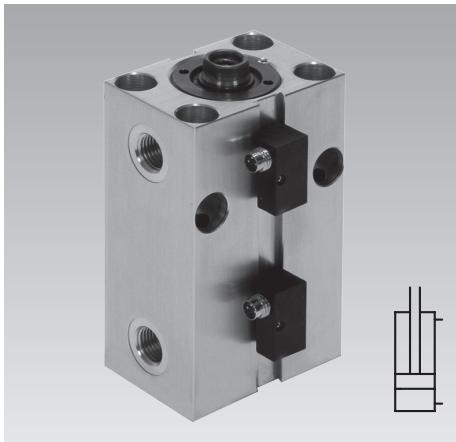




Block Cylinders

with aluminium or bronze housing for adjustable magnetic sensors,
double acting, max. operating pressure 350 bar or 500 bar



Application

Hydraulic block cylinders are universally used for all linear movements with high force requirements and very small dimensions.

With the adjustable magnetic sensors certain piston positions can be controlled exactly.

Function

The double-acting function ensures high function safety as well as exactly calculable and repeatable stroke times.

Description

The piston of these block cylinders is equipped with a ring-shaped magnet whose magnetic field actuates the sensor. The cylinder housing is therefore made of a non-magnetisable material.

Two variants are available:

- 154X X1X High-tensile aluminium alloy
max. operating pressure 350 bar
- 154X X5X High-tensile bronze alloy
max. operating pressure 500 bar

The magnetic sensors are guided in dovetail slots and allow a continuous control of the piston position.

Punching applications

- 154X X1X Block cylinder with aluminium housing

Not suitable for punching applications!

- 154X X5X Block cylinder with bronze housing
Suitable with the following restrictions:

- **max. operating pressure 250 bar**
- **only with external guide and tool stop**

Important notes

Block cylinders are intended exclusively for industrial applications and may only be operated with hydraulic oil.

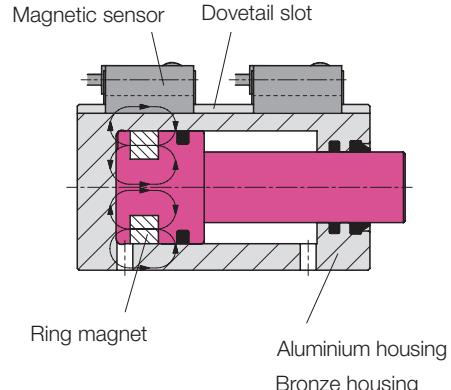
They can generate very high forces to be absorbed by the fixture or the machine.

In the effective area of the piston rod there is the danger of crushing. The manufacturer of the fixture or the machine is obliged to provide effective protection devices.

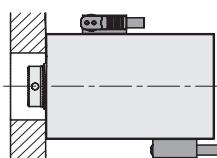
Further notes see page 3

Advantages

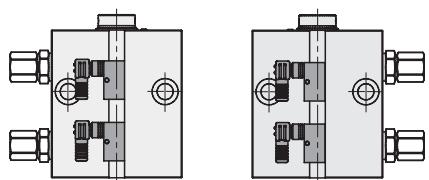
- 5 sizes with 3 stroke lengths
- Compact block design
- Same dimensions as block cylinder with steel housing, except for total length
- Multiple fixing possibilities
- Fixing screws counterbore
- Many connecting possibilities
- Magnetic sensors can be used up to 100 °C
- Fixing of the sensors at 2 sides possible
- Easy adjustment of switching point positions
- Piston rod case-hardened
- Stainless steel version optional
- Alternatively NBR or FKM seals
- Minimum leakage due to double rod seal
- Maintenance free



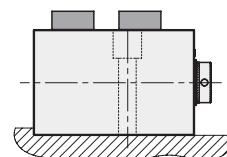
Fixing possibilities



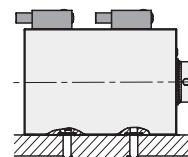
Hydraulic connecting possibilities Pipe thread



