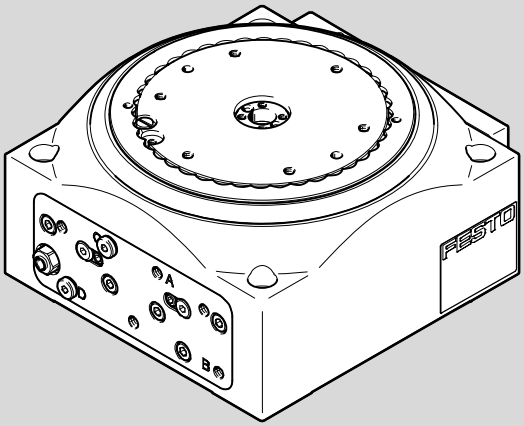
Rotaring indexing table

DHTG



FESTO

en Operating instructions

8085860
2018-02e
[8085862]

Translation of the original instructions
DHTG-EN

Identification of hazards and instructions on how to prevent them:

Danger
Immediate dangers which can lead to death or serious injuries

Warning
Hazards that can cause death or serious injuries

Caution
Hazards that can cause minor injuries

Other symbols:

Note
Material damage or loss of function

Recommendations, tips, references to other documentation

Essential or useful accessories

Information on environmentally sound usage

Text designations:
- Activities that may be carried out in any order

1. Activities that should be carried out in the order stated

– General lists

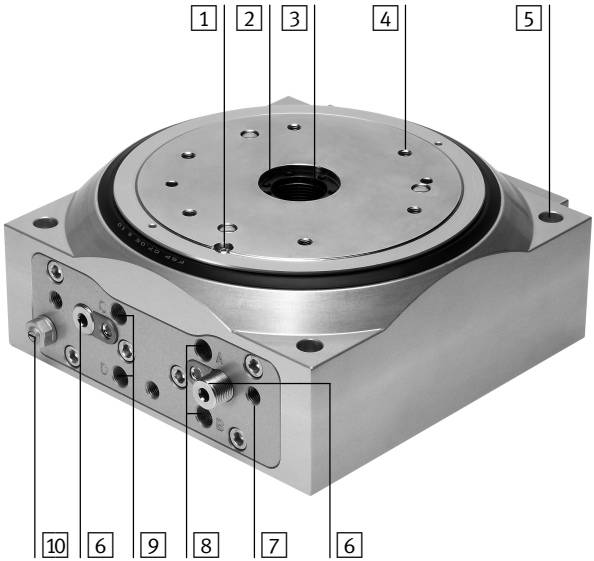
➔ Result of an action/References to more detailed information

English – Rotaring indexing table DHTG

Table of contents

1 Operating elements and connections

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



1 Retaining screw for table bearing
2 Threaded and pin hole for adapter
3 Through hole for power supply
4 Threaded and pin hole for plate
5 Centring/through hole and thread for fastening
6 Adjusting screw for setting the cushioning
7 Threaded hole for sensor for position sensing
8 Supply port A and B for clockwise/anti-clockwise rotation
9 Supply port C and D for reciprocating operation (sealed on delivery)
10 One-way flow control valve for speed regulation

Fig. 1

2 Function and application

The DHTG rotary indexing table is a double-acting rotary drive based on the toothed rack and pinion principle with forced locking (as from size DHTG-140 also with overload protection). When the compressed air ports are pressurised alternately, two toothed rod pistons move backwards and forwards. By means of a pinion, the pistons convert the linear movement into a rotary movement.
A second pair of pistons controls the engagement of the pinion in the table gearing and the locking of the holding position. The integrated shock absorber brakes the rotary indexing table in the direction of rotation.

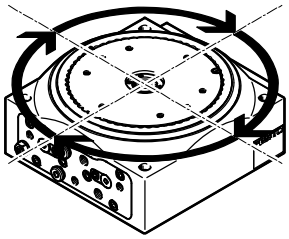


Fig. 2

The DHTG rotary indexing table is intended for turning the work load by a defined angle into a holding position.

3 Transport and storage

- Take the weight of the DHTG into consideration. It weighs up to 25 kg.
- Ensure the following storage conditions are met:
  - Short storage times and
  - Cool, dry, shaded, corrosion-resistant storage locations.

4 Requirements for product use

Note
Improper handling can result in malfunctions.
- Be sure to always comply with the specifications in this chapter.

