

Part number:

HYDROMA

HYDRAULICKÉ SYSTÉMY

**HIDROMA
SISTEMS**

UKŁADY HYDRAULICZNE

HYDROMA

ГИДРАВЛИЧЕСКИЕ СИСТЕМЫ

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.

D 7470 A/1

Directional seated valves
WN and WH

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

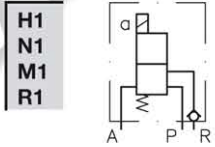
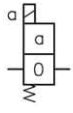
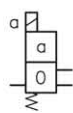
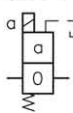
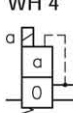
Table 1: Basic type and size

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

Table 2: Actuation solenoid ⁵⁾

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

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

Suited for	Directional seated valves				Directional spool valves	Only for WN 1, WH 1 and WH 2: 3/2-way valves with additional return pressure stop 
WN 1  2/2-way	D	Q ²⁾ ³⁾	F	E ²⁾	W	
WN 1  3/2-way	H	N ²⁾ ³⁾	M	R ²⁾	WX	
WH 1 to WH 4  2/2-way	D	Q ²⁾	F	E ²⁾		
WH 1 to WH 4  3/2-way	H	N ²⁾	M	R ²⁾		

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 4a footnote ³⁾.
The check valve insert can be retrofitted and is therefore separately available. Order coding EK01.

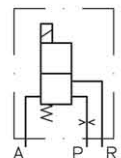
3) See also installation instruction in sect. 5.4

4) Not available for WH 4

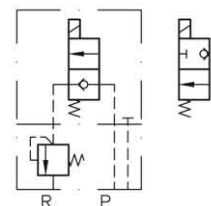
5) For further special voltage see section 2.2.2 "Special voltages"

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	

Basic type	Flow pattern	Switchable pressure (bar)			% ED	Ambient temperature
		Applied voltage	100	50		
WN 1 Directional seated valves	D, Q, R, H, N, M, J, L	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 WN1: 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 $0.75 U_N$ a. $0.5 U_N$), 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".

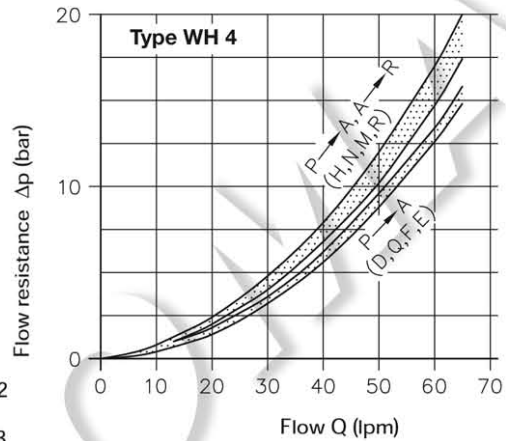
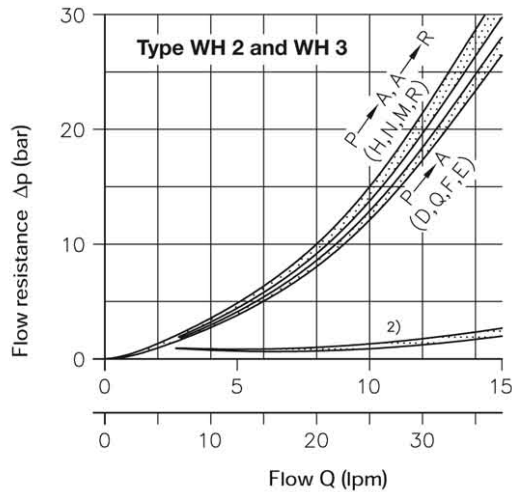
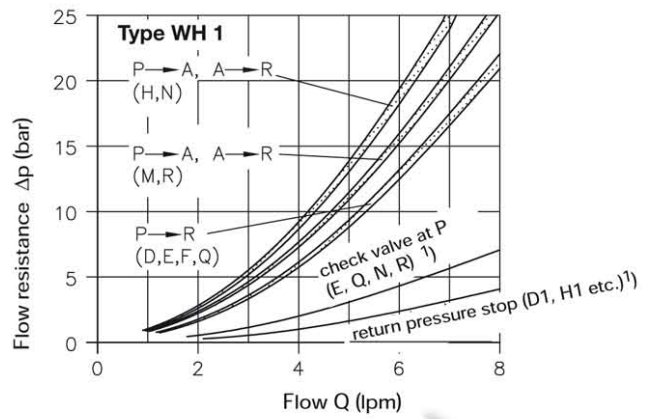
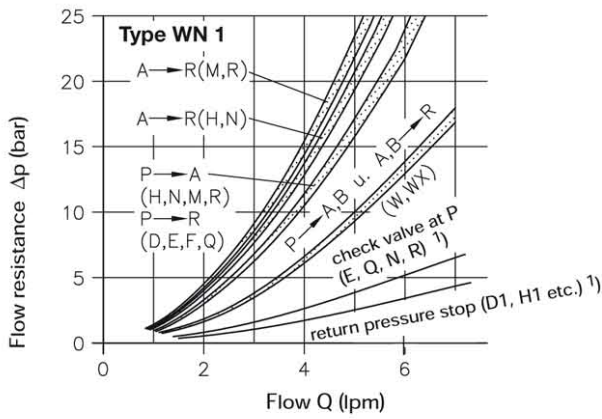
Perm. pressure in port R	WN1:	$p_R \leq 350$ bar, but observe that $p_R \leq p_A \leq p_P$!
		Note: Use code letter F and E as straight-way valve up to 320 bar only!
	WH1 (2, 3 a. 4):	Flow pattern symbols H, N, M and R $p_R \leq 20$ bar
		Flow pattern symbols D, Q, F and E $p_R \leq 350$ bar, $p_L \leq 20$ bar
	Sub-plates acc. to sect. 3:	Version ..S(SR) or ..V(VR) $p_R \leq 20$ bar

Static overload capacity	approx. $2 \times p_{max}$												
	Individual valve acc. to sect. 2.1			Individual valve with connection sub-plate acc. to section 3 without pressure limiting valve					with pressure limiting valve				
Mass (weight) approx. kg	D to F	H(1) to R(1)	W, WX	WN1 - 1/4(C)	WH..- 1/4(C, L)	D, Q, E, F	H(1), M(1), R(1)	W, WX	U, J, L	WN 1... - 1/4	WH 1... - 1/4	.. - 1/4 S	.. - 1/4 V
										H(1), N(1), M(1), R(1)	Q to R(1)	W, WX	F, D
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 mm²/s; opt. operation approx. 10... 200 mm²/s. Flow resistance will increase more sharply at viscosities over approx. 300 mm²/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 WN1, WH1, and WH2. 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 mm²/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 VDE 0580									
Basic type	WN 1, WH 1 and WH 2				WH 3 ⁶⁾				WH 4	
Coding acc. to section 2.1	G 12 X 12 L 12	G 24 X 24 L 24	WG 110 ⁴⁾ (G 98) (X 98)	WG 230 ⁴⁾ (G 205) (X 205)	G 12 X 12 L 12	G 24 X 24 L 24	WG 110 ⁴⁾ (G 98) (X 98)	WG 230 ⁴⁾ (G 205) (X 205)	G 24 X 24	WG 230 ⁴⁾ (G 205) (X 205)
Nom. voltage U _N for other voltage, see page 5	12VDC	24VDC	110VAC (98VDC)	230VAC (205VDC)	12VDC	24VDC	110VAC (98VDC)	230VAC (205VDC)	24VDC	230VAC (205VDC)
Nom. current I ₂₀ ³⁾ (A)	2	1	0.25	0.14	2.72	1.36	0.30	0.16	3.4	0.4
Power P _N ³⁾ (W)	24.4	24.4	24.4	24.4	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 ⁵⁾	
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										

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

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

⁵⁾ 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)

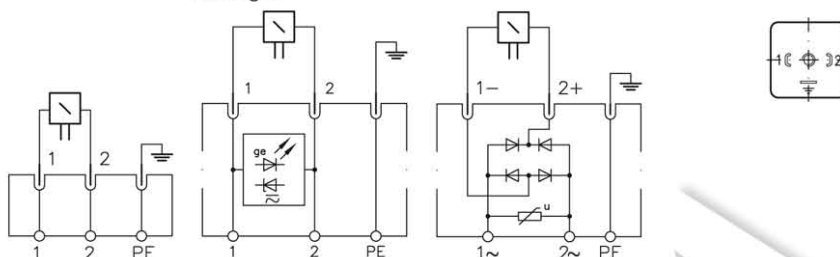
⁶⁾ For version with switching performance of 8 Watt, see section 5.3

Continuation: Electrical data

Protec. mode IEC70(Co)13 IP 65, 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) $W \leq 0.5 Ws$ (guideline + approx. 10% acc. to measurements with nom. voltage U_N)

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 Pg 9



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. 5.7).

Special voltage

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

Examples:
 WH 1 H - G 180 ($I_{20} = 0.33 A$)
 WH 3 E - G 48 ($I_{20} = 0.69 A$)

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: $I_{20} = P_N / U_N$ (see examples).

