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

Nomen-clature:	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

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

Indiv. connection blocks for pipe connection

Additional versions:

- 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

Additional elements

- 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)

Size Size 0 to 4

- 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

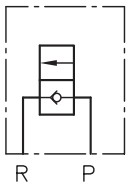
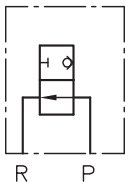
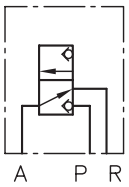
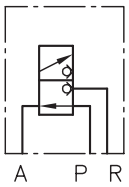
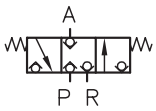
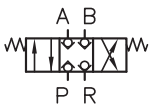
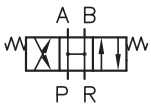
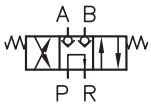
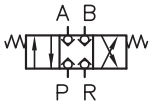
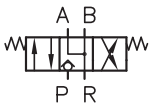
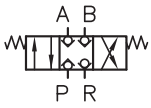
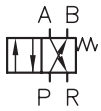
Function

- 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)

Actuation

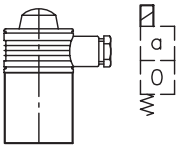
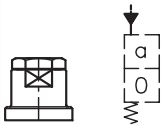
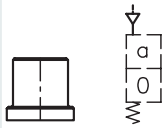
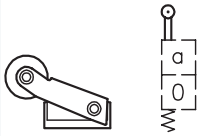
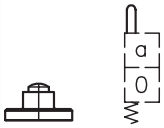
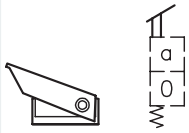
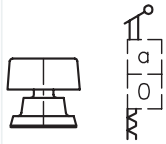
- Solenoid (G, WG)
- Hydraulic (H)
- Pneumatic (P)
- Mechanical (K, T, F, D)

Function

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	
R2	S2	3	Z3	21, 39	22, 45, 46, 47, 48, 49	4	Z4
					**22**  **45**  **46**  **47**  **48**  **49** 		

- 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

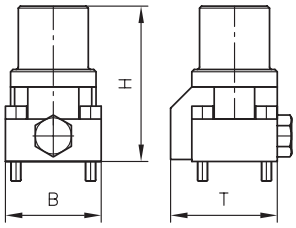
Actuation:

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 $p_{contr.\ max}$ [bar]: 400... 700 Control pressure $p_{contr.\ min}$ [bar]: 9... 16	 15 2.5... 4	Shifting force [N]: 25... 80 Shifting travel [mm]: 10.5... 30	 51... 20 4 and 5	Shifting force [N]: 25... 80 Shifting travel [mm]: 20.5... 45	Shifting torque [Ncm]: 45... 98

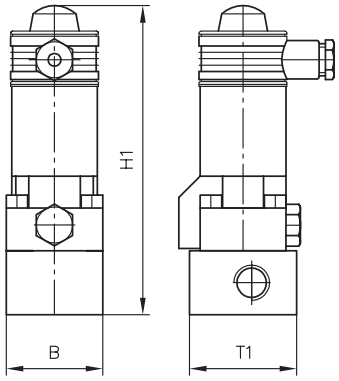
- Valve with solenoid actuation also available in ATEX-compliant version (24V DC)

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

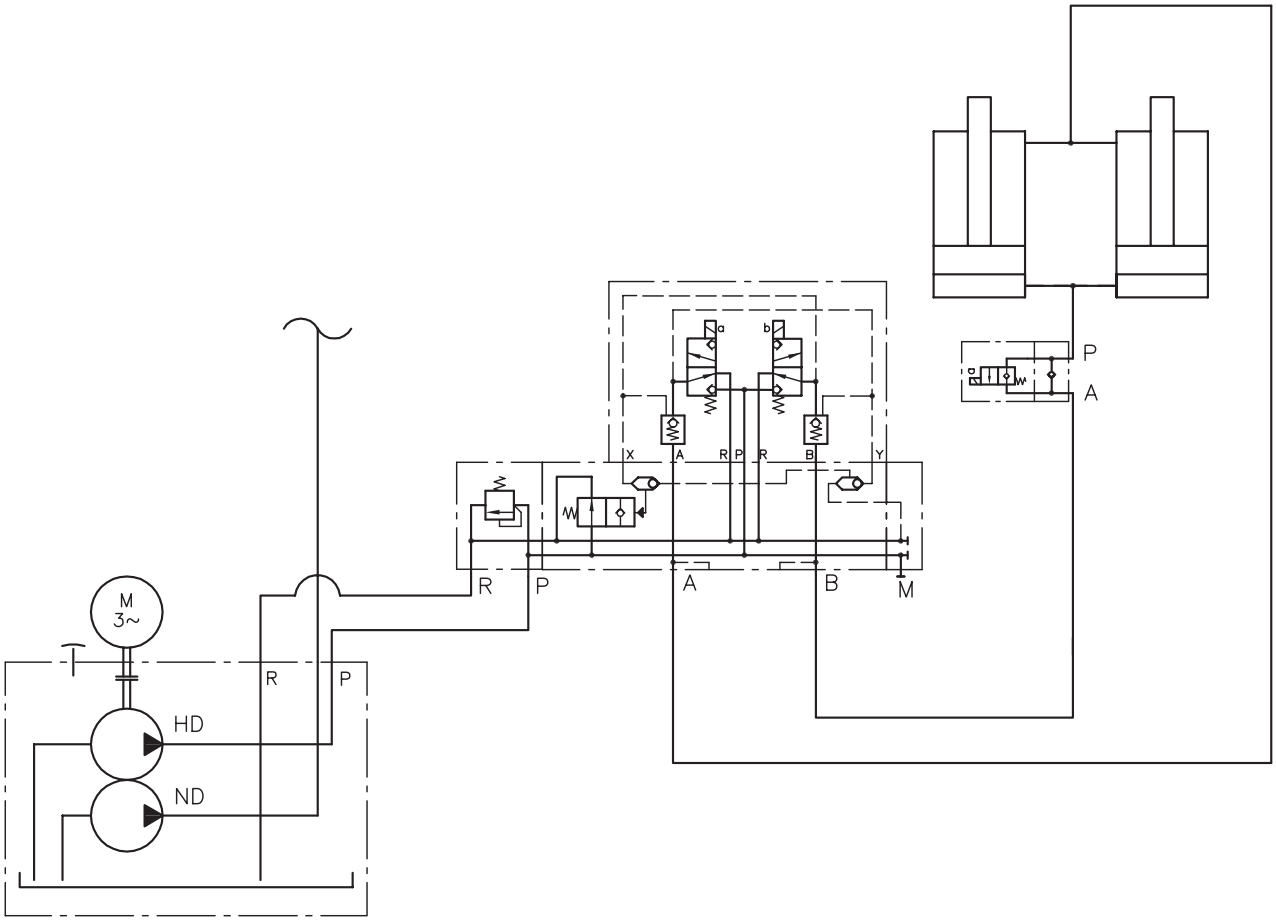
	Q_{max} [lpm]	p_{max} [bar]								Ports
Size		**Solenoid**		**Pressure**		**Mechanical**		**Manual**		
		G	**WG**	**H**	**P**	**K**	**T**	**F**	**D**	**P, R, A, B**
0	6	300... 500		500	-	-		-	500	G 1/4
1, 12	12	350... 500 (700)		500... 700		400... 700		400... 700		G 1/4 and G 3/8
2	25	350 ... 500		500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

Nomen-clature:	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

- 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

- 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

- With pressure reduction for gallery P or throttle for port A (parallel connection)

Actuation

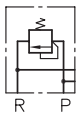
Connection block/adapter plate

- For pipe connection
- For direct mounting at compact hydraulic power packs
- For direct mounting at hydraulic power packs

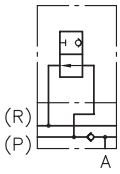
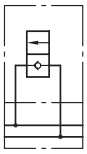
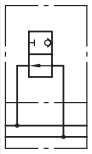
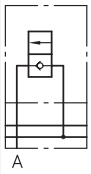
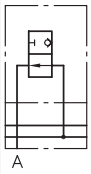
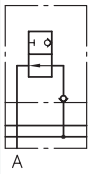
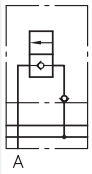
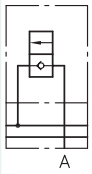
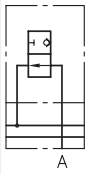
Basic type, size Type VB size 01, 12, 21, 22, 31, 41

Function

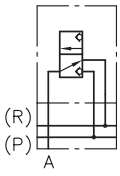
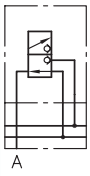
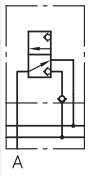
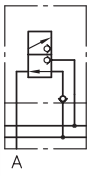
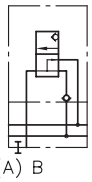
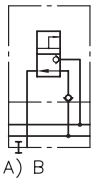
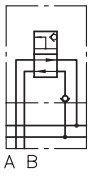
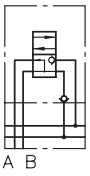
Connection blocks:

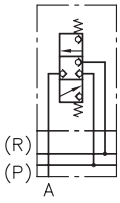
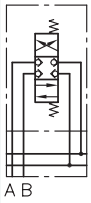
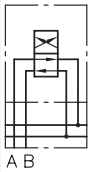
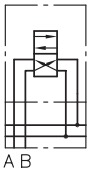
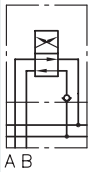
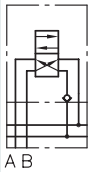
A .-1/..	C, D, E	F	G
			
For pipe connection, with fixed pressure limiting valve (/..- pressure specification in bar)	For mounting onto hydraulic power packs type R, Z and RZ, depending on tank and size	For mounting onto compact hydraulic power packs (type KA, HC, MP, MPN, HK)	

Valve sections:

A	D	F	B	C	E	Q	P	O
								

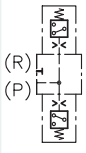
- A not for VB 01, VB 11 only with tapped ports G 1/4

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			

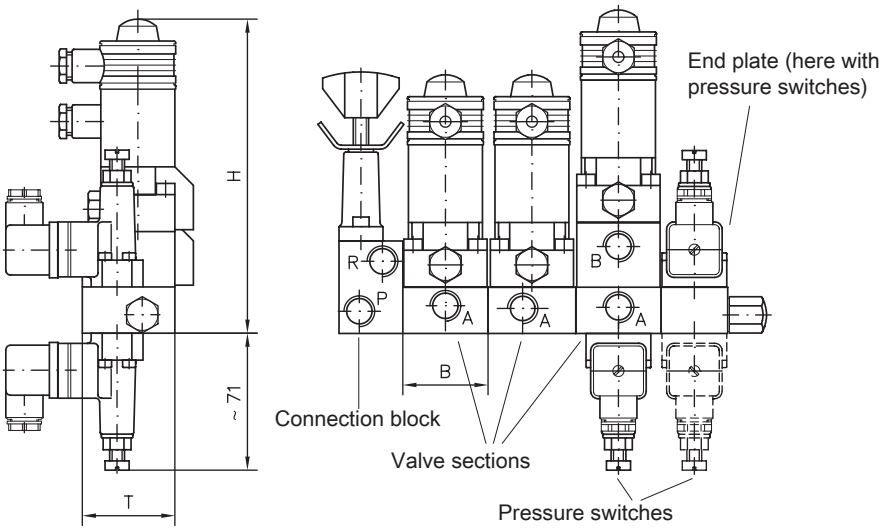
- J, I, Y, S, T, G39, G49 only available for VB 21, 22
- G not available for VB 41
- HX, LX, NX, RX only available for VB 11

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

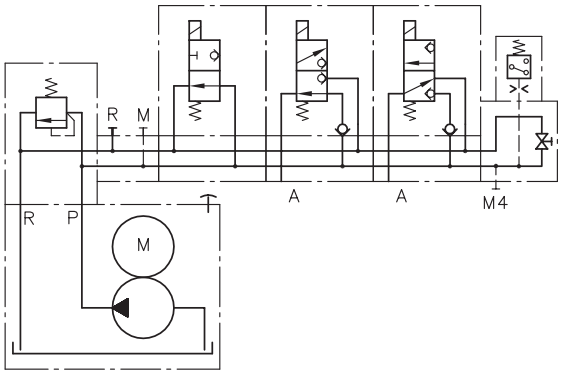
Compact hydraulic power pack type MP size 2, connection block with pressure limiting valve (tool adjustable)

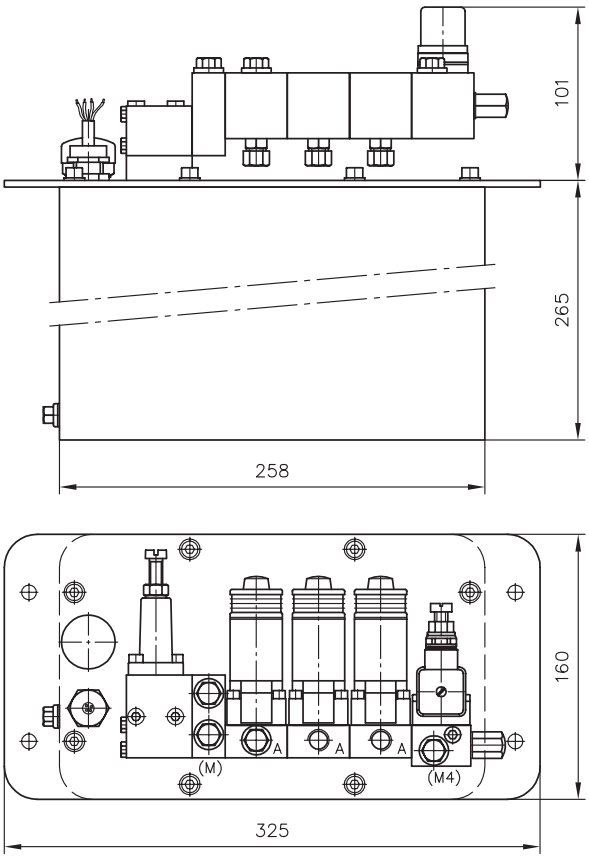
- VB01FM - FRN/32 - 1 - WG230

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

Nomen-clature:	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
- Versions with M12-plug and 8-Watt solenoid

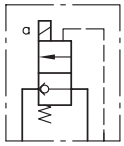
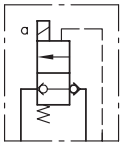
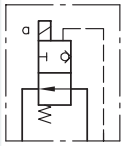
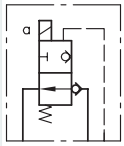
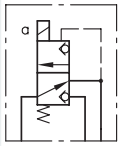
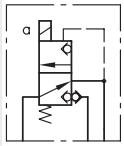
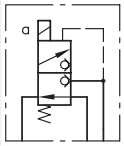
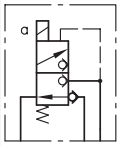
Single connection block Port size G 1/4, G 3/8, G 1/2 (BSPP)
- By-pass check valve or pressure limiting valve between P and R

Additional elements
- Return pressure stop for port R
- Check valve insert for port P
- Pressure limiting valve

Function
- 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

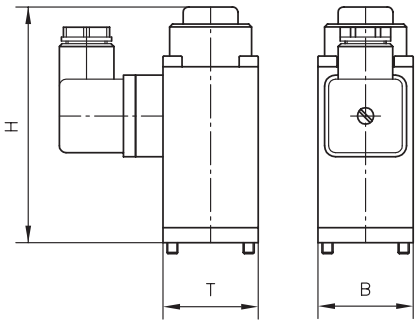
Function

D	Q	F	E	H	N	M	R
							

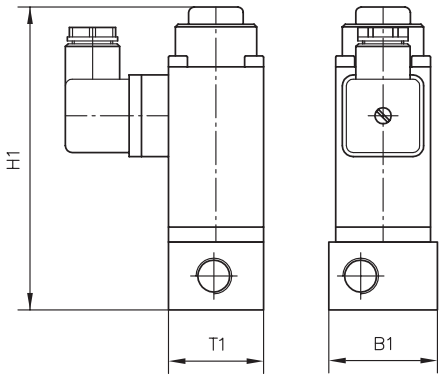
- Symbols show type WH
  View type WH
- Type WN 1 without de-pressuring duct for the solenoid (add. leakage duct is not necessary)
  Type WN1 without solenoid relief (no leakage line)

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

Nomen-clature:	Directional seated valve, zero leakage
Design:	Valve bank ▪ 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**

Solenoid voltage 12V DC, 24V DC, 110V AC, 230V AC
- Versions with M12-plug and 8-Watt solenoid

Port size G 1/4, G 3/8 (BSPP)

End plate
- With one or two pressure switches
- With accumulator drain valve
- With additional pressure limiting valve in gallery P

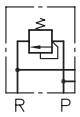
Valve sections
- Directional valves type WH or WN
- Valve section options:
  - Return pressure stop
  - Pressure switch for the consumer ports or for gallery P
  - Pressure limiting valves at the consumer port
  - Pressure reducing valve reducing the pressure in the downstream P gallery
- Additional sections:
  - Pressure reducing valve
  - Indiv. sub-plate with pressure switch
  - Separation plate for gallery P

Connection block/adapter plates
- 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

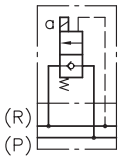
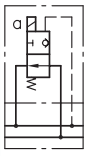
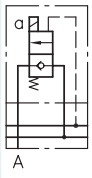
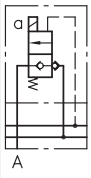
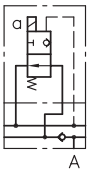
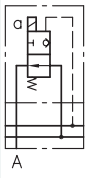
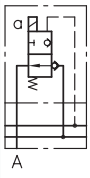
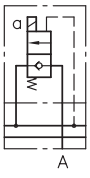
Basic type, size Type BWN, size 1 and type BWH, size 1 to 3

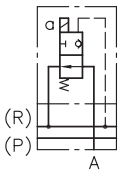
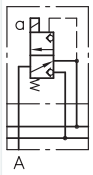
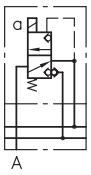
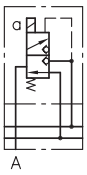
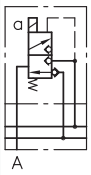
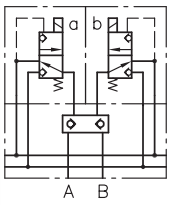
Function

