Contents

Rodless Pneumatic Cylinder Magnetically Coupled

Rodless Pneumatic Cylinder
Magnetically Coupled

P1Z Series
Ø 16 - 40 mm

P1Z Series

Ø 16 - 40 mm

Overview P1Z

Basic Version	
Hexagonal nuts (included in scope of delivery)	
Flange mounting Option	
Foot mounting Option	

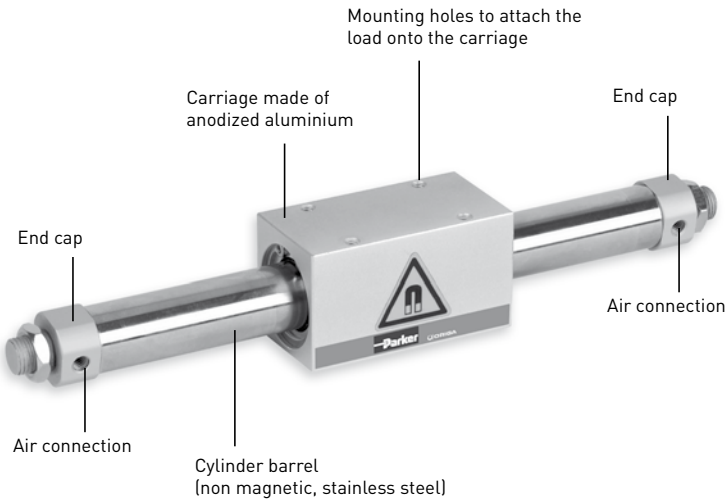
Guided Version	
Air connection on both sides Standard	
Air connection at one end Option	
With elastomeric bumpers Standard	
With hydraulic shock absorbers Option	
Profile rail for magnetic switches Option	
Profile rail with magnetic switches Option	

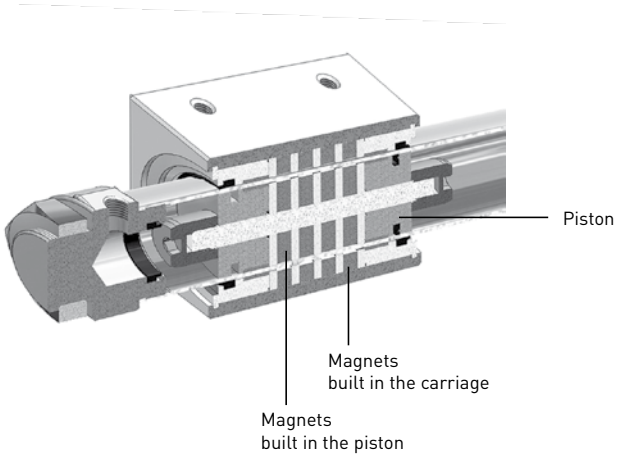
P1Z Series

Basic Version

Ø 16 - 40 mm

Basic Version





Features
P1Z Basic Version

- Double acting
- Magnetically coupled without mechanical connection
- Mechanical protection in case of occasional overload due to magnetic uncoupling
- Piston chamber and carriage are pressure tight
- Pressure tight and leak free system
- Dirt and dust cannot enter
- With adjustable pneumatic end cushioning on both sides
- Carriage is free to rotate 360° around the cylinder axis
- Various mounting arrangements

Description

The P1Z is a rodless pneumatic cylinder. The piston and the carriage are equipped with ring magnets. The motion is transmitted via the magnetic force locking between the piston and the carriage.

P1Z Series

Basic Version

Ø 16 - 40 mm

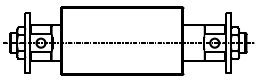
Mounting and technical data

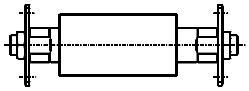
Mounting

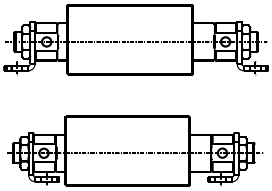
With 2 hexagonal nuts to fix the cylinder
(included in scope of delivery)

Flange mounting (pair)
option

Foot mounting (pair)
option







- The loads can be fitted onto the carriage by 4 tapped holes.
- The cylinder is mounted at the end caps with hexagonal nuts, flange or foot mountings.

Technical data

Piston diameter Ø [mm]	**16**	**20**	**25**	**32**	**40**
Max. stroke length [mm]	1000	1500	2000	2000	2000
Stroke tolerance [mm] up to 1000 mm	0/+1.5				
Stroke tolerance [mm] > 1000 mm	0/+2				
Temperature range [°C]	0 to 60				
Operating medium	Filtered compressed air, dry, lubricated or unlubricated * (other media on request)				
Air supply port size	M5	G1/8	G1/8	G1/8	G1/4
Max. magnetic coupling force [N]	157	236	383	703	942
Velocity range [m/s]	0.1 to 1.3				
Min. operating pressure [bar]	1.8				
Max. operating pressure [bar]	6.5	7			
Cushion length [mm]	9	15	15	12	19
Weight [kg]					
at 0 mm stroke	0.28	0.46	0.83	1.35	2.01
per 100 mm stroke	0.043	0.082	0.088	0.14	0.16

***** if external lubrication is added, this must always be continued.

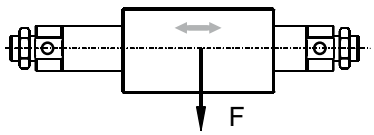
Materials

Cylinder barrel	Stainless steel
Carriage	Al, anodized
End cap	Al, anodized
Seals	NBR

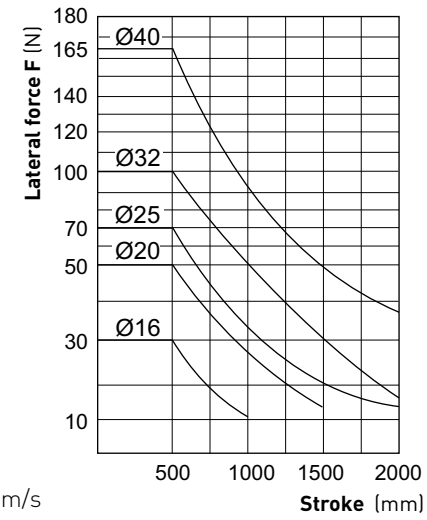
Loads, forces and moments

Forces [N]					
Piston Ø [mm]	16	20	25	32	40
Theoretical force at 6 bar [N]	120	188	295	483	754
Max. magnetic coupling force [N]	157	236	383	703	942

