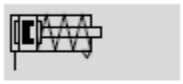
Single acting cylinders:

Round cylinders ESNU

FESTO

Technical data

Function
Flexible cushioning



- Ø - Diameter
  8 ... 25 mm
  ISO 6432
- Ø - Diameter
  32 ... 63 mm
- | - Stroke length
  1 ... 50 mm

ESNU-...-

ESNU-...-MA
Axial air connection MA

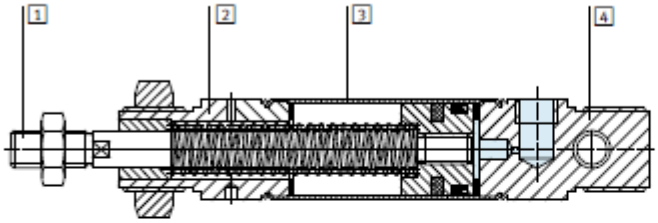
General technical data										
Piston Ø	8	10	12	16	20	25	32	40	50	63
Conforms	ISO 6432						–			
Pneumatic connection	M5	M5	M5	M5	G⅛	G⅛	G⅛	G¼	G¼	G⅜
Piston rod thread	M4	M4	M6	M6	M8	M10x1.25	M10x1.25	M12x1.25	M16x1.5	M16x1.5
Stroke[1] [mm]	1 ... 50									
Constructional design	Piston / Piston rod / Cylinder barrel									
Cushioning	Flexible cushioning rings/pads at both ends									
Position sensing	Via proximity sensor									
Type of mounting	Via accessories									
Mounting position	Any									

1) Cylinders with position sensing require a minimum stroke of 10 mm to ensure reliable sensing
- | - Note This product conforms to ISO 1179-1 and to ISO 228-1

Operating and environmental conditions										
Piston Ø	8	10	12	16	20	25	32	40	50	63
Operating medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4]									
Note on operating/pilot medium	Operation with lubricated medium possible (in which case lubricated operation will always be required)									
Operating pressure [bar]	1.5 ... 10			1.2 ... 10						
Ambient temperature[1] [°C]	–20 ... +80									
Corrosion resistance class CRC[2]	2									

Materials

Sectional view

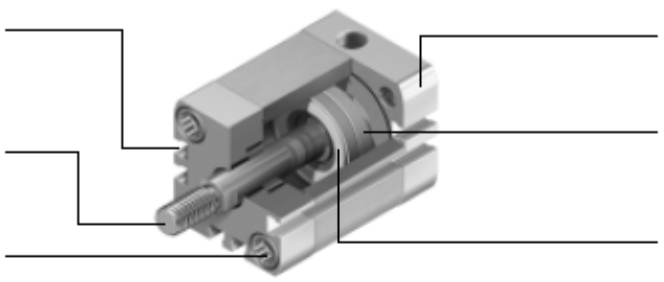


Round cylinder		
1	Piston rod	High-alloy steel
2	Bearing cap	Anodised aluminium
3	Cylinder barrel	High-alloy stainless steel
4	End cap	Anodised aluminium
–	Seals	TPE-U(PU), NBR
–	Spring	Spring steel
	Note on materials	RoHS compliant

Compact cylinders ADN/AEN, to ISO 21287

Key features

At a glance



More than the standard

- The compact cylinder series ADN/AEN complies with the standard ISO 21287
- The ADN/AEN is distinguished by its compact design and broad area of application thanks to the large number of variants
- The variants can be configured according to individual needs thanks to the modular product system

Powerful

- Flexible cushioning rings as standard for absorbing the residual energy facilitate high speeds and machine cycles
- Long service life thanks to exceptional cushioning characteristics and minimal friction factors
- The ADNP with bearing and end caps made of polymer is distinguished by its low weight

Convenient

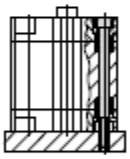
- Easy to mount with a comprehensive range of mounting accessories for just about every type of installation
- Highly flexible thanks to the wide range of variants
- Contactless position sensing using proximity sensors

Reliable

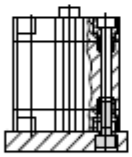
- Optimised manufacturing methods, patented technology and more than 40 years of experience in the field of cylinders make Festo and ADN/AEN a great team

Mounting options

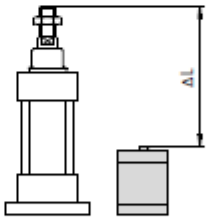
With through screw



Direct mounting



Size comparison between ISO 21287 and ISO 15552



- Space savings of up to 50% compared with the standard ISO 15552

Cushioning types

Cushioning P

Mode of operation

- The drive is equipped with polymer flexible end-position cushioning

Application

- Small loads
- Low speeds
- Small cushioning capacity

Advantages

- No adjustment required
- Time-saving

Cushioning PPS

Mode of operation

- The drive is equipped with self-adjusting, pneumatic end-position cushioning

Application

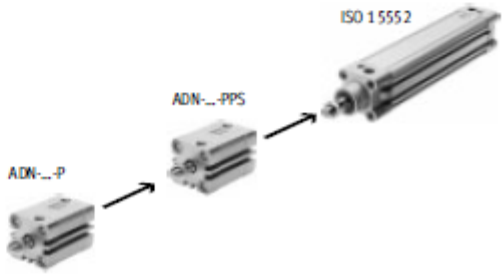
- Larger loads
- Higher speeds
- Larger cushioning capacity

Advantages

- No adjustment required
- Up to four times greater cushioning capacity than ADN-...-P
- Time-saving
- Noise reduction

Cushioning capacity of ISO 21287 and ISO 15552

In terms of cushioning capacity, the compact cylinder ADN-...-PPS fills the gap between ADN-...-P and standard cylinders with ISO 15552.



Compact cylinders AEN, to ISO 21287

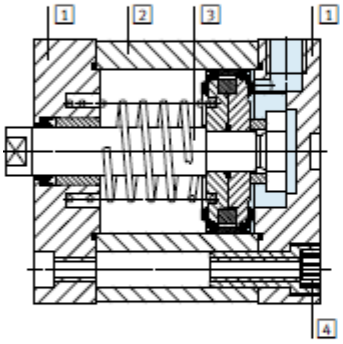
Technical data

FESTO

Weight [g]										
Piston Ø	12	16	20	25	32	40	50	63	80	100
Product weight with 0 mm stroke	77	79	131	156	265	346	540	722	1300	2154
Additional weight per 10 mm stroke	12	14	21	23	30	37	51	59	79	98
Moving load with 0 mm stroke	9	15	30	50	60	80	140	180	400	570
Additional load per 10 mm stroke	2	4	6	6	9	9	16	16	25	25

Materials

Sectional view



Compact cylinder			Basic version	S6
1	Bearing and end cap	Ø 12 ... 80	Anodised aluminium	
		Ø 100	Coated die-cast aluminium	
2	Cylinder barrel		Anodised aluminium	
3	Piston rod		High-alloy steel	
4	Flange screws	Ø 12 ... 16	High-alloy steel	
		Ø 20 ... 63	Galvanised steel	
		Ø 80 ... 100	Standard screws, galvanised steel	
–	Seals		Polyurethane	Fluoro elastomer
	Note on materials		RoHS-compliant	

Air Cylinder

Ø 6, Ø 10, Ø 16

New

RoHS

Double foot **Head flange**
Double-side bossed are added to the mounting types.

4 types ➡ 7 types

New For Ø 6, 3 types ➡ 6 types

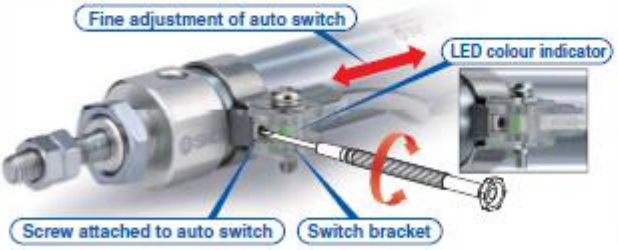
Improved amount of mounting freedom

Head cover with boss is added.

Easy fine adjustment of auto switch position

Fine adjustment of the auto switch position is possible by simply loosening the screw attached to the auto switch.

Transparent switch bracket improves visibility of indicator LED.



Head cover port location "Perpendicular to axis" is newly added to Ø 6.

Improved piping flexibility

New Ø 6	●	○
Ø 10	○	○
Ø 16	○	○

Series CJ2

SMC

CAT.EUS20-226D-UK

Air Cylinder

Part numbers with rod end bracket and/or pivot bracket available

Not necessary to order a bracket for the applicable cylinder separately

Note) Mounting bracket is shipped together with the product, but not assembled.

Example) CDJ2D16-50Z-**N W** -M9BW-B

Pivot bracket	
—	None
N	Pivot bracket is shipped together with the product, but not assembled.

*: Only for CJ2D (double clevis) type
*: Except Ø 6

N: Kit of pivot bracket and double clevis

Rod end bracket	
—	None
V	Single knuckle joint
W	Double knuckle joint
T	Rod end cap (Flat type)
U	Rod end cap (Round type)

*: Ø 6: Except V, W

With rod end bracket

V: Single knuckle joint

W: Double knuckle joint

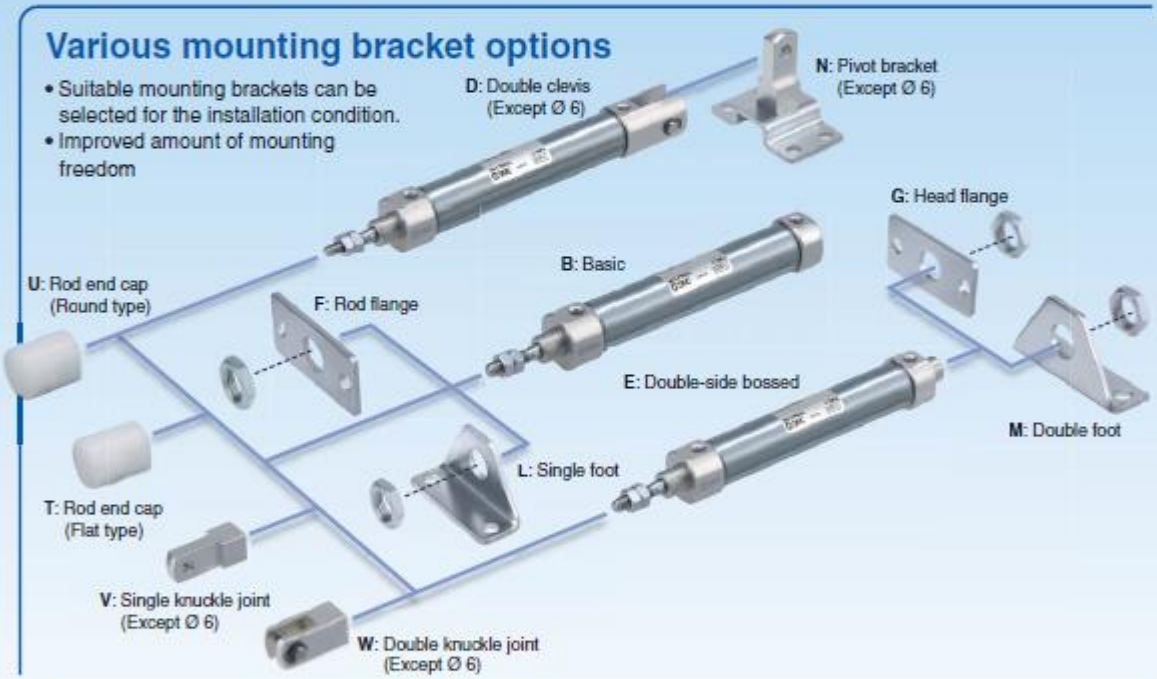
Rod end cap

T: Flat type

U: Round type

Various mounting bracket options

- Suitable mounting brackets can be selected for the installation condition.
- Improved amount of mounting freedom



2 mounting types of compact auto switches

- **Band mounting**
- **Rail mounting**

The auto switch mounting type, band or rail can be selected with the model number.

Water resistant compact auto switch now available

- **Solid state auto switch D-M9□A(V)**

Applicable to lead wire perpendicular entry type

Band mounting

Rail mounting
*: Except Ø 6

No environmental hazardous substances used

Specifications and dimensions are the same as the current product.

Head cover

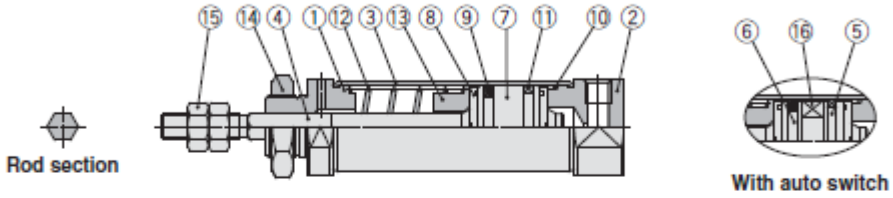
4 types of head cover shape are available.

Basic	Double clevis
	 (Except Ø 6)
Axial piping	**With boss**
	

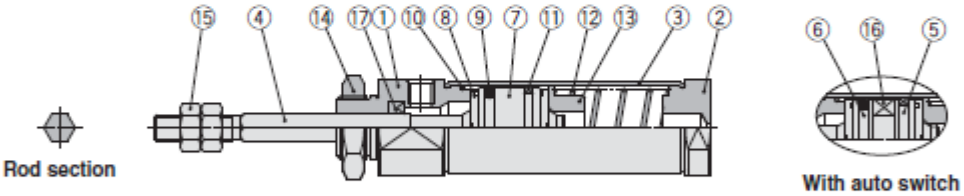
Series CJ2K

Construction (Not able to disassemble)

Single acting, Spring return



Single acting, Spring extend



Component Parts

No.	Description	Material	Note
1	Rod cover	Aluminium alloy	
2	Head cover	Aluminium alloy	
3	Cylinder tube	Stainless steel	
4	Piston rod	Stainless steel	
5	Piston A	Aluminium alloy	
6	Piston B	Aluminium alloy	
7	Piston	Aluminium alloy	
8	Bumper	Urethane	
9	Piston seal	NBR	

No.	Description	Material	Note
10	Tube gasket	NBR	
11	Wear ring	Resin	
12	Return spring	Piano wire	
13	Spring seat	Aluminium alloy	
14	Mounting nut	Rolled steel	
15	Rod end nut	Rolled steel	
16	Magnet	—	
17	Rod seal	NBR	

Double acting cylinders:

New Series C96

Weight reduced

Achieved weight reduction by changing rod cover shape and piston structure

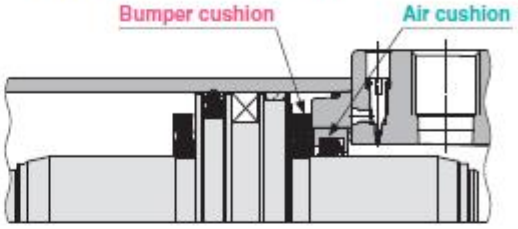
[kg]

Bore size [mm]	C96	Reduction rate
32	0.65	13 %
40	0.96	17 %
50	1.57	13 %
63	1.94	14 %
80	3.12	13 %
100	4.03	12 %

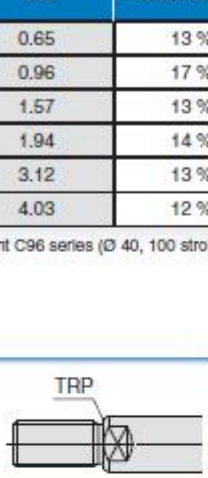
* Compared with the current C96 series (Ø 40, 100 stroke)

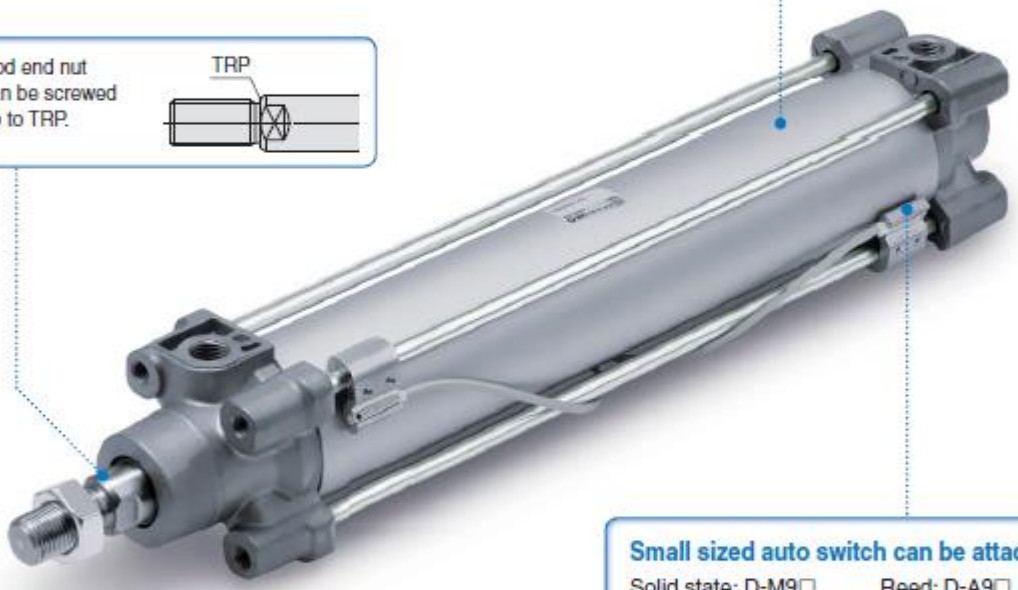
Air cushion + Bumper cushion Combined structure

- The cushion stroke time can now be reduced with the double cushioning, which improves the cycle time.
- The bumper cushion reduces the metal noise that occurs when the piston stops at the end of the stroke.



Rod end nut can be screwed up to TRP.



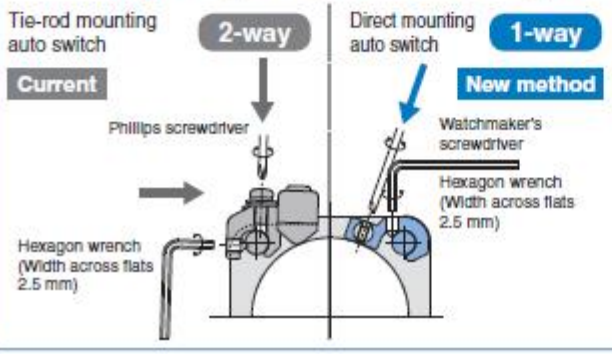


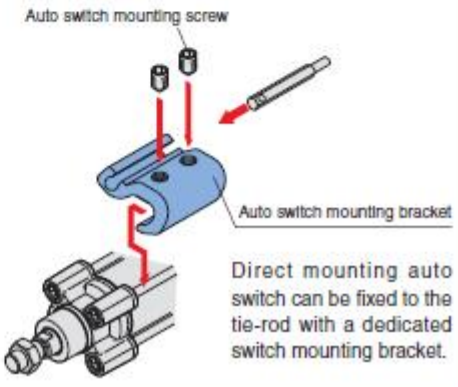
Small sized auto switch can be attached.

Solid state: D-M9□ D-M9□W Reed: D-A9□

Improved handling performance

Auto switch mounting and mounting position adjustment can be made in a one way direction.