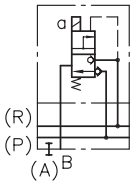
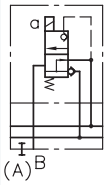
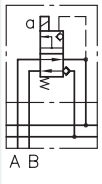
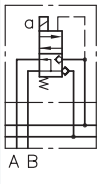
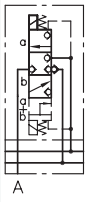
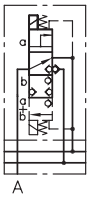
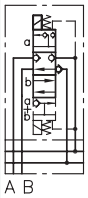
Connection blocks/adapter plates:

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

Valve sections:

D	F	B	Q	A	C	E	D
							

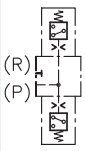
O	H	N	M	R	K
					

I	Y	S	T	J	U	L
						

Additional options for the valve sections:

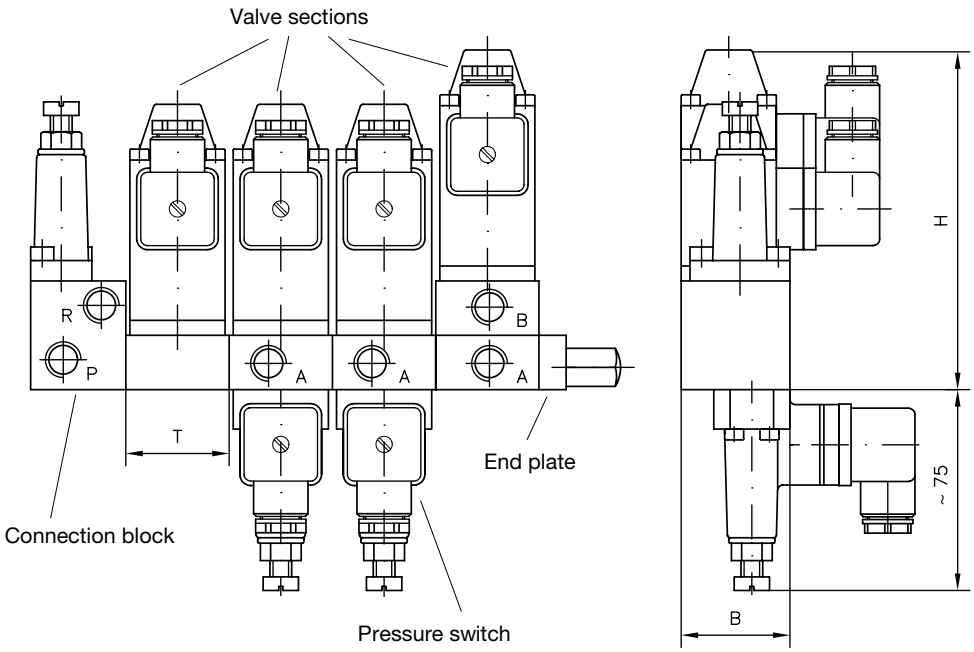
- Pressure switches in the consumer or pump channel. The pressure switches (type DG 3..) are directly flange-mounted to the sub-plate.
- Pressure-limiting valves in the consumer channel (for 3/2- or 3/3-way directional valves, for size 1). The pressure-limiting valve is directly incorporated in the sub-plate.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

End plates:

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

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

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
- With tapped plugs at P, R
- With accumulator port and drain valve

Valve sections
- With individual pressure reduction (parallel connection)
- Additional elements:
  - 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

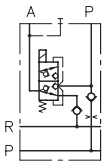
Connection blocks/adapter plates:

BVH

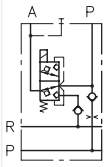
Direct mounting onto connection blocks type A etc.
for compact hydraulic power packs type KA, MPN, HC, HK, HKF, HKL

Valve sections:

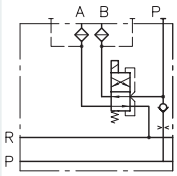
H



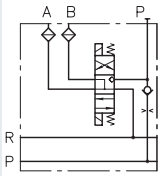
M



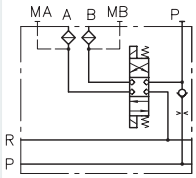
W



D



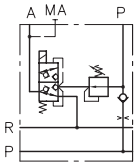
G



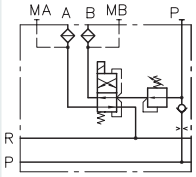
Additional options for the valve sections:

Individual pressure reduction (parallel connection)

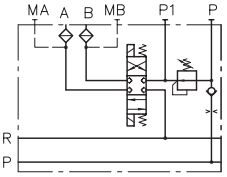
BVH 11 H/CZ...



BVH 11 W/CZ...

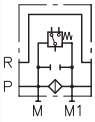


BVH 11 G/CZ...



Pressure filter

BVH 11 ZD



Actuations:

M:	Solenoid actuation (p_{max}= 400 bar)
GM:	Solenoid actuation (p_{max}= 250 bar)

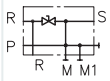
End plates:

-1

Tapped plug at P, R

-81

with accumulator port and drain valve



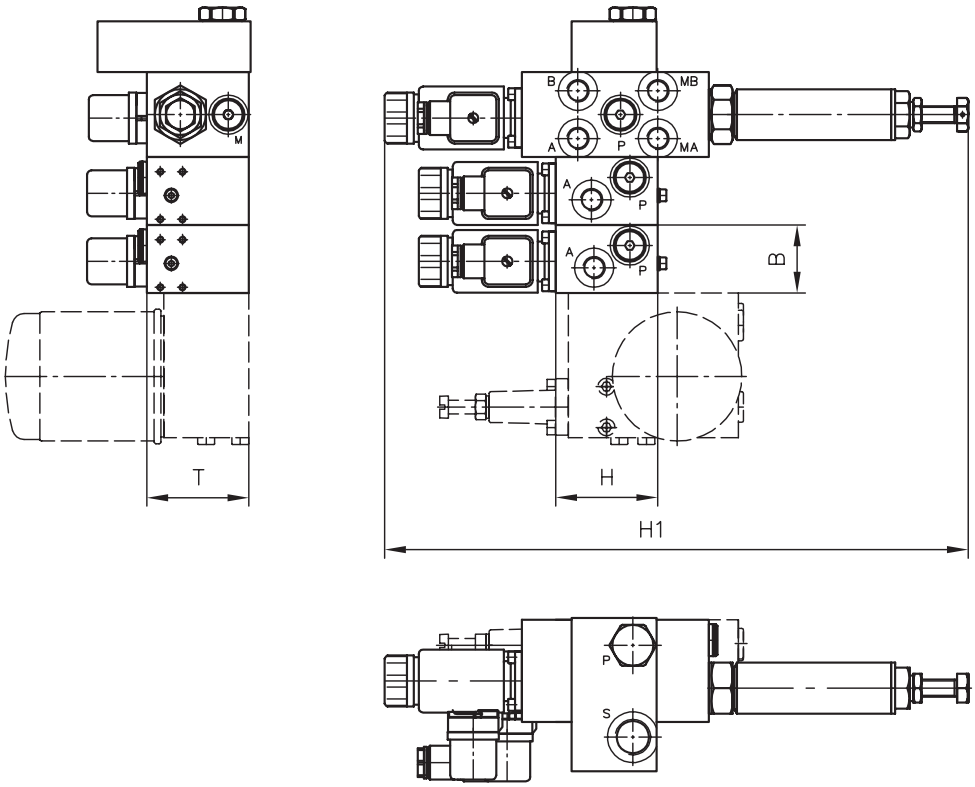
(A1F1/310)

- 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

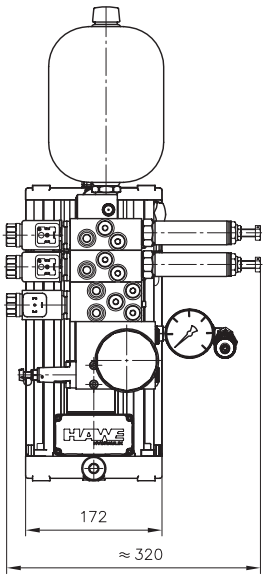
Compact hydraulic power pack type KA
1 kW motor power;
Connection block with return line filter
and TÜV-approved safety valve
set to 120 bar

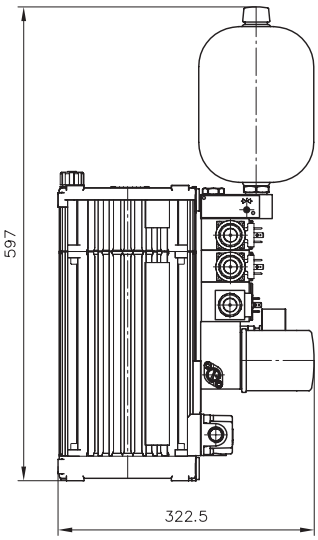
- AX 3 F 1 E/120
- BVH 11 W/M/RH/2
- BVH 11 M/CZ5/35/M/RHB 2.5
- BVH 11 M/CZ5/35/M/RHB 2.5
- 82-X 24 - AC 2001/60/3/A 3x400V 50 Hz

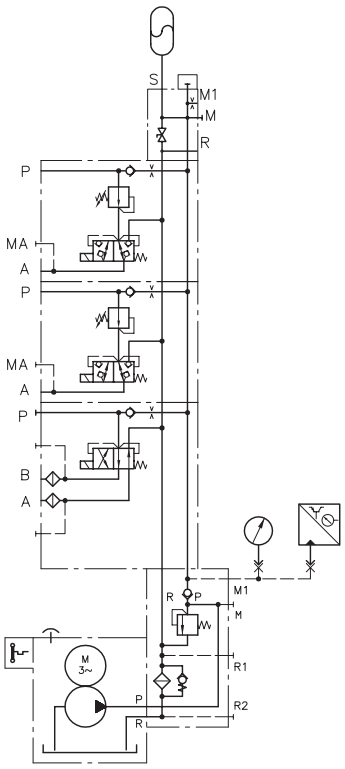
Valve bank type BVH with three valve sections,
two clamping functions with individually
adjustable clamping pressure

Parameters of the circuit example

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

Directional seated valves are a type of directional valve. The seated valve type VZP is a manifold mounting valve. Zero-leakage ball-seated and cone-seated valves of the same size are combined.

