

Directional spool valve

2.1

Directional spool valve bank type SWR and SWS

Directional spool valves are a type of directional valve. They control the direction of movement and the velocity of single and double-acting hydraulic consumers.

The directional spool valve bank type SWS is available with series connection. The consumers can be operated with on-off or proportional control. Versions are available for usage in potentially explosive atmospheres. By means of additional functions in the pump line, in the intermediate plates (longitudinal and sandwich valve combination) and ancillary blocks the directional spool valve bank can be flexibly adapted to different control tasks.

Intended applications include mobile hydraulics, in particular civil engineering, agricultural engineering and material handling.

Features and benefits:

- Can be combined for forklift trucks with lifting modules
- Suitable for constant pressure systems
- Proportional movements can also be controlled independently of the load
- Extensive range of ancillary blocks
- Compact and extremely space-saving dimensions

Intended applications:

- Material handling
- Wind turbines
- Construction and construction materials
- Handling and assembly techn.
- Municipal trucks



Nomen-clature:	Directional spool valve
Design:	Valve bank Combination with hydraulic power packs
Actuation:	Solenoid
p _{max} •	315 bar
Q _{max} •	25 l/min

Design and order coding example

SWR1

A-6/230

- GG

- 1

- G24

Solenoid voltage

12V DC, 24V DC, 110V AC, 230V AC

▪ Solenoids with various plug versions

End plate

▪ Additional ports P and/or R (P can be blocked)

▪ Idle circulation valve (ON/OFF, proportional)

▪ End spool valve

Valve sections

▪ Directional spool valve

▪ Additional options for the valve sections:

▪ Options upstream (orifice, flow controller)

▪ Consumer-side additional functions in ancillary block, e.g. double check valves, shock valves (load-holding valves etc.)

Connection block/adapter plate

▪ Pressure limiting valve (for pipe connection)

▪ Idle circulation valve

▪ 3-way flow controller

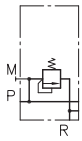
Basic type, size

Type SWR 1 and SWS 2

Function

Connection blocks:

A 6



With fixed pressure limiting valve
(for pipe connection)

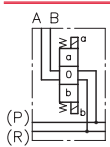
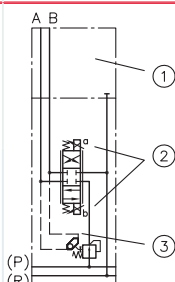
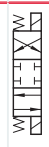
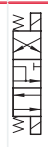
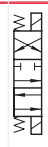
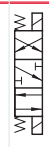
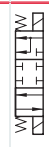
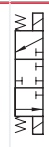






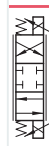

F/D



For direct mounting onto hydraulic power packs
(type KA, HC, MP, HK)

Valve sections:


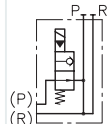
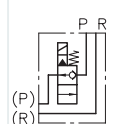
Basic symbol

SWR 1	SWS 2	Symbol											
		G	D	E	O	C	N	B	W	K	Q	R	U
	<p>1 Ancillary block with additional function (on the consumer side)</p> <p>2 Actuation</p> <p>3 Additional function (on the pump side)</p>												
Spool valves suited for prop. actuation													
		G	D										
													

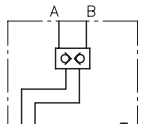
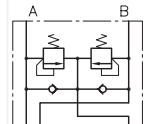
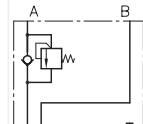
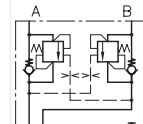
Additional versions for valve sections:

- b/w solenoids with stroke limitation
- prop. solenoids with stroke limitation
- solenoids also available in ATEX-compliant version ($p_{max} = 210$ bar)

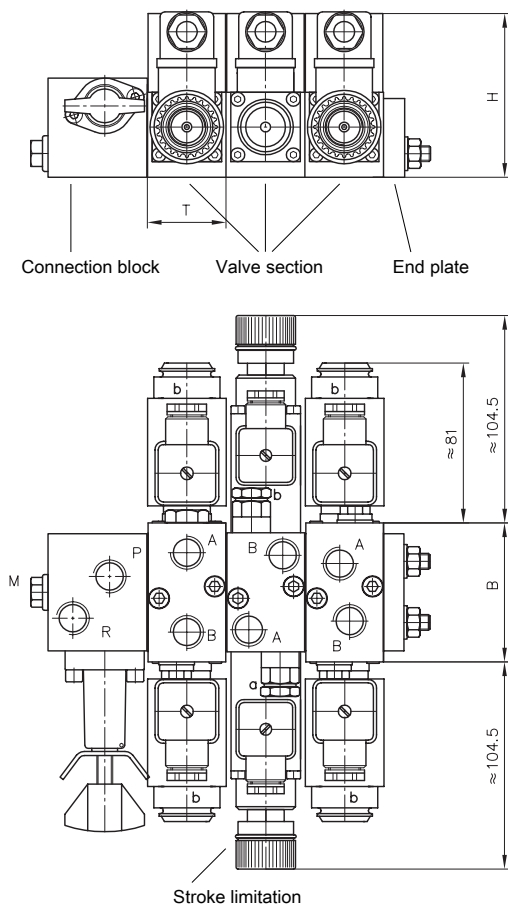
End plates (SWR 1/SWS 2):

Series	With circulation valve	With lockable pump output
		

Ancillary block type SWS 2 with additional functions (consumer side):

Releasable check valve	Shock valve	Sequence valve	Over center valve
			

General parameters and dimensions



- 1 Connection block
- 2 Valve section
- 3 End plate
- 4 Stroke limitation

	Q_{\max} [lpm]	p_{\max} [bar]	Ports	Dimensions [mm]			m_{\max} [kg]	
				H	B	T	Individual section	Connection block
SWR 1	12	315	G 1/4	77 - 90	40	40	1.1 - 1.5	0.6 - 0.7
SWS 2	25	315	G 3/8, G 1/4	78 - 82.5	60	40	1.1 - 2.4	0.8

Circuit example:
SWS 2 A 7/200

Valve bank type SWS, size 2, connection block with pressure-limiting valve (manually adjustable, set to 200 bar)

- G/M/2/2 RH

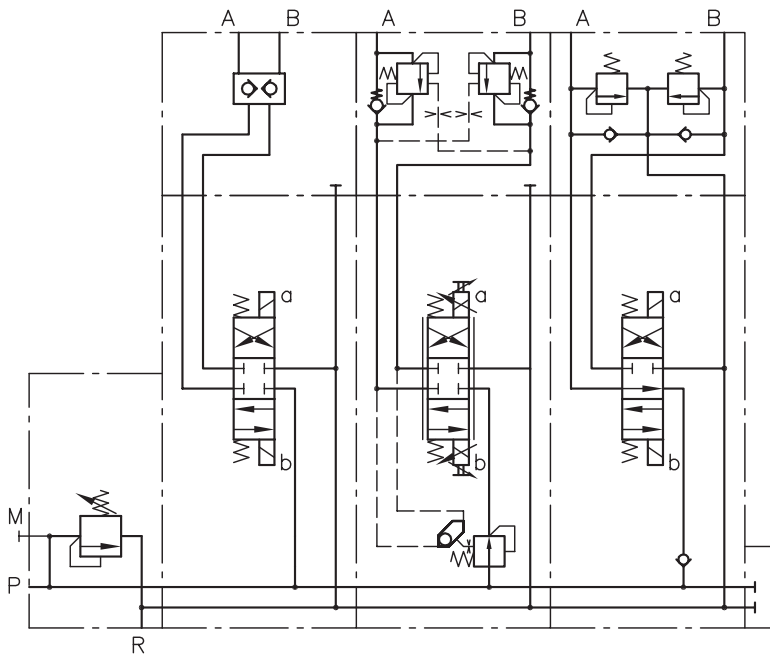
1. Valve section with circuit symbol G with solenoid actuation, no additional function in P gallery, with releasable check valves for A and B in the ancillary block

- G 10/MPF/DW/2 AL B 7/180 BLC 4/140

2. Valve section with circuit symbol G and proportional spool, max. flow rate A and B with 10 lpm, proportional solenoid MP with stroke limitation for A and B, pressure compensator in P gallery of the basic block (DW), ancillary block with load-holding valve for A (set to 180 bar) and for B (set to 140 bar)

- E/M/R/2 AN100 BN 100-1-G 24

3. Valve section with circuit symbol E and solenoid actuation, a check valve in the P gallery, ancillary block featuring shock and servo-suction valves for ports A and B (set to 100 bar), standard end plate, solenoid voltage 24V DC


Associated technical data sheets:

- [Directional spool valve type SW: D 7451](#)
- [Directional spool valve bank type SWS: D 7951](#)

Suited products for combination:

- Pressure switches type DG3..., DG5.E: [Page 262](#)

Similar products:

- Proportional directional spool valve type EDL: [Page 82](#)

Suitable male connectors:

- [Line connector type MSD and others: D 7163](#)
- With economy circuit: [D 7813](#), [D 7833/1](#)
- Proportional amplifier type EV2S: [Page 274](#)

Directional spool valve

2.1

Proportional directional spool valve type EDL

Proportional directional spool valves are a type of directional valve. They control the direction of movement and the velocity of individual or multiple hydraulic consumers actuated simultaneously. Control is independent of the load and continuous. The directional spool valve type EDL with series connection is actuated directly. The flow rates for the individual consumers can be individually adjusted. The proportional directional spool valve can be flexibly adapted to different control tasks by means of additional functions in the intermediate plates and ancillary blocks. The directional spool valve type EDL can be combined directly with the proportional directional spool valve type PSL and PSV in size 2 and is therefore suitable for constant and variable pump systems. It is used in mobile hydraulics, in particular in civil engineering and agricultural engineering.

Features and benefits:

- One valve for different control functions and small flow quantities
- Energy-saving closed-centre systems
- Compact and lightweight design
- Modular system can be directly combined with type PSL/PSV-2

Intended applications:

- Construction and construction materials machinery
- Cranes and lifting equipment
- Machines for forestry and agricultural purposes
- Municipal trucks



Nomenclature:	Directly Prop. directional spool valves as per load-sensing principle
Version:	Valve bank in series connection
Actuation:	solenoid-actuated
p _{max} †	320 bar
Q _{max, consumer} †	48 l/min
Q _{pu max} †	100 l/min

Design and order coding example

EDL	- DA2	L	40/25	E	/2	- G24	
							Solenoid voltage 12V DC, 24V DC
							▪ Actuated via prop. amplifier or PLVC
							Ancillary blocks
							Confirmation Type E, EI
							Volumetric flow Volumetric flow indicator, side A, B (3...40)
							Spool Type L, H
							Spool block Section with inflow controller
Basic type	Type EDL: directly actuated proportional directional spool valve						

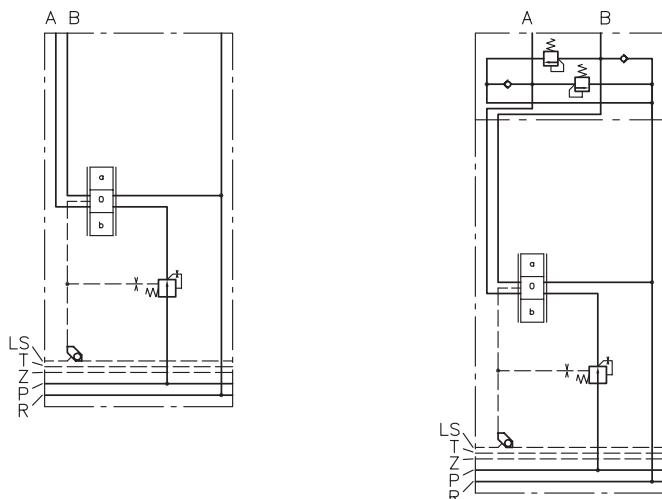
Function

Valve sections:

Circuit symbol



Versions of valve sections:



Additional functions in the ancillary block:

- Shock and servo-suction valves
- Load-holding valves
- Check valves with release, no leakage
- Floating and block functions can be switched

Characteristic values for max. volumetric flows:

	Q _{A, B}				
Size 2	3	6	10	25	40

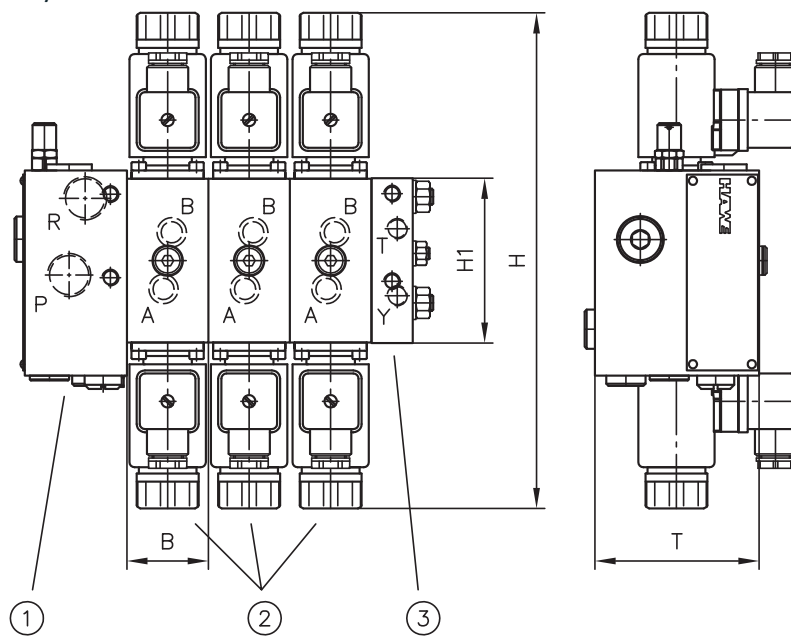
- Characteristic value corresponds to the max. volumetric flow [lpm] of inflow controller versions at the consumer ports A and/or B
- Volumetric flows for A and/or B can be selected separately

Actuations:

