH 1	all	$U_N$	450			
WH 2 (3 and 4)			350			

- An under voltage < 90% of  $U_N$  is not permissible with type WH.
- Valves type WN 1: The required solenoid force is usually directly proportional to the operating pressure to be switched. The supply voltage can be reduced (undervoltage see table above with  $0.75 U_N$  and  $0.5 U_N$ ), if the operation pressure in a hydraulic circuit is limited to a value lower than the maximum permissible value, by a pressure limiting valve. This means that the heat build-up of the solenoid is reduced, resulting in increased service life of the winding and reduced heat dissipation to neighboring parts (valve body with seals) and other valves (valve banks).
- The use of an economy circuit is recommended for prolonged operation durations. See also the respective notes in sect. 2.2.2 "Plugs".

Perm. pressure in port R

WN 1:  $p_R \leq 350$  bar, but observe that  $p_R \leq p_A \leq p_P!$   
 Note: Use code letter F and E as straight-way valve up to 320 bar only!  
 WH 1(2, 3 and 4): Flow pattern symbols H, N, M and R  $p_R \leq 20$  bar  
 Flow pattern symbols D, Q, F and E  $p_R \leq 350$  bar,  $p_L \leq 20$  bar  
 Sub-plates acc. to sect. 3: Version ..S(SR) or ..V(VR)  $p_R \leq 20$  bar

Static overload capacity

approx.  $2 \times p_{max}$

Mass (weight) approx. kg

	Individual valve acc. to sect. 2.1			Individual valve with connection sub-plate acc. to section 3							
	D to F	H (1) to R (1)	W, WX	without pressure limiting valve				with pressure limiting valve		with pressure limiting valve	
				WN 1 - 1/4 (C)	WH..- 1/4 (C, L)	W, U, J, L	U, J, L	WN 1../.. - 1/4	WH 1../.. - 1/4	.. - 1/4 S	.. - 1/4 V
				D, Q, E, F	H (1), N (1), M (1), R (1)	W, WX		H (1), N (1), M (1), R (1)	Q to R (1)	W, WX	.. - 1/4 VR
WN(H) 1	0.6	0.6	0.6	0.9	0.9	1.0	1.1	1.7	1.0	1.2	1.7
WH 2	0.7	1.2	--	1.0	1.0	--	1.9	--	1.2	--	--
WH 3	0.7	1.3	--	1.8	1.8	--	3.5	--	2.1	--	--
WH 4	2.7	3.0	--	3.6	4.0	--	7.4	--	--	--	--

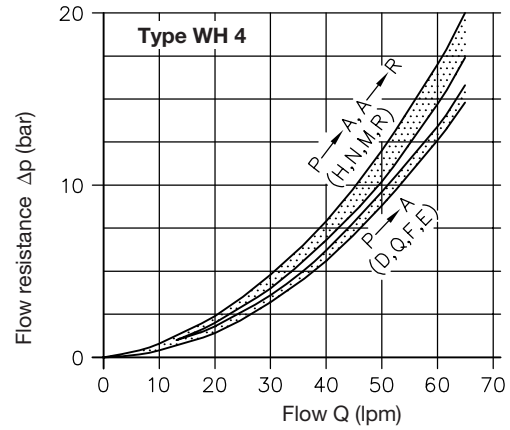
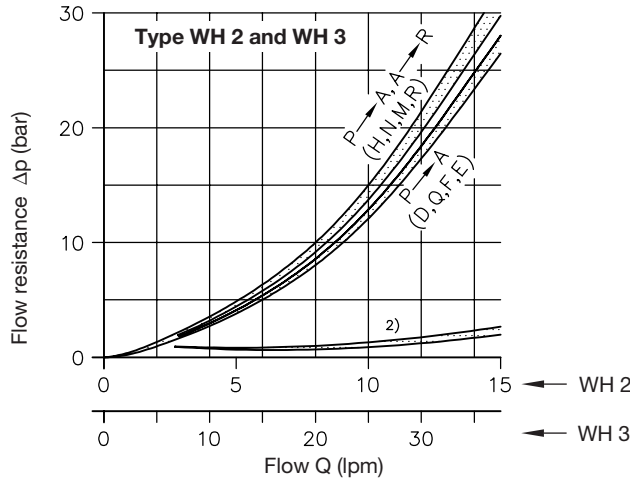
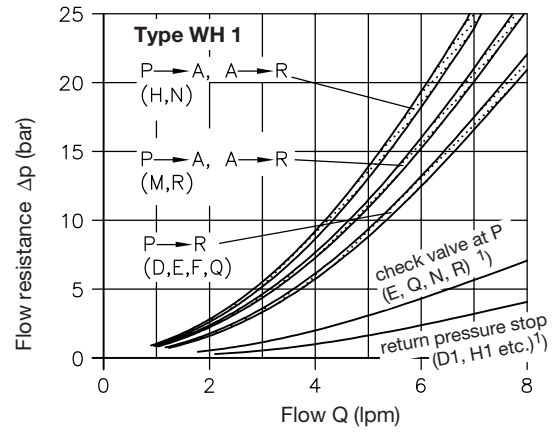
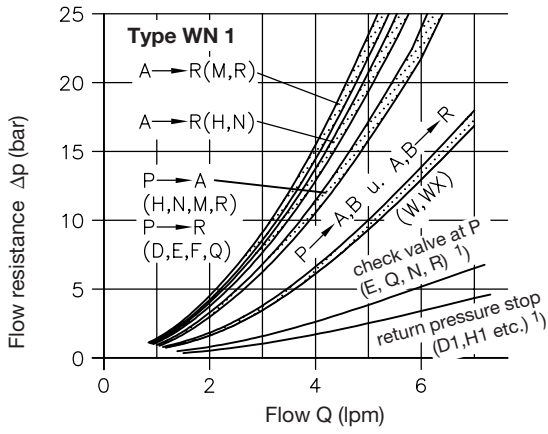
Pressure fluid

Hydraulic oil conforming DIN 51524 part 1 to 3: ISO VG 10 to 68 conforming DIN 51519.  
 Viscosity limits: min. approx. 4, max. approx. 800 mm<sup>2</sup>/s; opt. operation approx. 10... 200 mm<sup>2</sup>/s.  
 Flow resistance will increase more sharply at viscosities over approx. 300 mm<sup>2</sup>/s!  
 Also suitable for biological degradable pressure fluids types HEPG (Polyalkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70°C.  
 Versions for glycol-based brake fluids (conforming DOT 4) are available for WN 1, WH 1, and WH 2. Add suffix -AT to the order coding acc. to sect. 2.1.

Temperature

Ambient: approx. -40 ... +80°C (Observe restrictions in sect. 2.2.2 "Duty cycle")  
 Fluid: -25 ... +80°C, Note the viscosity range!  
 Permissible temperature during start: -40°C (Note start-viscosity!), as long as the service temperature is at least 20K higher for the following operation.  
 Biological degradable pressure fluids: Note manufacturer's specifications. By consideration of the compatibility with seal material not over +70°C.

Δp - Q-curves



Guideline for a fluid viscosity of approx. 60 mm<sup>2</sup>/s

- 1) Add to the characteristic flow resistance of the valve in flow direction when apparent
- 2) Add to the characteristic flow resistance of the valve (Q, E, N, and R) in flow direction when a check valve is installed at P

2.2.2 Electrical data (standard)

Solenoid	Wet armature solenoid, manufactured and tested conforming DIN VDE 0580									
Basic type	WN 1, WH 1 and WH 2				WH 3 <sup>6)</sup>				WH 4	
Coding acc. to section 2.1	G 12 X 12 L 12	G 24 X 24 L 24	WG 110 <sup>4)</sup> (G 98) (X 98)	WG 230 <sup>4)</sup> (G 205) (X 205)	G 12 X 12 L 12	G 24 X 24 L 24	WG 110 <sup>4)</sup> (G 98) (X 98)	WG 230 <sup>4)</sup> (G 205) (X 205)	X 24	WG 230 <sup>4)</sup> (G 205) (X 205)
Nom. voltage U <sub>N</sub> for other voltage, see page 5	12V DC	24V DC	110V AC (98V DC)	230V AC (205V DC)	12V DC	24V DC	110V AC (98V DC)	230V AC (205V DC)	24V DC	230V AC (205V DC)
Nom. current I <sub>20</sub> <sup>3)</sup> (A)	2.14	1.02	0.25	0.15	2.72	1.36	0.30	0.16	3.4	0.4
Power P <sub>N</sub> <sup>3)</sup> (W)	25.7	24.5	27.4	31.4	30	30	30	30	82.2	82.2
Switching time (guideline)	On: (ms) 60 ... 70 (WN(H) 1; 50 (WH 2)				50				100	
	Off: (ms) 30 ... 60 (WN(H) 1; 65 (WH 2)				40				40 ... 200 <sup>5)</sup>	
approx. 2 ... 3 times prolonged with WG versions										
Switching frequency / h approx.	WN 1 = 3600; WH 1 and WH 2 = 2000				2000				2000	
to be regarded as approx. evenly distributed										

<sup>3)</sup> The electrical data of the solenoids are reference values (max.) and can differ insignificantly depending on manufacturer

<sup>4)</sup> DC-solenoid 98V DC or 205V DC with plug featuring a bridge rectifier, see also „Plugs“, suited for mains 50 and 60 Hz.

