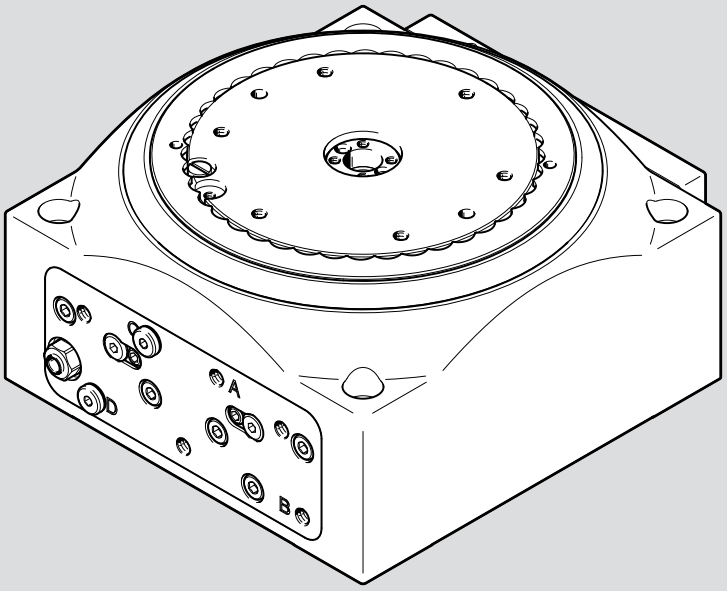
# DHTG
## Rotary indexing table




FESTO

Operating instruction

8225400

8225400
2025-01f
[8225402]

Original instructions

# Table of contents

# 1 Applicable documents

All available documents for the product ➔ www.festo.com/sp.

# 2 Safety

## 2.1 Safety instructions

- Only use the product in its original condition without unauthorised modifications.
- Observe the identifications on the product.
- Take into account the ambient conditions at the location of use.
- Store the product in a cool, dry environment protected from UV and corrosion. Keep storage times short.
- Before working on the product, switch off the compressed air supply and lock it to prevent it from being switched on again.

## 2.2 Intended use

The rotary indexing table rotates a payload and a defined rotation angle to a holding position.

## 2.3 Foreseeable misuse

Operation is prohibited in areas in the vicinity of machining, aggressive media, grinding dust or welding spatter.

## 2.4 Training of qualified personnel

Work on the product may only be carried out by qualified personnel who can evaluate the work and detect dangers. The qualified personnel have knowledge and experience in dealing with pneumatic drives and pneumatic axes.

# 3 Additional information

- Contact the regional Festo contact if you have technical problems ➔ www.festo.com.
- Accessories and spare parts ➔ www.festo.com/catalogue.

# 4 Product overview

## 4.1 Product design

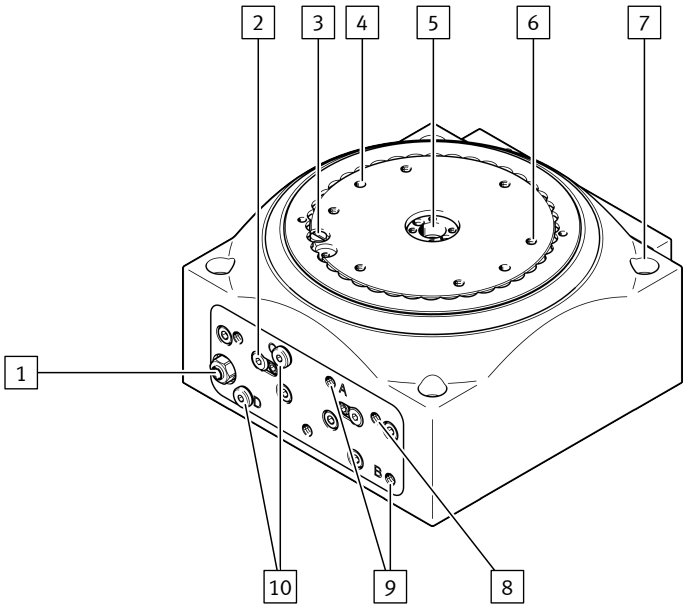



Fig. 1: Product design

1 One-way flow control valve
2 Adjusting screw for cushioning adjustment
3 Retaining screw for table bearing
4 Pin hole for plate (2x)
5 Through-hole for energy through-feed
6 Threaded hole for plate (6x)
7 Mounting hole (4x)
8 Threaded hole for position sensing (4x)
9 Pneumatic ports (A) and (B)
10 Pneumatic ports (C) and (D)

## 4.2 Function

The rotary indexing table is a double-acting semi-rotary drive based on the gear rack-pinion principle with positively guided interlock. Alternating pressurisation of the pneumatic ports moves two gear rack pistons back and forth. The pistons convert the linear motion to a rotary motion by a pinion.
After the rotation process, the positively guided interlock bolts are engaged to prevent rotation of the table top. The pinion is disengaged from the table top for the return stroke.
A second pair of pistons controls the engagement of the pinion in the table gearing and the interlock of the holding position. The integrated shock absorber brakes the rotary indexing table in the direction of rotation.