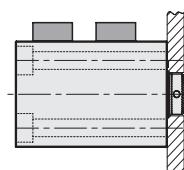
• Broad side



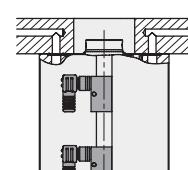
Flange with O-ring sealing • Broad side



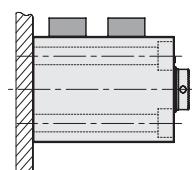
• Rod side



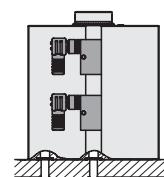
• Rod side



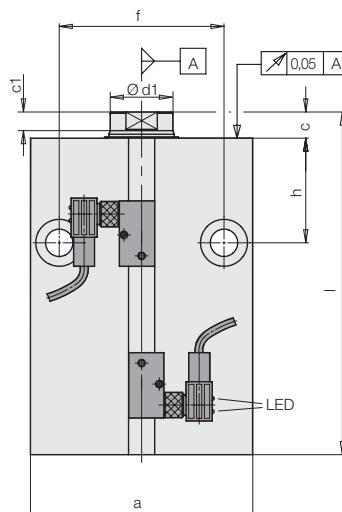
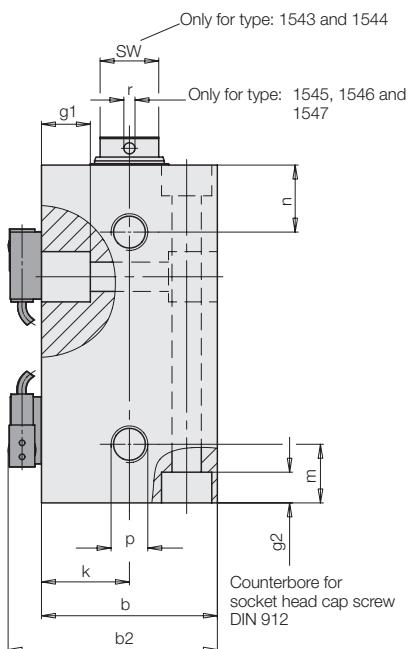
• Bottom side



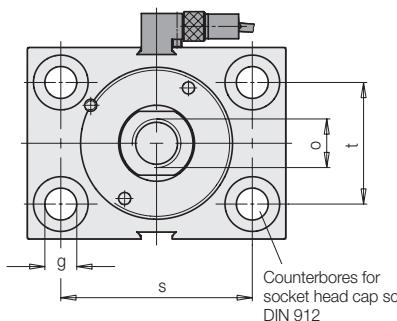
• Bottom side



Pipe thread



Accessories:
Magnetic sensors see page 7/8



Materials

Cylinder body	aluminium alloy (350 bar) bronze alloy (500 bar)
Piston	case-hardening steel, hardened and ground or stainless steel hardened and ground
Threaded bushing	free-cutting steel or stainless steel, hardened and tempered

Use only fixing screws 8.8!

Size	1543	1544	1545	1546	1547
Piston Ø	[mm] 25	[mm] 32	[mm] 40	[mm] 50	[mm] 63
Piston rod Ø	[mm] 16	[mm] 20	[mm] 25	[mm] 32	[mm] 40

Stroke +/- 0.7	[mm] 20	[mm] 25	[mm] 25	[mm] 25	[mm] 30
Total length l +/- 0.8	[mm] 85	[mm] 100	[mm] 106	[mm] 117	[mm] 135
Aluminium housing max. 350 bar					
Weight	[kg] 0.68	[kg] 1.1	[kg] 1.52	[kg] 2.6	[kg] 4.4
Part no. (NBR)	1543513	1544513	1545513	1546513	1547513
Bronze housing max. 500 bar					
Weight	[kg] 1.04	[kg] 2.24	[kg] 3.1	[kg] 5.1	[kg] 8.43
Part no. (NBR)	1543553	1544553	1545553	1546553	1547553
Stroke +/- 0.7	[mm] 50	[mm] 50	[mm] 50	[mm] 50	[mm] 63
Total length l +/- 0.8	[mm] 115	[mm] 125	[mm] 131	[mm] 142	[mm] 168
Aluminium housing max. 350 bar					
Weight	[kg] 0.9	[kg] 1.37	[kg] 1.94	[kg] 3.1	[kg] 5.45
Part no. (NBR)	1543516	1544516	1545516	1546516	1547516
Bronze housing max. 500 bar					
Weight	[kg] 1.94	[kg] 2.8	[kg] 3.7	[kg] 6	[kg] 11
Part no. (NBR)	1543556	1544556	1545556	1546556	1547556
Stroke +/- 0.7	[mm] 100	[mm] 100	[mm] 100	[mm] 100	[mm] 100
Total length l +/- 0.8	[mm] 165	[mm] 175	[mm] 181	[mm] 192	[mm] 205
Aluminium housing max. 350 bar					
Weight	[kg] 1.32	[kg] 1.86	[kg] 2.74	[kg] 4.1	[kg] 7.5
Part no. (NBR)	1543519	1544519	1545519	1546519	1547519
Bronze housing max. 500 bar					
Weight	[kg] 3.7	[kg] 4	[kg] 5.5	[kg] 8.2	[kg] 16.2
Part no. (NBR)	1543559	1544559	1545559	1546559	1547559