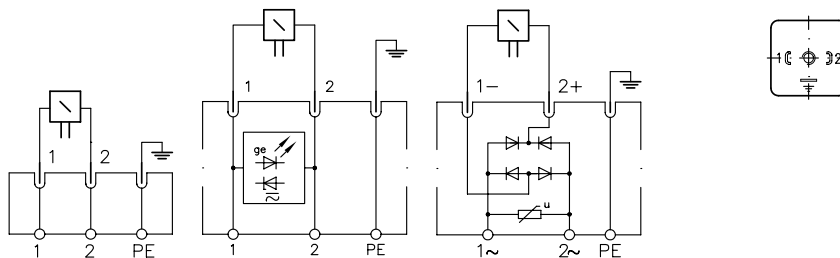
<sup>5)</sup> Switching time „off“ with WH 4  
 and flow pattern symbol  
 D, Q 130 ms  
 F, E 40 ms  
 H, N, M, R pressure-dependent (50 bar = 40 ms; 200 bar = 100 ms; 350 bar = 200 ms)

<sup>6)</sup> For version with switching performance of 8 Watt, see section 5.3

**Continuation: Electrical data**

Protec. mode IEC 70 (Co) 13	IP 65 (IEC 60529), with properly assembled plug			
Isolation class	F with WN 1, WH 1, WH 2 and WH 3; H with WH 4			
Switch-off energy (Ws)	W ≤ 0.5 Ws (guideline + approx. 10% acc. to measurements with nom. voltage UN)			
Plug (circuitry and symbol)	DC-voltage Coding G..	DC-voltage with LED's Coding L	AC-voltage Coding WG..	View of the terminal pattern (solenoid)

Al plugs



The plugs are automatically contained in the valve order coding.  
 For other plugs and their resp. data, see D 7163.  
 e.g. Type SVS 3129020 (yellow LED and protective circuitry)

Type MSD 3-209 C1 (clamp diode, suppressing cut-off peaks)

Valve versions G 24 and WG 110, WG 230 can be used together with plugs incorporating economy circuits, see D 7163, D 7813, D 7832, D 7833. Economy circuits enable a reduction of the final solenoid force, as soon as it has achieved its working position, by reducing the applied voltage. This will significantly reduce coil over-temperature in case of prolonged duty cycles or neighboring valves. An additional advantage is the increased service life of the connected solenoid.

Relative duty cycle	100% ED stamping on the solenoid	Depending on the ambient temperature during operation		
		At ambient temperature (°C)		
		< 40	60	< 80
Duty cycle (%ED)		100	approx. 60	approx. 40

Mounting The solenoid can be simply removed after slackening the 4 fixing bolts, easing replacement in case of an electrical defect (see also sect. 5.6).

**Special voltage**

Other solenoid voltages are available, beside the standard versions listed on page 4.

Examples:

- WH 1 H - G 180 (I<sub>20</sub> = 0.33 A)
- WH 3 E - G 48 (I<sub>20</sub> = 0.69 A)

The nominal power ratings are approximate reference values only, which can differ insignificantly depending on voltage and solenoid manufacturer. The nom. current can be calculated: I<sub>20</sub> = P<sub>N</sub>/U<sub>N</sub> (see examples).

Basic type		WN 1 WH 1 WH 2	WH 3	WH 4
Nominal power P <sub>N</sub>		~ 24 W	~ 30 W	~ 82 W
Voltage specification DC (Δ U <sub>N</sub> (V))	G 12 (X 12, L 12) <sup>1)</sup>	•	•	
	G 24 (X 24, L 24) <sup>1)</sup>	•	•	•
	G 36 (X 36)	•		
	G 42 (X 42)	•		
	G 48 (X 48)	•	•	
	G 80 (X 80)	•		
	G 98 (X 98) <sup>1)</sup>	•	•	
	G 110 (X 110)	•		
	G 180 (X 180)	•	•	•
	G 205 (X 205) <sup>1)</sup>	•	•	•
Voltage specification AC (50/60 Hz)	WG 24	•	•	
	WG 100	•		
	WG 110 <sup>1)</sup>	•	•	
	WG 200	•	•	•
	WG 230 <sup>1)</sup>	•	•	•

<sup>1)</sup> Standard version

**Notes for lay-out**

DC-voltage:

The voltage specification (solenoid lay-out) shall correspond to the actual supply voltage (perm. tolerance ± 5...10%). A reduced voltage leads to reduced solenoid force, an exceeded voltage causes an unpermissible solenoid heat built-up. Only exception is type WN 1, see section 2.2.1 "Operation pressure".

AC-voltage:

The voltage specification shall correspond to the actual supply voltage (50/60 Hz). The solenoid DC-voltage is approx. 0.9 U<sub>AC</sub> - 2 V because of the utilized rectifier plug. The table above lists the corresponding DC-solenoids for various AC supply voltage (e.g. for 110 V AC 50 Hz, solenoid with U<sub>N</sub> = 98 V DC Δ stamping on the magnet!).

### 3. Individual valve with connection sub-plate

For complete type overview see section 6.2, page 19.

#### 3.1 Type WN 1

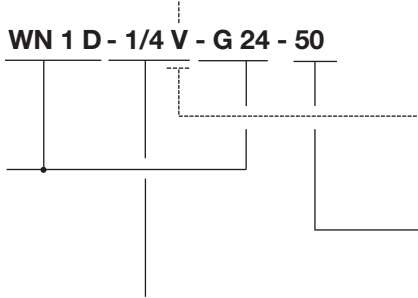
Order example: **WN 1H - 1/4 S - G 24 - 150**

Connection sub-plate with tool adjustable pressure limiting valve

**WN 1D - 1/4 V - G 24 - 50**

Connection sub-plate with pressure limiting valve connected in series 1)

Valve coding acc. to section 2.1



Pressure limiting valve: **S, V** = Tool adjustable



**SR, VR** = Manually adjustable



Desired pressure setting

Pressure ranges: (0) ... 80 bar

(0) ... 160 bar

(0) ... 315(350) bar

**Table 4 a:** Connection sub-plates for individual valves

Valve coding	For valves with flow pattern acc. to section 2.1				3/2-way directional valves		4/2-way directional spool valve	
	2/2-way directional valves		2/2-way directional valves		3/2-way directional valves		4/2-way directional spool valve	
Pressure lim. valve	D, F Q, E 2)	D, F	D, F Q, E 2)	D, F Q, E 2)	H, N, M, R	H, N, M, R	W, WX	W, WX
Suited for basic type	without	without	with 1) 3)	with 3)	without	with 3)	without	with 3)
WN 1	- 1/4	- 1/4 C	- 1/4 V - 1/4 VR	- 1/4 S - 1/4 SR	- 1/4	- 1/4 S - 1/4 SR	- 1/4	- 1/4 S - 1/4 SR
Flow pattern symbols								
Port P, R, A and B 4): Thread G 1/4 ISO 228/1 (BSPP), suited for pipe fittings shape B DIN 3852 page 2.								

**Table 4 b:** Directional valve combinations

WN 1 J - 1/4 - ..	WN 1 U - 1/4 - ..	WN 1.../... - 1/4 - ..
<p>2/2-way directional seated valve combination WN 1 D, Q or F Fixation of the consumer at any intermediate position 3/3-way function</p> <p>Example: WN 1 J - 1/4 - G 24 WN 1 U - 1/4 - WG 230</p>	<p>2/2-way directional seated valve combination WN 1 D, Q or F Fixation of the consumer at any intermediate position 3/3-way function</p>	<p>Double directional seated valve for pipe connection. Serve for the compact realization of two separate 3/2-way functions.</p> <p>Flow pattern symbol H(1), N(1), M(1), R(1) at port B at port A</p> <p>Order coding for connection sub-plate only (enabling retrofitting of a double valve): Sub-plate 7470 061 complete with readily installed screen filter discs HFC 1/4 F in P, A, and B.</p> <p>Example: WN 1 M/M - 1/4 - G 12</p>
Port P, R, A, B 4): Thread G 1/4 ISO 228/1 (BSPP), suited for pipe fittings shape B DIN 3852 page 2		

1) Utilized to activate a second pressure stage, e.g. for prop. directional spool valves type PSL, PSV acc. to D 7700 ++ or for pressure stage circuits of piloted pressure valves e.g. type DV acc. to D 4350 or AS, ALZ acc. to D 6170.

2) Valves coding E and Q should be preferred for by-passing to the tank; A return pressure stop may be installed at R, when pressure peaks could occur at R (see sect. 2.1).

3) **Attention:** Permissible pressure 20 bar in the return!

A steel spring housing is available, required when pressure surges (> 20 bar) might occur in the return, e.g. as result of decompression surges induced by accumulating consumers. Indicate in uncoded text „with steel spring housing“ added to the order coding.

