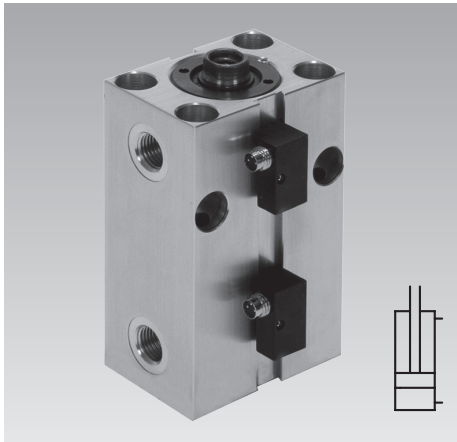




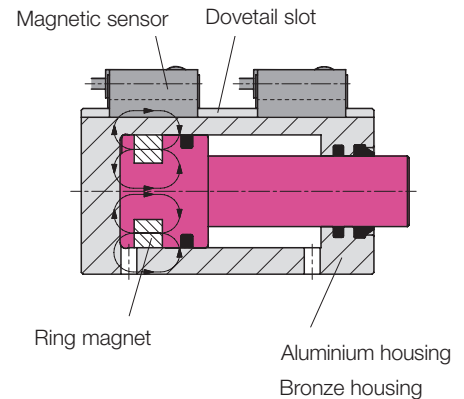
## Block Cylinders

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



### 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



### 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.

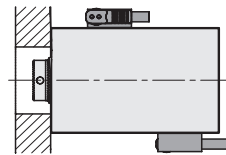
The cylinder housing is therefore made of a non-magnetisable material.

Two variants are available:

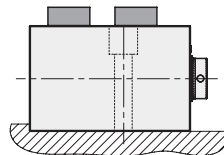
- 154X X1X High-tensile aluminium alloy  
max. operating pressure 350 bar
- 154X X5X High-tensile bronze alloy  
max. operating pressure 500 bar

