

2/2-, 3/2-, and 4/3-way seated valves type NBVP 16 with industrial standard connection pattern Cetop 3 conforming DIN 24 340-A6

for any flow direction, zero leakage

Pressure $p_{\max} = 400 \text{ bar}$
Flow $Q_{\max} = 20 \text{ lpm}$

Additional valves with same function

Type BVG 1 and BVP 1

see D 7765 ($Q_{\max} = 20 \text{ lpm}$, $p_{\max} = 400 \text{ bar}$)

Type BVG 3 and BVP 3

see D 7400 ($Q_{\max} = 60 \text{ lpm}$, $p_{\max} = 315 \text{ bar}$)

Type BVE

see D 7921 ($Q_{\max} = 70 \text{ lpm}$, $p_{\max} = 400 \text{ bar}$, cartridge valve)

Valve bank type BA

see D 7788

Intermediate plates type NZP

see D 7788 Z

1. General, brief description

The 2/2-, 3/2- and 4/3-way directional seated valves type NBVP 16 are cone seated valves and available with solenoid, hydraulic, pneumatic, or manual actuation. All ports of the 2/2- and 3/2-way directional valves are pressure resistant due to the internal pressure compensation.

Valves featuring a spring return will return automatically into their idle position when not activated. The detented version will achieve its idle or working position after a brief impulse at the opposing solenoid.

The 2/2- and 3/2-way directional valves are available with switching position monitoring and may be optionally equipped with directly mounted pressure switches.

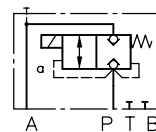
4/2- and 4/3-way valves and valves with switching position monitoring may be optionally equipped with pressure switches or pressure gauges, which can be directly mounted via the pick-up ports (G 1/8 (BSPP)) connected to the consumer ports A and B.

• Basic version

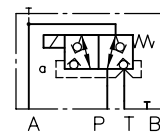


Example:

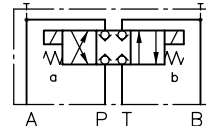
Type NBVP 16 R/2-G 24



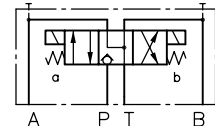
Type NBVP 16 Y/2-WG 230



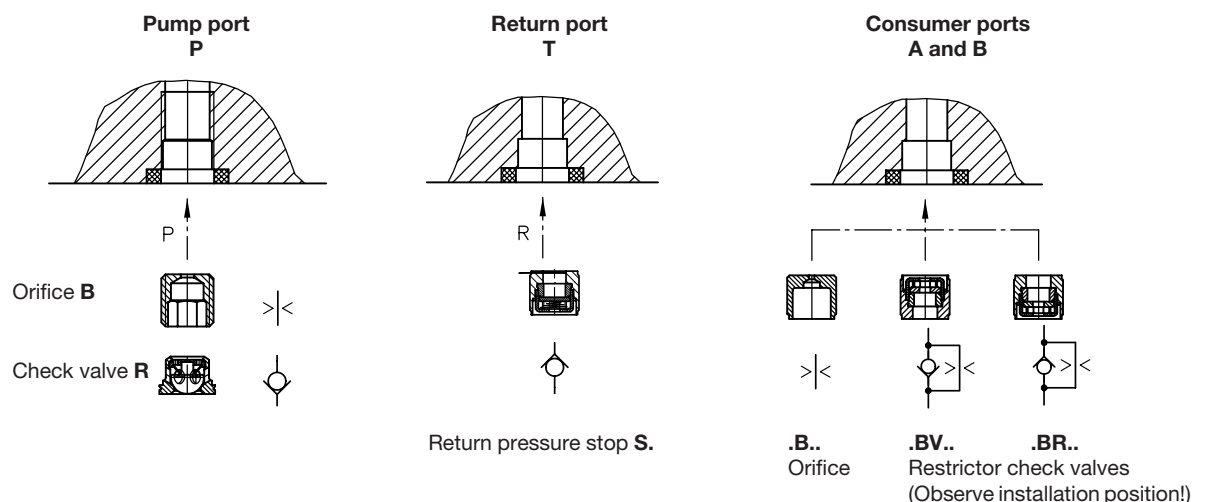
Type NBVP 16 G-GM 24



Type NBVP 16 D-WGM 230



• Additional elements for pump-, consumer- and return port



2. Available versions

2.1 Type coding, main data

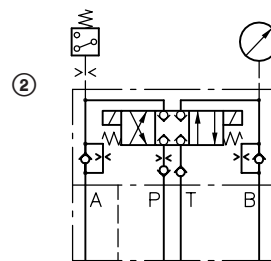
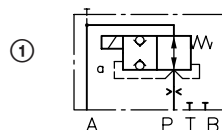
Order examples:

NBVP 16 S/B 0,8**/2****- WG 110**

①

NBVP 16 G/B 0,8 R/ABR2,0 BBR1,5 /A3 B9/400/S- GM 24 - 3/8

②

Sub-plate for pipe
connection (sect. 4.3)Actuation
(see table 7)Additional element in port T
(see table 6)Pressure switches and/or pressure
gauges (see table 5)Additional elements in
ports A and/or B
(see table 4)Additional elements in port P
(see table 3)**Table 1:** Basic type

Coding	Description	Flow Q_{max} (lpm)	Pressure p_{max} (bar)
NBVP 16	featuring a hole pattern conforming DIN 24340-A6	20	400 / 250 ¹⁾

Table 2: Symbols

(All valves are illustrated with solenoid actuation, for symbols with other actuations, see table 7)

R	S	B	Z	Y	ZD ²⁾

Q	K	RS	SR	W

J	G	D	DS
a+b = 4. switching position, when both solenoids are energized simultaneously			

RK RKM ²⁾	SK SKM ²⁾	ZK ZKM ²⁾	YK YKM ²⁾
Version ..K, electrical connection conf. DIN EN 175 301-803 A with plug acc.to the solenoid coding, see table 7 Version ..KM, electrical connection M12x1, without plug. For circuitry of the contact switch, see electrical data page 6.			