- Compare the maximum values specified in these operating instructions with those of your actual application (e. g. forces, torques, temperatures, masses, speeds).
  Only compliance with the load limits allows operation of the product in compliance with the relevant safety regulations.
- Take into consideration the ambient conditions at the location of use.
  Corrosive environments reduce the service life of the DHTG.
- Ensure that there is a supply of correctly prepared compressed air.
- Maintain the selected medium for the complete service life of the product.
  Example: Always use non-lubricated compressed air.
- Pressurise your entire system slowly.
  This will prevent uncontrolled movements from occurring.
  For slow start-up pressurisation use safety start-up valve type HEL.
- Comply with the regulations of the trade association, the German Technical Control Board or relevant national regulations.

- Remove all transport packing such as foils, caps, cartons (except for any sealing elements in the pneumatic connections and holes for the proximity switches). The packing is intended for recycling (except for: oiled paper = other waste).
- Use the product in its original condition without any unauthorised modifications.
- Take the tolerance of the tightening torques into account. Unless otherwise specified, the tolerance is ±20 %.

5 Installation

5.1 Mechanical assembly

- Make sure there is sufficient space for the pneumatic connections, for conversion or for replacing the shock absorber.
- Fasten the DHTG with four screws and ZBH centring sleeves.
  Tightening torques ➔ Tab. 1, Tab. 2.

Direct mounting from above					
Size		**65**	**90**	**140**	**220**
Screw		M4	M6	M6	M8
Recess for centring sleeve	[mm]	7	12	12	15
	[mm]	5	8	8	8
Tightening torque	[Nm]	2.9	9.9	9.9	24

Tab. 1

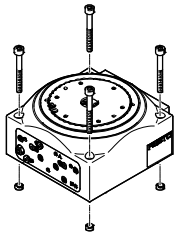


Fig. 3

Direct mounting from below					
Size		**65**	**90**	**140**	**220**
Screw		M5	M8	M8	M10
Recess for centring sleeve	[mm]	7	12	12	15
Tightening torque	[Nm]	5.9	24	24	47

Tab. 2

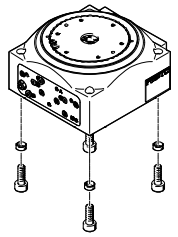


Fig. 4

- Fasten the blank plate with 6 screws and 2 centring pins.
  After fitting, the 6 screw recesses can be sealed with the cover caps supplied (press in until flush).

Blank plate mounting					
Size		**65**	**90**	**140**	**220**
Screw		M4	M4	M6	M8
Locating hole for centring pin	[mm]	4	4	5	6
Depth locating hole for centring pin	[mm]	5	8	8	8
Tightening torque	[Nm]	2.9	2.9	9.9	24

Tab. 3

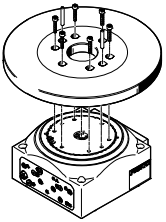


Fig. 5

5.2 Installing the pneumatic system

- Connect the pneumatic ports A to D (if applicable remove sealing elements).

Clockwise or anti-clockwise rotation[1)]				
Size	**65**	**90**	**140**	**220**
Connection A	Unlock and turn			
Connection B	Lock and return stroke			
Connecting thread	M5		G1⁄8	
Tightening torque	1.5 Nm		7 Nm	

1) Modification ➔ 9 Dismantling and repairs

Tab. 4

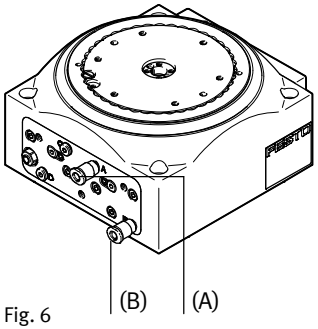


Fig. 6

Reciprocating operation[1)]				
Size	**65**	**90**	**140**	**220**
Connection A	Unlock			
Connection B	Lock			
Connection C	Clockwise rotation[2)]			
Connection D	Anti-clockwise rotation			
Connecting thread	M5		G1⁄8	
Tightening torque	1.5 Nm		7 Nm	

1) Separate kit required (Accessories ➔ www.festo.com/catalogue)
2) Use external flow control valve