The twin layout of the 3/2 and 2/2-way directional seated valves means that all functional elements for valve function and actuation share one housing, making them very compact. Depending on the pairing, these valves can realise either one 4/4, 4/3 or 3/3-way function, or two independent 3/2 and 2/2-way individual functions. Compared with individual valves for manifold mounting of conventional layout, the advantages are lower spatial requirements and the possibility of directly mounting pressure switches for monitoring the consumer pressure. A particularly compact option is to combine several valves connected in parallel in one valve bank (type BVZP).

Nomenclature:	Directional seated valve, zero leakage
Design:	Individual valve, manifold mounting
Actuation:	Solenoid
p_{max}:	450 bar
Q_{max}:	15 lpm

Features and benefits:

- Good price-performance ratio
- Max. operating pressures up to 450 bar
- Adapter plates for flange-mounting on compact hydraulic power packs
- Option to incorporate additional functions in the sub-plate, such as pressure switches, throttle and check valve combinations etc.

Intended applications:

- Machine tools (cutting and non-cutting)
- Mining machinery (incl. oil production)
- Clamping equipment, punching tools, jigs
- Rubber and plastics machinery

Design and order coding example

VZP1 | H | 12B1,0 | - G12

Solenoid voltage 12V DC, 24V DC, 110V AC, 230V AC
- Versions with M12-plug and 8-Watt solenoid

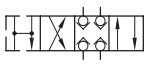
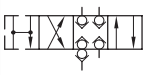
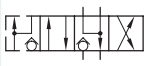
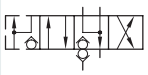
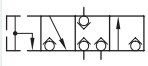
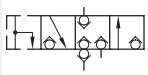
Additional elements
- Indiv. valves with check valve insert in gallery P
- Indiv. valves with return pressure stop in gallery R
- Pressure switch for the consumer ports

Function
- 4/2-way functions via directional spool valve
- 4/3-way directional seated valve (G, D, E, O)
- 3/3-way directional seated valve (J, P)
- 2/2- and 3/2-way directional seated valve (F, D - H, M, N, R)

Basic type, size Twin valve type VZP, size 1
- Connection blocks for pipe connection

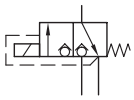
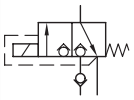
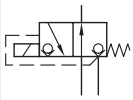
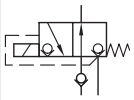
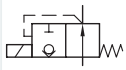
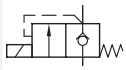
Function

Cone seated valves with 4/3- (4/4-) or 3/3- (3/4-) way functions up to 400 bar

E	G	D	O	P	J
					

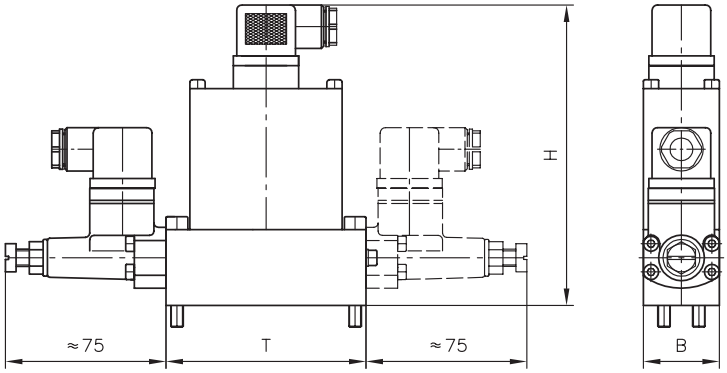
- 4. Switching position when both solenoids are energized simultaneously

Ball seated valves with 3/2- (2/2-) way functions up to 450 bar (always two valve functions in one valve body)

H	N	M	R	F	C
					

General parameters and dimensions

VZP 1 (example with mounted pressure switches)



	Q_{max} [lpm]	p_{max} [bar]	Dimensions [mm]			m [kg]
			H	B	T	
VZP 1	5... 15	250... 450	137... 142	35... 39	92	1.9... 2.2

- Weight m [kg] +0.3 kg per mounted pressure switch

Associated technical data sheets:

- Directional seated valve type VZP: D 7785 A

Accessories:

- Pressure switches type DG 3.., DG 5E: Page 262

Male connectors:

- 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.

Nomen-clature:	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
- Versions with M12-plug and 8-Watt solenoid
- Quarter-turn plug, plugs of Co. KOSTAL or AMP

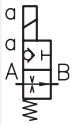
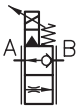
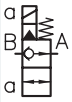
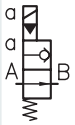
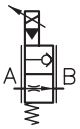
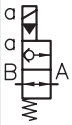
Connection blocks

Versions with
- 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
- V - 2/2-way valve (NC-type)
- S - 2/2-way valve (NO-type)

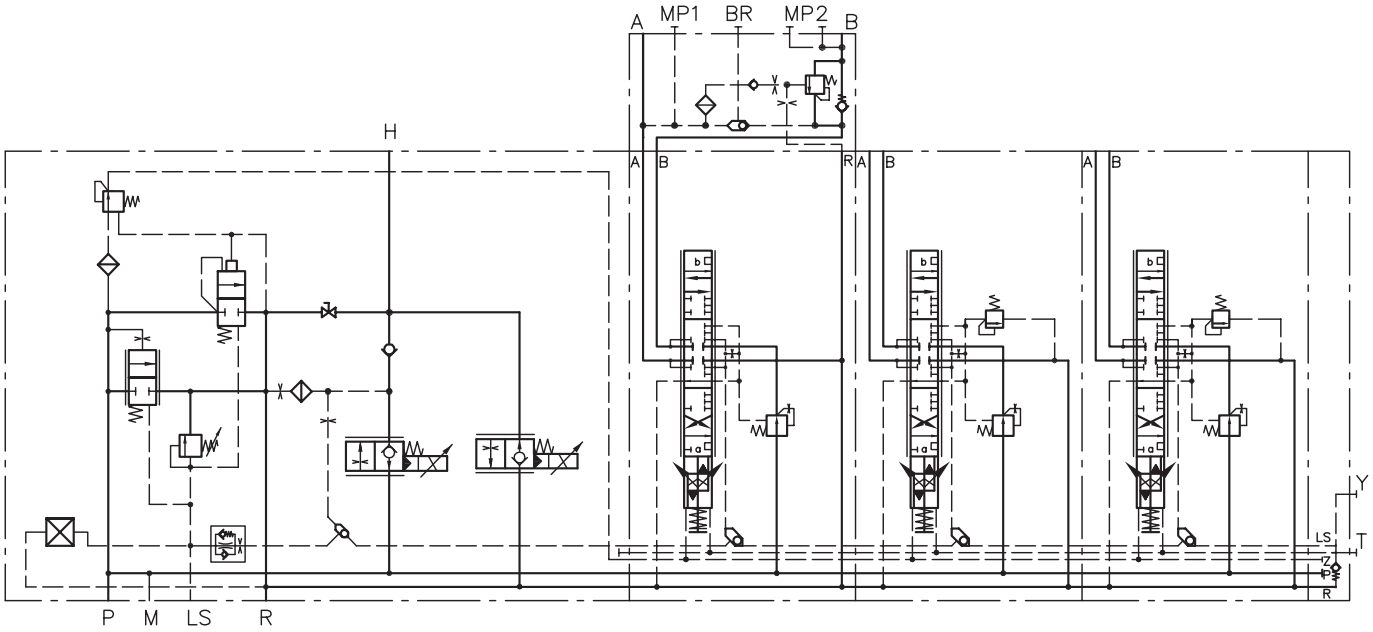
Basic type, size
- Type EM: Directional valve, size 1 to 4
- Type EMP: Prop. valve, size 1 to 4

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 

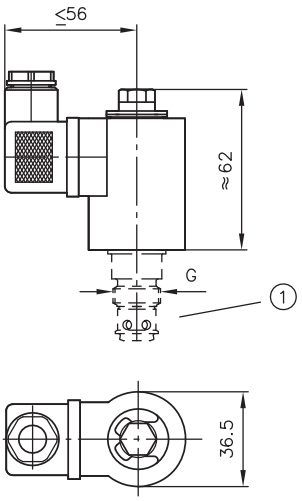
Circuit example:

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



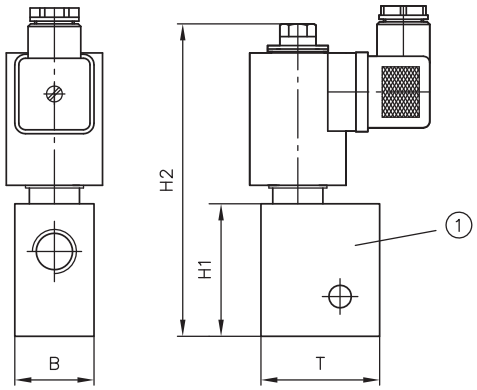
General parameters and dimensions

Screw-in valve



1 Screw-in valve

Valve compl. with connection block for pipe connection



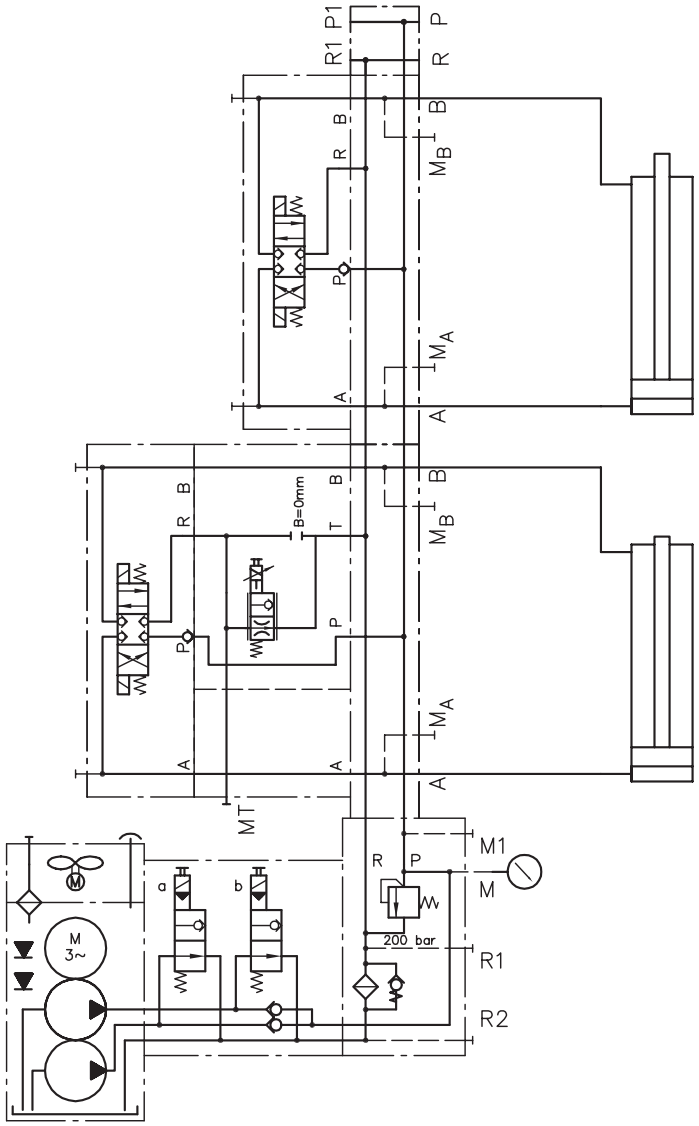
1 Connection block

			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

Nomen-clature:	Directional seated valve, zero leakage
Design:	Individual valve for pipe connection Individual valve, Manifold mounting
Actuation:	▪ 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
- 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
- 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:
$p_{contr.\ min}$ = 24 bar
$p_{contr\ max}$ = 320 bar

Pneumatic

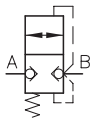
Control pressure:
$p_{contr.\ min}$ = 2... 3.5 bar
$p_{contr.\ max}$ = 15 bar

Manual

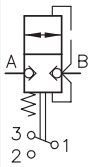
Actuation torque:
approx. 1.5 ... 3 Nm

Function

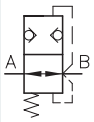
R



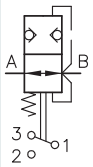
RK



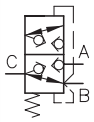
S



SK

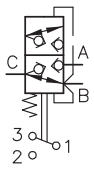


Z

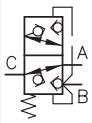


- Further circuit symbols available

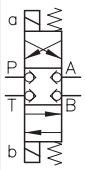
ZK



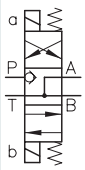
Y



G



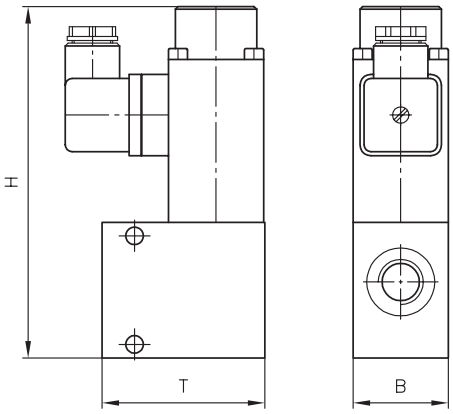
D



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

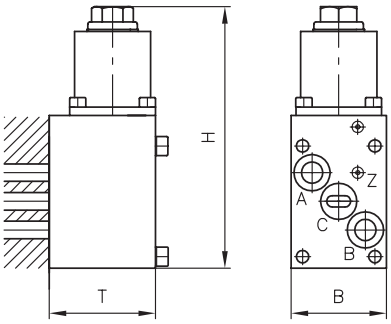
General parameters and dimensions

BVG



Version for pipe connection
(solenoid actuation)

BVP, NBVP



Version for base manifold mounting
(hydraulic actuation)

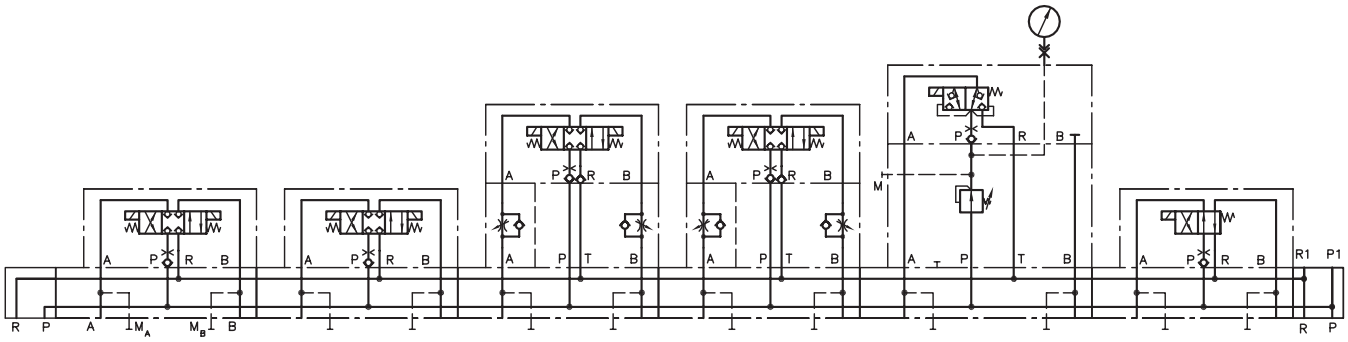
	Q_{max} [lpm]	p_{max} [bar]	Ports	Dimensions [mm]			m_{max} [kg]
			A, B, C	H_{max}	B_{max}	T_{max}	
BVG 1	20	400/250[1)]	G 1/4, G 3/8	115 (130)	60	40	1.6
BVP 1					35	39	1.0
NBVP 16	20	400/250[1)]	NG 6	230	45	45	2.1

[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

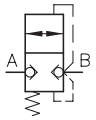
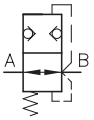
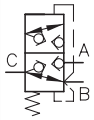
BVE1 - R -B1,0 - G 24 - 3/8

- **Port size or connection block** — **Version**
  - With threaded connection
  - For manifold mounting
- **Solenoid voltages** — 12 V DC, 24 V DC, 110 V AC, 230 V AC
- **Versions with**
  - M12 plug and 8 watt solenoid
  - AMP, DEUTSCH plugs
- **Additional elements** — Orifice in one port
- **Function**
  - 2/2-way directional valve (R, S)
  - 3/2-way directional valve (Z)
- **Basic type, size** — Type BVE, size 1, 3 and 5

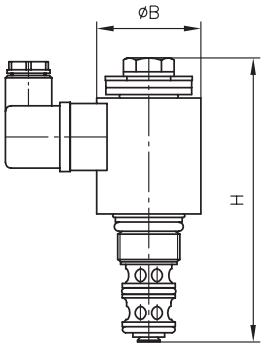
Actuations:

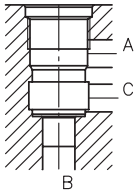
Solenoid

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

Nomen-clature:	**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
- Solenoid
- Mechanical: roller, feeler
- Manual: lever, turn-knob

Optional connection block For direct pipe connection

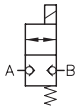
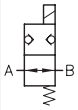
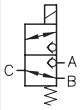
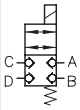
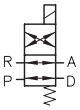
Function
2/2-way directional seated valve (R, S)
3/2-way directional seated valve (Z)
4/2-way directional seated valve (W, G)

Basic type, size Type VP, size 1
- Versions conforming ATEX

Actuation:

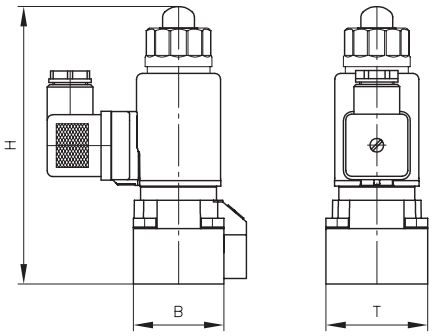
Solenoid	Hydraulic	Pneumatic
		
Solenoid voltage: 12V DC; 24V DC; 110V AC, 230V AC	Control pressure: $p_{control\ min}$ = 24 bar $p_{control\ max}$ = 320 bar	Control pressure: $p_{control\ min}$ = 2 ... 3.5 bar $p_{control\ max}$ = 15 bar

Function

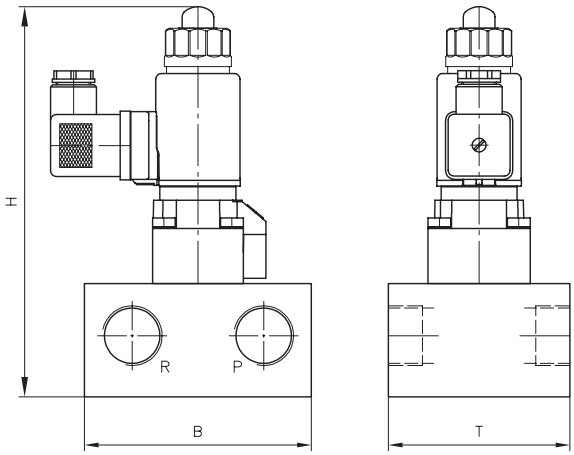
R	S	Z	G	W
				

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]
			A, B, C	H_{max}	B_{max}	T_{max}	
VP 1	15	400	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

2.2 Valve bank (nominal size 6) type BA

A valve bank combines different valves for operating independent consumers.
The directional valve bank type BA consists of several valve sections that are fitted to sub-plates with NG 6. Using these items compact control blocks can be assembled flexibly.
The intermediate plates type NZP make possible additional functions and contain, e.g., pressure-reducing valves, shock valves, load-holding valves etc. An intermediate plate can be inserted between the sub-plate and the valve. The valve bank type BA can be flange-mounted directly on the compact hydraulic power pack.

Features and benefits:

- Sub-plates for flexible combination of directional valve types with NG 6 (CETOP) standard connection pattern
- Valve bank can be flange mounted directly on the connection block of a compact hydraulic power pack or connected as a separately arranged valve bank for pipe connection
- Pressure switches and/or any other monitoring elements can be connected directly
- Additional elements, such as orifices, throttles and check valves for connections P, R, A and B can be integrated
- Hydraulic accumulator can be mounted directly

Intended applications:

- Clamping systems on machine tools and equipment
- Process control on deforming machine tools
- Brake and rotor adjustment modules on wind turbines

Nomenclature:	**Sub-plates/directional seated valve, zero leakage**
Version:	**Valve section with sub-plates for pipe connection**
Actuation:	**Solenoid** **Pressure-operated** ▪ **Hydraulic** ▪ **Pneumatic** **Manual** **Mechanical** ▪ **Pin** ▪ **Roller**
p_{max}:	**500 bar**
Q_{max}:	**50 lpm**

Design and order coding example

BA2 A5	NBVP16 NBVP16 NSWP2	S G G	B0,8 R B0,6 R	/ABR2,0/BBR1,5 /ABR1,0/BBR1,5	/A3B9/400 /50	/S /S	/0 /3 /0	- 1	- G24

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

End plate
- Drain valve with/without pressure switches
- with one or two accumulator ports with/ without release valve and/or with/without drain valve

Sub-plate
- Check valves with release
- Throttle
- Additional pressure gauge connections

Additional elements in R Return pressure stop

Pressure switch/pressure gauge in A and/or B

Additional elements in A, B Throttle check valve in A and/or B
Throttle valve in A and/or B

Additional elements in P Check valve
Orifice

Circuit symbol of the directional valve

Valve sections

Directional valves
- Type NSMD2, NSWP2, NBVP16, NBMD16, NG..-1, NZP16

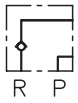
Intermediate plates for series connection
- Type CZ: with pressure-reducing valve in P gallery

Intermediate plates for parallel connection type NZP
- with throttle and/or throttle check valves
- with pressure-reducing valves
- with short-circuit and by-pass valves
- for random switching of a 2nd speed

Connection block
- Direct mounting onto type A, AF etc. connection blocks (for type KA, MP, MPN, HC, HK(F), HKL compact hydraulic power packs)
- Variant for pipe connection with/without pressure-limiting valve (A5)

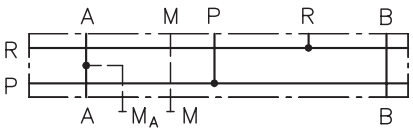
Function

Connection blocks/adapter plates:

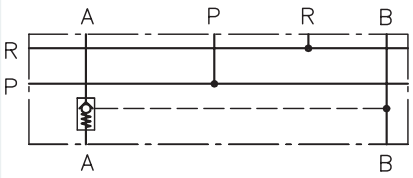
BA2 ..	BA2 A5	BA2 A8
Direct mounting onto type A, AF etc. connection blocks at type KA, MP, MPN, HC, HK(F), HKL compact hydraulic power packs	Version for pipe connection without pressure-limiting valve 	Like version BA2 A5 but with check valve in R 

Sub-plates for plate assembly valve

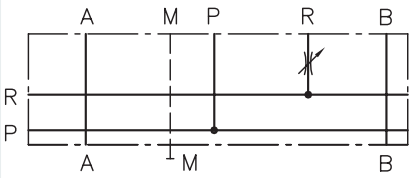
BA2.../0



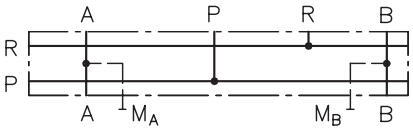
BA2../1



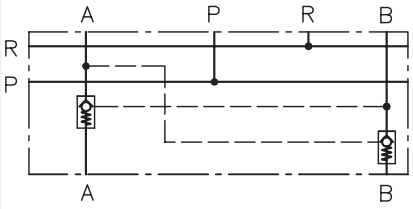
BA2../2



BA2../3



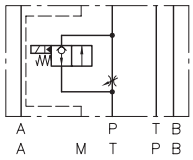
BA2../5



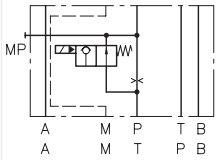
Valve section additional options

Intermediate plates for 2nd speed with orifice/throttle in P and T gallery

/NZP16(T)V/P(T)Q20...



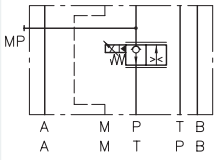
/NZP16(T)S/P(T)B...



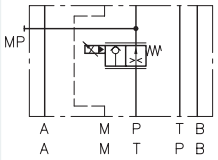
Example: .../NZP16TV/TB1.0/...
Type B1.0 orifice and type EM21V by-pass valve in T gallery

Intermediate plate for variable speed adaptation via proportional throttle in P and T gallery

/NZP16(T)VP

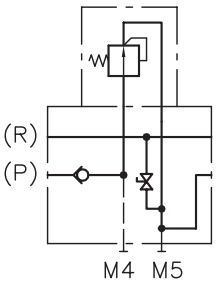


/NZP16(T)SP



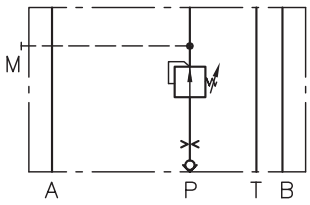
Example: .../NZP16VP/...
Type EMP21V proportional throttle valve in P gallery

Intermediate plate (series connection) with pressure-reducing valve for pressure reduction of the subsequent P gallery .../CZ...



Example: BAZ-CZ2/180/5R
Type CDK3 pressure-reducing valve set to 180 bar with check valve

Intermediate plates (parallel connection) with pressure-reducing valve in P gallery .../NZP16(26)CZ...