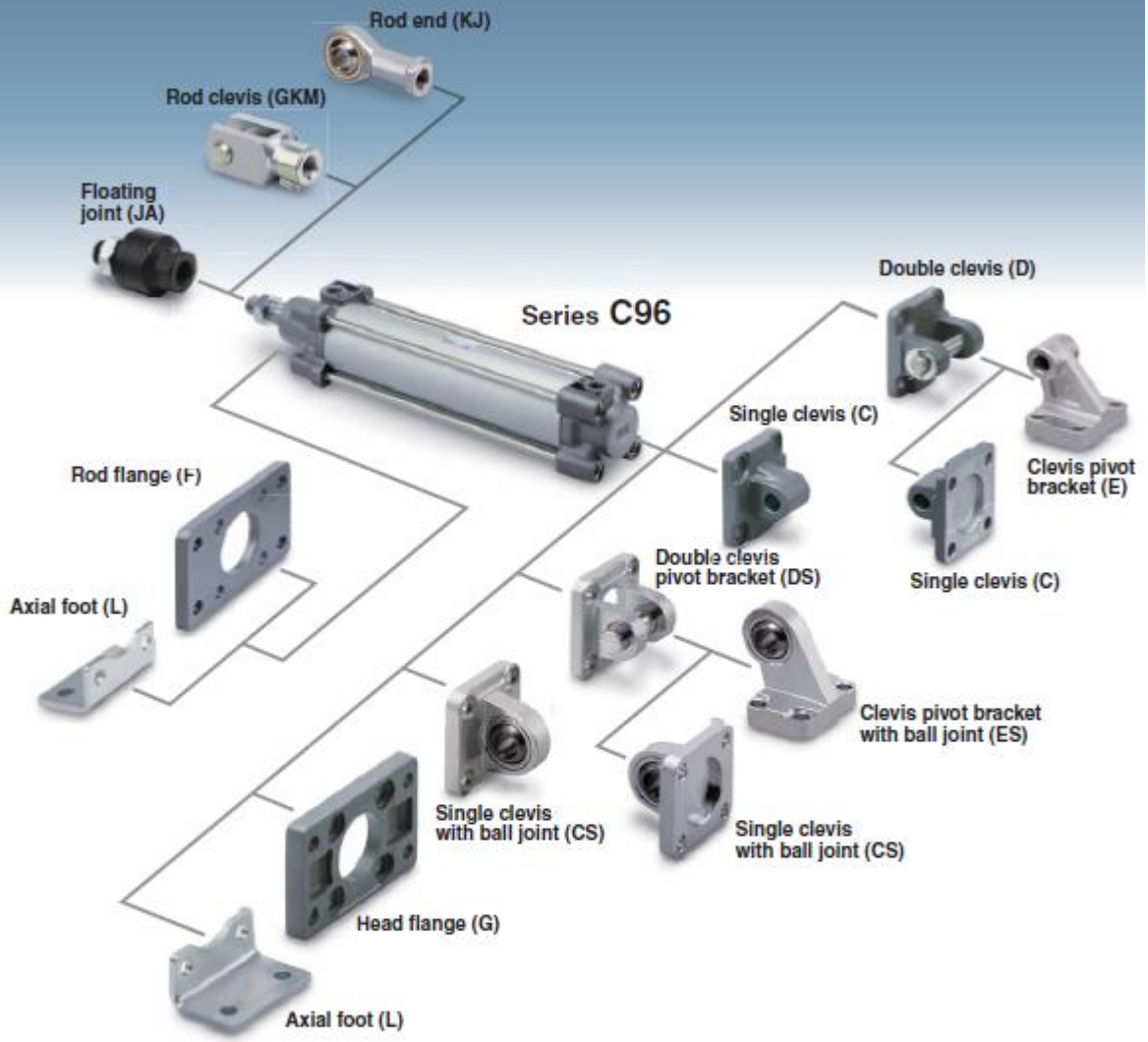




Direct mounting auto switch can be fixed to the tie-rod with a dedicated switch mounting bracket.

Various mounting bracket options

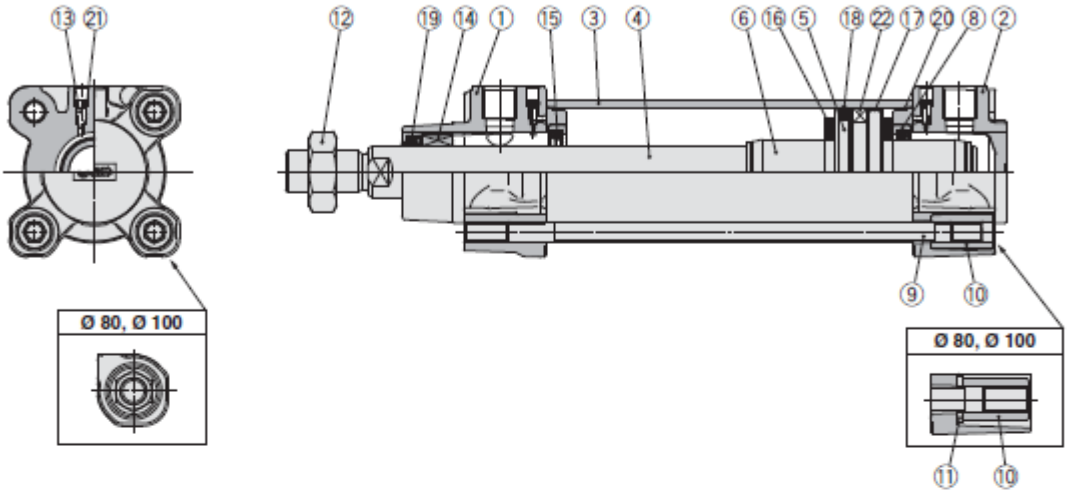
Mounting brackets can be combined according to the operating conditions.

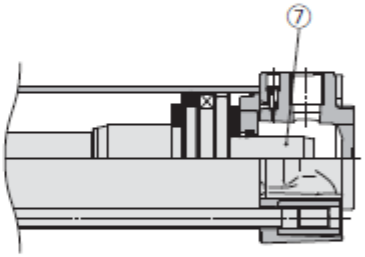


Series Variations

Series	Type	Bore size [mm] 32	40	50	63	80	100	Page
Standard Series C96	Double acting, Single rod	●	●	●	●	●	●	Page 3
	Double acting, Double rod	●	●	●	●	●	●	
Non-rotating rod Series C96K	Double acting, Single rod	●	●	●	●	●	●	Page 15
	Double acting, Double rod	●	●	●	●	●	●	
Smooth Cylinder Series C96Y	Double acting, Single rod	●	●	●	●	●	●	Page 19

Construction





Component Parts

No.	Description	Material	Note
1	Rod cover	Aluminium die-cast	
2	Head cover	Aluminium die-cast	
3	Cylinder tube	Aluminium alloy	
4	Piston rod	Carbon steel	
5	Piston	Aluminium alloy	Ø 32 to Ø 63
		Aluminium die-cast	Ø 80, Ø 100
6	Cushion ring A	Aluminium alloy	
7	Cushion ring B	Aluminium alloy	
8	Cushion seal holder	Aluminium alloy	
9	Tie-rod	Carbon steel	
10	Tie-rod nut	Steel	
11	Flat washer	Steel	Ø 80, Ø 100
12	Rod end nut	Steel	
13	Cushion valve	Resin	
14	Bushing	Bearing alloy	
15	Cushion seal	Urethane	
16	Bumper	Urethane	
17	Wear ring	Resin	
18	Piston seal	NBR	
19	Rod seal	NBR	
20	Cylinder tube gasket	NBR	
21	Cushion valve seal	NBR	
22	Magnet		

Replacement Parts/Seal Kit (Single rod)

Bore size [mm]	Kit no.	Contents
32	CS95-32	Kits include Items ⑮, ⑰ to ⑳.
40	CS95-40	
50	CS95-50	
63	CS95-63	
80	CS95-80	
100	CS96-100	

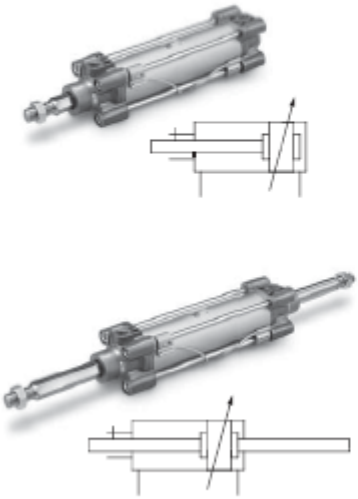
- Seal kits consist of Items ⑮, ⑰ to ⑳ and can be ordered by using the seal kit number corresponding to each bore size.
- The seal kit includes a grease pack (10 g for Ø 32 to Ø 50, 20 g for Ø 63 and Ø 80, 30 g for Ø 100).
  Order with the following part number when only the grease pack is needed.
  Grease pack part number: GR-S-010 (10 g), **GR-S-020** (20 g)

Seal Kit (Double rod)

Bore size [mm]	Kit no.	Contents
32	CS95W-32	Kits include Items ⑮, ⑱ to ⑳
40	CS95W-40	
50	CS95W-50	
63	CS95W-63	
80	CS95W-80	
100	CS96W-100	

- Seal kits consist of Items ⑮, ⑱ to ⑳ and can be ordered by using the seal kit number corresponding to each bore size.
- The seal kit includes a grease pack (10 g for Ø 32 to Ø 50, 20 g for Ø 63 and Ø 80, 30 g for Ø 100).
  Order with the following part number when only the grease pack is needed.
  Grease pack part number: GR-S010 (10 g), **GR-S-020** (20 g)

ISO (15552) Standard **Air Cylinder: Non-rotating Rod Type**
Double Acting, Single/Double Rod ***Series C96K***

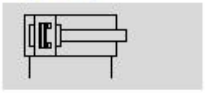


Specifications

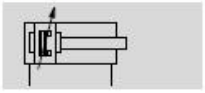
Bore size [mm]	32	40	50	63	80	100
Action	Double acting					
Fluid	Air					
Proof pressure	1.5 MPa					
Maximum operating pressure	1.0 MPa					
Minimum operating pressure	0.05 MPa					
Ambient and fluid temperature	Without auto switch: –20 to 70° C (No freezing) With auto switch: –10 to 60° C (No freezing)					
Lubrication	Not required (Non-lube)					
Operating piston speed	50 to 1000 mm/s					
Allowable stroke tolerance	Up to 500 stroke: $^{+2}_{0}$, 501 to 1000 stroke: $^{+2.4}_{0}$					
Cushion	Air cushion on both ends + Bumper cushion					
Port size	G 1/8	G 1/4	G 1/4	G 3/8	G 3/8	G 1/2
Mounting	Basic, Axial foot, Rod flange, Head flange, Single clevis, Double clevis, Centre trunnion					
Non-rotating accuracy	±0.5°		±0.5°		±0.3°	
Allowable rotational torque [N·m]	0.25	0.45	0.64		0.79	

Maximum Strokes

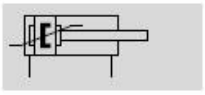
Function
P cushioning



PPV cushioning



PPS cushioning



DIN

Diameter
32 ... 125 mm

Stroke length
1 ... 2800 mm

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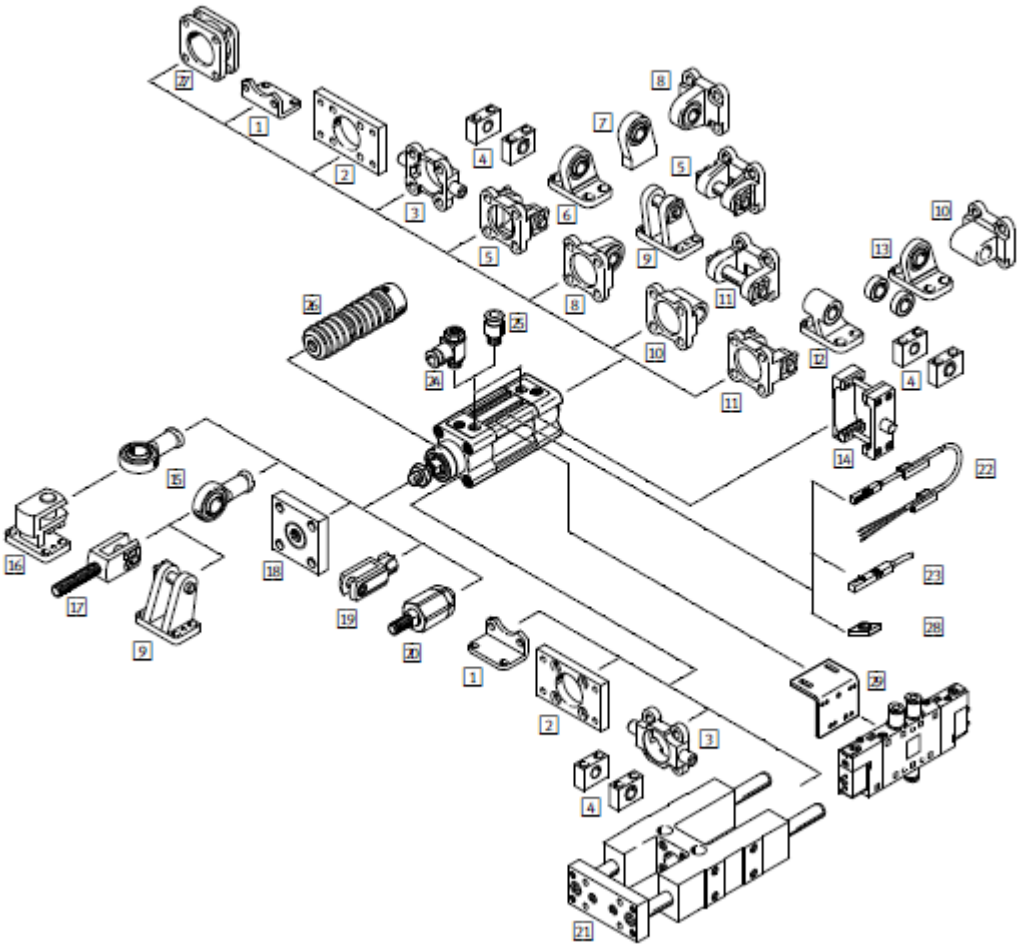
Standards-based cylinders DSBC, to ISO 15552

FESTO

Peripherals overview



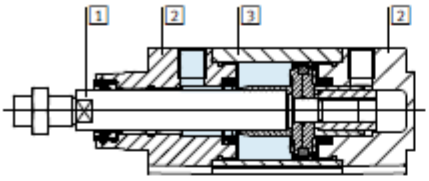
Standards-based cylinders DSBC, to ISO 15552

Technical data

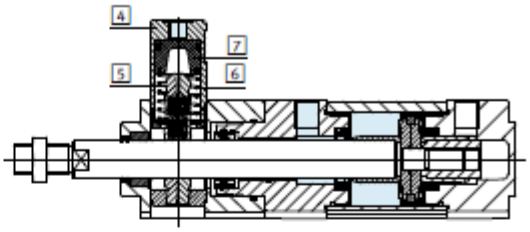
FESTO

Materials

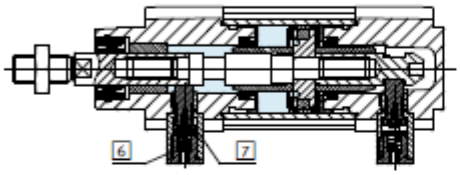
Sectional view – Basic design



With clamping unit



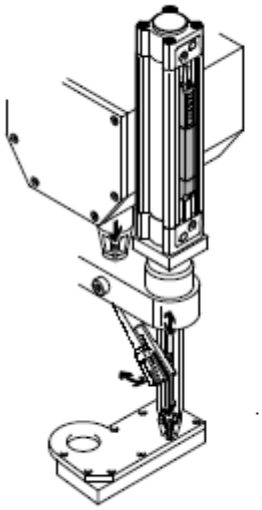
With end-position locking



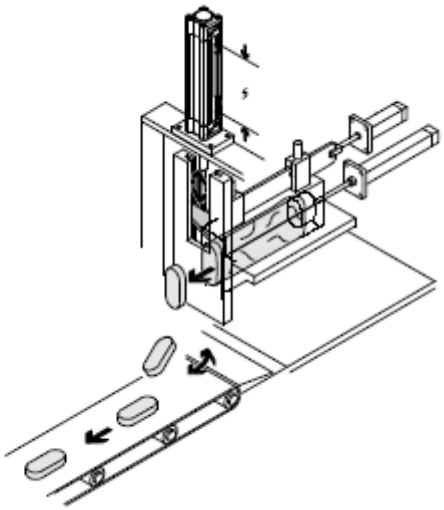
Standards-based cylinder		
1	Piston rod	
	DSBC-...	High-alloy steel
	DSBC-...-R3	High-alloy stainless steel
	DSBC-...-A2/-A6	Hard-chromium plated tempered steel
2	Cover	Die-cast aluminium, coated
3	Profile barrel	Anodised wrought aluminium alloy
4	Housing, clamping unit	Anodised wrought aluminium alloy
5	Clamping jaw	Brass
6	Spring	
	DSBC-...-C	Spring steel
	DSBC-...-E1/E2/E3	High-alloy stainless steel
7	Piston	
	DSBC-...-C	POM
	DSBC-...-E1/E2/E3	Hardened steel
–	Piston rod seal	
	DSBC-...	PUR
	DSBC-...-L/-U	FPM
	DSBC-...-L1	HNBR
	DSBC-...-T1/-T4/-A1	FPM
	DSBC-...-T3	PUR (suitable for low temperatures)
	DSBC-...-A3	UHMW-PE
	Rod wiper seal	
	DSBC-...-A6	CuZn
	Buffer seal	
	DSBC-...	PUR
	DSBC-...-U	FPM
	DSBC-...-T1/-T4	FPM
	DSBC-...-T3	PUR (suitable for low temperatures)
	Cushioning boss	
	DSBC-...	POM
	DSBC-...-L/-U	Aluminium
	DSBC-...-T1/-T3/-T4	Aluminium
–	Note on materials	
	DSBC-...	RoHS compliant
	DSBC-...-L/U/-T3/-T4/-A3	Contains paint-wetting impairment substances

Application examples

Automatic screw machine



For process control



New Series CP96

Weight reduced

Achieved weight reduction by changing rod cover shape and piston structure

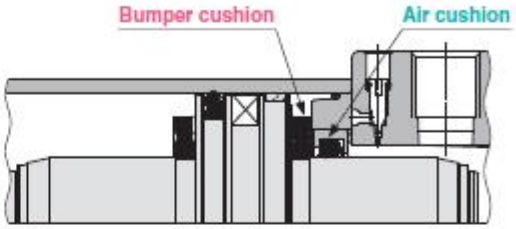
[kg]

Bore size [mm]	CP96	Reduction rate
32	0.74	11 %
40	1.02	15 %
50	1.74	11 %
63	2.12	12 %
80	3.40	11 %
100	4.33	11 %

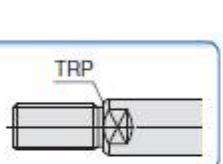
* Compared with the current CP96 series (Ø 40, 100 stroke)

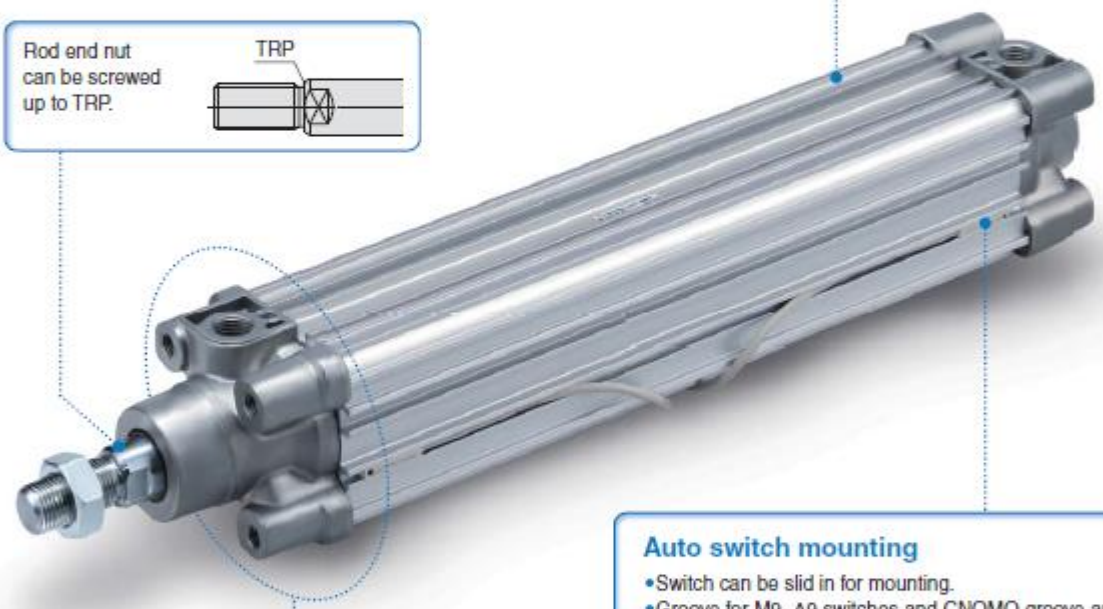
Air cushion + Bumper cushion Combined structure

- The cushion stroke time can now be reduced with the double cushioning, which improves the cycle time.
- The bumper cushion reduces the metal noise that occurs when the piston stops at the end of the stroke.



