Fluidic Muscle MAS

FESTO

- High initial force and acceleration
- Stick-slip-free operation
- Simple positioning
- Hermetically sealed design

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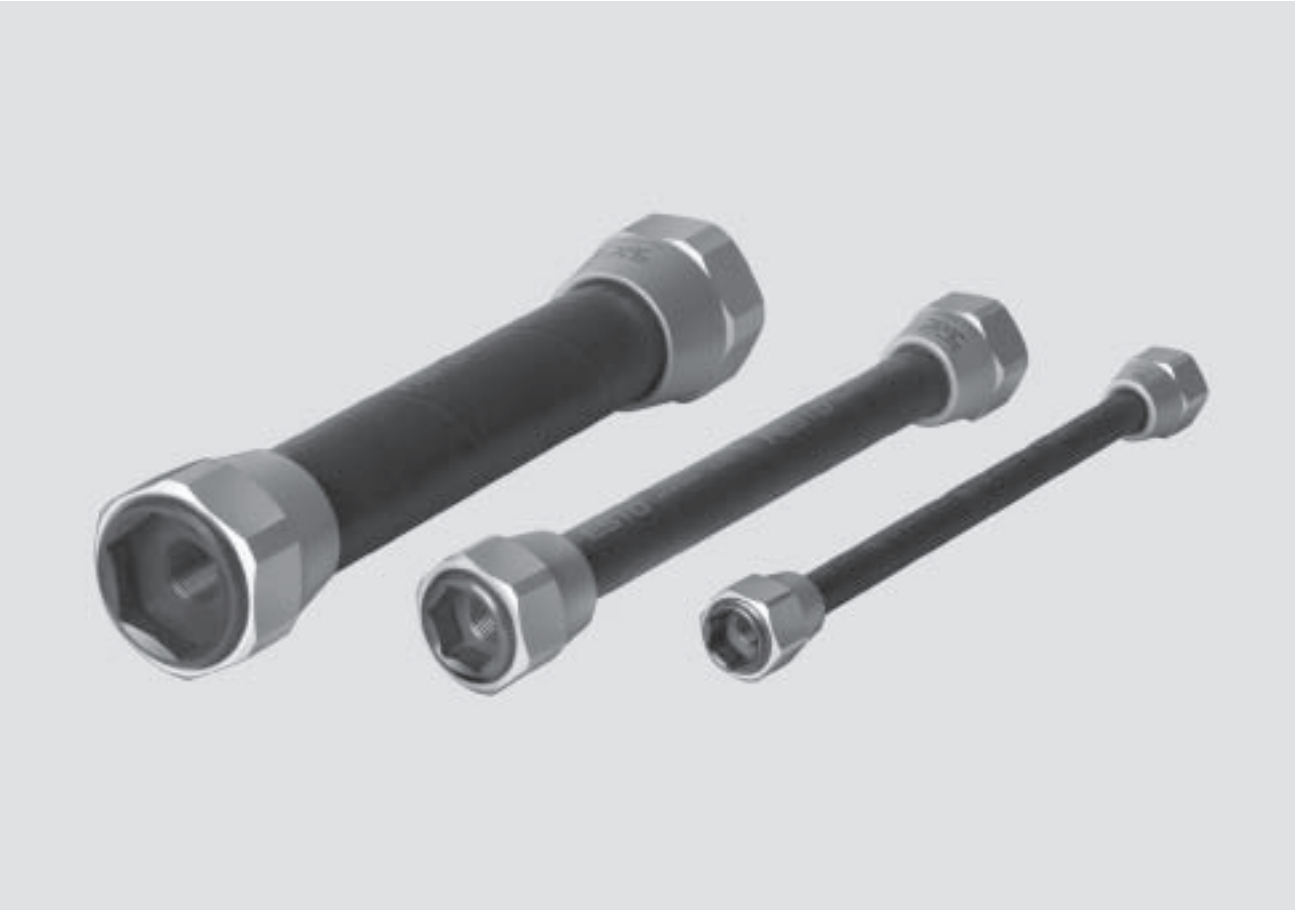
Fluidic Muscle MAS

Features



High initial force and acceleration

- Initial force up to 10 times higher than a conventional cylinder of the same diameter
- Highly dynamic response, even at high loads

Stick-slip-free operation

- No moving mechanical parts which rub against each other
- Jerk-free motion even at extremely slow speeds

Simple positioning

- By varying pressure, without the need of a displacement encoders

Hermetically sealed design

- Separation of operating air and ambient air
- Ideal for dusty and dirty environments
- Robust design
- Leak-free

Fluidic Muscle MAS

Features

Mode of operation

Fluidic Muscle is a tensile actuator which mimics natural muscular movement. It consists of a contraction system and appropriate connectors. The contraction system is formed by a pressure-sealed length of rubber hose, sheathed in high-strength fibres. The fibres create a rhomboidal pattern with a three-dimensional grid structure. When internal pressure is applied, the hose expands in its peripheral direction, thus creating a tensile force and a contraction motion in the muscle's longitudinal direction. The usable tensile force is at its maximum at the start of the contraction and then decreases in a virtually linear manner as a function of stroke. Fluidic Muscle allows usable working strokes of up to 25% of its nominal length.

The applications of Fluidic Muscle are as follows:
- Single-acting actuator
- Air spring

- Note

Fluidic Muscle is intended for use as a tensile actuator only.
The expansion in the peripheral direction cannot be used for clamping purposes, since external friction could cause damage to the muscle.

Sizing the muscle

Sizing software
Sizing should be carried out using the MuscleSIM software.
You can download this software from the Festo home page ➔ www.festo.com/download or request a copy of the catalogue CD-ROM from Festo.

Graphical sizing
Apart from sizing the muscle using the software, it is also possible to define the length of the muscle with the aid of force/displacement diagrams. Graphical sizing of the muscle is explained with the aid of two examples ➔ 1 / 5.6-14.

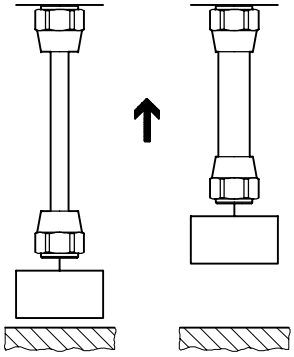
Force curve and load cases

The nominal length of the pneumatic muscle is defined in the non-pressurised, load-free state. It corresponds to the visible muscle length between the connections. The muscle extends when it is pretensioned by an external force. When pressurized, on the other hand, the muscle contracts, i.e. its length decreases.

