Swivel module

DSMI-...-B

FESTO

(en) Operating instructions

8076556
2017-12d
[8076558]

Translation of the original instructions

Symbols:

Warning

Installation and commissioning may only be performed in accordance with these instructions by technicians with appropriate qualifications.

Caution

Note

Environment

Accessories

English 3

Swivel Module DSMI-...-B

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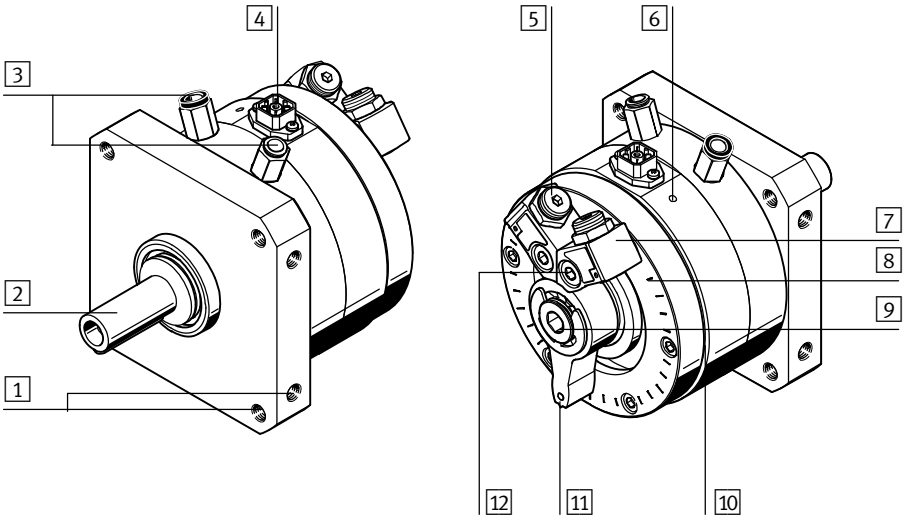
Documentation on the product

For all available product documentation ➔ www.festo.com/pk

1 Operating elements and ports



1 Mounting thread for drive

2 Drive shaft

3 Compressed air ports

4 Measuring system connection

5 Adjustment sleeve with lock nut

6 Hole for earth connection

7 Stop, consisting of shock absorber retainer and adjustment sleeve

8 Angle scale

9 Hexagon

10 Snap ring for optional cover cap

11 Stop lever with integrated magnet for position monitoring

12 Locking screw for shock absorber retainer

Fig. 1

2 Function and application

When the compressed air ports are pressurised alternately, the inner vane in the housing swivels backwards and forwards. This swivel movement is transmitted to the outer stop lever and the drive shaft as a rotary movement. The angle of rotation can be limited by means of adjustable stops and adjustment sleeves for the stop lever. To use the DSMI as a measuring cylinder, the adjustment sleeve in the shock absorber retainer can be replaced with cushioning components (elastomer shock absorbers or shock absorbers).

The pneumatic DSMI swivel module was designed for rotating or swiveling work loads which do not have to carry out a complete revolution.
The integrated measuring system was designed for monitoring the swivel position in combination with a positioning controller from Festo (e.g. CMPX, CMAX, SPC200, SPC11 “Soft Stop”) or for use as a measuring cylinder.

If it is used as a measuring cylinder, the compressed air will need to be throttled (e.g. using one-way flow control valves).

The device is intended for use in an industrial environment.

3 Transport and storage

- Take the weight of the DSMI into account:
  It weighs up to 7 kg.
- Ensure the following storage conditions:
  - Storage times should be kept to a minimum
  - Cool, dry and shaded storage locations protected from corrosion.

4 Safety conditions

For electronically closed-loop control of the DSMI in combination with a positioning controller:

Note
Special conditions apply to the electronic regulation of the DSMI.

- Note the warnings and instructions in the descriptions of the positioning controller.

The following applies to all applications:

Note
Malfunctions will occur if the device is not used correctly.

- Make sure that the specifications in this chapter are always observed.