Part-no. for pipe thread connection

- 154X5XX NBR seals see chart
- 154XX2X FKM seals with aluminium housing
- 154XX6X FKM seals with bronze housing
- 154X4XX Stainless steel version

Dimensions
Technical data • Important notes

Size		1543	1544	1545	1546	1547
Piston Ø	[mm]	25	32	40	50	63
Piston rod Ø	[mm]	16	20	25	32	40
Effective piston area	stroke to extend	[cm ²]	4.91	8.04	12.56	19.63
	stroke to retract	[cm ²]	2.9	4.9	7.65	11.59
Force to push at	100 bar	[kN]	4.91	8.04	12.56	19.63
	350 bar	[kN]	17.1	28.1	43.9	68.7
	500 bar	[kN]	24.5	40.2	62.8	98.1
Force to pull at	100 bar	[kN]	2.9	4.9	7.65	11.59
	350 bar	[kN]	10.1	17.1	26.7	40.5
	500 bar	[kN]	14.5	24.5	38.2	57.9
Oil volume per 10 mm stroke	stroke to extend	[cm ³]	4.91	8.04	12.56	19.63
	stroke to retract	[cm ³]	2.9	4.9	7.65	11.59
a	[mm]	65	75	85	100	125
b	[mm]	45	55	63	75	95
b2	[mm]	57	67	75	87	107
c	[mm]	7	10	10	10	14
Ø d1 x c1	[mm]	15x5	19x7.8	24x7.1	30.5x6.5	38.7x9.2
f	[mm]	50	55	63	76	95
g	[mm]	8.5	10.5	10.5	13	17
g1 at both sides	[mm]	12	16	17	22	-*
g2 at both sides	[mm]	9	11	11	13	17
h	[mm]	33	38	40	44	50
h1	[mm]	40	42	44	47	60
k	[mm]	22.5	27.5	31.5	37.5	47.5
m	[mm]	18	20	21	21	26
n	[mm]	18	22	24	27	26
o x depth of thread	[mm]	M10x15	M12x15	M16x25	M20x30	M27x40
p		G 1/4	G 1/4	G 1/4	G 1/4	G 1/2
r	[mm]	-	-	4	4	4
s	[mm]	50	55	63	76	95
t	[mm]	30	35	40	45	65
u +/- 0.05	[mm]	1.1	1.1	1.1	1.1	1.3
v1	[mm]	4	5	6	6	8
v2	[mm]	4	4.5	4.5	6	6
w +0.2	[mm]	9.8	10.8	10.8	10.8	15.8
x	[mm]	21.5	25	27	30	35
y	[mm]	21	25	27	29.5	32
SW	[mm]	13	17	-	-	-

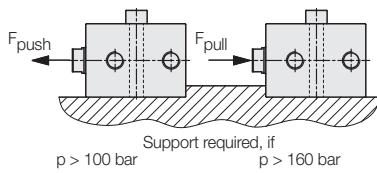
* Size 1547 without counterbores

Important notes

Housing support

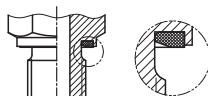
When fastened across the cylinder axis, block cylinders must be supported depending on the operating pressure.

Alternative: Keyway (see page 5)



Fittings

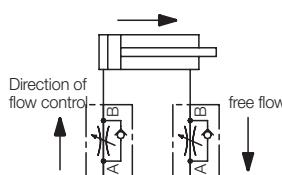
Use only fittings with elastic sealing instead of knife-edge sealing (see F 9.300).



DIN 3852 T11 form E and EN ISO 1179-2

Throttling of the flow rate

The throttling must take place in the supply line to avoid pressure intensification and thus pressures that exceed the maximum operating pressure.

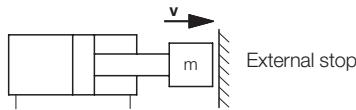


Admissible dynamic load

The max. piston speed is 0.25 m/s. Without effective stroke end cushioning, a mass attached to the piston will move unbraked against the internal stop.

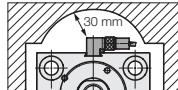
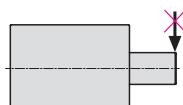
Therefore the following applies:

"For piston speeds exceeding 0.05 m/s and a mass greater than the dead weight of the cylinder, an external stop must be provided."



Side loads

Side loads should be avoided because they cause more or less wear to the piston guide and thus produce ferritic mini-particles (see "Cleanness of the hydraulic oil").



Admissible operating temperature

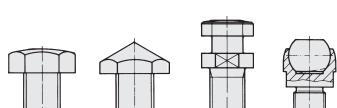
Magnetic sensor 154X X1X NBR FKM

without -30...+100 °C -20...+120 °C

with -25...+100 °C -20...+100 °C

Accessory - Contact bolts

Different contact bolts see data sheet G 3.800.