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

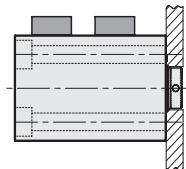
### Fixing possibilities



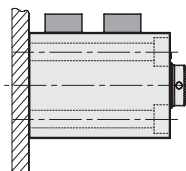
#### ● Broad side



#### ● Rod side

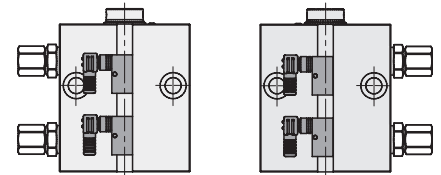


#### ● Bottom side



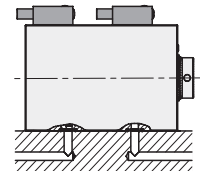
### Hydraulic connecting possibilities

#### Pipe thread

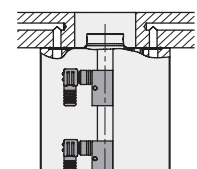


#### Flange with O-ring sealing

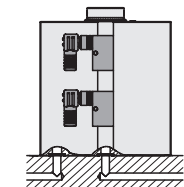
##### ● Broad side



##### ● Rod side



##### ● Bottom side



### 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

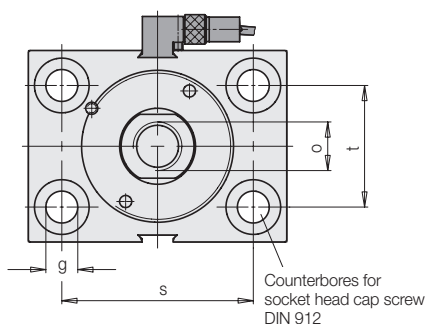
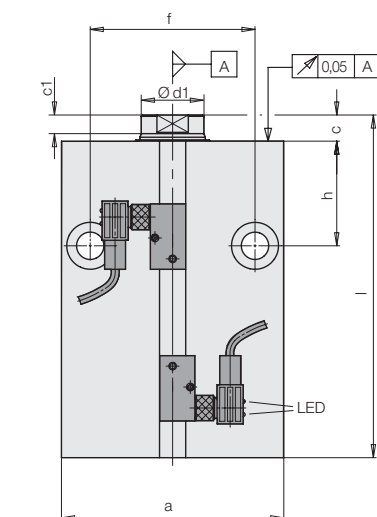
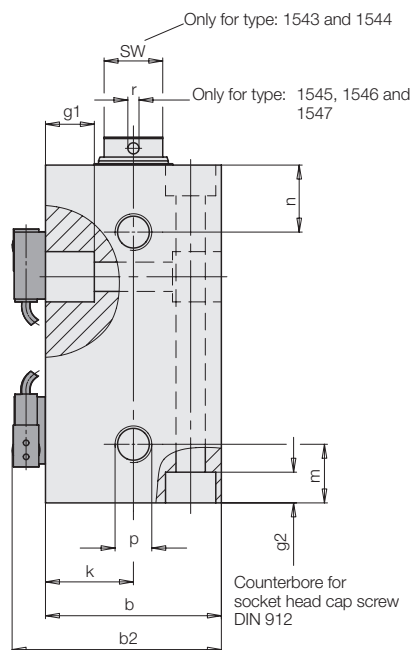
Block cylinders are intended exclusively for industrial applications and may only be operated with hydraulic oil.

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

## 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	32	40	50	63
Piston rod Ø	[mm]	16	20	25	32	40

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

Part-no. for pipe thread connection	154X5XX	NBR seals see chart
	154X X2X	FKM seals with aluminium housing
	154X X6X	FKM seals with bronze housing
	154X 4XX	Stainless steel version

## Dimensions

### Technical data • Important notes

Size			1543	1544	1545	1546	1547
Piston Ø			25	32	40	50	63
Piston rod Ø			16	20	25	32	40
Effective piston area	stroke to extend	[cm <sup>2</sup> ]	4.91	8.04	12.56	19.63	31.17
	stroke to retract	[cm <sup>2</sup> ]	2.9	4.9	7.65	11.59	18.6
Force to push at	100 bar	[kN]	4.91	8.04	12.56	19.63	31.17
	350 bar	[kN]	17.1	28.1	43.9	68.7	109
	500 bar	[kN]	24.5	40.2	62.8	98.1	155.8
Force to pull at	100 bar	[kN]	2.9	4.9	7.65	11.59	18.6
	350 bar	[kN]	10.1	17.1	26.7	40.5	65.1
	500 bar	[kN]	14.5	24.5	38.2	57.9	93
Oil volume	stroke to extend	[cm <sup>3</sup> ]	4.91	8.04	12.56	19.63	31.17
	stroke to retract	[cm <sup>3</sup> ]	2.9	4.9	7.65	11.59	18.6
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	M27 x40
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	-	-	-

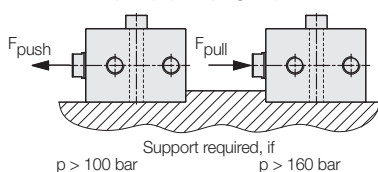
\* Size 1547 without counterbores

#### 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

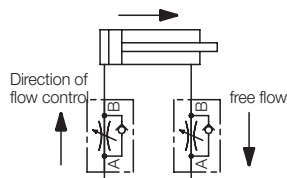
Use only fittings with elastic sealing instead of knife-edge sealing (see F 9.300).



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.

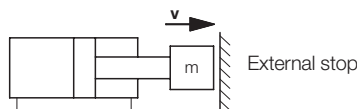


##### Admissible dynamic load

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.

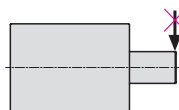
Therefore the following applies:

"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").



##### 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.

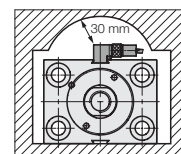
Recommendation: High-pressure filter with 10 µm Filter fineness (see data sheet F 9.500).

##### Influence of the magnetic field

Due to iron in the immediate vicinity of the block cylinder the magnetic field of the piston will be deflected. The switching points of the magnetic sensors must then be readjusted.

If no defined switching point can be adjusted, one can try again with stainless steel fixing screws.