Basic type	Brief description	Circuit symbol (example)
E	electrical actuation with stroke limitation	
EI	electrical actuation without stroke limitation and with emergency manual actuation	

General parameters and dimensions

PSL/EDL



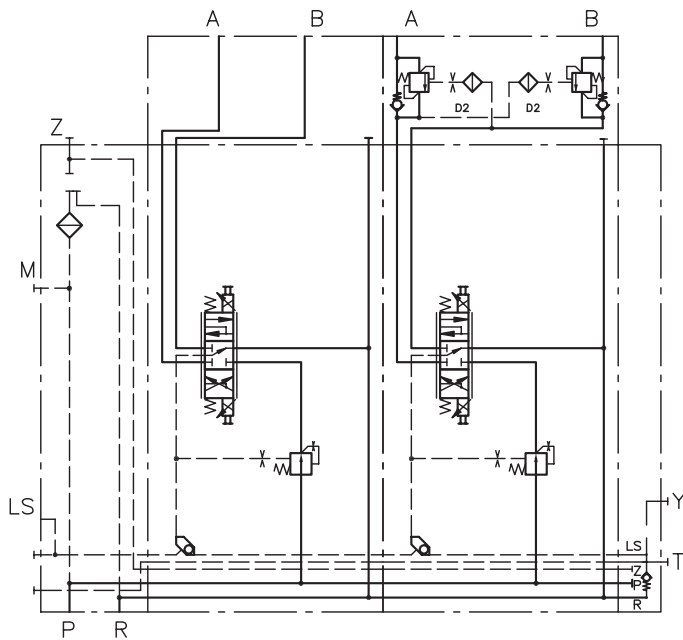
- 1 Connection block
- 2 Valve section
- 3 End plate

	Flow [lpm]		Oper. pressure [bar]	Ports		Dimensions [mm]				m [kg]
	Q_{max}	$Q_{pu\ max}$	p_{max}	P, R	A, B	H	H1	B	T	Per valve section ¹⁾
EDL	3 ... 40	80	320	G 1/2, 3/4-16 UNF-2B	G 3/8, 3/4-16 UNF-2B	241	80	40	64	1.8 ... 2.9

1) Dep. on actuation and additional functions

Circuit example:
PSV 3-2

- DA2L40/25/E/2
- DA2L25/16/E/24I-O-A4/210-BI0-B4/210
- E4-G24


Associated technical data sheets:

- [Proportional directional spool valve type EDL: D 8086](#)
- [Proportional directional spool valve, type PSL and PSV size 2: D 7700-2](#)
- [Proportional directional spool valve, type PSL, PSM and PSV size 3: D 7700-3](#)
- [Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5](#)
- [Connection block type HMPL and HMPV for proportional directional spool valve: D 7700 H](#)

Directional seated valves

2.2 Directional seated valve type G, WG and others

Directional seated valves are a type of directional valve. As ball valves they have zero leakage in the closed state.

The directional seated valve type G, WG, H, P, K, T and D is available as a 2/2, 3/2, 4/2, 3/3 and 4/3 directional seated valve with different actuation types. Actuation using a hand lever enables switchable pressures of up to 700 bar.

Appropriate connection blocks enable direct pipe connection. The directional seated valves are available in a combination of valves in valve bank type VB.

Features and benefits:

- Zero-leakage ball valve construction with high switching reliability
- Solenoid, pressure, mechanical or manual actuation
- Low shifting forces and gentle, smooth switching
- Operating pressures up to 700 bar

Intended applications:

- Machine tools (cutting and non-cutting)
- Clamping equipment, punching tools, jigs
- Rubber and plastics machinery
- Oil hydraulics and pneumatics



Nomenclature:	Directional seated valve, zero leakage
Design:	Individual valve, manifold mounting combination with sub-plates for pipe connection
Actuation:	Solenoid Pressure (hydraulic, pneumatic) Mechanical (roller, pin) Manual (hand lever, adjusting knob)
p_{max}*	700 bar
Q_{max}*	120 l/min

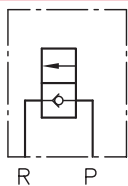
Design and order coding example

G	R2	- 3	R	- 1/2	- G24
					<p>Solenoid voltage 12V DC, 24V DC, 110V AC, 230V AC</p> <p>Indiv. connection blocks for pipe connection</p> <p>Additional versions:</p> <ul style="list-style-type: none"> Connection blocks with by-pass check valve or pressure limiting valve between P and R Connection block with bridge rectifier circuit. Check valves in "GRAETZ"-circuitry ensure flow direction through the valve
					<p>Additional elements</p> <ul style="list-style-type: none"> With check valve insert for port P With check valve insert for port P With return pressure stop for port R Position monitoring (size 3 and 4)
					<p>Size Size 0 to 4</p> <ul style="list-style-type: none"> Size 1 also available with industrial connection hole pattern NG 6 (CETOP), type NG Size 12 with interchangeable coil Size 22 reinforced version 700 bar
					<p>Function</p> <ul style="list-style-type: none"> 2/2-way directional valve (R2, S2) 3/2-way directional valve (3, Z3) 3/3-way directional valve (21, 39) 4/3 directional valve (22, 45, 46, 47, 48, 49) 4/2-way directional valve (4, Z4)
					<p>Actuation</p> <ul style="list-style-type: none"> Solenoid (G, WG) Hydraulic (H) Pneumatic (P) Mechanical (K, T, F, D)

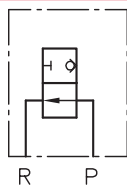
Function

2/2-way directional valve

R2

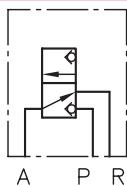


S2

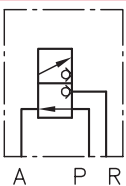


3/2-way directional valve

3

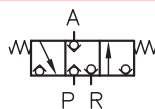


Z3



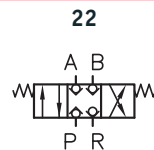
3/3-way directional valve

21, 39

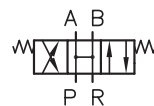


4/3-way directional valve

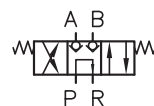
22, 45, 46, 47, 48, 49



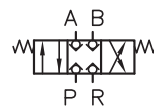
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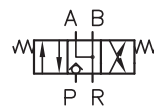
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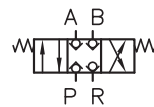
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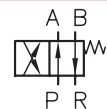


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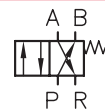


4/2-way directional valve

4

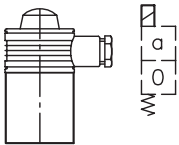
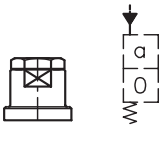
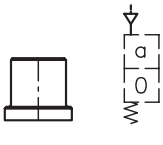
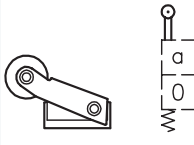
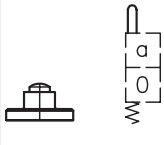
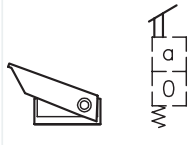
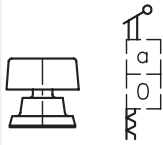


Z4



- Simplified symbols for 3/3-, 4/3- and 4/2-way functions
- Type 21, 22 not in size 4
- Type 39, 45, 46, 47, 48, 49 only in size 22
- Type 4, Z4 only in size 1

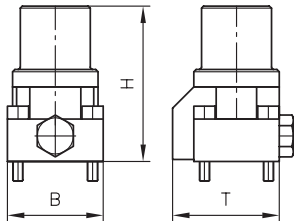
Actuation:

Solenoid		Pressure		Mechanical		Manual	
		Hydraulic	Pneumatic	Roller	Pin	Hand lever	Turn knob
G	WG	H	P	K	T	F	D
							
Solenoid voltages: 12V DC, 24V DC (type G) 230V AC (type WG)		Control pressure $p_{\text{contr. max}}$ [bar]: 400... 700		Shifting force [N]: 25... 80		Shifting force [N]: 25... 80	
		Control pressure $p_{\text{contr. min}}$ [bar]: 9... 16		Shifting travel [mm]: 10.5... 30		Shifting travel [mm]: 20.5... 45	
		15		51... 20		45... 98	
		2.5... 4		4 and 5			

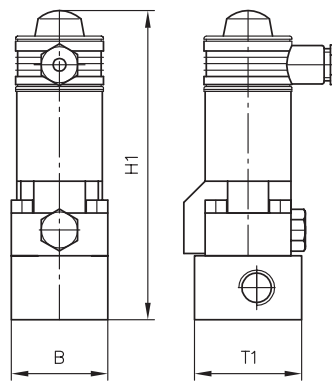
- Valve with solenoid actuation also available in ATEX-compliant version (24V DC)

General parameters and dimensions

Individual valve



Valve with connection block



Dimensions							
Size	H _{max}	H1 _{max}	B		T _{max}	T1	m _{max} [kg]
			2/2- and 3/2-way	3/3- and 4/3-way			
0	90.5	110.5	36	75	41.5	40.0	0.8/1.0
1, 12	115	145	45	92	50	50	1.4/1.9
2, 22	126.5; 134.5	156.5; 161.5	56; 56	116; 116	62.5; 67.5	56; 56	2.9/3.9; 3.0/4.0
3	162	202	70	144	91.5	70	5.7/7.1
4	226	226	80	162	127	125	16.3/20.1

	Q _{max} [lpm]	p _{max} [bar]								Ports
Size		Solenoid		Pressure		Mechanical		Manual		
		G	WG	H	P	K	T	F	D	P, R, A, B
0	6	300... 500		500	-	-		-	500	G 1/4
1, 12	12	350... 500 (700)		500... 700		400... 700		400... 700		G 1/4 and G 3/8
2	25	350 ... 500		500		400... 500		400... 500		G 3/8 and G 1/2
22	25	700								
3	65	350... 400		400		350	-	350	-	G 1/2 and G 3/4
4	120	350		-		-				G 3/4 and G 1

Circuit example:

RZ 4.0/2-12.3-B 75-V 5.5

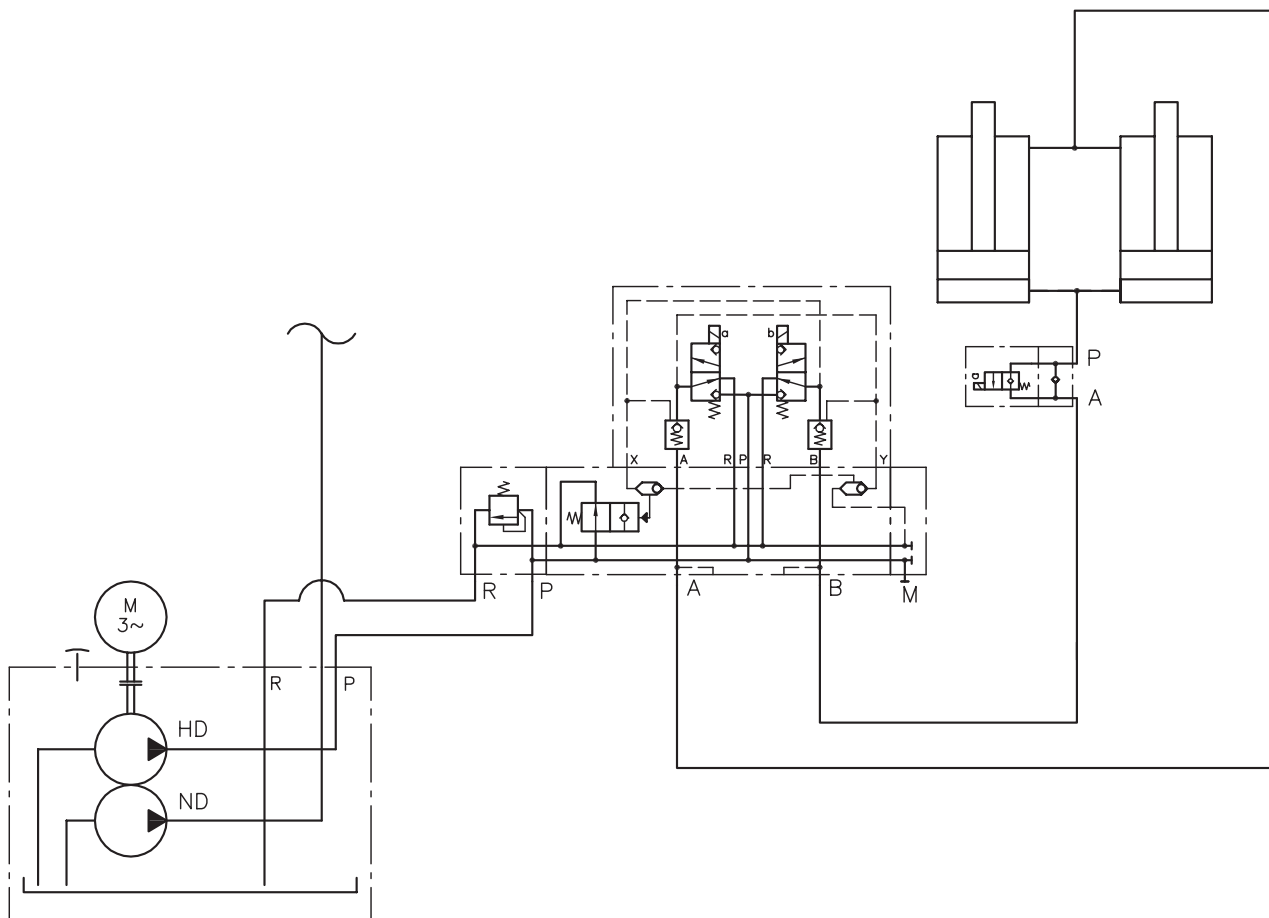
- 3 x 690/400 V 50 Hz

VB 22 AM 1/500

-G 49/U 22

-8 E-2-G 24

GR 2-12-3/8 C-G 24


Associated technical data sheets:

- [Directional seated valve type G, WG and others: D 7300](#)
- [Directional seated valve type NG, NGW and others: D 7300 N](#)
- [Directional seated valve type G, WG and others with position monitoring: D 7300 H](#)

Valve banks:

- Valve banks type VB: [Page 114](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)

Directional seated valves

2.2

Valve bank (directional seated valve) type VB

A valve bank combines different valves for operating independent consumers. The valve bank type VB comprises several directional seated valves of type G, WG among others that are connected in parallel. The directional seated valves as ball valves have zero leakage in the closed state. They are attached to sub-plates. These sub-plates are clamped between the inlet section (P and R port) and the end plate via tension rods. Pressure switches or pressure-limiting valves can be integrated into the pumps and/or consumer lines.