Other data see data sheet A 0.100.

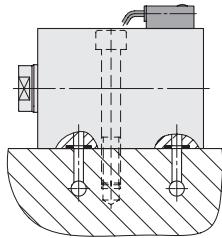
Cleanness of the hydraulic oil

Ferritic swarf in the hydraulic oil are attracted by the permanent magnet at the piston, accumulate in the cylinder area and damage seals and guides. Flush all drilled channels, pipes and hoses thoroughly before start up.

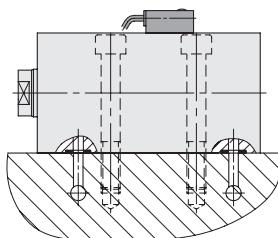
Recommendation: High-pressure filter with 10 µm Filter fineness (see data sheet F 9.500).

Flange with O-ring sealing

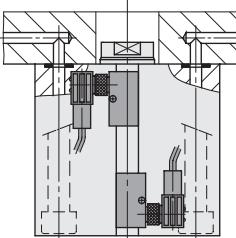
Broad side K
Stroke 1 - 49 mm
2 cross holes
154X XXXK



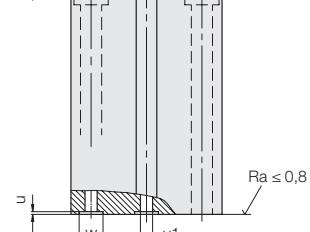
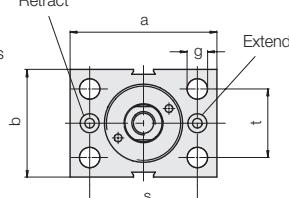
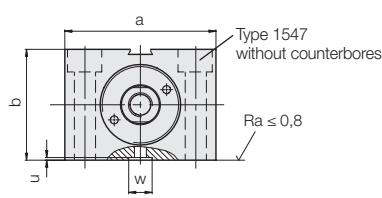
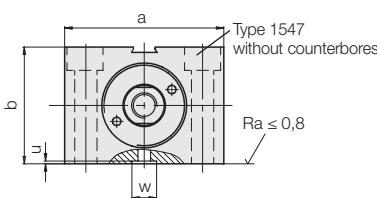
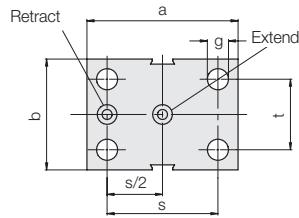
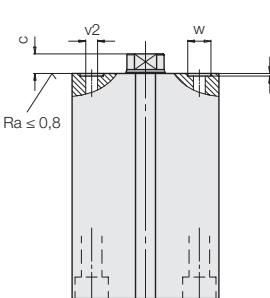
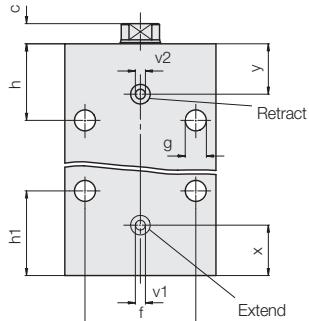
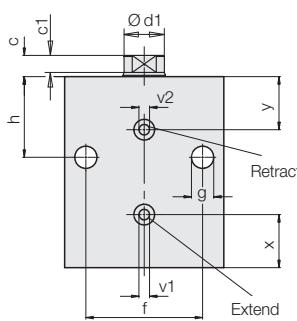
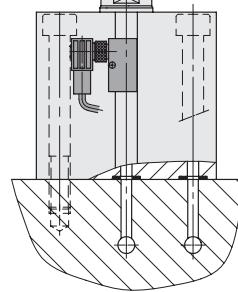
Broad side L
from 50 mm stroke
4 cross holes
154X XXXL



Rod side S
All strokes
4 longitudinal holes
154X XXXS



Bottom side B
All strokes
4 longitudinal holes
154X XXXB



Size

Piston Ø	1543	1544	1545	1546	1547
Piston rod Ø	25	32	40	50	63
[mm]	25	32	40	50	63

Stroke +/- 0.7

Total length l +/- 0.8	[mm]	20	25	25	25	30
	[mm]	85	100	106	117	135

Aluminium housing max. 350 bar

Weight	[kg]	0.68	1.1	1.52	2.6	4.4
Part no. (NBR)		1543513X	1544513X	1545513X	1546513X	1547513X

Bronze housing max. 500 bar

Weight	[kg]	1.04	2.24	3.1	5.1	8.43
Part no. (NBR)		1543553X	1544553X	1545553X	1546553X	1547553X