Single-acting actuator

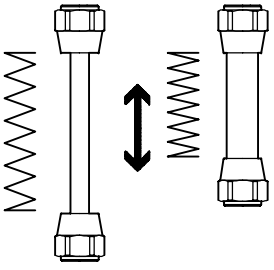
In the simplest case, Fluidic Muscle operates as a single-acting actuator against a constant load. Assuming that this load is permanently attached to the muscle, it will project from its initial position when in the extended non-pressurised state. This operating status is ideal with regard to the technical properties of Fluidic Muscle: when pressurized, a Fluidic Muscle pretensioned in this way develops maximum force with optimum dynamic characteristics and minimum air consumption. The usable force is also at a maximum in this case. If a Fluidic Muscle is required to be free of forces in the extended state, for example to allow a load to be attached, a holding force must first be developed for lifting purposes, leaving a small force component for the motion itself.

Load = Constant



Fluidic Muscle behaves like a spring with a changing external force: it follows the direction of action of the force. With 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. These produce different spring characteristics which allow the spring effect to be matched perfectly to a given application.

Pressure/volume = Constant



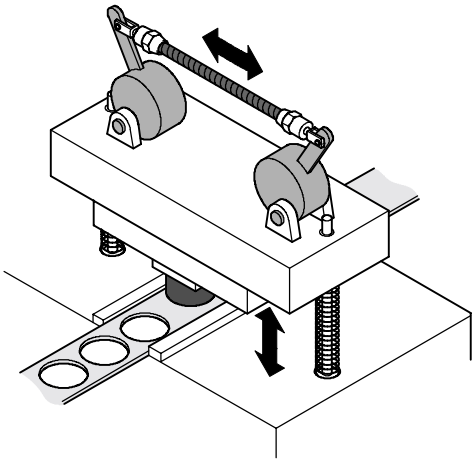
- Note

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

Fluidic Muscle MAS

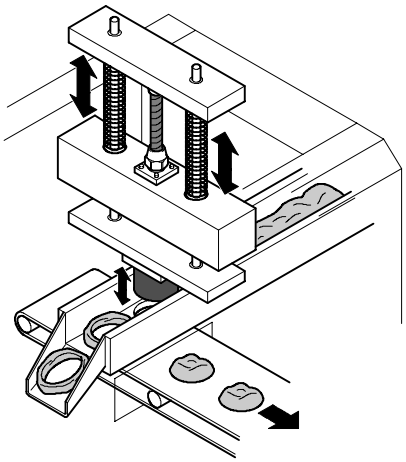
Typical applications

Force and dynamism



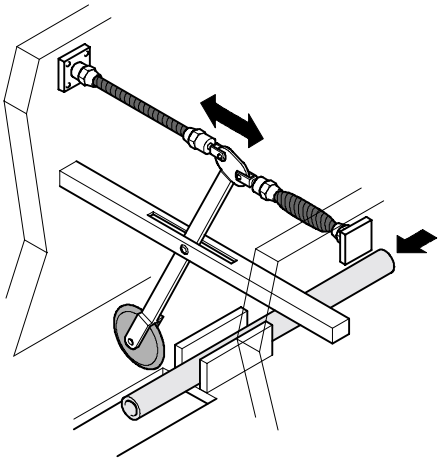
Drive for punching out cardboard boxes

The highly dynamic response and initial power of the muscle produce optimum punching results. These characteristics can be further improved through the use of eccentric rods. The return stroke of the wear-resistant system is effected by two mechanical springs.



Drive for tab punching

Very high cycle rates are possible with the muscle, on the one hand because of its low weight and on the other because it has no moving parts (e.g. pistons). The simple construction – one muscle pretensioned using two springs – replaces a complicated toggle lever clamping system using cylinders. This puts frequency increases of 3 to 5 Hz well within the realm of possibility. Over 50 million load fluctuations have been achieved thus far.



Drive for a fly cutter for cutting plastic profiles

This application is a perfect utilization of the muscle's characteristics: quick and immediate acceleration at the start of the stroke, which guarantees powerful separation of the plastic profiles, as well as a gentle approach to the end position – the falling charateristic force acts like a built-in soft stop.

Fluidic Muscle MAS

Typical applications

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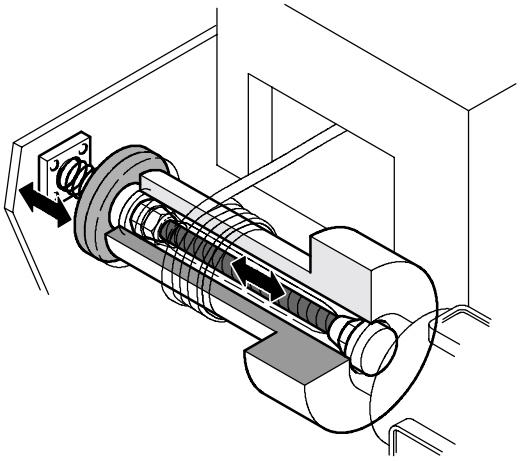
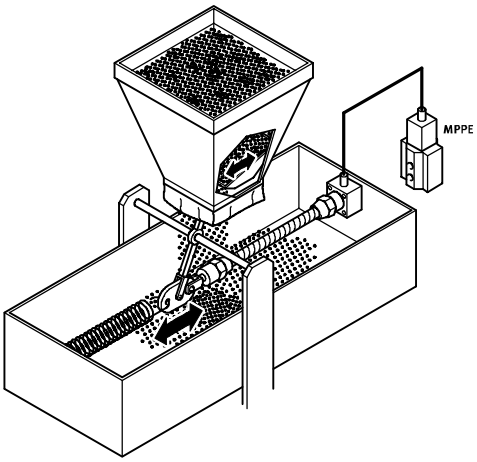
Stick-slip-free movements



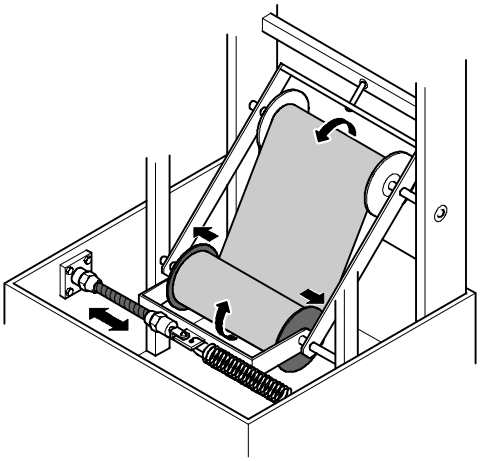
Brake actuator for rewinding equipment

The friction-free muscle allows uniform and gentle braking of the pay-out reel, ensuring highly precise winding at constant speed. Control is provided by a proportional control valve whose signals are regulated via force sensors.