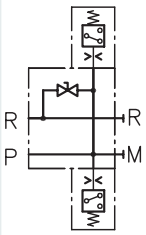
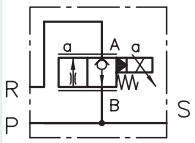
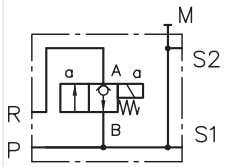


Example: .../NZP16CZ08/350/B0.8R/...
Type CDK0.8 pressure-reducing valve set to 350 bar with orifice and check valve in P gallery

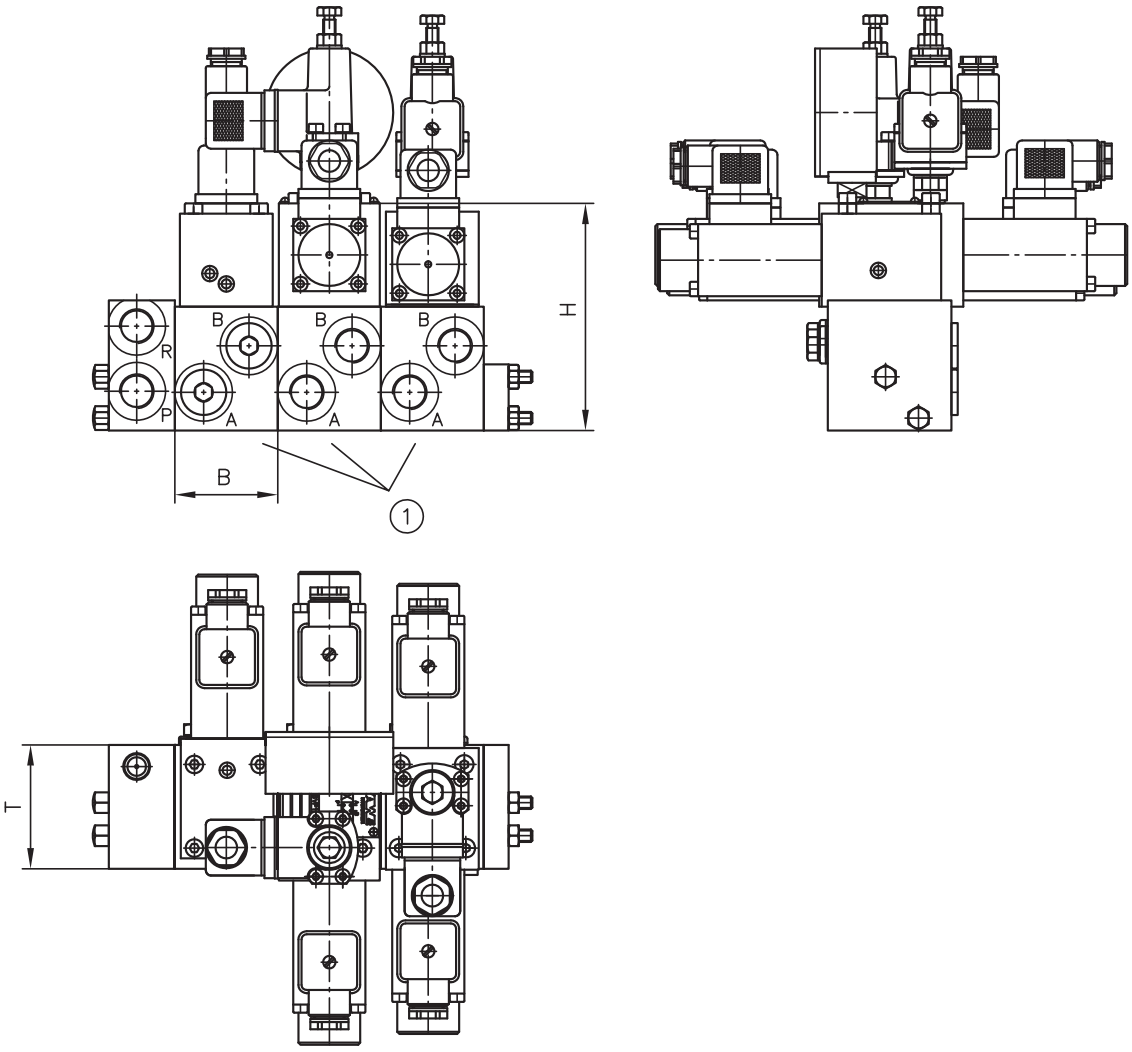
Actuations:

M:	Solenoid actuation (p_{max}= 400 bar)	P:	Pneumatic
GM:	Solenoid actuation (p_{max}= 250 bar)	A:	Manual actuation
H:	Hydraulic actuation	T:	Pin
		K:	Roller

End plates

-1	-6	-422	-8	-80/-8W	-880(88W)/...
Series	with drain valve	with drain valve and pressure switches	with accumulator port and drain valve	with accumulator port and release valve	with two accumulator ports and release valve
					

Mounted valve type BA



1 Sub-plates type BA2

	Q_{max} [lpm]	p_{max} [bar]	Ports (BSPP)	Dimensions [mm]			m [kg]
			A, B, P, R, M	H	B	T	Valve section
BA2	20	400	G 1/4, G 3/8	139	50	60	0,8

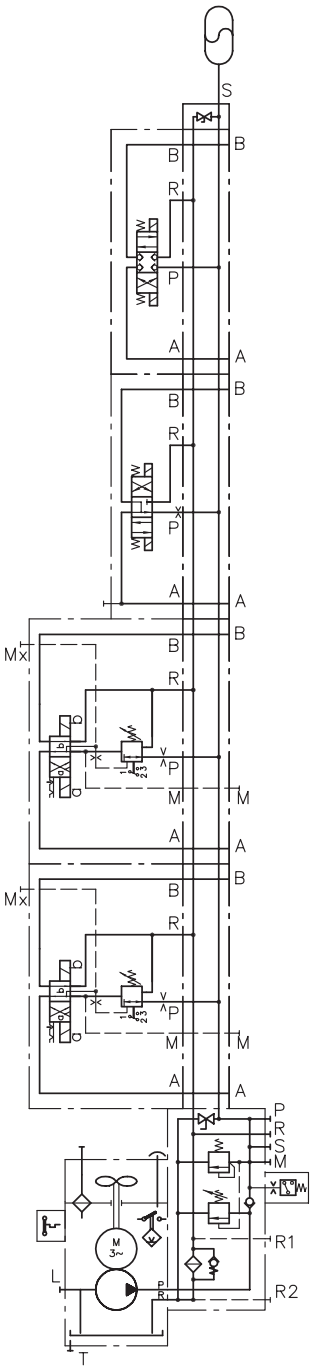
Circuit example:

HK 449 LDT/1 - Z16
- AL21R F2 - F/50/60 - 7/45

Type HK compact hydraulic power pack size 4;
connection block with accumulator charging valve, setting: 50 bar,
pressure-limiting valve,
setting: 60 bar,
filter and pressure switch,
setting: 45 bar

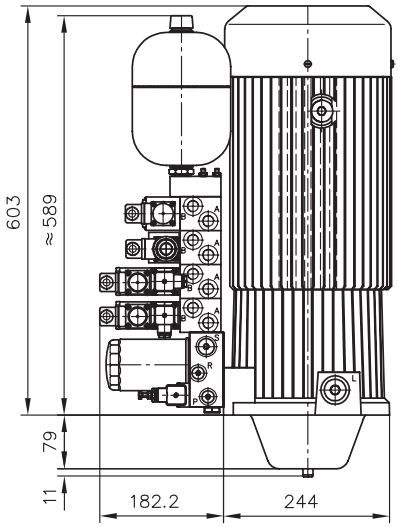
- BA2
- NSMD2W/GRK/B2.0/0
- NSMD2W/GRK/B2.0/0
- NSWP2D/B2.0/20/1
- NBVP16G/0
- 8 - AC2001/35 - L24

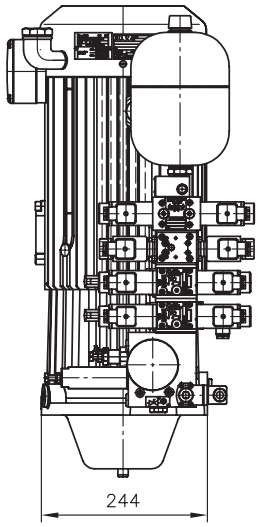
Type BA2 valve bank with four industrial standard valves mounted on sub-plates, two clamping functions for work piece clamping with combined option to adjust pressure and pressure switches, two additional functions for indexing and tool clamping



Parameters of the example circuit:

- Q_{Pu} = 16 lpm (at 1450 rpm)
- $p_{max\ Pu}$ = 110 bar
- p_{System} = 60 bar
  (pressure-limiting valve setting)
- $p_{switch\text{-}off\ feature}$ = 50 bar
- V_{load} = approximately 5 l





Associated technical data sheets:

- Valve bank (nominal size 6) type BA: D 7788
- Intermediate plate type NZP: D 7788 Z

Suitable compact hydraulic power packs:

- See chapter on hydraulic power packs

Suitable connection block:

- Type A: Page 62

Combined products:

- Clamping module type NSMD: D 7787
- Directional spool valves type NSWP: Page 72
- Directional spool valve type SWPN: D 7451 AT
- Directional seated valves type NBVP: Page 134

Suitable accessories:

- Pressure switches type DG: Page 262
- Hydraulic accumulator type AC: Page 258

Suitable plugs:

- Line connector type MSD and others: D 7163

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

Nomen-clature:	Valve combination consisting of: ■ 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

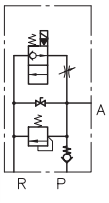
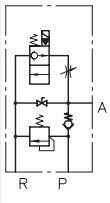
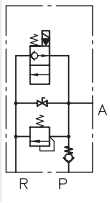
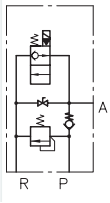
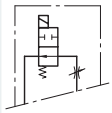
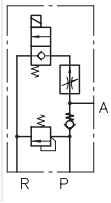
Solenoid voltage — 12 V DC, 24 V DC, 110 V AC, 230 V AC
HSV 21 and HSV 22 also in explosion-proof version