- Compare the limit values specified in these operating instructions with your actual application (e.g. pressures, forces, torques, temperatures, masses). The product can only be operated in accordance with the relevant safety guidelines if the maximum load limits are observed.
- Take the ambient conditions at the location of use into account. Corrosive environments (e.g. ozone) will reduce the service life of the product.
- Make sure that the compressed air is properly prepared (➔ Technical data).
- Maintain the selected medium for the complete service life of the product. Example: Always use non-lubricated compressed air.
- Pressurise your entire system slowly. There will then be no uncontrolled movements.
  For slow start-up pressurisation, use the HEL pressure build-up.
- Please comply with national and local safety laws and regulations.
- Remove all transport packaging such as foils, caps and cartons (except for any plugs in the pneumatic connections).
  The packaging is intended for recycling on the basis of its constituent materials (exception: oiled paper = other waste).

- Unauthorised product modification is not permitted.
- Note the warnings and instructions on the product and in the relevant operating instructions.
- Take the tolerance of the tightening torques into account. Without special specification, the tolerance is ±20 %.

5 Installation

Mechanical installation

For electronically closed-loop control of the DSMI in combination with a positioning controller:

Note
Special installation specifications apply to the electronically controlled operation.

- To install the mechanical system, please observe the instructions in the descriptions of the positioning controller.

The following applies to all applications:

- Handle the DSMI with care so that the drive shaft is not damaged. This applies in particular to the following:
- Check whether it is necessary to drill additional holes in the mounting flange of the DSMI.

  The grey areas (G) in the drawing show where additional holes can be drilled on the DSMI (e.g. to mount centring pins).

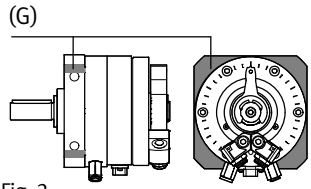


Fig. 2

- Position the DSMI so that you can easily reach the operating parts.
- Fasten the DSMI with at least 2 screws.

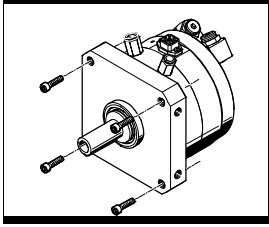
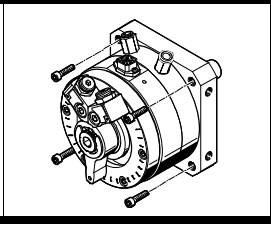
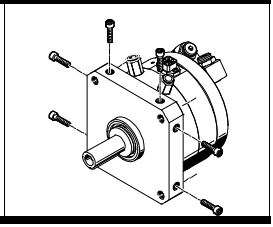
Front mounting	Rear mounting	Side mounting
		

Fig. 3

When using the hexagon socket to fit a self-configured second drive shaft:

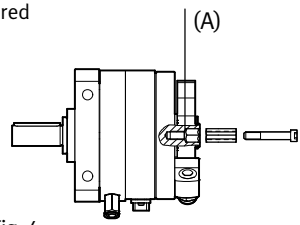


Fig. 4

- Make sure that the second drive shaft cannot slide out of the hexagon socket 9. This is ensured by the thread (A) at the base of the hexagon socket. A fixing screw can be fitted in this case. For this, the second drive shaft must be hollow.

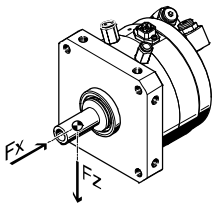


Fig. 5

- When placing the moving mass, make sure that the following specifications are fulfilled (➔ “Technical data” and “Characteristic curves” chapters):
  - It must not be tilted,
  - Permissible radial force Fz,
  - Permissible axial force Fx,
  - Permissible mass moment of inertia.

  The mass moment of inertia of the moving mass should be calculated. Lever arms, cantilever arms and masses on a second drive shaft should be taken into account in the calculation. The permissible mass moment of inertia (➔ Catalogue specifications) depends on the specific situation:
  - Nominal size of the DSMI
  - Type of end-position cushioning
  - Swivel time
  - Swivel angle

  It can be taken from the catalogue data or the description of the positioning controller.

To fasten the work load:

1. Push the moving mass on to the drive shaft.
2. Make sure that the moving mass cannot slide off the drive shaft. This is ensured by the thread in the drive shaft. When tightening the screws, lock them at the hexagon socket [9].

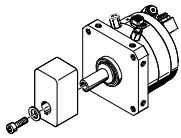


Fig. 6

DSMI-...-B		25	40	63
Tightening torque	[Nm]	2.9	9.9	47

Fig. 7

- Adjust the stops of the end positions statically according to the type.
- If possible, use symmetric angle settings that follow the line of symmetry of the DSMI.

  These produce a more even movement between right-hand and left-hand swiveling movements.