Drive for a metering dispenser in an automatic grinding machine

The muscle, pretensioned via a spring, permits jerk-free and uniform opening and closing of the silo valve. This guarantees optimum metering of the grinding material. Control is provided by a proportional control valve which regulates the quantity of granulate in accordance with the belt speed of the grinding machine.



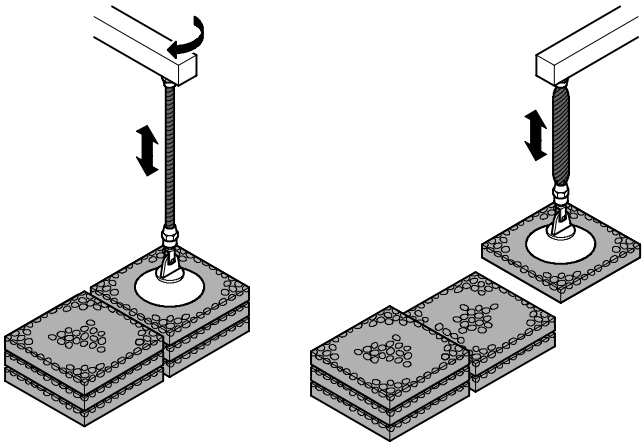
Belt edge control for winding processes

The aim: uniform winding of paper, foil or textiles.
The requirement: a friction-free drive with quick and immediate response characteristics.
The solution: Fluidic Muscle. The drum attached to a moving frame is displaced by a pneumatic muscle as soon as the sensor detects misalignment. This means that the winding edge is 100% exact.

Fluidic Muscle MAS

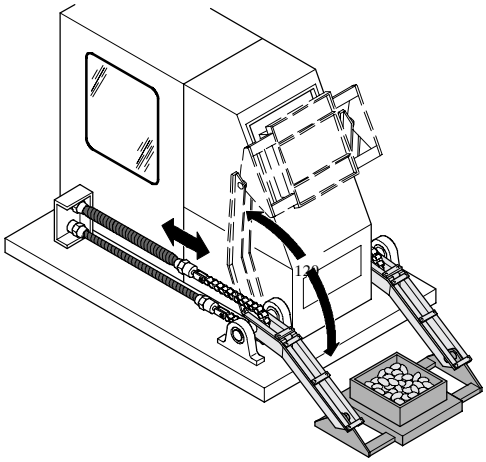
Typical applications

Simple positioning systems



Simple lifting device for manipulating concrete slabs and car wheel rims

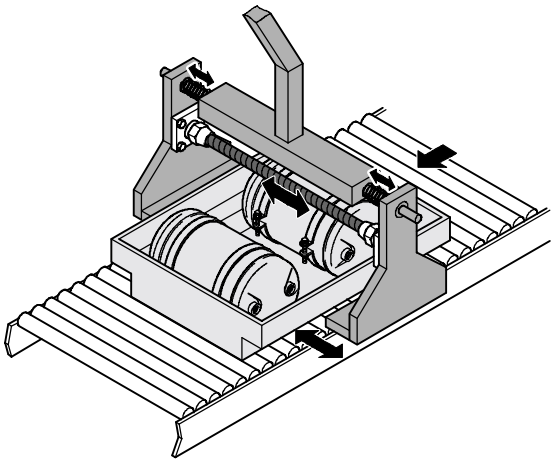
Intermediate positions? No problem with pressure regulation. The workpieces can be raised or lowered as required by pressurising or exhausting the muscle via a hand lever valve. Muscle lengths up to 9 m facilitate various application ranges.



Drive for the feeding unit of an automatic washing machine

Swivel motions are no problem for the muscle. As in a human body, flexors and extensors drive a gear wheel which can swivel a feeding unit through 120°. Proportional directional control valves allow intermediate positions through regulation of the pressure.

Harsh environmental conditions



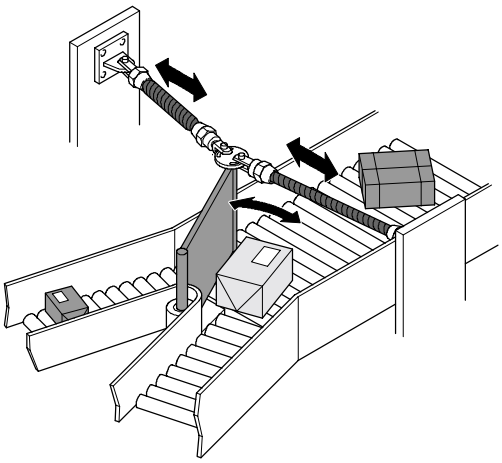
Actuator for a palette gripper

Low weight and high force when closing gripper jaws make the dirt-insensitive muscle the perfect drive for a palette gripper (with its outstanding power to weight ratio). Its completely closed system makes it ideal for use in the warehouse environment, where not even the harsh conditions can affect the service life. Cycle times can be reduced due to the lightweight gripper.

Fluidic Muscle MAS

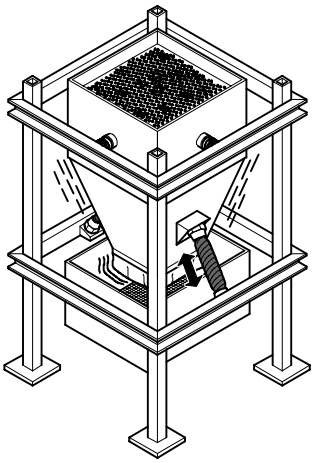
Typical applications

Dynamic



Drive for sorting/stopper devices

The ideal drive for sorting tasks and stop functions in delivery processes thanks to the muscle's high speed and good acceleration behavior. The short response times mean that cycle rates can be increased considerably.