**Overload protection**

The rotary indexing tables DHTG-140 and DHTG-220 are also fitted with overload protection to prevent overload.

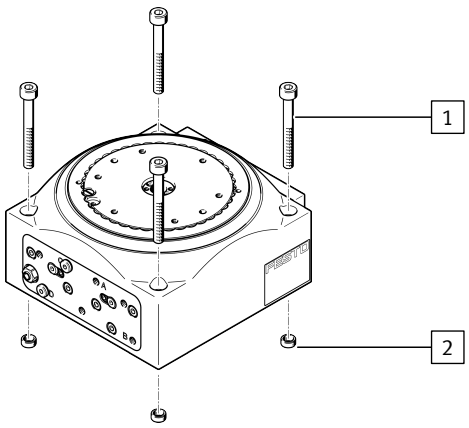
# 5 Mounting

## 5.1 Fixing

The retaining screws must be supplied by the customer. Use only retaining screws with a minimum strength class of 8.8.

Requirements:
– Sufficient space for maintenance and renovation work.

**Direct fastening from above**



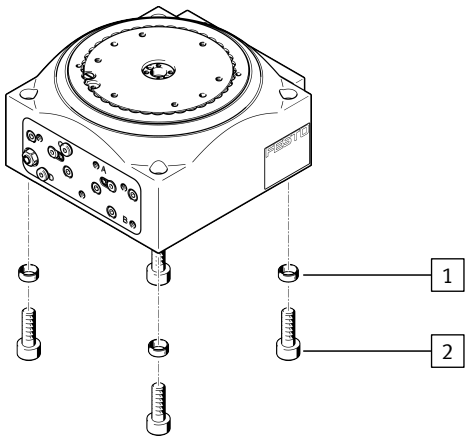

1 Retaining screw (4×)
2 Centring sleeve (4×)

Fig. 2: Direct fastening from above

1. Insert the centring sleeves ZBH into the DHTG from below.
2. Position the DHTG on the mounting surface.
3. Screw in and tighten the retaining screws from above.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Retaining screw | | M4 | M6 | | M8 |
| Max. tightening torque | [Nm] | 2.9 | 9.9 | | 24 |

**Direct fastening from below**




1 Centring sleeve (4×)
2 Retaining screw (4×)

Fig. 3: Direct fastening from below

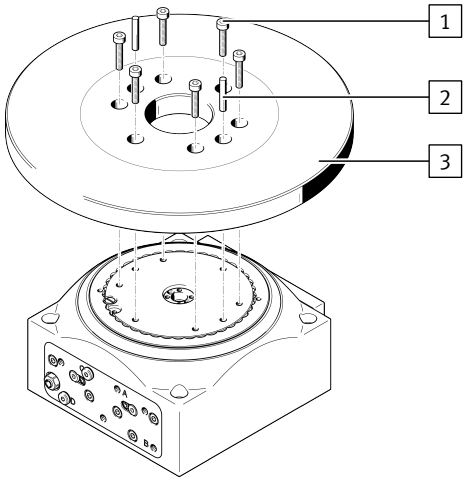
1. Insert the centring sleeves ZBH into the DHTG from below.
2. Position the DHTG on the mounting surface.
3. Screw in and tighten the retaining screws from below.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Retaining screw | | M5 | M8 | | M10 |
| Max. tightening torque | [Nm] | 5.9 | 24.9 | | 47 |

## 5.2 Attachment of plate

The retaining screws must be supplied by the customer. Use only retaining screws with a minimum strength class of 8.8.

Requirements:
– The DHTG is mounted at the assembly location.