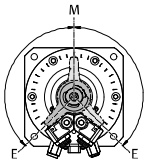


Fig. 8

Adjusting the stops on the DSMI

Note
Operating the DSMI without cushioning will destroy it.

- Make sure that the DSMI is always only operated with shock absorbers (electronically controlled, internal or external).
- Make sure that the locking screws [12] of the shock absorber retainers are retightened with the specified tightening torque.
- Observe the instructions in the descriptions of the positioning controller when adjusting the stops.

For use as a measuring cylinder:

- Replace the adjustment sleeves with cushioning elements (elastomer shock absorbers or shock absorbers ➔ “Accessories” chapter). Observe the enclosed documentation.

1. Remove the cover cap of the DSMI from the housing (if present).
2. Swivel the moving mass to the desired end position.

   If the DSMI is depressurised, this can be done by hand or using a hexagon spanner on the swivel lever 11.
   The angle scale can be used for precise positioning.

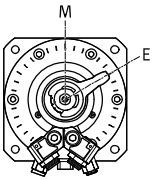


Fig. 9

DSMI-...-B		25	40	63
Graduation (1 graduation mark =)	[°]	2	1	1

Fig. 10

3. Unscrew the locking screws 12 for the shock absorber retainers. To shift the shock absorber retainers, it is sufficient to slacken the locking screws until they can just barely be shifted.

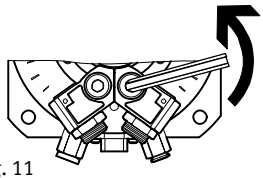


Fig. 11

4. Push the shock absorber retainer towards the stop lever until the adjustment sleeve or the fixed stop of the shock absorber (elastomer shock absorber or shock absorber) touches the stop lever.

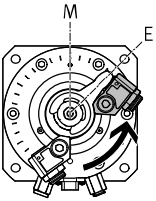


Fig. 12

5. Retighten the locking screw 12 of the shock absorber retainer with the following tightening torque.
   Only with the specified tightening torque will the gearing of the shock absorber retainer grip the housing material.

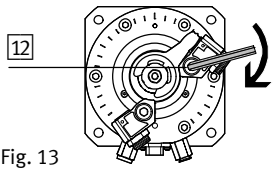


Fig. 13

DSMI-...-B		25	40	63
Tightening torque 12	[Nm]	10	39	79

Fig. 14

6. Repeat the adjustment for the other end position.
7. Press the cover cap of the DSMI back on to the snap ring of the housing (if present).
   The cover cap can also be snapped on to freely positioned shock absorber retainers if the elements are broken through at the predetermined breaking point.

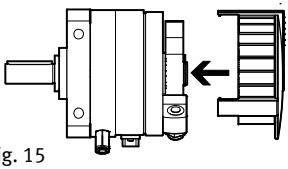


Fig. 15

- Check whether additional shock absorbers or stops are necessary.
  Additional shock absorbers or stops are necessary in the following cases:
  – For moving masses with a mass moment of inertia greater than the determined permitted mass moment of inertia
  – When the DSMI is operated without an air cushion on the exhaust side (e.g. after long breaks between the individual swivel movements).

Adjusting the DSMI with internal stop system

When external stops and shock absorbers are used:

- Make sure that the following specifications are complied with:
  – Point of impact in the mass moment of inertia (important for eccentric masses on the lever arm)
  – Max. permissible stop force
  – Minimum stop radius r_{min} (➔ Technical data)
  – Using protective devices (e.g. cover cap ➔ Accessories)

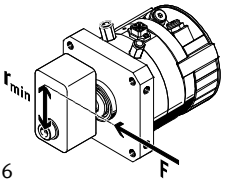


Fig. 16

Installing the pneumatic system

Note
Uncontrolled operation without positioning controller and without additional external one-way control valves will destroy the DSMI, even if it is pressurised only once for test purposes.

- Note that the DSMI does not have any flow control for the pneumatic connections.

  The DSMI may only be used without external one-way control valves in electronically controlled operation in combination with a positioning controller.

For electronically closed-loop control of the DSMI in combination with a positioning controller:

Note
Special installation specifications apply to the electronically controlled operation.

- To install the pneumatic system, please observe the instructions in the descriptions of the positioning controller.

- Connect the tubing of the DSMI with the proportional directional control valve according to the colour codes of the connections.
  - Black release ring (looking at the stop lever, it swivels in clockwise direction).
  - Blue release ring (looking at the stop lever, it swivels in anticlockwise direction).