Permissible lateral force, depending on the stroke length

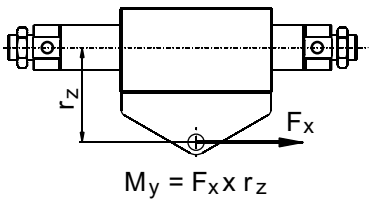


Ø [mm]	**Permissible lateral force F** [N]
16	30.0
20	50.0
25	70.0
32	100.0
40	165.0



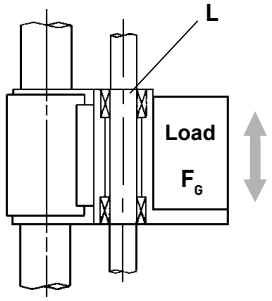
The values are based on velocities v<= 0.4m/s

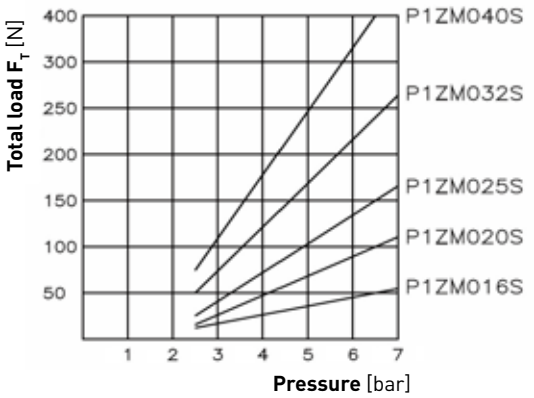
Permissible axial load , horizontal mounting



Ø [mm]	**Max. Moment My** [Nm]
16	1.2
20	2.5
25	3.8
32	8.5
40	13.0

Permissible axial load , vertical mounting





L = Weight of the external carriage
$\mathbf{F_G}$ = Load
$\mathbf{F_T}$ = Total load = Load $\mathbf{F_G}$ + Weight of the external carriage **L** + Force due to friction

Loads, forces and moments

If the operating conditions are outside of the permissible values, either the P1Z guided version or the P1Z in combination with an external guide should be used !
Please note page 8.

Dynamic forces must not exceed the maximum magnetic coupling force!

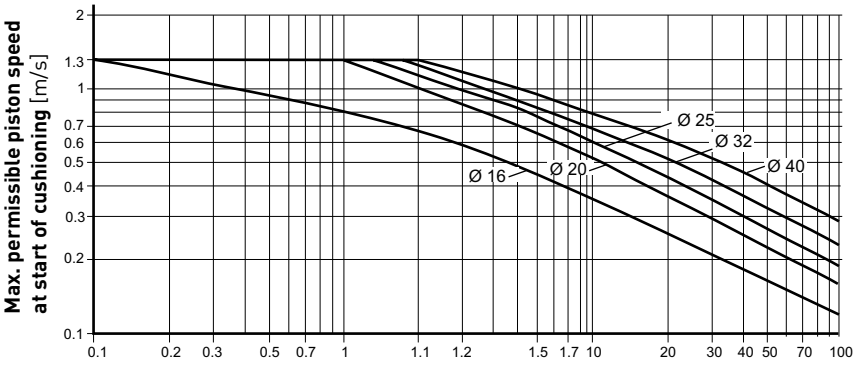
P1Z Series

Basic Version

Ø 16 - 40 mm

If the permitted limit values are exceeded, additional shock absorbers should be fitted in the area of the centre of gravity.

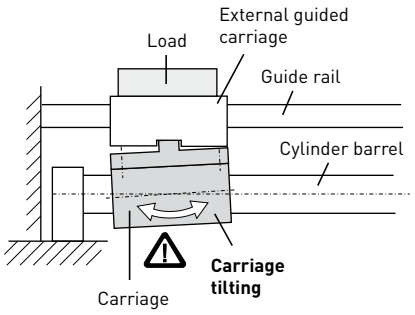
Cushioning diagram

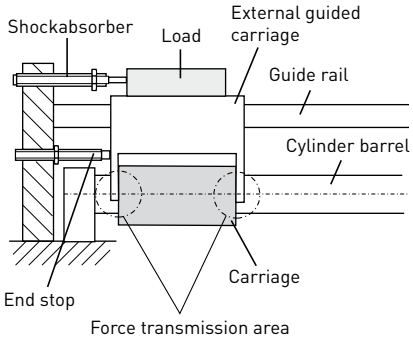


Horizontal mounting position, operating pressure p = 6 bar

Installation tips for use with external guide

When stopping a load having a large inertia force at the stroke end, tilting of the carriage and damage to the bearings and cylinder barrel may occur (fig. left).
To prevent this, the force transmission should be realized at the middle axis of the cylinder.
The combination of the shock absorber with an end stop, can help to prevent the tilting of the carriage (fig. right).