1) 250 bar with solenoid actuation coding GM..., WGM.. acc. to table 7

2) Coding G, WG only with solenoid actuation

Table 3: Additional elements in port P ⁵⁾

Additional element (also in combination)	Coding ³⁾	Ø (mm)
Orifice 	B 0,4	0,4
	B 0,5	0,5
	B 0,6	0,6
	B 0,7	0,7
	B 0,8	0,8
	B 0,9	0,9
	B 1,0	1,0
	B 1,1	1,1
	B 1,2	1,2
	B 1,4	1,4
	B 1,5	1,5
	B 1,8	1,8
	B 2,0	2,0
	B 2,4	2,4
	B 2,5	2,5
	B 3,0	3,0
	B 3,5	3,5
	B 4,0	4,0
Check valve 	R	---

Table 4: Additional elements in consumer ports A and/or B

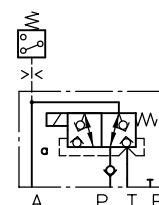
Additional element	Coding ^{3) 4)}		Ø (mm)
	all flow pattern symbols	only flow pattern symbols G, D	
Orifice in A and/or B 	AB 0,3	BB 0,3	0,3
	AB 0,4	BB 0,4	0,4
	AB 0,5	BB 0,5	0,5
	AB 0,6	BB 0,6	0,6
	AB 0,7	BB 0,7	0,7
	AB 0,8	BB 0,8	0,8
	AB 0,9	BB 0,9	0,9
	AB 1,0	BB 1,0	1,0
	AB 1,2	BB 1,2	1,2
	AB 1,5	BB 1,5	1,5
	AB 2,0	BB 2,0	2,0
	AB 2,5	BB 2,5	2,5
Restrictor check valve at A and/or B throttling the flow to the consumer 	ABV 0,6	BBV 0,6	0,6
	ABV 0,7	BBV 0,7	0,7
	ABV 0,8	BBV 0,8	0,8
	ABV 0,9	BBV 0,9	0,9
	ABV 1,0	BBV 1,0	1,0
	ABV 1,2	BBV 1,2	1,2
	ABV 1,5	BBV 1,5	1,5
	ABV 2,0	BBV 2,0	2,0
Restrictor check valve at A and/or B throttling the flow from the consumer 	ABR 0,6	BBR 0,6	0,6
	ABR 0,7	BBR 0,7	0,7
	ABR 0,8	BBR 0,8	0,8
	ABR 0,9	BBR 0,9	0,9
	ABR 1,0	BBR 1,0	1,0
	ABR 1,2	BBR 1,2	1,2
	ABR 1,5	BBR 1,5	1,5
	ABR 2,0	BBR 2,0	2,0

Table 5: Pressure switches and/or pressure gauges at ports A and/or B

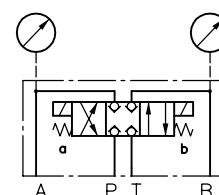
	Coding dep. on flow pattern symbols		
	R, S, B, Z, Y ¹⁾	ZD, G, D, DS, W, Q, RS, SR, K, J Connection A	G, D, DS, Q, RS, SR, W, K Connection B
Pressure switch/metering range (adjustable range (bar))			
without DG (prepared for retrofitting)	2	---	---
DG 33 (200...700) acc. to	3	A3	B3
DG 34 (100...400) D 5440	4	A4	B4
DG 35 (20...250)	5	A5	B5
DG 36 (4...12)	6	A6	B6
DG 365 (12...170)	7	A7	B7
DG 364 (4...50)	8	A8	B8
DG 5 E-100 acc. to	5E1	A5E1	B5E1
DG 5 E-250 D 5440 E/1	5E2	A5E2	B5E2
DG 5 E-400	5E4	A5E4	B5E4
DG 5 E-600	5E6	A5E6	B5E6
DG 61 acc. to	6E1	A6E1	B6E1
DG 61 R D 5440 F	6ER1	A6ER1	B6ER1
DG 62	6E2	A6E2	B6E2
DG 62 R	6ER2	A6ER2	B6ER2
DG 64	6E4	A6E4	B6E4
DG 64 R	6ER4	A6ER4	B6ER4
Pressure gauge with scale up to (bar) acc. to			
100 D 7077	---	A9/100	B9/100
160	---	A9/160	B9/160
250	---	A9/250	B9/250
400	---	A9/400	B9/400
600	---	A9/600	B9/600

Examples:

NBVP 16 Y/R/5-GM 24



NBVP 16 G/A9/400 B9/400-G 24



¹⁾ Mounting of a pressure gauge or another additional element instead of the pressure switches is possible via the fitting Y9-X84.. acc. to D 7077

²⁾ With ports G 1/8 (BSPP) for pressure gauge

³⁾ Part No. for spare parts order etc. see section 5.1 "Appendix"

⁴⁾ Versions A(B) BR.. and A(B) BV.. are identical, only install position differs (see illustration sect. 1)

⁵⁾ not available with symbol B

Table 6: Additional elements at port T

Additional element	Coding	Open-up pressure
without	---	
Return pressure stop (check valve) 	S	approx. 0.07 bar
	S 0,2	approx. 0.2 bar
	S 1	approx. 1.0 bar