2/2 and 3/2- 4/2, 3/3 and 4/3 directional seated valves are available with different types of actuation. The valve bank can be mounted directly to compact hydraulic power packs using connection blocks.

- Features and benefits:**
- Compact hydraulic controls for high pressure
 - Combination with compact hydraulic power packs result in cost efficient turn-key solutions
 - Elimination of time-consuming installation due to combination with hydraulic power packs
 - Simple repairs thanks to modular structure of the systems

- Intended applications:**
- Machine tools (chipping and non-chipping)
 - Clamping, punching and jigs
 - Rubber and plastics machinery
 - Oil hydraulics and pneumatics



Nomenclature:	Directional seated valve, zero leakage
Design:	Valve bank for pipe connection
Actuation:	Solenoid Pressure: Hydraulic, Pneumatic Manual: Hand lever, Turn knob
p _{max} :	700 bar
Q _{max} :	120 l/min

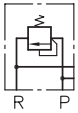



Design and order coding example

VB12 F M DCNR5 1 WG230

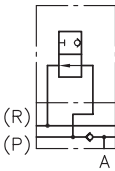
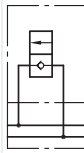
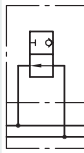
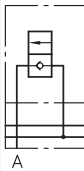
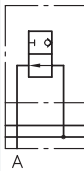
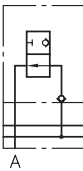
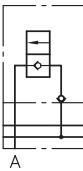
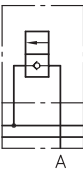
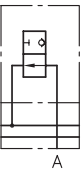
	Solenoid voltage	12V DC, 24V DC, 110V AC, 230V AC
	Port size	G 1/4 (1), G 3/8 (2), G 1/2 (3) (BSPP)
	Valve sections	Symbols: 2/2-way directional valve, 3/2-way directional valve, 3/3-way directional valve, 4/3-way directional valve, 4/2-way directional valve
	Valve section options	<ul style="list-style-type: none">▪ Pressure switch for P or the consumer side▪ Pressure reducing valve reducing the pressure in the downstream gallery P▪ Orifices in gallery P and/or return pressure stop in gallery R
	Sub-plates	<ul style="list-style-type: none">▪ With 2-way flow controller by-passing to the tank▪ Pressure reducing valve reducing the pressure in the downstream gallery P▪ With pressure limiting valve and throttle▪ With idle circulation valve and/or shuttle valve
	Intermediate plates	<ul style="list-style-type: none">▪ With pressure reduction for gallery P or throttle for port A (parallel connection)
	Actuation	
	Connection block/adapter plate	<ul style="list-style-type: none">▪ For pipe connection▪ For direct mounting at compact hydraulic power packs▪ For direct mounting at hydraulic power packs
Basic type, size	Type VB size 01, 12, 21, 22, 31, 41	

Function

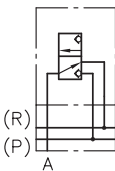
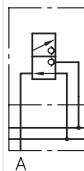
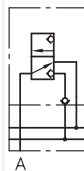
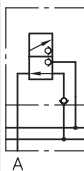
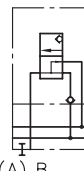
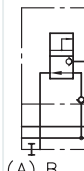
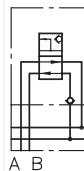
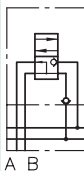
Connection blocks:

A -1/..	C, D, E	F	G
			
For pipe connection, with fixed pressure limiting valve (/..- pressure specification in bar)	For mounting onto hydraulic power packs type R, Z and RZ, depending on tank and size	For mounting onto compact hydraulic power packs (type KA, HC, MP, MPN, HK)	

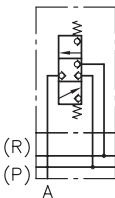
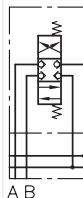
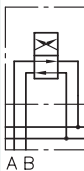
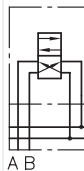
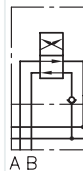
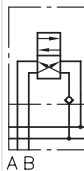
Valve sections:

A	D	F	B	C	E	Q	P	O
								

- A not for VB 01, VB 11 only with tapped ports G 1/4

H	L	N	R	Y	I	S	T
							

Simplified flow pattern



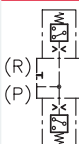
J, G39	G, G49	HX	LX	NX	RX
					

Simplified flow pattern

Simplified flow pattern

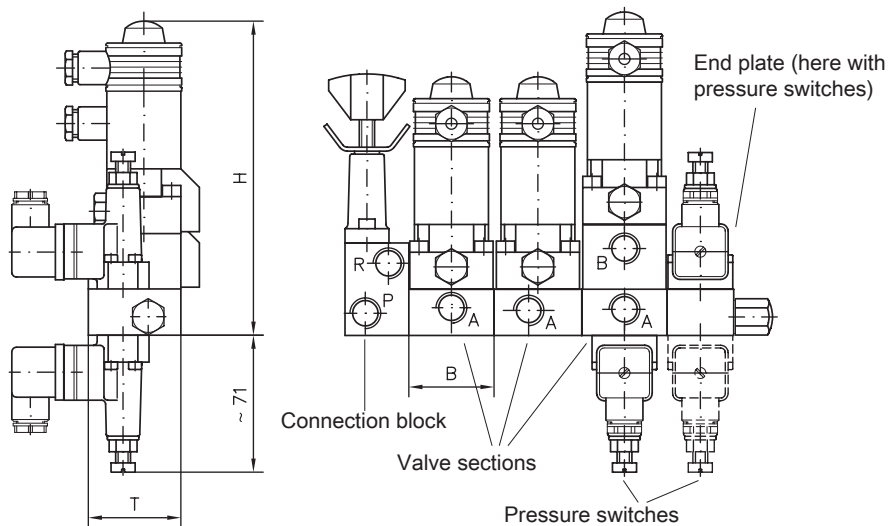
- J, I, Y, S, T, G39, G49 only available for VB 21, 22
- G not available for VB 41
- HX, LX, NX, RX only available for VB 11

End plates:

	/2	/3 ... /65
		
Standard end plate	End plate with accumulator drain valve	End plates with one or two pressure switches type DG 3..

- /2, /3 ... /65 only available for VB01 and VB11

General parameters and dimensions



- 1 Connection block
- 2 Valve sections
- 3 Pressure switches
- 4 End plate (here with pressure switches)

	Q_{\max} [lpm]	p_{\max} [bar]					Ports	Dimensions [mm]			m [kg]
		Solenoid	Pressure	Manual							per valve section
		M	H	P	F	D	P, R, A, B	H	B	T	
VB 01	6	300 ... 500	-	500	-	500	G 1/4	110 ... 135	38	40	0.6 ... 1.25
VB 12	12	350 ... 500 (700)	500 ... 700	400 ... 700	G 1/4 and G 3/8			139 ... 174	46	50	1.1 ... 2.3
VB 21	25	350 ... 500 (700)	500	400 ... 500	G 3/8 and G 1/2			180 ... 220	58	63	2.0 ... 4.6
VB 22	25	700						172 ... 221	58	70	2.2 - 4.8
VB 31	65	350 ... 400	400	-	350	G 1/2 and G 3/4		202 ... 252	72	80	4.5 ... 9.1
VB 41	120	350	-	-	G 3/4 and G 1			265 ... 312	82	100	8.9 ... 14

Circuit example:

MP24A - H1.39/B5 - A1/300

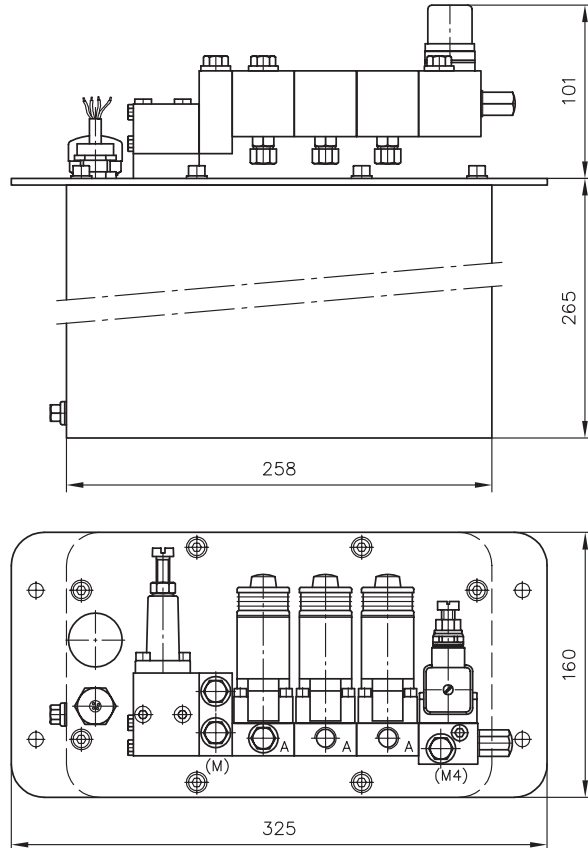
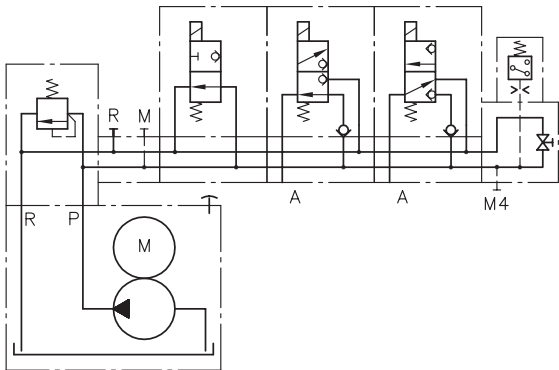
Compact hydraulic power pack type MP size 2, connection block with pressure limiting valve (tool adjustable)

- VB01FM - FRN/32 - 1 - WG230

Valve bank type VB size 0 with 3 valves (actuation type M (solenoid), solenoid voltage 230V 50/60 Hz) and end plate. Here 32 with pressure switch and drain valve

Parameters of the circuit example:

- Q_{pu} = approx. 1.39 lpm (at 1450 rpm)
- $p_{max\ pu}$ = 400 bar
- p_{system} = 300 bar (set pressure of the pressure-limiting valve)
- Tank V_{usable} = approx. 6 l, V_{total} = approx. 7.7 l



Suites compact hydraulic power packs:

- Type MP, MPN, MPNW, MPW: [Page 50](#)
- Type HC, HCW, HCG: [Page 42](#)
- Type HK, HKF, HKL: [Page 54](#)
- Type NPC: [Page 40](#)
- Type KA, KAW: [Page 46](#)
- Connection blocks type A: [Page 62](#)

Suites hydraulic power packs:

- Standard power pack FXU with pumps R, RG, RZ: [Page 58](#)

Corresponding pamphlets (data sheets):

- [Valve bank \(directional seated valve\) type VB: D 7302](#)

Suited valves:

- Directional seated valves with various actuations: [Page 108](#)

Accessories:

- Pressure switches type DG 3.., DG 5 E: [Page 262](#)
- Pressure reducing valves type CDK: [Page 180](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)
- [Economy circuit type MSD: D 7813, D 7833](#)

Directional seated valves

2.2 Directional seated valve type WN and WH

Directional seated valves are a type of directional valve. As ball valves they have zero leakage in the closed state.

The directional seated valves type WN and WH are manifold mounting valves. 2/2 and 3/2 directional seated valves are available. These are also available combined as 3/3 and 4/3 directional seated valves. The type WH contains an internal pressure balance. As a result, the permissible operating pressure is higher than the type WN.

Appropriate connection blocks enable direct pipe connection. The directional seated valves are available in a combination of valves in valve bank type BWN and BWH.