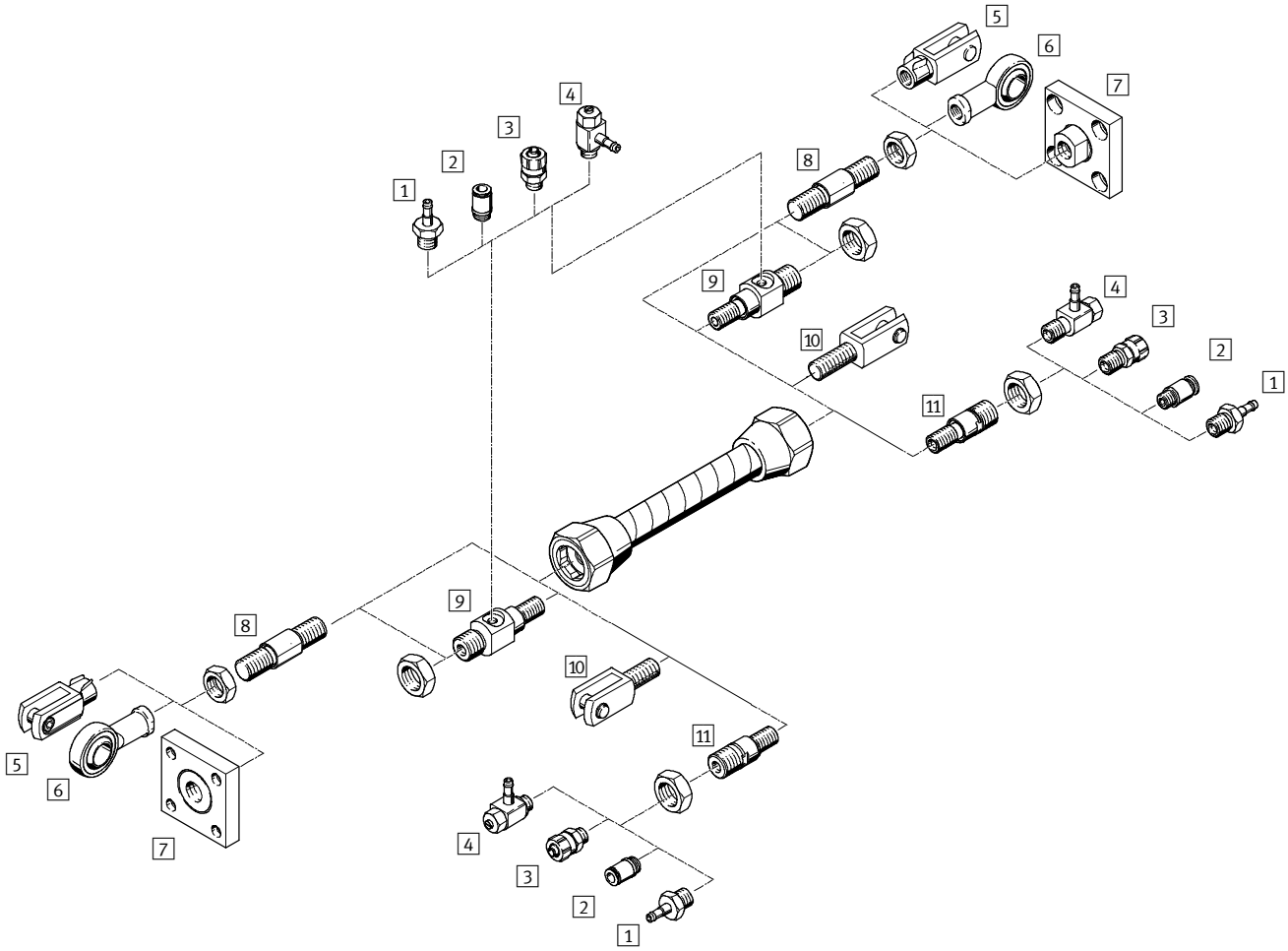


Drive for a vibratory hopper

Hoppers and silos are susceptible to the problem of clogging material during feeding. Fluidic Muscle facilitates stepless regulation of a pneumatic shaker between 10 and 90 Hz, thereby guaranteeing continuous delivery.

Fluidic Muscle MAS

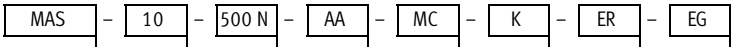
Peripherals overview



Mounting attachments and accessories		
	Brief description	**➔ Page**
1 Push-in fittings N	for connecting compressed air tubing with standard internal diameters	Volume 3
2 Push-in fittings QS	for connecting compressed air tubing with standard external diameters	Volume 3
3 Quick connectors CK	for connecting compressed air tubing with standard internal diameters	Volume 3
4 One-way flow control valves GRLA	to regulate speed	1 / 5.6-19
5 Rod clevis SG	permits swivel mounting of the Fluidic Muscle in one plane	1 / 5.6-19
6 Rod eye SGS	with spherical bearing	1 / 5.6-19
7 Coupling pieces KSG/KSZ	for compensating radial deviations	1 / 5.6-19
8 Threaded rod MXAD-T	for connecting drive accessories	1 / 5.6-19
9 Radial adapter MXAD-R	for connecting drive accessories and the air supply in radial direction	1 / 5.6-18
10 Rod clevis SGA	with male thread for direct attachment to a Fluidic Muscle	1 / 5.6-19
11 Axial adapter MXAD-A	for connecting drive accessories and the air supply in axial direction	1 / 5.6-18

Fluidic Muscle MAS

Type codes



Drive function	
Single acting, pulling	
MAS	Fluidic Muscle

Internal dia. [mm]	

Nominal length [mm]	
...N	40 ... 9,000

Material	
AA	Standard material (chloroprene, Aramid)

Connection type	
MC	Open at one end
MO	Open at both ends

Connection type	
K	Screwed with force compensator
O	Screwed without force compensator

Accessories supplied loose	
Adapter	
ER	1 adapter for radial air supply, at one end
EA	1 adapter for axial air supply, at one end
BR	2 adapters for radial air supply, at both ends
BA	2 adapters for axial air supply, at both ends
RA	1 adapter for radial and 1 adapter for axial air supply
Module retainer	
EG	1 threaded rod for mounting, at one end
BG	2 threaded rods for mounting, at both ends

- Note

The nominal length N here must not be confused with the stroke length.

With the variant MAS-...-MC-K, the integrated force compensator is always open.

When replacing a previously used Fluidic Muscle MAS and related mounting accessories with a Fluidic Muscle MAS as documented here along with the illustrated mounting accessories, it is essential to consult with your contact person at Festo because interchangeability is not necessarily assured under all circumstances due to altered installation dimensions.

