

2/2-way cartridge valves with position monitoring

RE 21017/09.08

Nominal size (NG) 16 to 50
Maximum working pressure 315 bar



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Features

- Small installation volume, low weight
 - Service-friendly
 - Can control large flow rates
 - Low pressure peaks
 - Low leakage flow
 - High switching speed
 - Short-circuit-proof position switch
 - Optional add-on pilot valve
 - Optional differential piston (active logic)
- Further information:
- 2-way cartridge valves (passive)
1987761105, RE 21010, RE 21050
 - 2-way cartridge valves with position switch RE 21015

For information regarding the available spare parts see:
www.boschrexroth.com/spc

General information

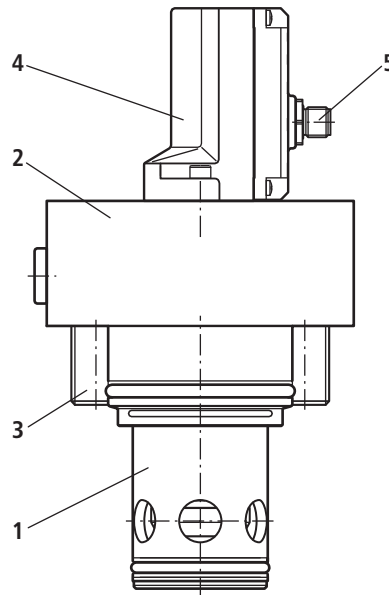
- 1 Valve body
- 2 Valve cover
- 3 Fastening bolts
- 4 Inductive position switch
- 5 M12 connector (4-way)

2/2-way cartridge valves are designed for compact cartridge-type installation.

The power section with ports A and B is integrated in a locating hole standardized to ISO 7368 in the control block, and is sealed with a cover.

This technology has become known as cartridge technology. The definitive term "2-way cartridge valves" was established by ISO standard 7368. With this technology, valve elements without their own casing are inserted in mounting holes and linked to one another via connecting holes to form complex valve control systems.

Installation in the control block means that the hoses and/or pipes otherwise needed to connect the valves to one another can be dispensed with. In this way, complex, compact hydraulic systems can be achieved simply.



Version without pilot valve ("remote controlled")

System components

1.1 Cartridge element (in the form of a poppet valve with cushioning pin)

Cartridge valves are hydraulically controlled poppet or spool valves with two working ports (A, B) and one or two control ports: X, plus Z in the case of the differential cartridge.

Y is usually the drain port. The valves are available in sizes 16, 25, 32, 40 and 50. The size is selected primarily on the basis of the flow that is to be controlled. Further criteria are the flow resistance of the cartridges and their area ratio.

1.2 Valve cover

The task of the valve covers is to seal the hole for the installed elements, but also to act as a link between the cartridge and the pilot valve.

2.1 Pilot valve

In the pilot-operated version with connection facility for NG6 directional control valves, the mounting hole configuration conforms to DIN 24340-A6.

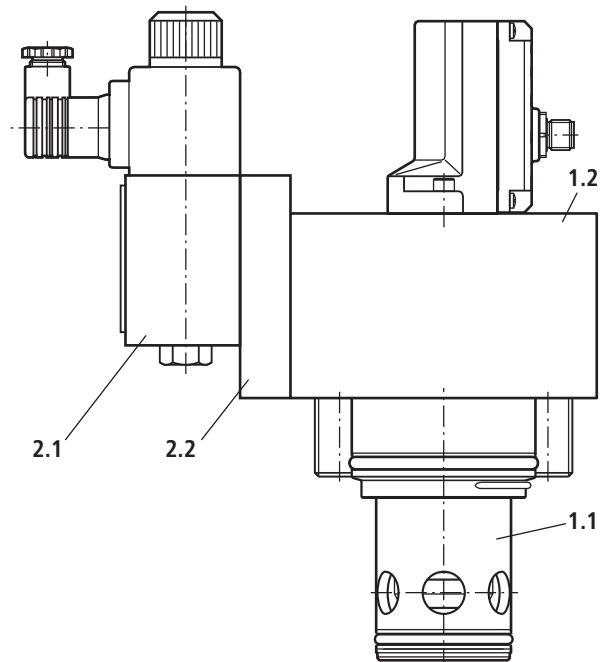
2.2 Intermediate plate

The use of an adapter plate may be necessary, depending on the type of valve (installed length).

Basic sketch

The diagram shows all the components mentioned above in assembled condition.

The cartridge element (1.1) and valve cover (1.2) form a functional unit, which is calibrated at the factory and must not be dismantled or mixed with other parts.



Version with factory-fitted pilot valve ("directly pilot-operated")

Function

2/2-way cartridge valves work as a function of pressure. This produces two important surface areas that are subject to pressure: A_X and A_A . Area A_A acts in the opening direction, area A_X and the integrated spring in the closing direction. The area in the opening direction, A_A , is defined as 100%. The ratio between the two areas $A_A:A_X$ represents a typical value for 2/2-way cartridge valves.

$A_A:A_X = 1:1.6$ (different area ratios are mentioned separately in the Technical Data Sheet).

Fluid can flow through the 2/2-way cartridge valves from A to B or from B to A. When area A_X is subjected to pressure by the removal of control oil from channel B, channel A is sealed without leaks.

Nozzles can be retrofitted to achieve the soft opening and closing of the valves.

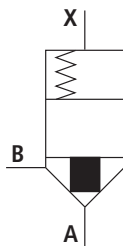
Position monitoring

The "closed" position of the piston is recognized and evaluated by the integrated position switch.