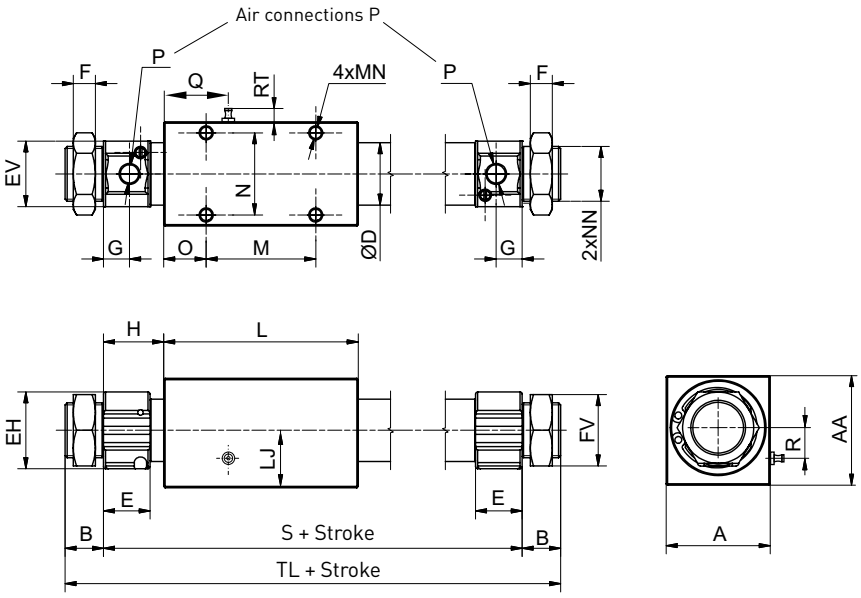


P1Z Series

Basic Version

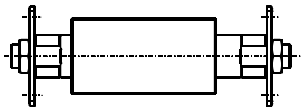
Ø 16 - 40 mm

Dimensions



Ø [mm]	A	AA	B	ØD	E	EH	EV	F	FV	G	H	L	LJ
16	32	34	10	18	14	18	18	4	14	5.5	18.5	61	16
20	38	40	14	22.8	17	28	24	8	26	9.5	22	71	19
25	48	48	16	27.8	17	34	30	8	32	9.5	22	76	24
32	60	60	16	35	17	40	36	8	32	9.5	23	87	30
40	70	70	16	43.0	21	48	45	10	41	11	29	92	35

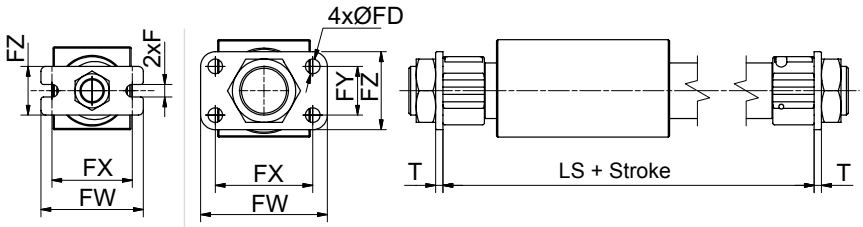
Ø [mm]	M	MN	N	NN	O	P	Q	R	RT	S	TL
16	34	M4 x 0.7 x 6	25	M10 x 1	13.5	M5 x 0.8	-	-	-	98	118
20	40	M5 x 0.8 x 8	30	M20 x 1.5	15.5	G 1/8	-	-	-	115	143
25	50	M5 x 0.8 x 8	30	M26 x 1.5	13	G 1/8	21	16	9	120	152
32	50	M6 x 1 x 10	40	M26 x 1.5	18.5	G 1/8	-	-	-	133	165
40	60	M6 x 1 x 10	40	M32 x 1.5	16	G 1/4	24	21	9	150	182



Flange mountings

Ø [mm]	F	Ø FD	FW	FX	FY	FZ	T	LS	Order no.
16	5.2	-	42	33	-	20	2.3	92	**PDC15-FH***
20	-	6	52	40	20	32	3	115	**PK1A20-FH***
25	-	7	80	64	28	44	5	120	**PK1A25-FH***
32	-	7	80	64	28	44	5	133	**PK1A25-FH***
40	-	7	80	64	28	44	5	150	**PK1A40-FH***

Ø 16 mm **Ø 20 - 40 mm**

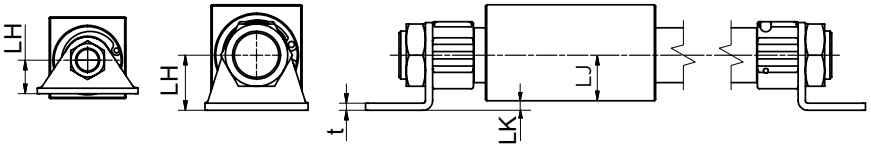


Material: galvanised steel
* The mountings are supplied in pairs.

Foot mountings

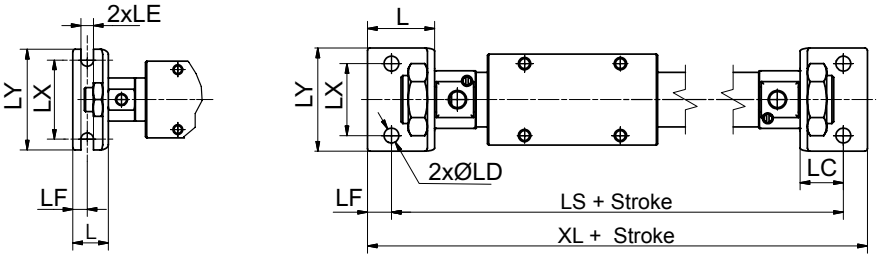
Ø [mm]	t	L	LC	ØLD	LE	LF	LH	LJ	LK	LX	LY	LS	LT	XL	XM	Order no.
16	2.3	14.8	8.8	—	5.2	6	14	16	- 2	33	42	109.6	79	121.6	96.6	**PDC15-LB***
20	3	28	18	6.2	—	10	23	19	4	30	43	151	85	171	121	**PK1A20-LB***
25	3	35	23	7	—	12	30	24	6	46	62	166	**	222	**	**PK1A25-LB***
32	3	35	23	7	—	12	30	30	0	46	62	179	**	203	**	**PK1A25-LB***
40	3	36	24	7	—	12	30	35	5	46	62	198	**	254	**	**PK1A40-LB***

Ø 16 mm **Ø 20 - 40 mm**



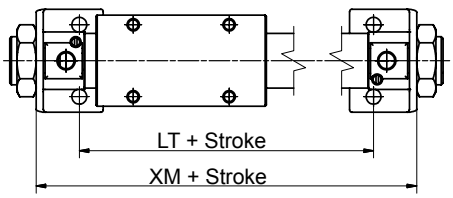
Foot mounting outside

Ø 16 - 40 mm



Foot mounting inside

<u>Only</u> Ø 16 and 20 mm



Material: galvanised steel
* The mountings are supplied in pairs.