1 Retaining screw (6×)
2 Centring pin (2×)
3 Plate

Fig. 4: Attachment of plate

1. Place the plate at the correct position.
2. Screw in the retaining screws but do not tighten them yet.
3. Drive the centring pins through the plate into the DHTG.
4. Tighten the retaining screws.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Retaining screw | | M4 | | M6 | M8 |
| Max. tightening torque | [Nm] | 2.9 | | 9.9 | 24 |

# 6 Installation

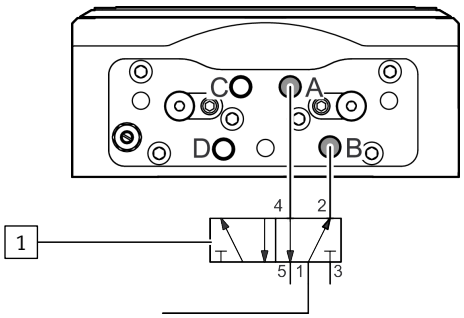
## 6.1 Installation, pneumatic

1. Use fittings, seals and suitable tubing from the Festo catalogue ➔ 3 Additional information.
2. Screw the fittings into the corresponding pneumatic ports.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 1.5 ± 20% | | 7 ± 20 % | |

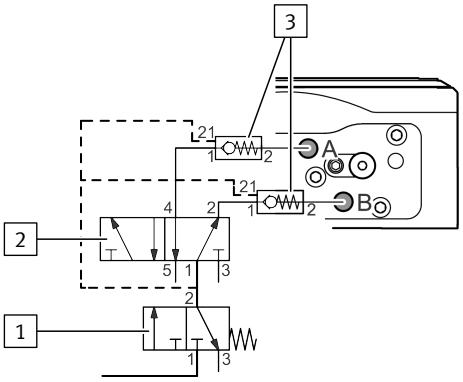
3. Insert suitable tubing into the fitting to the stop.
4. Seal pneumatic ports that are not required.

### 6.1.1 Examples of connection for clockwise or anticlockwise rotation




1 5/2-way valve

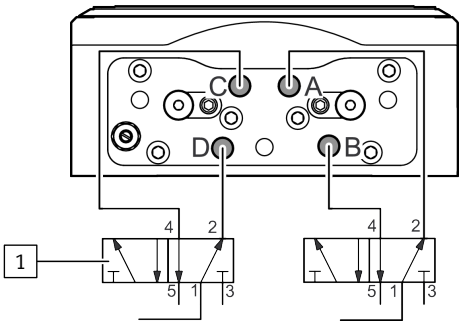
Fig. 5: Single circuit




1 3/2-way valve
2 Monostable or bistable 5/2-way valve
3 Check valve, controlled

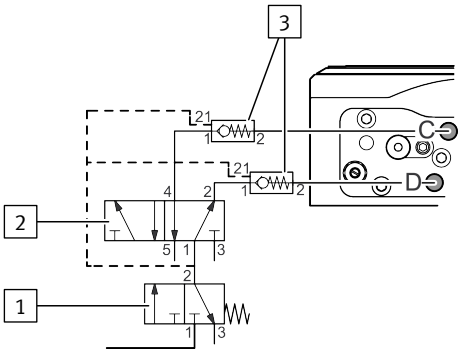
Fig. 6: Extended circuit

### 6.1.2 Example of connection for pendulum operation




1 5/2-way valve

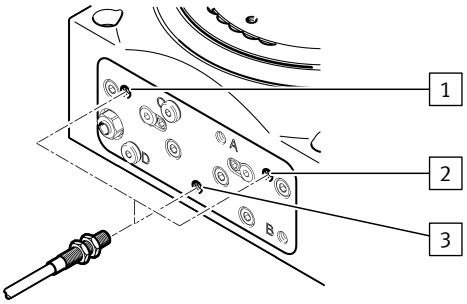
Fig. 7: Single circuit




1 3/2-way valve
2 Monostable or bistable 5/2-way valve
3 Check valve, controlled

Fig. 8: Extended circuit

## 6.2 Installation, electrical




1 Thread (U)
2 Thread (W)
3 Thread (V)

Fig. 9: Proximity switch connection

The proximity switches must be screwed into the corresponding drilled holes depending on the direction of rotation.

| Sensing | Direction of rotation | |
|---|---|---|
| | Clockwise rotation | Anticlockwise or pendulum operation |
| Rotary motion | W | U |
| Interlock | V | V |
| Piston end position | U | W |

Tab. 1

1. Use the appropriate proximity switches from the Festo catalogue ➔ 3 Additional information.
2. Screw the proximity switches into the corresponding drilled holes.