Table 7: Actuation modes

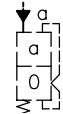
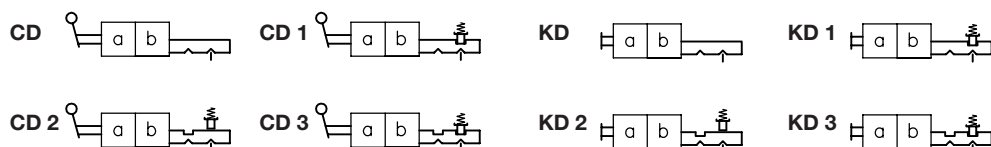
Actuation	Pressure p _{max} (bar) ⁴⁾	for symbols	Coding With plug	Plug with LED	Without plug	Main data, also see section 3.2	
Solenoid	400	R, S, B, Z, Y, ZD Q, K, RS, SR, W ⁵⁾ J, G, D, DS	G 12 G 24 WG 110 ²⁾ WG 230 ²⁾	L 12 L 24 --- ---	X 12 X 24 X 98 X 205	U _N = 12 V DC U _N = 24 V DC U _N = 110 V AC, 50/60 Hz (98 V DC) U _N = 230 V AC, 50/60 Hz (205 V DC)	
	250	R, S, B, Z, Y, ZD Q, K, RS, SR, J, G, D, DS	GM 12 ³⁾ GM 24 ³⁾ WGM 110 ^{2) 3)} WGM 230 ^{2) 3)}	LM 24 LM 24 --- ---	XM 12 XM 24 XM 98 XM 205	U _N = 12 V DC U _N = 24 V DC U _N = 110 V AC, 50/60 Hz (98 V DC) U _N = 230 V AC, 50/60 Hz (205 V DC)	
	250	R, S, B, Z, Y, K, RS, SR, J, G, D, DS	M 24/8W	---	---	U _N = 24 V DC, 8 Watt	
	250	R, S, B, Y, ZD, K, RS, SR, J, G, D, DS	G 24 EX ¹⁾	---	---	U _N = 24 V DC	
	400	Z					
Hydraulic	400	R, S, B, Z, Y, Q, K, RS, SR, W ⁵⁾ J, G, D, DS	H 1/4	External control G 1/4 (BSPP)		Control pressure: p _{contr min} = 24 bar p _{contr max} = 400 bar	
Pneumatic	400		P	External control G 1/4 (BSPP)		Control pressure: p _{contr min} = 3 bar p _{contr max} = 15 bar	
Mechanical	400	R, S, B, Z, Y, Q, K, RS, SR, W ⁵⁾	T	Pin		Actuation force: F = appr. 80 ... 190 N	
			K	Roller		Actuation force: F = appr. 22 ... 35 N	
Manual			A	with hand lever (spring return)		Actuation moment: appr. 1.5 ... 3 Nm	
Manual with detent			CD	With hand lever		Actuation moment: appr. 1.5 ... 3 Nm	
			KD ⁶⁾	Without hand lever			
Symbole		Solenoid	Hydraulic H 1/4	Pneumatic P	Pin T	Mechanical Roller K	Manual A
							

Table 7 a: Additional lock at actuation CD, KD with detent

--	without (no coding)	2	in working position a
1	in working position b	3	in working position a and b

Symbole



¹⁾ Explosion-proof version ($p_{\max T} = 250 \text{ bar}$ with symbol Z)

²⁾ DC-solenoid (98 V DC, 205 V DC) with bridge rectifier in the plug

³⁾ Versions GM, WGM, LM, XM are priced lower than version G, WG etc.; Observe their reduced pressure rating!

⁴⁾ Observe the max. pressure specification at T (see sect. 3.1)

⁵⁾ Symbol W permissible pressure $p_{\max} = 250 \text{ bar}$

⁶⁾ Actuation with tool a/f 13

3. Further characteristic data

3.1 General and hydraulic data

Installed position	Any
Overlap at 3/2-way valves	Negative (overlap only apparent during transition from one to the other end position). All ports are interconnected during the switching process.
Operating pressure	$p_{\max}$ acc. to table 7, sect. 2.1 $p_{\max T} = p_{\max}$ - symbols R, S, Z, Y = 250 bar - symbol Z (- G 24 EX) = 250 bar - symbol ZD = 50 bar - symbols B, Q, K, RS, SR, W, G, D, DS The pressure at T has to be always be lower than the pressure apparent at P or A and B
Static overload capacity	Ports P, A, and B approx. $2 \times p_{\max}$
Housing material and surface coating	Steel, gas nitrided (basic valve)

Mass (weight) approx. kg	Complete with actuation	NBVP 16 B NBVP 16 R NBVP 16 S	NBVP 16 Z NBVP 16 Y	NBVP 16 ZD (Q, K, RS, SR, W)	NBVP 16 G (J) NBVP 16 D (DS)
Solenoid	G., G 24 EX, L., X., WG., M..	1.5	1.7	2.1	2.4
	GM., LM., XM., WGM..	1.4	1.6	1.9	2.2
Hydraulic	H 1/4	1.1	1.3	2.3	3.0
Pneumatic	P	1.0	1.2	1.6	1.6
Manual	A	1.4	1.6	2.0	---
Manual with detent	CD, KD	1.4	1.6	1.9	---
Mechanical	T	1.1	1.3	1.7	---
	K	1.4	1.6	2.0	---

per pressure switch + 0.3

Pressure fluid Hydraulic oil conforming DIN 51524 part 1 to 3: ISO VG 10 to 68 conforming DIN 51519.
Viscosity limits: min. approx. 4, max. approx. 1500 mm²/s; opt. operation approx. 10... 500 mm²/s.
Also suitable are biologically degradable pressure fluids types HEPG (Polyalkylenglycol) and HEES (Synth. Ester) at service temperatures up to approx. +70°C.

Temperature Ambient: approx. -40...+80°C; Fluid: -25...+80°C, pay attention to the viscosity range!
Start temperature down to -40°C are allowable (Pay attention to the viscosity range during start!), as long as the operation temperature during subsequent running is at least 20K higher. Biological degradable pressure fluids: Pay attention to manufacturer's information. With regard to the compatibility with sealing materials do not exceed +70°C.

Restrictions for version with ex-proof solenoid!