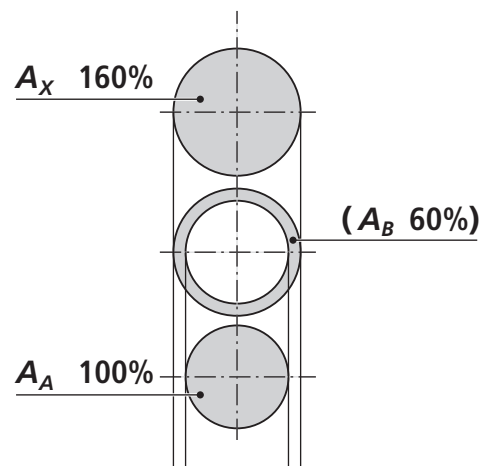
Symbol

Cartridge valve with cushioning pin

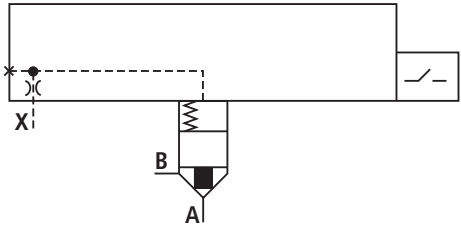
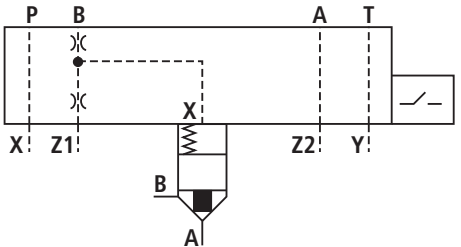
Area ratio
 $A_A:A_X = 1:1.6$

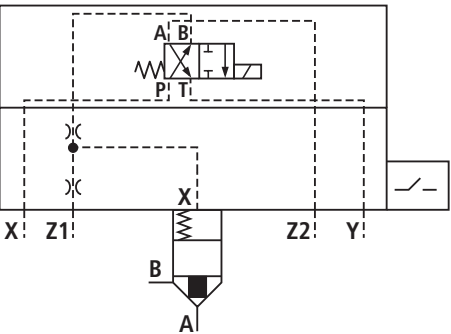
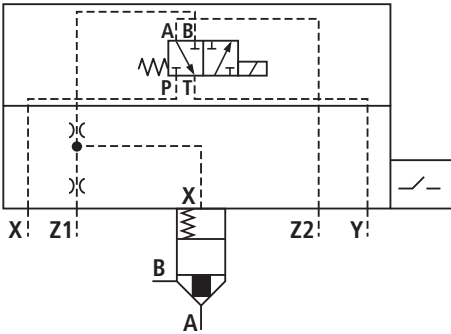


Surface areas under pressure



Standard piston, ordering data

Symbol	NG	Opening pressure approx. (bar)	kg	Material number	
①  1:1.6	16	4.0	2.1	0 810 060 705	
	25		2.3	0 810 060 059	
	32		3.0	0 810 060 065 ¹⁾	
	40			0 810 070 035	
	50			8.0 0 810 070 021	
		14.0	0 810 070 026		
②  1:1.6	25	4.0	4.3	0 810 060 060	
	32		5.7	0 810 070 036	
	40		11.0	0 810 100 022	

Symbol	NG	Opening pressure approx. (bar)	kg	Old	New
				up to 12.2007 Material number	from 01.2008 Material number
③  1:1.6	25	4.0	5.8	0 810 060 061	R901200614
	40		12.5	0 810 100 023	R901200617
			12.7	0 810 100 025 ²⁾	On request
④  1:1.6	25	4.0	5.8	0 810 060 062	R901200616
	40		12.5	0 810 100 024	R901200618

1) Piston seal

2) Pilot valve with position monitoring

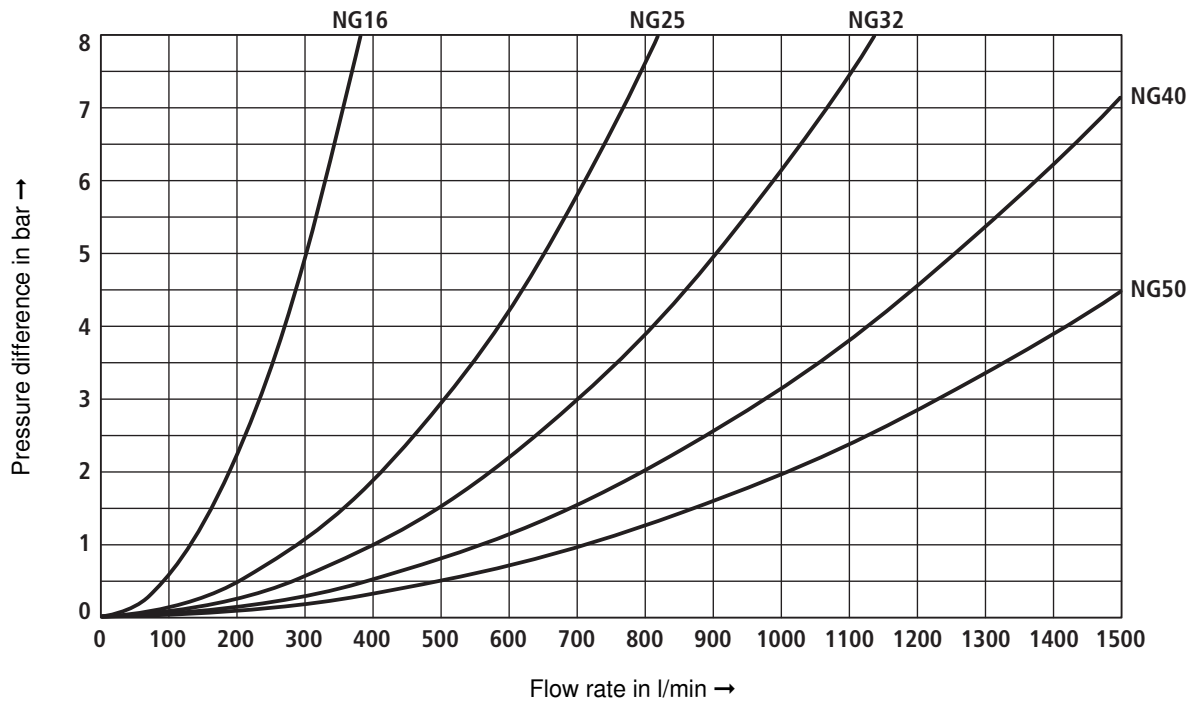
Standard piston, technical data

Installation position	Position switch on top or horizontal		
Installation dimensions	To ISO 7368, see page 7		
Ambient temperature range		°C	-25...+50
Maximum working pressure	Ports A, B, F	bar	315
	Port T	bar	250
	Pilot valve	bar	160
Maximum flow rate		l/min	See characteristic curve, page 6
Spring (opening pressure in A)	See page 4		
Pressure fluid	Mineral oil (HL, HLP) to DIN 51524, other pressure fluids on request		
Seal material	NBR		
Pressure fluid temperature range		°C	-25...+70
Viscosity range	Recommended	mm ² /s	20...100
	Maximum permitted	mm ² /s	10...500
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)	Class 18/16/13 ¹⁾		
Pilot valve (symbols ③ and ④ only)			
Supply voltage		V	$U_B = 24 \pm 10\%$ DC
Solenoid output with 24-V solenoid		W	33
Cyclic duration factor		%	100
Power supply	Unit connector to DIN EN 175301-803		
Degree of protection to EN 60529	IP 65 with correctly fitted and locked plug-in connector		