Tab. 5

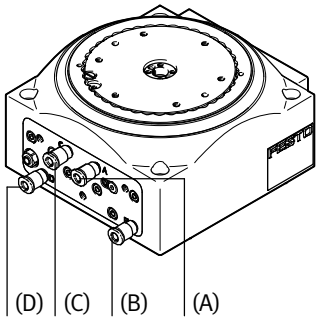
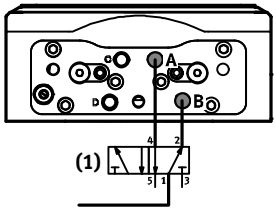
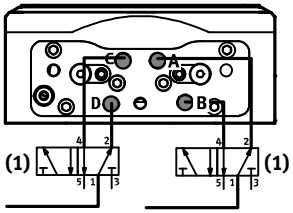


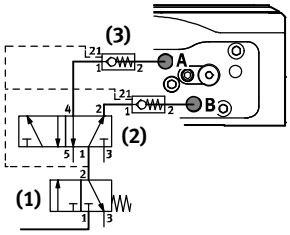
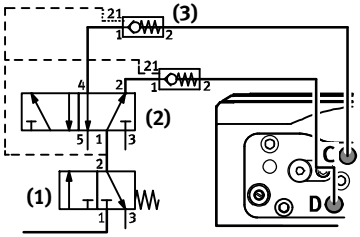
Fig. 7

As an example 4 interfaces are shown:

Simple interface	
Clockwise/anti-clockwise rotation	**Reciprocating operation/flexible control**
	
(1) Manual or electrically actuated 5/2-way valve	

Tab. 6

Note
If used in safety relevant applications, additional measures are necessary, e. g. in Europe the standards listed under the EU machine guidelines must be observed. Without additional measures in accordance with statutory minimum requirements, the product is not suitable for use in safety-related sections of control systems.

Extended interface	
Clockwise/anti-clockwise rotation	**Reciprocating operation/flexible control**
	
(1) Manual or electrically actuated 3/2-way valve (2) Single or double-solenoid 5/2-way valve (3) Non-return valve controlled	
The compressed air is interrupted in the basic position of the valve (1). The air in the table is locked in and the movement stops. The speed at which the table comes to a stand depends on the mass moment of inertia and the angular velocity (division). It may therefore happen that the table moves into its end position but without additional tightening torque. The table can be moved by hand within a certain range.	

Tab. 7

5.3 Electrical installation

If proximity switches are used for position sensing:

Note
Faulty switching or damage to the proximity switches due to being screwed in too far.
- Make sure the proximity switches are screwed into the thread (U), (V) or (W) up to the following maximum depth.

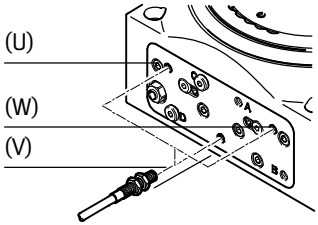


Fig. 8

Max. screw-in depth					
Size		**65**	**90**	**140**	**220**
Thread (U), (W)	[mm]	11.5	11.5	13.5	18.5
Thread (V)	[mm]	19.7	14	16	21

Tab. 8

- Screw the proximity switches into the following threaded holes:

Sensing	**Direction of rotation of plate**	
	Clockwise rotation	**Anti-clockwise rotation (reciprocating operation/ flexible control)**
Direction of rotation	(W)	(U)
Locking mechanism	(V)	(V)
Piston end position	(U)	(W)

Tab. 9

When the DHTG is used with 3-part split (DHTG-140 and DHTG-220):

Note
Based on the design, the rotating plate can engage in an intermediate position (corresponding to the 6-index stations).
- After an emergency stop / overload, make sure that the rotating plate is in the desired position before the system is placed back in operation.
  If the rotating plate is engaged in an intermediate position, bring the locked rotating plate into the desired position by jerking and twisting it against the overload protection.

6 Commissioning

Warning
Risk of injury from rotating masses.
- Make sure nobody can place his/her hand in the positioning range of the DHTG and that no objects lie in its path (e. g. by providing a protective screen).

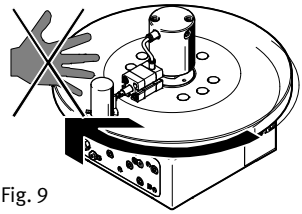


Fig. 9

Note
Incorrect functioning due to inaccurate toothed rod position. When the DHTG is exhausted, the resetting force of the shock absorber can push the rotary table out of the end position and into an undefined position.
- Before each commissioning procedure, pressurise the last pressurised connection:
  - Connection (B) for clockwise/anti-clockwise rotation
  - Connection (C) or (D) for reciprocating operation/flexible control.