Fluidic Muscle MAS

Data sheet

FESTO

Diameter
10 ... 40 mm

Stroke length
40 ... 9,000 mm

Force
0 ... 5,700 N

General technical data				
Size		10	20	40
Pneumatic connection		➔ Adapter MXAD-... from page 1 / 5.6-18		
Constructional design		Fibre-reinforced contraction diaphragm		
Mode of operation		Single acting, pulling		
Internal dia.	[mm]	10	20	40
Nominal length	[mm]	40 ... 9,000	60 ... 9,000	120 ... 9,000
Max. additional load, freely suspended	[kg]	30	80	250
Max. additional load liftable from floor, start position not pretensioned	[kg]	63	150	600
Max. permissible pretensionsing[1)]		3% of nominal length	4% of nominal length	5% of nominal length
Max. permissible contraction		25% of nominal length		
Diameter expansion[2)] at max. contraction	[mm]	23	39	72
Max. Hysteresis without/with load		≤3% of nominal length	≤2,5% of nominal length	
Max. Relaxation at room temperature		≤4% of nominal length		3% of tubing length
Repetition accuracy		≤1% of nominal length		
Max. permissible operating frequency[3)]	[Hz]	3		
Max. permissible offset of connections		Angular tolerance: <0,3°		
		Parallel tolerance: ±0,5% (up to 400 mm nominal length), <2 mm (more than 400 mm nominal length)		
Type of mounting		With accessories		
Mounting position		Any (an external guide is required if lateral forces occur)		

1) The max. pretensioning is achieved when the max. permissible freely suspended useful load is attached.
2) The diameter expansion must not be used for clamping purposes.
3) Nominal conditions: at 6 bar, nominal length 10x diameter, max. pretensioned.

Operating and environmental conditions				
Size		10	20	40
Operating pressure	[bar]	0 ... 8	0 ... 6	
Operating medium		Filtered compressed air, lubricated or unlubricated (further media upon request)		
Ambient temperature	[°C]	–5 ... 60		
Corrosion resistance class CRC[1)]		2		

1) Corrosion resistance class 2 according to Festo standard 940 070
Components requiring moderate corrosion resistance. Externally visible parts with primarily decorative surface requirements which are in direct contact with a surrounding industrial atmosphere or media such as cooling or lubricating agents.

Forces [N] at max. permissible operating pressure			
Size	10	20	40
Theoretical force	630	1,500	6,000
Force required to achieve pretensioning of 3%	300	800	2,500
Force compensation	400	1,200	4,000

Fluidic Muscle MAS

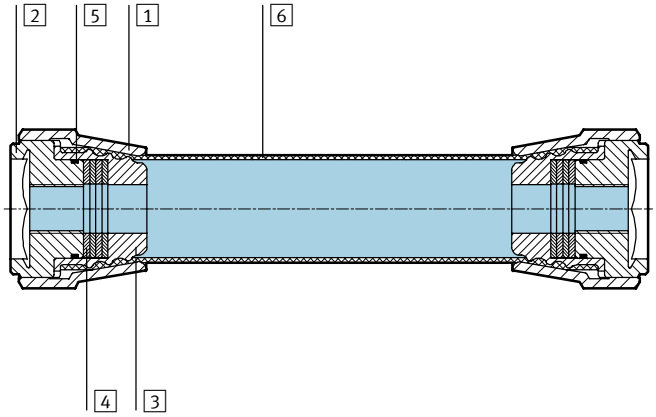
Data sheet

FESTO

Weights [g]				
Size		10	20	40
Product weight for 0 m length		77	238	673
Additional weight per 1 m length		94	178	340
Connection without force limiter	Open at one end (MC-0)	39	124	342
	Open at both ends (MO-0)	38	114	331
Connection with force limiter	Open at one end (MC-K)	49	153	521
	Open at both ends (MO-K)	49	153	521

Materials

Sectional view

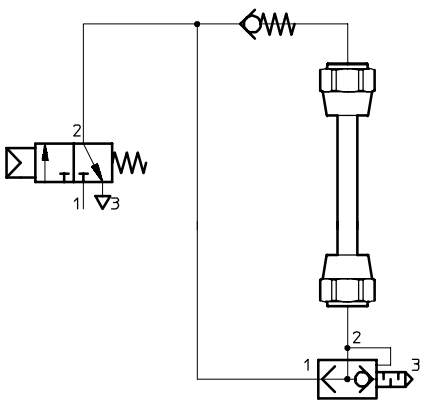


Cylinder		
1	Union nut	Wrought aluminium alloy, clear anodized
2	Flange	Wrought aluminium alloy, blue anodized
3	Internal cone	Wrought aluminium alloy, clear anodized
4	Cup springs	Steel
5	Sealing ring	NBR
6	Diaphragm hose	Chloropren, Aramid
–	Adhesive	Loctite 243 (thread locking agent)
–	Lubricant	Klüberplex BE 31-102
	Note on material	Free of copper, PTFE and silicone

Note

The service life of the pneumatic muscle is clearly dependent on usage which manifests itself as thermal load resulting from the deformation and additional load.

Pressurizing both sides significantly reduces the thermal load on the component, thus increasing the service life.



Permissible force F [N] as a function of the contraction h [%] of the nominal length

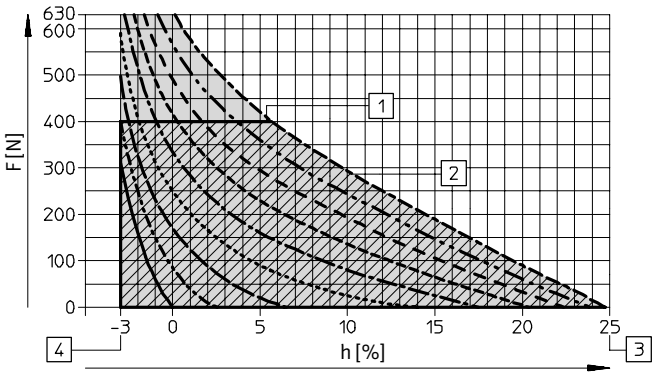
Force/displacement diagrams and sizing ranges

The limit for "freely suspended" loads is derived from the contraction. With the Fluidic Muscle MAS-10-..., a loosely attached additional load of 30 kg results in 3% pretensioning (see diagramm).
The limits specified in the technical data must be complied with when using the muscle.
The diagrams below illustrate the operating range of the muscle, depending on the diameter, as the area within the following boundary lines.

Using the diagrams

1. The left limit of the grey area describes the load limit of the muscle defined by the max. pretensioning.
2. The upper limit of grey shaded area gives the maximum theoretical force at maximum permissible operating pressure.
2. The right limiting curve of the grey area describes the max. permissible operating pressure.
3. The right vertical limit of the grey area describes the max. permissible contraction.

Operating range MAS-10-...