Features and benefits:

- Excellent price/performance ratio
- Compact design
- Directional seated valves with zero leakage
- Solenoid version with 8-watt technology

Intended applications:

- Machines for forestry and agricultural purposes
- Clamping, punching and jigs
- Clamping equipment, punching tools, jigs
- Process engineering systems



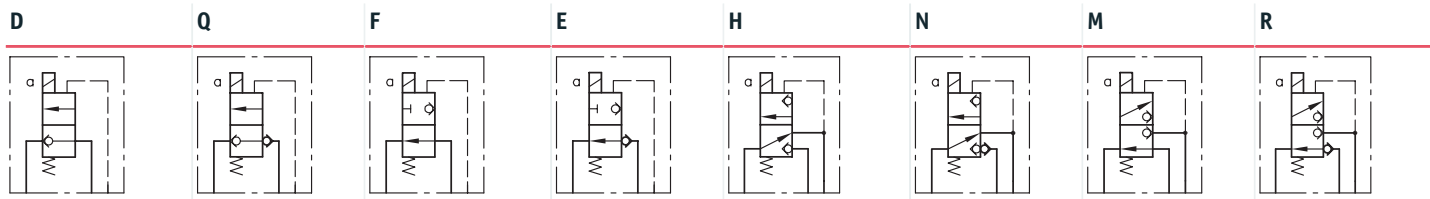
Nomenclature:	Directional seated valve, zero leakage
Design:	Individual valve, manifold mounting combination with connection blocks for pipe connection
Actuation:	Solenoid
p _{max} :	450 bar
Q _{max} :	60 l/min

Design and order coding example

WN1 H 1 - 1/4 - G24

	Solenoid voltage	12V DC, 24V DC, 110V AC, 230V AC <ul style="list-style-type: none">▪ Versions with M12-plug and 8-Watt solenoid
	Single connection block	Port size G 1/4, G 3/8, G 1/2 (BSPP) <ul style="list-style-type: none">▪ By-pass check valve or pressure limiting valve between P and R
	Additional elements	<ul style="list-style-type: none">▪ Return pressure stop for port R▪ Check valve insert for port P▪ Pressure limiting valve
Function		<ul style="list-style-type: none">▪ 2/2-way directional valve (F, D, Q, E)▪ 3/2-way directional valve (H, R, M, N)▪ 3/3-way directional valve (J, U)▪ 4/2-way directional valve (W)
Basic type, size	Type WN, size 1 Type WH, size 1 to 4	

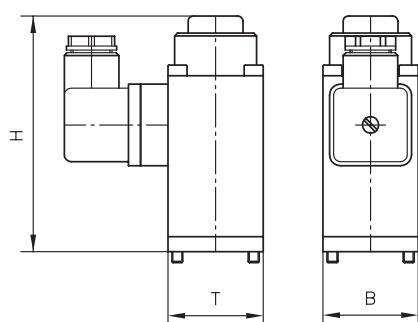
Function



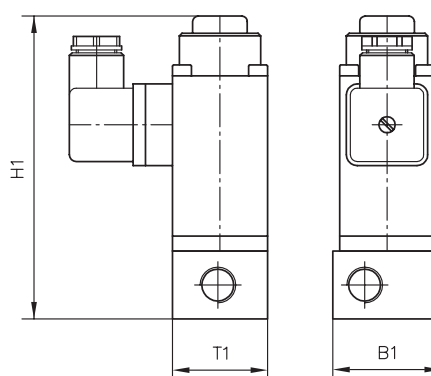
- Symbols show type WH
View type WH
- Type WN 1 without de-pressuring duct for the solenoid (add. leakage duct is not necessary)
Type WN1 without solenoid relief (no leakage line)

General parameters and dimensions

Individual valve



Valve with sub-plate for pipe connection



	Q_{\max} [lpm]	p_{\max} [bar]	Ports	Dimensions (individual valve) [mm]			m_{\max} [kg]	Dimensions (with sub-plate) [mm]			m [kg]
				H	B	T		H1	B1	T1	
WN 1	5	320 ... 350	G 1/4	87	35	35	0.6	112	40	35	0.9
WH 1	8	450	G 1/4	87	35	35	0.6	112	40	35	0.9
WH 2	15	350	G 1/4	95.2 ... 101.7	35	35	0.65 ... 0.7	125.2 ... 131.7	40	40	1.0
WH 3	30	350	G 3/8	93.5 ... 103.5	45	45	1.2 ... 1.3	128.5 ... 138.5	50	50	1.8
WH 4	60	350	G 1/2	118 ... 133	60	60	2.7 ... 3.0	158 ... 173	70	70	3.6 ... 4.0

Associated technical data sheets:

- [Directional seated valve type WN and WH: D 7470 A/1](#)

Valve banks:

- Type BWN1, BWH: [Page 120](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)
- With economy circuit: [D 7813](#), [Economy circuit type MSD 4 P55: D 7833](#)

Directional seated valves

2.2 Valve bank (directional seated valve) type BWN and BWH

A valve bank combines different valves for operating independent consumers.

The valve bank type BWN or BWH comprises several directional seated valves of type WN or WH that are connected in parallel. The directional seated valves as ball valves have zero leakage in the closed state. They are attached to sub-plates. These sub-plates are clamped between the inlet section (P and R port) and the end plate via tension rods. Pressure switches or pressure-limiting valves can be integrated into the pumps and/or consumer lines.

2/2 and 3/2- directional seated valves . Combined, these are also available as 3/3 and 4/3 directional seated valves. The valve bank can be mounted directly to compact hydraulic power packs using connection blocks.

Features and benefits:

- Modular concept
- Adapter plates for flange-mounting on hydraulic power packs or combination with other valve types
- With the valve bank version, option to incorporate additional functions in the sub-plate, such as pressure-limiting valves, pressure switches etc.
- Energy-efficient solutions in connection with hydraulic accumulators

Intended applications:

- Machine tools (chipping and non-chipping)
- Rubber and plastic machinery
- Mining machinery (incl. oil production)
- Rubber and plastics machinery



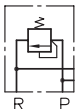


Nomenclature:	Directional seated valve, zero leakage
Design:	Valve bank <ul style="list-style-type: none">▪ For pipe connection▪ Combination with hydraulic power packs
Actuation:	Solenoid
p_{max}:	450 bar
Q_{max}:	30 lpm

Design and order coding example

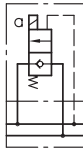
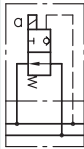
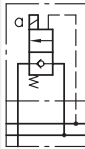
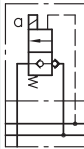
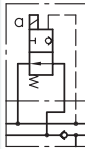
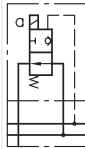
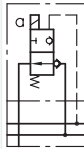
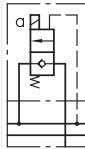
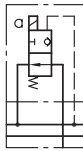
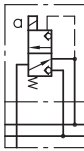
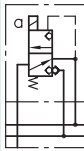
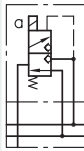
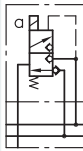
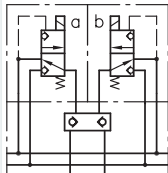
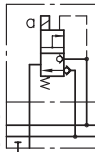
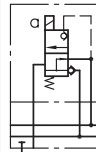
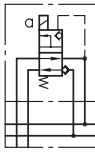
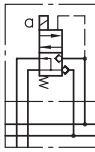
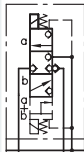
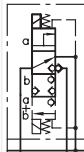
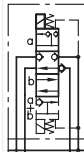
BWH2	A-1/300	- FH5N5	- 1	- 1	- G24
<p>Solenoid voltage 12V DC, 24V DC, 110V AC, 230V AC</p> <ul style="list-style-type: none"> Versions with M12-plug and 8-Watt solenoid 					
<p>Port size G 1/4, G 3/8 (BSPP)</p>					
<p>End plate</p> <ul style="list-style-type: none"> With one or two pressure switches With accumulator drain valve With additional pressure limiting valve in gallery P 					
<p>Valve sections</p> <ul style="list-style-type: none"> Directional valves type WH or WN Valve section options: <ul style="list-style-type: none"> Return pressure stop Pressure switch for the consumer ports or for gallery P Pressure limiting valves at the consumer port Pressure reducing valve reducing the pressure in the downstream P gallery Additional sections: <ul style="list-style-type: none"> Pressure reducing valve Indiv. sub-plate with pressure switch Separation plate for gallery P 					
<p>Connection block/adaptor plates</p> <ul style="list-style-type: none"> For pipe connection, with/without pressure limiting valve, manually or fixed, with/without prop. pressure limiting valve For direct mounting at compact hydraulic power packs For direct mounting at hydraulic power packs Adapter plates for combination with directional valves type BVZP or SWR/SWP 					
Basic type, size	Type BWN, size 1 and type BWH, size 1 to 3				

Function

Connection blocks/adaptor plates:

A-1/...	C	F
 <p>For pipe connection, with fixed pressure-limiting valve (/...- pressure specification in bar)</p>	 <p>For mounting onto hydraulic power packs</p>	 <p>For mounting on compact hydraulic power packs with connection block (type KA, HC, MP, MPN and HK)</p>



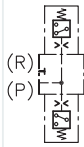
Valve sections:

D	F	B	Q	A	C	E	D
							
O	H	N	M	R	K		
							
I	Y	S	T	J	U	L	
							

Additional options for the valve sections:

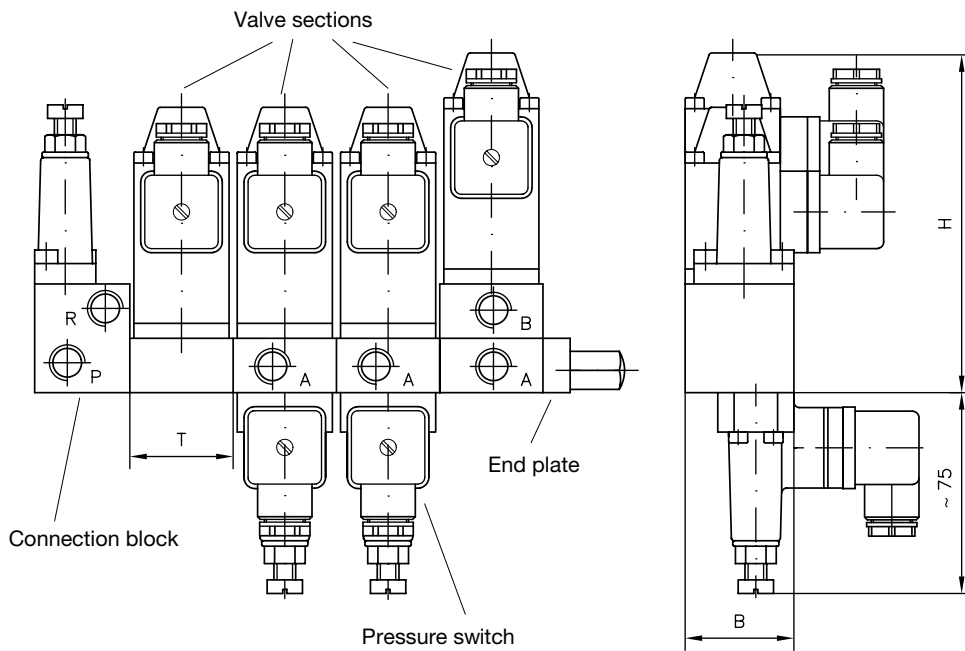
- Pressure switches in the consumer or pump channel. The pressure switches (type DG 3..) are directly flange-mounted to the sub-plate.
- Pressure-limiting valves in the consumer channel (for 3/2- or 3/3-way directional valves, for size 1). The pressure-limiting valve is directly incorporated in the sub-plate.
- Pressure-reducing valves for pressure reduction in the subsequent pump channel.

End plates:

1	2	3../3..
 <p>Standard end plate</p>	 <p>End plate with accumulator drain valve</p>	 <p>End plate with one or two pressure switches connected to the P gallery</p>

General parameters and dimensions

Version for pipe connection:



- 1 Connection block
- 2 Valve sections
- 3 End plate
- 4 Pressure switches

	Q_{\max} [lpm]	p_{\max} [bar]	Ports P, R, A, B	Dimensions [mm]			m [kg]
				H	T	B	
BWN 1	5	350	G 1/4	116.5 ... 131.5	38	40	0.8 ... 0.9
BWH 1	8	450	G 1/4	116.5 ... 131.5	38	40	0.8 ... 0.9
BWH 2	15	350	G 1/4	122 ... 157.5	38	50	0.9 ... 1.1
BWH 3	30	350	G 3/8	155.5 ... 168	50	60	1.9 ... 2.4

- Weight m [kg] per individual element: + 0.3 kg per pressure switch fitted

Associated publications:

- Valve bank (directional seated valve) type BWN and BWH: [D 7470 B/1](#)
- Directional seated valve type WN and WH: [D 7470 A/1](#)

Connection block:

- Type A: [Page 62](#)

Compact hydraulic power packs:

- Type HC, HCW, HCG: [Page 42](#)
- Type HK, HKF, HKL: [Page 54](#)

- Type NPC: [Page 40](#)

- Type KA, KAW: [Page 46](#)

Hydraulic accessories:

- Pressure switches type DG 3.., DG 5E: [Page 262](#)
- Pressure reducing valves type CDK: [Page 180](#)

Mounted valves

2.2

Valve bank (directional seated valve) type BVH

A valve bank combines different valves for operating independent consumers.

The valve bank type BVH comprises several directional seated valves that are connected in parallel. As cone valves the directional seated valves have zero leakage in the closed state. The valve sections are connected using banjo bolts. 2/2, 3/2, 4/2 and 4/3-way directional seated valves are available.

Depending on the functional requirement, pressure reducing valves, pressure switches, check valves, restrictors or restrictor check valves are integrated into the valve section. The valve bank can be flange-mounted directly on compact hydraulic power packs or integrated into a pipe system via a piping block.

- Features and benefits:**
- Flexible expandability
 - Compact and lighter design (elimination of the base plates)

- Intended applications:**
- Auxiliary and clamping functions on machine tools and fixtures
 - Auxiliary and clamping functions on forming machine tools
 - Brake and rotor adjustment modules on wind turbines



Nomen-clature:	Valve sections Directional seated valve Zero leakage
Version:	Valve sections for pipe connection
Actuation:	Solenoid
p_{max}:	400 bar
Q_{max}:	20 l/min

Design and order coding example

BVH 11	M/CZ/35/M/R/2	- 8	- G24
		Solenoid voltage	12V DC, 24V DC, 110V AC, 230V AC
		End plate	<ul style="list-style-type: none">▪ With tapped plugs at P, R▪ With accumulator port and drain valve
	Valve sections	<ul style="list-style-type: none">▪ With individual pressure reduction (parallel connection)▪ Additional elements:<ul style="list-style-type: none">▪ Pressure-reducing valves▪ Orifice and/or check valve in P gallery▪ Orifice or restrictor check valve for A▪ Return pressure block in R gallery▪ Pressure switches for A	
Basic type	Type BVH 11 for direct mounting onto connection blocks type A etc. (for compact hydraulic power packs type KA, MPN, HC, HK, HKF, HKL)		

Function

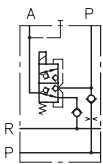
Connection blocks/adaptor plates:

BVH

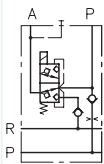
Direct mounting onto connection blocks type A etc.
for compact hydraulic power packs type KA, MPN, HC, HK, HKF, HKL

Valve sections:

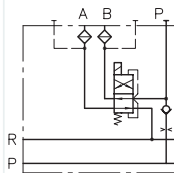
H



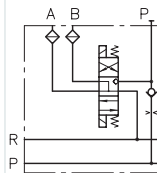
M



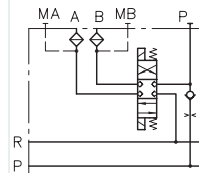
W



D



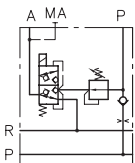
G



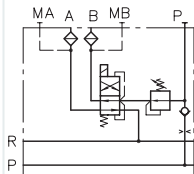
Additional options for the valve sections:

Individual pressure reduction (parallel connection)

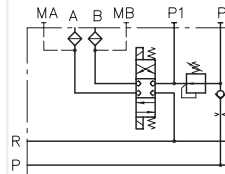
BVH 11 H/CZ...