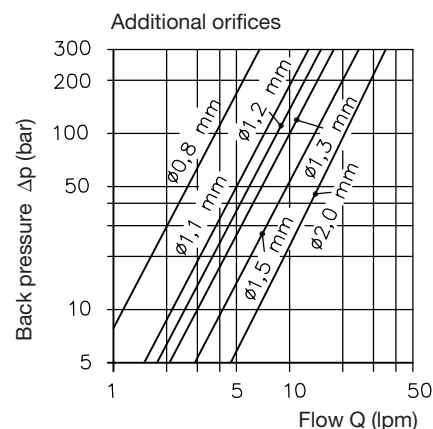
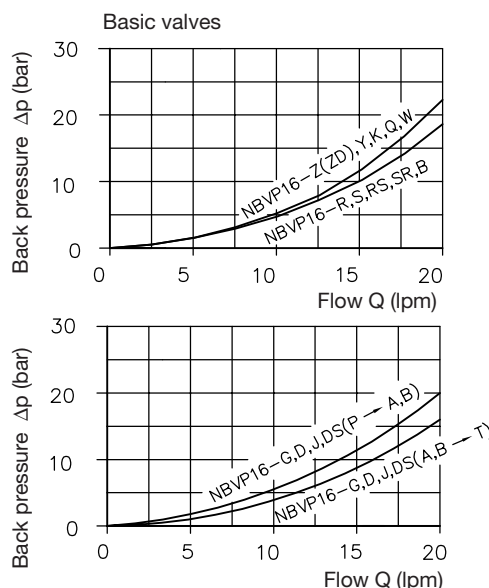
Attention: Observe the restrictions regarding the perm. duty cycles of the solenoids in sect. 3.2!

Flow $Q_{\max} = 20$ lpm
Trigger point for valves with switching position monitoring $Q \leq 1$ lpm

Flow limitation It is necessary to limit the flow down to the permissible range depending on the system pressure via orifices (see sect. 2.1). This applies to all circuits fed by an accumulator or when connected to high pressure circuits fed by high delivery pumps.
The orifice must be located on the accumulator side always. For more detailed information, see table 3 and 4, section 2.1.

The check valves (see table 3 and 6 in sect. 2.1) prevent an undesired reversal of the flow direction.

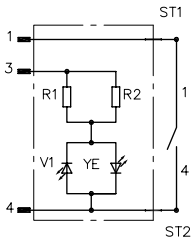
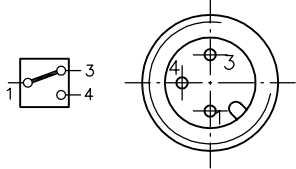
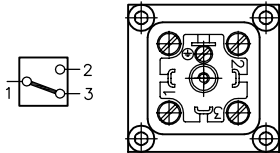
Δp -Q curve



Viscosity during measurements approx. 60 mm²/sec

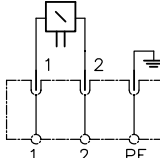
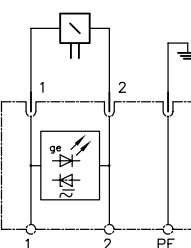
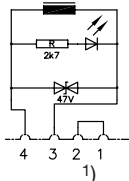
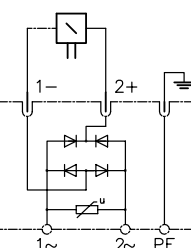
Electrical data for
contact switch

Type	V4NC SET 7 Co. SAIA-Burgess	
Mech. service life	5 x 10 ⁶	
Electr. service life (approx. cycles)	12 V, 3 A = 0,05 x 10 ⁶ , 100 mA = 3 x 10 ⁶ (cos φ = 1)	
Power supply	12 V DC, 5 A 24 V DC, 5 A	
	To ensure save function the min. current specifications must be maintained; I _{min} (12 V DC) = 10 mA, I _{min} (24 V DC) = 100 mA	
Plug	DIN EN 175 301-803	M12x1
Protection class (properly assembled)	IP 65 (acc. to IEC 60529)	IP 67 (acc. to IEC 60529)
Circuitry	Idle position 1-3 Working position 1-2	Working position 1-4



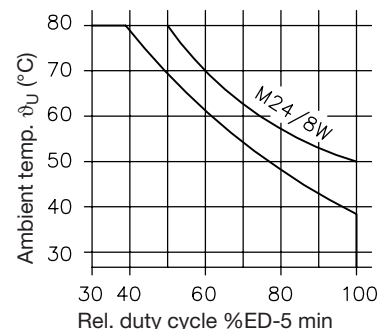
3.2 Actuators

Solenoid

		All solenoids are built and tested acc. to VDE 0580									
Coding		G 12 L 12 X 12	GM 12 LM 12 XM 12	G 24 L 24 X 24	GM 24 LM 24 XM 24	G 24 EX ---	M 24/8W ---	WG 110 ---	WGM 110 ---	WG 230 ---	WGM 230 ---
Nom. voltage	U_N (V)	12	12	24	24	24	24	110	110	230	230
DC-voltage							AC-voltage, 50 and 60 Hz				
Nom. power	P_N (W)	29.4	26.2	27.6	26.5	23.4	8	28.6	24.8	30.2	28
Connection and circuitry Vers. G, GM, L, LM, WG, WGM: All plugs DIN EN 175 301-803 For additional plugs, see D 7163 Version G 24 EX: Cable cross section 3x0.5 mm ² , Cable length 3 m, Option 10 m (cable ÖLFLEX-440P ® Co. LAPP, D-70565 Stuttgart) Version M 24/8W: Plug M12x1 - DESINA		DC-voltage Type G... (applies also to contact switch)  Type L...  Type M 24/8W  AC-voltage Type WG..  									
Switching time (reference value)		On or Off: approx. 50...60 ms, at M 24/8W and longer with WG...									
Switching/hour		approx. 2000, approximately evenly distributed									
Min. pulse duration		approx. 500 ms with flow pattern ZD									
Protection class		IP 65 (IEC 60529) (plug properly mounted) IP 67 (IEC 60529 with G 24 EX and M 24/8W)									
Insulation material class		F									
Contact temperature		approx. 120°C, with ambient temperature 20°C									
Switch-off energy		$W_A \leq 0.4$ Ws									
Surface coating (solenoid)		DIN 50961-Fe/Zn 12 bk cC									