Note
Clockwise rotation is controlled internally through the flow control valve 10.
Reciprocating operation must be controlled externally through an additional one-way flow control valve GRLA, Connection (C), Fig. 10 (➔ www.festo.com/catalogue).

- Screw the flow control screw 10:
  - in completely,
  - then loosen one rotation
- Slowly pressurise the complete system with at least 4 bar.
- Start a test run Tab. 10.
- Check in a test run at low pulse frequency whether the following modifications are necessary:
  - Readjustment of the proximity switches
  - Increase the speed step-by-step by unscrewing the flow-control screw 10
  - Set the cushioning.

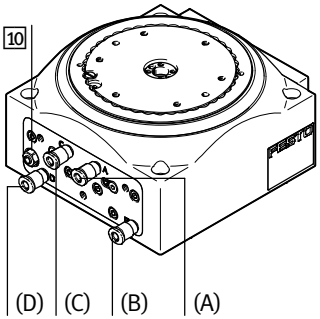


Fig. 10

Direction of rotation of plate	
Clockwise/anti-clockwise rotation	**Reciprocating operation/flexible control[1)]**
Basic position: Connection (B) pressurised	➔ see examples Tab. 11 to Tab. 13
1. Slowly pressurise connection (A)	
2. Provide clock pulses for the valve	

1) Internal flow control in one direction only (if necessary throttle different direction externally)

Tab. 10

Examples for reciprocating operation/flexible control

Clockwise rotation	**Reaction**
Basic position: Connection (B) and (D) pressurised	
1. Pressurise connection (A)	Unlock
2. Pressurise connection (C)	Pulse right
3. Pressurise connection (B)	Lock
4. Pressurise connection (D) (continue with 1.)	Return stroke

Tab. 11

Anti-clockwise rotation	**Reaction**
Basic position: Connection (B) and (C) pressurised	
1. Pressurise connection (A)	Unlock
2. Pressurise connection (D)	Pulse left
3. Pressurise connection (B)	Lock
4. Pressurise connection (C) (continue with 1.)	Return stroke

Tab. 12

2 x clockwise and 2 x anti-clockwise rotation	**Reaction**
Basic position: Connection (B) and (D) pressurised	
1. Pressurise connection (A)	Unlock
2. Pressurise connection (C)	Pulse right 1
3. Pressurise connection (B)	Lock
4. Pressurise connection (D)	Return stroke
5. Pressurise connection (A)	Unlock
6. Pressurise connection (C)	Pulse right 2
7. Pressurise connection (B)	Lock
Direction of rotation change	
8. Pressurise connection (A)	Unlock
9. Pressurise connection (D)	Pulse left
10. Pressurise connection (B)	Lock
11. Pressurise connection (C)	Return stroke
12. Pressurise connection (A)	Unlock
13. Pressurise connection (D)	Return stroke
14. Pressurise connection (B) (continue with 1.)	Lock

Tab. 13

- Note the maximum permitted frequencies as a factor of the moment of mass inertia (➔ Technical specifications).
  The rotary indexing table must **not** strike hard against the end stops and the overload protection must not be triggered.
- End the test run.

For setting the cushioning:

- Loosen the clamping element (K) one rotation.
- Screw in the adjusting screw 6 until the desired cushioning is achieved. The rotary indexing table must **not** strike hard against the end stops and the overload protection must not be triggered. The maximum moment of mass inertia must not be exceeded.

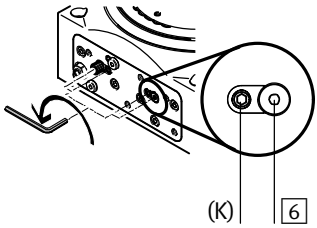


Fig. 11

Adjusting screw direction of rotation 6	Reaction
Clockwise[1)]	Cushioning is increased
Anti-clockwise	Cushioning is reduced

1) Screw in the adjusting screw until it is flush

Tab. 14

- Tighten the clamping element (K) again.

Tightening torque				
Size	**65**	**90**	**140**	**220**
Width across flats	2.5	2.5	4	4
Tightening torque [Nm]	0.8	0.8	2.5	2.5

Tab. 15

7 Operation

Warning
Risk of injury from rotating masses.
- Make sure nobody can place his/her hand in the positioning range of the DHTG and that no objects lie in its path (e. g. by providing a protective screen).