BVH 11 W/CZ...

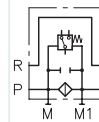


BVH 11 G/CZ...



Pressure filter

BVH 11 ZD



Actuations:

M: Solenoid actuation ($p_{\max} = 400$ bar)

GM: Solenoid actuation ($p_{\max} = 250$ bar)

End plates:

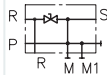
-1

Tapped plug at P, R



-81

with accumulator port and drain valve



General parameters and dimensions

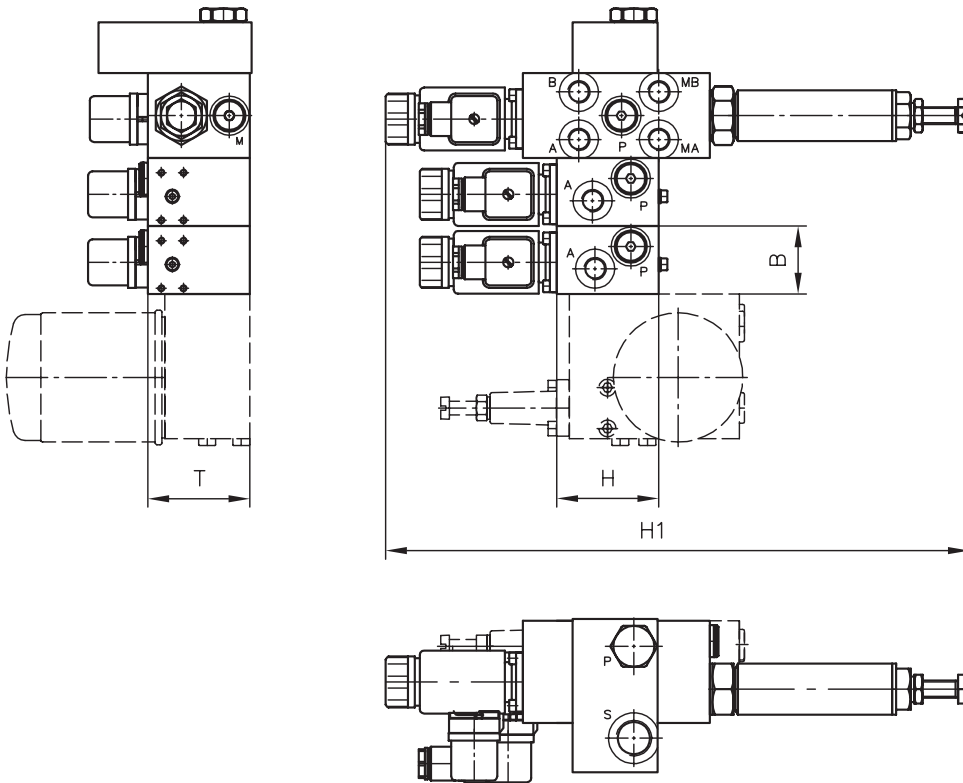
(A1F1/310)

- BVH 11 H/M/R/2
- BVH 11 M/M/R B2.5/3
- BVH 11 W/CZ 5/35/M/R/22 - 81 - G 24

Type BVH valve bank for direct mounting at type A connection block

Valve section 1 with 3/2-way function circuit symbol H, P check valve (coding R), no pressure switch (coding 2)
Valve section 2 with 3/2-way function circuit symbol M, check valve and orifice in P gallery (coding R, B, 2, 5) and pressure switch for A (coding 3)
Valve section 3 with 4/2-way function circuit symbol W, individual pressure-reducing valve set to 35 bar (coding CZ5/35) and check valve in P gallery (coding R), no pressure switch
End plate for accumulator port (coding 8) and 24V DC solenoid voltage

Mounted valve type BVH



	Q_{\max} [lpm]	p_{\max} [bar]	Ports (BSPP)	Dimensions [mm]				m [kg]
			A, B, P, R, M	H	H1	B	T	Valve section
BVH	20	400	G 1/4	60	343	40/50	60	0,8

Circuit example:
KA 281 SKT/Z 9.8

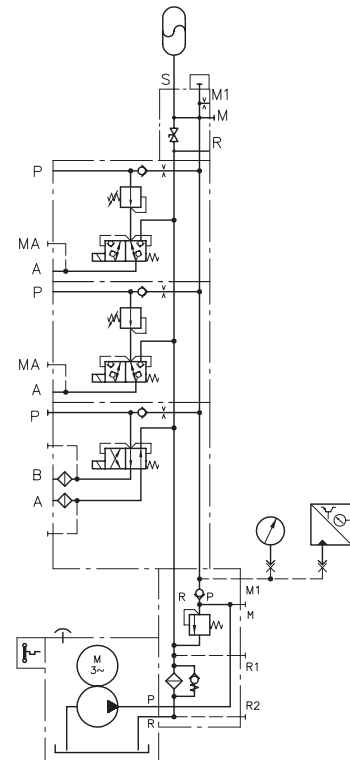
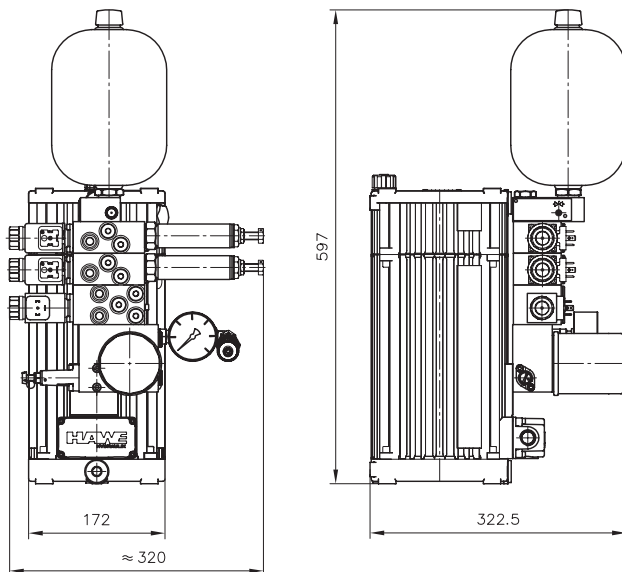
Compact hydraulic power pack type KA
 1 kW motor power;
 Connection block with return line filter
 and TÜV-approved safety valve
 set to 120 bar

- AX 3 F 1 E/120
- BVH 11 W/M/RH/2
- BVH 11 M/CZ5/35/M/RHB 2.5
- BVH 11 M/CZ5/35/M/RHB 2.5
- 82-X 24 - AC 2001/60/3/A 3x400V 50 Hz

Valve bank type BVH with three valve sections,
 two clamping functions with individually
 adjustable clamping pressure

Parameters of the circuit example

- $Q_{Pu} = 9.8 \text{ lpm}$ (at 1450 rpm)
- $p_{\max Pu} = 170 \text{ bar}$
- $p_{\text{System}} = 120 \text{ bar}$
- $p_{\text{switch-off feature}} = 50 \text{ bar}$
- $V_{\text{use}} = \text{approx. } 3 \text{ l}$


Associated technical data sheets:

- [Valve bank \(directional seated valve\) type BVH: D 7788 BV](#)

Compact hydraulic power packs:

- See section "Compact hydraulic power packs"

Connection blocks:

- Type A: [Page 62](#)

Combinable products:

- Directional seated valves type NBVP: [Page 134](#)
- Pressure reducing valves type CDK, DK: [Page 180](#)

Accessories:

- Pressure switches type DG: [Page 262](#)
- Hydraulic accumulator type AC: [Page 258](#)

Plug:

- [Line connector type MSD and others: D 7163](#)

Directional seated valves

2.2 Directional seated valve type EM and EMP

Directional seated valves are a type of directional valve. As cone valves they are tightly sealed without leakage in the closed state.

The directional seated valves type EM and EMP are screw-in valves. 2/2 directional seated valves with direct or pilot-controlled electromagnetic actuation are available. The directional seated valve type EM is available as a directional valve or damped switching (soft-shift). Type EMP is a proportionally actuated directional seated valve with throttle function.

Appropriate connection blocks make possible direct pipe connection or manifold mounting. You can obtain additional components, e.g. a drain valve, bypass throttle valve, pressure switch or flow control valve.

Features and benefits:

- Zero leakage in blocked state
- Directly switching up to approx. 3 lpm and piloted up to 160 lpm
- Minimized flow resistance even at high flow rate
- Long lifetime due to hardened valve seats

Intended applications:

- Cranes and lifting equipment
- Road construction industry
- Materials handling, industrial trucks etc.
- Handling and assembly robots, etc.

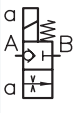
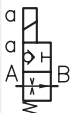
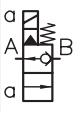
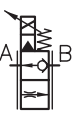
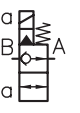
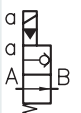
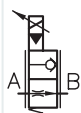
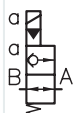


Nomenclature:	Directional seated valve, zero leakage
Design:	Screw-in valve Combination Combination with connection block for pipe connection Combination with connection block for swivel fitting Combination with connection block for manifold mounting
Actuation:	Solenoid
p _{max} :	450 bar
Q _{max} :	160 lpm

Design and order coding example

EM 21	V	- 3/8	- G24
		Solenoid voltage	12V DC, 24V DC, 110V AC, 230V AC
		Versions with	<ul style="list-style-type: none">▪ Versions with M12-plug and 8-Watt solenoid▪ Quarter-turn plug, plugs of Co. KOSTAL or AMP
		Connection blocks	Versions with <ul style="list-style-type: none">▪ Drain valve▪ Drain valve and drop-rate braking valve▪ Drain valve and by-pass check valve▪ Bypass- throttle▪ Pressure switch▪ 2-way flow controller
	Function		<ul style="list-style-type: none">▪ V - 2/2-way valve (NC-type)▪ S - 2/2-way valve (NO-type)
Basic type, size			<ul style="list-style-type: none">▪ Type EM: Directional valve, size 1 to 4▪ Type EMP: Prop. valve, size 1 to 4

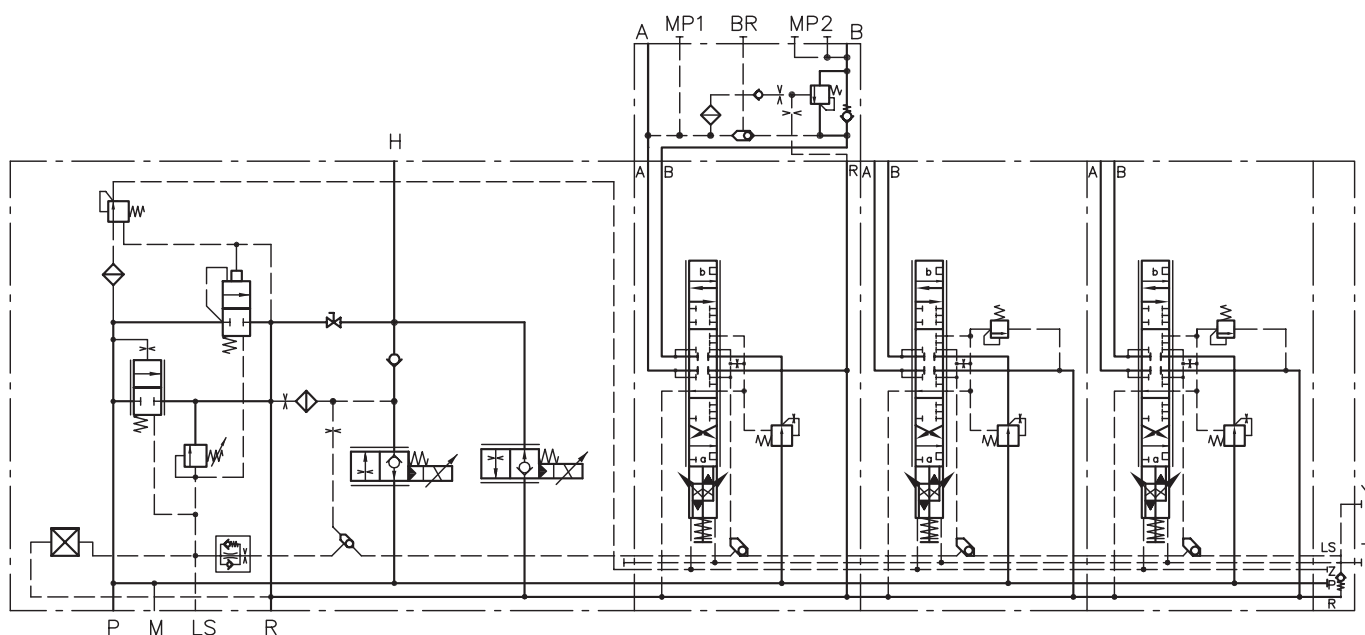
Function

	Flow in arrowed direction		Arbitrary flow direction	Flow in arrowed direction		Arbitrary flow direction
	Energized open			Energized closed		
Directly actuated	EM .1 D 			EM .1 DS 		
Pilot actuated	EM .1 V 	EMP .1 V 	EM .2 V 	EM .1 S 	EMP .1 S 	EM .2 S 