4) For permissible operation pressure, see section 2.2.1



### 3.2 Type WH 1, WH 2, WH 3 and WH 4

Order example: **WH 2 H - 1/4 - WG 230**

**WH 3 D - 3/8 SR - G 24 - 200**

Valve coding acc. to section 2.1

Version with pressure limiting valve

**S, V** = Tool adjustable



**SR, VR** = Manually adjustable



Desired pressure setting

Pressure ranges: (0) ... 80 bar

(0) ... 160 bar

(0) ... 315(350) bar

(0) ... 450 bar with WH 1

**Table 5 a:** Connection sub-plates for individual valves

		For valves with flow pattern acc. to section 2.1 2/2-way directional valves Port R is not pressure resistant, not suited for by-pass circuits				3/2-way directional valves Port R is pressure resistant <sup>2)</sup>			Port P, R, A and L ISO 228/1 (BSPP)
Valve coding		D, F				D, Q, F, E	H, N, M, R		
Pressure lim. valve		without <sup>1)</sup>	without	with <sup>1)</sup>	with <sup>1)</sup>	without	without	with <sup>1)</sup>	
Suited for basic type	WH 1	- 1/4	- 1/4 C	- 1/4 V(VR)	- 1/4 S(SR)	- 1/4 L	- 1/4	- 1/4 S(SR)	G 1/4
	WH 2	- 1/4	---	---	- 1/4 S(SR)	- 1/4 L	- 1/4	- 1/4 S(SR)	G 1/4
	WH 3	- 3/8	---	---	- 3/8 S(SR)	- 3/8 L	- 3/8	- 3/8 S(SR)	G 3/8
	WH 4	- 1/2	---	---	---	- 1/2 L	- 1/2	---	G 1/2
Flow pattern symbols									For perm. operation pressure, see sect. 2.2.1

**Table 5 b:** Directional valve combinations

2/2-way directional seated valve combination WH..D, Q or F Fixation of the consumer at any intermediate position  3/3-way function		Double directional seated valve for pipe connection. Serve for the compact realization of two separate 3/2 way functions.	Port P, R, A a. B ISO 228/1 (BSPP)
<b>WH 1 J - 1/4 - ..</b>	<b>WH 1 U - 1/4 - ..</b>	 Example: WH 1 M/M-1/4-G 12 Order coding for connection sub-plate only (enabling retrofitting of a double valve): Sub-plate 7470 061 complete with readily installed screen filter discs HFC 1/4 F in P, A, and B.	G 1/4
<b>WH 2 J - 1/4 - ..</b>	<b>WH 2 U - 1/4 - ..</b>		G 1/4
<b>WH 3 J - 3/8 - ..</b>	<b>WH 3 U - 3/8 - ..</b>		G 3/8
 Example: WH 2 J - 1/4 - G 24 WH 1 U - 1/4 - WG 230		 For perm. operation pressure, see sect. 2.2.1	

1) The connection sub-plate features an internal connection L→R only for idle circulation circuits.

**Attention:** Permissible pressure 20 bar in the return!

A steel spring housing is available, required when pressure surges (> 20 bar) might occur in the return, e.g. as result of decompression surges induced by accumulating consumers. Indicate in uncoded text „with steel spring housing“ added to the order coding.

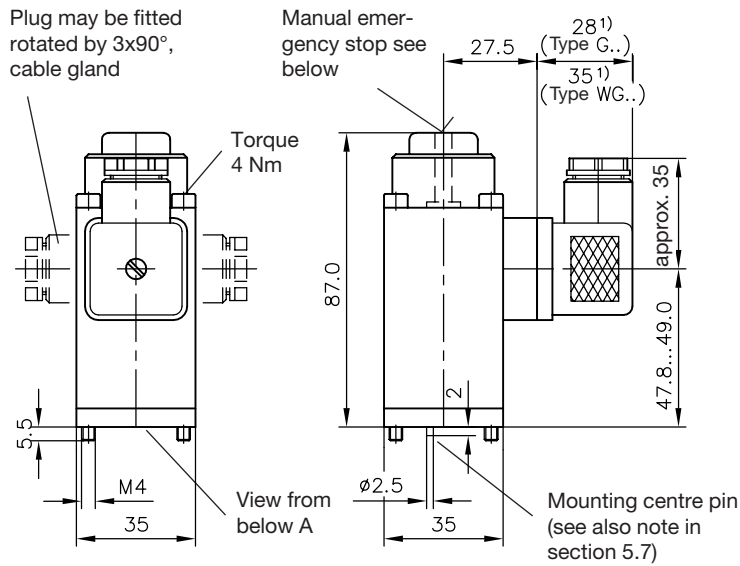
2) The relieve port L should be routed pressurless to the tank, mainly used when A and P may be pressurized during operation.

## 4. Unit dimensions

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

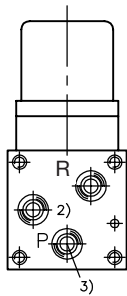
### 4.1 Single valve (basic version)

#### 4.1.1 Type WN 1 and WH 1

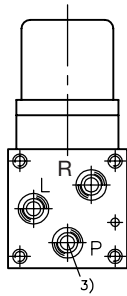


#### Views from below A:

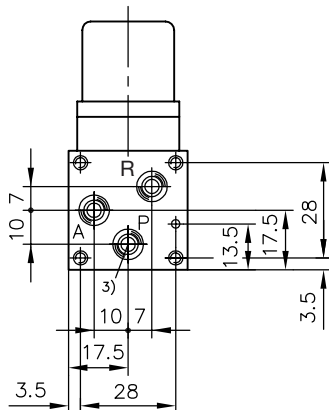
Type WN 1 D, Q, F and E



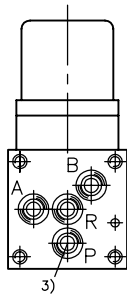
Type WH 1 D, Q, F and E



Type WN 1 H, N, M and R  
WH 1 H, N, M and R

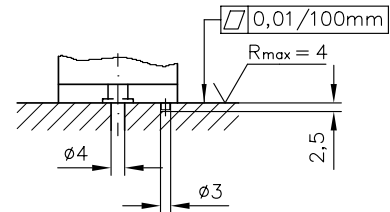


Type WN 1 W(X)



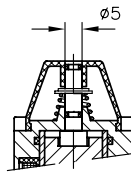
O-ring seal 6x1.5 for connections A, B, P, R, L  
Also part of seal kit DS 7470 A-10.

Connection holes for A, B, P, R, L and accommodation for mounting centre pin



#### Manual emergency operation:

Tool used (max  $\varnothing$  4.5 mm) for manual actuation (must not have sharp edges)



For WN 1 type valves (not WH 1) a higher actuation force is necessary if the valve outlet is connected to a pressurized consumer. Symbol D, Q, F, E and J, U, L (always solenoid a).

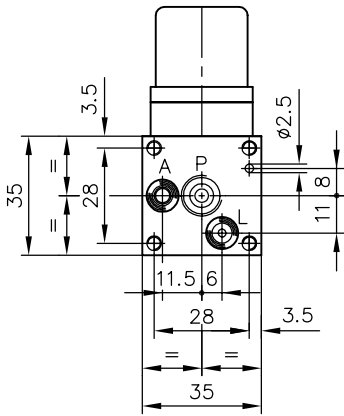
- 1) This dimension depends on the manufacturer and can be max. 40 mm acc. to DIN EN 175 301-803 A
- 2) Blind counterbore with O ring 6x1.5. Serves only to close the compensation hole in the sub-plate (see sect. 3), which is also used for WH 1 type valves. In the case of WH 1 it serves for the volume compensation of the armature cavity (sect. 1).  
When sub-plates for 2/2-way WN 1 valves are customer furnished this counterbore is unimportant, as there is no such hole.
- 3) Inserted screen filter (mesh width 0.25 mm)



**4.1.2 Type WH 2**

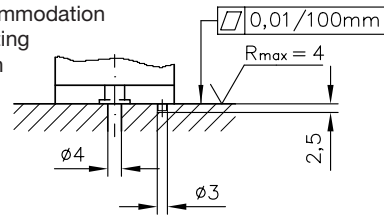
Type WH 2 D to E

Type WH 2 H(1) to R(1)

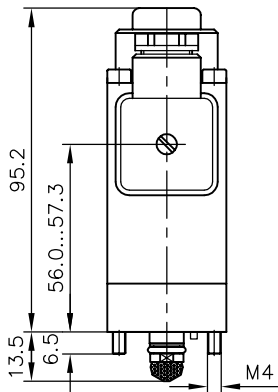


Assembly centering pin  
(Also see assembly note in section 5.6)

Connection holes for A, P, R, L  
and accommodation  
for mounting  
centre pin

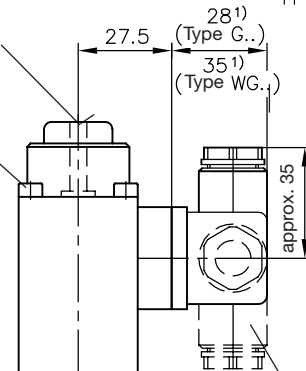
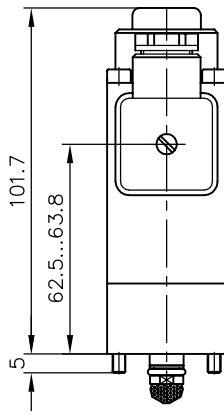


**Note:**  
For routing of gal-  
leries (ports) within  
the sub-plate see  
section 4.1.5 !



Manual emergency  
stop see section 4.1.1

Torque 4 Nm



Sealing of ports  
via O-rings NBR 90 Sh:

	O-ring
A, P and L	6.07x1.78
R	7.65x1.78

Also part of seal kit  
DS 7470 A-20.