Rod end nut can be screwed up to TRP.



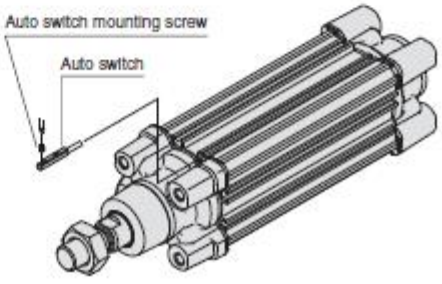


Auto switch mounting

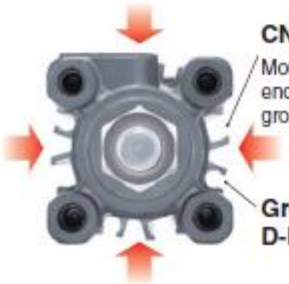
- Switch can be slid in for mounting.
- Groove for M9, A9 switches and CNOMO groove are on all four sides. Max. four sides, slide-in mountable

Auto switch can be slid in.

Mountable from both the head end and the rod end.



Auto switch mounting surface



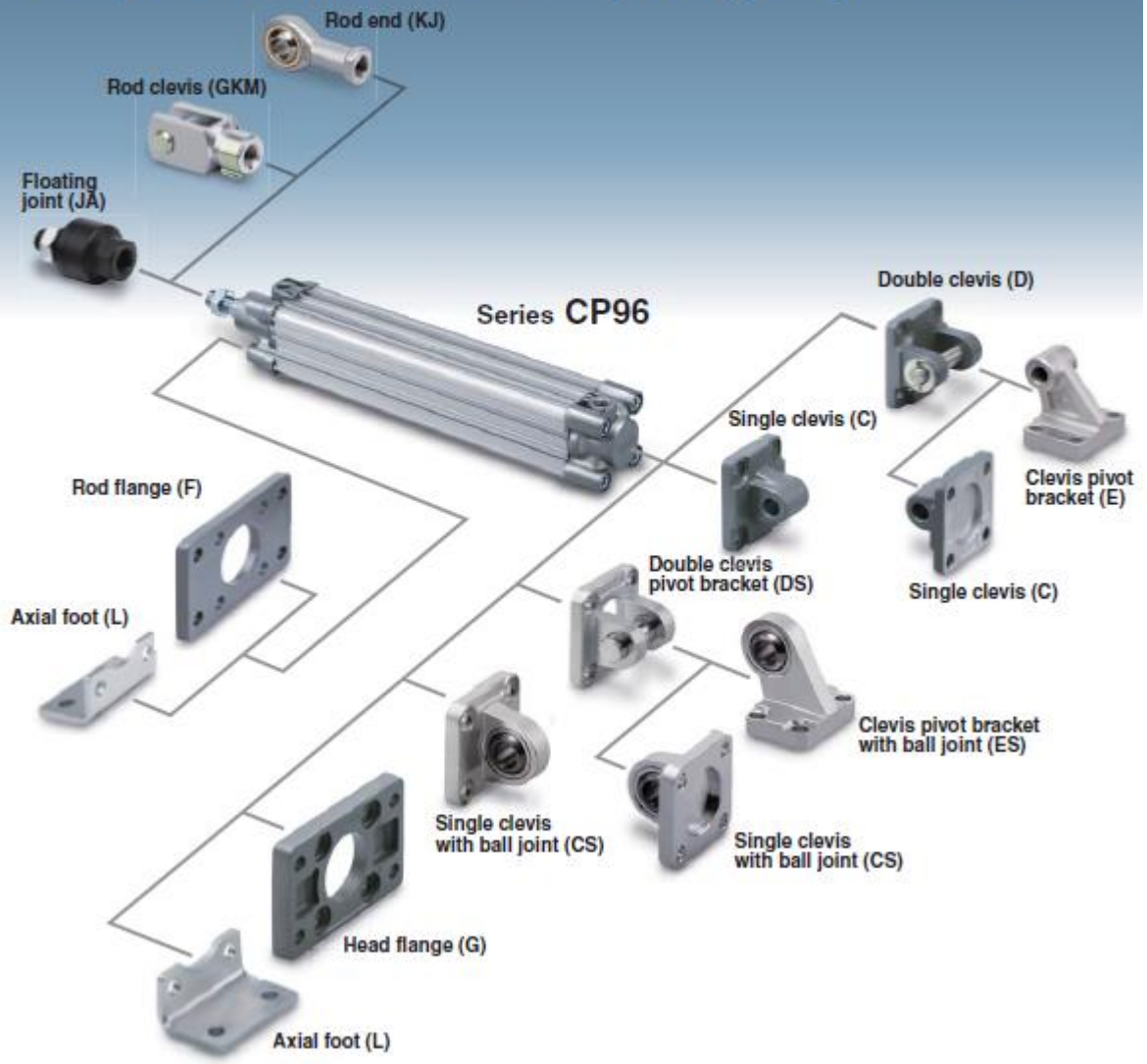
CNOMO grooves

Mount a switch from the head end for attaching to the CNOMO groove on the port surfaces.

Groove for the D-M9□, A9□ type

Various mounting bracket options

Mounting brackets can be combined according to the operating conditions.



Guide units FEN/FENG for ISO cylinders

Key features

At a glance

The guide units FEN and FENG protect ISO cylinders against torsion when these are subjected to high torque loads.

They offer high precision guidance for workpiece handling and other handling applications.

Two guide variants are available:
- Plain-bearing guide (GF)
- Recirculating ball bearing guide (KF)

Drive/guide unit combination options

Drive/guide unit	DSBC	DSBG	DNC	DSNU	DSN
FENG	■	■	■	–	–
FEN	–	–	–	■	■
→ Page/Internet	dsbc	dsbg	dnc	dsnu	dsn

Position sensing

With ISO cylinder DNC:
When installed, a mounting kit is required to sense the front end position. The rear end position can be sensed directly via the sensor slot.

With ISO cylinder DSNU:
With these ISO cylinders, a mounting kit is absolutely necessary for sensing the end positions.

Mounting kits

Drive	Piston diameter	Part No.	Type
DSNU-...-A	8	175091	SMBR-8-8
	10	175092	SMBR-8-10
	12	175093	SMBR-8-12
	16	175094	SMBR-8-16
	20	175095	SMBR-8-20
	25	175096	SMBR-8-25
DNC-...-A	32, 40	175705	SMB-8-FENG-32/40
	50, 63	175706	SMB-8-FENG-50/63
	80, 100	175707	SMB-8-FENG-80/100

Compact Guide Cylinder

ø12, ø16, ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100

Up to 17% Weight reduced!

Weight reduced by up to 17% with a shorter guide rod and thinner plate

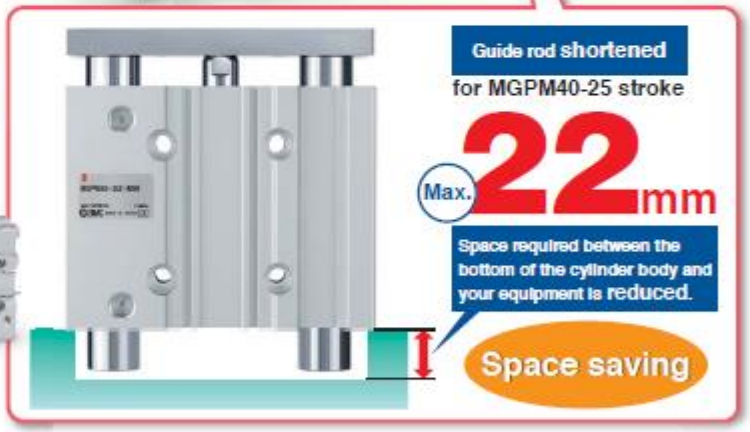
- With air cushion
- Water resistant cylinder are now available.

New

With air cushion

New

Water resistant cylinder



Guide rod shortened

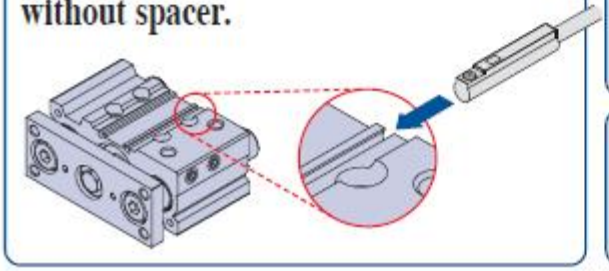
for MGPM40-25 stroke

Max. **22** mm

Space required between the bottom of the cylinder body and your equipment is reduced.

Space saving

Round type and magnetic field resistant auto switches are mountable directly without spacer.



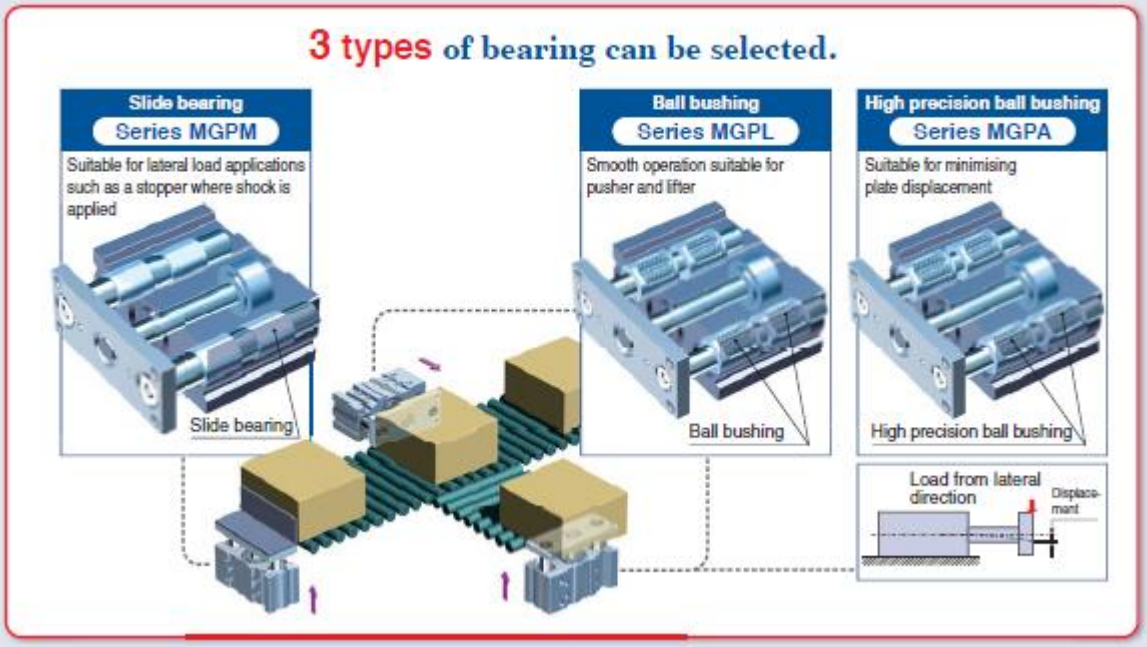
3 types of bearing can be selected.

- **Slide bearing** Series MGPM
- **Ball bushing** Series MGPL
- **High precision ball bushing** Series MGPA

Made to Order

Change of guide rod end shape (**-XA□**), intermediate stroke (**-XB10**), low speed cylinder (**-XB13**), side porting type (**-X867**), made of stainless steel (**-XC6**), adjustable stroke cylinder/adjustable extension type (**-XC8**), and with coil scraper (**-XC35**) etc. are now available.

Compact Guide Cylinder



ROTARY ACTUATORS

Vane Type

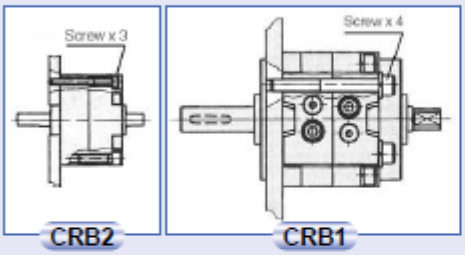
Rotation: 90°, 180°, 270°
All series can rotate up to 270°.

The use of specially designed seals and stoppers now enables our compact vane type rotary actuators to rotate up to 270° (single vane type).

Direct mounting

The body of rotary actuator can be mounted directly.

* Direct mounting is possible for size 10 to 30 rotary actuators with angle adjuster only.



Excellent reliability and durability

The use of bearings in all series (CRB2/CRBU2/CRB1) to support thrust and radial loads, along with the implementation of an internal rubber bumper (except for size 10), improves reliability and durability.

Two different connecting port positions (side and axial) are available.

The port position can be selected according to the application. (Only side ports are available for actuators with angle adjuster.)

Low pressure operation

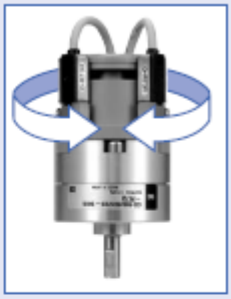
Special seal construction allows for a broader operating pressure range and makes operation in low pressure applications possible.

Minimum operating pressure

Size 10: 0.2MPa
Sizes 15 to 100: 0.15MPa

Unrestricted auto switch mounting position

Since the switches can be moved anywhere along the circumference of rotary actuator, they can be mounted at the optimum position according to the rotary actuator's specifications.

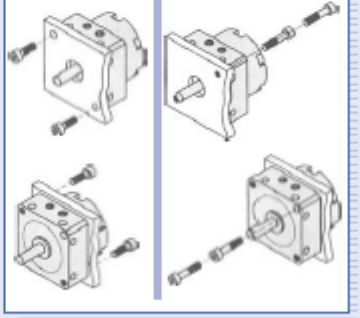


Direct mounting from 3 different directions is possible (CRBU2).

Series CRBU2 can be mounted in 3 directions: axial, top-ported, and side-ported. In the axial direction, there are 3 mounting variations.

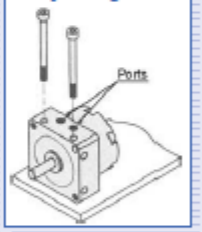
Axial mounting

Body taps | Body through holes



Top-ported mounting

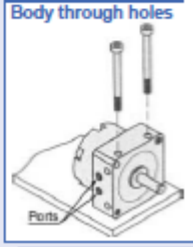
Body through holes



Since it may not be necessary to use all the convenient mounting holes to mount the actuator from three directions at the same time, the remaining holes can be used for other purposes.

Side-ported mounting

Body through holes



Rotary Actuator

CRB2
Sizes: 10, 15, 20, 30, 40

Free-mounting type

CRBU2
Sizes: 10, 15, 20, 30, 40

CRB1
Sizes: 50, 63, 80, 100

Double vane construction is now a standard feature for 90° and 100° rotation type actuators.

Although the outside dimensions of the double vane construction actuators are equivalent to those of the single vane construction type (except for size 10), the double vane construction achieves twice the torque of the single vane type.

Model		Rotations					
		90°	100°	180°	180°	270°	280°
CRB2	Single vane	●		●		●	
	Double vane	●	●				●
CRBU2	Single vane	●		●		●	
	Double vane	●	●				●
CRB1	Single vane	●	●	●	●	●	●
	Double vane	●	●				

Rotary Table
Series MSU

Vane type/Sizes 1, 3, 7, 20

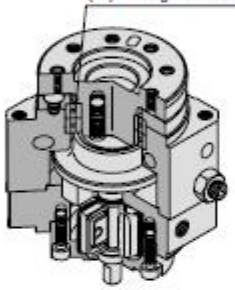
High Precision Type
Sizes 1, 3, 7, 20

Series MSUA

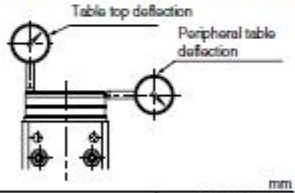
Improved table deflection accuracy:
0.03mm or less

High precision/High rigidity

Special bearing
(duplex single row ball bearing)



Deflection accuracy:
Displacement for 180° rotation

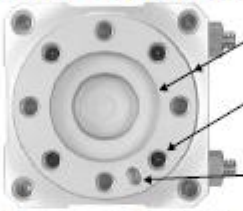


mm

Model	MSUA
Table top deflection	0.03 (0.1 to 0.2)
Peripheral table deflection	0.03 (0.1 to 0.2)

Values inside ( ) are for series MSUB

Easy alignment when mounting the load



- **Table inside/outside diameter tolerance H9/h9**
- **Female threads for load mounting provided in eight places.**
  (increases freedom in mounting the load)
- **Mounting reference pin holes**

Easy alignment when mounting the body

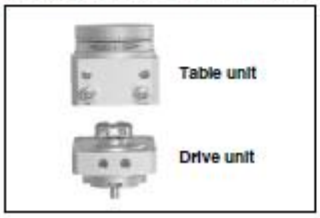
- **Mounting reference pin holes**
  (alignment with center of body)
  Provided on three sides, excluding port side
- **Reference diameter h9**
  (alignment with center of table rotation)

Angle is adjustable

90°±10°, 180°±10°
Double vane (MSUB only) 90°±5°

Disengageable

Maintenance work is simplified.
The drive unit can be replaced with the load mounted.



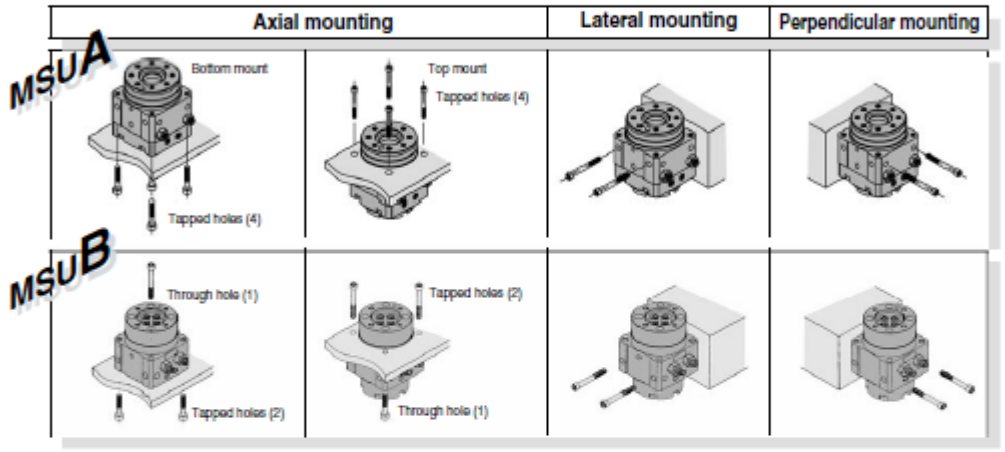
Auto switch capable

Since switches can be moved anywhere on the circumference, they can be mounted at positions which accommodate the specifications.