** Inside foot mounting is not possible.

Order instructions – Basic Cylinder – Series P1Z

Basic cylinder (15 digits)															With option (18 digits)		
P	**1**	**Z**	**M**	0	1	6	**S**	A	**N**	0	8	5	0	W	F	M	**N**

Piston diameter	
016	Ø 16 mm
020	Ø 20 mm
025	Ø 25 mm
032	Ø 32 mm
040	Ø 40 mm

Options	
B	without
W	with

End of stroke cushioning	
A	Pneumatically adjustable (Ø 16, 20, 25, 32 and 40 mm)

Mountings	
N	without
F	Foot mounting
L	Flange mounting

Stroke length	
max. stroke [mm]	Piston Ø [mm]
1000	Ø 16
1500	Ø 20
2000	Ø 25
2000	Ø 32
2000	Ø 40

Air supply port type	
M	Metric thread (Ø 16 mm)
B	G-thread (Ø 20 - 40 mm)
(Other types on request)	

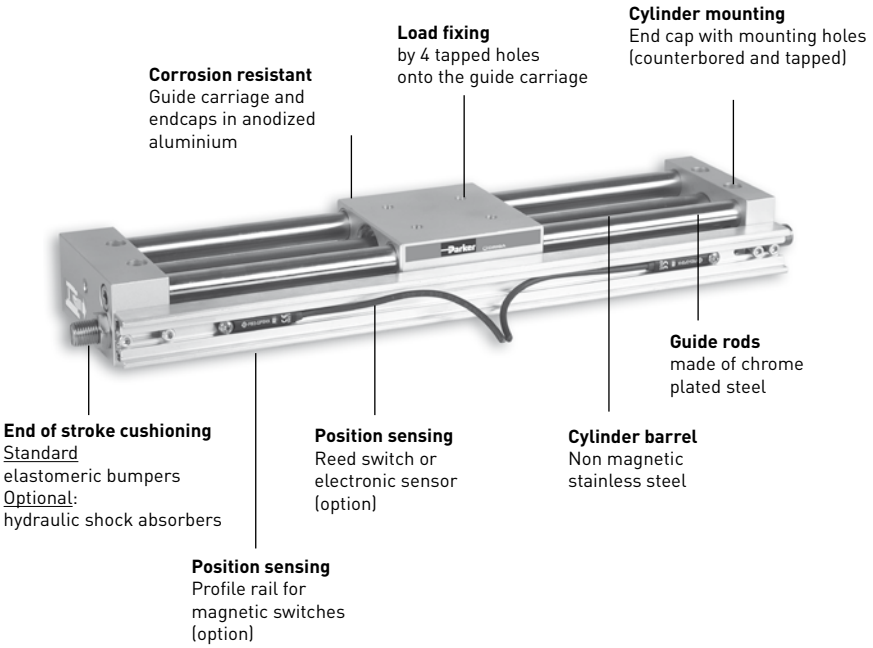
Order code examples:

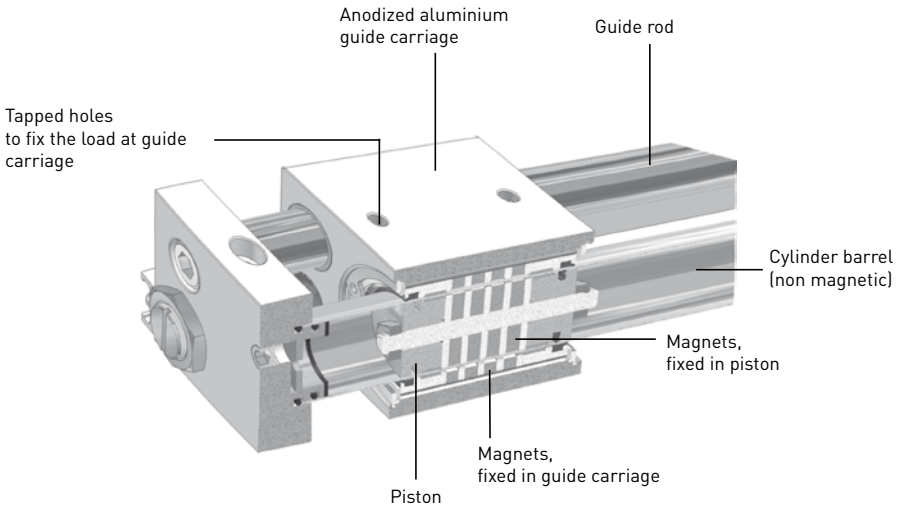
- P1ZM016SAN0100B Ø 16 mm, stroke 100 mm, supplied with hexagonal nuts on each end cap.

- P1ZM020SAN1000WFBN Ø 20 mm, stroke 1000 mm, with foot mounting at both end caps.

P1Z Series
Guided Version
Ø 16 - 40 mm

Guided Version





Features
Guided Version P1Z

- Double acting with guide
- Magnetically coupled without mechanical connection
- Mechanical protection in case of occasional overload due to magnetic uncoupling
- Piston chamber and Slide are pressure tight
- Pressure tight and leak free system
- Air connection at one end (option)
- End of stroke cushioning: with elastomeric bumpers (standard), with hydraulic shock absorbers (option)
- Position sensing: Al-profile rail for magnetic switches (option). Magnetic switches available as reed switches or as electronic sensors (option).

Description

The P1Z is a rodless pneumatic cylinder with guide. The piston and the guide carriage are equipped with ring magnets.

The motion is transmitted via the magnetic force between the piston and the guide carriage.

The guided version consists of a carriage fitted with 4 plain bearings, guided on 2 guide rods. The design provides high rigidity, accurate guidance and a non rotating movement.

P1Z Series
Guided Version
Ø 16 - 40 mm

Overview

Air connection

Guided version P1Z and
air connection on both sides
(standard)

Guided version P1Z and
air connection at one end
(option)

End of stroke cushioning

The end of stroke cushioning for light loads is provided by elastomeric bumpers (standard).

For medium and heavy loads hydraulic shock absorbers should be used (option).

Guided version P1Z and
elastomeric bumpers
(standard)

Guided version P1Z and
hydraulic shock absorbers
(option)

Position sensing

The guide carriage is fitted with a magnet for position sensing (standard)

An Al-profile rail for magnetic switches is available as an option. The rail is located on the same side as the elastomeric bumpers or the shock absorbers.