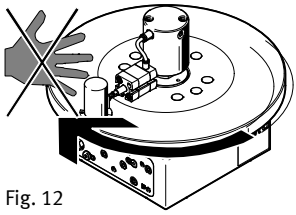


Fig. 12

- Note the moment of mass inertia as a factor of the switching or cycle frequency (➔ Characteristic curves).
  - The maximum achievable switching frequency as a factor of the moment of mass inertia can be read in the diagram **Switching frequency**. The switching time can be calculated from this by T = 60/f. The response time comprises: **Switching time** = unlocking, turning, locking and the return stroke of the work piston.

– The maximum achievable cycle frequency as a factor of the moment of mass inertia can be read in the diagram **Cycle frequency**. The minimum possible cycle time can be calculated from this by T = 60/f.

The actual cycle time is then calculated as follows:
Cycle time = switching time + processing time + dwell time.
– The processing time results from the time which the relevant customer application requires (e. g. time for removing components, press-in time, etc).
– Dwell time may be necessary if the actual cycle time is less than the minimum possible cycle time (calculation example ➔ Catalogue specifications).

- Note that the viscosity of the shock absorber oil decreases with increasing heat. The shock absorber might therefore strike through if the device is operated for too long a period. If necessary reduce the moment of mass inertia.
- Avoid the DHTG coming into contact with:
  – Aggressive media
  – Grinding dust
  – Glowing sparks or chips.
  These will damage the DHTG.

8 Maintenance and care

- Switch off the power supplies:
  – Operating voltage
  – Compressed air supply.

Cleaning:
- Only clean the DHTG using a soft cloth.
  All non-abrasive cleaning agents are permitted.
  Due to its service life lubrication the DHTG does not require any maintenance.
  Regular removal of the lubricating grease on the surface of the piston rod will reduce the service life.

- After a conversion (e. g. to reciprocating operation) lubricate the following components with LUB-E1:
  – piston, piston chamber, seal, lock, toothed rod, pinion, table bearing, dividing disc.
  We recommend the mechanical components are lubricated again after every 5 million switching cycles.
- Check the shock absorbers every 2 million strokes for:
  – Oil leakage
  – Hard knocking
  – Function (shock absorber head must not remain in the retracted end position).
  Dismantling the shock absorber (➔ Dismantling and repairs).

- Replace the shock absorber when it shows one of the following signs of wear, or every 10 million strokes at the latest.
- Check whether lubrication/testing must be carried out more frequently.
  This may be necessary in case of:
  – High temperatures
  – Excessive dirt
  – Fat solvent fluids or fumes in the vicinity.

9 Dismantling and repairs

- Recommendation: Return the product to our repair service for overhaul.
  The necessary fine adjustments and tests will then be taken into account.
- Information about spare parts and aids can be found at: www.festo.com/spareparts
- Switch off the power supplies:
  – Operating voltage
  – Compressed air
- Exhaust the system and the product.

Replacing the integrated **shock absorber**:

1. Unscrew the flow-control screw 10.
2. Unscrew the fastening screws (M) on the sub-base.
3. Using pliers, remove the retaining ring on the shock absorber.
4. Replace the shock absorber.
5. Fit the individual parts again in reverse sequence (tightening torque ➔ Tab. 16).

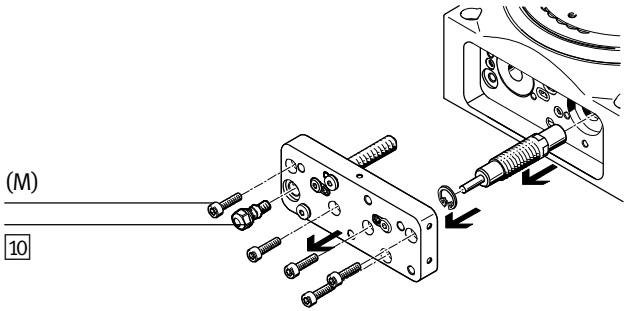


Fig. 13

Tightening torque					
Size		**65**	**90**	**140**	**220**
Flow control screw 10	[Nm]	1.5	1.5	5.5	5.5
Fastening screws (M)	[Nm]	2.9	2.9	9.9	9.9

Tab. 16

Conversion from clockwise rotation (as supplied) to anti-clockwise rotation:

1. Loosen the clamping element (K) of the adjusting screw one rotation.
2. Unscrew the adjusting screw 6 a few rotations.
3. Unscrew flow control screw 10 and the fastening screws (M) from the sub-base.
4. Using pliers, remove the retaining ring (S) on the shock absorber.
5. Fit the following:
   – the shock absorber with the retaining ring in the adjacent hole
   – the O-ring (P) / buffer (for DHTG-65) in the adjacent groove
   – the distance piece (T) in the same hole (distance piece omitted for 2/3 index stations)
   – the sub-base with the fastening screws and the flow control screw in reverse sequence (tightening torque ➔ Tab. 17).
6. Unscrew the fastening screws (N) on the stop plate.
7. Unscrew:
   – both locking screws (O) on the rear of the stop plate to begin with,
   – then screw them in again into the open holes (tightening torque ➔ Tab. 17).
   The open holes **(R) or (L)** in Fig. 14 determine the direction of rotation
   (Holes (R) open: clockwise rotation).
8. Screw the fastening screws (N) on the stop plate again (tightening torque ➔ Tab. 17).
   The rotary indexing table remains pneumatically controlled as before.
9. Screw in the adjusting screw 6 until the desired cushioning is achieved ➔ Fig. 11.
10. Tighten the clamping element (K) of the adjusting screw (tightening torque ➔ Tab. 15).

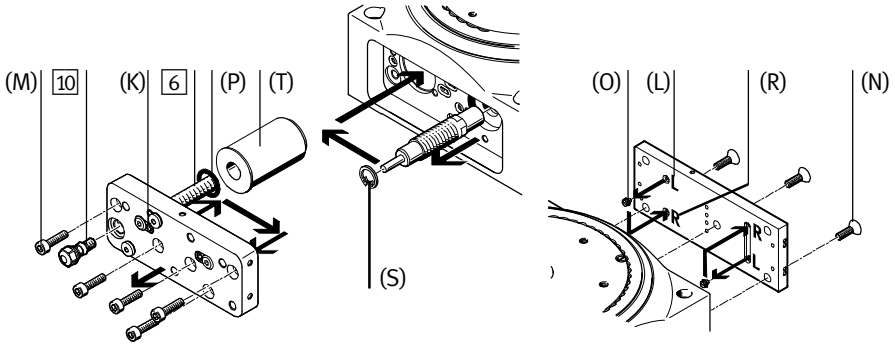


Fig. 14

Tightening torque					
Size		**65**	**90**	**140**	**220**
Flow control screw 10	[Nm]	1.5	1.5	5.5	5.5
Fastening screws (M)	[Nm]	2.9	2.9	9.9	9.9
Plug screw (O)	[Nm]	0.5			
Fastening screws (N)	[Nm]	1.5	2.9	5.9	5.9

Tab. 17

10 Accessories

Note

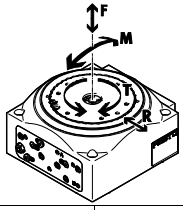
- Please select the appropriate accessories from our catalogue
  ➔ www.festo.com/catalogue

11 Troubleshooting

Malfunction	Possible cause	Remedy
Rotating plate does not move	Overload protection is active	Pressurise connection (B) and turn the plate back against the direction of rotation as far as possible. Doing this causes the overload protection and the locking mechanism, if applicable, to engage audibly
	Audible leakage	Send DHTG to Festo
	Flow-control screw closed completely	Open screw
Rotating plate does not engage	End position not reached	Unscrew the adjusting screw for the shock absorber until the rotating plate engages
	Overload protection is active	➔ see above
	Toothed disc and pinion stand tooth on tooth	Please contact Festo's Technical Hotline
Hard metal impact at the end position	Adjusting screw for shock absorber unscrewed too far	Screw in adjusting screw
	Shock absorber defective	Replace shock absorber (➔ 9 Dismantling and repairs)
Hard metallic knocking in the locking mechanism	Adjusting screw for shock absorber screwed in too far (e. g. when changing the direction of rotation)	Unscrew adjusting screw
Plate position incorrect	Overload protection engaged incorrectly at 180° (plate offset 30°)	Force overload protection and turn until it re-engages