Circuit example:

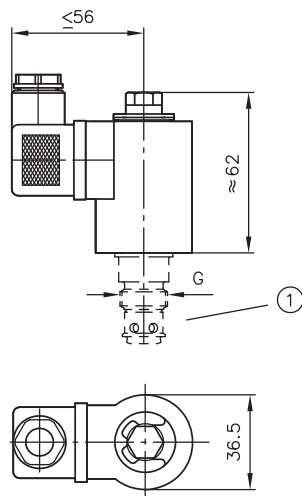
HMPL 5 US 1/PVPV/250-3

- A2 L 25/25/EI/3 BL 5 D7/120
- 32 L 25/25 C160/EI
- 32 L 63/63 C220/EI
- E4 - AMP 12 K4



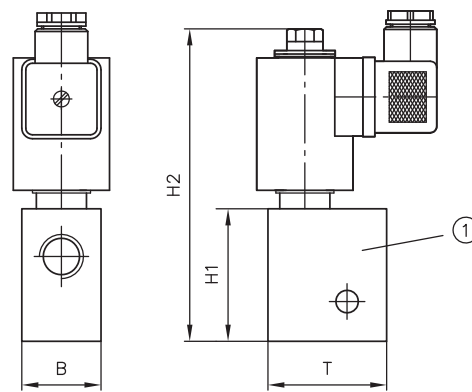
General parameters and dimensions

Screw-in valve



1 Screw-in valve

Valve compl. with connection block for pipe connection



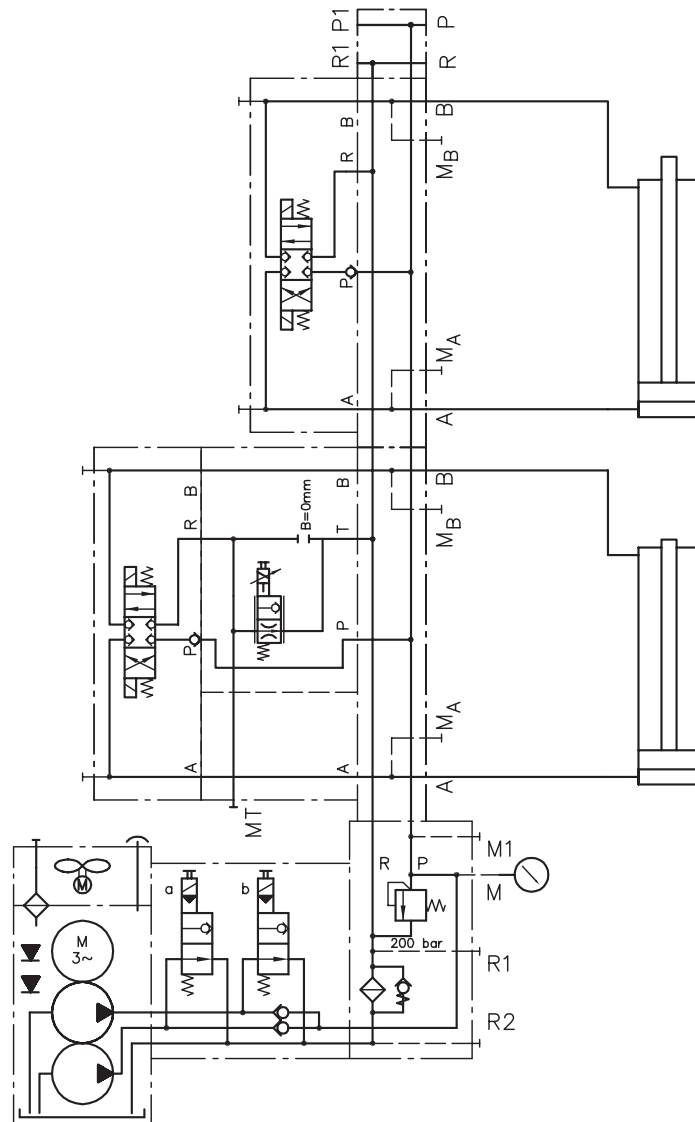
1 Connection block

			Screw-in valve		Valve with connection block					
	Q _{max} [lpm]	p _{max} [bar]	G	m [kg]	Ports	Dimensions [mm]				m [kg]
						H1	H2	B	T	
EM 11 (D, DS)	5	450	M 14 x 1.5	0.3	G 1/4	40	approx. 120	20	35	0.6
EM 21 (D, DS)	3	400	M 18 x 1.5	0.35	G 1/4	50	approx. 120	30	45	0.7
EM 1.. (V, S)	20	450	M 14 x 1.5	0.3	G 1/4	40	approx. 120	20	35	0.6
					G 3/8			25	45	
EM/EMP 2.. (V, S)	40	400	M 18 x 1.5	0.35	G 3/8	50	approx. 120	30	45	0.7
					G 1/2				50	
EM/EMP 3.. (V, S)	80	400	M 18 x 1.5	0.4	G 1/2	60	approx. 133	40	55	1.0
					G 3/4				60	
EM/EMP 4.. (V, S)	160	400	M 33 x 2	0.6	G 3/4	70	approx. 150	40	65	1.2
					G 1			50	70	

- Pressure above 300 bar only with manifolds made of steel. Pay attention to the possibly reduced rigidity of the thread with other materials (e.g. cast, aluminium).

Circuit example:

KA 442 LFK/HH 13.1/13.1
 -SS-A 1 F 3/200
 -BA 2
 -NBVP 16 G/R-GM/NZP 16 TSPG/TB 0/3
 -NBVP 16 G/R-GM/3
 -2-G 24
 -X 84 G-9/250
 -3 x 400/230V 50 Hz-4.0 kW/24V DC


Suitable products:

- Intermediate plates NG 6 type NZP: [D 7788 Z](#)
- Connection blocks type HMPL and HMPV: [Page 90](#)
- Lifting/lowering valves type HSV: [Page 150](#)
- Lifting modules type HST, HMT etc.: [Page 154](#)

Associated technical data sheets:

- Directional seated valves type EM, EMP: [D 7490/1](#), [D 7490/1 E](#)

Accessories:

- Pressure switches type DG 3.., DG 5E: [Page 262](#)
- Drop-rate braking valves type SB, SQ, SJ: [Page 210](#)
- Suitable proportional amplifiers: [Page 272](#)

Male connectors:

- Line connector type MSD and others: [D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)
- Proportional amplifier type EV2S: [Page 274](#)

Directional seated valves

2.2 Directional seated valve type BVG, BVP and NBVP

Directional seated valve BVG, BVP, NBVP

Directional seated valves are a type of directional valve. As cone valves they are tightly sealed without leakage in the closed state.

The directional seated valve type BVG is installed directly in the pipe. The valves type BVP and NBVP are valves for manifold mounting. The type NBVP has the standard connection pattern nominal size NG 6. 2/2, 3/2, 3/3 and 4/3 directional seated valves are available with different types of actuation. All connections can be subjected to the same pressures. Depending on the functional requirement, a check valve, restrictors and/or restrictor check valves are integrated into type NBVP, for example. Type NBVP is used together with other valves in valve bank type BA.

Features and benefits:

- Explosion-proof design
- 4th switching position on 4/3 directional valves
- 8-Watt solenoid

Intended applications:

- Machine tools
- Woodworking and processing machinery
- Testing machinery
- Jig construction



Nomenclature:	Directional seated valve, zero leakage
Design:	Individual valve for pipe connection Individual valve, Manifold mounting
Actuation:	<ul style="list-style-type: none">▪ Solenoid▪ Hydraulic▪ Pneumatic▪ Manual
p _{max} •	400 bar
Q _{max} •	20 l/min

Design and order coding example

BVG1 - R /B2 - 1/4 - WGM 230

	Actuations:	Solenoid, hydraulic, pneumatic, manual
	Connection size or connection block	
	Additional elements	<ul style="list-style-type: none">▪ Orifice in one port▪ NBVP: orifice and/or check valve in the P gallery, orifice, restrictor check valve and/or pressure switches in port A, B, return pressure stop in T
	Function	<ul style="list-style-type: none">▪ 2/2-way directional valve (R, S), also available in version with position monitoring (RK, SK)▪ 3/2-way directional valve (Z, Y), also available in version with position monitoring (ZK)▪ 4/3-way directional valve (G, D)
Basic type, size	Type BVG and BVP, size 1 and 3	
	Type NBVP (with standard connection pattern NG 6), size 1	

Actuations:

Solenoid



Solenoid voltages: 12V DC, 24V DC, 110V AC, 230V AC

- BVP 1, NBVP16 also available in ATEX-compliant version
- Version with M12 plug and 8-watt solenoid

Hydraulic



Control pressure:

$p_{\text{contr. min}} = 24 \text{ bar}$

$p_{\text{contr. max}} = 320 \text{ bar}$

Pneumatic

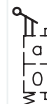


Control pressure:

$p_{\text{contr. min}} = 2 \dots 3.5 \text{ bar}$

$p_{\text{contr. max}} = 15 \text{ bar}$

Manual

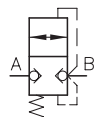


Actuation torque:

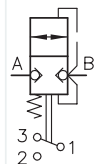
approx. 1.5 ... 3 Nm

Function

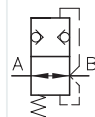
R



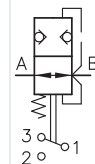
RK



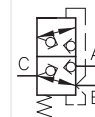
S



SK

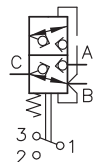


Z

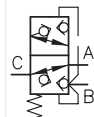


- Further circuit symbols available

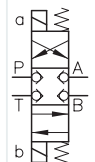
ZK



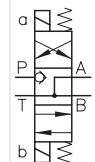
Y



G



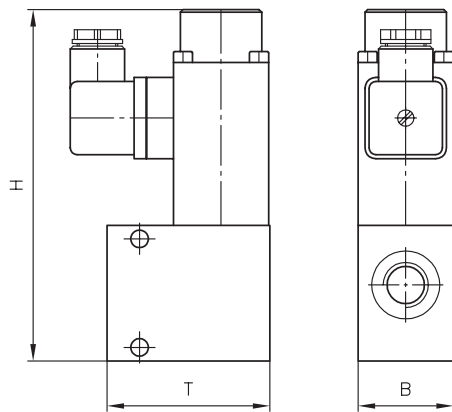
D



- additional switching symbols available
- **G, D:** only for type NBVP16
- Versions with contact switch for position monitoring

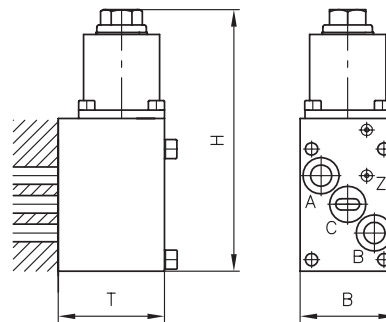
General parameters and dimensions

BVG



Version for pipe connection
(solenoid actuation)

BVP, NBVP



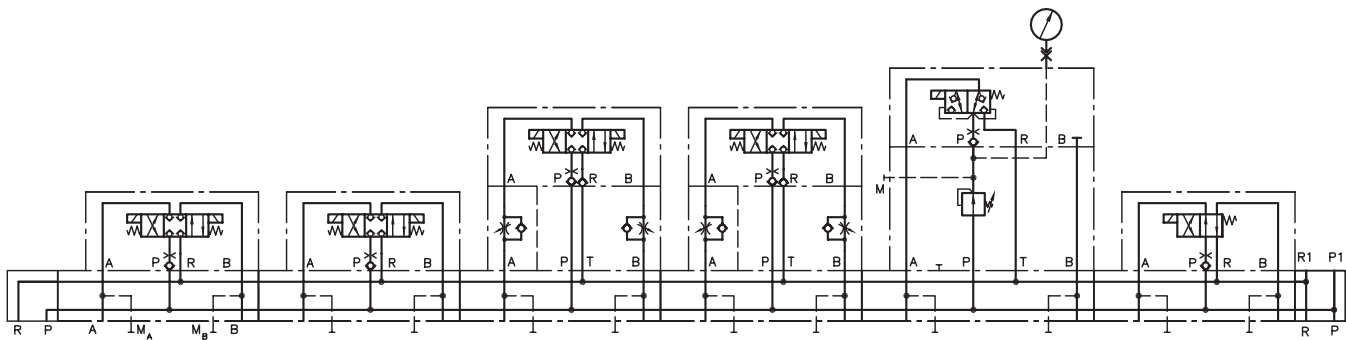
Version for base manifold mounting
(hydraulic actuation)

	Q_{max} [lpm]	p_{max} [bar]	Ports	Dimensions [mm]			m_{max} [kg]
				H_{max}	B_{max}	T_{max}	
BVG 1	20	400/250 ¹⁾	A, B, C G 1/4, G 3/8	115 (130)	60	40	1.6
BVP 1					35	39	1.0
NBVP 16	20	400/250 ¹⁾	NG 6	230	45	45	2.1

¹⁾ with solenoid actuation GM.. and WGM

Circuit example:
BA2A5

- NBVP16G/B2.0R/3
- NBVP16G/B2.0R/3
- NBVP16G/R/S/NZP16Q22/3
- NBVP16G/R/S/NZP16Q22/3
- NBVP16Y/B2.0R/2/NZP16CZ5/50/3 - X84V - 9/100A
- NBVP16W/B2.0R/3
- 2 - LM24


Associated technical data sheets:
Directional seated valves

- [Directional seated valve type BVG 1 and BVP 1: D 7765](#)
- [Directional seated valve type NBVP 16: D 7765 N](#)

Products:

- Type BA: [Page 144](#)
- Type NZP: [Page 144](#)
- Type BVH: [Page 124](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)

Directional seated valves

2.2

Directional seated valve type BVE

Directional seated valves are a type of directional valve. As cone valves they are tightly sealed without leakage in the closed state.