Basic type		WN 1 WH 1 WH 2	WH 3	WH 4
Nominal power P_N		~ 24 W	~ 30 W	~ 82 W
Voltage specification D_C (ΔU_N (V))	G 12 (X 12, L 12) ¹⁾	•	•	
	G 24 (X 24, L 24) ¹⁾	•	•	•
	G 36 (X 36)	•		
	G 42 (X 42)	•		
	G 48 (X 48)	•	•	
	G 80 (X 80)	•		
	G 98 (X 98) ¹⁾	•	•	
	G 110 (X 110)	•		
	G 180 (X 180)	•		
	G 205 (X 205) ¹⁾	•	•	•
Voltage specification AC (50/60 Hz)	WG 24	•	•	
	WG 100	•		
	WG 110 ¹⁾	•	•	
	WG 200	•		
	WG 230 ¹⁾	•	•	•

1) Standard version

Notes for lay-out

DC-voltage:

The voltage specification (solenoid lay-out) shall correspond to the actual supply voltage (perm. tolerance $\pm 5...10\%$). 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. $0.9 U_{AC} - 2V$ because of the utilized rectifier plug. The table above lists the corresponding DC-solenoids for various AC supply voltage (e.g. for 110V AC 50 Hz, solenoid with $U_N = 98V DC \Delta$ 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

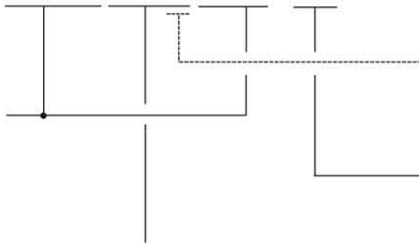
Order example: **WN 1H - 1/4 S - G 24 - 150**

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 4a: 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
	without	without	with 1) 3)	with 3)	without	with 3)	without	with 3)
Suited for basic type 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 DIN ISO 228/1 (BSPP), suited for pipe fittings shape B DIN 3852 page 2.								

Table 4b: Directional valve combinations

2/2-way directional seated valve combination WN 1D, Q or F Fixation of the consumer at any intermediate position 3/3-way function			4/3-way function	Double directional seated valve for pipe connection. Serve for the compact realization of two separate 3/2-way functions.
WN 1 J - 1/4 - ..	WN 1 U - 1/4 - ..	WN 1 L - 1/4 - .. 5)		WN 1.../... - 1/4 - ..
Example: WN 1 J - 1/4 - G 24 WN 1 L - 1/4 - WG 230				Flow pattern symbol H(1), N(1), M(1), R(1) at port B at port A 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. Example: WN 1 M/M - 1/4 - G12
Port P, R, A, B 4): Thread G 1/4 DIN ISO 228/1 (BSPP), suited for pipe fittings shape B DIN 3852 page 2				

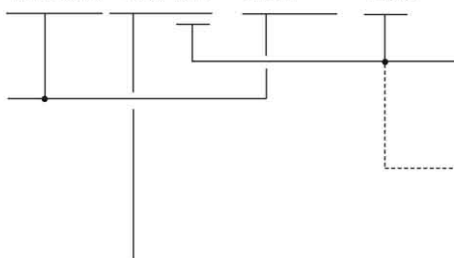
- Utilized to activate a second pressure stage, e.g. for prop. directional spool valves type PSL, PSV acc. to D 7700 ++ or for pressure stage circuits of piloted pressure valves e.g. type DV acc. to D 4350 or AS, ALZ acc. to D 6170.
- Valves coding E and Q should be preferred for by-passing to the tank; A return pressure stop may be installed at R, when pressure peaks could occur at R (see sect. 2.1).
- 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.
- For permissible operation pressure, see section 2.2.1
- Take into account the back pressure, see section 5.5! Permissible pump delivery flow approx. 0.5 Q_{max}
Attention: There are no connection sub-plates with pressure limiting valve available.

3.2. Type WH 1, WH 2, WH 3 and WH4

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 5a: 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 ²⁾			Port P, R, A and L DIN ISO 228/1(BSP)
Valve coding		D, F				D, Q, F, E	H, N, M, R		
Pressure lim. valve		without ¹⁾	without	with ¹⁾	with ¹⁾	without	without	with ¹⁾	
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 5b: Directional valve combinations

2/2-way directional seated valve combination WH..D, Q or F Fixation of the consumer at any intermediate position			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 DIN ISO 228/1 (BSP)
3/3-way function		4/3- way function			
WH 1 J - 1/4 - ..	WH 1 U - 1/4 - ..	WH 1 L - 1/4 - ..³⁾	WH 1 M/... - 1/4 - ..		G 1/4
WH 2 J - 1/4 - ..	WH 2 U - 1/4 - ..	---	<p>Flow pattern symbol H(1), N(1), M(1), R(1) at port B at port A</p>		G 1/4
WH 3 J - 3/8 - ..	WH 3 U - 3/8 - ..	---			G 3/8
WH 4 J - 1/2 - ..	WH 4 U - 1/2 - ..	---			G 1/2
<p>Example: WH 2 J - 1/4 - G 24 WH 1 U - 1/4 - WG 230</p>			<p>Example: WH 1 M/M-1/4-G 12</p> <p>Order coding for connection sub-plate only (enabling retrofitting of a double valve): Sub-plate 7470 061 complete with readily in- stalled screen filter discs HFC 1/4 F in P, A, and B.</p>		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.

3) Take into account the back pressure, see section 5.5! Permissible pump delivery flow approx. 0.5 Q_{max}
 Attention: Connection sub-plates featuring a pressure limiting valve are not available.

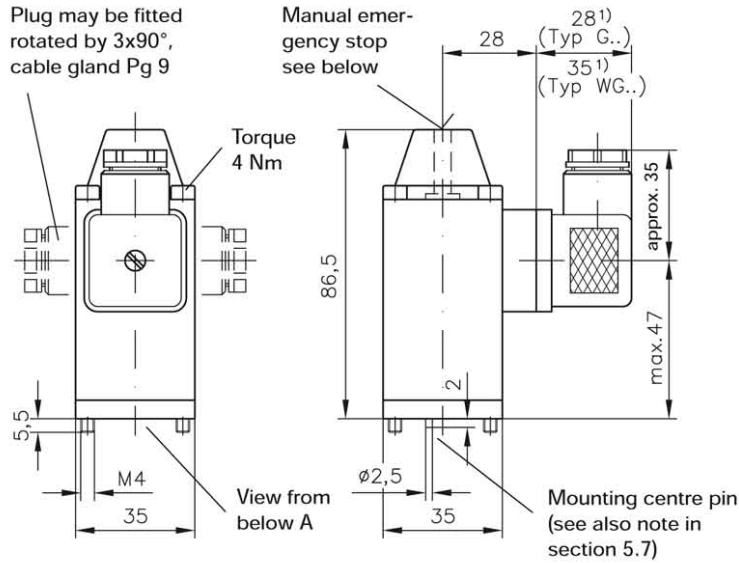
4. Unit dimensions

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

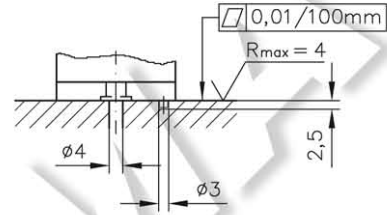
4.1. Single valve (basic version)

4.1.1. Type WN 1 and WH 1

Plug may be fitted rotated by 3x90°, cable gland Pg 9

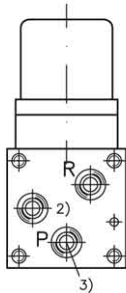


Connection holes for A, B, P, R, L and accommodation for mounting centre pin

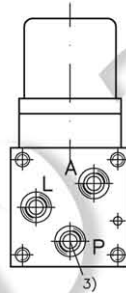


Views from below A:

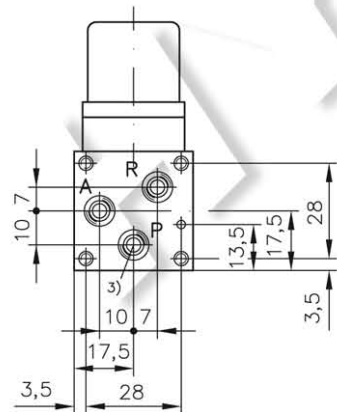
Type WN1D, Q, F and E



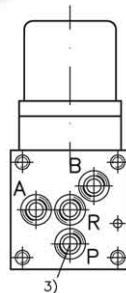
Type WH1D, Q, F and E



Type WN1H, N, M and R
WH1H, N, M and R

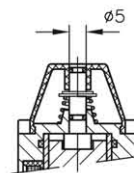


Type WN1W(X)



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).

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

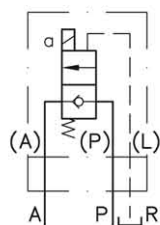
- 1) This dimension depends on the manufacturer and can be max. 40 mm acc. to DIN 43650
- 2) Blind counterbore with O ring 6x1.5. Serves only to close the compensation hole in the sub-plate (see sect. 3), which is also used for WH 1 type valves. In the case of WH 1 it serves for the volume compensation 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)

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

Type WH .. D to E

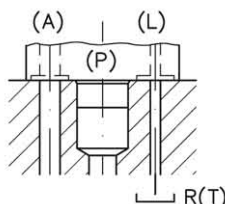
2/2 directional valves may be connected either directly to a pressurized pipe (both P and A are pressure resistant) or to a bypass pipe leading directly back to the tank (e.g. depressurizing a consumer, idle pump circulation etc.). Therefore the routing of the galleries in the manifold depends on the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

Valve directly in the pressure pipe (thru-valve)

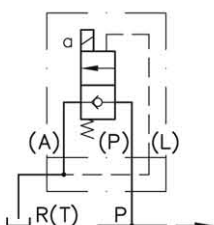


Ongoing pressure gallery

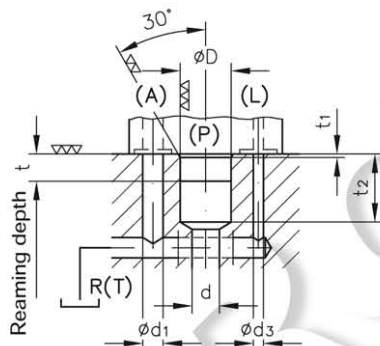
Both sides A and B are pressure resistant, L pressureless to the tank.