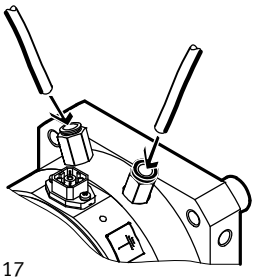


Fig. 17

The following applies to all other applications (e.g. as measuring cylinder):

- Use one-way flow control valves GRLA to set the swivel speed.

  These are screwed directly into the compressed air ports (for this, remove the standard connection with colour code).

- Connect the DSMI tubing.

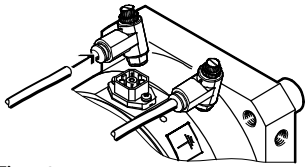


Fig. 18

For eccentric masses:

- Check whether controlled HGL non-return valves or a VZS compressed air compensation reservoir are necessary.

  In this way you can prevent the moving mass from moving down and hitting the bottom if there is a sudden drop in pressure.

Electrical installation

Note
Leakage currents can impair the measuring system.

- Make sure that the earth connection 6 is connected with the earth potential (earth cable optionally either with eyelet or blade connector).
  The cable cross section of the earth cable must be at least 2.5 mm^2 and the cable length must not exceed 0.5 m.

- Insert the supplied screw 13 with cutting thread into the hole for the earth connection 6.

  This will ensure the electrical contact in spite of the anodising layer.

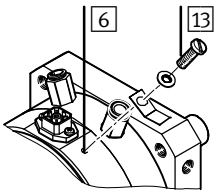


Fig. 19

- Connect the measuring system to the connecting cable as described in the description of the positioning controller.

  The PIN assignment is shown in the table below:

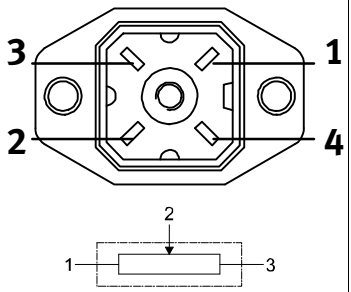
Pin	Designation	Assignment
1	DC +10 V	
2	Signal [1]	
3	GND	
4	Screen	
[1] Terminating resistor: 5 kΩ Linearity: ±0.25 %		

Fig. 20

For interrogation of the end positions with DSMI-12 ... 40-B:

- Place the proximity switch (B) SME/SMT-10**F**-...-**KL** on the groove of the shock absorber retainer.
  A sensor bracket (D ➔ Accessories) is required to fasten the proximity switch.
  The proximity switch is actuated by magnets (C) in the stop lever.

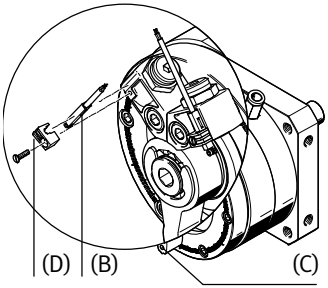


Fig. 21

For interrogation of the end positions with DSMI-63 ...-B:

- Place the SME/SMT-8..-... proximity sensor (B) in the sensor bracket (E ➔ Accessories).
  The proximity sensor is actuated by magnets (C) in the stop lever.

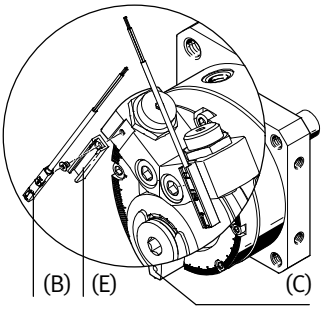


Fig. 22

6 Commissioning

Commissioning the complete system

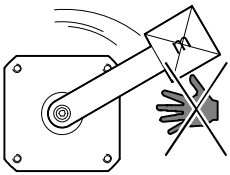
- Pressurise your entire system slowly to avoid any uncontrolled movements.

Commissioning an individual unit

When adjusting the DSMI:

Warning
Risk of injury from rotating masses.

- Make sure that the DSMI is set into motion only when the safety devices are fitted.
- Make sure that the swivel range of the DSMI
  - is safeguarded to prevent anyone from reaching into the swivel range
  - no objects can get there (e.g. by means of an individual protective screen).



Note
The mechanically set end position may change under operating pressure.

- Repeat the setting procedure under operating conditions.

Note
The swivel module will be destroyed by excessive mass moments of inertia.