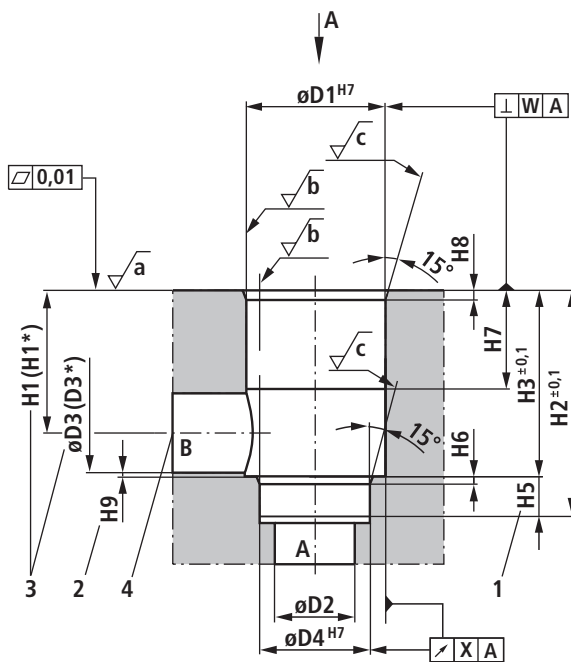
¹⁾ The purity classes stated for the components must be complied with in hydraulic systems.

Effective filtration prevents problems and also extends the service life of components.

For a selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50087 and RE 50088.

Standard piston, characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

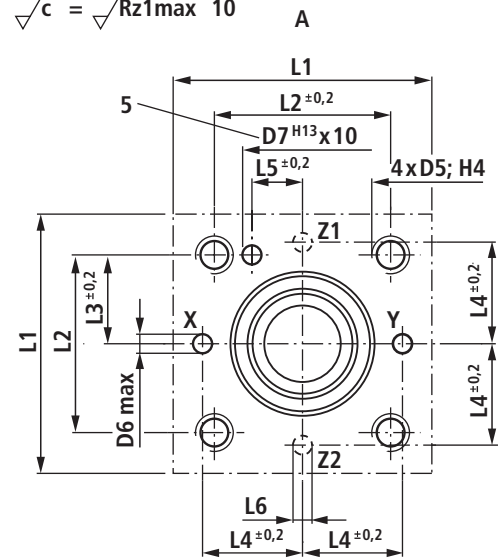
Standard piston, mounting hole (dimensions in mm)



$$\sqrt{a} = \sqrt{Rz1max \ 4}$$

$$\sqrt{b} = \sqrt{Rz1max \ 8}$$

$$\sqrt{c} = \sqrt{Rz1max \ 10}$$



NG	16	25	32	40	50
ØD1	32	45	60	75	90
ØD2	16	25	32	40	50
ØD3	16	25	32	40	50
(ØD3*)	25	32	40	50	63
ØD4	25	34	45	55	68
D5	M8	M12	M16	M20	M20
D6¹⁾	4	6	8	10	10
D7	4	6	6	6	8
H1	34	44	52	64	72
(H1*)	29.5	40.5	48	59	65.5
H2	56	72	85	105	122
H3	43	58	70	87	100
H4	20	25	35	45	45
H5	11	12	13	15	17
H6	2	2.5	2.5	3	3
H7	20	30	30	30	35
H8	2	2.5	2.5	3	4
H9	0.5	1	1.5	2.5	2.5
L1	65/80	85	102	125	140
L2	46	58	70	85	100
L3	23	29	35	42.5	50
L4	25	33	41	50	58
L5	10.5	16	17	23	30
W	0.05	0.05	0.1	0.1	0.1
X	0.03	0.03	0.03	0.05	0.05

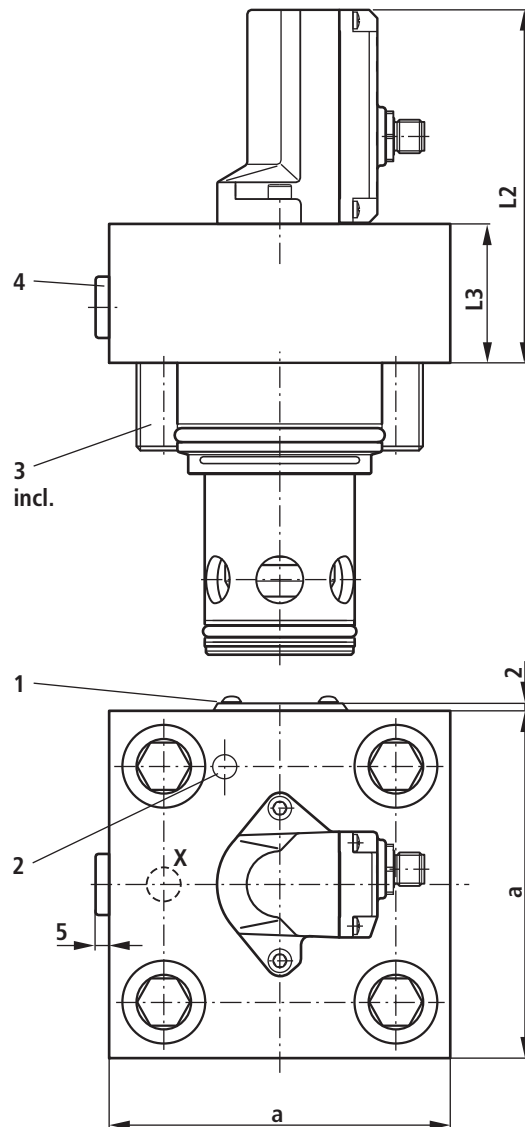
- 1 Mating depth
- 2 Reference dimension
- 3 If the diameter of port B is not ØD3 or (ØD3*), the distance from the bearing surface of the cover to the center of the bore must be calculated.
- 4 Port B can be arranged around the center axis of port A. However, care must be taken not to damage the fastening holes and control holes.
- 5 Locating hole

¹⁾ Maximum dimension

Standard piston, unit dimensions (dimensions in mm)