Rotary actuator with lightweight, compact table for robotic hands

■ Free-mount type

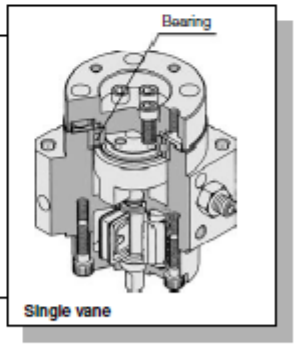
Can be mounted from three directions: axial, lateral, perpendicular



Basic Type *Series MSUB*

Sizes 1, 3, 7, 20

- **Single vane and double vane standardized**
- **Double vane has the same dimensions as single vane** (except size 1)



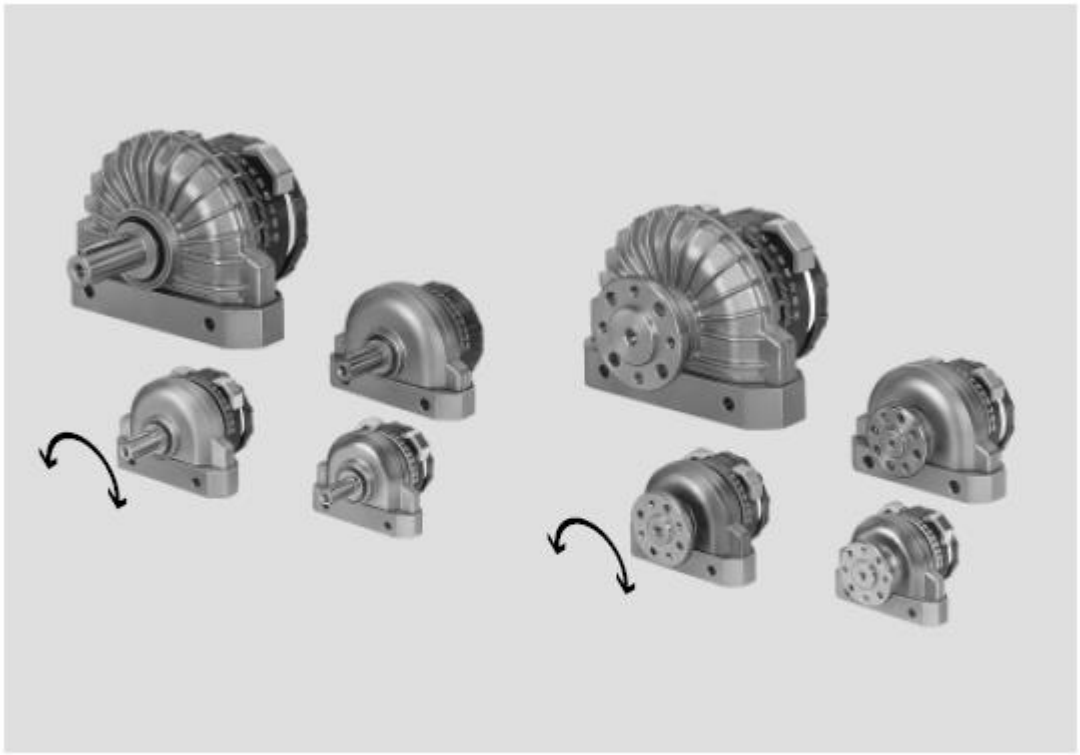
■ Series variations

Series	Size	Rotation	Vane type	Applicable auto switch
High precision type **MSUA**	1	90° 180°	Single vane	D-9, D-T99 D-9□A, D-S99, S9P
	3			
	7			D-R73, D-T79 D-R80, D-S79, S7P
	20			
MSUB	1	90° 180°	Single vane* Double vane	D-9, D-T99 D-9□A, D-S99, S9P
	3			
	7			D-R73, D-T79 D-R80, D-S79, S7P
	20			

* Double vane is available with 90° rotation setting only.

Semi-rotary drives DSR/DSRL

Features



Brief description

In these semi-rotary drives, the force is directly transmitted to the drive shaft via a rotary vane. The swivel angle is infinitely adjustable from 0 ... 184° (DSRL-10 and 12: 0 ... 181°).

The adjustable stop system is separate from the rotary vane so that any forces which occur are absorbed by the stop blocks. The impacts are cushioned at the end positions by flexible plastic plates.

DSRL-...-FW
This design with hollow flanged shaft permits the passage of liquid or gaseous media, or even tubing or wiring. The force is transmitted directly and backlash-free via a splined shaft.

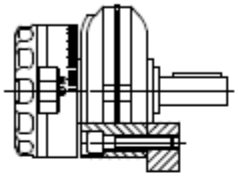
Semi-rotary drives DSR/DSRL

Features

Mounting options

Without mounting attachments

Direct mounting



With mounting attachments

for DSR

Foot mounting HSR-...-FW

Flange mounting FSR

Push-on flange FWSR

for DSRL

Foot mounting HSR-...-FW

Freewheel unit for synchronous movements

The freewheel unit is an attachment which is fitted to the drive shaft of the semi-rotary drive DSR. The freewheel unit converts the oscillating rotary movement of the semi-rotary drive into a synchronous, indexing movement. The movement of the semi-rotary drive shaft only occurs in the working directions left or right. This permits infinitely adjustable feed movements.

The minimum possible swivel angle is 0.4°. Switching accuracy is also dependent upon switching speed and load.

Note

The load must be stopped externally!

FLSR-...-L (left-hand)
Viewed from the drive shaft side, rotation counter-clockwise.

FLSR-...-R (right-hand)
Viewed from the drive shaft side, rotation clockwise.

FLSR with semi-rotary drive

Accessories

Speed regulation

→ 20

Swivel modules DSM/DSM-B

Key features

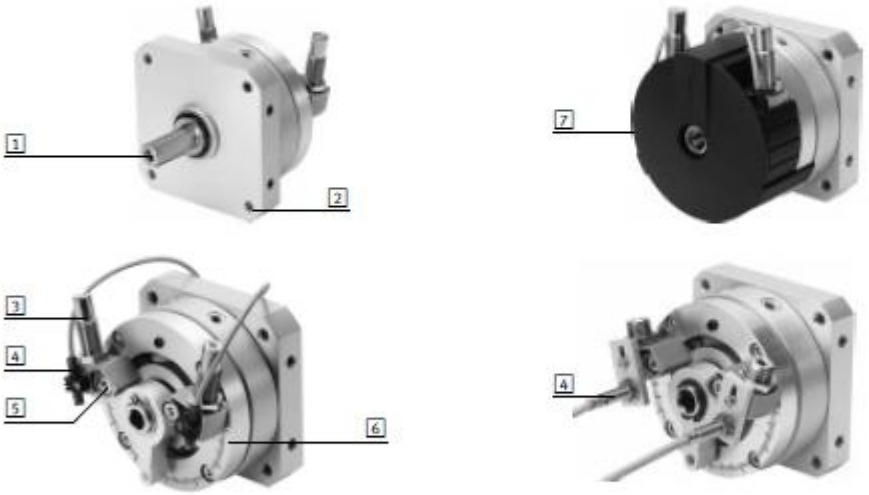
At a glance

- Double-acting swivel module with rotary vanes
- The swivel angle is infinitely adjustable over the entire swivel range
- High precision thanks to metal fixed stops
- Polyurethane ensures a long service life for the rotary vane and sealing system
- Easy precision adjustment of the end positions using the cushioning components
- The mechanical gearing between the stop element and the swivel module prevents movement of the stop system under load
- Torques of up to 80 Nm with tandem rotary vanes in combination with multi-tooth shaft

The technology in detail

Size 6 ... 10

Size 12 ... 63



1 Interface
- Choice of:
  - Spigot shaft
  - Flanged shaft

2 Wide range of mounting options

3 Cushioning with
size 6 ... 10:
- Elastic cushioning components with metal fixed stop (P)

3 Cushioning with
size 12 ... 63:
- Three cushioning types, with metal fixed stop:
  - Elastic cushioning components (P)
  - Adjustable, elastic cushioning components (P1)
  - Hydraulic shock absorbers (CC)

4 Position sensing
- With size 6 ... 10:
  - SME/SMT-10
- With size 12 ... 40:
  - SME/SMT-10 or SIEN
- With size 63:
  - SME/SMT-8

5 Precision end-position adjustment
- Very precise adjustment of the end positions is possible by moving the stops

6 Angle scale
- The required swivel angle can be easily preset using the scale

7 Cover cap
- The cover cap prevents unwanted interference in the swivel motion and reduces the risk of injury

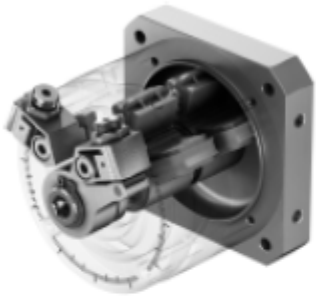
Swivel modules DSM/DSM-B

Key features

FESTO

Wide choice of variants

DSM-T-...: Swivel module with tandem rotary vanes



The arrangement of two rotary vanes on the multi-tooth shaft enables torques of up to 80 Nm to be achieved.
The functionality is the same as that of the DSM without tandem rotary vanes:

- Infinitely adjustable swivel angle
- Identical interfaces
- Identical accessories

DSM-...-HD: Swivel module with heavy-duty bearing

Backlash-free, preloaded, high-quality bearing elements allow very high load torques and very precise bearing with high running accuracy.
The functionality corresponds to that of the DSM-B without heavy-duty bearing:

- Infinitely adjustable swivel angle
- Identical mounting interfaces
- Identical accessories

Choice of two cushioning types:

- Cushioning P1 and CC

Special cylinders:

Tandem cylinders DNCT, standard port pattern

Technical data

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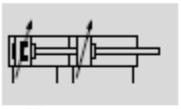
Function



Diameter
32 ... 125 mm

Stroke length
Ø 32 ... 50:
2 ... 500 mm

Ø 63 ... 125:
3 ... 500 mm

www.festo.com

Variants

S6

Based on standard
- DIN ISO 6431
- VDMA 24562

ISO DIN VDMA

General technical data								
Piston Ø		32	40	50	63	80	100	125
Pneumatic connection		G⅛	G¼	G¼	G⅜	G⅜	G½	G½
Piston rod thread		M10x1.25	M12x1.25	M16x1.5	M16x1.5	M20x1.5	M20x1.5	M27x2
Constructional design		Piston						
		Piston rod						
		Cylinder barrel						
Cushioning		Pneumatic cushioning adjustable at both ends						
Cushioning length	[mm]	20	20	22	22	32	32	42
Position sensing		For proximity sensing						
Type of mounting		With female thread						
		Via accessories						
Mounting position		Any						

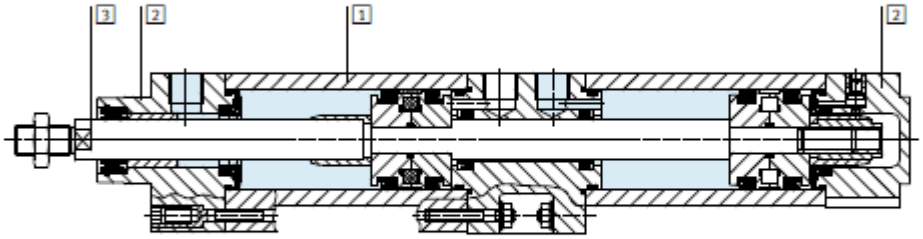
Tandem cylinders DNCT, standard port pattern

Technical data

FESTO

Materials

Sectional view



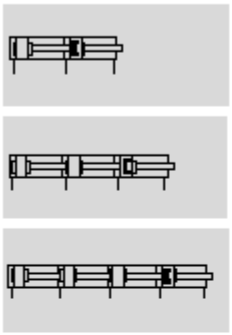
Tandem cylinder		Basic version	S6
1	Cylinder barrel	Wrought aluminium alloy, smooth anodised	Wrought aluminium alloy, smooth anodised
2	Bearing and end cap	Die-cast aluminium	Die-cast aluminium
3	Piston rod	High-alloy steel	High-alloy steel
–	Seals	Polyurethane, nitrile rubber	Flurocarbon rubber
	Note on materials	RoHS compliant	

High-force cylinders ADNH, standard port pattern

Technical data

FESTO

Function



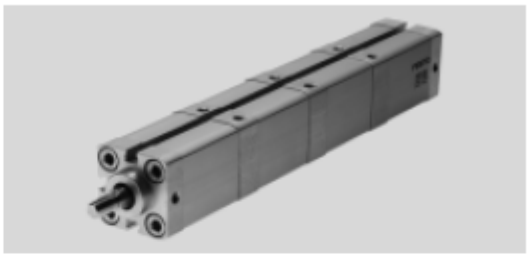
Variants

K2

K5

K8

S6



Ø Diameter
25 ... 100 mm

Stroke length
1 ... 150 mm

General technical data					
Piston Ø		25	40	63	100
Pneumatic connection		M5	M5	G⅛	G⅛
Piston rod thread	Female	M6	M10	M12	M16
	Male	M8	M12x1.25	M16x1.5	M20x1.5
Constructional design		Piston			
		Piston rod			
		Cylinder barrel			
Cushioning		Flexible cushioning rings/pads at both ends			
Position sensing		Via proximity sensor			
Type of mounting		Via female threads			
		Via accessories			
Mounting position		Any			

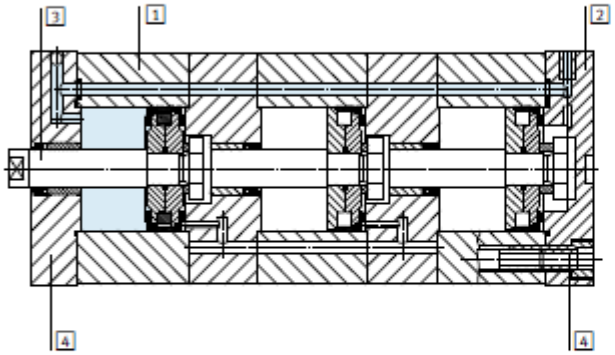
High-force cylinders ADNH, standard port pattern

Technical data

FESTO

Materials

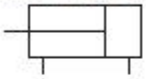
Sectional view



High-force cylinder		Basic version	S6
1	Cylinder barrel	Anodised aluminium	Anodised aluminium
2	Cover	Anodised aluminium	Anodised aluminium
3	Piston rod	High-alloy steel	High-alloy steel
4	Flange screws	Galvanised steel	Galvanised steel
–	Seals	Polyurethane, nitrile rubber	Fluoro elastomer
	Notes on materials	RoHS compliant	

JIS symbol

Double acting/Single rod



Specifications

Bore size (mm)	32	40	50	63	80	100
Type	Pneumatic (non-lube) type					
Fluid	Air					
Proof pressure	1.5MPa					
Maximum operating pressure	1.0MPa					
Ambient and fluid temperature	Without auto switch: −10 to 70°C With auto switch: −10 to 60°C (with no freezing)					
Rubber bumper	None					
Rod end threads	Female threads					
Rod end thread tolerance	JIS class 2					
Stroke length tolerance	$^{+1.0}_{0}$					
Mounting	Through hole					
Piston speed	0.5 to 300mm/s					

Note 1) For cylinders without auto switches, MS applies to the 5mm stroke only.

Minimum Operating Pressure

Bore size (mm)	32	40	50	63	80	100
Min. operating pressure (MPa)	0.025	0.025	0.01			

Standard Strokes

Bore sizes (mm)	Standard strokes (mm)
32, 40	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100
50, 63 80, 100	10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100

• Manufacturing intermediate strokes

Intermediate strokes can be manufactured in 1mm increments by installing spacers in a standard stroke cylinder. However, consult with SMC regarding a size ø40 cylinder with bumper.

Example) For CQ2XB40-57D, an 18mm spacer is installed inside a standard stroke CQ2XB40-75D cylinder.

⚠ Specific Product Precautions

Be sure to read before handling.
Refer to pages 4 to 13 for safety instructions and precautions.

Snap Ring Installation and Removal

⚠ Caution

1. Use the appropriate pliers (C-type snap ring mounting tool) for installation and removal of the snap ring.
2. Take precautions even when using the appropriate pliers (C-type snap ring mounting tool). The snap ring may slip off the end of the pliers (C-type snap ring mounting tool) and spring out, causing bodily injury or damage to nearby equipment. Furthermore, make sure the snap ring is securely seated in its mounting groove before supplying air.

Pneumatic Circuit

1. Allow an extra margin when you set the supply pressure for the cylinder to ensure sufficient pressure always. If the operating pressure is too low, low speed operation may not be stable depending on the condition of the load. Furthermore, the maximum speed may be restricted depending on the pneumatic circuit or operating pressure.

Maintenance

⚠ Caution

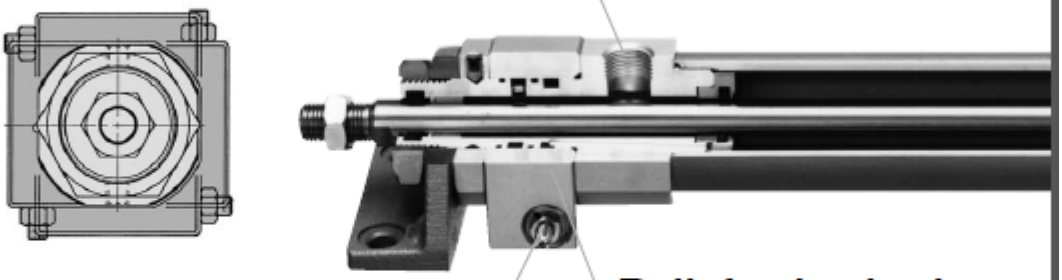
1. Replacement parts/Seal kits
   Replacement parts and seal kits can be ordered using the seal kit number for each bore size.

Bore size (mm)	Seal kit no.	Kit components
32	CQ2X32-PS	Piston seal: 1 pc.
40	CQ2X40-PS	
50	CQ2X50-PS	Rod seal: 1 pc.
63	CQ2X63-PS	Gasket: 1 pc.
80	CQ2X80-PS	Grease pack (10g): 1 pc.
100	CQ2X100-PS	

2. Grease packs
   When maintenance requires only grease, use the following part numbers to order.
   Grease pack
   GR-L-005 (5g)
   GR-L-010 (10g)
   GR-L-150 (150g)

High Power Cylinder

Smooth cushioning from high speed (3000mm/s)/ligh
Energy absorbing capacity 10 to 20 times that of genera



Supply/Exhaust port
Port orifices have been enlarged to accommodate high speed movement.

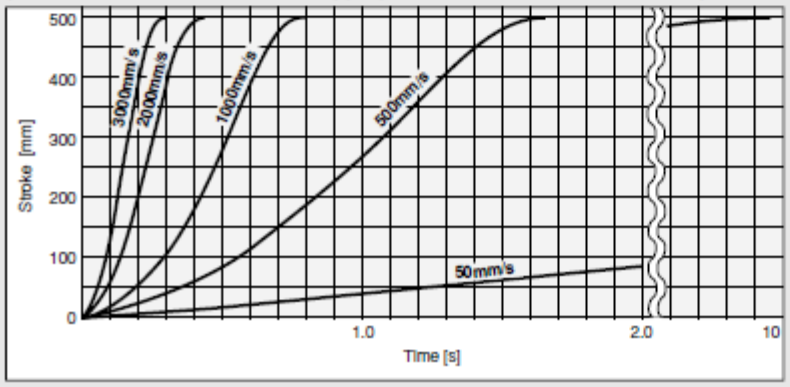
Relief valve body
The relief valve body rotates 360° allowing relief adjustment from any direction.