Reed switches or electronic sensors in several versions can be moved in the profile rail along the entire stroke length.
(Versions of magnetic switches refer to page 21.)

Guided version P1Z with magnet in the guide carriage for position sensing (standard).

Guided version P1Z and
Al-profile rail for magnetic switches
(option).

Guided version P1Z and
Al-profile rail with 2 magnetic switches
(option).

P1Z Series
Guided Version
Ø 16 - 40 mm

Technical Data					
Piston diameter [mm]	**16**	**20**	**25**	**32**	**40**
Max. stroke length [mm]	750	1000	1500	1500	1500
Stroke tolerance [mm] up to 1000 mm	0/+1.5				
Stroke tolerance [mm] > 1000 mm	0/+2				
Temperature range [°C]	0 to 60				
Operating medium	Filtered compr. air, dry, lubricated or unlubricated * . (other media on request)				
Air supply port size	M5	G1/8	G1/8	G1/8	G1/4
Magnetic coupling force [N]	157	236	383	703	942
Velocity range [m/s]	0.05 to 0.4				
Min. operating pressure [bar]	2.3	2			
Max. operating pressure [bar]	6.5	7			
Weight [kg]					
at 0 mm stroke	0.9	1.52	1.70	3.63	5.44
per 100 mm stroke	0.2	0.33	0.42	0.53	0.86

***** if external lubrication is added, this must always be continued.

Materials	
Cylinder barrel	Stainless steel
Carriage	Al, anodized
End cap	Al, anodized
Seals	NBR
Guide rods	Steel, chrome plated

Mounting and technical data

The loads can be fixed onto the guide carriage by 4 tapped holes.

Cylinder mounting provided with 4 tapped and counterbored holes. Additional mountings are not required.

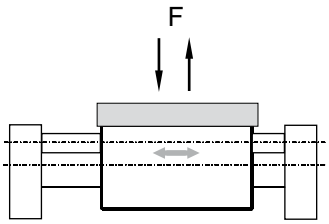
P1Z Series
Guided Version
Ø 16 - 40 mm

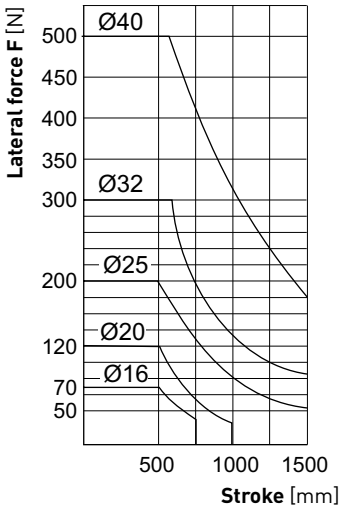
Forces [N]					
Piston Ø	16	20	25	32	40
Theoretical force at 6 bar [N]	120	188	295	483	754
Max. magnetic coupling force [N]	157	236	383	703	942

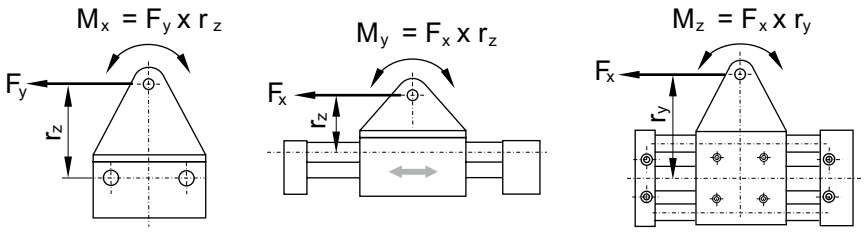
Permissible lateral force, depending on the stroke length

Loads, forces and moments

Dynamic forces must not exceed the maximum magnetic coupling force!

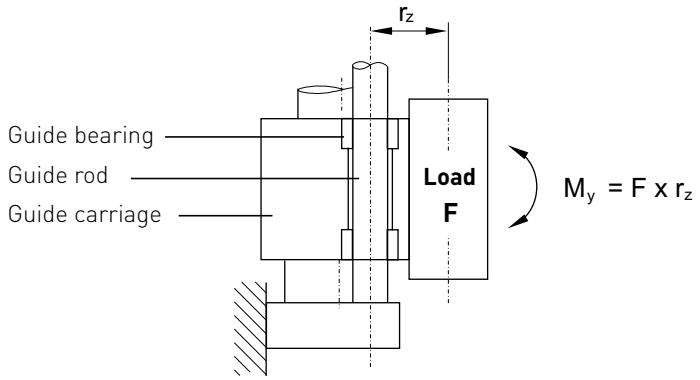






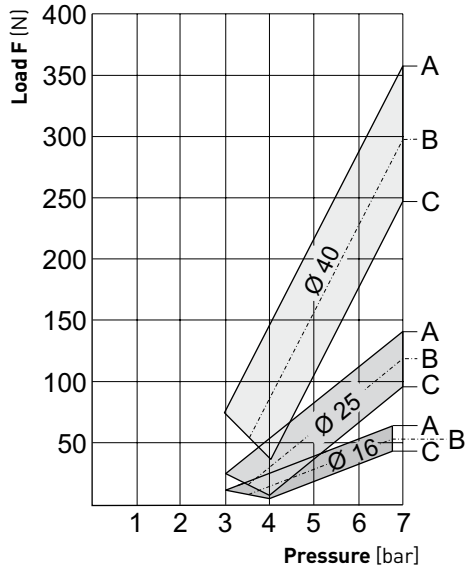
Ø [mm]	Max. Moment M_x [Nm]	Max. Moment M_y [Nm]	Max. Moment M_z [Nm]
16	0.5	2.4	2.4
20	1.0	5.0	5.0
25	1.8	9.5	9.5
32	3.0	15.0	15.0
40	4.5	24.0	24.0

Permissible axial load, vertical mounting

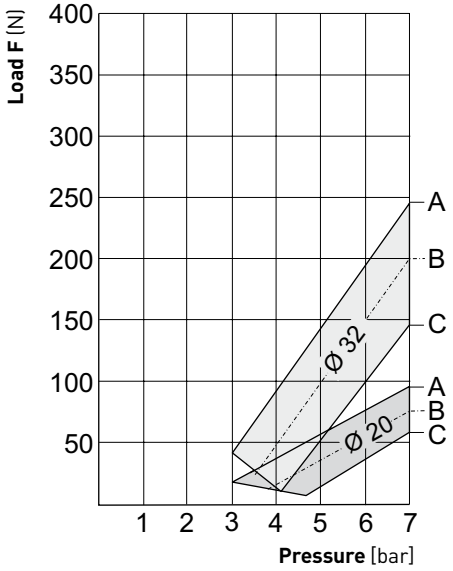


For vertical application please refer to the values in the diagrams !