Symbol ①

NG16, 25, 32, 40, 50



- 1 Nameplate
 2 Clamping pin
 3 Fastening bolts (see below)
 4 Measuring connection
 Screw plug (ISO 228)
 NG16: G $\frac{1}{8}$, $M_A = 14^{+6}$ Nm
 NG25: G $\frac{1}{4}$, $M_A = 19^{+6}$ Nm
 NG32: G $\frac{3}{8}$, $M_A = 40^{+10}$ Nm
 NG40: G $\frac{3}{8}$, $M_A = 40^{+10}$ Nm
 NG50: G $\frac{1}{2}$, $M_A = 59^{+20}$ Nm

	NG16	NG25	NG32	NG40	NG50
L2	130	107	117	127	137
L3	52	30	40	50	60
a	65	82	102	125	140

Fastening bolts (ISO 4762-10.9)

NG	Dimensions	Qty.	Tightening torque M_A in Nm ¹⁾
16	M8x30	4	26 ⁺⁵
25	M12x35	4	90 ⁺¹⁵
32	M16x50	4	240 ⁺²⁰
40	M20x60	4	450 ⁺⁵⁰
50	M20x70	4	450 ⁺⁵⁰

¹⁾ Calculated with overall coefficient of friction μ_m 0.14
 (adjust for different surfaces)

Standard piston, unit dimensions (dimensions in mm)

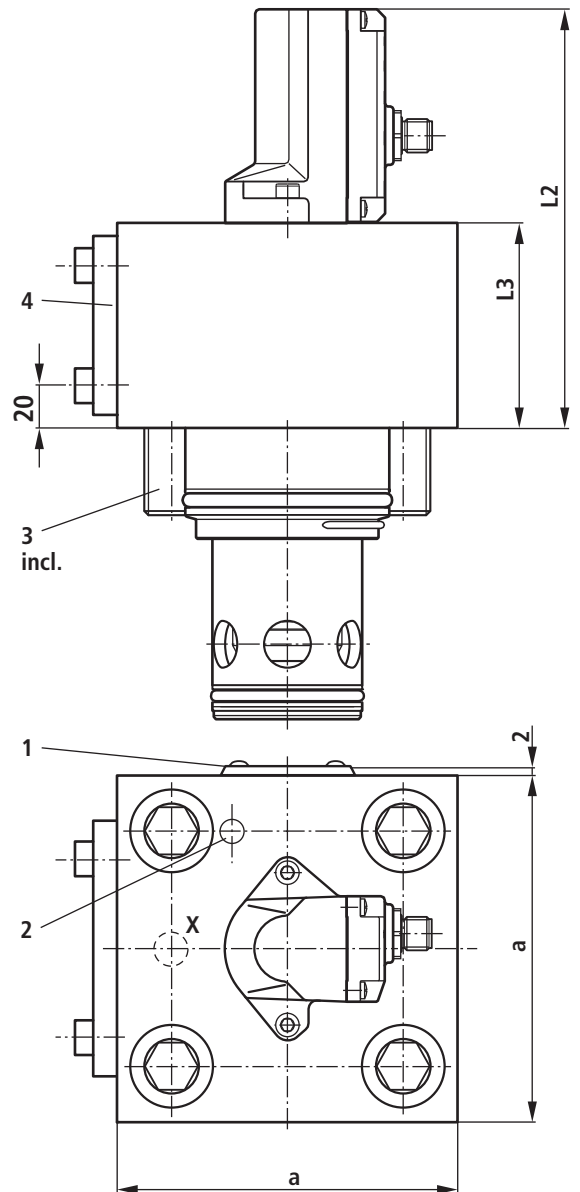
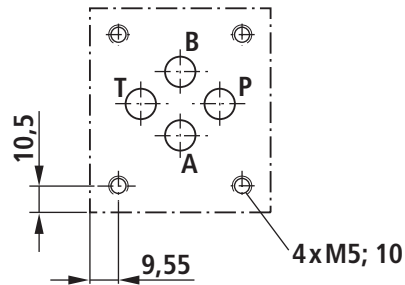
Symbol ②

NG25, 32, 40

Pilot valve NG6 can be attached,
see page 10.

The adapter plate may be required depending
on the shape/length of the pilot valve.

Position of ports as per DIN 24340-A6.



- 1 Nameplate
- 2 Clamping pin
- 3 Fastening bolts (see below)
- 4 Cover plate (transport protection)

	NG25	NG32	NG40
L2	151	151	151
L3	74	74	74
a	82	102	125

Fastening bolts (ISO 4762–10.9)

NG	Dimensions	Qty.	Tightening torque M_A in Nm ¹⁾
25	M12x35	4	90 ⁺¹⁵
32	M16x50	4	240 ⁺²⁰
40	M20x60	4	450 ⁺⁵⁰