The directional seated valve type BVE is a screw-in valve. 2/2 and 3/2 directional seated valves are available. All connections can be subjected to the same pressures.

Optionally a version for highly viscous media (e.g. lubricating grease) is available.

Appropriate connection blocks make possible direct pipe connection or manifold mounting.

Features and benefits:

- Any flow direction
- No interaction between actuation elements and medium
- No resinification or sticking as a result of increased temperatures is possible.
- For highly viscous media (e.g. lubricating grease)

Intended applications:

- Lubrication systems
- Mining machinery
- Construction and construction material machinery
- Handling and mounting technology



Nomenclature:	Directional seated valve, zero leakage
Design:	Individual valve for pipe connection Individual valve for manifold mounting
Actuation:	Solenoid
p _{max} •	500 bar
Q _{max} •	300 l/min

Design and order coding example

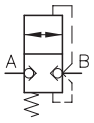
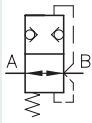
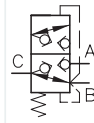
BVE1	- R	-B1,0	- G 24	- 3/8
		Port size or connection block		Version
				<ul style="list-style-type: none">With threaded connectionFor manifold mounting
		Solenoid voltages		
		12 V DC, 24 V DC, 110 V AC, 230 V AC		
		Versions with		
		<ul style="list-style-type: none">M12 plug and 8 watt solenoidAMP, DEUTSCH plugs		
		Additional elements		
		<ul style="list-style-type: none">Orifice in one port		
		Function		
		<ul style="list-style-type: none">2/2-way directional valve (R, S)3/2-way directional valve (Z)		
Basic type, size		Type BVE, size 1, 3 and 5		

Actuations:

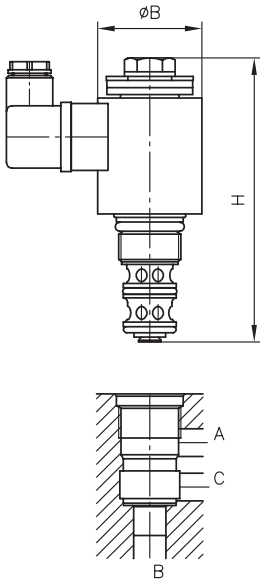
Solenoid



Function

R

S

Z


General parameters and dimensions



	Q_{\max} [lpm]	p_{\max} [bar]	Dimensions [mm]		m_{\max} [kg]
			H_{\max}	B_{\max}	
BVE 1	20	500	121	37	0,4
BVE 3	70	400	122,5	45	0,7
BVE 5	300	400	206,5	72	1,5

Associated technical data sheets:

Directional seated valves

- Directional seated valve type BVE: [D 7921](#)

Similar products

- Type BA: [Page 144](#)
- Type NZP: [Page 144](#)
- Type BVH: [Page 124](#)
- Type BVG, BVP, NBVP: [Page 134](#)

Suitable male connectors:

- Line connector type MSD and others: [D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)

Directional seated valves

2.2 Directional seated valve type VP

Directional seated valves are a type of directional valve. As cone valves they are tightly sealed without leakage in the closed state.

The directional seated valve type VP is a valve for manifold mounting. 2/2, 3/2 and 4/2 directional seated valves with different types of actuation are available. All connections can be subjected to the same pressures.

The directional seated valve type VP is suitable above all for highly viscous media (e.g. lubricating grease). Appropriate connection blocks make possible direct pipe connection.

Features and benefits:

- Any flow direction
- No interaction between actuation elements and medium
- No sticking or resinification as a result of increased temperatures is possible.
- Suitable for highly viscous media (e.g. lubricating grease)
- Explosion-proof version

Intended applications:

- Lubricating systems
- Mining machinery
- Construction and construction materials machinery
- Handling and assembly technology



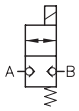
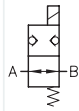
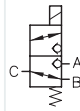
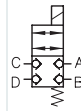
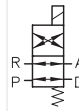
Nomenclature:	Directional seated valve, zero leakage
Design:	Manifold mounting
Actuation:	Solenoid Hydraulic Pneumatic
p _{max} :	400 bar
Q _{max} :	15 l/min

Design and order coding example

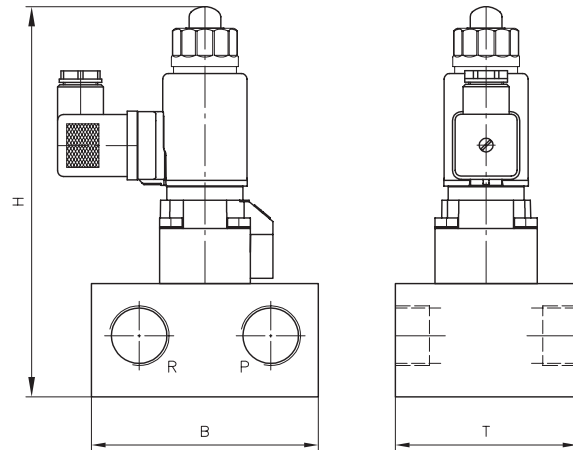
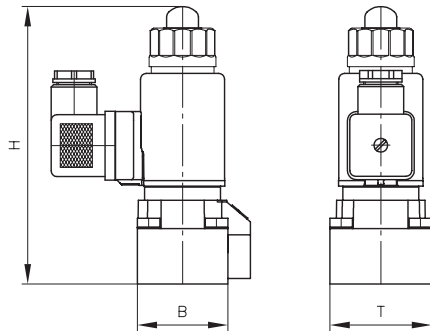
VP1	- R	- 3/4	- G24
			Actuation <ul style="list-style-type: none">▪ Solenoid▪ Mechanical: roller, feeler▪ Manual: lever, turn-knob
			Optional connection block For direct pipe connection
	Function	2/2-way directional seated valve (R, S) 3/2-way directional seated valve (Z) 4/2-way directional seated valve (W, G)	
Basic type, size	Type VP, size 1 <ul style="list-style-type: none">▪ Versions conforming ATEX		

Actuation:

Solenoid	Hydraulic	Pneumatic
		
Solenoid voltage: 12V DC; 24V DC; 110V AC, 230V AC	Control pressure: p _{control min} = 24 bar p _{control max} = 320 bar	Control pressure: p _{control min} = 2 ... 3.5 bar p _{control max} = 15 bar

Function
R

S

Z

G

W

General parameters and dimensions

 Individual valve
 Example: VP1R-G24

 Valve with sub-plate
 Example: VP1W-3/4-WG 230


	Q_{\max} [lpm]	p_{\max} [bar]	Ports	Dimensions [mm]			m_{\max} [kg]
				H_{\max}	B_{\max}	T_{\max}	
VP 1	15	400	A, B, C G 1/4, G 3/8, G 3/4	127	40	50	1.0
VP 1 with sub-plate				147 ... 177	50 ... 100	45 ... 80	1.5 ... 2.2

 - H_{\max} : Values apply for electro-magnetic actuation

Associated technical data sheets:

- Directional seated valve type VP: [D 7915](#)

Similar products:

- Directional seated valve type BVG1, BVP1, NBVP16:
[Page 134](#)
- Directional seated valve type BVE:
[Page 138](#)

Male connectors:

- Line connector type MSD and others: [D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)

Directional seated valves

2.2 Lifting/lowering valve type HSV

Lifting-lowering valves are a combination of directional valves and metering valves. The valve block type HSV provides the function of a 2/2-way directional seated valve with electrical actuation for lowering the load. Adjustable throttle valves or flow control valves independent of the load control the lowering speed. An integrated pressure-limiting valve limits the permissible load. The lifting/lowering valve type HSV is used to control lifting equipment with single-acting cylinders.

- Features and benefits:**
- Optimum control of lifting and lowering function
 - High pressures up to 400 bar
 - Zero leakage to prevent unwanted lowering of loads and platforms
 - Integrated overpressure protection

- Intended applications:**
- Cranes and lifting equipment
 - Materials handling
 - Road vehicle
 - Mining machinery



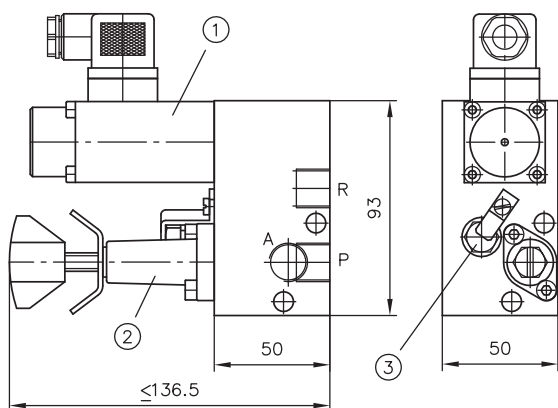
Nomenclature:	Valve combination consisting of: <ul style="list-style-type: none">▪ 2/2-way directional seated valve, solenoid actuated▪ Pressure-limiting valve▪ Check valve optional▪ Throttle or 2-way flow control valve
Design:	Individual valve for pipe connection
Actuation:	Solenoid
p_{max}:	400 bar
Q_{max}:	120 l/min

Design and order coding example

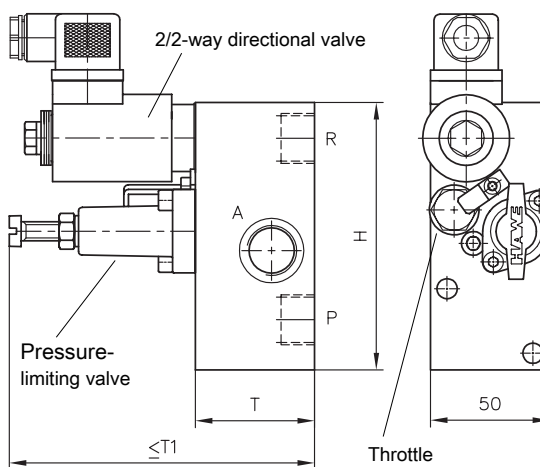
HSV 21	- R1	- R-150	- G24
			Solenoid voltage 12 V DC, 24 V DC, 110 V AC, 230 V AC HSV 21 and HSV 22 also in explosion-proof version
			Pressure limiting valve Manually adjustable or fixed, pressure setting in bar
			Function
Basic type, size	Type HSV, sizes 2 and 7		

Function

	With throttle		Without throttle		With/without throttle	With 2-way flow control valve
	R 1	R 2	R 3	R 4	S 1 ... S 4	R 6
HSV 21 HSV 22 HSV 71						

General parameters and dimensions
HSV 21; HSV 22


- 1 2/2 directional seated valve
- 2 Pressure-limiting valve
- 3 Throttle

HSV 71


- 1 2/2 directional seated valve
- 2 Pressure-limiting valve
- 3 Throttle

	Q_{max} [lpm]	p_{max} [bar]	Ports		Dimensions [mm]			m [kg]
			P	A, R	H	T	T1	
HSV 21	20	315	G 3/8	G 3/8	see illustration			2.2
HSV 22	30	315	G 3/8	G 1/2	see illustration			2.2
HSV 71	120	315	G 3/4	G 3/4	100	80	160	3.1

Associated technical data sheets:

- [Lifting/lowering valve type HSV: D 7032](#)

Similar products:

- [Connection block type HMPL and HMPV for proportional directional spool valve: D 7700 H](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)

Directional seated valves

2.2 Switch unit type CR

Switch units combine the function of a directional seated valve with a pressure valve and check valve. They control dual stage pumps, a combination of high-pressure pump and low-pressure pump, in bottom and top ram presses. The low-pressure circuit and the high-pressure circuit are combined for rapid movement.

If the low-pressure value is reached or exceeded, the switch unit type CR switches the low-pressure circuit to circulation. The high-pressure pump carries out the pressing action. The switch unit hydraulic release acts automatically. It initiates surge-free decompression that relieves the press. In the closed state the switch unit has zero leakage.

The switch unit type CR can be attached directly to hydraulic power packs type MPN and RZ.

Features and benefits:

- Special valve for controlling upstroke presses
- Smooth, gentle switching
- No pressure drop during press operation due to zero leakage
- Fully automatic switching of the low-pressure pump to circulation

Intended applications:

- Machine tools (presses)
- Woodworking and processing machinery
- Printing and paper technology
- Foodstuff and packaging machinery



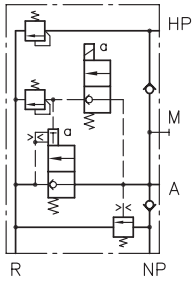
Nomenclature:	Valve combination consisting of: <ul style="list-style-type: none">▪ 2/2-directional seated valve▪ Ball-type check valve▪ Pressure valve
Design:	Individual valve for pipe connection
Actuation:	Solenoid Manual
p _{max} †	HP 400 bar NP 60 bar
Q _{max} †	HP 20 lpm NP 160 lpm A → R 300 lpm

Design and order coding example

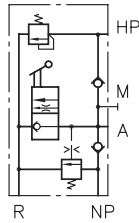
CR4	M-WG230	- 400/60
		Pressure settings [bar] High-/low pressure
	Actuation mode	<ul style="list-style-type: none">▪ Solenoid Voltage of the actuation solenoids 24V DC, 230V AC 50/60 Hz▪ Manually
Basic type, size	Type CR, size 4 and 5	

Function

CR 4M; CR 5M

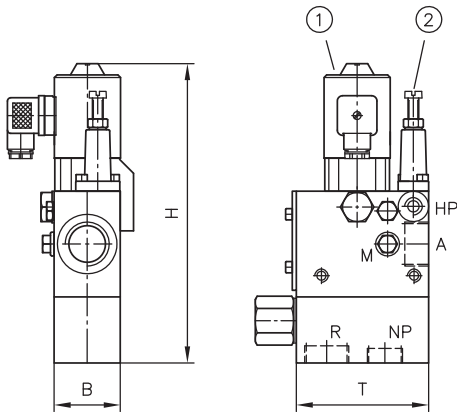


CR 4H

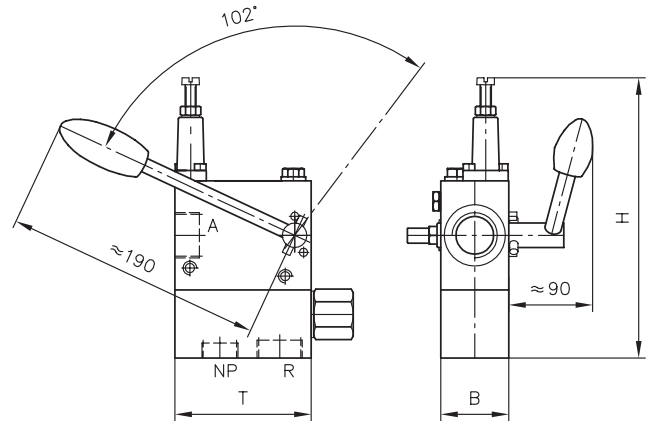


General parameters and dimensions

CR 4M



CR 4H



- 1 Actuating solenoid
- 2 Pressure-limiting valve

	Q _{max} [lpm]			p _{max} [bar]		Ports				Dimensions [mm]			m [kg]
	HP	NP	A→R	HP	NP	A and R	HP	NP	M	H	B	T	
CR 4M	8	80	200	400	(0) ... 60	G 1	G 1/4	G 3/4	G 1/4	247.5	50	100	5.2
CR 4H	8	80	200	400	(0) ... 60	G 1	G 1/4	G 3/4	G 1/4	202	50	100	4.7
CR 5M	20	160	300	400	(0) ... 60	G 1 1/4	G 3/8	G 1	G 1/4	277.5	63	135	10.0

Associated technical data sheets:

- [Switch unit type CR: D 7150](#)

Similar products:

- Two-stage valves type NE: [Page 192](#)

Hydraulic power packs:

- Compact hydraulic power packs type MP, MPN, MPNW, MPW: [Page 50](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)

Directional seated valves

2.2 Lifting module type HMT and HST

Lifting modules or hoist control valves are a combination of directional valves and pressure control valves. They are used to control a lifting function. The flow rate is controlled or limited proportionally both on lifting and also on lowering.