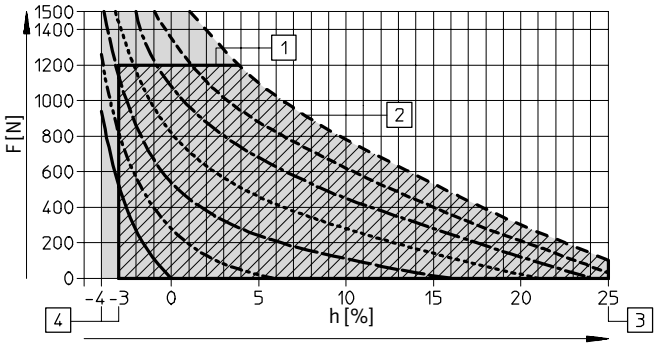


0 bar
1 bar
2 bar
3 bar
4 bar
5 bar
6 bar
7 bar
8 bar

1 Force compensation with MAS-10-...-K
2 Max. operating pressure
3 Max. deformation
4 Max. pretensioning

Permissible operating range for MAS-10-...
Permissible operating range for MAS-10-...-K

Operating range MAS-20-...

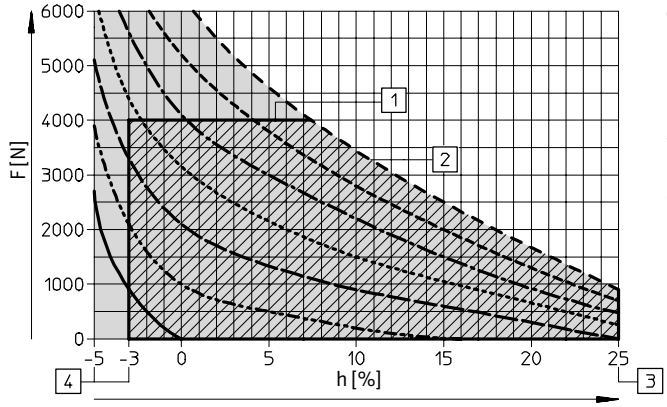


0 bar
1 bar
2 bar
3 bar
4 bar
5 bar
6 bar

1 Force compensation with MAS-20-...-K
2 Max. operating pressure
3 Max. deformation
4 Max. pretensioning

Permissible operating range for MAS-20-...
Permissible operating range for MAS-20-...-K

Operating range MAS-40-...



0 bar
1 bar
2 bar
3 bar
4 bar
5 bar
6 bar

1 Force compensation with MAS-40-...-K
2 Max. operating pressure
3 Max. deformation
4 Max. pretensioning

Permissible operating range for MAS-40-...
Permissible operating range for MAS-40-...-K

Note

The specified pretensioning applies to the design without force compensation – the diagrams were determined using muscles with standard length. Sizing should be carried out using the Fluidic Muscle sizing software.

This software can be downloaded from the Festo homepage.
➔ www.festo.com/download or request a copy on CD-ROM from Festo.

Sizing example 1

Lifting a constant load

A Fluidic Muscle is to be used to engage free of forces with a constant load of 80 kg on a supporting surface and raise this a distance of 100 mm. The operating pressure is to be 6 bar.

The size (diameter and nominal length) of the muscle is to be found.

Note

The limits specified in the technical data must be complied with when using the muscle.

Amongst other factors, service life depends upon the selected pressure setting and the utilized contraction.

General conditions	Values
Required force at rest	0 N
Required stroke	100 mm
Required force in contracted state	approx. 800 N
Operating pressure	6 bar

Solution method

Step 1
Determining the required muscle size

Determine the most suitable muscle diameter on the basis of the required force. The required force is 800 N,

therefore an MAS-20-... or MAS-40-... is selected.

Step 2:
Entering load point 1

Load point 1 is entered into the force/displacement diagram for the MAS-20-...

Force F = 0 N
Pressure p = 0 bar

Step 3:
Entering load point 2

Load point 2 is entered into the force/displacement diagram.

Force F = 800 N
Pressure p = 6 bar

Step 4:
Reading the length change

The change in the length of the muscle is read between the load points on the X axis (contraction in %).

Result:
9.6% contraction.

Step 5:
Calculating the nominal length

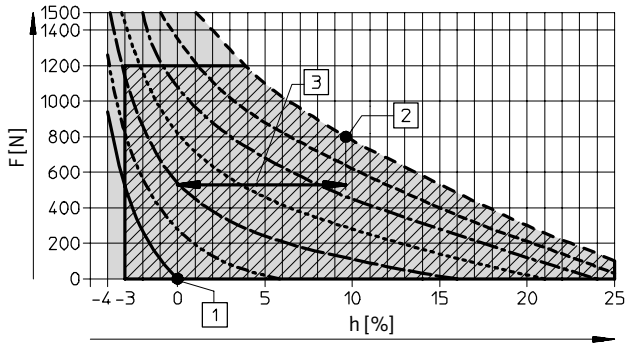
The required nominal muscle length for a stroke of 100 mm is obtained by dividing by the contraction in %.

Result:
100 mm / 9.6% ~ 1,042 mm.

Step 6:
Result

A Fluidic Muscle with a nominal length of 1,042 mm should be ordered.

In order to attach a load of 80 kg free of forces and lift this 100 mm, a MAS-20-1042N-AA-... is required.



0 bar
1 bar
2 bar
3 bar
4 bar
5 bar
6 bar

1 Load point 1
2 Load point 2
3 Length change = 9.6%

Sizing example 2

Use of the muscle as a tension spring

In this example, the muscle is to be used as a tension spring.

The diameter and nominal length of the muscle are to be found.

Note

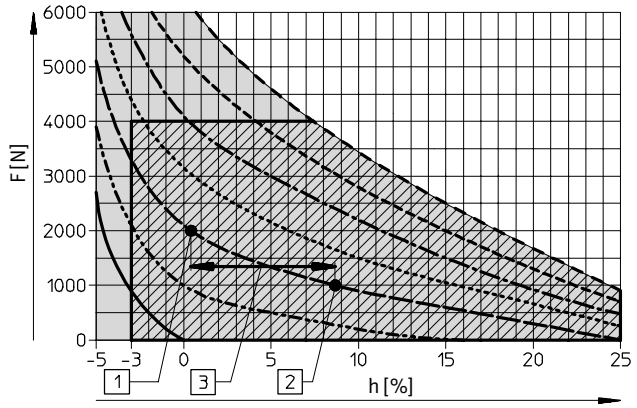
The limits specified in the technical data must be complied with when using the muscle.

Amongst other factors, service life depends upon the selected pressure setting and the utilized contraction.