Stroke +/- 0.7

Total length l +/- 0.8	[mm]	50	50	50	50	63
	[mm]	115	125	131	142	168

Aluminium housing max. 350 bar

Weight	[kg]	0.9	1.37	1.94	3.1	5.45
Part no. (NBR)		1543516X	1544516X	1545516X	1546516X	1547516X

Bronze housing max. 500 bar

Weight	[kg]	1.94	2.8	3.7	6	11
Part no. (NBR)		1543556X	1544556X	1545556X	1546556X	1547556X

Stroke +/- 0.7

Total length l +/- 0.8	[mm]	100	100	100	100	100
	[mm]	165	175	181	192	205

Aluminium housing max. 350 bar

Weight	[kg]	1.32	1.86	2.74	4.1	7.5
Part no. (NBR)		1543519X	1544519X	1545519X	1546519X	1547519X

Bronze housing max. 500 bar

Weight	[kg]	3.7	4	5.5	8.2	16.2
Part no. (NBR)		1543559X	1544559X	1545559X	1546559X	1547559X

Spare O-rings

7x1.5 8x1.5 8x1.5 8x1.5 12.42x1.78

Part no. (NBR)	3000342	Part no. (NBR)	3000343	Part no. (NBR)	3000343	Part no. (NBR)	3000343	Part no. (NBR)	3000335
Part no. (FKM)	3001077	Part no. (FKM)	3000275	Part no. (FKM)	3000275	Part no. (FKM)	3000275	Part no. (FKM)	3001152

Part-no. for flange type

154X5XXX Flange K, L, S, B (see above), NBR seals

154XX2XXX FKM seals with aluminium housing

154XX6XXX FKM seals with bronze housing

154X4XXX Stainless steel version

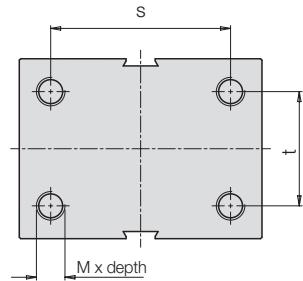
Standard variants

Thread • Keyway • Stroke limitation

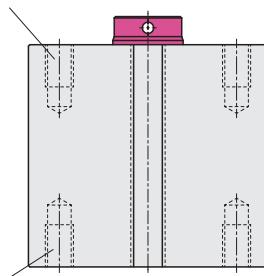
4 threads at the front

to fix the housing **C, D**

Instead of longitudinal holes and cross holes the block cylinders can be provided with 4 interior threads, alternatively at the rod side **C** or at the bottom side **D**.



Rod side: 15XXXXX**C**



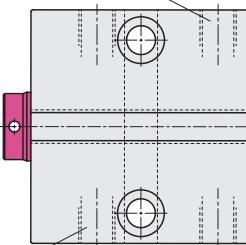
Bottom side: 15XXXXX**D**

Keyway to support the housing **E, F, Q**

Block cylinders with keyway are supplied without longitudinal holes and with only one trapezoidal slot for the magnetic sensors. For pipe thread connection, the position of the connecting threads has to be determined in advance (identification code **E** or **F** see drawing). For flange-type connection K or L (see page 4) the identification code is **Q**.

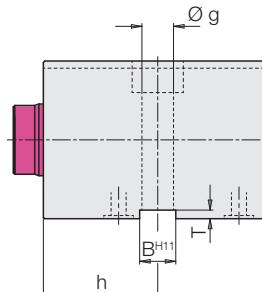
Pipe thread connection at the right side:

15XXXXX**E**



Pipe thread connection at the left side:

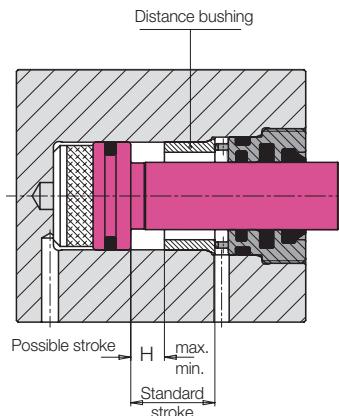
15XXXXX**F**



Flange-type connection: 15XXXXXX**Q**

Stroke limitation by distance bushing **H**

The extending piston stroke of block cylinders can be limited by installing a distance bushing. The minimum stroke should not be less than 1 mm. The maximum possible stroke starting from the standard stroke is indicated in the below chart.



Example: Possible stroke

Block cylinder 1545516

Standard stroke 50 mm

As per table:

Hmin. = 1 mm

Hmax. = 50 - 3 = 47 mm

Possible combinations of standard variants see page 6.