1) Terminals 1+ 2 optionally for diagnosis

Relative duty cycle during operation
(100% ED stamping on the solenoid)



Electrical data for ex-proof solenoids

ATEX-Certificate of conformity

Coding

Oper. duration

Duty cycle

Nom. voltage U_N

Power P_N

Restrictions for use:

Ambient temperature

max. fluid temperature

el. protection against overload (conf. IEC 60127)

Surface coating

TÜV-A 12ATEX 0006 X

⊕ II 2 G Ex d IIB + H2 T4 Gb

⊕ II 2 D Ex tb IIIC T135°C Db

100% ED

IP 67 (IEC 60529)

24 V DC

23 W

-35 ... +40°C

+70°C

$I_F < 1.6$ A-T

Housing galvanically zinc coated

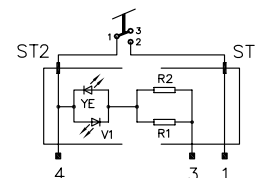
Coil and connection cavity are moulded

Attention: Protect the complete valve against direct sun light.

Observe the operation manuals B 03/2004 and B ATEX!

Electrical lay-out and testing conforming EN 60079, VDE 0170-1, VDE 0170-5

Circuitry switching position monitoring: Version .KM (plug M12x1)

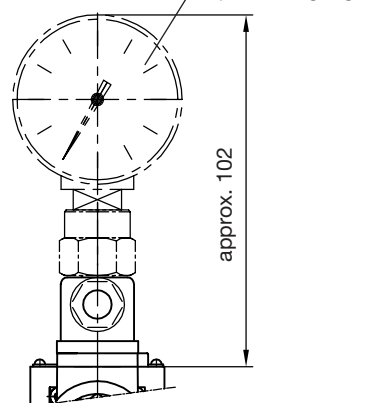
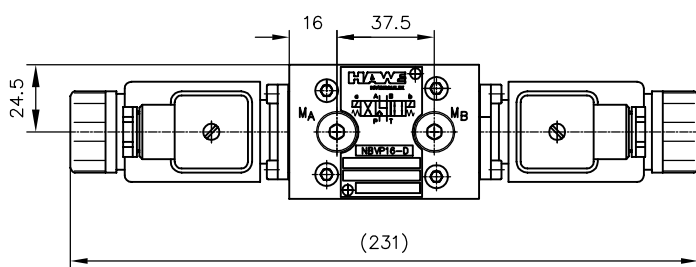
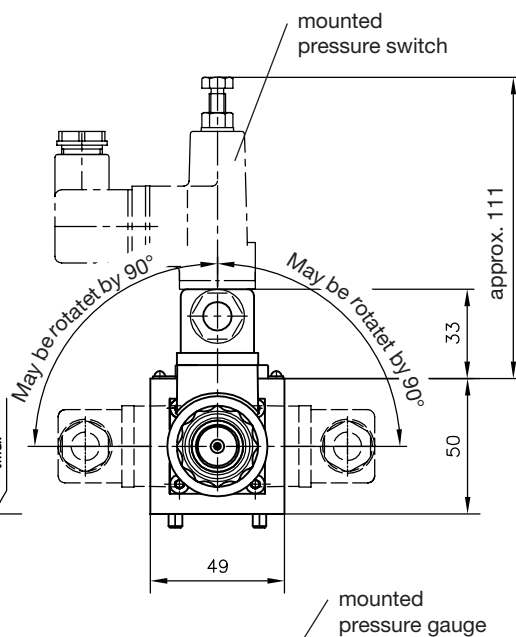


		Hydraulic (coding H 1/4)	Pneumatic (coding P)	Manual (coding A, CD, KD)	Mechanical (coding T) (coding K)	
Control pressure	$p_{contr min}$	24 bar	3 bar	---	---	---
	$p_{contr max}$	400 bar	15 bar	---	---	---
Permissible residual pressure in the control line for save return into the idle position		< 2 bar	---	---	---	---
Z static overload capacity		appr. 1.5 $p_{contr max}$ bar	appr. 1.5 $p_{contr max}$ bar	---	---	---
Control displacement (geometric)		1.4 cm ³	9.3 cm ³	---	---	---
Housing material and surface coating		Steel (control housing) zinc galvanized	Light alloy (control housing) black anodized	Steel (lever housing) gas nitrided	Steel (control housing) gas nitrided	---
Actuation moment		---	---	appr. 1.5 ... 3 Nm	---	---
Actuation force		---	---	---	appr. 80..190 N	appr. 22..35 N

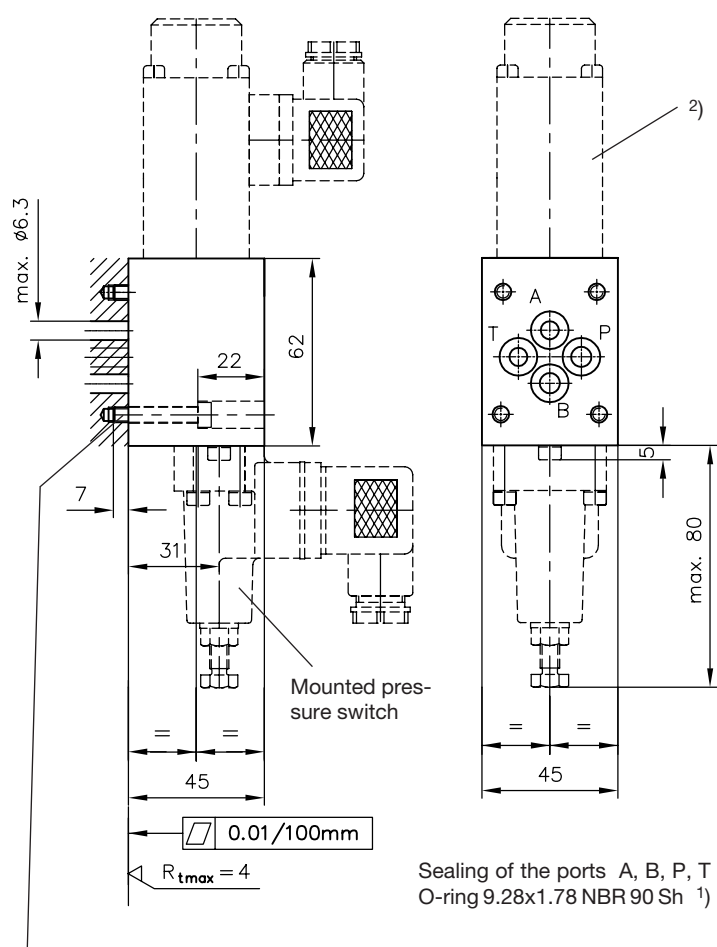
Technical drawing of a mechanical part showing dimensions and tolerances. The drawing includes a top view and a side view. Key dimensions and tolerances are:

- Top view dimensions: 0.75, 12.7, 21.5, 30.2, 40.5, 6.25, 32.5, 45, max. 6.3.
- Side view dimensions: 0, 5.1, 15.5, 25.9, 31, 0.75, 12.7, 21.5, 30.2, 40.5, 6.25, 32.5, 45, max. 6.3.
- Feature labels: A, B, P, T.
- Thread specification: M5, 8 deep.

Manual emergency actuation

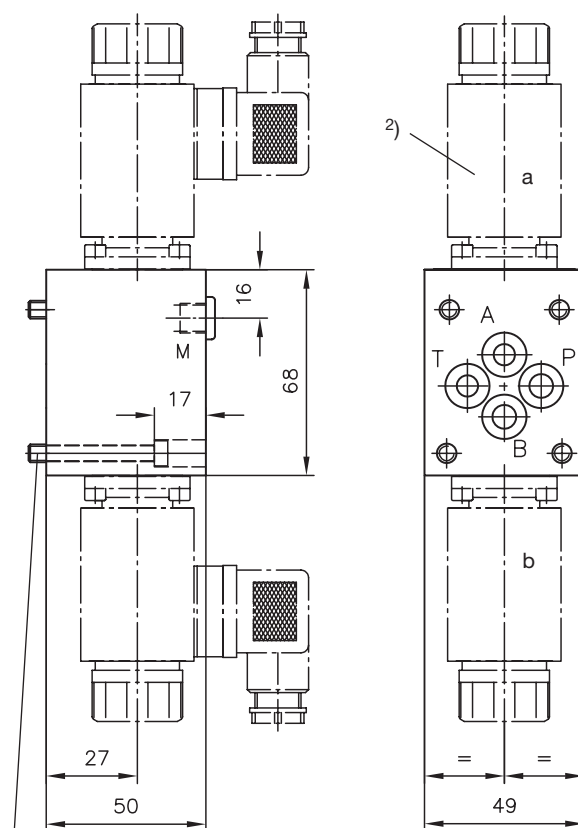


Type NBVP 16 R
NBVP 16 S
NBVP 16 B
NBVP 16 Z
NBVP 16 Y



4x Socket head screws
ISO 4762-M5x30-12.9, $\Rightarrow$ 9.3 Nm

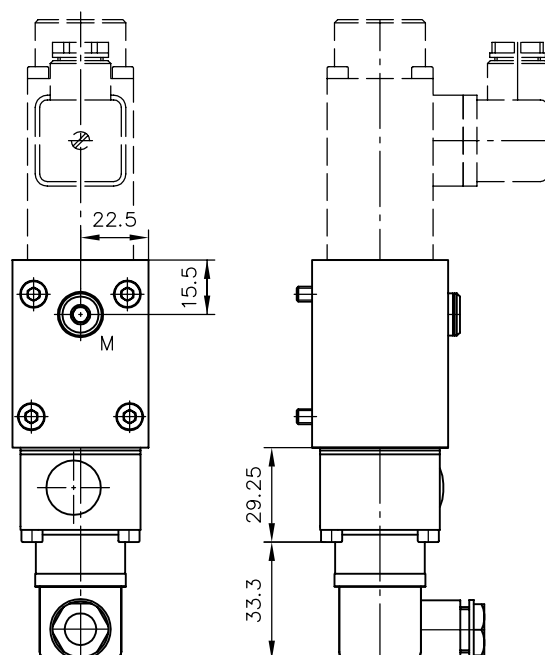
Type NBVP 16 ZD



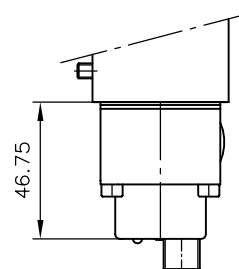
1) Part of seal kit DS 7765-1 (including O-rings for actuation, H 1/4)

2) For dimension of the differing actuations, see section 4.3!