General conditions	Values
Required force in extended state	2,000 N
Required force in contracted state	1,000 N
Required stroke (spring length)	50 mm
Operating pressure	2 bar

Solution method

Step 1: **Determining the required muscle size**	Determine the most suitable muscle diameter on the basis of the required force. The required force is 2,000 N,	therefore an MAS-40-... is selected.
Step 2: **Entering load point 1**	Load point 1 is entered into the force/displacement diagram for the MAS-40-...	Force F = 2,000 N Pressure p = 2 bar
Step 3: **Entering load point 2**	Load point 2 is entered into the force/displacement diagram.	Force F = 1,000 N Pressure p = 2 bar
Step 4: **Reading the length change**	The change in the length of the muscle is read between the load points on the X axis (contraction in %).	Result: 8.7% contraction.
Step 5: **Calculating the nominal length**	The required nominal muscle length for a stroke of 50 mm is obtained by dividing by the contraction in %.	Result: 50 mm / 8.7% ~ 544 mm.
Step 6: **Result**	A Fluidic Muscle with a nominal length of 544 mm should be ordered.	For use as a tension spring with a force of 2,000 N and a spring travel of 50 mm, a MAS-40-544N-AA-... is required.

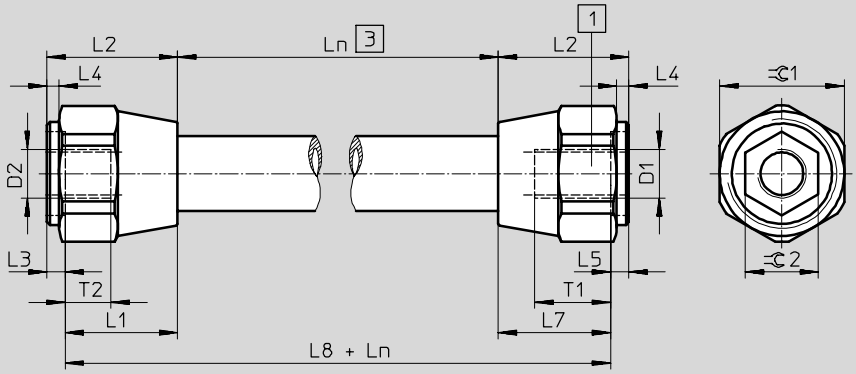


0 bar
1 bar
2 bar
3 bar
4 bar
5 bar
6 bar

1 Load point 1
2 Load point 2
3 Length change = 8.7%

Dimensions

Download CAD data ➔ **www.festo.com/en/engineering**



1 Force compensator for MAS- ...-K
3 Nominal length

Note

When replacing a previously used Fluidic Muscle MAS and related mounting accessories with a Fluidic Muscle MAS as documented here along with the illustrated mounting accessories, it is essential to consult with your contact person at Festo because interchangeability is not necessarily assured under all circumstances due to altered installation dimensions.

Size	Variant	D1	D2	L1 ±0.6	L2 ±0.4	L3 ±0.2	L4	L5	L7
10	MC-K	M10x1.25	M10x1.25	30.1	34.1	4	3.5 ±0.2	2.5 ±0.4	31.6 ±0.8
	MC-O							4 ±0.2	30.1 ±0.6
	MO-K							2.5 ±0.4	31.6 ±0.8
	MO-O							4 ±0.2	30.1 ±0.6
20	MC-K	M16x1.5	M10x1.25	36.5	42.5	6	3.5 ±0.2	5.5 ±0.4	37 ±0.8
	MC-O							6 ±0.2	36.5 ±0.6
	MO-K		M16x1.5					5.5 ±0.4	37 ±0.8
	MO-O							6 ±0.2	36.5 ±0.6
40	MC-K	M20x1.5	M16x1.5	47.5	55.5	8	3.5 ±0.3	6.5 ±0.4	49 ±0.8
	MC-O							8 ±0.2	47.5 ±0.6
	MO-K		M20x1.5					6.5 ±0.4	49 ±0.8
	MO-O							8 ±0.2	47.5 ±0.6

Size	Variant	L8	Ln min.	Ln max.	T1 min.	T2 max.	⊂1	⊂2
10	MC-K	61.7	40	9,000[1)]	15	10	27	17
	MC-O	60.2			10			
	MO-K	61.7			15			
	MO-O	60.2			10			
20	MC-K	73.5	60		24	15	41	24
	MC-O	73			26.5			
	MO-K	73.5			24	26.5		
	MO-O	73			26.5			
40	MC-K	96.5	120		30	20	60	41
	MC-O	95			21.8			
	MO-K	96.5			30	21.8		
	MO-O	95			21.8			

1) Tolerance for up 100 mm ±1 mm, from 100 mm to 400 mm: ±1%, for greater than 400 mm: ±4 mm

Fluidic Muscle MAS

Ordering data – Modular product system

FESTO

M Mandatory data							O Options	
Module No.	**Drive function**	**Internal dia.**	**Nominal length**	**Material**	**Connection type**	**Connection type**	**Adapter**	**Module retainer**
534 201 534 202 534 203	MAS	10 20 40	...N	AA	MC MO	K O	ER EA BR BA RA	EG BG
Ordering example								
534 201	**MAS** –	**10** –	**500 N** –	**AA** –	**MC** –	**K** –	**ER** –	**EG**

Ordering table

Size			10	20	40	Condi-tions	Code		Enter code
M	Module No.		**534 201**	**534 202**	**534 203**				
	Drive function		Fluidic Muscle				**MAS**		MAS
	Internal dia.	[mm]	10	20	40		**-...**		
	Nominal length	[mm]	40 ... 9,000	60 ... 9,000	120 ... 9,000		**-...N**		
	Material		Standard material (chloroprene)				**-AA**		-AA
	Connection type		Fluidic Muscle open at one end				**-MC**		
			Fluidic Muscle open at both ends				**-MO**		
	Connection type		Screwed connection with force compensator				**-K**		
			Screwed connection without force compensator				**-O**		
O	Adapters, supplied loose		1 adapter for radial air supply, at one end			1	**-ER**		
			1 adapter for axial air supply, at one end			1	**-EA**		
			2 adapters for radial air supply, at both ends			2	**-BR**		
			2 adapters for axial air supply, at both ends			2	**-BA**		
			1 adapter for radial and 1 adapter for axial air supply			2	**-RA**		
	Mounting, supplied loose		1 threaded rod for attaching, at one end			3	**-EG**		
			2 threaded rods for attaching, at both ends			4	**-BG**		

1 **ER, EA** Not in combination with connection type MO.

2 **BR, BA, RA** Not in combination with connection type MC.

3 **EG** In combination with connection type MO only permissible in combination with adapter BR, RA.