With ferritic swarf, the conditions change from stroke to stroke. An exact adjustment is no longer possible. A cover with a minimum distance of 30 mm will help.

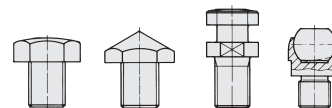


##### Admissible operating temperature

Magnetic sensor	154X X1X NBR	154X X2X FKM
without	-30 ... +100 °C	-20 ... +120 °C
with	-25 ... +100 °C	-20 ... +100 °C

##### Accessory - Contact bolts

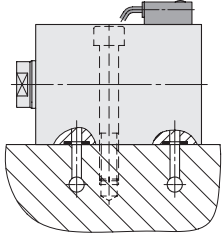
Different contact bolts see data sheet G 3.800.



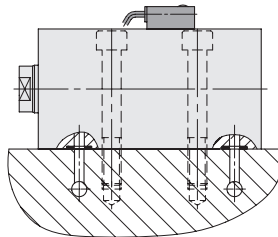
Other data see data sheet A 0.100.

## Flange with O-ring sealing

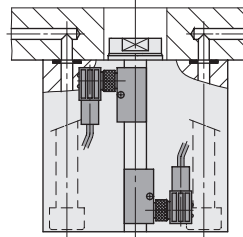
**Broad side K**  
Stroke 1 – 49 mm  
2 cross holes  
154X XXXK



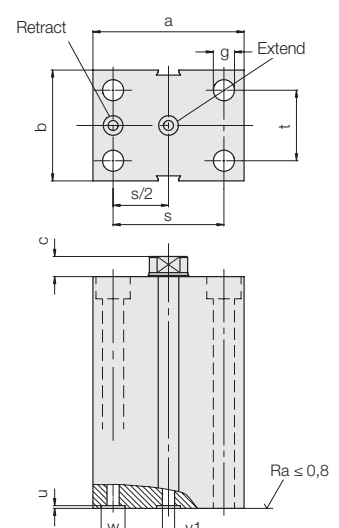
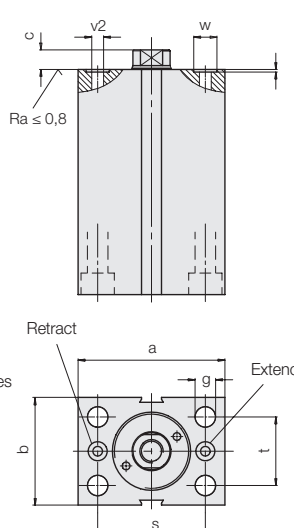
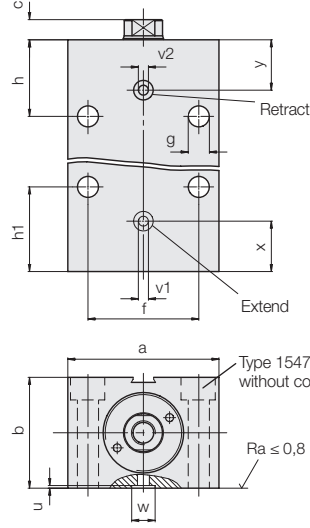
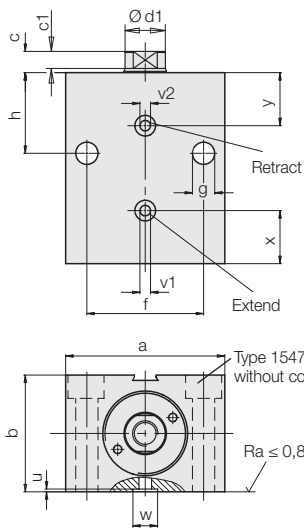
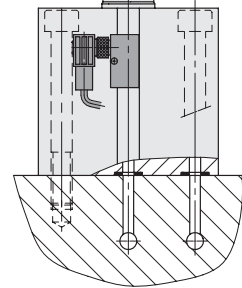
**Broad side L**  
from 50 mm stroke  
4 cross holes  
154X XXXL