Relief valve adjustment screw

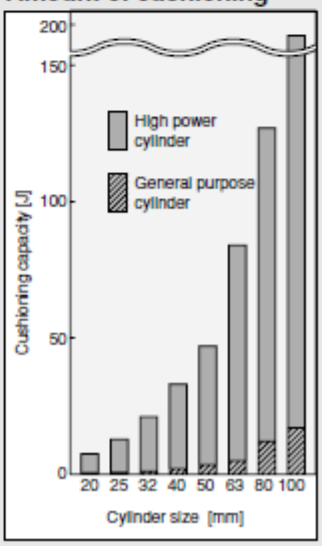
Mounting and Cushion Adjustment

Piping and mounting labour is the same as general purpose cylinders. Cushion adjustment (relief adjustment) labour is the same as general purpose cylinder adjustment (cushion needle adjustment).

Cushioning quality
(RHCF40-500, load weight 5kg, supply pressure 0.5MPa, horizontal drive)



Amount of cushioning



: Series RHC

t load to medium low speed/heavy load
ıl purpose cylinders

Cushion ring

The cushion ring has been lengthened for greater energy (speed/weight) absorption.

Cushion seal

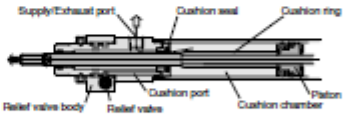
The use of heavy duty seals provides improved durability at high speeds and increased buffer capacity.

Relief valve

The use of a relief valve as the cushion valve (pressure control) provides a better cushioning effect as compared with needle adjustment on a general purpose cylinder (flow control).

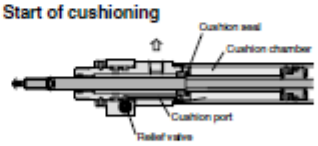
Operating Principles

1. Before cushioning starts



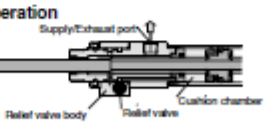
Air passes through the space between the cushion seal and piston rod to the supply/exhaust port.

2. Start of cushioning



The cushion chamber is closed by the cushion seal. Air flows to the cushion port provided in the rod cover.

3. Relief operation

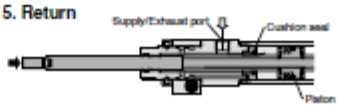


Air passes through the relief valve provided in the relief valve body, and through the inside of the rod cover to the supply/exhaust port.

4. Completion of cushioning

Shifting to the reverse stroke, the air that passed through the cushion seal, which works as a check valve, starts to push the piston.

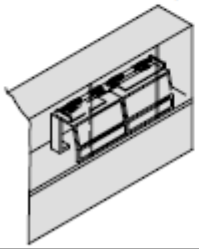
5. Return



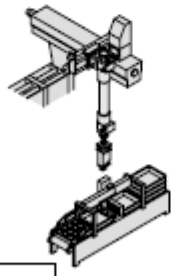
The cushion ring pulls out of the cushion seal beginning the stroke opposite to 1, and the operations in 1 to 4 above are performed

Applications

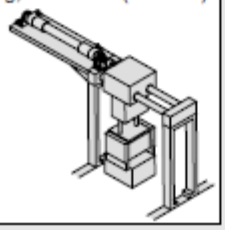
Opening and closing doors
(2000mm/s, several 10kg)



High speed Z-axis
(to 3000mm/s, several kg)



Transfer equipment
40kg, 1000mm/s (with ø32)



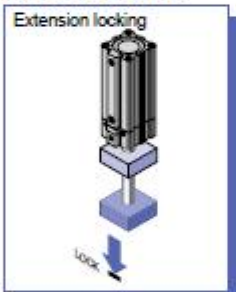
Series CLQ

Locking is possible at any position within the entire stroke

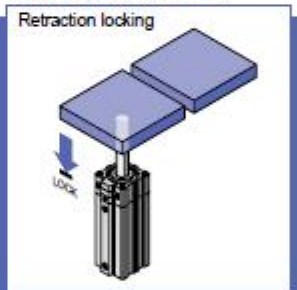
Can be locked at any desired positior

- Drop prevention for mid-stroke emergency stops
- Locking position can be changed to accommodate external stopper positions and thickness of clamped work pieces

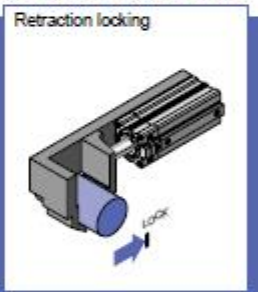
Drop prevention for press fitting jig, etc.



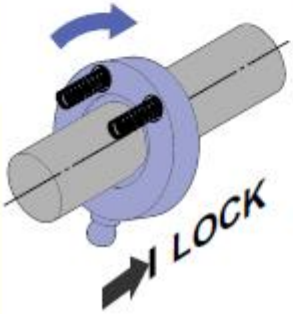
Drop prevention for lifter

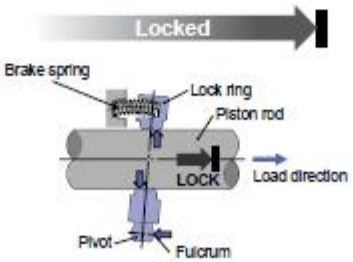


Holding a clamped condition



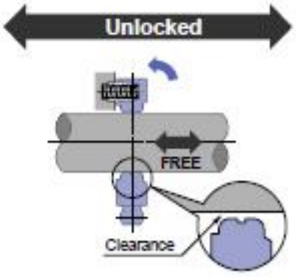
Simple construction/Simple and reliable locking system





Unlocking port: Air exhausted

1. The lock ring is tilted by the brake spring force.
2. The tilting is increased by the load and the piston rod is securely locked.



Unlocking port: Air supplied

1. The lock ring becomes perpendicular to the piston, creating clearance between the piston rod and lock ring, which allows the piston rod to move freely.

Compact Cylinder with Lock

ø20, ø25, ø32, ø40, ø50, ø63, ø80, ø100

Low profile with compact lock unit

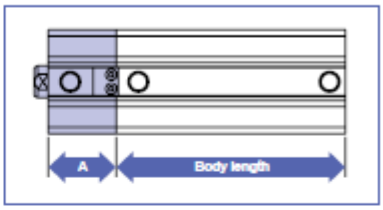
- Lock unit length

27mm to 50mm

- The lock unit does not project beyond the cylinder's external dimensions

Lock unit thickness (mm)

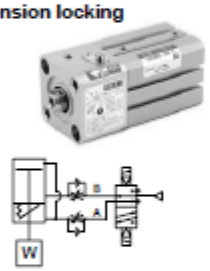
Bore size (mm)	A
20	27
25	31
32	32
40	34
50	35
63	38
80	43
100	50



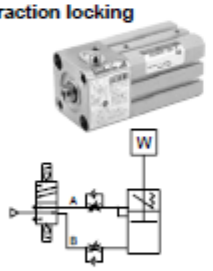
Locking direction is selectable.

(Must be selected at time of order.)

Extension locking

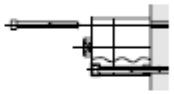


Retraction locking



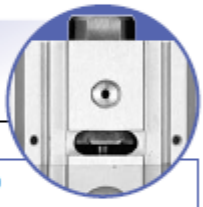
Two types of mounting

Through holes

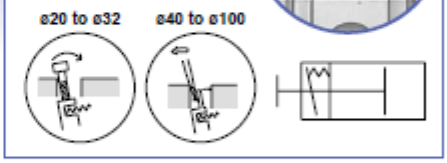


Double end taps

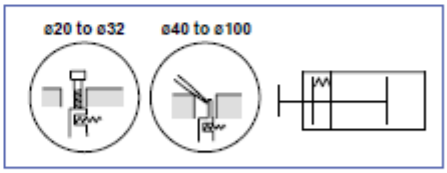
Easy manual unlocking



Locked



Unlocked



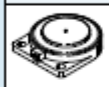
Wide variations from ø20 to ø100

Series	Mounting	Locking direction	Bore size (mm)	Standard stroke (mm)											
				5	10	15	20	25	30	35	40	45	50	75	100
CLQ	Through holes, double end taps common	Extension locking	20	●	●	●	●	●	●	●	●	●	●		
			25	●	●	●	●	●	●	●	●	●	●		
	Through holes		32		●	●	●	●	●	●	●	●	●	●	●
			40		●	●	●	●	●	●	●	●	●	●	●
	Double end taps	Retraction locking	50		●	●	●	●	●	●	●	●	●	●	●
			63		●	●	●	●	●	●	●	●	●	●	●
			80		●	●	●	●	●	●	●	●	●	●	●
			100		●	●	●	●	●	●	●	●	●	●	●

Clamping modules EV

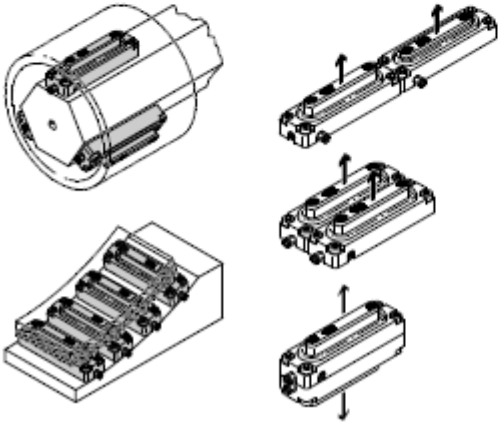
Product range overview

FESTO

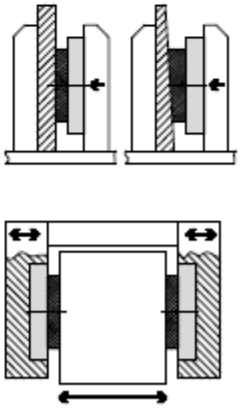
Function	Version	Type	Clamping area [mm]	Stroke [mm]
Single-acting	Clamping module, block shaped			
		EV	10x30	3
			15x40	4
			15x63	4
			20x75	5
			20x120	5
			20x180	5
	Clamping module, round			
		EV	Ø 12	3
			Ø 16	4
			Ø 20	4
			Ø 25	4
			Ø 32	5
			Ø 40	5
			Ø 50	5
			Ø 63	5

Examples of applications and installations

Clamping module, block shaped



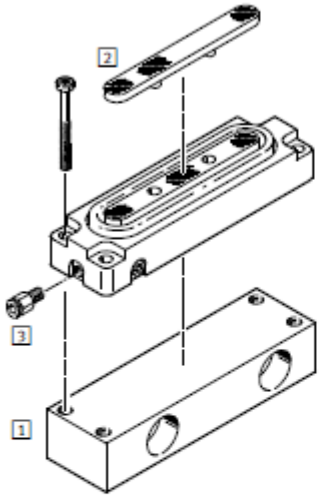
Clamping module, round

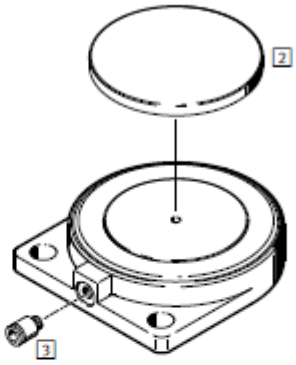


Clamping modules EV

Peripherals overview and type code

FESTO





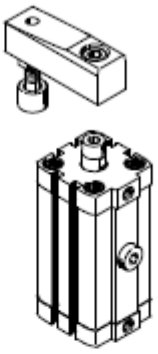
Mounting attachments and accessories					
		Description	Clamping module, block shaped	Clamping module, round	→ Page/Internet
1	Foot mounting HBEV	For horizontal clamping direction	■	-	8
2	Pressure plate EV-...-DP	Protects the diaphragm against external damage	■	■	8
3	Push-in fitting QS	For connecting compressed air tubing with standard O.D.	■	■	qs

Linear/swivel clamp CLR

Key features

Functional description

The linear/swivel clamp CLR is used for all types of clamping. Through the combination of the linear and swivel motion of the piston rod, it is possible to insert and remove workpieces even beyond the clamping range. It is possible to choose between versions swivelling to the right or to the left, while the CLR also boasts a linear stroke with diameters of 40 and larger.



Clamping finger:
Can be ordered as an accessory

Optimal range

- Uncomplicated mechanical system
- Sturdy design
- Long service life
- Low purchasing, assembly and maintenance costs
- New: CLR with dust and welding spatter protection

Flexible

- Swivel direction can be adjusted subsequently
- Compact dimensions for tight installation spaces

Easy to install

- The port pattern corresponds to ISO 21287, meaning that foot and flange mountings from the standard accessories range can be used
- Female threads in the bearing and end caps enable easy assembly of the cylinder either directly or using mounting accessories

Practical

- Clamping finger including plug-on rubber cap to protect sensitive surfaces available as accessory
- Clamping finger can be freely adjusted across a full 360°
- Can be repaired using set of wearing parts
- Corresponding accessories such as tubing, flow control valves and push-in fittings

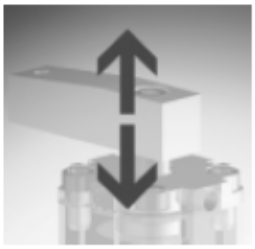
Swivel direction

Swivel motion to the right

View from above of the piston rod side with the piston rod retracted. Clockwise swivel direction.

Swivel motion to the left

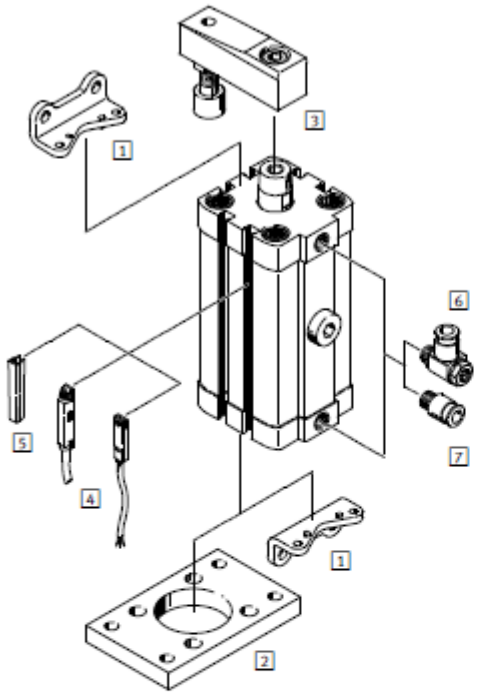
View from above of the piston rod side with the piston rod retracted. Anticlockwise swivel direction.



Straight

Linear/swivel clamp CLR

Peripherals overview



Mounting components and accessories		
	Description	→ Page/Internet
1 Foot mounting HNA	For bearing or end caps	14
2 Flange mounting FNC	For end caps	15
3 Clamping finger CLR-...-FS	Comprising clamping finger, mounting screw, tightening bolt, lock nut and dust cap	15
4 Proximity sensor SME/SMT	Can be integrated in the cylinder profile barrel	17
5 Slot cover ABP-5-S	For protecting the sensor cable and keeping dirt out of the sensor slots	17
6 One-way flow control valve GRLA	For speed regulation	16
7 Push-in fitting QS	For connecting compressed air tubing with standard O.D.	quick star

Bellows actuator EB

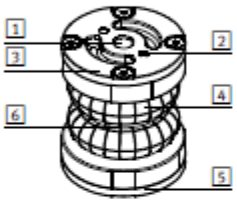
Key features

Key features

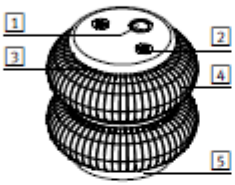
- Suitable for use in harsh, dusty ambient conditions
- Can be used under water
- Sturdy design
- Large forces range from 1 ... 50 kN
- Low installation height
- No stick-slip effect
- Maintenance-free

Bellows actuators function both as driving and pneumatic spring components. Bellows actuators function as a driving component by providing supply and exhaust functions. As the stroke increases, the force generated is reduced in relation to the contractional force of the bellows. When bellows actuators are supplied with permanent pressure, they act as a cushioning component. The simple design consists of two metal port plates with an attached rubber bellows. There are no sealing components and no moving mechanical parts. Bellows actuators are single-acting drives that do not require spring returns, as the reset is achieved by the application of external force.

EB-80



EB-145 ... 385

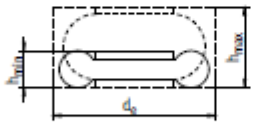


1 Pneumatic connection
2 Mounting thread
3 Port plate, on top
4 Bellows
5 Port plate, underneath
6 Belt ring

Prerequisites for using a bellows actuator

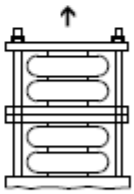
Space required

Observe the installation space to ensure the bellows actuator does not come into contact with other machine parts during expansion.



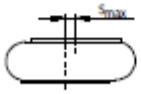
Combined installation

When using two or more bellows actuators, the necessary mounting plates must be inserted between the cylinders to prevent a lateral break out.



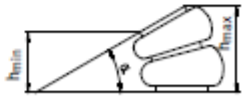
Lateral offset

The max. lateral offset must not be exceeded.



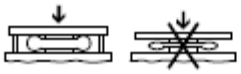
Tilted installation

The max. tilt angle α must not be exceeded to ensure that the bellows walls cannot touch.



Minimum height

The bellows actuator must not fall below a min. height, otherwise it will be damaged.



Maximum height

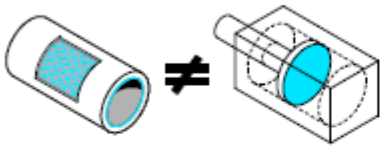
The bellows actuator must not exceed a max. height, otherwise it will be damaged.

Fluidic Muscle DMSP/MAS

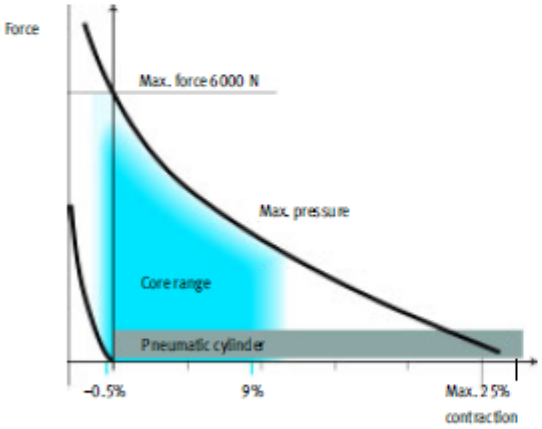
Key features

Mode of operation

Fluidic Muscle is a tensile actuator which mimics the natural movement of a muscle. It consists of contractible tubing and appropriate connectors. The contractible tubing is made up of a rubber diaphragm with a non-crimped fibre made of aramid yarns on the inside. The diaphragm provides a hermetic seal enclosing the operating medium. The yarns serve as a reinforcement and transmit power. When internal pressure is applied, diaphragm extends in the circumferential direction. This creates a tensile force and a contraction motion in the longitudinal direction. The usable tensile force is at its maximum at the start of the contraction and then decreases with the stroke.



Force profile and operating range



The muscle expands lengthways when it is pretensioned by an external force. When pressurised, on the other hand, the muscle contracts, i.e. its length decreases.

Areas of application

Clamping

- High force combined with a small diameter
- Insensitive to dirt
- Frictionless movement
- Hermetically sealed

Vibrating and shaking

- Frequency up to 150 Hz
- Amplitude/frequency can be adjusted independently of each other
- Insensitive to dirt

Pneumatic spring

- Adjustable spring force
- Frictionless movement
- Hermetically sealed
- Easy to handle

Other

- Positioning using pressure
- High acceleration of a load

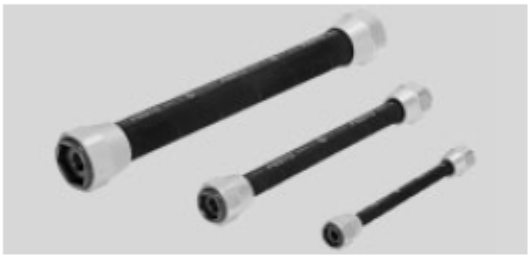
Fluidic Muscle DMSP/MAS

Key features

Fluidic Muscle DMSP with press-fitted connection → 11

In the DMSP, the diaphragm is crimped by means of a sleeve and the adapters are integrated.
The DMSP is further distinguished from the MAS by its compact design (25% smaller cross section, 30% lighter).