Tab. 18

12 Technical data

Size		65	90	140	220
Operating mode		Double-acting double piston mode			
Mounting position		Any			
Position sensing		For inductive proximity sensors			
Cushioning		Adjustable shock absorber stroke, hard characteristic curve			
Operating medium		Compressed air according to ISO 8573-1:2010 [7:4:4]			
Operating pressure	[bar]	4 ... 8			
Pneumatic connection		M5		G1/8	
Max. axial force F	[N]	1000	2000	4000	5000
Max. radial force R	[N]	2000	5000	6000	8000
Max. tilting torque M	[Nm]	100	150	300	500
Max. tangential torque T	[Nm]	100	150	200	500
					
Max. mass moment of inertia with flow control screw opened completely (➔ 7 Operation, ➔ 13 Characteristic curves)	[kgm²]	0.015	0.03	0.3	2.5
Theor. torque at 6 bar	[Nm]	2.1	4.4	18.1	58.9
Parallelism of plate[1)]	[mm]	≤ 0.04			
Axial eccentricity of plate[2)]	[mm]	≤ 0.02			
Concentricity of plate[3)]	[mm]	≤ 0.02			
Repetition accuracy of swivel angle	[°]	≤ 0.03			
Replacement accuracy	[mm]	< 0.2			
Ambient temperature	[°C]	+5 ... +60			
Storage temperature	[°C]	–20 ... +80			
Protection class		IP54			
Material					
Cover, housing		Wrought aluminium alloy			
Stops, plate		Galvanised steel			
Seals		Nitrile rubber, polyurethane			
Note on materials		Free of copper and PTFE			
Product weight	[kg]	1.9	4.5	10	24

1) Parallelism of the plate surface relative to the housing support

2) Measured on the surface of the plate at the edge of the plate in relation to the housing support

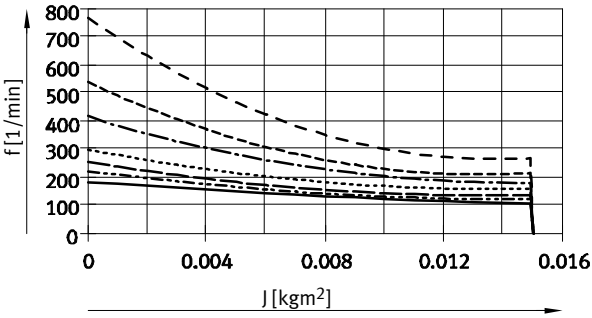
3) Measured on the inner diameter of the plate in relation to the housing