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

# 7 Commissioning

When exhausting the DHTG, the reset force of the shock absorber may move the rotating plate from the end position to an undefined position.
Always pressurise the last pressurised pneumatic port before commissioning:
- Pneumatic port (B): clockwise or anticlockwise rotation
- Pneumatic port (C) or (D): pendulum operation

The compressed air is interrupted at the piston end position of the 5/2-way valve. The compressed air in the DHTG is trapped and the movement is stopped. The speed at which the DHTG comes to a standstill depends on the mass moment of inertia and the angular velocity. The table may move to its end position, but without additional driving torque. The table can be moved manually within a specific range.

The rotational speed is controlled internally by the one-way flow control valve for clockwise and anticlockwise rotation. The pendulum operation must be controlled externally by an additional one-way flow control valve in the pneumatic port ➔ www.festo.com/catalogue.

The increased heat during operation reduces the viscosity of the shock absorber oil and the shock absorber can bottom out if the mass moment of inertia is too high.
- Reduce the mass moment of inertia.

Requirements:
– The DHTG is mounted.
– The pneumatic and electrical installation is complete and tested.

1. Check the operating conditions and critical limits ➔ 12.1 Technical data, general.
2. Screw in the flow control screw completely.
3. Unscrew the flow control screw one revolution.
4. Switch on the compressed air supply and start the test run.

## 7.1 Clockwise or anticlockwise rotation

1. Pressurise the pneumatic port (A).
   ⇨ The rotary indexing table rotates to the right or left depending on whether the DHTG is mounted for clockwise or anticlockwise rotation ➔ 11 Modification.
2. If necessary, adjust the rotational speed ➔ 8.1 Adjusting rotational speed.
3. If necessary, adjust the cushioning ➔ 8.2 Adjusting cushioning.
4. If necessary, readjust the proximity switches ➔ 6.2 Installation, electrical

## 7.2 Pendulum operation

**Clockwise rotation**

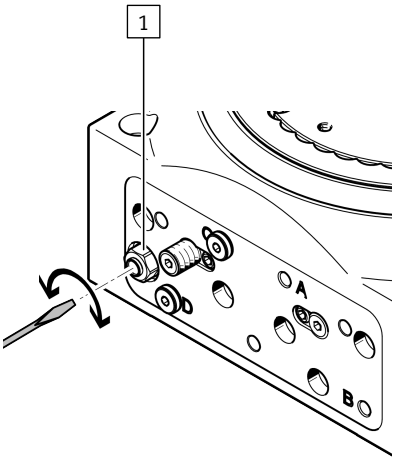
1. Pressurise the pneumatic port (A).
   ⇨ The DHTG is unlocked.
2. Pressurise the pneumatic port (C).
   ⇨ The plate rotates clockwise.
3. Pressurise the pneumatic port (B).
   ⇨ The DHTG is locked.
4. Pressurise the pneumatic port (D).
   ⇨ The plate rotates anticlockwise.
5. If necessary, adjust the rotational speed ➔ 8.1 Adjusting rotational speed.
6. If necessary, adjust the cushioning ➔ 8.2 Adjusting cushioning.

**Anticlockwise rotation**

1. Pressurise the pneumatic port (A).
   ⇨ The DHTG is unlocked.
2. Pressurise the pneumatic port (D).
   ⇨ The plate rotates anticlockwise.
3. Pressurise the pneumatic port (B).
   ⇨ The DHTG is locked.
4. Pressurise the pneumatic port (C).
   ⇨ The plate rotates clockwise.
5. If necessary, adjust the rotational speed ➔ 8.1 Adjusting rotational speed.
6. If necessary, adjust the cushioning ➔ 8.2 Adjusting cushioning.

# 8 Operation

## 8.1 Adjusting rotational speed



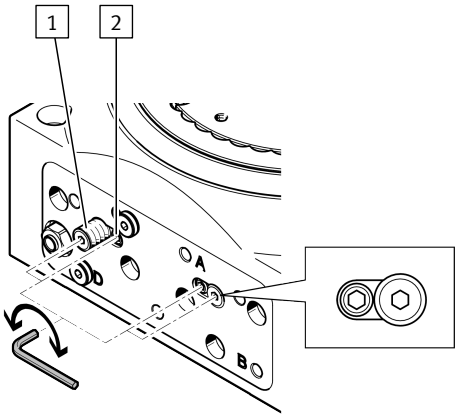

1 One-way flow control valve

Fig. 10: Adjusting rotational speed

The rotational speed is adjusted by the one-way flow control valve.

- Set the desired rotational speed with the one-way flow control valve.
  ⇨ Clockwise rotation: rotational speed slows.
  ⇨ Anticlockwise rotation: rotational speed is faster.