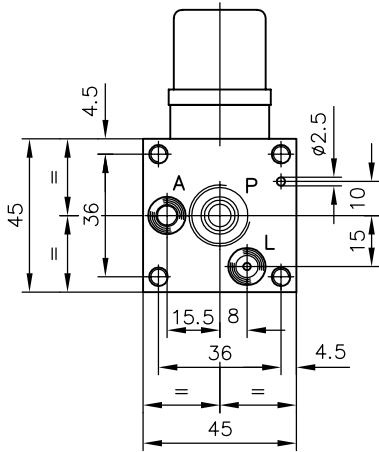
Plug may be fitted  
rotated by 3x90°,  
cable gland

Inserted screen filter (Ø0.9 mm)

**4.1.3 Type WH 3**

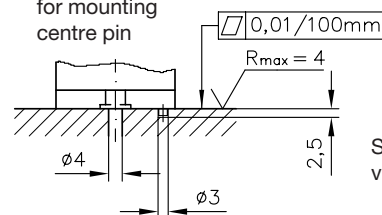
Type WH 3 D to E

Type WH 3 H(1) to R(1)

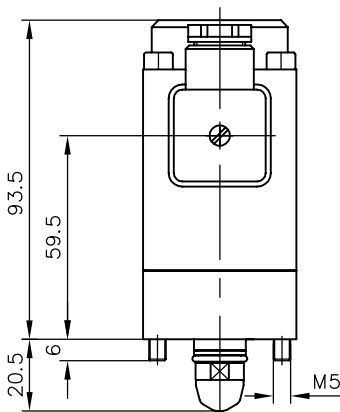


Assembly centering pin  
(Also see assembly note in section 5.6)

Connection holes for A, P, R, L  
and accommodation  
for mounting  
centre pin

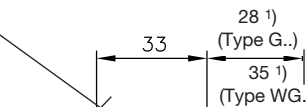
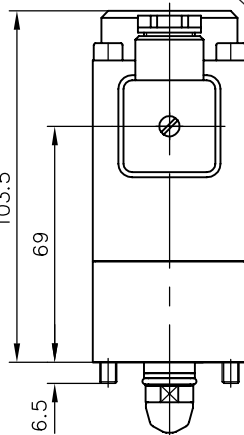


**Note:**  
For routing of gal-  
leries (ports) within  
the sub-plate see  
section 4.1.5 !



Manual emergency  
stop see below!

Torque 7.8 Nm



Sealing of ports  
via O-rings NBR 90 Sh:

	O-ring
A, R and L	7.65x1.78
P	11.1x1.78

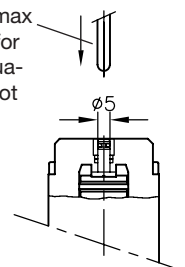
Also part of seal kit  
DS 7470 A-30.

Plug may be fitted  
rotated by 3x90°,  
cable gland

Inserted screen filter  
(Ø0.9 mm)

**Manual emergency operation:**

Tool used (max  
Ø 4.5 mm) for  
manual actua-  
tion (must not  
have sharp  
edges)



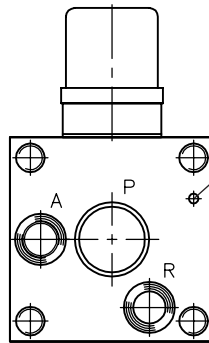
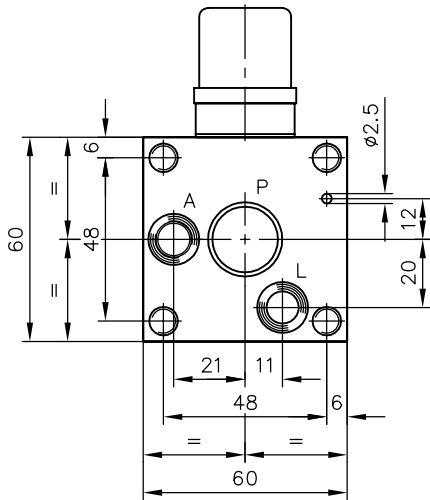
Actuation force  
approx. 40 N for  
pressure 20 bar  
in R(L)

1) This dimension depends on the manufacturer and may be max. 40 mm acc. to DIN EN 175 301-803 A

**4.1.4 Type WH 4**

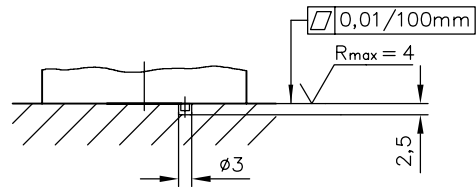
Type WH 4 D to E

Type WH 4 H to R

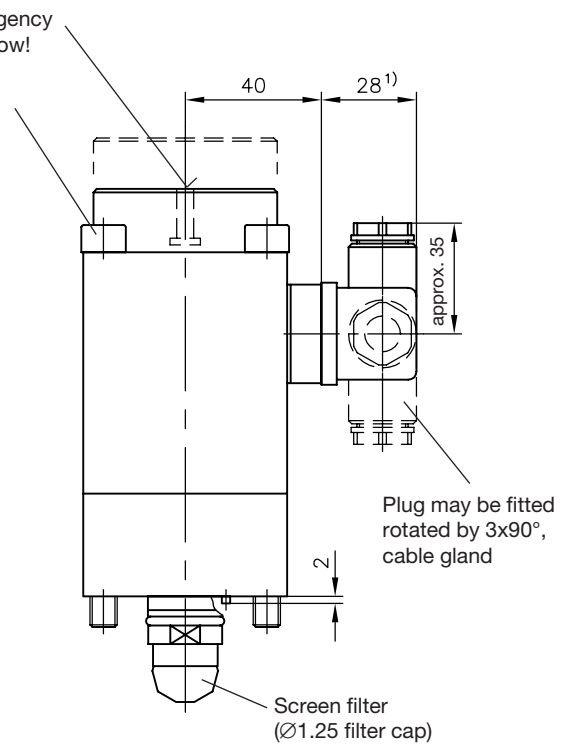
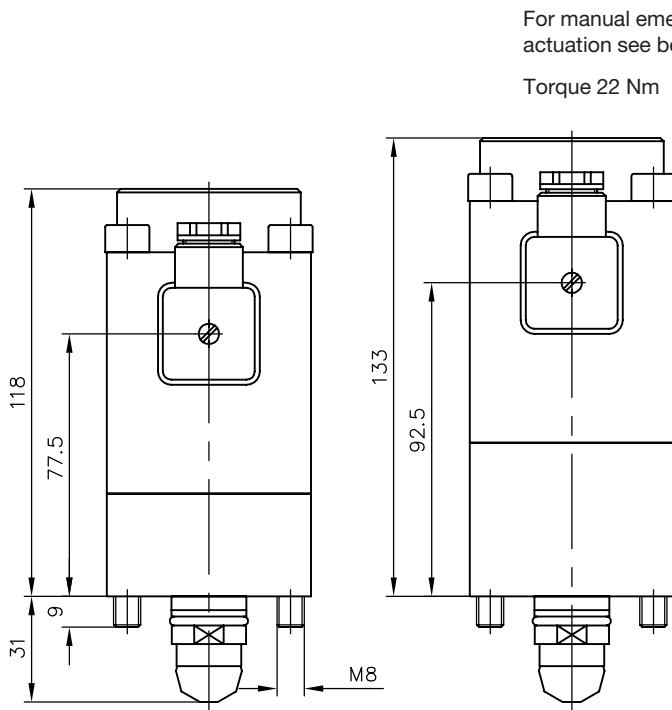


Assembly centering pin  
(Also see assembly note in section 5.6)

Holes for A, P, R, L and centering pin



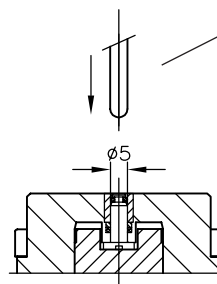
**Note:**  
For routing of galleries (ports) within the sub-plate see section 4.1.5 !



**Sealing of ports**

A, R and L = O-ring 11.89x1.78 NBR 90 Shore  
P = O-ring 17.12x2.62 NBR 90 Shore  
Also part of seal kit DS 7470 A-40.

**Manual emergency operation:**



Tool used  
(max Ø4.5 mm) for  
manual actuation (must  
not have sharp edges)

Actuation force approx.  
10 N at pressure 20 bar  
in R(L)

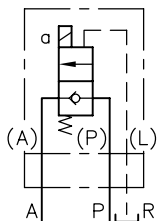
1) This dimension depends on the manufacturer and may be max. 40 mm acc. to DIN EN 175 301-803 A.

**4.1.5 Routing of galleries (ports) within the sub-plate (for type WH 2, WH 3 and WH 4)**

**Type WH .. D to E**

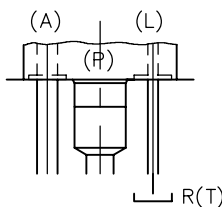
2/2 directional valves may be connected either directly to a pressurized pipe (both P and A are pressure resistant) or to a bypass pipe leading directly back to the tank (e.g. depressurizing a consumer, idle pump circulation etc.). Therefore the routing of the galleries in the manifold depends on the intended function.

Valve directly in the pressure pipe (thru-valve)

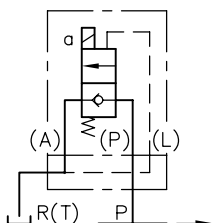


Ongoing pressure gallery

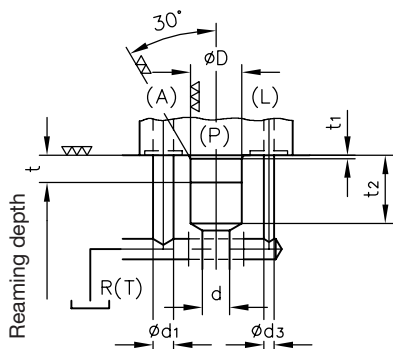
Both sides A and B are pressure resistant, L pressureless to the tank.