Basic type	Dimensions							Stroke limitation H	
	4 threads C, D			Keyway E, F, Q					
Part no. (page 2 to 4)	M x depth	s	t	B ^{H11}	T	Ø g	h	Hmin.	Hmax.
1543XXXX	M 8x12	50	30	10	2	8.5	33	1	Standard stroke - 3
1544XXXX	M 10x15	55	35	12	3	10.5	38	1	Standard stroke - 3
1545XXXX	M 10x15	63	40	12	3	10.5	40	1	Standard stroke - 3
1546XXXX	M 12x18	76	45	15	5	13	44	1	Standard stroke - 4
1547XXXX	M 16x24	95	65	20	5	17	50	1	Standard stroke - 4

General tolerances as per DIN ISO 2768-mH

All dimensions in mm.

Examples for ordering:

4 threads

Block cylinder 1547513
(pipe thread connection)
with 4 threads M16 at the bottom side

Part no. 1547513D

Block cylinder 1547516
(pipe thread connection)
with 4 threads M16 at the rod side

Part no. 1547516C

Block cylinder 1547513B
(flange-type connection)
with 4 threads M16 at the bottom side

Part no. 1547513BD

Keyway

Block cylinder 1546523
(pipe thread connection)
with keyway and connecting thread
at the right side

Part no. 1546523E

Block cylinder 1546513
(pipe thread connection)
with keyway and connecting thread
at the left side

Part no. 1546513F

Block cylinder 1546556L
(flange-type connection)
with keyway

Part no. 1546556LQ

Stroke limitation

Block cylinder 1545513
(pipe thread connection)
with stroke limitation to 12 mm

Part no. 1545513H12

Block cylinder 1545519
(pipe thread connection)
with stroke limitation to 80 mm

Part no. 1545519H80

Block cylinder 1545556LQ
(flange-type connection)
with keyway and stroke
limitation to 40 mm

Part no. 1545556LQH40

Code for part numbers

Code for part numbers of the basic versions*

(page 2 to 4)

Piston diameter

- 43 = 25 mm
- 44 = 32 mm
- 45 = 40 mm
- 46 = 50 mm
- 47 = 63 mm

1 5 **X X**

X X X X

Not applicable for pipe thread connection

Flange with O-ring sealing at the

- K** = broad side with 2 cross holes, stroke 20 to 30 mm
- L** = broad side with 4 cross holes, stroke from 50 mm
- S** = rod side with 4 longitudinal holes
- B** = bottom side with 4 longitudinal holes

Piston stroke

- 3** = 20 – 30 mm
- 6** = 50 – 63 mm
- 9** = 100 mm

Seals

- 1** = NBR 350 bar
- 2** = FKM 350 bar
- 5** = NBR 500 bar
- 6** = FKM 500 bar

Piston and threaded bushing

- 4** = stainless steel
- 5** = case-hardening steel and free-cutting steel

*) Important notes

The code for part numbers enables the determination of the technical data with a known part number.

The code for part numbers is not suitable for selecting any variant. Only the versions as per the charts on page 2 or 4 are available as standard elements.

Special variants are available on request.

Maximum available stroke lengths:

Piston Ø 25 mm → up to 160 mm

Piston Ø 32, 40, 50 and 63 mm → up to 200 mm

Code for part numbers of the standards variants and possible combinations

Explanation of the identification codes and order examples see page 5

Basic version
(see above)

Pipe thread

	1 5 X X	X X X X X X X		
Basic version (see above)				
		H		Option
	4 interior threads rod side	C H		+ stroke limitation (e.g. H15)
	4 interior threads bottom side	D H		+ stroke limitation
				+ stroke limitation
	Keyway, connection at the right side	E H		+ stroke limitation
	Keyway, connection at the left side	F H		+ stroke limitation

Flange with O-ring sealing

Broad side	20 to 30 mm stroke from 50 mm stroke	K H	+ stroke limitation
		L H	+ stroke limitation
Rod side		S H	+ stroke limitation
Bottom side		B H	+ stroke limitation
Broad side	20 to 30 mm stroke from 50 mm stroke	K Q H	+ keyway + stroke limitation
		L Q H	+ keyway + stroke limitation
Rod side		S C H	+ 4 interior threads + stroke limitation
Bottom side		B D H	+ 4 interior threads + stroke limitation

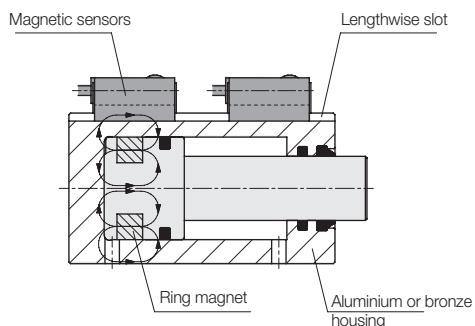
Magnetic Sensors for Position Monitoring of block cylinders and pneumatic swing clamps