**Rod side S**  
All strokes  
4 longitudinal holes  
154X XXXS



**Bottom side B**  
All strokes  
4 longitudinal holes  
154X XXXB



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

Stroke +/- 0.7	[mm]	20	25	25	25	30
Total length l +/- 0.8	[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	[mm]	50	50	50	50	63
Total length l +/- 0.8	[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	[mm]	100	100	100	100	100
Total length l +/- 0.8	[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	3000343	3000343	3000343	3000335
Part no. (FKM)		3001077	3000275	3000275	3000275	3001152

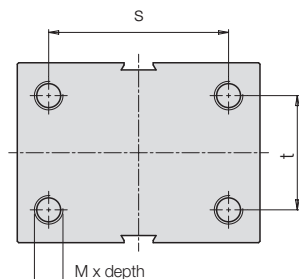
Part-no. for flange type	154X5XXX	Flange K, L, S, B (see above), NBR seals
	154X2XXX	FKM seals with aluminium housing
	154X6XXX	FKM seals with bronze housing
	154X4XXX	Stainless steel version

## Standard variants

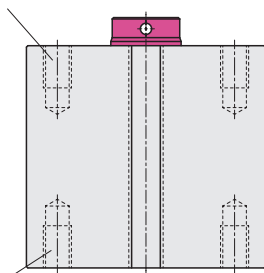
### Thread • Keyway • Stroke limitation

#### 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**



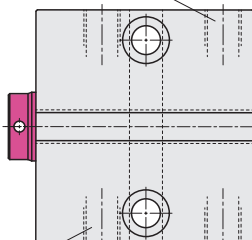
#### Bottom side: 15XXXXX**D**

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

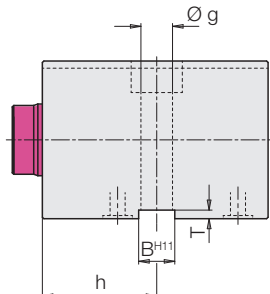
Block cylinders with keyway are supplied without longitudinal holes and with only one trapezoidal slot for the magnetic sensors.

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**



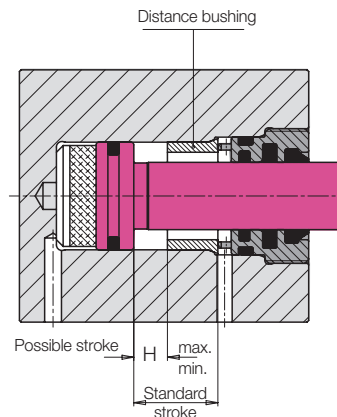
#### Pipe thread connection at the left side: 15XXXXX**F**



#### Flange-type connection: 15XXXXX**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 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 <b>H</b>	
	4 threads <b>C, D</b>			Keyway <b>E, F, Q</b>						
Part no. (page 2 to 4)	M x depth	s	t	B <sup>H11</sup>	T	Ø g	h	Hmin.	Hmax.	
<b>1543XXXX</b>	M 8x12	50	30	10	2	8.5	33	1	Standard stroke – 3	
<b>1544XXXX</b>	M 10x15	55	35	12	3	10.5	38	1	Standard stroke – 3	
<b>1545XXXX</b>	M 10x15	63	40	12	3	10.5	40	1	Standard stroke – 3	
<b>1546XXXX</b>	M 12x18	76	45	15	5	13	44	1	Standard stroke – 4	
<b>1547XXXX</b>	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**

(page 2 to 4)

### Piston diameter

**47** = 63 mm

**B** = bottom side with 4 longitudinal holes

**9** = 100 mm

**6** = FKM 500 bar

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

**Special variants are available on request.**

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

Explanation of the identification codes and order examples see page 5

(see above)

Keyway, connection at the left side

F

H

- + stroke limitation

Rod side  
Bottom side

B

D

H

+ 4 interior threads + stroke limitation



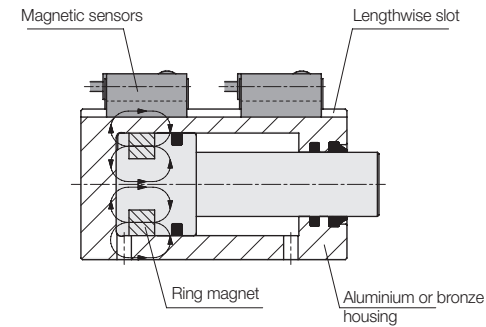
# Magnetic Sensors for Position Monitoring of block cylinders and pneumatic swing clamps



## 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.

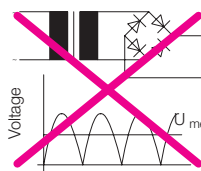
## Demands on voltage supply

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.