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



Pressure gallery



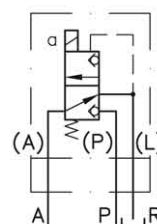
Both L and outlet A may be joint and led to outlet R(T) within the manifold, which again is routed to the tank. For permissible pressure at L and R, see sect. 2.2.1.

Type	D	d	d1	d2	d3	t	t1	t2	t3
WH 2	10 ^{H7}	7	5	6	3	10	1	13	11
WH 3	15 ^{H7}	8	6	8	3	8	1.5	20	18
WH 4	22 ^{H8}	12	10	12	4	16	1.5	34	29

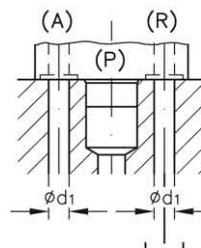
t2 and t3 = min. dimension

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. 5.6).

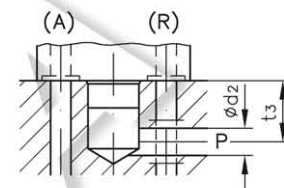
Type WH .. H(1) to R(1)



Ongoing pressure gallery



Lateral P connection (example)



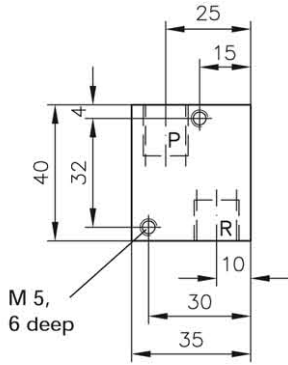
For missing dimensions, see illustration below!

4.2. Individual valves with connection sub-plates

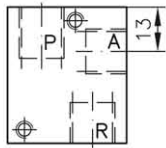
Valves acc. to section 3. Only the connection sub-plate dimensions are illustrated. For missing dimensions of the directly mounted valves, see section 4.1.

4.2.1. Type WN 1 and WH 1

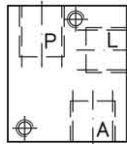
Type WN(H)1D (Q, F, E) -1/4



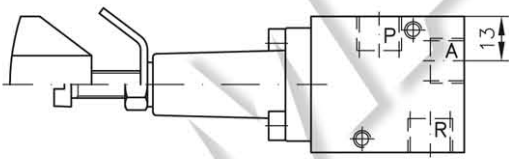
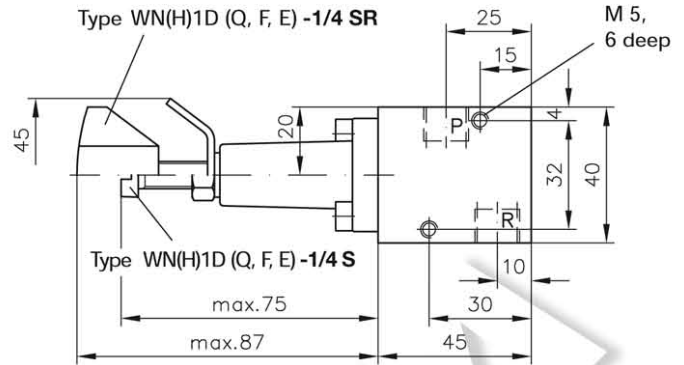
Type WN(H)1H (N, M, R) -1/4



Type WH1D (Q, F, E) -1/4 L

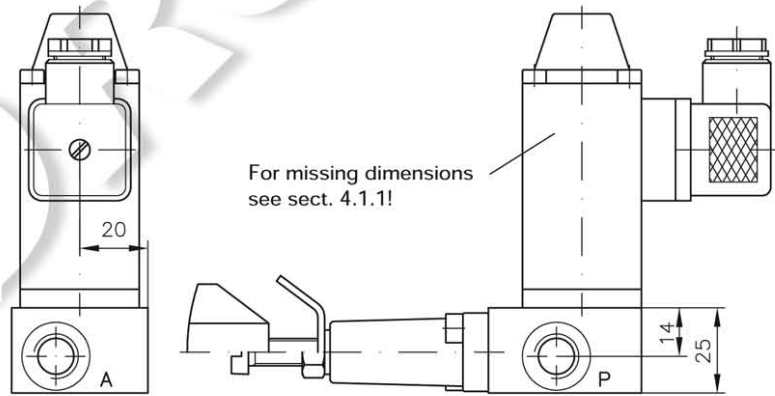
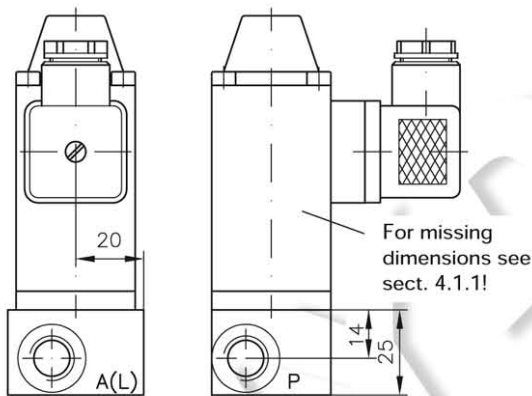


Port
A, P, R and L = G 1/4

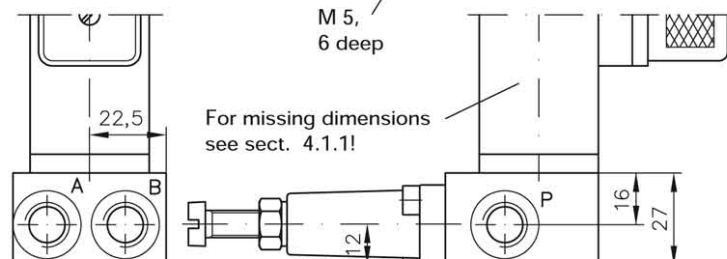
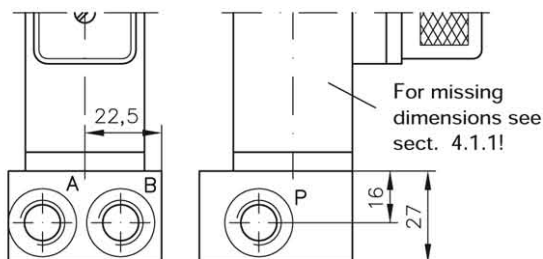
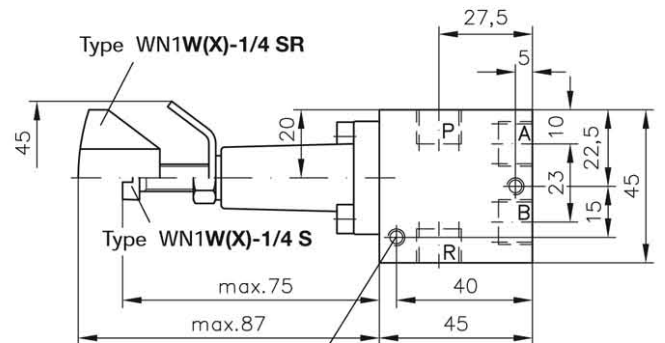
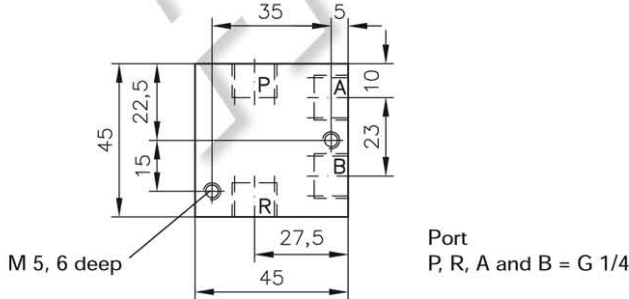


Type WN(H)1H (N, M, R) -1/4 S(SR)