Pressure limiting valve — Manually adjustable or fixed, pressure setting in bar

Function

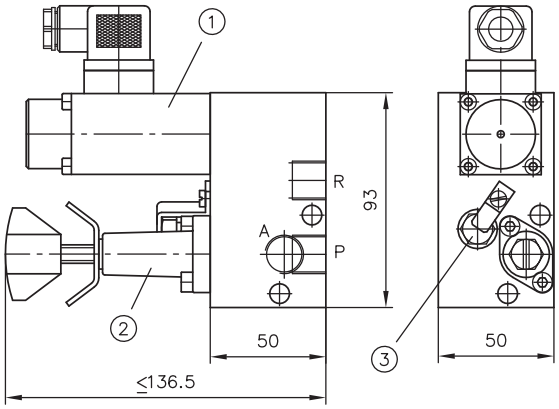
Basic type, size — Type HSV, sizes 2 and 7

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						

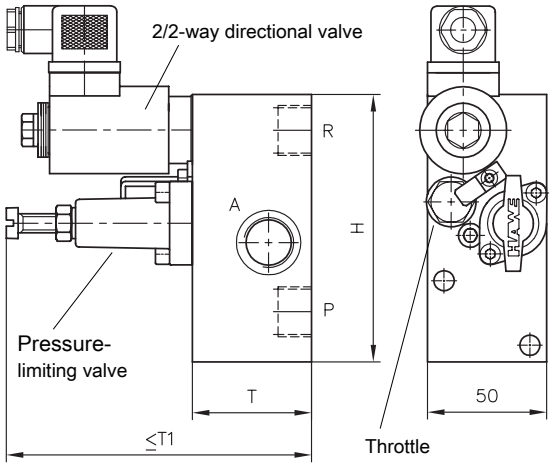
General parameters and dimensions

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

Nomen-clature:	**Valve combination consisting of:** ▪ 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**

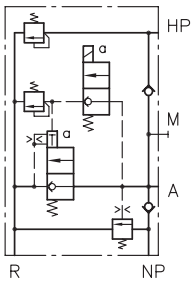
Pressure settings [bar] High-/low pressure

Actuation mode
- Solenoid
  Voltage of the actuation solenoids 24V DC, 230V AC 50/60 Hz
- Manually

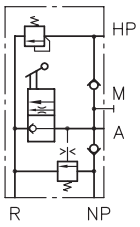
Basic type, size Type CR, size 4 and 5

Function

CR 4M; CR 5M

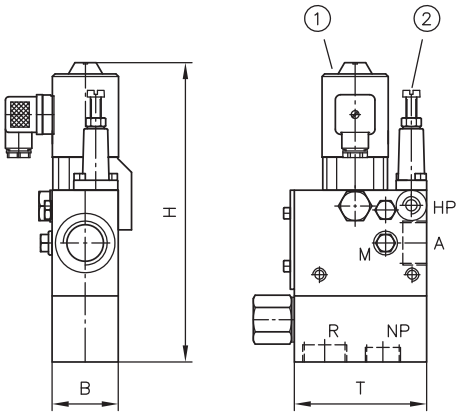


CR 4H



General parameters and dimensions

CR 4M



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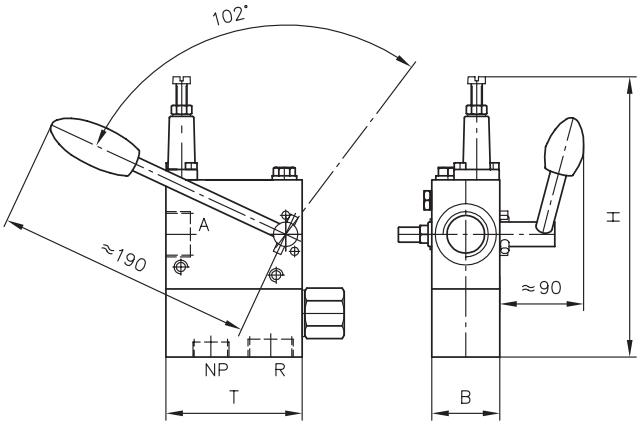


1 Actuating solenoid

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

Male connectors:

- Line connector type MSD and others: D 7163

Similar products:

- Two-stage valves type NE: Page 192

Hydraulic power packs:

- Compact hydraulic power packs type MP, MPN, MPNW, MPW: Page 50

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:** ▪ 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
- 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
- Connection blocks type SWR, SWS
  - 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)

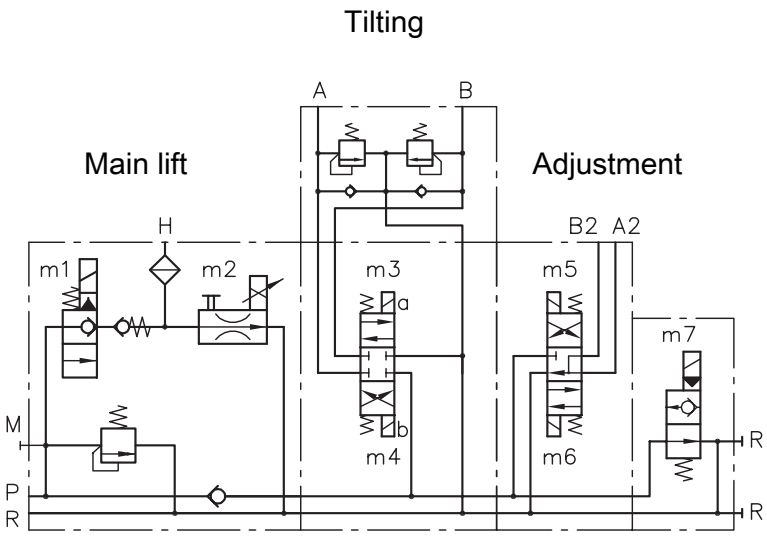
Drive concepts:

- 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

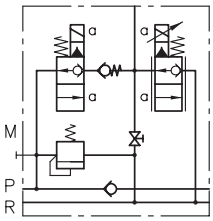
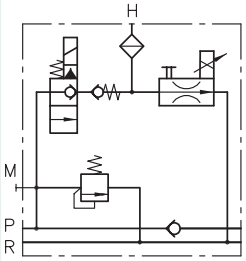
Lifting module type HMT, size 3, port size 4 with pressure-limiting valve (set to 200 bar), output controller with 70 l control orifice closed in normal position; segment G with shock and servo-suction valves (set values 40 and 130 bar) in ancillary block; end plate with idle circulation valve open in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



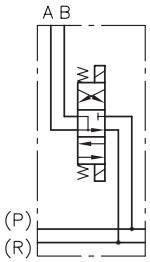
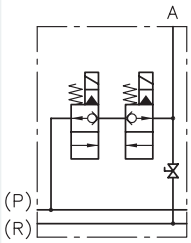
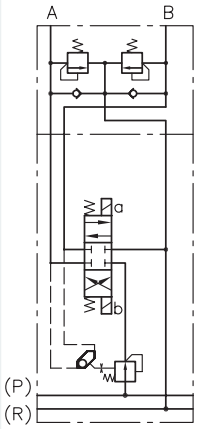
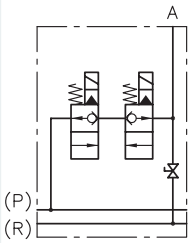
1 Main stroke
2 Tilt
3 Fork adjustment

Function

Lifting modules and connection blocks:

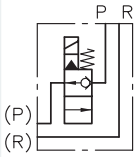
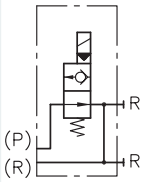
HST	HMT
	

Intermediate blocks (main and initial lift):

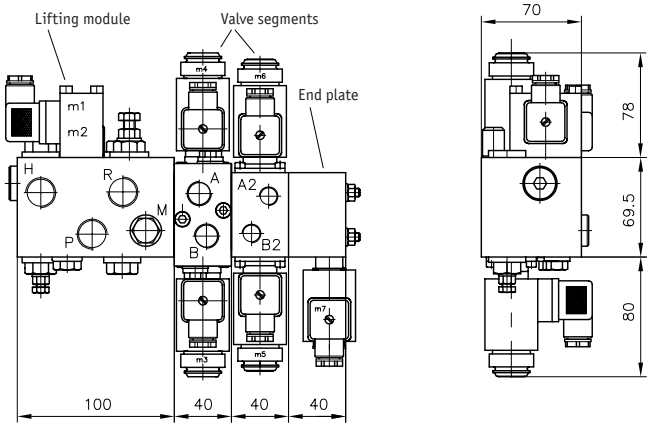
Size 2		Size 3	
D	**T2**	**G/M/DW/2 AN... BN...**	**T2**
			

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

End plates:

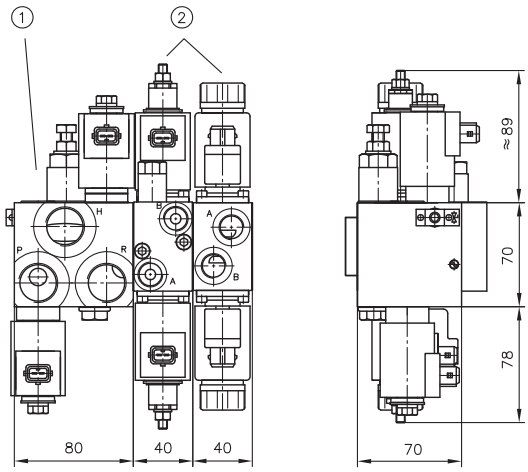
Size 2 and 3	Size 2 and 3	Size 3	Size 3
1	**2**	**21E**	**31E**
			

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