Cylinder Ø 16, 25, 40



Cylinder Ø 20, 32



A = curve at moment $\mathbf{M_y = 0}$

B = curve at moment $\mathbf{M_y/2}$ = see **column B**

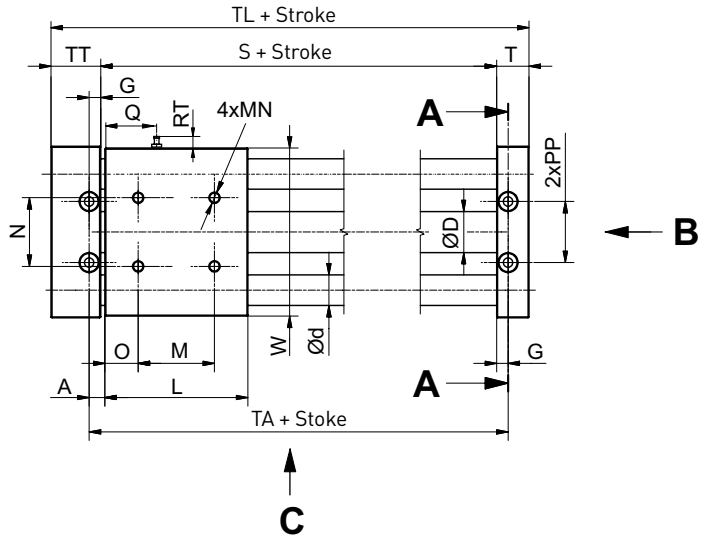
C = curve at moment $\mathbf{M_{y\,max.}}$ = see **column C**

Ø [mm]	**Max. Load** **F** [N]	**B** **Moment** **My / 2** [Nm]	**C** **Max. Moment** **My** [Nm]
16	50.0	1.2	2.4
20	100.0	2.5	5.0
25	140.0	4.75	9.5
32	240.0	7.5	15.0
40	360.0	12	24.0

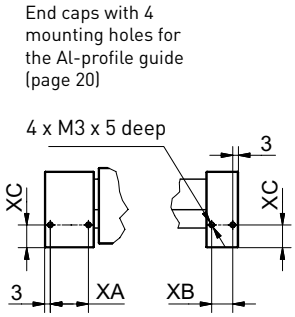
P1Z Series
Guided Version
Ø 16 - 40 mm

Dimensions

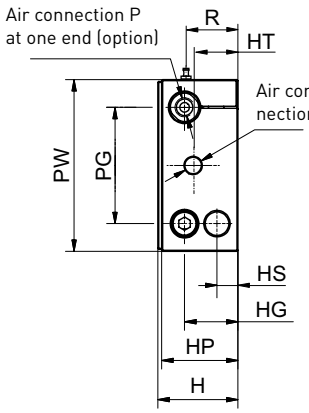
Dimensions [mm]



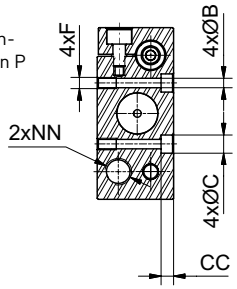
View C



View B



View A-A

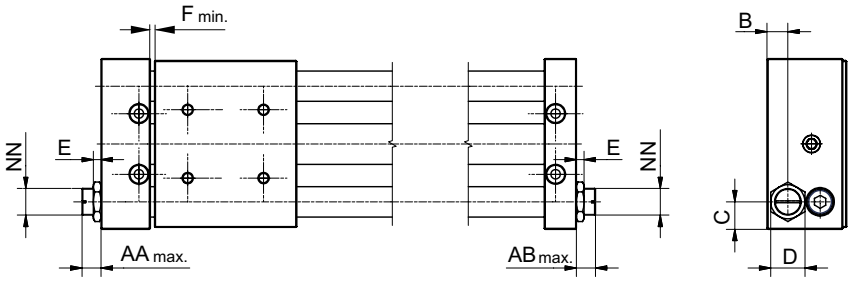


Ø [mm]	A	ØB	ØC	CC	ØD	Ød	F x depth	G	H	HG	HP	HS	HT	L	M	MN x depth
16	8	4.3	8	4.5	17.4	12	M5 x 10	6	34	25	33.5	12	21.5	65	34	M5 x 8
20	8	5.5	9.5	6.5	21.4	16	M6 x 10	6	42	28	40	12	23.5	75	40	M6 x 10
25	10	7	11	6.5	26.4	16	M8 x 10	8	54	32	52	40	24.5	80	40	M8 x 10
32	13.5	8.7	14	8	33.6	20	M10 x 15	10	66	46	64	20	41	91	60	M8 x 12
40	12.5	8.7	14	8	41.6	25	M10 x 15	10.5	76	50	74	56	28	95	65	M8 x 12

Ø [mm]	N	O	P	PG	PP	PW	Q	R	RT	S	T	TA	TL	TT	W	XA	XB	XC
16	30	15.5	M5	50	27	70	-	-	-	69	14	81	106	23	68	17	8	12
20	36	17.5	G1/8	61	32	90	-	-	-	79	17	91	122	26	88	20	11	12
25	70	20	G1/8	70	42	100	23	34	9	84	17	100	127	26	97	20	11	32
32	50	15.5	G1/8	86	50	122	-	-	-	97	20	117	145	28	118	22	14	12
40	105	15	G1/4	104	64	145	25.5	59	9	99	22	120	156	35	142	28	16	42