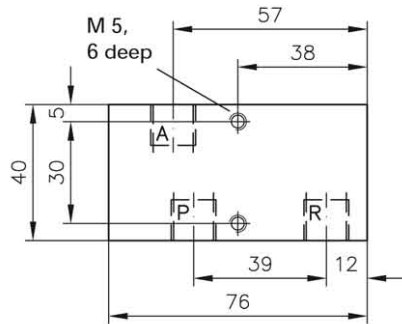
Port
A, P and R = G 1/4



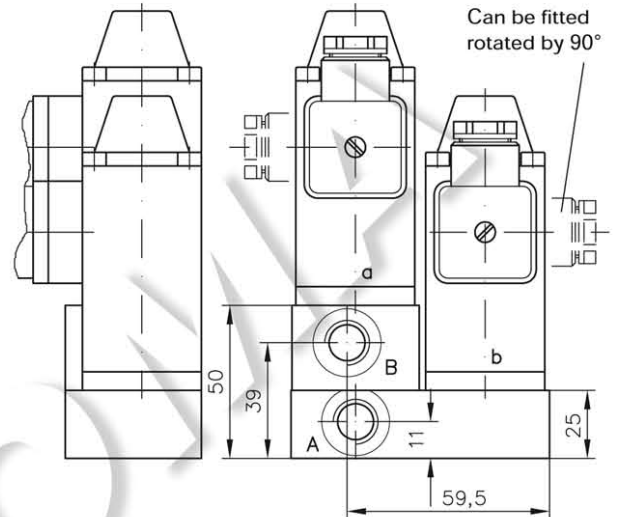
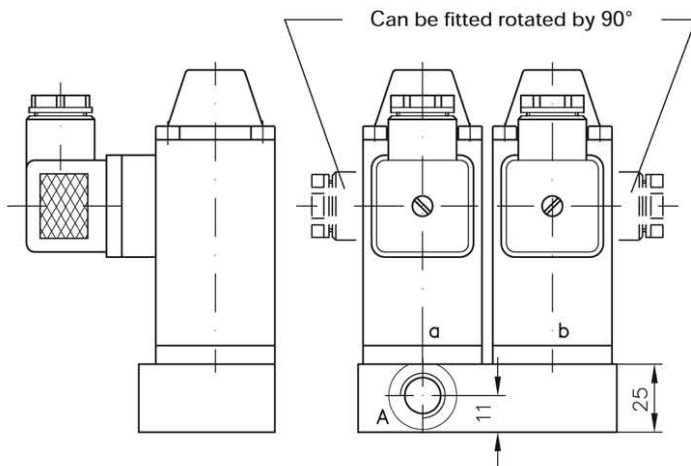
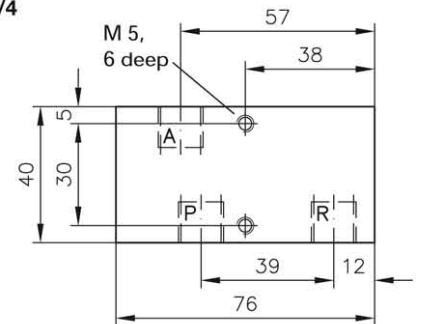
Type WN1W(X)-1/4



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



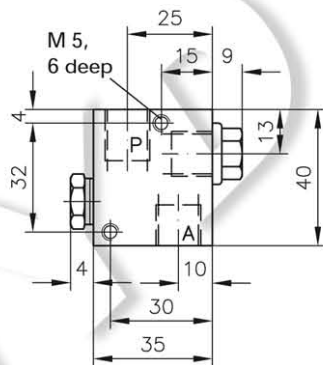
Type WN1L-1/4
WH1L-1/4



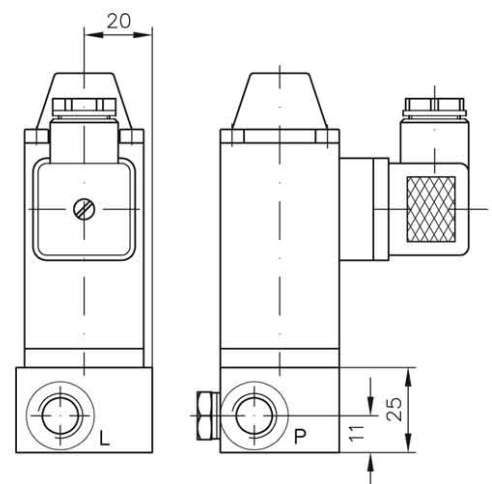
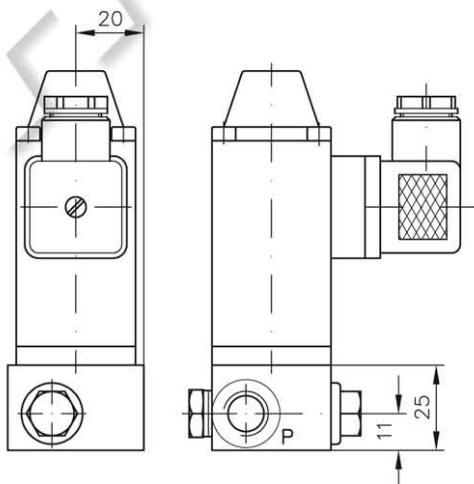
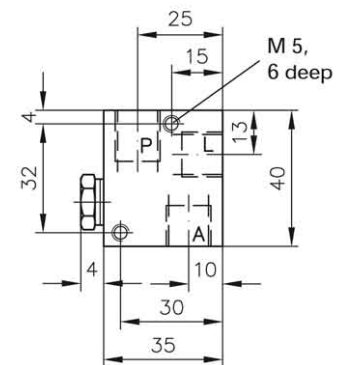
Port P, A and R = G 1/4
For missing dimensions, see sect. 4.1.1!

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

Type WN1D(F)-1/4C

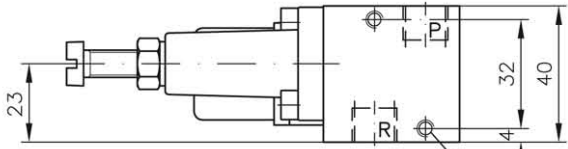


Type WH1D(F)-1/4C



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

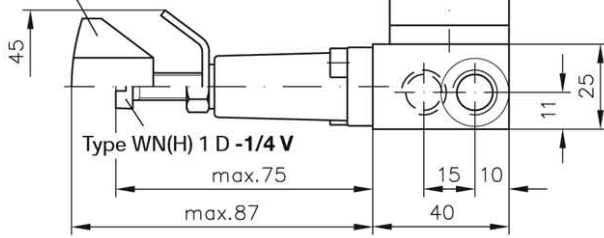
Port A, P and L = G 1/4
For missing dimensions, see sect. 4.1.1!



M 5,
6 deep

For missing dimensions,
see sect. 4.1.1!

Type WN(H) 1 D -1/4 VR

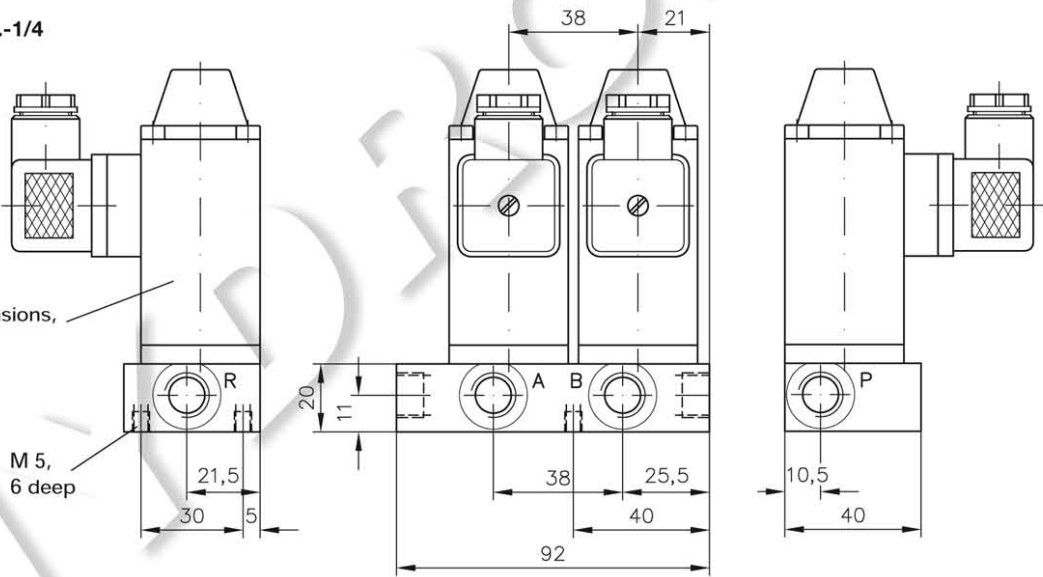


Type WN(H) 1 D -1/4 V

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

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

For missing dimensions,
see sect. 4.1.1!



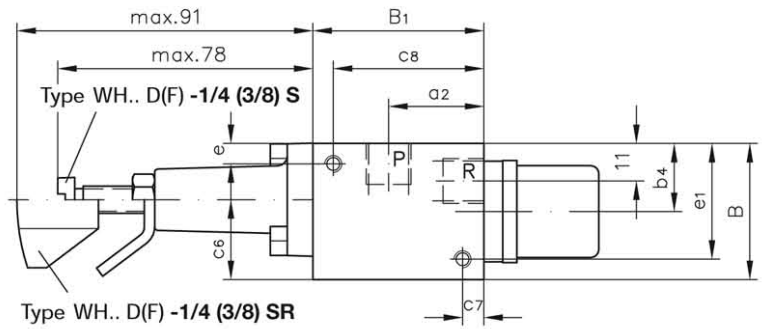
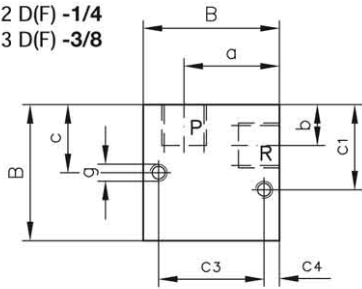
M 5,
6 deep

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

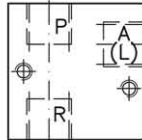
4.2.2. Type WH 2 ..-1/4 ... and WH 3..-3/8...