In the lifting module type HMT and HST directional seated valves are used that ensure the load is held securely. Two-way flow control valves are used to limit the maximum flow rate. Valve sections of type SWS can be attached space-savingly to the lifting module to control additional functions. The lifting module type HMT and HST is suitable for use in industrial trucks and agricultural machinery.

Features and benefits:

- Flexible design for fixed or variable displacement pump systems
- Low spatial requirements due to steel design
- Flexible combination with directional valves

Intended applications:

- Materials handling (industrial trucks etc.)
- Cranes and lifting equipment
- Road vehicle



Nomenclature:	Valve combination according to type consisting of: <ul style="list-style-type: none">▪ 2-way flow control valves▪ 2-way seated valves▪ Directional spool functions
Design:	Valve bank
Actuation:	Solenoid
p_{max}†	315 bar
Q_{max}†	90 lpm

Design and order coding example

HMT34D - 1/250 - G/MP/0/2 - 31EP - G 24

		End plate	<ul style="list-style-type: none">▪ With two P ports and one R port▪ With prop. idle circulation valve▪ With solenoid valve for the parking brake
		Valve sections, ancillary- and intermediate blocks	Various intermediate blocks for mast tilting, mast shifting, auxiliary hydraulics Directional valve sections type SWR 1 with additional functions Directional valve sections type SWS 2
	Connection block	Pressure setting [bar] of the pressure limiting valve	
		Additional versions	<ul style="list-style-type: none">▪ Connection blocks type SWR, SWS<ul style="list-style-type: none">▪ With flow divider▪ With/without pressure limiting valve▪ With shut-off valve for P and H (lift)
Basic type	Lifting modules and hoist control valves		

Drive concept and application:

	Drive concept		Application					
	1	2	Scissor lift	Miniature stacker, Walkie stacker	Counter balance truck	Reach truck	Order picker (warehouse)	
							no man aloft	man aloft
HST	x	x	x	x	x	x	x	x
HMT		x			x	x	x	(x)

Drive concepts:

- 1: Constant pump, lifting/lowering via a controller (throttle)
- 2: Lifting via a speed-controlled pump, lowering via a controller (throttle)

Circuit example:

HMT 34-1/200-70F

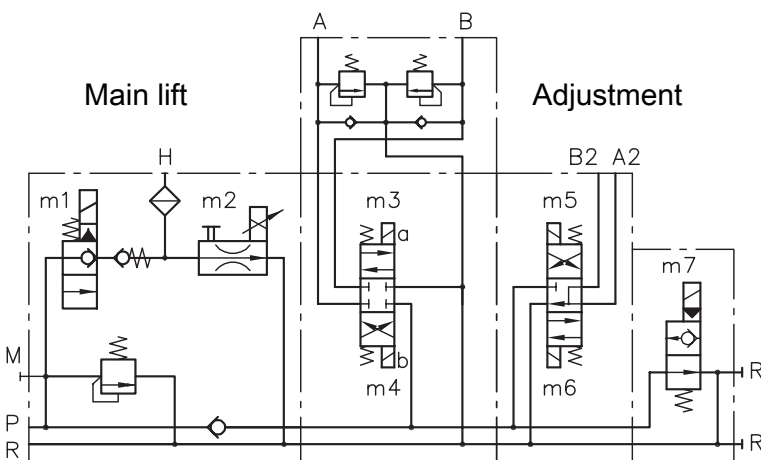
-G/M/0/2 AN40 BN130

-D/M/0/02

-31E-P12/G 24

Lifting module type HMT, size 3, port size 4 with pressure-limiting valve (set to 200 bar), output controller with 70 l control orifice closed in normal position; segment G with shock and servo-suction valves (set values 40 and 130 bar) in ancillary block; end plate with idle circulation valve open in neutral position, proportional solenoid voltage for flow control valves 12V DC, solenoid voltage for directional spool valve and directional seated valves 24V DC

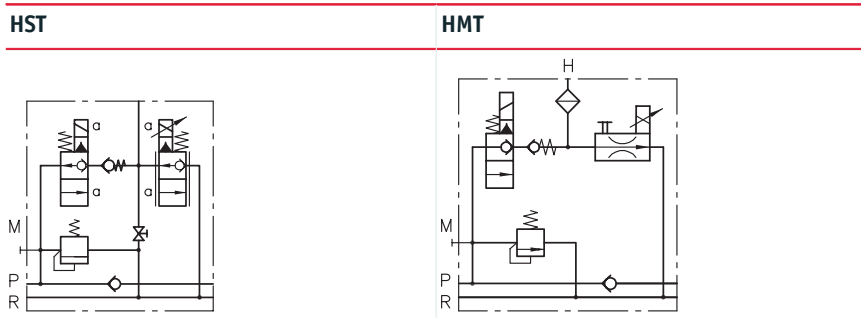
Tilting



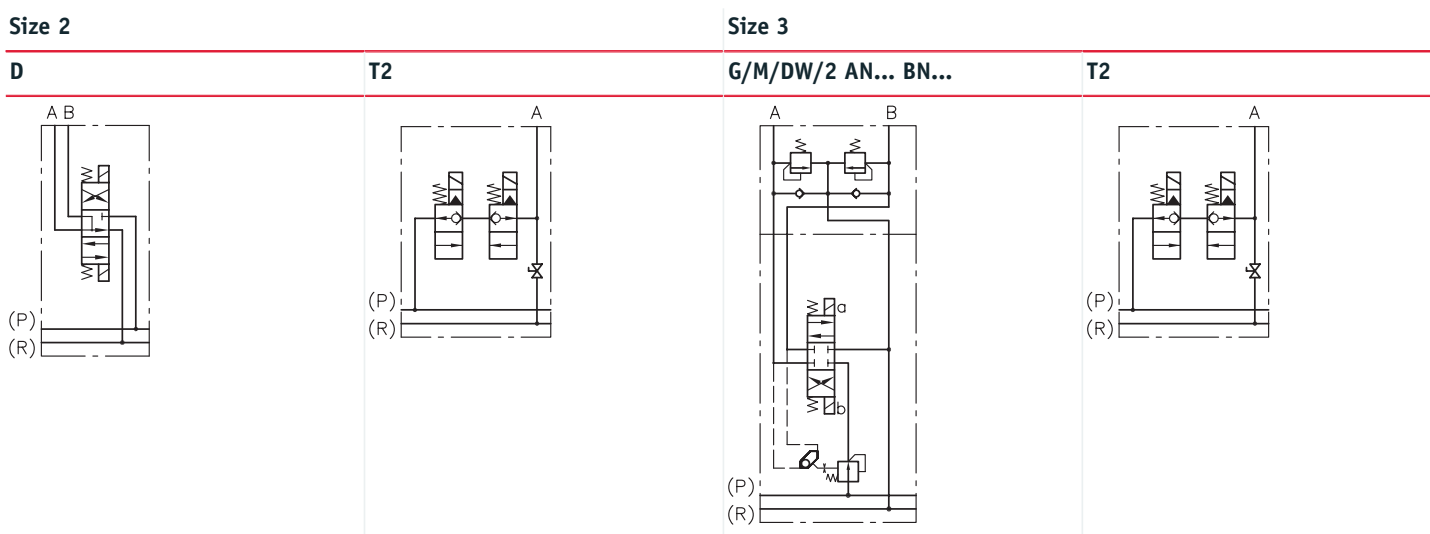
- 1 Main stroke
- 2 Tilt
- 3 Fork adjustment

Function

Lifting modules and connection blocks:

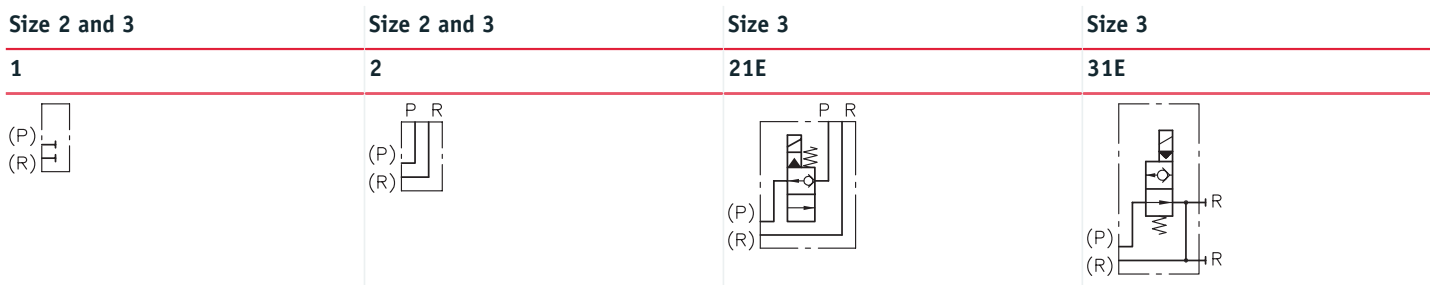


Intermediate blocks (main and initial lift):



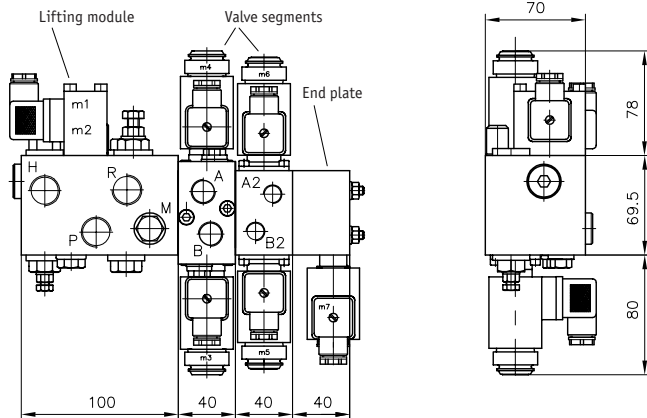
- Size 2: Hole pattern SWR 1, size 3: Hole pattern SWR 2/SWS 2

End plates:



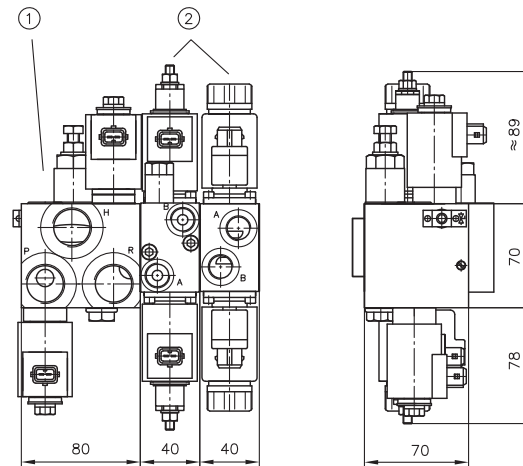
General parameters and dimensions

HMT 34 ...



- 1 Lifting module
- 2 Valve segments
- 3 End plate

HST 3 ...



- 1 Lifting module
- 2 Valve segments

	Q_{max} [lpm]	p_{max} (bar)	Note	Ports
HST 2	20 - 40	315	Connection blocks of lifting module Add-on components: - SWR/SWS-Valve sections - Intermediate blocks - End plates	P, R, H= G 1/2; M = G 3/8
HST 3	30 - 60			P, R, H= G 3/4; M = G 3/8
HMT 3	70 - 90			H, P, R= G 1/2; M = G 3/8
HMT 34	70 - 90			H= G 3/4; P, R = G 1/2; M = G 3/8

Associated technical data sheets:

- Type HMT: **Sk 7758 HMT ff**
- Type HST: **Sk 7650 HST ff**

Information on additional lifting modules on inquiry

Similar products:

- Directional spool valves type SWR, SWS 2: [Page 76](#)
- Connection blocks type HMPL and HMPV: [Page 90](#)

Male connectors:

- [Line connector type MSD and others: D 7163](#)
- With economy circuit: [D 7813](#), [D 7833](#)
- Proportional amplifier type EV2S: [D 7818/1](#)