By-pass circuitry, A connected to the return gallery.

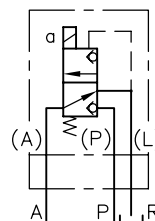


Pressure gallery

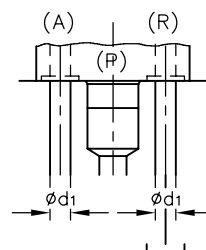


Both L and outlet A may be joint and led to outlet R(T) within the manifold, which again is routed to the tank. For permissible pressure at L and R, see sect. 2.2.1.

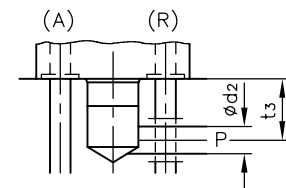
**Type WH .. H(1) to R(1)**



Ongoing pressure gallery



Lateral P connection (example)



For missing dimensions, see illustration below!

Type	D	d	d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	t	t <sub>1</sub>	t <sub>2</sub>	t <sub>3</sub>
WH 2	10 <sup>H7</sup>	7	5	6	3	10	1	13	11
WH 3	15 <sup>H7</sup>	8	6	8	3	8	1.5	20	18
WH 4	22 <sup>H8</sup>	12	10	12	4	16	1.5	34	29

t<sub>2</sub> and t<sub>3</sub> = min. dimension

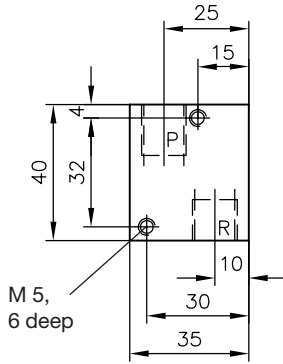
The valve inlet P is protected against coarse contaminations that may occasionally be carried along in the fluid via a screen filter (filter cap), see dimensional drawings in sect. 4.1.2 to 4.1.3. They serve to prevent sudden disturbance caused by coarse contaminations that otherwise could get struck at the valve seat. It may be also advantageous to protect port A from coarse contaminations returning from the consumer via screen filters (e.g. type HFC in D 7235) mounted in the customer furnished manifold. The sub-plates for type WN 1, WH 2, and WH 3 are equipped with screen filters as standard (see sect. 5.5).

## 4.2 Individual valves with connection sub-plates

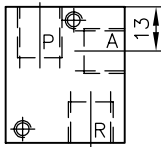
Valves acc. to section 3. Only the connection sub-plate dimensions are illustrated. For missing dimensions of the directly mounted valves, see section 4.1.

### 4.2.1 Type WN 1 and WH 1

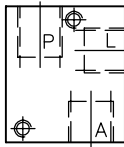
Type WN(H) 1 D (Q, F, E) -1/4



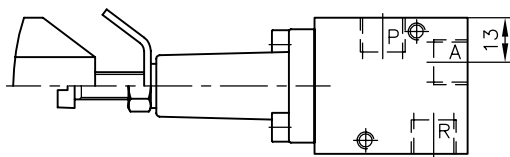
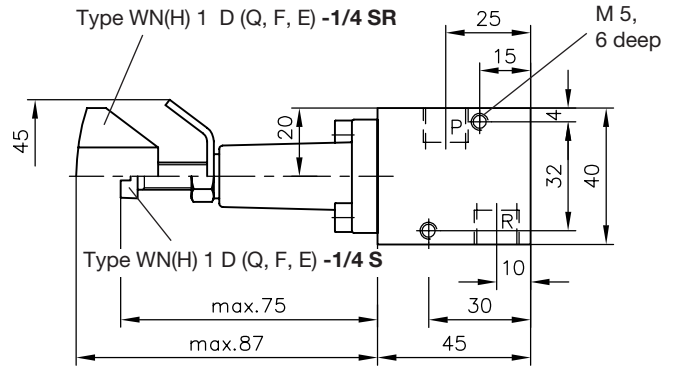
Type WN(H) 1 H (N, M, R) -1/4



Type WH 1 D (Q, F, E) -1/4 L

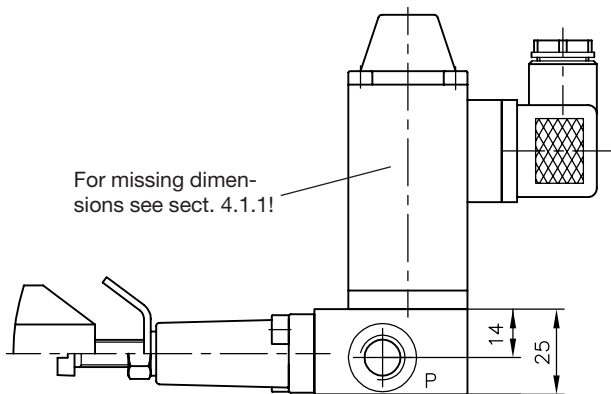
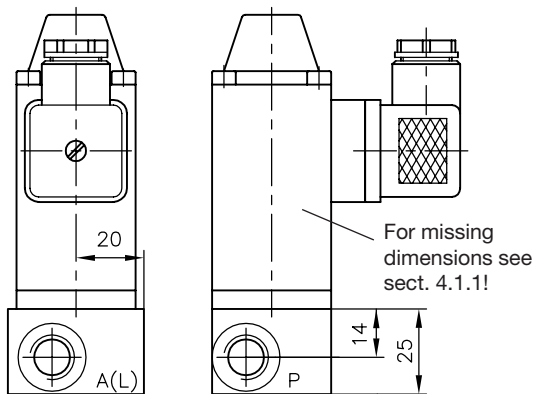


Port  
A, P, R and L = G 1/4 (BSPP)

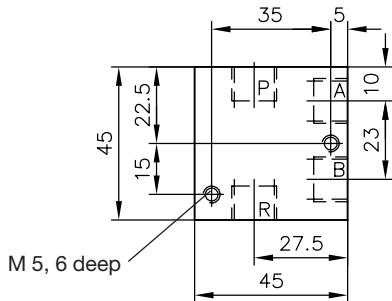


Type WN(H) 1 H (N, M, R) -1/4 S(SR)

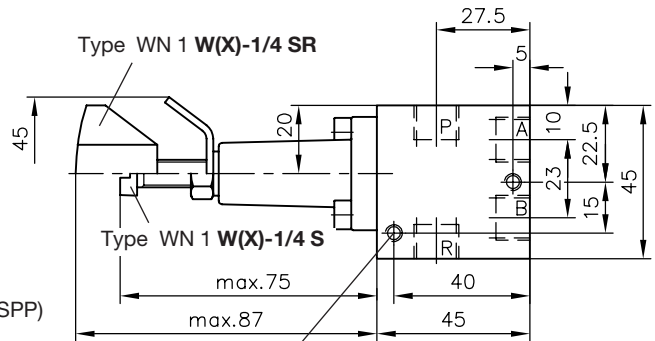
Port  
A, P and R = G 1/4 (BSPP)



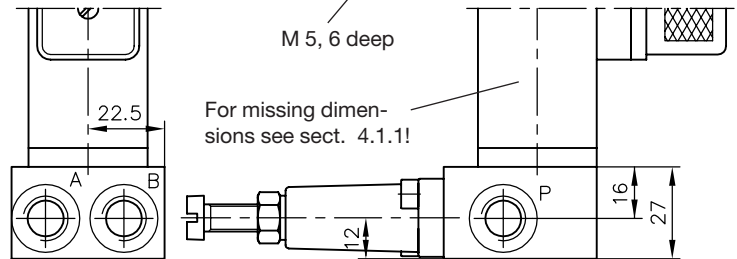
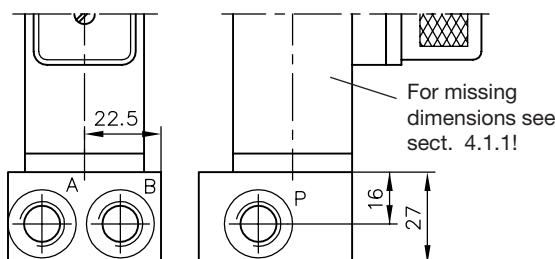
Type WN 1 W(X)-1/4



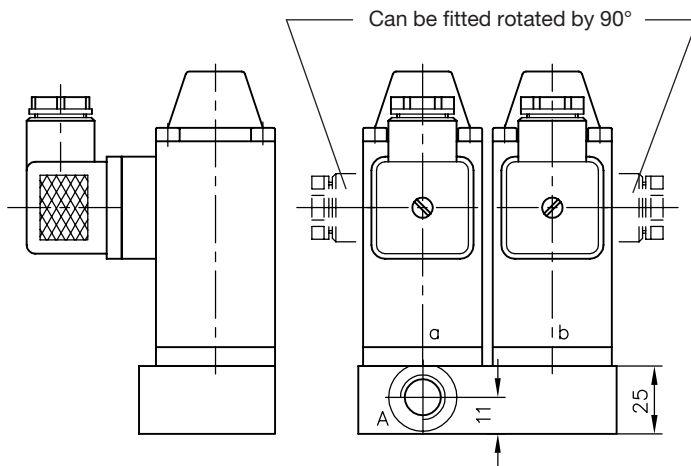
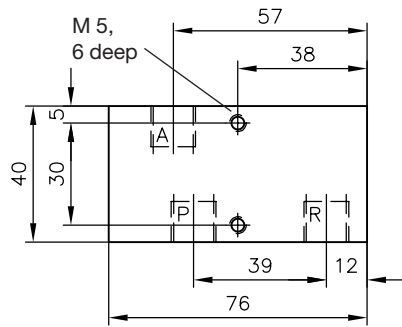
Port  
P, R, A and B = G 1/4 (BSPP)