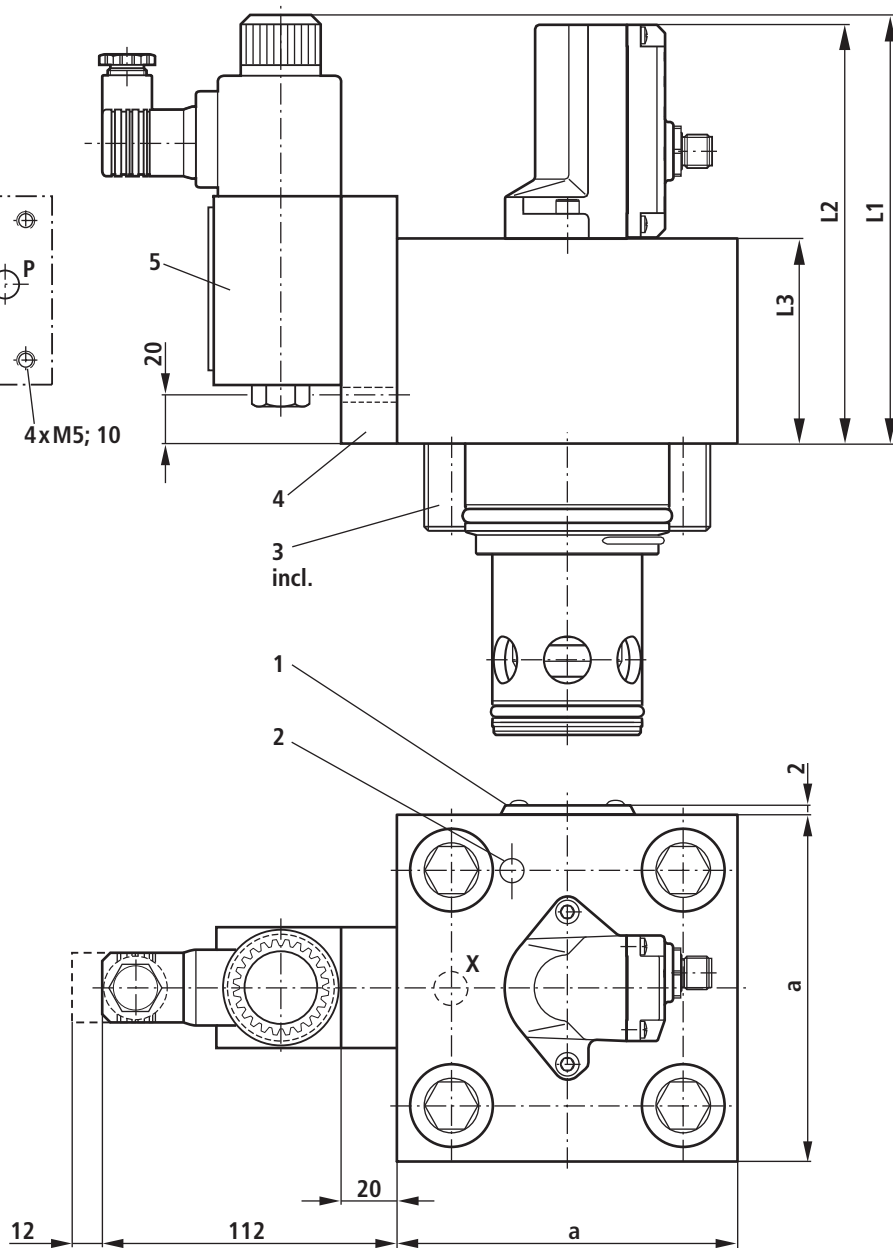
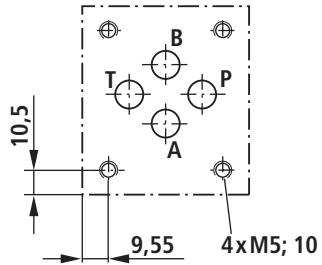
¹⁾ Calculated with overall coefficient of friction μ_m 0.14
(adjust for different surfaces)

Standard piston, unit dimensions (dimensions in mm)

Symbols ③ and ④

NG25, 40, with pilot valve NG6

Position of ports as per DIN 24340-A6



- 1 Nameplate
- 2 Clamping pin
- 3 Fastening bolts (see below)
- 4 Adapter plate (R901200431)
- 5 Pilot valve

	NG25	NG40
L1	160	160
L2	151	151
L3	74	74
a	82	125

Fastening bolts (ISO 4762-10.9)

Description	NG	Dimensions	Qty.	Tightening torque M_A in Nm ¹⁾
Logic valve	25	M12x35	4	90 ⁺¹⁵
	40	M20x60	4	450 ⁺⁵⁰
Pilot valve	6	M5x30	4	6 ⁺²
Adapter plate	-	M5x20	4	6 ⁺²

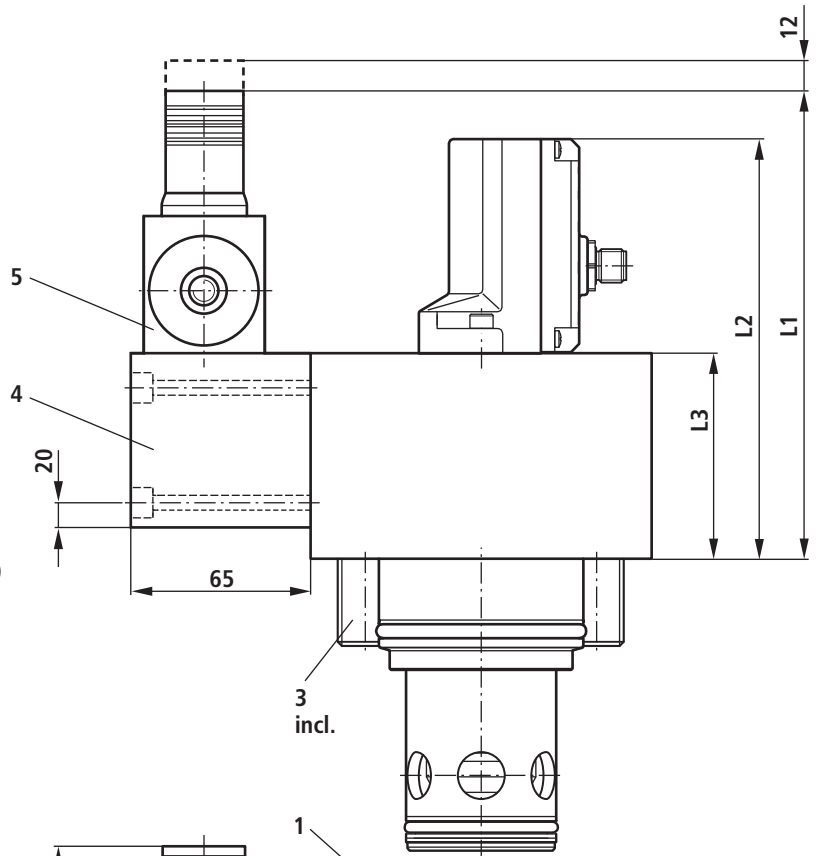
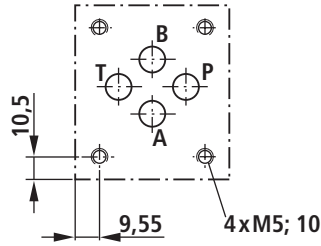
¹⁾ Calculated with overall coefficient of friction μ_m 0.14 (adjust for different surfaces)

Standard piston, unit dimensions (dimensions in mm)