Illustration shows type WH 2!

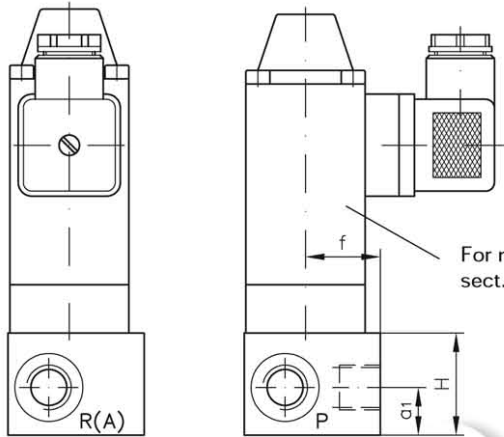
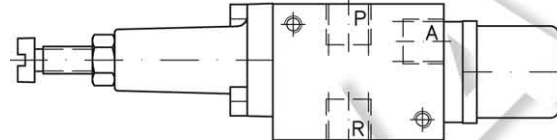
Type WH 2 D(F) -1/4
WH 3 D(F) -3/8



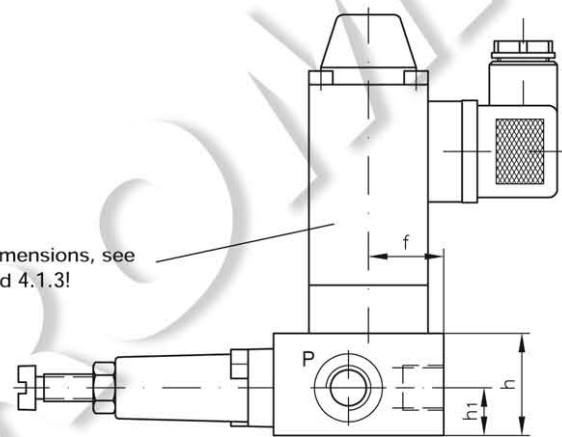
Type WH.. D(Q, F, E) -1/4 L (3/8 L)
WH.. H(N, M, R) -1/4 (3/8)



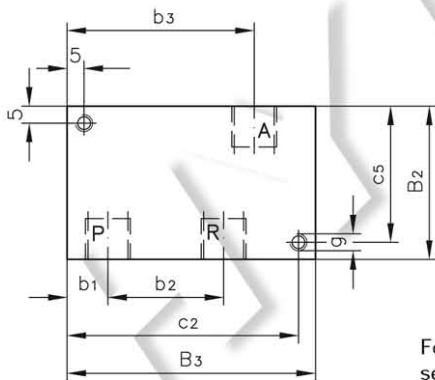
Type WH.. H(N, M, R) -1/4 (3/8) S
WH.. H(N, M, R) -1/4 (3/8) SR



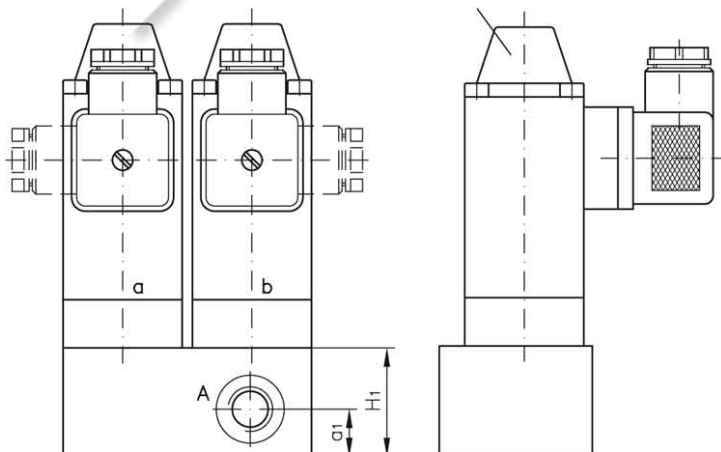
For missing dimensions, see sect. 4.1.2 and 4.1.3!



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



For missing dimensions, see sect. 4.1.2 and 4.1.3!



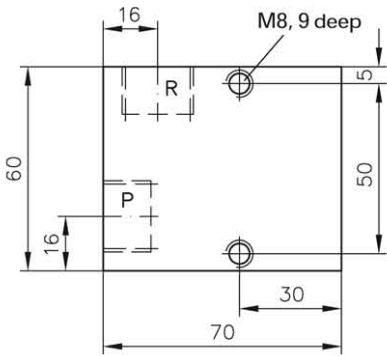
Type	Ports DIN ISO 228/1 (BSPP) A, P and R						
		B	B1	B2	B3	H	H1
WH 2..	G 1/4	40	50	45	73	30	32
WH 3..	G 3/8	50	63	50	97	35	35

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

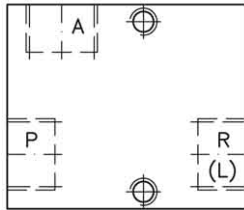
Type	c1	c2	c3	c4	c5	c6	c7	c8	d
WH 2..	34	68	31	4,5	40	23,5	6	44	18
WH 3..	29	92	40	5	45	30	7	56	25

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

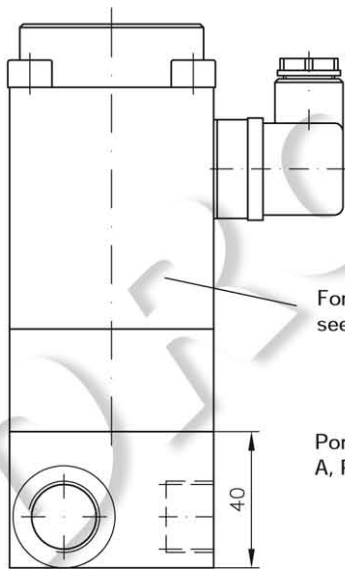
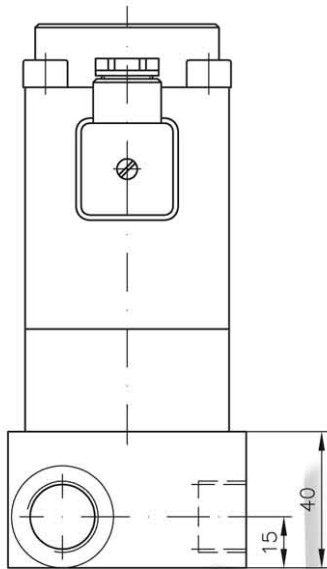
4.2.3. Type WH 4 ...-1/2



Type WH 4 D(F) -1/2

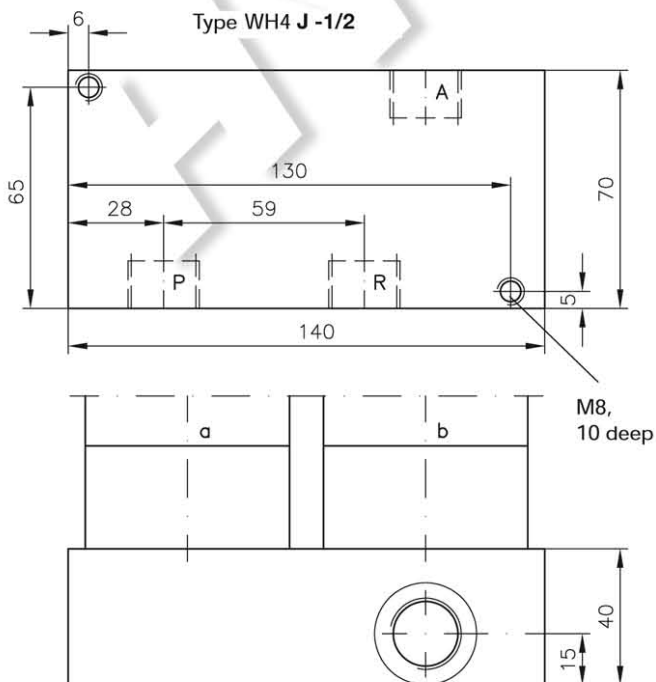


Type WH4 D(Q, F, E) -1/2 L
WH4 H(N, M, R) -1/2

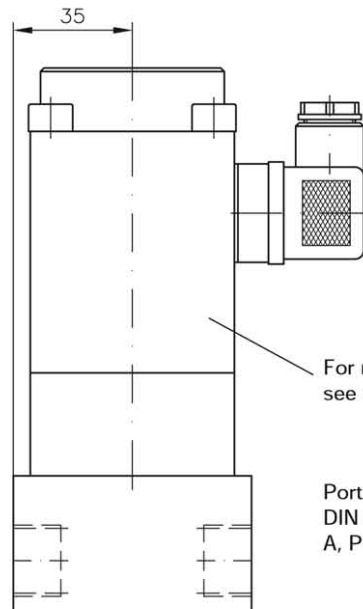


For missing dimensions,
see sect. 4.1.4!

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



Type WH 4 J -1/2



For missing dimensions,
see sect. 4.1.4!