Type NBVP 16 RK
NBVP 16 SK
NBVP 16 ZK
NBVP 16 YK



Type NBVP 16 RKM
NBVP 16 SKM
NBVP 16 ZKM
NBVP 16 YKM



For missing dimensions, see above

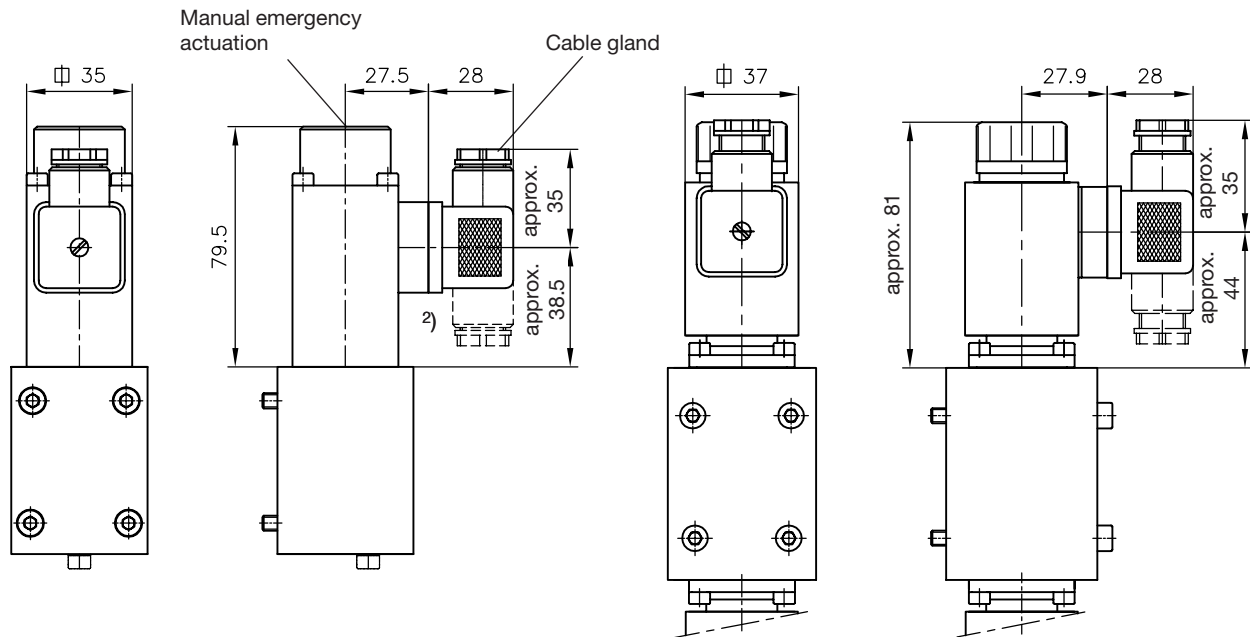
4.3 Control elements

Electrical actuation

Coding G and WG

Symbols R, S, B, Z, Y

Symbols Q, RS, SR, K, W, ZD, G, D, DS, J

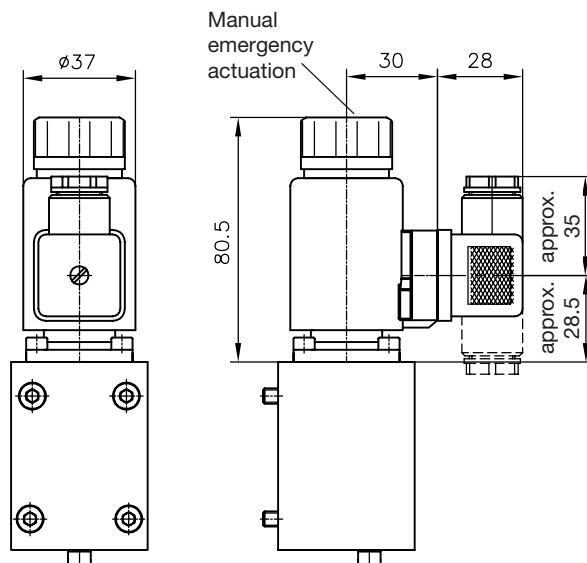


1) **Note:** This dimension depends on the manufacturer and may be max. 40 mm acc. DIN EN 175 301-803!

2) Solenoid may be installed off-set by 4x90°. Plug may be installed off-set by 2x180°.

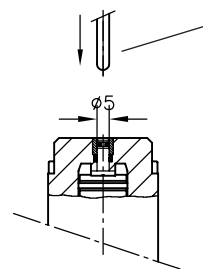
Coding GM and WGM

(all symbols beside W)



Manual emergency actuation

(applies to all solenoid versions)



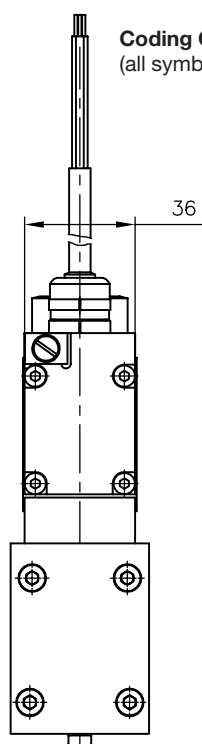
Actuation aid (do not use any sharp-edged parts)

The valve can be actuated, if required, by pushing the emergency actuation pin inward (visible from the top side) by means of a screw driver or similar.

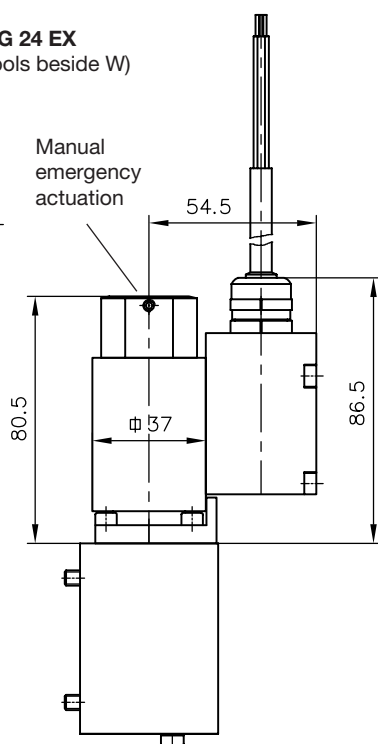
Note:

The pressure at port B acts on the cross section area of the brass pin Ø5, i.e. 100 bar will result in 195 N!