M 5, 6 deep

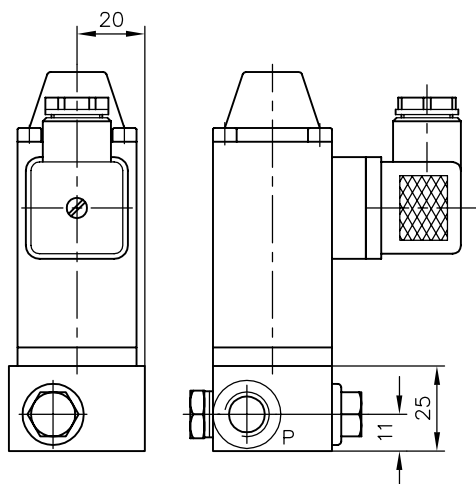
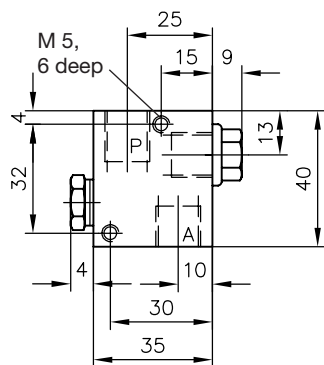


Type WN(H) 1 J-1/4  
WN(H) 1 U-1/4



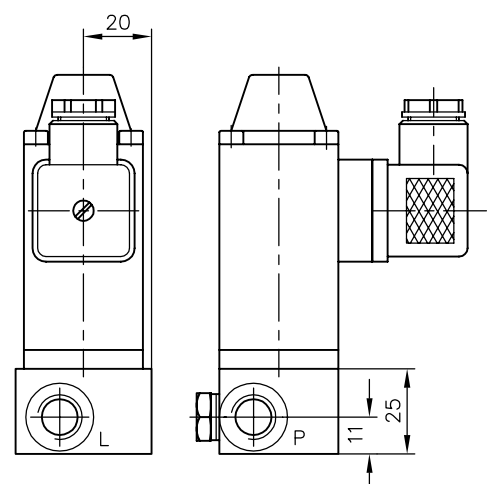
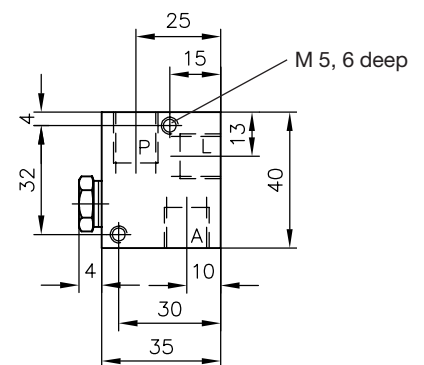
Port P, A and R = G 1/4 (BSPP)  
For missing dimensions, see sect. 4.1.1!

Type WN 1 D(F)-1/4C

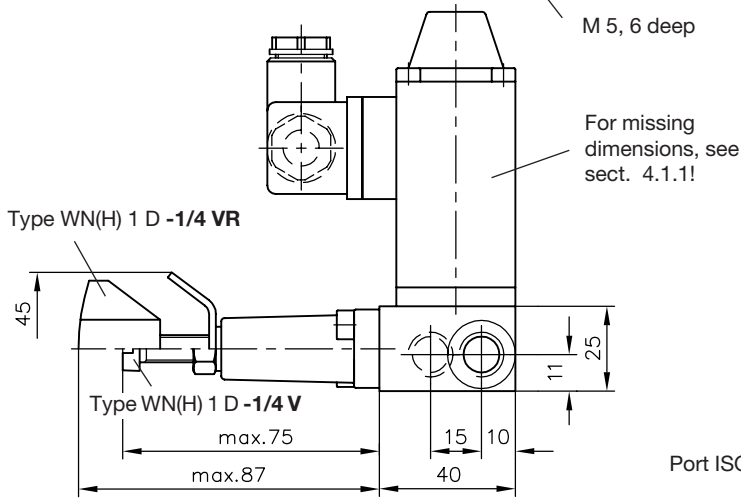
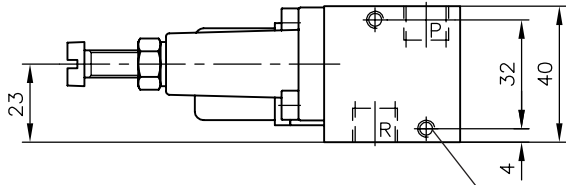


Port P and A = G 1/4 (BSPP)  
For missing dimensions, see sect. 4.1.1!

Type WH 1 D(F)-1/4C



Port A, P and L = G 1/4 (BSPP)  
For missing dimensions, see sect. 4.1.1!

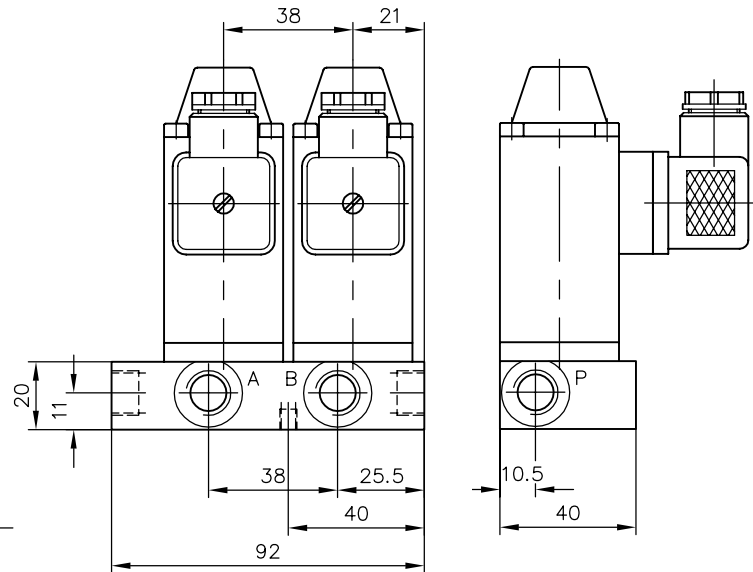


Port ISO 228/1: P and R = G 1/4 (BSPP)

Type WN(H) 1 .../-1/4

For missing dimensions, see sect. 4.1.1!

M 5, 6 deep

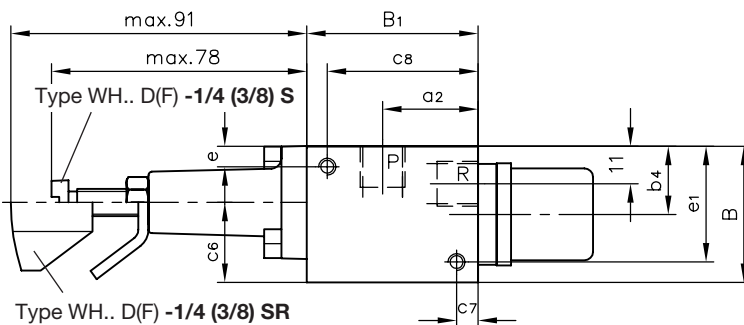
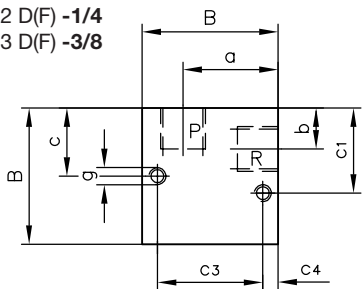


Port ISO 228/1: A, B, P, R = G 1/4 (BSPP)

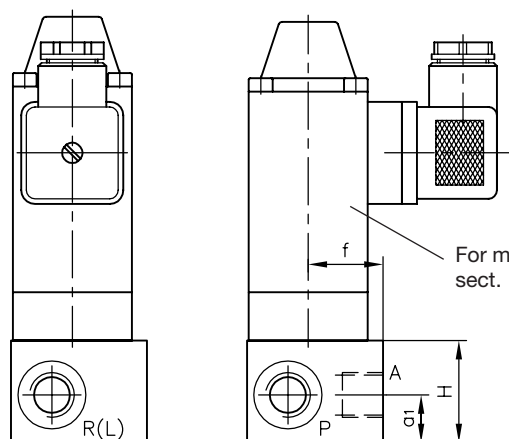
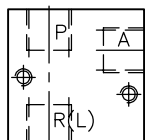
**4.2.2 Type WH 2..-1/4 ... and WH 3..-3/8...**

Illustration shows type WH 2!