Tab. 19

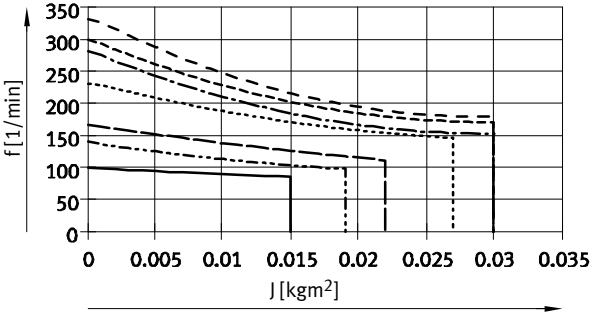
13 Characteristic curves

Switching frequency f as a function of mass moment of inertia J

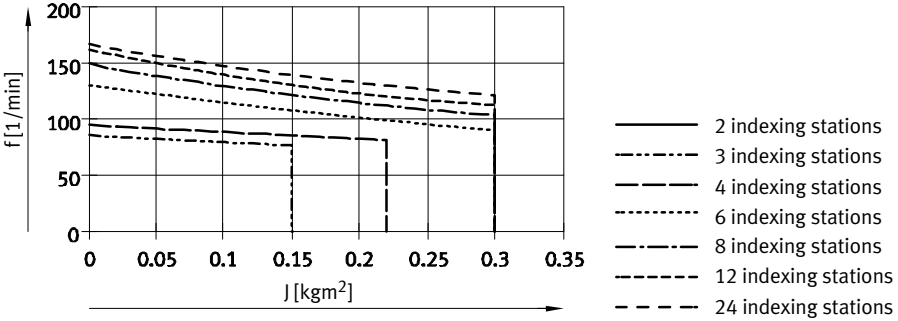
Size 65



Size 90

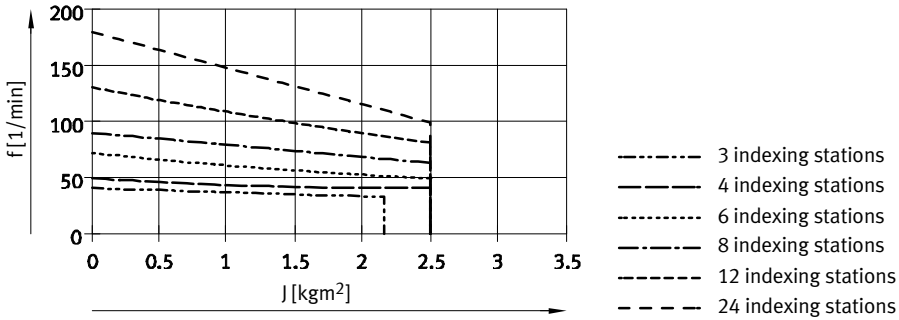


Size 140



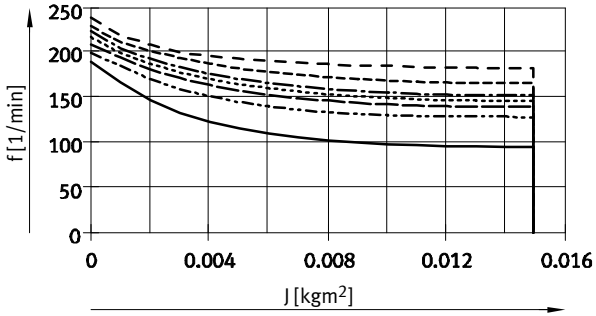
Switching frequency f as a function of mass moment of inertia J

Size 220

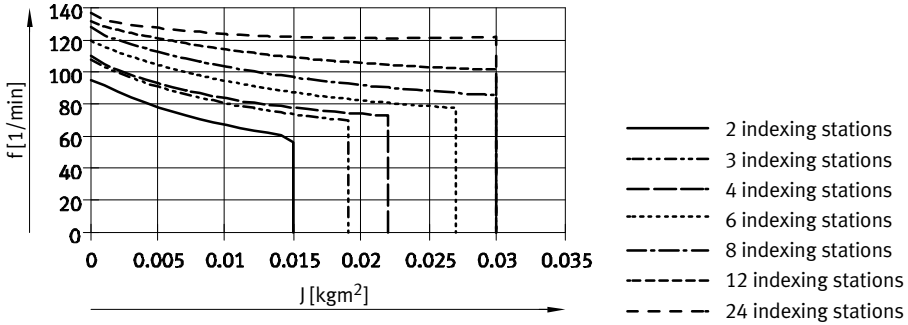


Max. permissible cycle frequency f as a function of mass moment of inertia J

Size 65

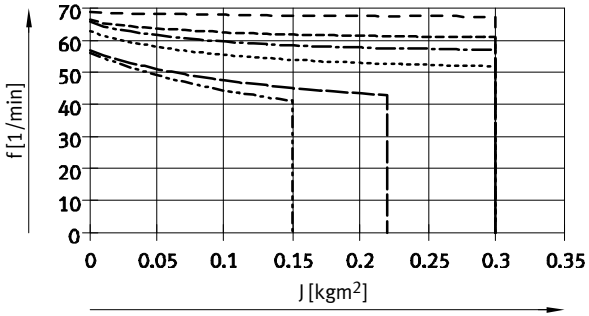


Size 90

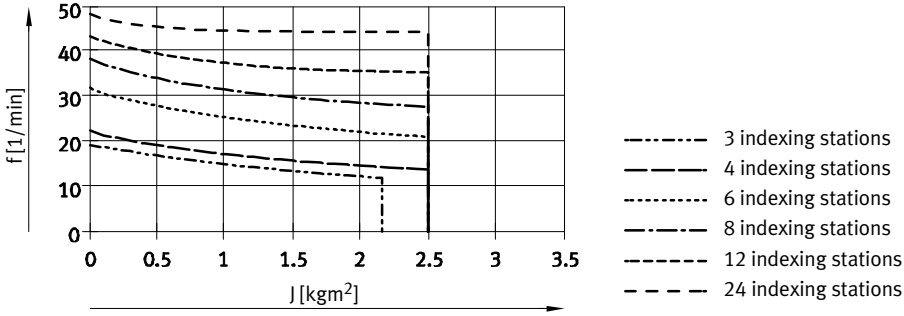


Max. permissible cycle frequency f as a function of mass moment of inertia J

Size 140



Size 220



Copyright:
Festo SE & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany

Phone:
+49 711 347-0

Fax:
+49 711 347-2144

E-mail:
service_international@festo.com

Internet:
www.festo.com