- Make sure that the permitted mass moment of inertia is complied with for the various operating modes.

  The permissible mass moment of inertia during electronically controlled operation exceeds the value of unthrottled use several times.

For electronically closed-loop control of the DSMI in combination with a positioning controller:

Note
Special commissioning specifications apply to the electronically controlled operation.

- Observe the instructions in the descriptions of the positioning controller for commissioning.
- Make sure that the DSMI with electronic end position cushioning (e.g. in combination with CMPX or SPC11 soft stop) is always operated with metal stops (no elastomer shock absorbers or shock absorbers permitted).

The following applies to all other applications (e.g. as measuring cylinder):

1. Close both upstream one-way flow control valves
   - Completely first,
   - Then open them again approximately one turn.
2. Make sure that the operating conditions lie within the permitted ranges.

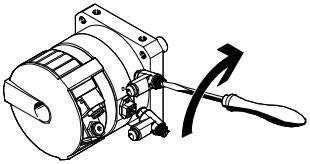


Fig. 23

3. Pressurise the drive in one of the following ways:
   - Slow pressurisation of one side,
   - Simultaneous pressurisation of both sides with subsequent venting of one side
4. Start a test run.
5. During the test run, check whether the following settings on the DSMI need to be modified:
   - The swivel range of the moving mass,
   - The swivel speed of the moving mass.
6. Unscrew the one-way flow control valves slowly until the desired swivel speed is set.

   The stop lever should reach the end position safely, but not strike hard against it.

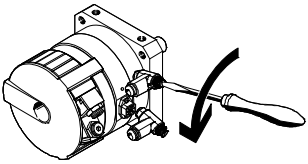


Fig. 24

Note
If the impact is too hard, it will cause the stop lever to rebound out of the end position, resulting in a reduction of the service life.

If the stop lever can be heard to strike hard:

7. Interrupt the test run.
   Causes of hard knocking may be:
   – Mass moment of inertia of the moving mass too high
   – Swivel speed of the moving mass too high
   – No compressed air cushion on the exhaust side
   – Insufficient shock absorption.
8. Make sure you remedy the above-mentioned causes.
9. Repeat the test run.

When all necessary corrections have been made:

10. End the test run.

Fine adjustment of the end positions

Note
An adjustment sleeve that is screwed out too far [5] or a shock absorber that is screwed in or out too far results in the stop lever:
– Either hitting the adjustment sleeve or the shock absorber at an impermissible angle or
– Hitting the shock absorber retainer without shock absorption.
In such a case there is a risk of the DSMI or the shock absorber being destroyed.

- Make sure that you do not screw the adjustment sleeve or shock absorber in or out any further than shown in the following table (➔ Fig. 26).

- Pressurise the desired end position on the DSMI.
  The end positions can be adjusted under pressure.

1. Remove the cover cap from the housing (if present).
2. Unscrew the locking nut (K) from the adjustment sleeve or the shock absorber.

   The unscrewing length 14 and 15 of the adjustment sleeve or of the shock absorber (elastomer shock absorber or shock absorber) can be used to compensate the deviation of the end position.

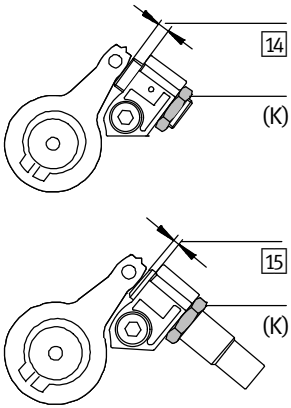


Fig. 25

3. Screw the adjustment sleeve or shock absorber into or out of the shock absorber retainer using a hexagon spanner.
   The permissible unscrewing lengths are listed in the following table.

DSMI-...-B		25	40	63
Unscrewing length 14 (adjustment sleeve/elastomer shock absorber)	[mm]	0 ... 4	0 ... 5.4	0 ... 6.6
Unscrewing length 15 (shock absorber)	[mm]	0 ... 2	0 ... 2.7	0 ... 3.3

Fig. 26

When all adjustment sleeves or shock absorbers have been adjusted:

4. Retighten the locking nuts (K) of the adjustment sleeves or shock absorbers.

DSMI-...-B		25	40	63
Tightening torque: adjustment sleeve[1)]	[Nm]	3	20	35
1) Please refer to the operating instructions for the shock absorber for the tightening torques.				