Type WH 2 D(F) -1/4  
WH 3 D(F) -3/8

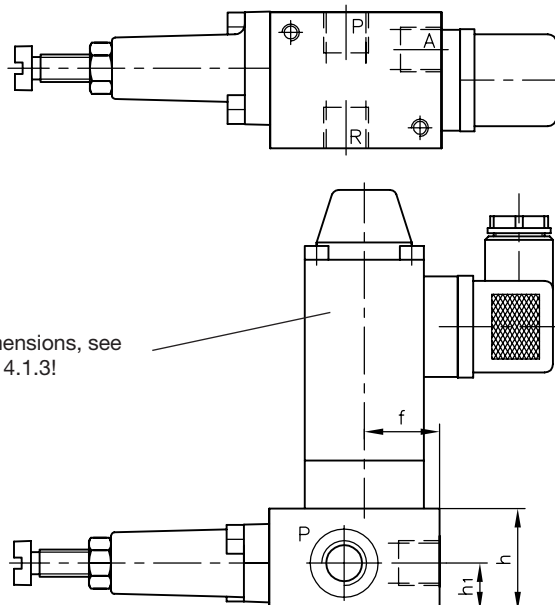


Type WH.. D(Q, F, E) -1/4 L (3/8 L)  
WH.. H(N, M, R) -1/4 (3/8)

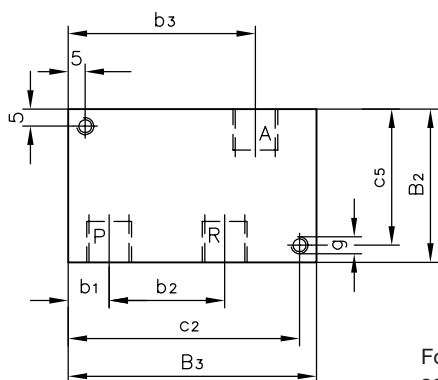


Type WH 2 J -1/4  
WH 3 J -3/8

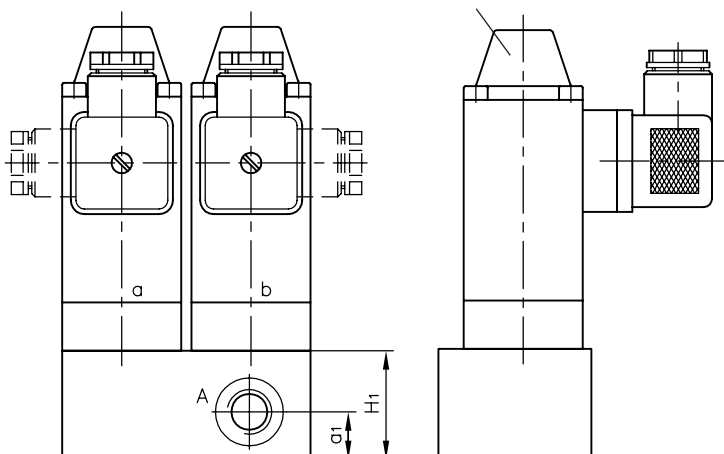
Type WH.. H(N, M, R) -1/4 (3/8) S  
WH.. H(N, M, R) -1/4 (3/8) SR



For missing dimensions, see sect. 4.1.2 and 4.1.3!



For missing dimensions, see sect. 4.1.2 and 4.1.3!



Type	Ports ISO 228/1 (BSPP) A, P and R	B	B1	B2	B3	H	H1
		WH 2..	G 1/4	40	50	45	73
WH 3..	G 3/8	50	63	50	97	35	35

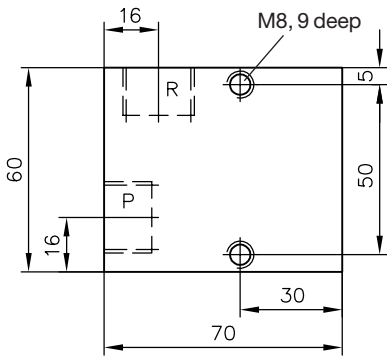
Type	a	a1	a2	b	b1	b2	b3	b4	c
WH 2..	28	14	28	12	12	34	55	20	20
WH 3..	36	15	39	11	19	41	73.5	25	29

Type	c1	c2	c3	c4	c5	c6	c7	c8	d
WH 2..	25	68	31	4.5	40	23.5	6	44	18
WH 3..	29	92	40	5	45	30	7	56	25

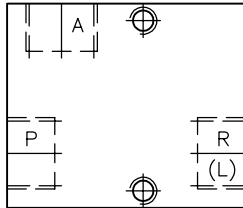
Type	d1	d2	e	e1	f	g	h	h1
WH 2..	17.5	38	18	25	22	M5, 8 deep	30	14
WH 3..	23.5	50	27.5	27.5	25	M6, 8 deep	32	12



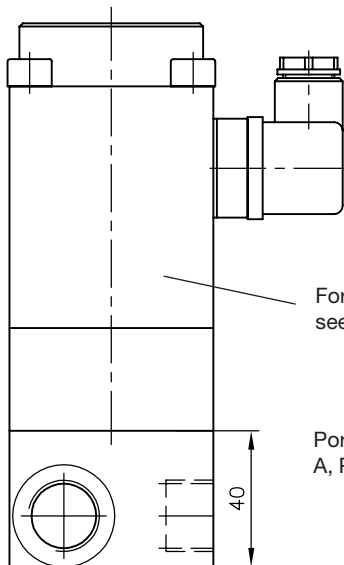
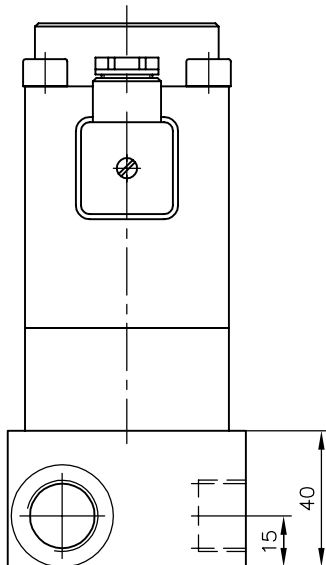
4.2.3 Type WH 4 ...-1/2



Type WH 4 D(F) -1/2



Type WH 4 D(Q, F, E) -1/2 L  
WH 4 H(N, M, R) -1/2



For missing dimensions,  
see sect. 4.1.4!

Port ISO 228/1 (BSPP) :  
A, P and R = G 1/2

## 5. Appendix

### 5.1 2/2-way directional seated valve with pressure limiting valve in the intermediate plate (only type WN 1 D(F), WH 1 D(F))

This intermediate plates, features a pressure limiting valve (tool adjustable), allow compact and easy realization of pressure stage circuitries at piloting circuits. They are used e.g. with prop. directional spool valves type PSL/PSV (see D 7700 ++) for activating a second pressure stage at the gallery LS. They can be also combined with connection sub-plates (acc. to sect. 3) coding ...-1/4 or ...-1/4 L as alternative to version ...-1/4 V.

**Parameters:**

Pressure  $p_{max}$  = 400 bar  
 Flow  $Q_{max}$  = 2 lpm

For all other parameters and dimensions, see section 2 and 4!

**Order coding for individual valve (example):**

WN 1 F/250 - G 24  
 WH 1 D/400 - 1/4 - WG 230

Pressure specification (bar) of the pressure limiting valve

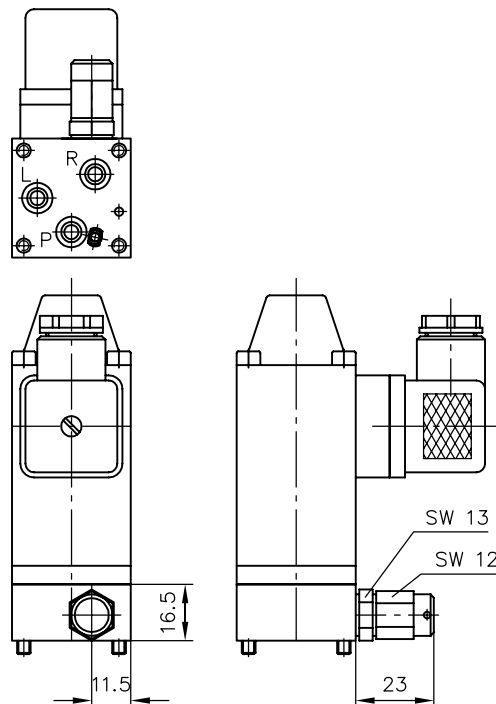
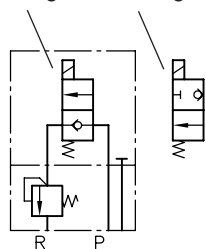
Order coding for intermediate plate as individual element (complete with pressure limiting valve and 4 socket head screws ISO 4762-M4x85-12.9 galvanized):

Intermediate plate 7470 104

**Symbol**

(shown as type WN 1..)

Coding D Coding F

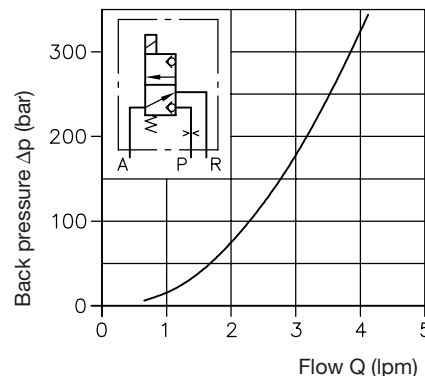


### 5.2 Orifice insert (only type WN 1 and WH 1)

These orifices serve as flow limitation (see  $\Delta p$ -Q curves). They should be used, whenever flows higher than  $Q_{max}$  (sect. 2.1) could appear during switching operation P→A(R): Hydraulic accumulators on the pump side (gallery P) or at hydraulic pre-controls of directional spool valves with control oil supply from a main line with large flow. Available for type WN 1 and WH 1, symbols D, F, H, M and W (acc. to table 3).