Port
DIN 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):

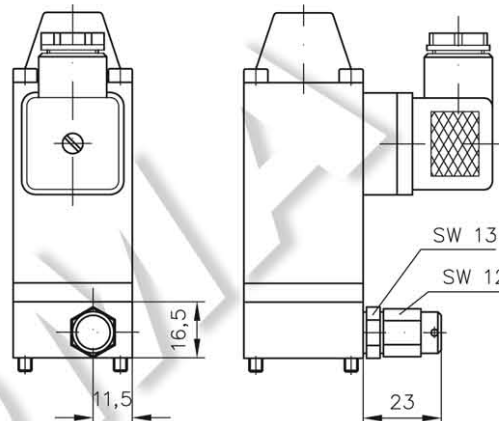
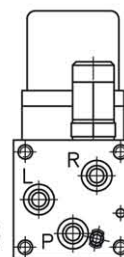
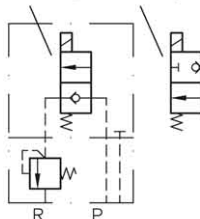
WN 1 F/250 - G24
 WH 1 D/400 - 1/4 - WG 230

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(H) 1!)

These orifices serve as flow limitation (see Δp -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 \varnothing 0.7 (parts No. for retrofitting 7470 040)

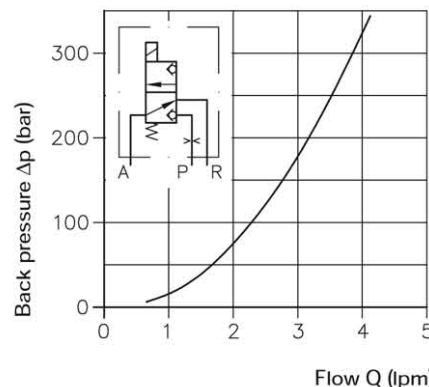
These orifices can't be mounted, when a check valve insert is already installed (e.g. WN(H)1Q, N, R etc.).

Order coding for individual valves:

Add coding B 0.7 directly after the valve coding acc. to sect. 2.1:

Valves acc. to section 2.1: WN 1H/B 0,7 - G 24
 WH 1H/B 0,7 - WG 230

Valves acc. to section 3: WN 1H/B 0,7 - 1/4 - G 24



5.3. 3/2-way directional seated valve with reduced switching performance (only type WH 3)

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.

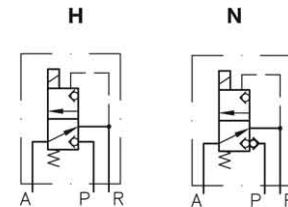
The following types are available WH 3H - G 24/8W
 and WH 3N - G 24/8W for all such cases.

Parameters:

Switching performance 8 W
 Nom. voltage 24V DC
 Max. flow 30 lpm
 Max. operation pressure 250 bar

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

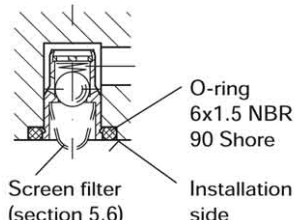
Symbol



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

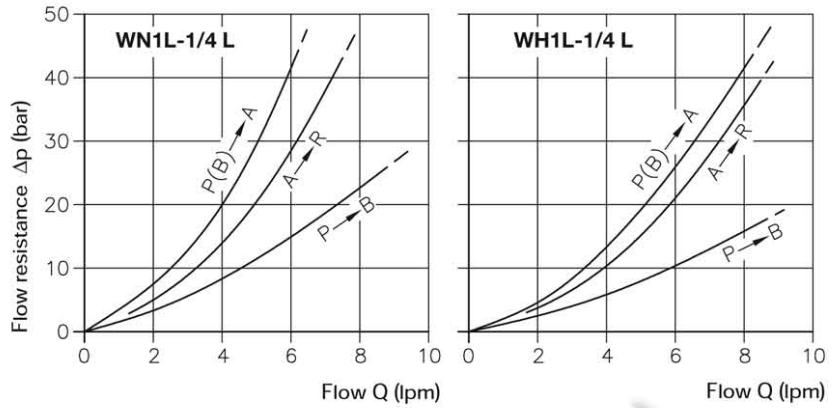
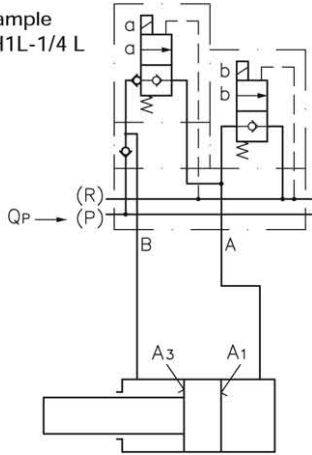


Due to the O-ring's elasticity it may occur that the check valve may move and protrude a few tenths of a millimetre before being bolted to the sub-plate. If the valve WN 1 is filled with oil (e.g. due to functional test on a test rig previously), tightening of the bolts may cause a compression of the 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. WN(H)1L-type valve acc. to section 3

This valve is used for the control of double acting hydraulic cylinders e.g. acc. to DIN ISO 7481 with unequal piston areas if arbitrary stop is required at any lift position.
 Permissible pump delivery flow
 WN 1 L: $P_{PU} = 3 \text{ lpm}$
 WH 1L: $P_{PU} = 4 \text{ lpm}$

Example
 WH1L-1/4 L



Flow resistance, related to inlet P:

Cylinder extended $\Delta p = \Delta p_{P(B) \rightarrow A}$ can be read directly from Δp -Q-curves

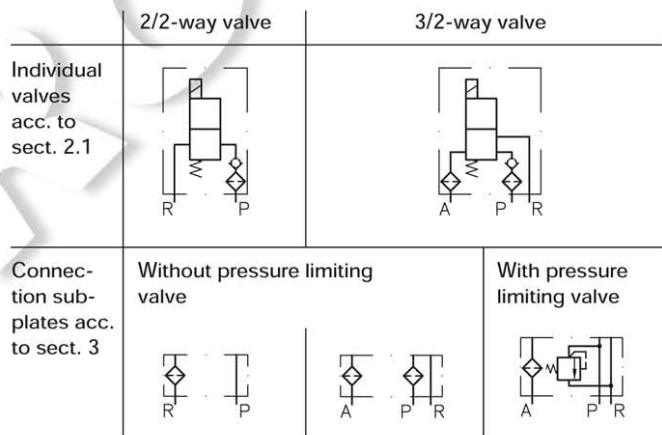
$$\text{using } Q = Q_p + Q_{B \rightarrow A} = Q_p \left(1 + \frac{1}{\frac{A_1}{A_3} - 1} \right)$$

Cylinder retracted $\Delta p = \Delta p_{P \rightarrow B} + \Delta p_{A \rightarrow R} \frac{A_1}{A_3}$
 can be read using $Q = Q_p$ can be read using $Q = Q_p \frac{A_1}{A_3}$

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

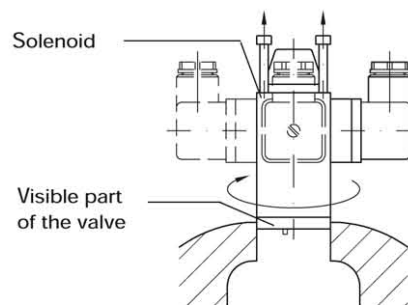
To prevent sudden disturbance caused by coarse contaminations that may occasionally be carried along in the oil (such as torn off particles of tubing, packing, scale swarf,) directional seated valves are fitted with screen filter elements with 0.25 mm mesh width in the ports P and A (see sect. 4.1). 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.



5.7. Rotating the solenoid

When required the solenoid can be rotated on the valve body by another $3 \times 90^\circ$ 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) G 12, G 24, WG 110, WG 230 and others.			•	•	•	•
Additional element (see sect. 2.1 or 5.2)						
1	Return pressure stop (optional, for 2/2 and 3/2-way functions)		•	•		
/B 0,7	Orifice insert Ø0.7 mm (only with flow pattern D, F, H, M and W)		•			
/..	Pressure limiting valve in the intermediate plate, acc. to sect. 5.1 (only flow pattern D and F)		•			
Flow pattern (see sect. 2.1)						
D, Q, F, E	2/2-way function (seated valve)		•	•	•	•
H, N, M, R	3/2-way function (seated valve)		•	•	•	•
W, WX	Only type WN 1: 4/2-way function (directional spool valve)		•			
Basic valve type and size (differences see sect. 1)						
WN 1			•			
WH 1			•			
WH 2				•		
WH 3					•	
WH 4						•

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) G 12, G 24, WG 230 and others			•	•	•	•
Connection sub-plate (additional element) (without) no additional elements in the connection sub-plate						
L	Only with type WH: external leakage connection 2/2-way valves		•	•	•	•
S, SR	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 4a)		•	•	•	
V, VR	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 4a) mit Druckangabe		•			
C	bypass check valve (sect. 3.1 Table 4a)		•			
Connection sub-plate (ports, DIN ISO 228/1 (BSPP))						
-1/4	G 1/4		•	•		
-3/8	G 3/8				•	
-1/2	G 1/2					•
Additional elements (see sect. 2.1 or 5.2)						
1	Return pressure stop (optional, with 2/2, 3/2, 3/3-way function; see sect. 2.1)		•	•		
/B 0,7	Orifice insert Ø0.7 mm (only with flow pattern D, F, H, M, W)		•			
/..	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)						
D, Q, F, E	2/2-way function (seated valve)		•	•	•	•
H, N, M, R	3/2-way function (seated valve)		•	•	•	•
W, WX	4/2-way function (directional spool valve)		•			
J, U	3/3-way function (combination of two seated valves)		•	•	•	•
L	4/3-way function (combination of two seated valves)		•			
M. / R.	Double valve, two separately actuatable 3/2-way functions (flow pattern H(1), N(1), M(1), R(1), section 3.2 Table 5b)		•			
Basic valve type and size. For differences see sect. 1.						
WN 1			•			
WH 1			•			
WH 2				•		
WH 3					•	
WH 4						•