Symbol ③

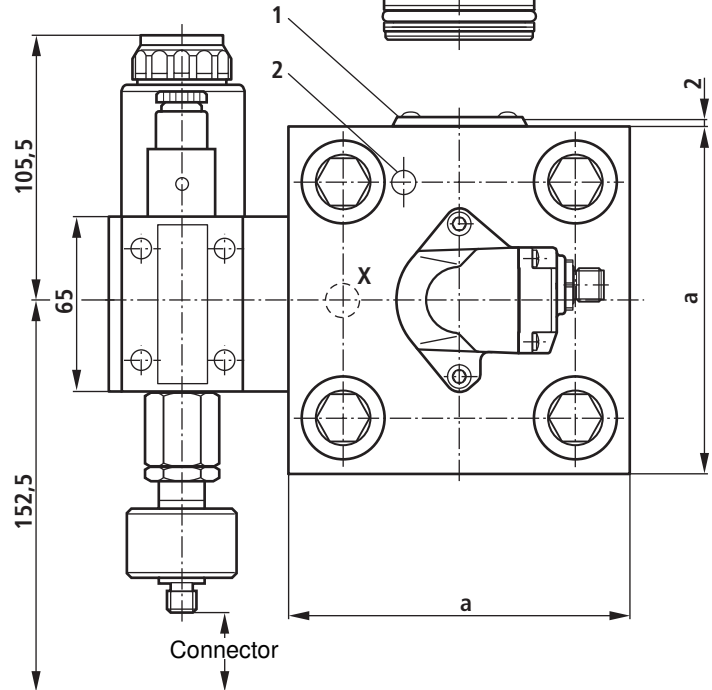
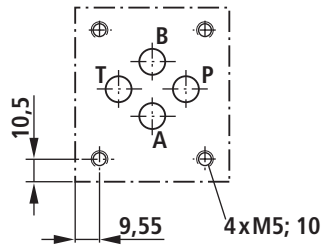
NG40, with pilot valve NG6
(position-monitored on request)

Position of ports as per DIN 24340-A6



- 1 Nameplate
- 2 Clamping pin
- 3 Fastening bolts (see below)
- 4 Adapter plate (R901196704)
- 5 Pilot valve

Position of ports as per DIN 24340-A6



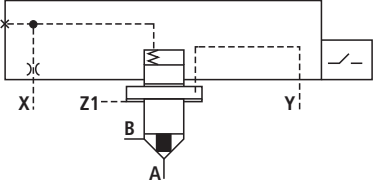
Fastening bolts (ISO 4762-10.9)

NG	Dimensions	Qty.	Tightening torque M_A in Nm ¹⁾
40	M20x60	4	450 ⁺⁵⁰

¹⁾ Calculated with overall coefficient of friction μ_m 0.14 (adjust for different surfaces)

	NG40
L1	166
L2	151
L3	74
a	125

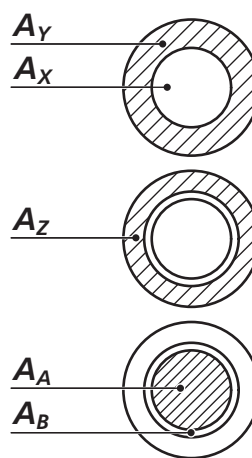
Differential piston, ordering data

Symbol	NG	Opening pressure approx. (bar)	V_2 (cm ³)	$V_X + V_Y$ (cm ³)	A_2 (mm ²)	$A_X + A_Y$ (mm ²)	A_A (mm ²)	A_X (mm ²)	A_B (mm ²)	kg	Material number
	25	3.0	6.2	9.1	597	881	254	531	30	4.0	0 810 060 063 ¹⁾
			3.9		379				248		0 810 060 064 ²⁾
	32	3.0	13.9	20.4	1131	1662	471	908	60	6.9	0 810 070 037 ¹⁾
			9.9		807				384		0 810 070 038 ²⁾
	40	4.0	23.9	35.4	1787	2642	779	1257	76	13.2	0 810 100 028 ¹⁾
			19.4		1447				416		0 810 100 029 ²⁾
	50	4.0	44.8	66.9	2800	4185	1225	1964	160	20.3	0 810 100 027 ²⁾