Fig. 27

5. Press the cover cap (if present) of the DSMI back on to the snap ring.
6. Repeat the test run.

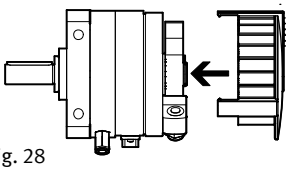


Fig. 28

7 Operation

Warning
- Make sure that:
  - Nobody can reach into the swivel range of the moving mass
  - And that no objects can get there (e.g. by means of a self-made protective screen).

For several uninterrupted swivel cycles:

- Make sure that the maximum permitted swivel frequency is not exceeded (➔ Technical data).
  Otherwise, the functional reliability will be impaired by excessive heating.

To extend the service life of the shock absorbers:

- Apply a thin coat of grease to the stop caps of the shock absorbers.

To check the functions:

- Check the shock absorbers for oil loss after every 2 million switching cycles.
- Replace shock absorbers with visible oil loss or at the latest every 5 million switching cycles (➔ Accessories).

8 Care and maintenance

- In case of contamination, clean the product with a soft cloth.
  All non-abrasive cleaning agents are permitted (e.g. warm soap suds up to +60 °C).

9 Disassembly and repairs

For eccentric masses on the lever arm:

Warning
Risk of injury from masses that slide down suddenly if there is a drop in pressure.

- Make sure that the mass has reached a stable position before venting (e.g. the lowest point).

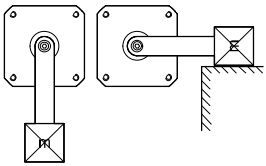


Fig. 29

Recommendation:

- Return the product to our repair service for overhaul.
  The necessary fine adjustments and tests will then be taken into account.
- Information on spare parts and aids can be found under:
  www.festo.com/spareparts

10 Accessories

Note

- Please select the appropriate accessories from our catalogue:
  www.festo.com/catalogue

11 Troubleshooting

Fault	Possible cause	Remedy
Uneven movement of the moving mass	Asymmetric angle setting	Symmetric setting preferred
Hard metal impact at the end position	Residual energy too high	– Select lower swivel speed; – Use internal or external shock absorbers; – Move only against residual air cushion on the exhaust side; – Select a small mass.
Drive shaft does not remain in the end position		
In combination with positioning controllers	See detailed description of the relevant positioning controller	

Fig. 30

12 Technical data

DSMI-...-B		25	40	63
Design		Semi-rotary vane drive with drive shaft on ball bearings and integrated displacement encoder		
Mode of operation		Double-acting		
Operating medium[1)]		Filtered and unlubricated compressed air (filter fineness: 5 µm)		
Assembly position[2)]		As desired		
Max. swivel angle	[°]	272		
Pneumatic connection		M5 (with QSM-M5-6)	G⅛ (with QS-1/8-8)	G¼ (with QS-1/4-8-I)
Operating pressure[1)]	[bar]	4 ... 8		

1) Applies only to applications with positioning controller
2) Please observe the additional data in the descriptions of the positioning controller

DSMI-...-B		25	40	63
Ambient temperature	[°C]	–10 ... +60		
Max. perm. radial force F_Z	[N]	120	350	500
Max. permissible axial force F_X	[N]	50	120	500
Minimum stop radius r_{min}	[mm]	21	40	50
Max. permissible stop force F	[N]	320	650	1050
Torque at 6 bar (theoretical)	[Nm]	5	20	40
Max. permissible impact energy	[Nm]	0.05	0.1	0.1
Max. permissible mass moment of inertia with elastomer damping[3)]	[kgm^2]	1.1 x 10^{-4}	2.4 x 10^{-4}	20 x 10^{-4}
Max. perm. work load component[3)]		Depends on the type, speed and load; can be calculated according to catalogue specifications		
Max. swiveling frequency	[Hz]	2		1
Protection class		IP65		
CE symbol (see declaration of conformity) ➔ www.festo.com[4)]		According to EU EMC directive		
Materials				
– Housing, flange, stop lever		Anodised aluminium		
– Drive shaft		Nickel-plated steel		
– Fixed stop, screws, woodruff key		Steel		
– Measuring system connection		Polyurethane		Nitrile rubber
– Rotary vane		Polyurethane (reinforced)		
– Plug housing		Polyamide (reinforced)		
Weight (without shock absorber)	[kg]	1.08	3.95	6.90

3) Please observe the additional data in the descriptions of the positioning controller
4) The device is intended for use in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.

Fig. 31

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