Directional seated valves type WN(H) and BWN(H)



Basic type	WN, WH, BWN, BWH
Nomenclature	Directional seated valve, zero leakage
Oper. pressure	350 ... 450 bar
Flow	5 ... 60 lpm
Version	Individual valves with/without sub-plate (WN, WH) Valve banks for pipe connection or combination with hydraulic power packs (BWN, BWH)

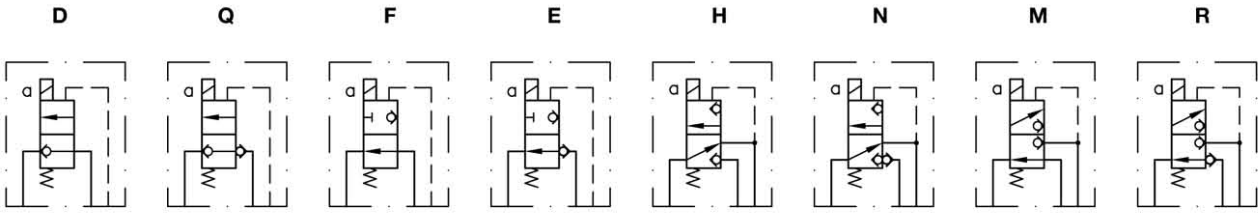
These directional seated valves (zero leakage) control the direction of movement for single and double acting consumers in hydraulic circuits. Modular in concept, these valves can provide consumer specific control system solutions. These valves may be combined to form valve banks and can

be directly mounted to various hydraulic power packs.

Features and benefits

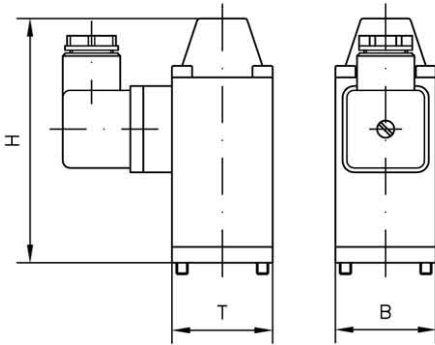
- Good performance/price ratio
- Maximum flow up to 60 lpm
- Maximum operation pressure up to 450 bar
- Low space requirements
- Directional seated valves, zero leakage
- Various flow pattern available
- Additional functions can be integrated into the sub-plates of a valve bank e.g. pressure limiting valves, pressure switches etc.
- Pressure reducing valve can be integrated into valve banks
- Adapter plates enable direct mounting on to hydraulic power packs or combination with other valve types
- Various solenoid voltages available
- Special variants on enquiry

Flow pattern (basic functions)



Technical data

Individual valve

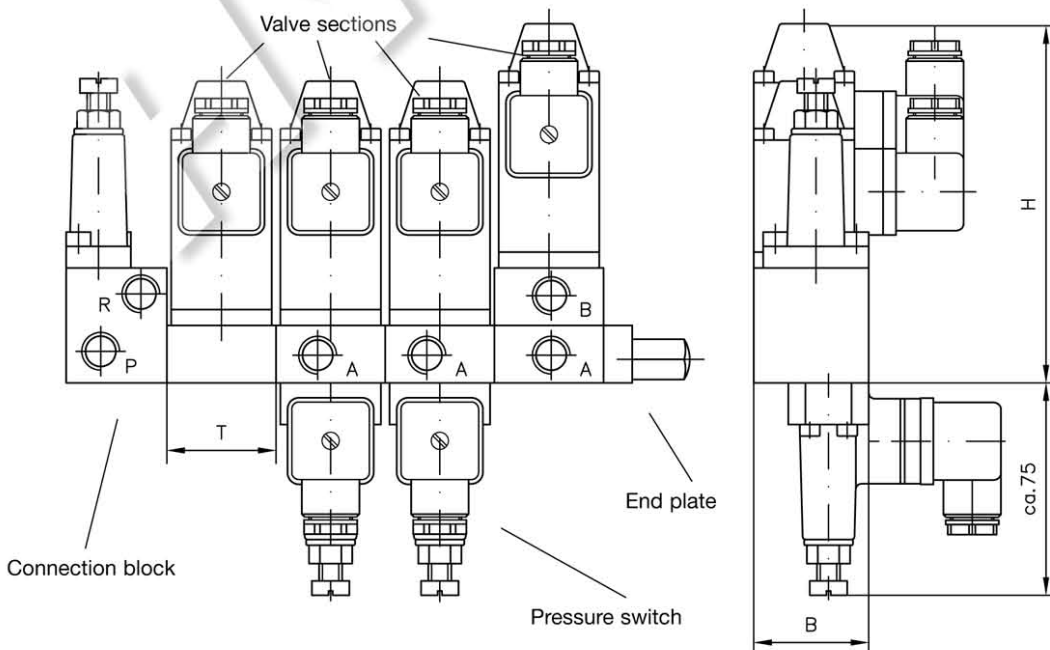


Basic type	WN1 BWN1	WH1 BWH1	WH2 BWH2	WH3 BWH3	WH4
Oper. pressure (bar)	350	450	350	350	350
Flow (lpm)	5	8	15	30	60

Basic type	WN1 BWN1	WH1 BWH1	WH2 BWH2	WH3 BWH3	WH4
H	86.5	86.5	97.0	95.5	118.0
B	35	35	35	45	60
T	35	35	35	45	60

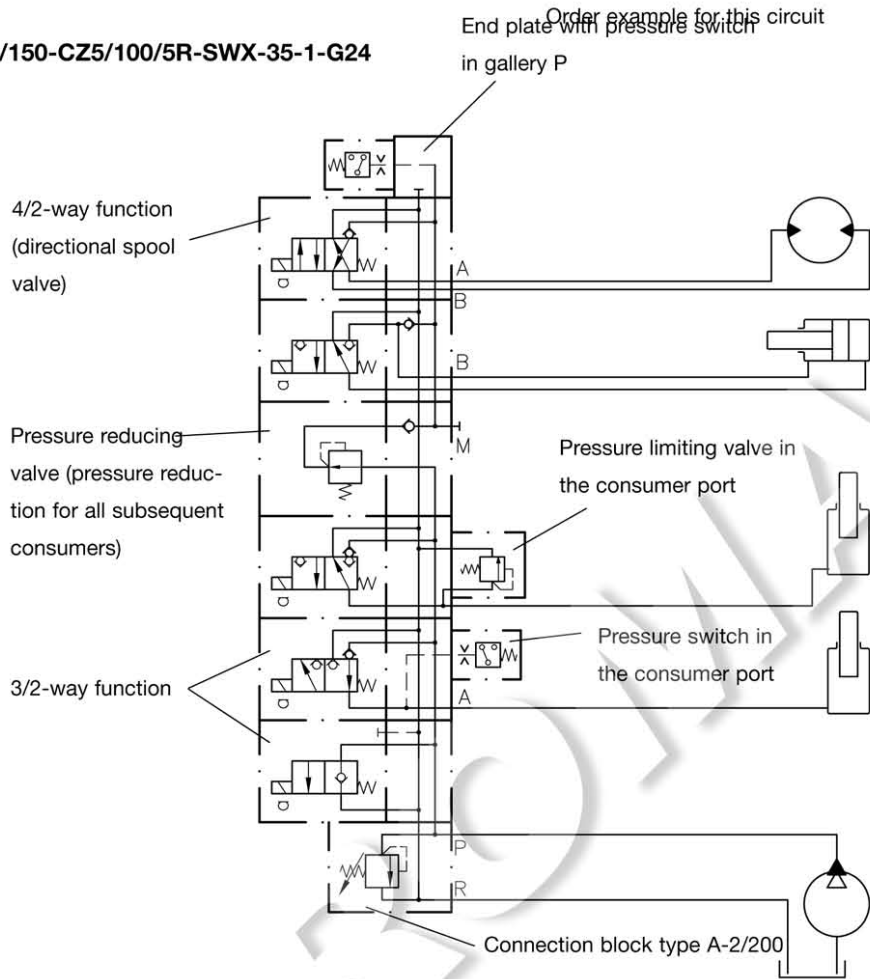
All dimensions in mm, subject to change without notice !