¹⁾ Preferred types

²⁾ Special version with reduced control area A_Z

Surface areas under pressure



$$A_B = (A_X + A_Y) - A_Z - A_A$$

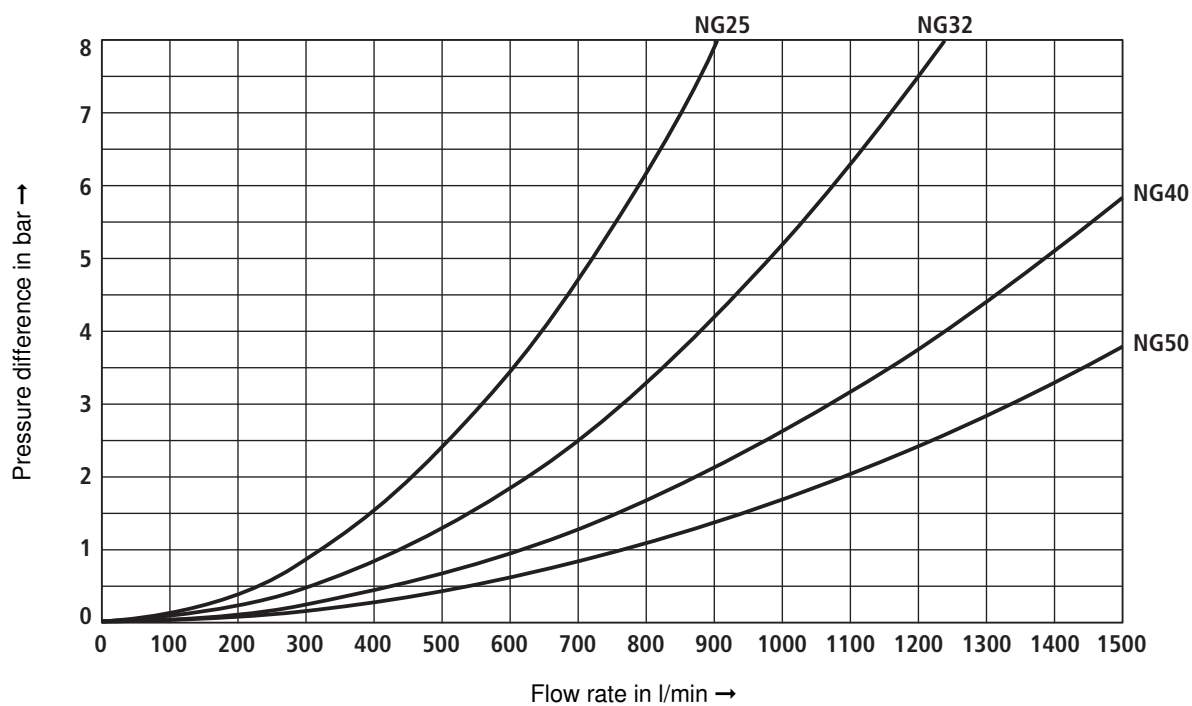
Differential piston, technical data

Installation position	Position switch on top or horizontal		
Installation dimensions	To ISO 7368, see page 15		
Ambient temperature range	°C	-25...+50	
Maximum working pressure	Ports A, B, F	bar	315
	Port T	bar	250
Maximum flow rate	l/min	See characteristic curves, page 14	
Spring (opening pressure in A)	See page 12		
Pressure fluid	Mineral oil (HL, HLP) to DIN 51524, other pressure fluids on request		
Seal material	NBR		
Pressure fluid temperature range	°C	-25...+70	
Viscosity range	Recommended	mm ² /s	20...100
	Maximum permitted	mm ² /s	10...500
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)	Class 18/16/13 ¹⁾		
Pilot valve			
Supply voltage	V	$U_B = 24 \pm 10\%$ DC	
Solenoid output with 24-V solenoid	W	33	
Cyclic duration factor	%	100	
Power supply	Unit connector to DIN EN 175301-803		
Degree of protection to EN 60529	IP 65 with correctly fitted and locked plug-in connector		

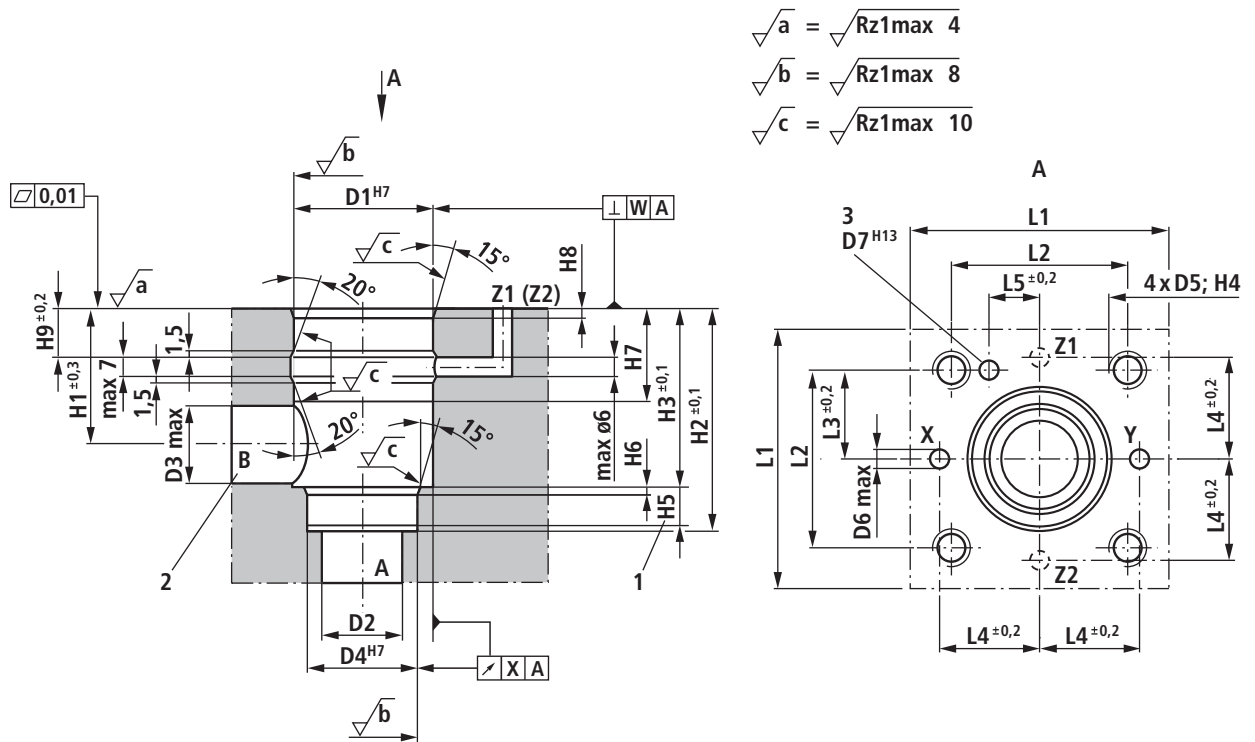
¹⁾ The purity classes stated for the components must be complied with in hydraulic systems.

Effective filtration prevents problems and also extends the service life of components.

For a selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50087 and RE 50088.

Differential piston, characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$)

Differential piston, mounting hole (dimensions in mm)



NG	25	32	40	50
ØD1	45	60	75	90
ØD2	25	32	40	50
ØD3	24	32	39	50
ØD4	34	45	55	68
D5	M12	M16	M20	M20
D6 ¹⁾	6	8	10	10
D7	6	6	6	8
H1	44	52	64	72
H2	72	85	105	122
H3	58	70	87	100
H4	25	35	45	45
H5	12	13	15	17
H6	2.5	2.5	3	3
H7	30	30	30	35
H8	2.5	2.5	3	3
H9	15	17.5	24.5	24.5
L1	85	102	125	140
L2	58	70	85	100
L3	29	35	42.5	50
L4	33	41	50	58
L5	10.5	17	23	30
W	0.05	0.1	0.1	0.1
X	0.03	0.03	0.05	0.05

¹⁾ Maximum dimension

- 1 Mating depth
- 2 Port B can be arranged around the center axis of port A. However, care must be taken not to damage the fastening holes and control holes.
- 3 Locating hole