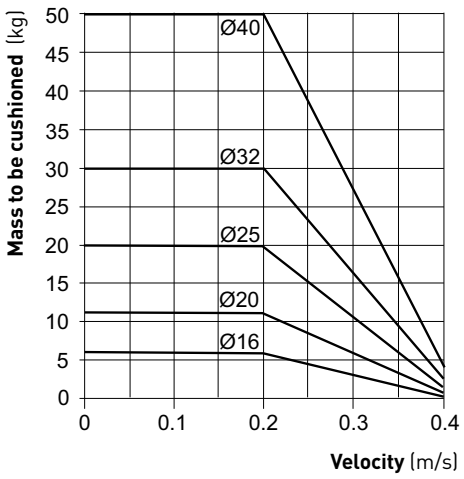
Standard: Elastomeric bumpers

Dimensions



Ø [mm]	$AA_{max.}$	$AB_{max.}$	B	C	D	E	$F_{min.}$	NN
16	13	13	12	10	14	4	2	M10X1
20	10	10	11	14.5	17	6	2	M14X1.5
25	11	20	40	15	17	6	2	M14x1.5
32	12	12	20	18	27	6	2,5	M20X1.5
40	11	11	56	20.5	27	6	2	M20x1.5

Cushioning diagram for elastomeric bumpers



The diagram shows the capacities of the P1Z cylinders with elastomeric bumpers.

If the intersection between speed and mass is above the curves, it is imperative to use hydraulic shock absorbers to prevent cylinder damage.

Example:

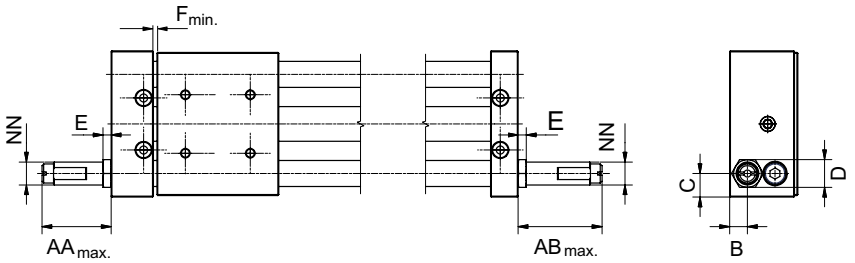
Cylinder Ø 32 mm, at a velocity of 0.3 m/s with a mass of 25 kg choose hydraulic shock absorbers.

Cylinder Ø 20 mm, at a velocity of 0.2 m/s with a mass of 10 kg choose the elastomeric bumpers.

P1Z Series
Guided Version
Ø 16 - 40 mm

Option: Hydraulic shock absorbers

Dimensions



Ø [mm]	$AA_{max.}$	$AB_{max.}$	B	C	D	E	$F_{min.}$	NN
16	18	27	12	10	12	4	2	M10X1
20	47	56	11	14.5	17	6	2	M14X1.5
25	47	56	40	15	17	6	2	M14x1.5
32	56	66	20	18	23	8	3.5	M20x1.5
40	51	64	56	20.5	23	8	2	M20x1.5

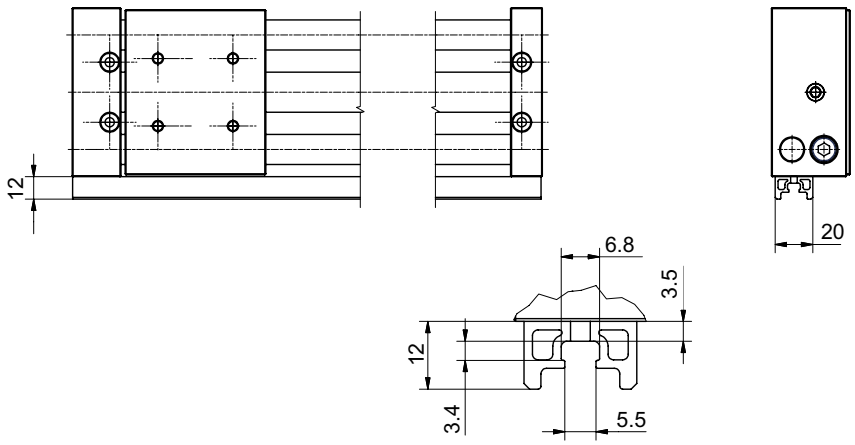
Option: Al-profile rail for magnetic switches

Position sensing

The rail is located on the same side as the end of stroke cushioning elements (Bumpers or shocks).

Reed switches or electronic sensors can be moved in the profile rail along the entire stroke length.

Dimensions (Ø 16 - 40 mm)



Magnetic Switches

Reed Switch and Electronic Sensor

Series P8S

Technical Data			
Magnetic sensor	**Unit**	**P8S-GR**	**P8S-GP**
Electrical Characteristics			
Switching output / function		Reed / NO	PNP / NO
Electric configuration		2-pole	3-pole
Indicator LED yellow		yes	
Operating voltage Ub	V	10 - 30 AC/DC	10 - 30 DC
Ripple of Ub	%	⩽ 10	⩽ 10
Voltage drop	V	⩽ 3	⩽ 2
Power consumption unloaded Ub = 24 V	mA	-	⩽ 10
Continuous current	mA	⩽ 500	⩽ 200
Max. switching capacity	W	⩽ 6	-
Switchable capacity load @100 W @ 24 V DC	nF	100	-
Switching frequency	Hz	⩽ 400	⩽ 1,000
Swich on delay / Time delay off	ms	1.5 / 0.5	0.5 / 0.5
Switch point accuracy	mm	⩽ 0.2	⩽ 0.2
Switching distance	mm	ca. 15	ca. 15
Hysteresis	mm	2	2
EMC to EN 60947-5-2		yes	
Lifetime		⩾ 20 x 10^6 cycles	unlimited
Short circuit protection		-	yes
Reverse polarity protection		-	yes
Power-up pulse Suppression		-	yes
Protection for inductive load		-	yes
ATEX certification		-	on request
Mechanical characteristics			
Housing		PA12	
Cable type		PUR / black	
Cable cross section	mm^2	2 x 0.14	3 x 0.14
Bending radius fixed installation	mm	⩾ 30	
Bending radius moving	mm	⩾ 45	
Shock resistance			
Protection EN 60529	IP	68	
Ambient temperature range	°C	- 30 to + 80	
Vibration EN 60068-2-6	G	30, 11 ms, 10 up to 55 Hz, 1 mm	
Shock EN 60068-2-27	G	50, 11 ms	

Magnetic Switches

Magnet switches are used for the contactless sensing of end or intermediate positions of the carriage.
The new generation of t-slot switches convince with easy mounting avoiding special tools and with a drop in mounting.
Due to new electronics the hysterisis is very small and allows a very accurate switching point.