Valve bank

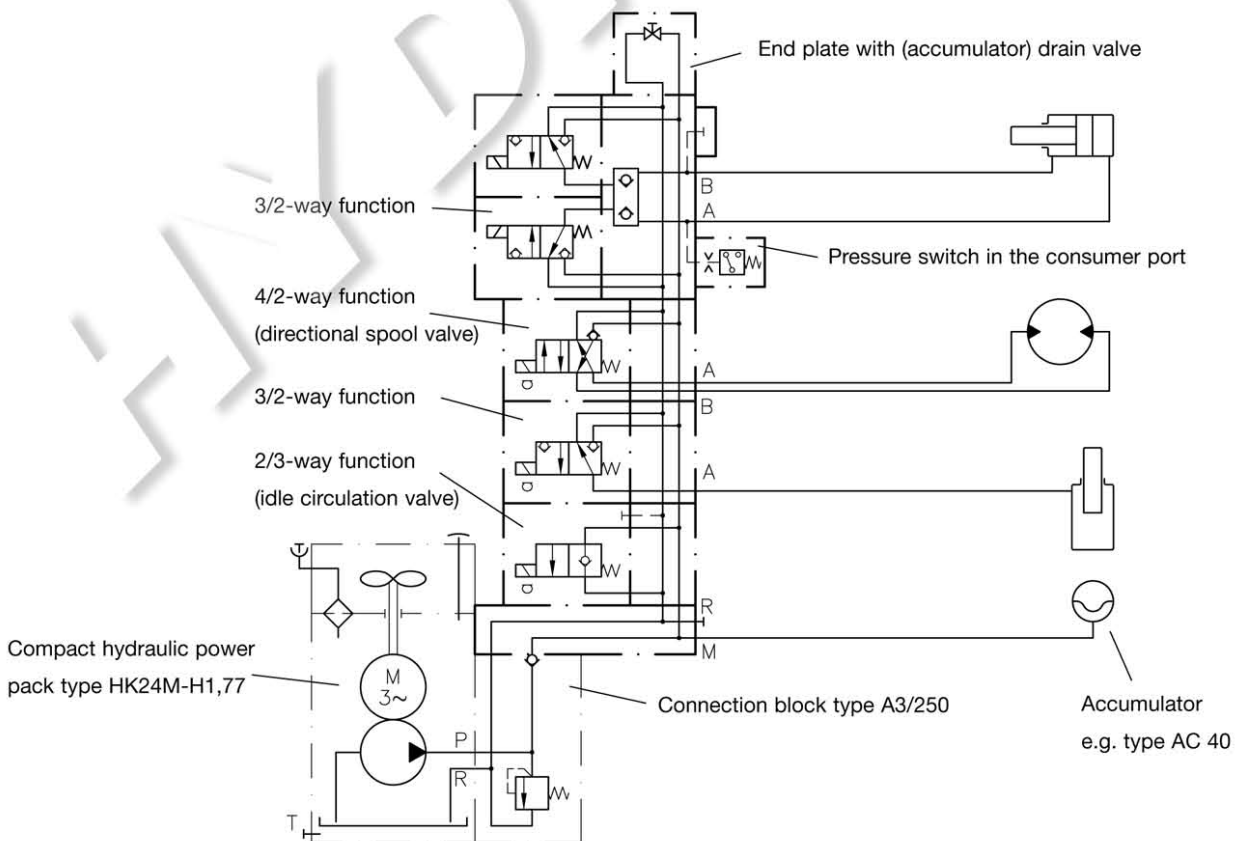


Example circuit (valve bank)

BWN1A-2/200-DR5N/150-CZ5/100/5R-SWX-35-1-G24



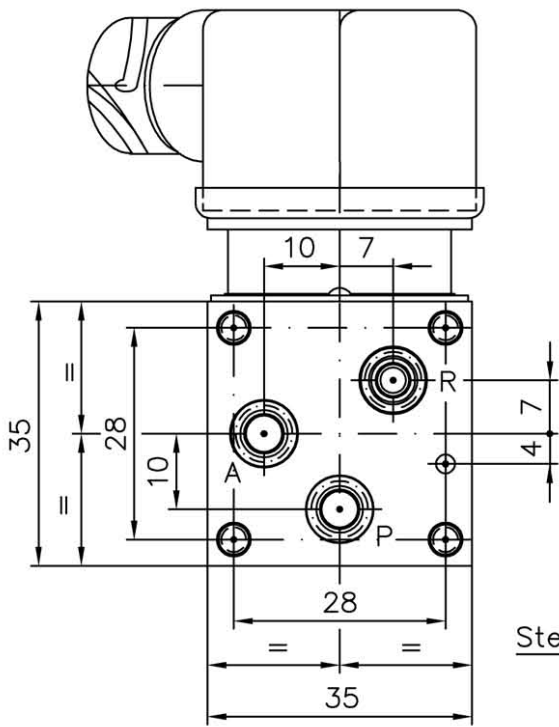
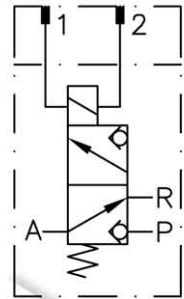
HK24M-H1.77-A3/250-BWN1F-DHWXK4/2-2-1-G24



Additional information related to this topic

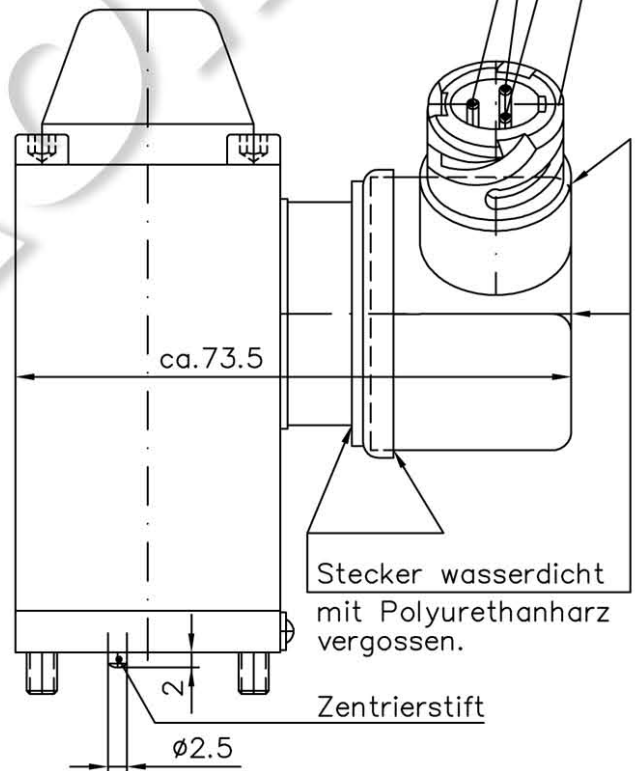
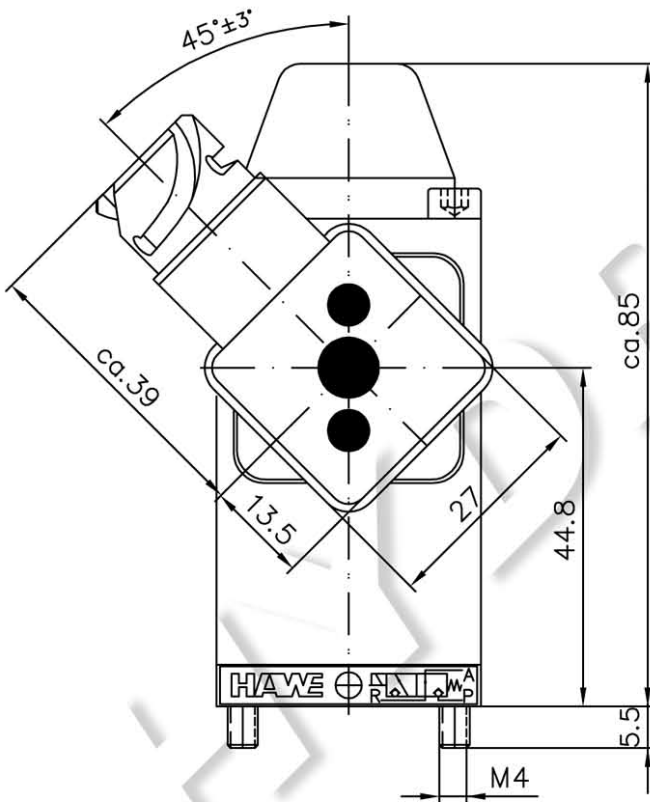
• Product overview	K 177
• Directional seated valves type WN 1 and WH	D 7470 A/1
• Valve banks type BWN 1 and BWH	D 7470 B/1
• Directional seated valves type VZP 1	D 7785 A
• Valve banks type BVZP 1	D 7785 B
• Directional seated valves with various actuation modes	D 7300
• Valve banks type VB	D 7302
• Compact hydraulic power packs type HK 24	D 7600-2
• Compact hydraulic power packs type HK 33, 34	D 7600-3
• Compact hydraulic power packs type HK(F) 43, 44	D 7600-4
• Compact hydraulic power packs type MP and MPW	D 7200, D 7200 H
• Compact hydraulic power packs type HC and HCW	D 7900
• Connection blocks type A	D 6905 A, D 6905 AF/1, D 6905 AP, D 6905 TÜV
• Pressure switches type DG	D 5440
• Pressure switches type DG 5E	D 5440 E
• Pressure reducing valves type CDK	D 7745
• Miniature accumulator type AC	D 7571

Sinnbild:



Steckeranschluß Bajonett PA6; der Fa.Schlemmer

Kontaktstift 2
 Kontaktstift 1
 Kontaktstift 3 (blind)



Magnetventil Typ: SK 7470 901

Sonderausführung mit Schlemmerstecker (Steckerstellung 45°) für Fa. Rotzler

Volumenstrom max. 5 l/min

Betriebsdruck max. 350 bar

Fehlende Technische Daten und Maße entsprechen der Type: WN1H-G24 nach Druckschrift D 7470A/1.

Ventil nach Zeichnung u. Stückliste 7470 901a montiert.

Bestellbezeichnung: Magnetventil Typ: SK 7470 901-G24

Magnetspannung

Alle Maße in mm. Änderungen vorbehalten.

Maßstab 1:1	Magnetventil Typ: SK 7470 901 Sonderausführung für Fa. Rotzler	
		SK 7470 901