Avail. versions	Dwg-No.
Coding	Ø-orifice for indiv. orders
<b>B 0,4</b>	0.4 mm 7470 075 A
<b>B 0,6</b>	0.6 mm 7470 075 D
<b>B 0,7</b>	0.7 mm 7470 075 B
<b>B 0,8</b>	0.8 mm 7470 075 E
<b>B 1,2</b>	1.2 mm 7470 075 C

Order example: WN 1 H / **B 0,7** - G 24  
 WH 1 H / **B 0,4** - 1/4 - WG 230



### 5.3 Wegesitzventile mit verminderter Schaltleistung

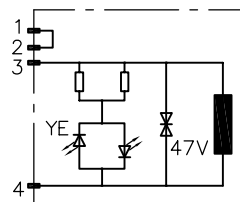
Valves with reduced switching performance may be required, when several valves are connected in parallel or individual valves are connected to a SPS or field bus system. Type WH 1 and WH 2 come with plug M12x1, conforming DESINA.

Order example: WH 1 H - M 24 / 8 W  
 WH 3 N - G 24 / 8 W

**Parameters**

Basic and size	WH 1	WH 2	WH 3
Flow pattern symbols	all	all	H, N
Switching power	8 W	8 W	8 W
Electr. connection	M12x1	M12x1	DIN EN 175 301-803 A
Nom. voltage	24 V DC	24 V DC	24 V DC
max. flow	6 lpm	15 lpm	30 lpm
max. operating pressure	400 bar	200 bar	250 bar

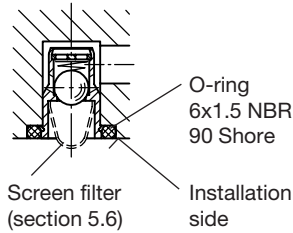
Coding M.. / 8 W



For all other parameters and dimensions, see sect. 2 and 4. A combination with connection sub-plates acc. to section 3 is possible.

### 5.4 Installation instruction

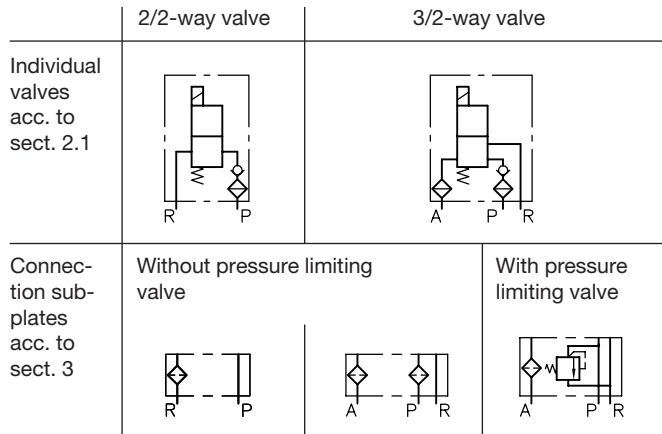
Check valve insert EK 01  
 Only for WN 1 type valves code letter Q and N acc. to sect. 2.1



Due to the O-ring's elasticity it may occur that the check valve may move and protrude a few tenths of a millimetre before being bolted to the sub-plate. If the valve WN 1 is filled with oil (e.g. due to functional test on a test rig previously), tightening of the bolts may cause a compression of the trapped oil due to the check valve being forced in. The resulting pressure would exceed the one at which the solenoid is still able to actuate. While tightening, it is therefore advisable to press either the manual emergency actuation (see sect. 4.1.1) or energise the solenoid via the plug. This cannot occur with WH 1 type valves due to the hydraulic relief.

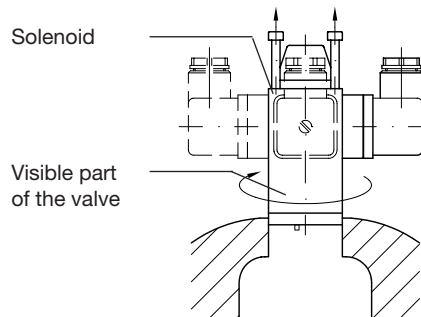
### 5.5 Screen filter elements installed as standard (only type WN(H) 1, WH 2 and WH 3!)

To prevent sudden disturbance caused by coarse contaminations that may occasionally be carried along in the oil (such as torn off particles of tubing, packing, scale swarf,) directional seated valves are fitted with screen filter elements with 0.25 mm mesh width in the ports P and A (see sect. 4.1). The directional spool valves (only WN 1) cannot be fitted in the housing with these filter elements for reasons of the ducts' design but they are less sensitive to the contaminations mentioned above. For further protection, the sub-plates for individual valves (sect. 3) are fitted with fine screen filter discs HFC 1/4F and 3/8 (acc. to D 7235) as standard at A and B. Connection blocks without pressure limiting valve also in P. These screen filter elements must not be understood as a replacement for usual hydraulic filters. In practice, however, they provide sufficient protection against malfunctions in small hydraulic systems. The filter elements should be checked first, whenever such malfunctions occur. These filter elements are not explicitly shown in the diagrams, for the sake of simplicity,.



### 5.6 Rotating the solenoid

When required the solenoid can be rotated on the valve body by another 3x90° in addition to the standard assembly position: The best way is to carefully clamp the valve body in a vice and partly or completely remove the screws from above. Turn the solenoid in the desired position and retighten the screws. In order to prevent mounting the valve incorrectly onto the sub-plate (e.g. during replacement, if only the position of the solenoid is considered), a center pin is provided on the underside of the valve, which fits into a hole in the sub-plate.



## 6. Type overview

### 6.1 Single valve acc. to sect. 2.1:

#### WN 1 H/200 1 - G 24

Size	1	2	3	4
Nom. voltage (see sect. 2.2.2) <b>G 12, G 24, WG 110, WG 230</b> and others.	•	•	•	•
Additional element (see sect. 2.1 or 5.2)				
<b>1</b> Return pressure stop (optional, for 2/2 and 3/2-way functions)	•	•		
<b>/B 0,7</b> Orifice insert Ø0.7 mm (only with flow pattern D, F, H, M and W)	•			
<b>/..</b> Pressure limiting valve in the intermediate plate, acc. to sect. 5.1 (only flow pattern D and F)	•			
Flow pattern (see sect. 2.1)				
<b>D, Q, F, E</b> 2/2-way function (seated valve)	•	•	•	•
<b>H, N, M, R</b> 3/2-way function (seated valve)	•	•	•	•
<b>W, WX</b> Only type WN 1: 4/2-way function (directional spool valve)	•			
Basic valve type and size (differences see sect. 1)				
<b>WN 1</b>	•			
<b>WH 1</b>	•			
<b>WH 2</b>		•		
<b>WH 3</b>			•	
<b>WH 4</b>				•

### 6.2 Individual valve with connection sub-plate section 3:

#### WN 1 H 1 - 1/4 SR - G 24 - 200

Size	1	2	3	4
Nom. voltage (see sect. 2.2.2) <b>G 12, G 24, WG 230</b> and others	•	•	•	•
Connection sub-plate (additional element) (without) no additional elements in the connection sub-plate	•	•	•	•
<b>L</b> Only with type WH: external leakage connection 2/2-way valves	•	•	•	•
<b>S, SR</b> Pressure limiting valve (tool or manually adjustable) with pressure specification, connected in parallel to the 3/2- or 4/2-way directional valve (P→R, sect. 3.1 table 4 a)	•	•	•	
<b>V, VR</b> Pressure limiting valve (adjustable manually or with tools) connected in series behind the directional valve (only flow pattern D and F, sect. 3.1 Table 4 a) with pressure indication	•			
<b>C</b> Bypass check valve (sect. 3.1 Table 4 a)	•			
Connection sub-plate (ports, ISO 228/1 (BSPP))				
<b>-1/4</b> G 1/4	•	•		
<b>-3/8</b> G 3/8			•	
<b>-1/2</b> G 1/2				•
Additional elements (see sect. 2.1 or 5.2)				
<b>1</b> Return pressure stop (optional, with 2/2, 3/2, 3/3-way function; see sect. 2.1)	•	•		
<b>/B 0,7</b> Orifice insert Ø0.7 mm (only with flow pattern D, F, H, M, W)	•			
<b>/..</b> Pressure limiting valve in the intermediate plate, acc. to sect. 5.1 (only with flow pattern D and F), e.g. in comb. with connection sub-plate -1/4(L)	•			
Flow pattern (see sect. 2.1)				
<b>D, Q, F, E</b> 2/2-way function (seated valve)	•	•	•	•
<b>H, N, M, R</b> 3/2-way function (seated valve)	•	•	•	•
<b>W, WX</b> 4/2-way function (directional spool valve)	•			
<b>J, U</b> 3/3-way function (combination of two seated valves)	•	•	•	
<b>L</b> 4/3-way function (combination of two seated valves)	•			
<b>M. / R.</b> Double valve, two separately actuatable 3/2-way functions (flow pattern H(1), N(1), M(1), R(1), section 3.2 Table 5 b)				
Basic valve type and size. For differences see sect. 1.				
<b>WN 1</b>	•			
<b>WH 1</b>	•			
<b>WH 2</b>		•		
<b>WH 3</b>			•	
<b>WH 4</b>				•