## Incorrect:



## Correct:

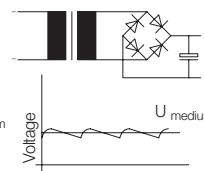


Figure 1: Generation of supply voltage

## 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.

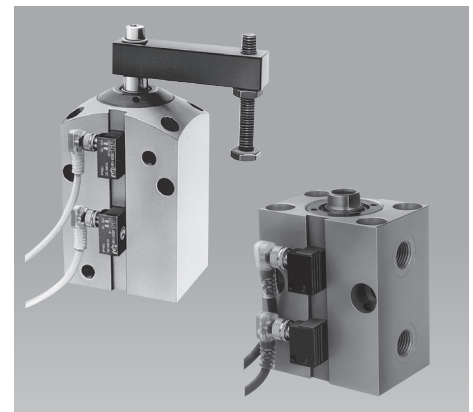
The magnetic sensors are fixed outside in the lengthwise slots of the cylinder body. The switching points are adjustable by displacement of the magnetic sensors in the lengthwise slots of the body.

## 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.

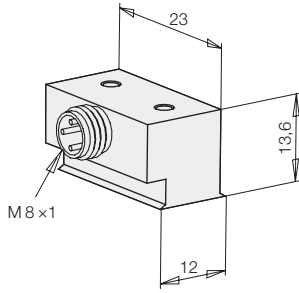
## Application examples



# Dimensions

## Technical Data • Accessories

### Dimensions



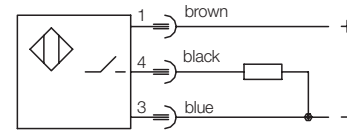
### Electric connection

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

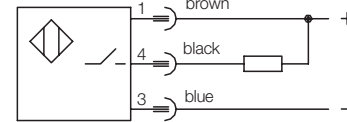
### Switching hysteresis of approx. 3 mm and path

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

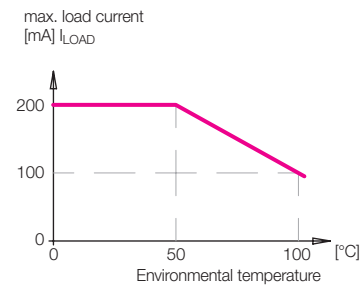


nnp = minus switching

### 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	nnp
Part no. (1 off)	3829 234	3829 240

### Temperature curve



### Maximum operating temperature

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

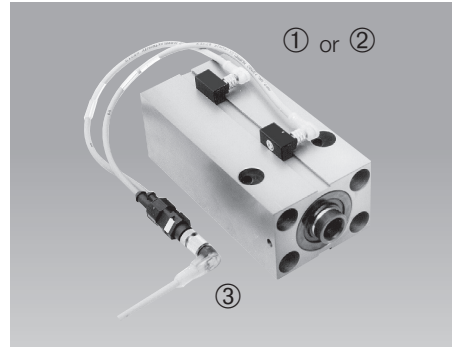
Magnetic sensors for an operating temperature up to 120 °C are available on request.

### 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	nnp
Part no. (1 off)	3829 099	3829 124

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. 3829 118**
- 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. 3829 125**
- ③ Right angle plug M12 with 3 LED  
5 m 4-wire cable for common connection of the Y-distributor  
**Part no. 3829 106**

- ① Right angle plug M12 with 2 LED  
3 m 3-wire cable for common connection of the Y-distributor  
**Part no. 3829 049**
- ② Straight plug M12 without LED  
5 m 3-wire cable for common connection of the Y-distributor  
**Part no. 3829 078**

### 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)