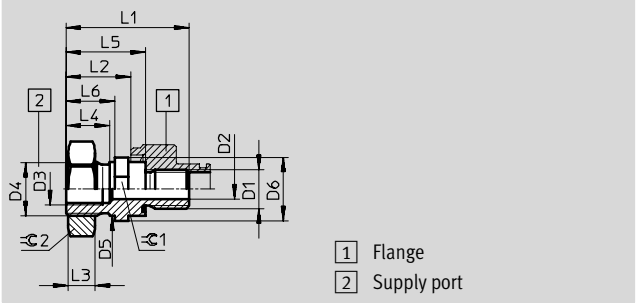
4 **BG** In combination with connection type MC only permissible in combination with adapter ER.
In combination with connection type MO only permissible in combination with adapter BR.

Transfer order code

	MAS	–		–		–	**AA**	–		–		–		–	

Axial adapter MXAD-A

Material:
Adapter: Anodized aluminum
Nut: Brass
Seal: Nitrilkautschuk



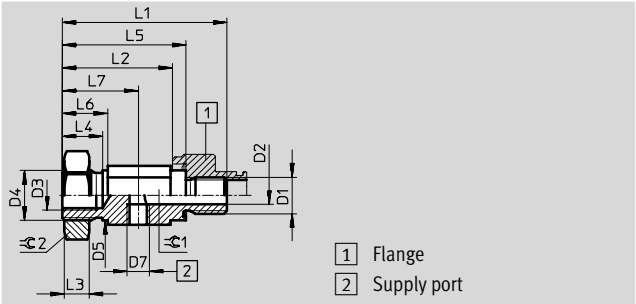
Dimensions and ordering data

For size	D1	D2 ∅	D3	D4	D5 ∅ h11	D6 ∅	L1	L2	L3
10	M10x1.25	5	G1/8	M16x1.5	16	20	39.9	25.9	8
20	M16x1.5	8	G1/4	M22x1.5	22	26	50.5	26.5	11
40	M20x1.5	10	G3/8	M30x1.5	30	40	73.5	45.5	8

For size	L4	L5	L6	⌀1	⌀2	Weights [g]	Part No.	Type
10	15.4	29.9	17.4	17	24	33	**534 400**	**MXAD-A10**
20	18	32.5	20	24	32	69	**534 402**	**MXAD-A16**
40	35	53.5	38	36	46	184	**534 404**	**MXAD-A20**

Radial adapter MXAD-R

Material:
Adapter: Anodized aluminum
Nut: Brass
Seal: Nitrilkautschuk



Dimensions and ordering data

For size	D1	D2 ∅	D3	D4	D5 ∅ h11	D7	L1	L2	L3
10	M10x1.25	5	M10x1.25	M16x1.5	16	M5	55.5	41.5	8
20	M16x1.5	8	M10x1.25	M22x1.5	22	G1/8	72.5	48.5	11
40	M20x1.5	10	M16x1.5	M30x1.5	30	G1/4	103.5	75.5	8

For size	L4	L5	L6	L7	⌀1	⌀2	Weights [g]	Part No.	Type
10	15.4	45.5	17.4	26.7	17	24	44	**534 401**	**MXAD-R10**
20	18	54.5	20	33.5	24	32	109	**534 403**	**MXAD-R16**
40	35	83.5	38	56	36	46	263	**534 405**	**MXAD-R20**

- Note

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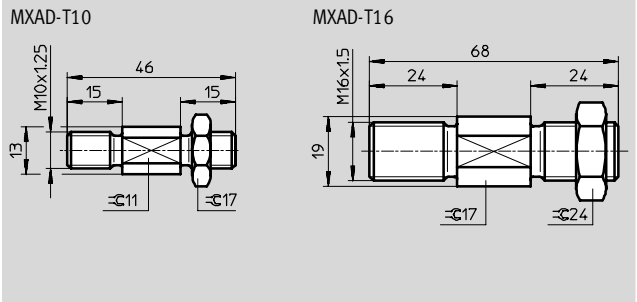
Threaded rod MXAD-T

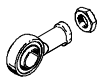
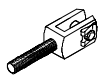
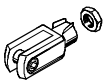
Material:
Aluminum

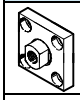
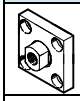


Dimensions and ordering data

For size	Suitable for threaded connection	Weights [g]	Part No.	Type
10/20	M10x1.25	40	**187 597**	**MXAD-T10**
40	M16x1.5	140	**187 609**	**MXAD-T16**

Ordering data – Drive couplings — Technical data ➔ 1 / 10.3-2

Designation	For size	Part No.	Type
Rod eye SGS[1]			
	10	**9 261**	**SGS-M10x1,25**
	20	**9 261**	**SGS-M10x1,25**
	40	**9 263**	**SGS-M16x1,5**
Rod clevis SGA			
	10	**32 954**	**SGA-M10x1,25**
	20	**32 954**	**SGA-M10x1,25**
	40	**10 768**	**SGA-M16x1,5**
Rod clevis SG[1]			
	10	**6 144**	**SG-M10x1,25**
	20	**6 144**	**SG-M10x1,25**
	40	**6 146**	**SG-M16x1,5**

Designation	For size	Part No.	Type
Coupling piece KSG[1]			
	10	**32 963**	**KSG-M10x1,25**
	20	**32 963**	**KSG-M10x1,25**
	40	**32 965**	**KSG-M16x1,5**
Coupling piece KSZ[1]			
	10	**36 125**	**KSZ-M10x1,25**
	20	**36 125**	**KSZ-M10x1,25**
	40	**36 127**	**KSZ-M16x1,5**

1) Threaded rod MXAD-T... is required.

Ordering data – One-way flow control valves — Technical data ➔ Volume 2

	Connection		Material	Part No.	Type
	Thread	For tubing OD			
	M5	3	Metal design	**196 137**	**GRLA-M5-QS-3-D**
		4		**193 138**	**GRLA-M5-QS-4-D**
		6		**193 139**	**GRLA-M5-QS-6-D**
	G1/8	3		**193 142**	**GRLA-1/8-QS-3-D**
		4		**193 143**	**GRLA-1/8-QS-4-D**
		6		**193 144**	**GRLA-1/8-QS-6-D**
		8		**193 145**	**GRLA-1/8-QS-8-D**
	G1/4	6		**193 146**	**GRLA-1/4-QS-6-D**
		8		**193 147**	**GRLA-1/4-QS-8-D**
		10		**193 148**	**GRLA-1/4-QS-10-D**

Core Range