Advantages

- Compact design, minimum space requirement
- Adjustable switching points by displacement of the sensor
- Monitoring of several positions
- Indifference to shock and vibration
- Bounce-free output signal
- Only one switching point
- Wear resistant
- Protected against reverse battery
- Protected against short circuits
- Sensor locking with 2 screws

Function



Application

Magnetic sensors are used for position monitoring of block cylinders and pneumatic swing clamps of the following data sheets:

- Block cylinders with aluminium or bronze housing B 1.554
- Block cylinder with guide housing B 1.738
- Pneumatic swing clamp J 7.202

Monitoring of several positions

In the two lengthwise slots of the cylinder body several sensors can be fixed (depending on the length of the slot or the stroke).

In one slot, the minimum distance between the switching points is 6 mm; with two slots it is 3 mm.

Influencing the magnetic field with adjacent, magnetisable components (e.g. steel parts)

In order to guarantee perfect functioning, it is recommended to maintain a distance of at least 25 to 30 mm between magnetic sensor and magnetisable components. The function is indeed possible with a smaller distance but this depends highly on the individual circumstances for fitting. Thus ordinary steel bolts can also normally be used for fastening the cylinder. In borderline cases, screws of non-magnetisable steel (e.g. VA screws) can cause an improvement in the magnetic field.

Influencing the magnetic field with adjacent magnetic sensors

If several cylinders with magnetic sensors are installed directly adjacent to one another, the magnetic sensors can have a reciprocal influence and malfunctions occur. Troubles of functioning can occur. A magnetisable steel sheet can help, placed between the cylinders or magnetic sensors as a shield.

Demands on voltage supply

Frequently a simple two-phase bridge connection is used, as it is often used for contactor or relay control. Such a connection is not suitable for voltage supply of position monitorings! In figure 1 the progression of the output voltage of such a connection is represented over time. You can recognise that the voltage obtains temporarily the zero point. An electronic system could not function correctly in this case. In addition, you see that the peak values of the voltage exceed considerably their mean value. The electronic can be destroyed by too high peak spikes.

Usually voltmeters or multimeters measure the mean value of the voltage. The peak value is increased approx. by factor 1.5. A measure of quality of a d.c. voltage is the residual ripple. An ideal d.c. voltage, as it is generated by a battery, has a residual ripple of 0%, the above described two-phase bridge connection obtains a residual ripple of 48%. 10% is admissible!

The residual ripple can be improved by topping a sufficiently-designed capacitor. This is called "smoothing" of the voltage. But thereby the mean value of the d.c. voltage is increased. Therefore it is recommended to provide a "smoothed" voltage supply when planning an installation.

Description/Function

Electronic magnetic sensors allow position monitoring of the pistons of cylinders with non-magnetisable housings (aluminium or bronze). An annular permanent magnet is fixed to the piston, and its magnetic field is detected by an electronic magnetic sensor.

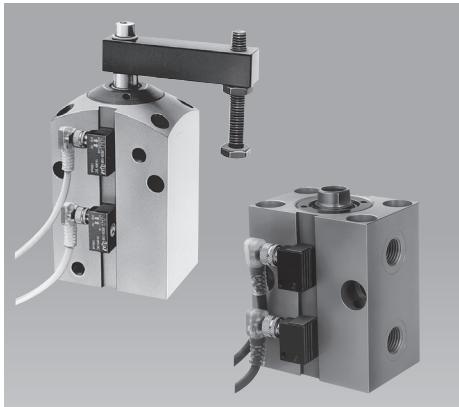
The magnetic sensors are fixed outside in the lengthwise slots of the cylinder body. The switching points are adjustable by displacement of the magnetic sensors in the lengthwise slots of the body.

Spikes

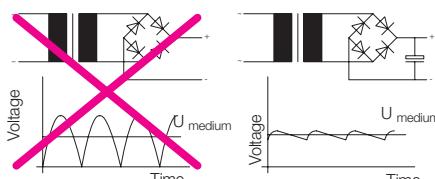
A danger for position monitorings are elements with high inductivity, which are operated with the same voltage supply as the position monitorings. Such elements, as e.g. solenoid valves, contactors and motors can generate high and high-energy peak spikes, which are transmitted by the voltage supply to the position monitorings.

Therefore critical elements have to be screened. For this purpose recovery diodes or RC-networks are indicated, which are mounted directly at the sources of interference. An alternative solution is the separated voltage supply for position monitorings and critical consumers.