Electronic Sensor

This type of electronic sensor with PNP function provides a short circuit as well as a transient protection as standard.
The new state of the art electronics inside can be used for endless lifetime. Especially if the application demand for high switching frequency is required.

Reed Switch

The 2-pole reed switch is a price attractive alternative while offering reliable and proven function for a lot of applications.
An integrated LED shows the status of the switch visually.

Carriage speed and switching distance affect signal duration and should be considered in conjunction with the minimum reaction time of ancillary control equipment.
In accordance to this, the contact travel must be included in the calculation.

$$\text{Min. reaction time} = \frac{\text{Switching distance}}{\text{Piston speed}}$$

Magnetic Switches

Reed Switch and Electronic Sensor

Series P8S

Electric Service Life Protective Measures

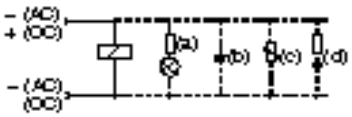
The reed switches are sensitive to excessive currents and inductions. With high switching frequencies and inductive loads such as relays, solenoid valves or lifting magnets, service life will be greatly reduced.

With resistive and capacitative loads with high switch-on current, such as light bulbs, a protective resistor should be fitted. This also applies to long cable lengths and voltages over 100 V.

In the switching of inductive loads such as relays, solenoid valves and lifting magnets, voltage peaks (transients) are generated which must be suppressed by protective diodes, RC loops or varistors.

Connection Examples

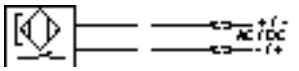
Load with protective circuits
(a) Protective resistor for light bulb
(b) Freewheel diode on inductivity
(c) Varistor on inductivity
(d) RC element on inductivity



For the type P8S-GP, external protective circuits are not normally needed.

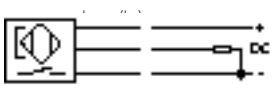
Electrical Connection Reed Switch

normally open

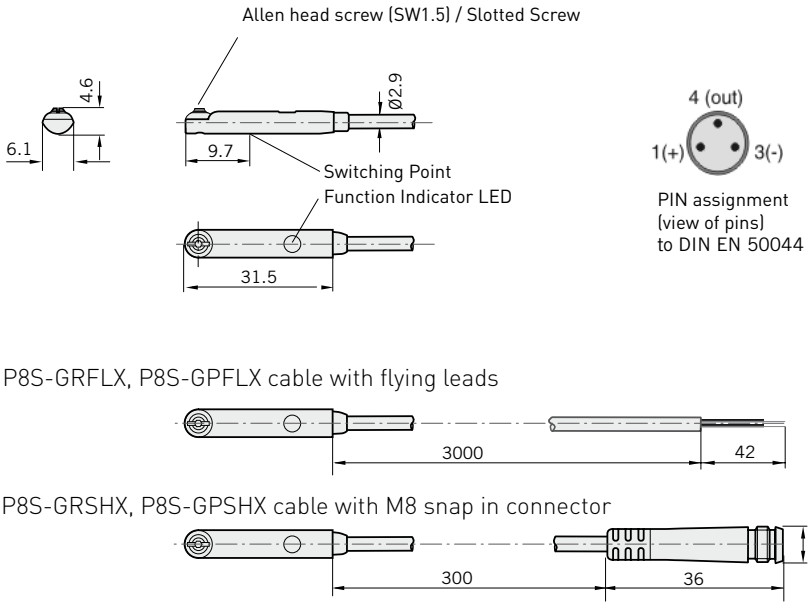


Electrical Connection Electronic Sensor PNP

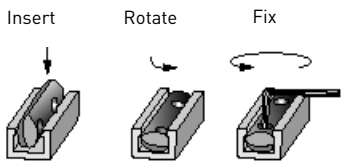
normally open



Dimensions (mm) – Type P8S-GR, P8S-GP



Installation for Magnetic T-Slot Switches



Order number

	M8 Connector, snap in, 3-pole 0.3 m	FL flying leads 3 m
Reed NO (2-wire)	P8S-GRSHX	P8S-GRFLX
PNP NO	P8S-GPSHX	P8S-GPFLX

Order instructions

Basic cylinder (15 digits)																With option (18 digits)		
P	1	Z	M	0	1	6	T	C	N	0	8	5	0	W		N	M	L

Piston diameter	
016	Ø 16 mm
020	Ø 20 mm
025	Ø 25 mm
032	Ø 32 mm
040	Ø 40 mm

Options	
B	without
W	with

Version	
G	Guided version and air connection on both sides
T	Guided version and air connection at one end

Air supply port type	
M	Metric thread (Ø 16 mm)
B	G-thread (Ø 20 - 40 mm)
(Other types on request)	

End of stroke cushioning	
C	with elastomeric bumpers
H	with two hydraulic shock absorbers

Position sensing	
N	without
L	Al-profile without magnetic switch
S	2 Reed switches, 0.3 m with M8 connector, snap in
C	2 Reed switches, 3 m flying leads
K	2 Electronic sensors PNP 0.3 m with M8 connector, snap in
H	2 Electronic sensors PNP 3 m flying leads

Stroke length	
max. stroke [mm]	piston Ø [mm]
750	Ø 16
1000	Ø 20
1500	Ø 25
1500	Ø 32
1500	Ø 40

Order code examples:

- **P1ZM016TCN0100B** Cylinder guided version -Ø 16 mm, stroke 100 mm, with air connection at one end and elastomeric bumpers.

- **P1ZM020GHN1000WNBL** Cylinder guided version -Ø 20 mm, stroke 1000 mm, with air connection on both sides, with two hydraulic shock absorbers and profile rail for magnetic switches.