Fluidic Muscle MAS with screwed connections → 20



In the MAS, the diaphragm is clamped by means of a threaded connection.
Adapter and threaded rod are available separately.
The MAS is optionally available with force limiter.

Nominal length

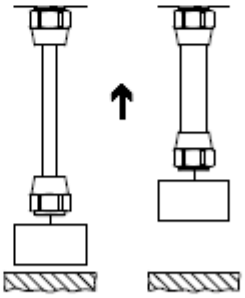
The nominal length of the Fluidic Muscle is defined in the non-pressurised, load-free state. It corresponds to the visible muscle length between the connections (→ 16).

Single-acting actuator

Sizing examples → 33

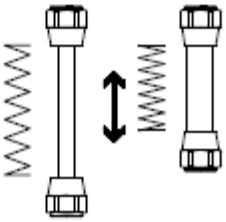
In the simplest case, the Fluidic Muscle operates as a single-acting actuator against a mechanical spring or a load. The mechanical spring pretensions the muscle out of its normal position when in the expanded, non-pressurised state. Ideal: 0.5% of nominal length. This operating state is ideal with regard to the technical properties of the Fluidic Muscle: In the unpressurised state, the diaphragm is not compressed. When pressurised, a muscle pretensioned in this way develops maximum force with optimum dynamic characteristics and minimum air consumption.
The most effective operating range is provided with contractions below 9%. The smaller the degree of contraction of the Fluidic Muscle, the more effectively it works.

Load = Constant



The muscle behaves like a spring when there is a change in external force: it follows the application of force. With the Fluidic Muscle, both the pretensioning force of this "pneumatic spring" and its spring stiffness can be varied. The Fluidic Muscle can be operated as a spring with constant pressure or constant volume. This produces different spring characteristics that enable the spring effect to be matched perfectly to the application.

Pressure/volume = Constant



Note

If the muscle is fed with compressed air and the volume id blocked, the pressure in the muscle can increase significantly when the external force is varied.

Fluidic Muscle DMSP/MAS

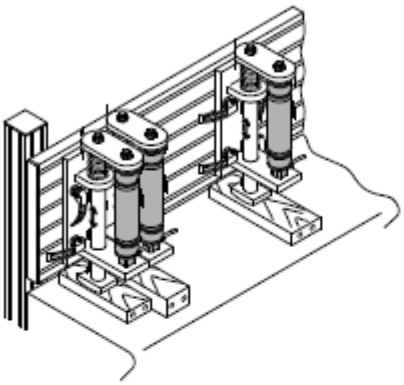
Application examples

FESTO

Successful areas of application
Clamping

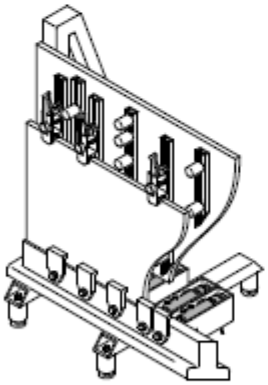
- High force combined with a small diameter
- Insensitive to dirt
- Frictionless movement
- Hermetically sealed

Clamping workpieces



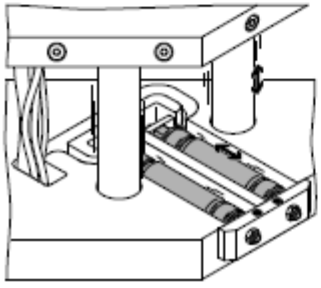
High forces combined with a small diameter? Not a problem for the Fluidic Muscle.
Thanks to its small diameter, it can be integrated and used in the smallest of spaces, e.g. when clamping workpieces. It has an initial force 10 times higher than that of a conventional pneumatic cylinder.

Clamping metal sheets



The Fluidic Muscle enables large and unwieldy workpieces, such as plates, walls and side covers, to be easily clamped so they can be machined (turning, drilling, milling). This brings out the muscle's outstanding characteristics, such as high force combined with a small diameter, frictionless and thus jerk-free movement, insensitivity to dirt (swarf, abraded particles) and hermetically sealed design.

Clamping parts to be joined



In joining processes such as those that take place in welding machines, the components to be welded are held in place by the Fluidic Muscle during the joining procedure. Here, too, the muscle can make the most of its high force combined with a small diameter.

Fluidic Muscle DMSP/MAS

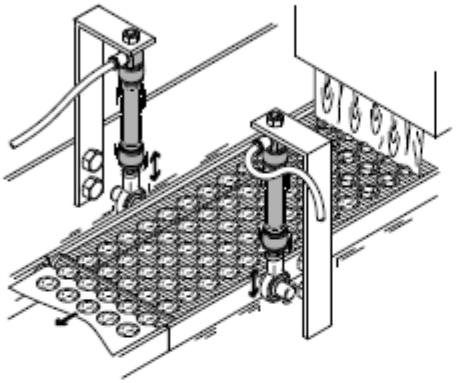
Application examples

FESTO

Successful areas of application
Vibrating and shaking

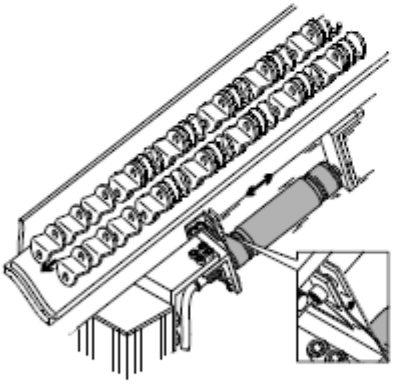
- Frequency up to 150 Hz
- Amplitude/frequency can be adjusted independently of each other
- Insensitive to dirt

Distributing



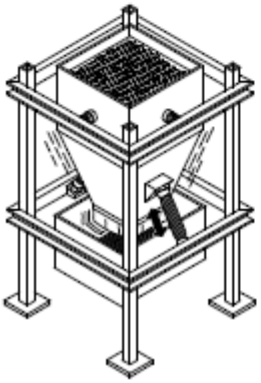
When a viscous coating agent is applied to a fixed substance carrier, a vibrating support is required to ensure even distribution over the surface. In the case of strokes of less than 1 mm, the Fluidic Muscle can achieve cycle rates of up to 150 Hz.

Conveying



The Fluidic Muscle is exceptionally well suited to transporting or aligning parts. Amplitude and cycle rate can be adjusted simply and independently of each other. The muscle's flexibility makes it possible to set the optimum conveying speed for any conveying process.

Releasing



Hoppers and silos are often susceptible to problems, such as a "jamming arch" forming during feeding. In practice, discharge aids such as vibrators or knockers are used to prevent such a jam from forming. This function can be implemented with the help of the Fluidic Muscle. The frequency can be set in an infinitely adjustable manner up to 150 Hz, independently of the amplitude. This guarantees a continuous conveying process.

Fluidic Muscle DMSP/MAS

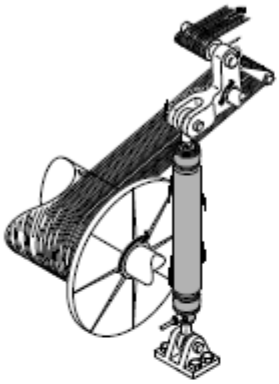
Application examples

FESTO

Successful areas of application
Pneumatic spring

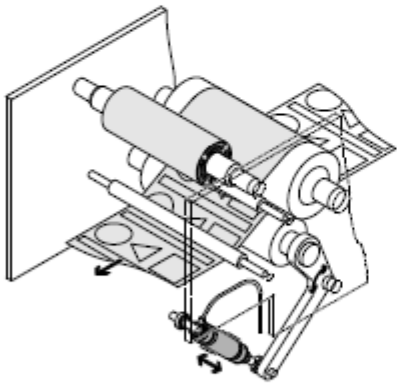
- Adjustable spring force
- Frictionless movement
- Hermetically sealed
- Easy to handle

Stress equalisation



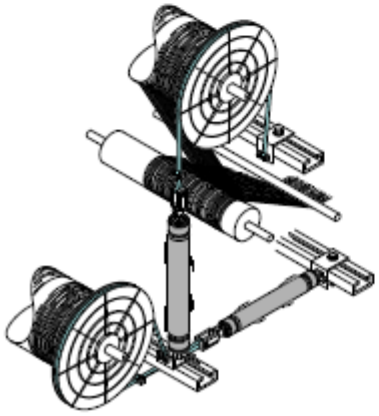
In all applications in which threads, films, papers or tapes are transported or wound and unwound using rollers, high stresses develop (peak stresses) and the continuous material being transported can tear. With its adjustable spring force and frictionless movement, the Fluidic Muscle can absorb these stresses. The muscle stands out because of the simple adjustment of the spring strength by means of the pressure and hence by its ease of use. Changes to the process require a change of the mechanical spring and weights. The Fluidic Muscle is an excellent replacement for existing solutions using loads and mechanical springs.

Adjustable contact pressure



The Fluidic Muscle is exceptionally well suited to pressing on rollers. The contact pressure can be varied using the operating pressure. The design means that components do not become stuck and there are thus no peak forces. The Fluidic Muscle is hermetically sealed and can be disconnected from the compressed air supply. It will nevertheless continue to perform its function.

Brakes for tension regulation



The spring properties of the Fluidic Muscle make it exceptionally well suited to regulating the thread tension when winding threads. The tension in the threads is always as high as it needs to be for the process in question. This means that the optimum thread tension is always available, leading to better protection of the threads and counteracting wear on all components.

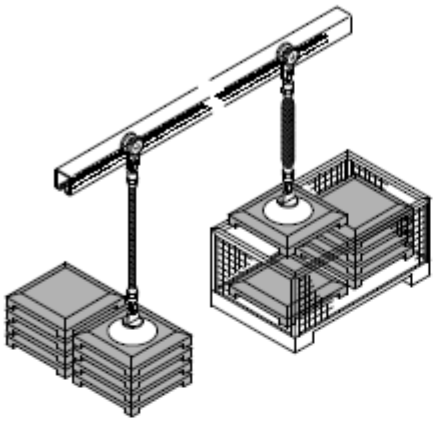
Fluidic Muscle DMSP/MAS

Application examples

FESTO

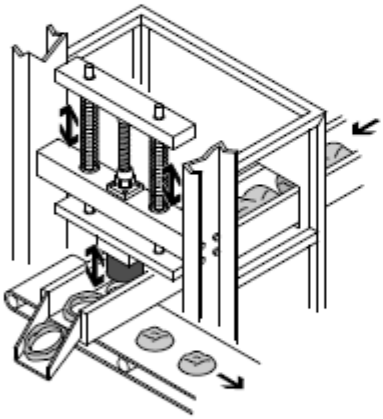
Other possible applications

Lifting aid



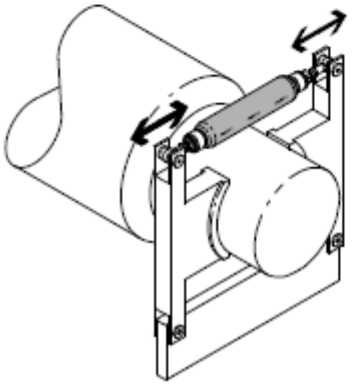
Achieving intermediate positions? Very simple, using pressure regulation: the workpieces can be raised or lowered as required by pressurising or exhausting the muscle via a hand lever valve. Muscle lengths up to 9 m facilitate various types of application.

Punching



Very high cycle rates can be achieved with the muscle, on the one hand because of its low weight and on the other because it has no moving parts (e.g. a piston). The simple design – one muscle pretensioned using two springs – replaces a complicated toggle lever clamping system using cylinders.

Emergency stop device



The Fluidic Muscle is setting benchmarks in applications that require fast response times. The emergency stop for rollers demands both speed and a high initial force. This can prevent risks to the operator in the event of malfunctions.

Rodless cylinders:

Linear drives DGC

FESTO

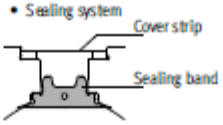
Features

At a glance

- Without external guide, for simple drive functions
- Compact – fitting length relative to stroke
- Fully interchangeable with the linear drive DGP

- Easy assembly and installation
- Choice of:
  - Standard piston
  - Extended piston

- Sealing system



Advantages of the sealing system:
- Long strokes with no restrictions
- Virtually no leakage

- Optional: NSF-H1 lubricant for the food industry

The linear drive is of limited suitability for the food industry.

More information on suitability for use in the food industry
➔ Manufacturer's declaration.

Guide variants

Compact design DGC-K

- Piston Ø 18 ... 80 mm
- Stroke lengths from 1 ... 8500 mm
- 30% narrower than the DGC-G
- Low moving dead weight
- Symmetrical design

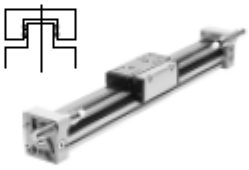
Basic design DGC-G

- Piston Ø 8 ... 63 mm
- Stroke lengths from 1 ... 8500 mm
- Guide backlash = 0.2 mm
- For small loads
- Operating behaviour with torque load = average

Plain-bearing guide DGC-GF

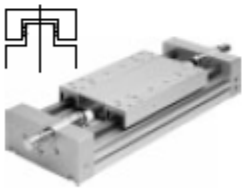
- Piston Ø 18 ... 63 mm
- Stroke lengths from 1 ... 8500 mm
- Guide backlash = 0.05 mm
- For small and medium loads
- Operating behaviour with torque load = average

Recirculating ball bearing guide DGC-KF



- Piston Ø 8 ... 63 mm
- Stroke lengths from 1 ... 8500 mm
- Guide backlash = 0 mm
- For medium and large loads
- Precision mounting interface with stainless steel slide
- Operating behaviour under torque load = very good

Heavy-duty guide DGC-HD



- Piston Ø 18, 25, 40 mm
- Stroke lengths from 10 ... 5000 mm
- Guide backlash = 0 mm
- For large loads
- Operating behaviour under torque load = very good

Passive guide axis DGC-FA

- Without drive
- Piston Ø 8 ... 63 mm
- Stroke lengths from 1 ... 8500 mm
- Guide backlash = 0 mm
- Precision guide, suitable for DGC-KF. Can be used as machine component or as twin guide with DGC-KF

D2 – Compressed air connection at both ends

The compressed air connections on the linear drive DGC-K are located on the end caps as standard.

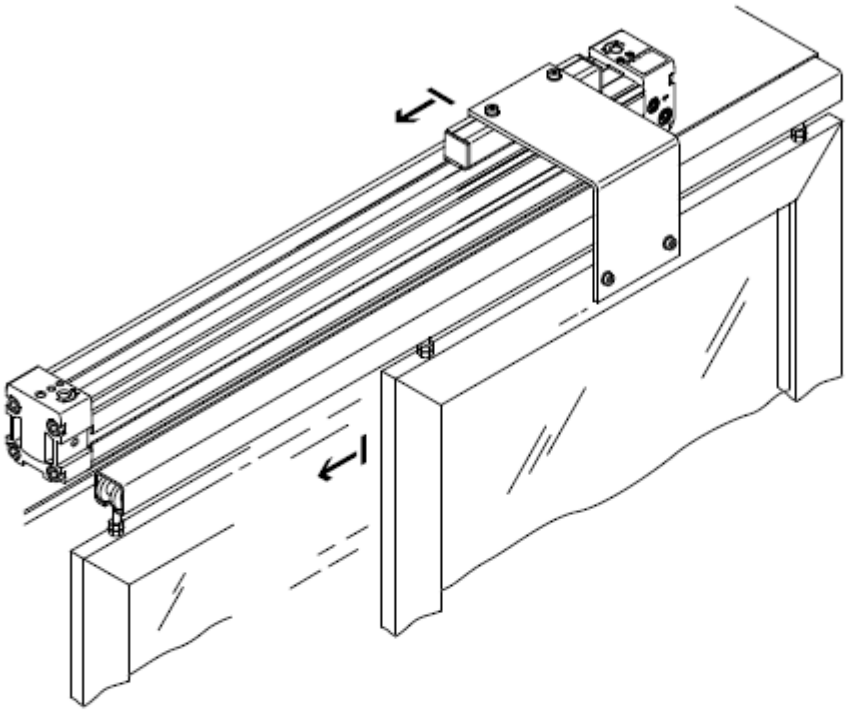
The linear drive is actuated at both ends by specifying order code D2 in the modular product system. Actuation at one end is no longer possible.

Linear drives DGC

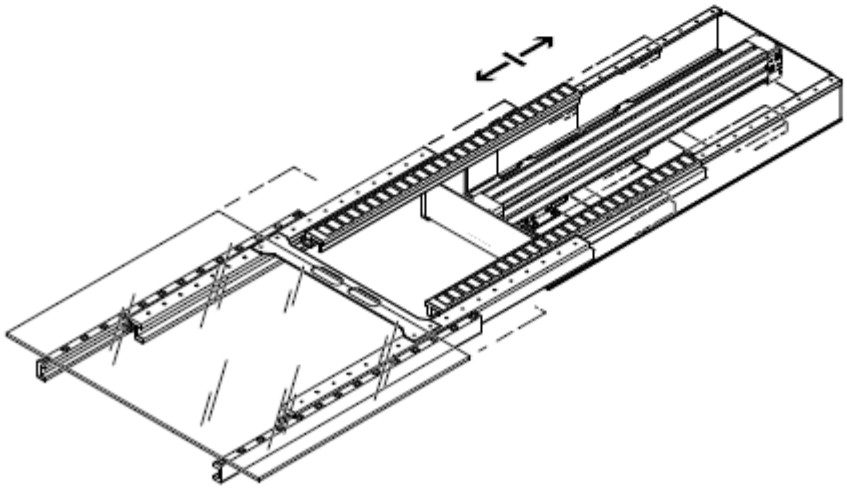
Features

Application examples

For opening and closing doors

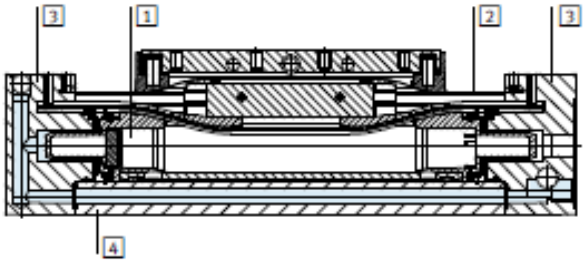


For transporting glass plates



Materials

Sectional view



Linear drives		
1	Slide	Anodised aluminium
2	Sealing band/cover band	Polyurethane/steel
3	Cover	Painted aluminium
4	Cylinder barrel	Anodised aluminium
–	Piston seal	Polyurethane
–	Slide elements	Polyacetal
	Note on materials	RoHS-compliant

Linear drive units DGO

Features

General information

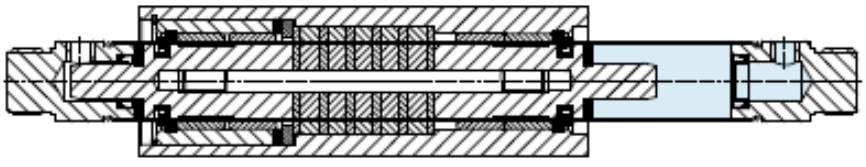
- Double-acting
- Magnetically coupled without mechanical connections
- Piston chamber and slide are pressure tight
- Pressure tight and leak-free system
- Dirt and dust cannot enter
- Space-saving installation with long strokes
- For contactless position sensing
- With adjustable end-position cushioning at both ends (not for piston Ø of 12 mm)

The technology in detail

Motion is transmitted via the force locking of the magnetic coupling on the moveable outer slide.