Application examples



Incorrect:



Correct:

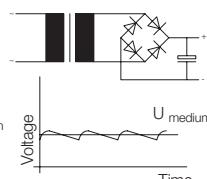
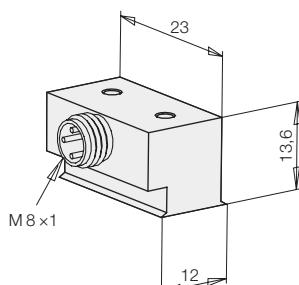


Figure 1: Generation of supply voltage

Dimensions Technical Data • Accessories

Dimensions



Electric connection

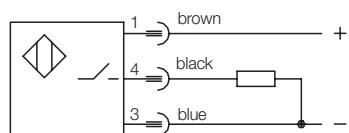
Electric connection is made as per traditional inductive proximity switches. Up to four magnetic sensors can be connected in series.

Switching hysteresis of approx. 3 mm and path

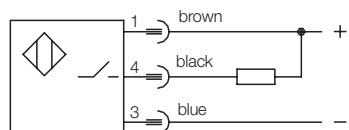
This has to be considered already when adjusting the magnetic sensors. For static pistons, the magnetic sensor must always be pushed forward to the piston from the opposite direction.

Magnetic sensors with short path are available on request.

Connecting scheme



pnp = plus switching



npn = minus switching

Technical data

Body material aluminium black anodised

Voltage 10 – 30 V DC

Residual ripple max. 10%

Current load I_{LOAD}
200 mA – up to 50 °C
150 mA – at 75 °C
100 mA – at 100 °C

Current consumption < 15 mA

Voltage drop (max. load) < 2 V

Protected against short circuits yes

Protection against reverse battery installed

Switching frequency 1 kHz

Switching hysteresis 3 mm

Protection as per DIN 40050 IP 67

Environmental temperature –25 °C up to +100 °C

Port M8 plug

LED no

Output (interlock) pnp

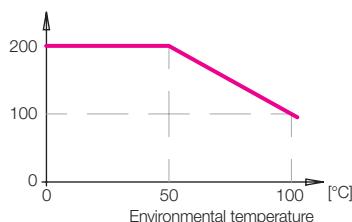
3829234

npn

3829240

Temperature curve

max. load current
[mA] I_{LOAD}



Maximum operating temperature

- Magnetic sensor + 100 °C
- Permanent magnet: + 100 °C
- Connecting cable with right angle plug: + 90 °C

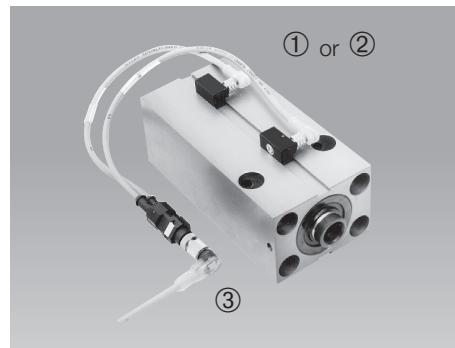
Magnetic sensors for an operating temperature up to 120°C are available on request.

Connecting cable

With angle plug M8



Y-distributor pnp



With pnp angle plug M12



Technical data

Port M8 plug, knee-type

Voltage 10 – 30 V DC

Protection as per DIN 40050 IP 67

Environmental temperature – 25 °C to +90 °C

LED: Voltage (green)
Function display (yellow)

Cable, length of cable PUR, 5 m

Output (interlock) pnp npn

Part no. (1 off) 3829099 3829124

The Y-distributor allows connection of two proximity switches or magnetic sensors at a four-pole plug-type connector M12. For each cylinder only one cable has to be placed.

For easier adjustment of the switching points the right angle plugs M8 are equipped with two LEDs each, which indicate the operating voltage and the switching position. Plug-type connector M12 is equipped with three LEDs.

① Y-distributor with cable 0.3 m
with 2 right angle plugs M8 with 2 LED each and 1 plug-type connector M12 with 3 LED
Part no. 3829118

② Y-distributor with cable 0.3 m
with 2 straight plugs M8 without LED and 1 plug-type connector M12 with 3 LED
Part no. 3829125

③ Right angle plug M12 with 3 LED
5 m 4-wire cable for common connection of the Y-distributor
Part no. 3829106

① Right angle plug M12 with 2 LED
3 m 3-wire cable for common connection of the Y-distributor
Part no. 3829049

② Straight plug M12 without LED
5 m 3-wire cable for common connection of the Y-distributor
Part no. 3829078

Technical data

Voltage 10 – 30 V DC

Protection as per DIN 40050 IP 67

Environmental temperature – 25 °C to +90 °C

LED: Voltage (green)
Function display (yellow)