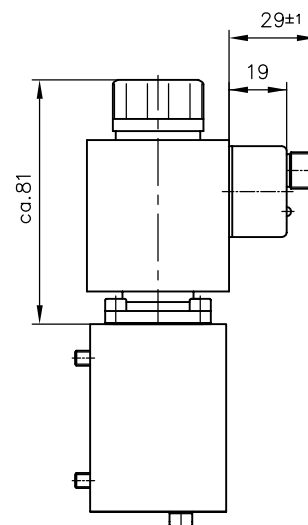
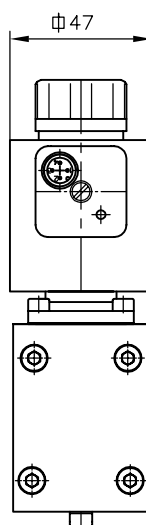
Continuation „Solenoid actuation“



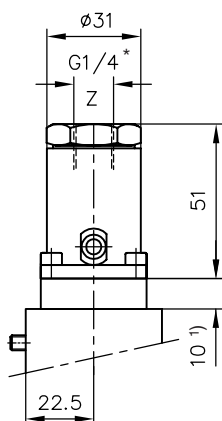
Coding G 24 EX
(all symbols beside W)



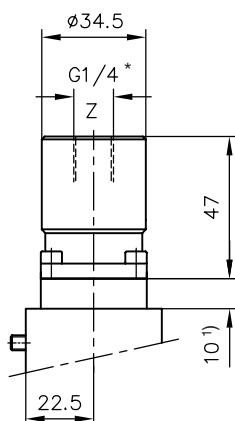
Coding M 24/8W
(all symbols beside W)



Hydraulic 1)
Coding H 1/4

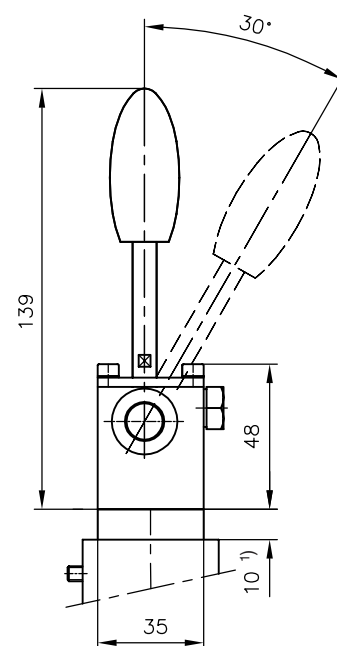
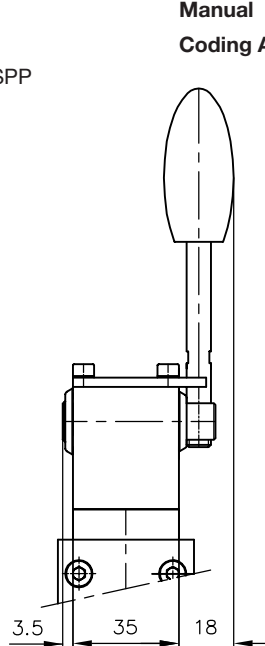


Pneumatic 1)
Coding P



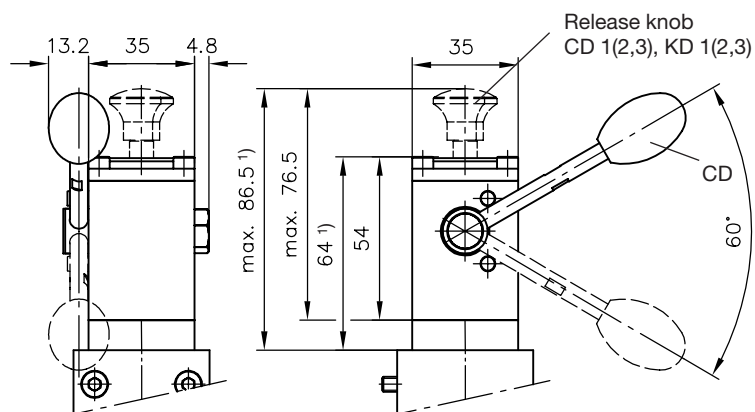
* = BSPP

Manual 1)
Coding A

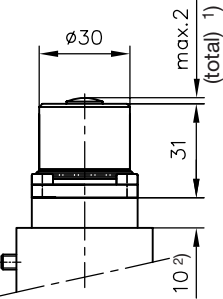


1) intermediate plate apparent with symbols
Q, K, RS, SR, W, D, DS, J, G

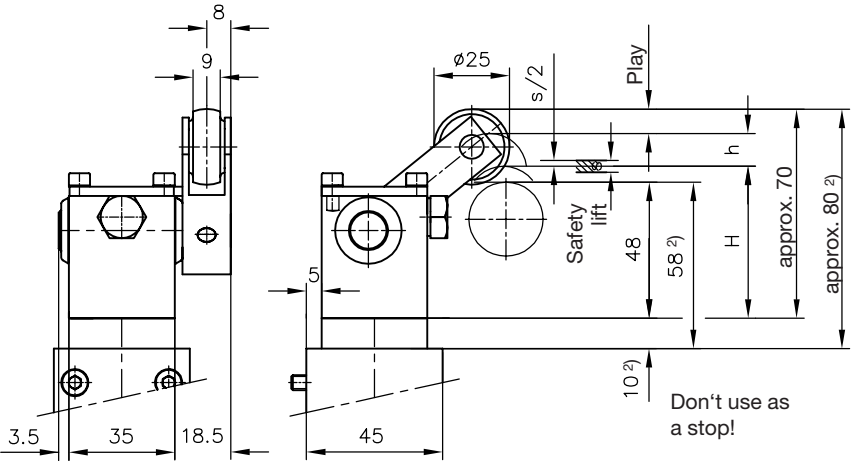
Manual with detent
Coding CD, KD



Mechanical
Coding T



Coding K



Actuation force F at 100 ... 400 bar:
Type NBVP 16 R.-T = 80 ... 140 N
NBVP 16 Z.-T = 140 ... 190 N
NBVP 16 S.-T = 140 ... 190 N

Working storke (mm) with		NBVP 16 R.-K	NBVP 16 S.-K	NBVP 16 Z.-K
Start of function	(H+h)	66	66	66
Functional storke	h	14	10	14
Switching position range	s	---	±1	±1
Actuation force	N	approx. 26	approx. 22	approx. 35

- 1) Distribution: Play 0.5 mm
Working stroke 1 mm
Safety lift 0.5 mm
- 2) intermediate plate apparent with symbols Q, K, RS, SR, W, D, DS, J, G