This means that there is no advancing piston rod; the installation space required is less than for conventional pneumatic cylinders.

The cylinder chamber is hermetically sealed against the outer slide as there is no mechanical connection. This prevents any leakage loss.



Grippers

Parallel grippers DHPS

FESTO

Key features

At a glance

General information

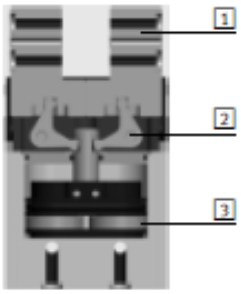
- Resilient and precise T-slot guide of the gripper jaws
- Oval piston for high gripping forces
- High gripping forces with compact dimensions
- Gripper jaw centring options
- Max. repetition accuracy
- Gripping force retention
- Internal fixed flow control
- Wide range of options for mounting on drive units
- Sensor technology:
  - Adaptable position sensor for the small grippers
  - Integratable proximity sensors for the medium and large grippers

Flexible range of applications

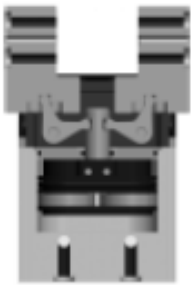
- Can be used as a double-acting and single-acting gripper
- Compression spring for supplementary or retaining gripping forces
- Suitable for external and internal gripping

The technology in detail

Gripper closed



Gripper open



1 Gripper jaw
2 Reversing lever
3 Piston with magnet

Note

Gripper selection sizing software
➔ www.festo.com

Position sensing/force control

With position transmitter SMAT-8M, SDAT

Analogue positional feedback possible

- Analogue output
  - 0 ... 10 V
  - 4 ... 20 mA

With proportional pressure regulator VPPM

Infinite adjustment of the gripping force possible

- Setpoint input
  - 0 ... 10 V
  - 4 ... 20 mA

With proximity sensor SMT-8G/-10G

Multiple positions can be sensed:

- Open
- Closed
- Workpiece gripped

Three-point grippers DHDS

Key features

At a glance

General information

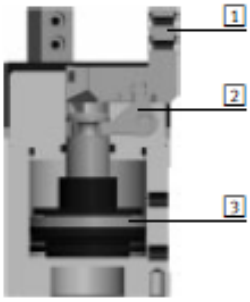
- Resilient and precise T-slot guide of the gripper jaws
- High gripping forces with compact dimensions
- Gripper jaw centring options
- Max. repetition accuracy
- Gripping force retention
- Internal fixed flow control
- Wide range of options for mounting on drive units
- Sensor technology:
  - Adaptable position sensor for the small gripper sizes
  - Integratable proximity sensors for the medium and large gripper sizes

Flexible range of applications

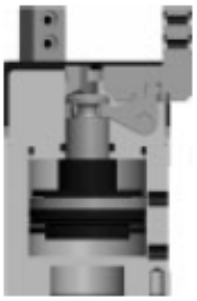
- Can be used as a double-acting and single-acting gripper
- Compression spring for supplementary or retaining gripping forces
- Suitable for external and internal gripping

The technology in detail

Gripper closed



Gripper open



1 Gripper jaw
2 Reversing lever
3 Piston with magnet

Note

Gripper selection sizing software
→ www.festo.com

Position sensing/force control

With position transmitter SMAT-8M

Analogue positional feedback possible
- Analogue output 0 ... 10 V

With proportional pressure regulator VPPM

Infinite adjustment of the gripping force possible
- Setpoint input
  - 0 ... 10 V
  - 4 ... 20 mA

With proximity sensor SMT-8G

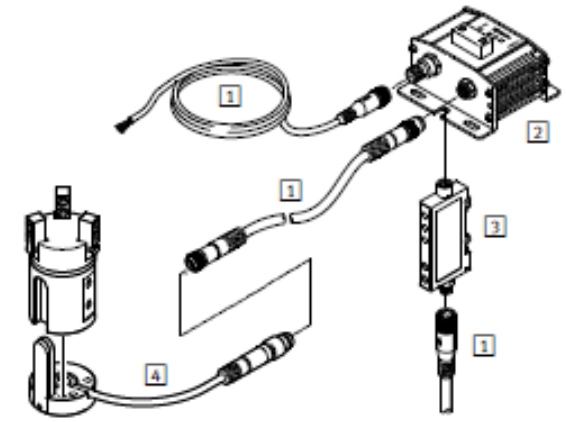
Multiple positions can be sensed:
- Open
- Closed
- Workpiece gripped

Three-point grippers DHDS

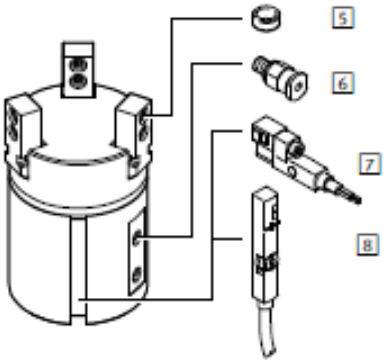
Peripherals overview

Peripherals overview

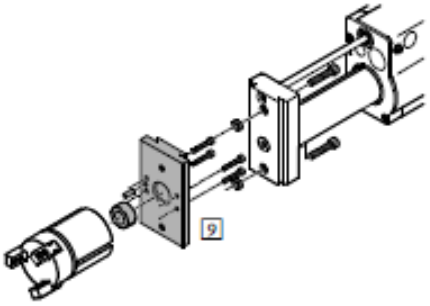
DHDS-16



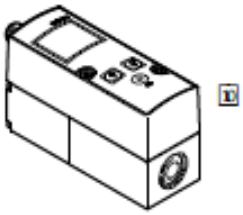
DHDS-32, 50



System product for handling and assembly technology



Proportional pressure regulator VPPM



Parallel Style Air Gripper
With Dust Cover

Model variations with excellent dust proof and drip proof dust cover are expanded.

MHZL2 Long stroke type MHZL2 series ø 10, ø 16 and ø 20 with dust cover are newly released.

Silicone rubber

Chloroprene rubber

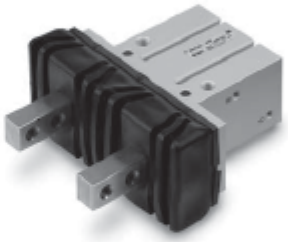
Fluororubber

With Dust Cover Variations

★: New model

Series	Bore size [mm]			
	10	16	20	25
New Long stroke type with dust cover MHZL2-X6110 	★	★	★	—

MHZJ2 ø 32 and ø 40 added to the MHZJ2 series with dust cover.



Chloroprene rubber

Fluororubber

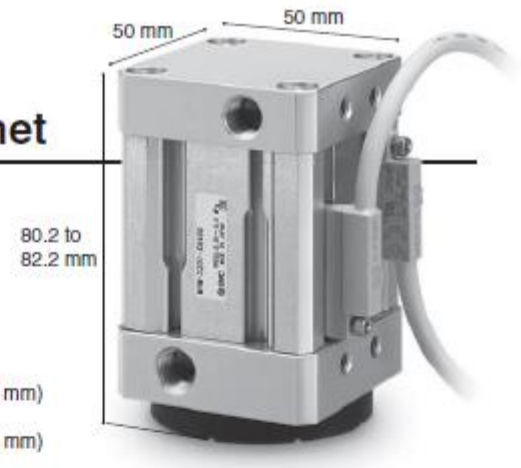
★: New model ●: Existing model

Series	Bore size [mm]						
	6	10	16	20	25	32	40
With dust cover Series MHZJ 	●	●	●	●	●		
New With dust cover MHZJ2-X6100 						★	★

* For details about dust cover types and option combinations, refer to How to Order.

Magnet Gripper

Adsorbs and Holds with a Magnet



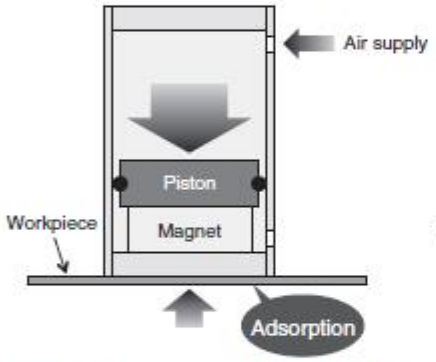
■**Steel plates can be transferred without a vacuum.**
Supports workpieces with holes and uneven surfaces where a vacuum pad cannot be used.

■**Holds workpieces even when air is shut off.**

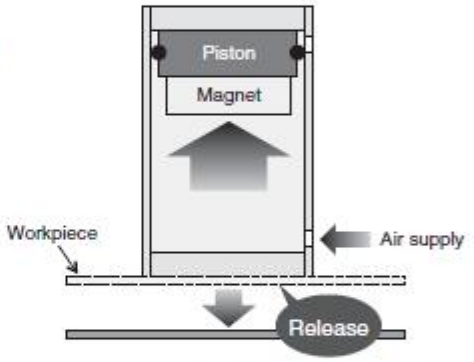
■**High holding force** **80 N** (Workpiece plate thickness: 0.6 mm)
120 N (Workpiece plate thickness: 1.4 mm)

■**Residual holding force** **0.3 N** **or less** (Reduces workpiece release time)

Workpiece adsorption/holding



Workpiece release



■**Holding force can be adjusted with a bumper with 3 types of thicknesses.**

Thickness	Holding force
6 mm	80 N
7 mm	50 N
8 mm	30 N

Prevents deformation of workpieces and accidental adsorption of a second piece. Fluororubber with excellent oil resistance is used. Has a contact surface structure which reduces sideslip. Bumper can be replaced without a tool.

■**Auto switches can be mounted on 4 surfaces.**

Magnetic field resistant auto switch:
D-P3DWA

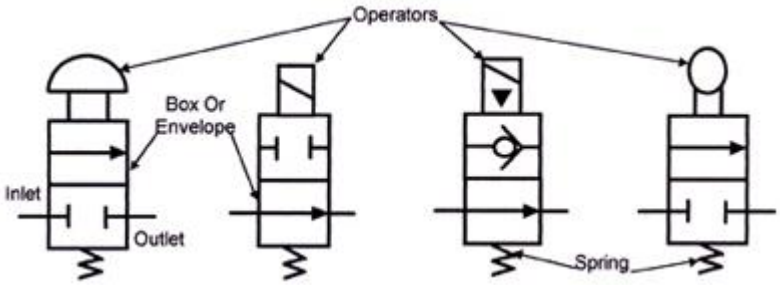
Small auto switch:
D-M9□V

■**Mountable on 3 surfaces.**

VALVES

Directional valves

2/2-valves:



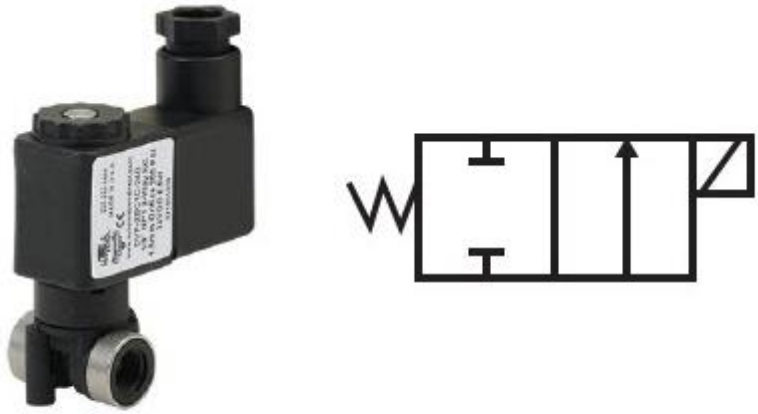
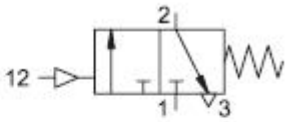


Figure 5B: 2-way, 2-position, normally closed direct-acting solenoid valve, spring return

3/2-valves:

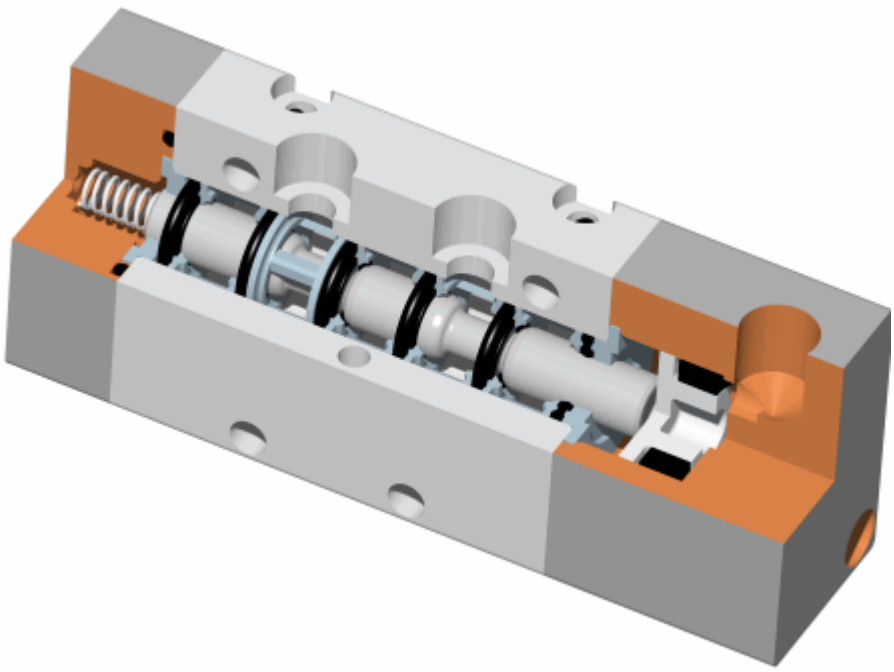

VHEM-P...
K/O-3-PK-3
H-3-¼-B
KH/O-3-PK3
TH/O-3-PK3
VHEM-L...
F-3-¼-B

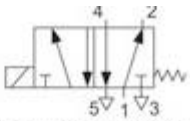


5/2 or 4/2 valves:

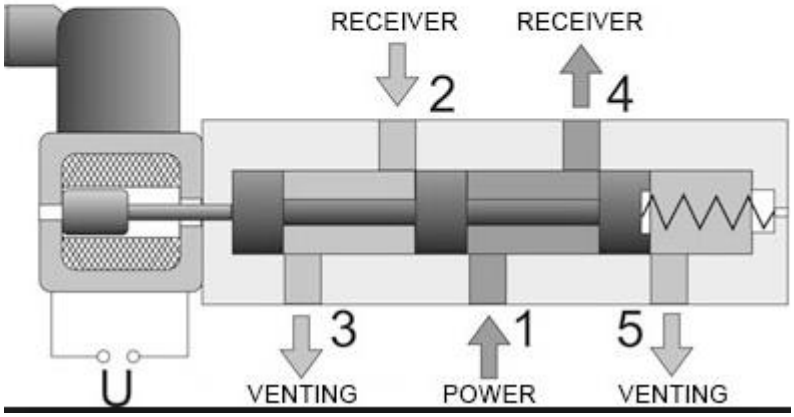

ASCO
52100005

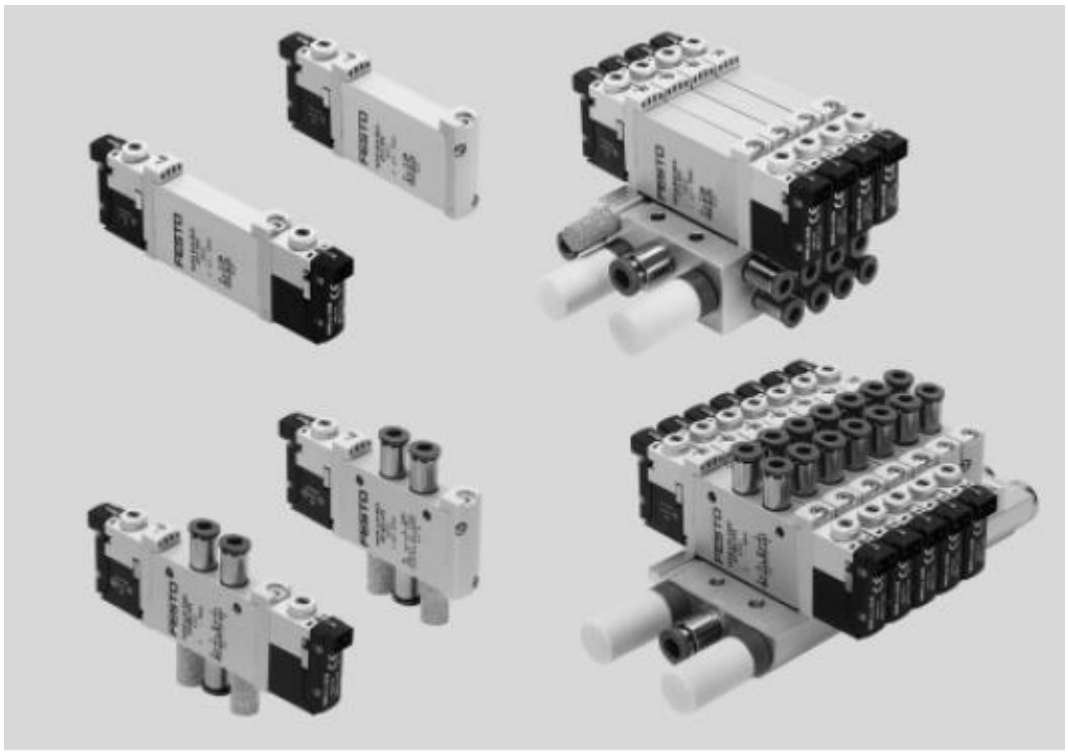

DOUBLE PILOT VALVE
ADZY
4
2
5
1
3





GRAPHIC DIAGRAM




FESTO
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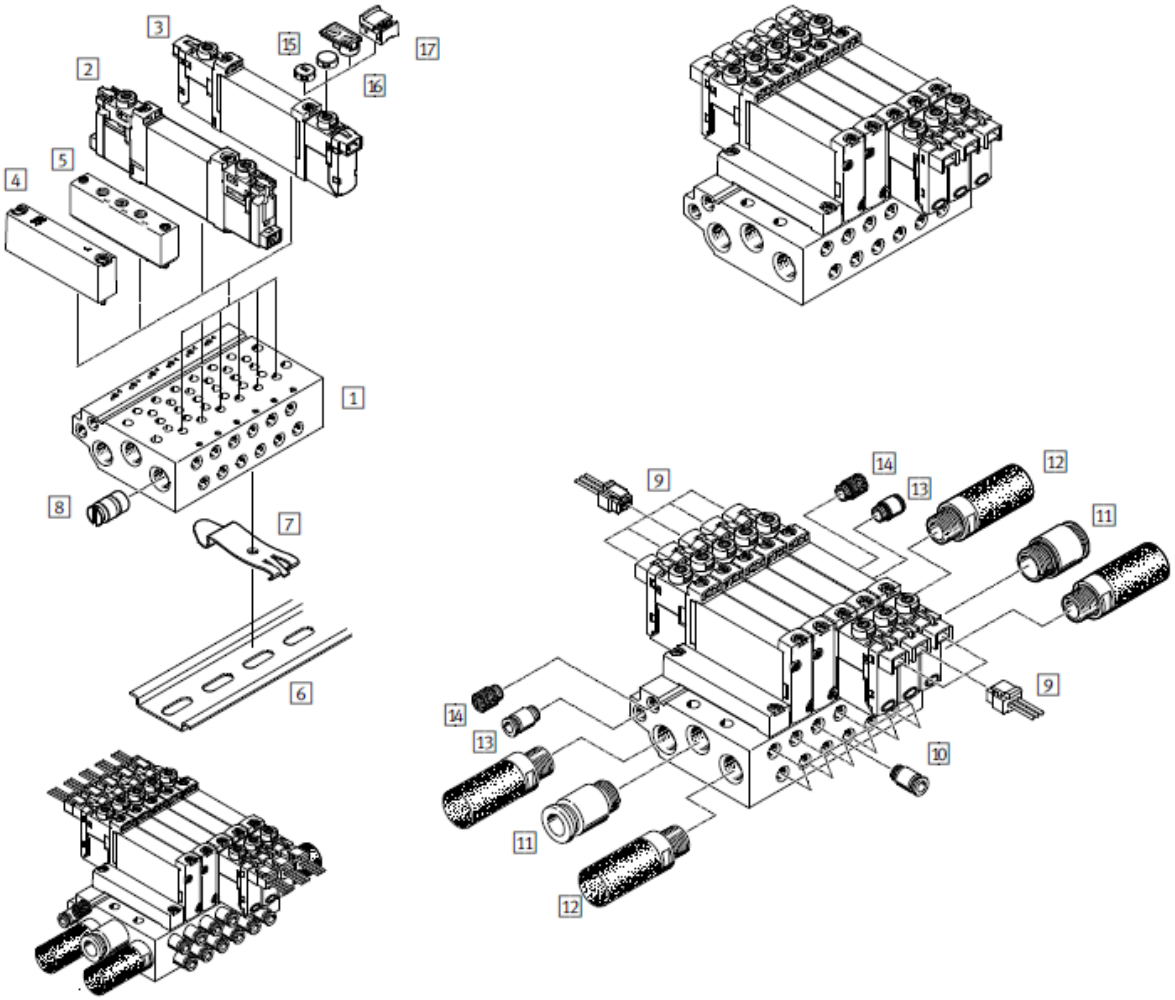
Solenoid valves VUVG