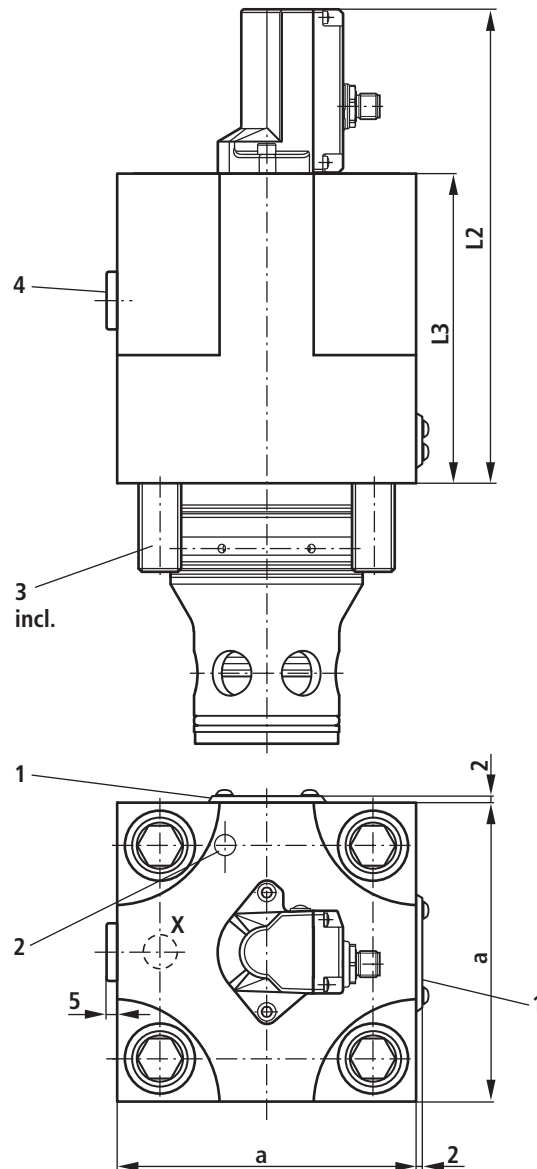
Note:
Hole similar to ISO 7368,
version "Z1" differs.

Differential piston, unit dimensions (dimensions in mm)

Symbol

NG25, 32, 40, 50

- 1 Nameplate
 2 Clamping pin
 3 Fastening bolts (see below)
 4 Measuring connection
 Screw plug (ISO 228)
 NG25: G $\frac{1}{4}$, $M_A = 19^{+6}$ Nm
 NG32: G $\frac{3}{8}$, $M_A = 40^{+10}$ Nm
 NG40: G $\frac{1}{2}$, $M_A = 59^{+20}$ Nm
 NG50: G $\frac{1}{2}$, $M_A = 59^{+20}$ Nm



Fastening bolts (ISO 4762-10.9)

NG	Dimensions	Qty.	Tightening torque M_A in Nm ¹⁾
25	M12x35	4	90 ⁺¹⁵
32	M16x50	4	240 ⁺²⁰
40	M20x60	4	450 ⁺⁵⁰
50	M20x70	4	450 ⁺⁵⁰

	NG25	NG32	NG40	NG50
L2	160	174	202	222
L3	72	97	125	145
a	82	102	125	140

¹⁾ Calculated with overall coefficient of friction μ_m 0.14
 (adjust for different surfaces)

Inductive position switch

The non-contact position switch changes its output signals to pin 2/4 within the piston overlap as a function of the direction of motion (changeover contact).

This enables the hydraulic zero (= safe end position) to be clearly evaluated.

Advantages of the position switch:

- Short-circuit-proof
- M12x1 plug-in connection
- Long life
- Highly reliable
- Switch reaction time ≤ 15 ms.
- Technical data, see page 18

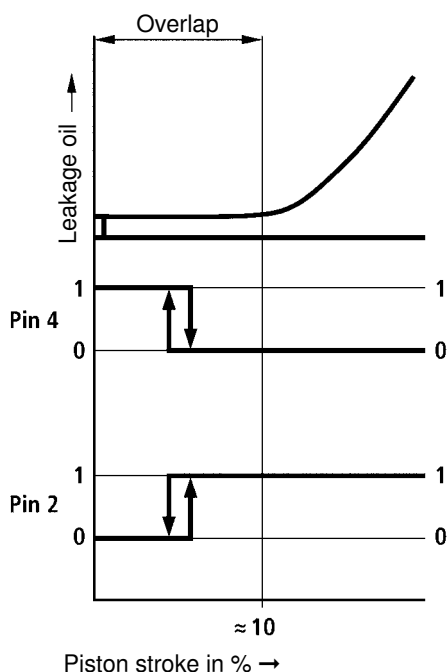
⚠ Warning!

Valves with **inductive position switches and proximity sensors in control systems relevant to safety** may **only** be fitted and brought into operation by specialist personnel with training in hydraulics and electrical engineering. Adjustment and maintenance work requires the use of special tools and devices. This work may only be performed by authorized specialist personnel or at the factory!

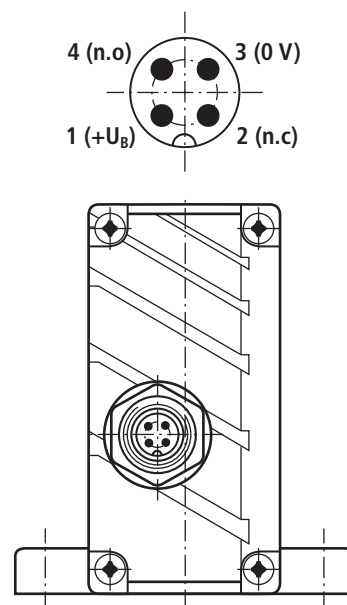
Unskilled work on safety equipment results in danger to people and the risk of material damages!

- The essential valve parts are mutually coordinated at the production plant and calibrated on assembly. They may not be changed around. In the event of a fault in the valve or position switch, the complete valve must be replaced.
- The default setting of the position switch must not be changed. The position switch may only be adjusted by the valve manufacturer.
- The position switch must be independently monitored by the machine control system in such a way that a new machine cycle cannot be initiated even if the position switch fails.
- The machine control system and the selected components must be arranged in such a way that leaks cannot lead to unwanted closing movements.

Circuit logic



Pin contacts on position switch



Technical data (inductive position switch)

Basic design		Inductive position switch
Switching point		Within positive overlap
Supply voltage	V	$U_B = 24 \text{ V} \pm 20\% \text{ DC}$
Residual ripple	%	<10
Current input	mA	Approx. 20
Reverse voltage protection	V	Integrated, max. 300
Max. voltage switched		\cong supply voltage
Max. current switched	mA	$I_S \cong 250$
Residual voltage of switching outputs	V	$\cong 2.5$
Outputs		Electronic, short-circuit-proof changeover contact
Degree of protection to EN 60529		IP 65 with correctly fitted and sealed plug-in connection
Cyclic duration factor	%	100
Operating temperature	°C	-25...+85
Vibration resistance		40 g for 150 h (3-plane vibration)
Electromagnetic compatibility (EMC)		As per EN 61000-6-3: 2002-08 and EN 61000-6-2: 2002-08
Contact assignment		M12x1, 4-way, DIN EN 50044

See page 17 for further information

Notes

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