Sample system overview, sub-base valves M5/M7

FESTO

Manifold assembly



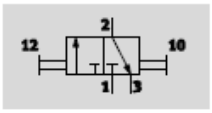
Shut off valves:

Hand slide valves W

Technical data

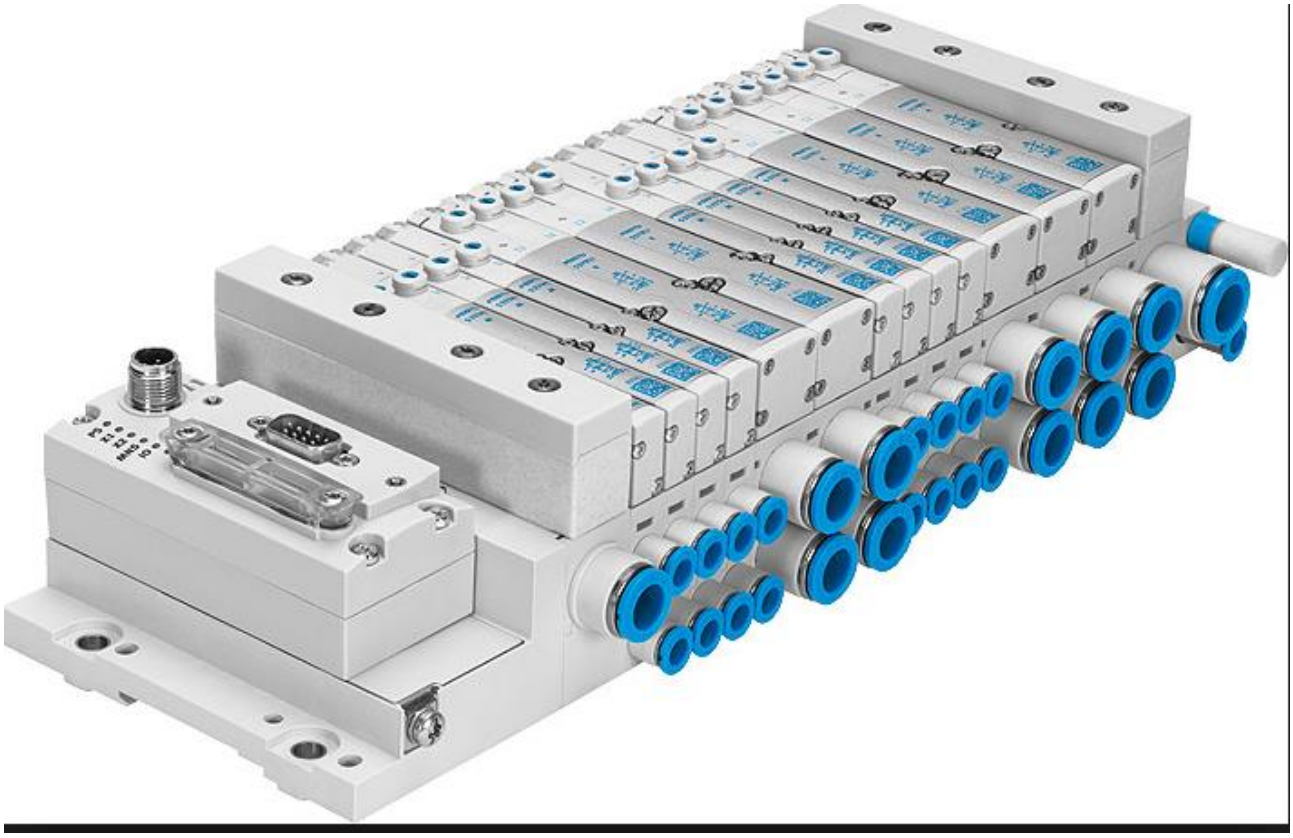
FESTO

Function



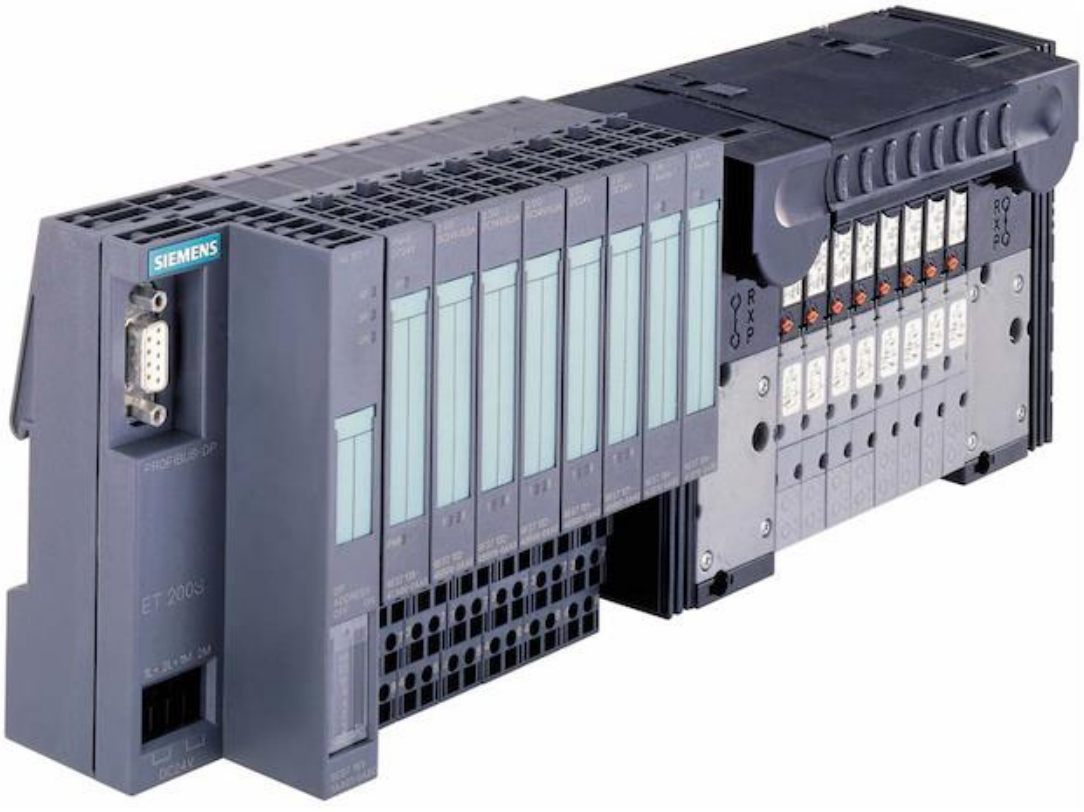
- Standard nominal flow rate
  120 ... 6,800 l/min
- Temperature range
  –10 ... +60 °C
- Operating pressure
  –0.95 ... +10 bar

Valve terminals:




RE 04/6-M

PROFI®
PROCESS FIELD BUS



Terminals assembled into a cabinet

Flow control valves:

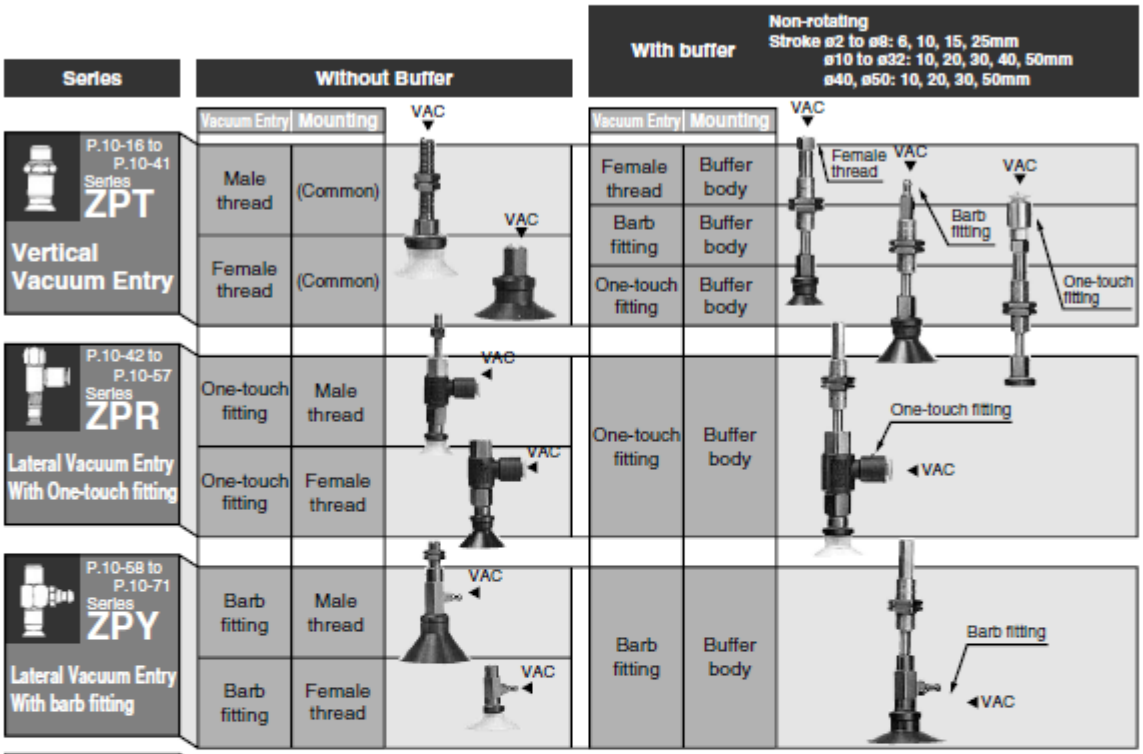

JELPC
P
A
ASC-10


JELPC
12

Vacuum devices:

Vacuum Pad

Series ZP



Pad diameter	ø2	ø4	ø6	ø8	ø10	ø13	ø16	ø20	ø25	ø32	ø40	ø50
Flat	●	●	●	●	●	●	●	●	●	●	●	●
Flat with ribs	—	—	—	—	●	●	●	●	●	●	●	●
Deep	—	—	—	—	●	—	●	—	●	—	●	—
Bellows	—	—	●	●	●	●	●	●	●	●	●	●

Pad material

NBR (Black), Silicon rubber (White), Urethane rubber (Brown), Fluorine rubber (Black with green mark), Conductive NBR (Black with one white mark), Conductive silicon rubber (Black with two white marks)

Option

① Long stroke ② Oval pad ③ Ball joint pad ④ Large size pad

Pad material and Characteristics

◎ : Little or no influence ○ : Can be used depending on conditions X: Not suitable

Material \ Item	Durometer HS (±5°)	Operating press. range (°C)	Oil resistance (gasoline)	Oil resistance (benzol)	Alkaline resistance	Acid resistance	Weatherability	Ozone resistance	Abrasion resistance	Water resistance	Solvents (benzene) (toluene)
NBR	50°	0 to 120	◎	x	○	○	○	x	◎	○	x
Silicon rubber	40°	–30 to 200	x	x	○	x	◎	◎	x	○	x
Urethane rubber	60°	0 to 60	◎	x	x	x	○	◎	◎	x	x
Fluorine rubber	60°	0 to 250	◎	◎	x	◎	◎	◎	○	◎	◎
Conductive NBR	50°	0 to 100	○	x	○	x	○	x	○	○	x
Conductive silicon rubber	50°	–10 to 200	x	x	○	x	◎	◎	x	○	x

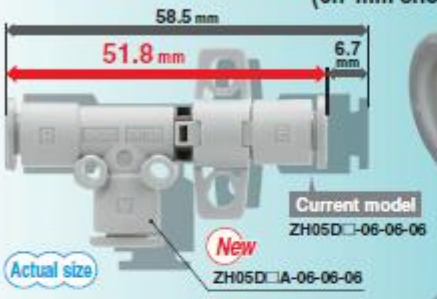
The above table covers only general characteristics of subject rubber materials.
Pad materials used by SMC pass JIS standards; however the actual performance depends on operating conditions.

Body Ported Type Vacuum Ejector New

RoHS

Compact and Lightweight

Overall length Max. **11** % reduction
(6.7 mm shorter)



Port height Max. **25** % reduction (9.1 mm shorter)

Weight Max. **74** % reduction (65.1 g lighter)

4 mounting types

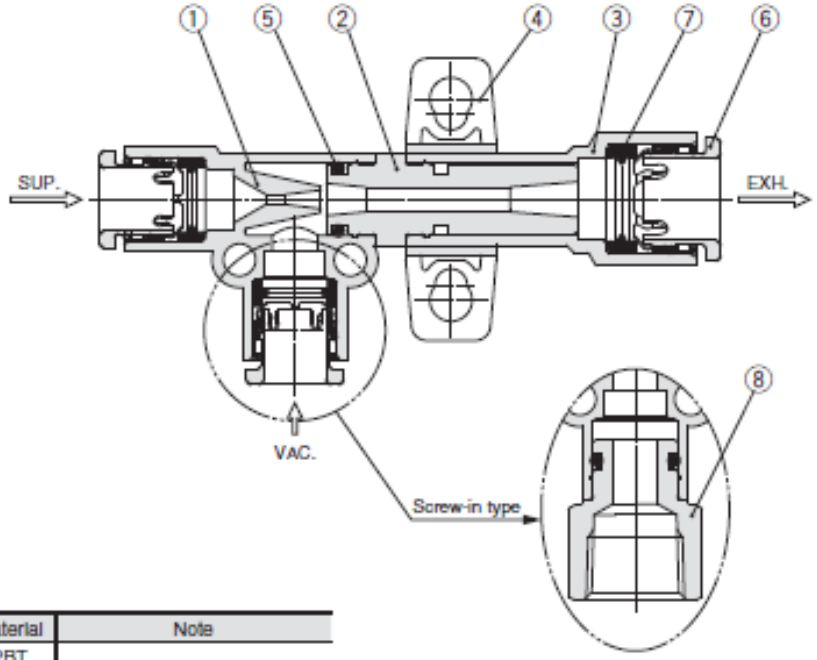
Variations

Model	Nozzle nominal size [mm]	Vacuum pressure reached* [kPa]		Maximum suction flow rate [l/min (ANR)]		Air consumption [l/min (ANR)]
		Type S	Type L	Type S	Type L	
ZH05D□A	0.5	−90	−48	6	13	13
ZH07D□A	0.7			12	28	27
ZH10D□A	1.0			26	52	52
ZH13D□A	1.3			40	78	84
ZH15D□A	1.5		−66	58	78	113
ZH18D□A	1.8			76	128	162
ZH20D□A	2.0			90	155	196

* Supply pressure: 0.45 MPa

Construction

Body Ported



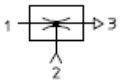
Component Parts

No.	Description	Material	Note
1	**Body**	PBT	
2	**Diffuser**	PPS	Type S: Brown, Type L: Black
3	**Adapter**	PBT	
4	**Standard bracket**	PBT	Detachable (Accessory)
5	**O-ring**	NBR	Grease applied
6	**Cassette**	—	
7	**Seal**	NBR	Grease applied
8	**Screw-in stud**	Brass	Electroless nickel plating

Vacuum generators VAD/VAK

Key features

At a glance



- Vacuum generation via ejector principle
- Mounting holes in metal housing
- Connecting thread for the suction cup

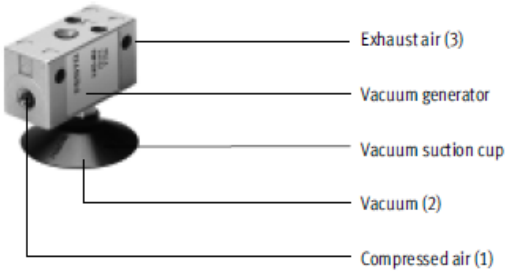
Compressed air flowing from 1 to 3 generates a vacuum at port 2 in accordance with the ejector principle.

The low noise levels which occur during exhaust can be further reduced with a silencer at port 3.

Workpieces can be picked up in any position. When the compressed air is turned off, the suction process ends and the vacuum dissipates.
During the suction process, the vacuum generator VAK fills a reservoir of approx. 32 cm^3 with compressed air, which creates an ejector pulse when the input pressure is switched off and reliably releases the workpiece from the suction cup.
Max. switching frequency approx. 10 Hz at 6 bar and with approx. 1 m suction line.

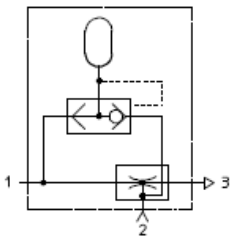
Vacuum generator VAD-... without ejector pulse

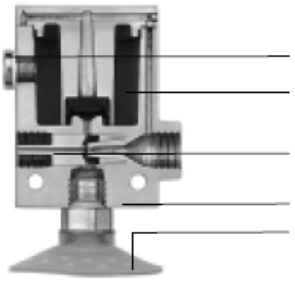
- Workpieces can be picked up in any position.
- Sturdy and resistant to environmental factors
- Easy to install
- No moving parts, maintenance-free
- Connecting threads and mounting holes available



Vacuum generator VAK-... with ejector pulse

- Quick and reliable setting down of parts via an ejector pulse from a pre-filled reservoir
- Robust vacuum generator for a broad field of applications
- Optional silencer





Suction grippers ESG

Key features

FESTO

Product overview

Festo suction grippers offer outstanding functionality and quality.

An extensive, modular range of suction cups with connection attachments, in different shapes, materials and sizes, plus a wide selection of suction cup holders, angle and height compensators and vacuum filters within the modular suction gripper system, provide users with a huge range of possible combinations for a wide variety of applications.

Suction grippers ESG

→ 7

Modular products with over 2000 variants

- The ideal solution for the transport of workpieces of different weights, surfaces and shapes
- Choose from:
  - 15 suction cup diameters
  - 6 different materials – including antistatic types
  - 6 suction cup shapes
  - Numerous suction cup holders
  - Optional accessories (vacuum filters and angle compensators)
- Wide range of variants
- A suitable solution for every task
- Wide range to suit applications with various temperature ranges and workpiece surfaces
- Suction cups made from silicone are approved for use in the food industry

Suction gripper as a complete solution

Suction gripper ESG

=

Suction gripper made of individual components

Suction cup holder ESH

+

Angle compensator ESWA (optional)

+

Vacuum filter ESF (optional)

+

Suction cup with connection attachments ESS

Suction cup ESV (optional)