## 8.2 Adjusting cushioning




1 Adjusting screw
2 Clamping component

Fig. 11: Adjusting cushioning

1. Loosen the clamping component one revolution.
2. Set the adjusting screw to the desired cushioning with an Allen key. Avoid a hard stop at the end positions. The overload protection must also not be triggered.
   ⇨ Clockwise rotation: cushioning is increased.
   ⇨ Anticlockwise rotation: cushioning is reduced.
3. Tighten the clamping component.

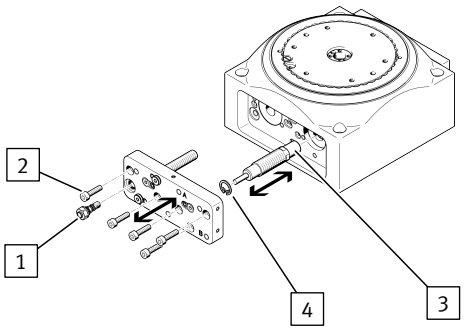
| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 0.8 ± 20% | | 2.5 ± 20% | |

# 9 Maintenance

## 9.1 Maintenance work

Check the shock absorbers every 2 million strokes:
– Oil leak
– Hard stops
– General Function

## 9.2 Replacing shock absorbers




1 One-way flow control valve
2 Retaining screw
3 Shock absorber
4 Retaining ring

Fig. 12: Replacing shock absorbers

Replace the shock absorber after 10 million load cycles at the latest.

Requirements:
– The power supply is switched off and locked to prevent unauthorised reactivation.
– The compressed air supply is switched off and locked to prevent unauthorised reactivation.
– The system is completely exhausted.

**Removal**

1. Unscrew the one-way flow control valve from the connecting plate.
2. Unscrew the retaining screws of the connecting plate and remove the connecting plate.
3. Remove the retaining ring on the shock absorber.
4. Replace the shock absorber.

**Mounting**

1. Insert the shock absorber.
2. Mount the retaining ring on the shock absorber.
3. Position the connecting plate correctly and screw in and tighten the retaining screws.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 2.9 ± 20% | | 9.9 ± 20% | |

4. Screw in the one-way flow control valve and tighten it.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 1.5 ± 20% | | 5.5 ± 20% | |

## 9.3 Cleaning

Regularly removing lubricant from the surfaces reduces the service life.

- Clean the outside of the product as required with a soft cloth.
  Permissible cleaning agents:
  – Detergent, maximum +60 °C
  – Petroleum ether, free of aromatic compounds

## 9.4 Lubrication

General relubrication of the mechanical components is recommended every 5 million switching cycles.

After a conversion re-lubricate the following components with LUB-E1:
– Piston and piston chamber
– Seal
– Interlock
– Gear rack with pinion
– Table bearings
– Indexing disc

# 10 Malfunctions

## 10.1 Fault clearance

| Malfunction | Cause | Remedy |
|---|---|---|
| The rotating plate does not rotate. | The overload protection is active. | – Pressurise pneumatic port B and rotate the rotating plate manually against the direction of rotation until it can no longer be moved. The overload protection and possibly the interlock audibly engage. |
| | An audible leakage. | – Contact the regional Festo contact if you have technical problems ➔ www.festo.com. |
| | The one-way flow control valve is completely closed. | – Open the one-way flow control valve. |
| The rotating plate does not engage. | The end position has not been reached. | – Unscrew the shock absorber adjusting screw until the rotating plate engages. |
| | The overload protection is active. | – Pressurise pneumatic port B and rotate the rotating plate manually against the direction of rotation until it can no longer be moved. The overload protection and possibly the interlock audibly engage. |
| | The toothed disc and the pinion are aligned tooth to tooth. | – Contact the regional Festo contact if you have technical problems ➔ www.festo.com. |
| Hard metallic impacts at the end position. | The adjusting screw for the shock absorber is unscrewed too far. | – Screw in the adjusting screw. |
| | The shock absorber is faulty. | – Replace the shock absorber. |
| Hard metallic impacts in the interlock. | The shock absorber adjusting screw was screwed in too far, e.g. when changing the direction of rotation. | – Unscrew the adjusting screw. |
| The plate position is incorrect. | The overload protection is incorrectly engaged by 180° (plate offset by 30°). | – Force the overload protection and turn until the overload protection engages again. |

Tab. 2: Fault clearance

# 11 Modification

The DHTG can also be converted from clockwise rotation to anticlockwise rotation similar to the steps described below.

Requirements:
- The power supply is switched off and locked to prevent unauthorised reactivation.
- The compressed air supply is switched off and locked to prevent unauthorised reactivation.
- The system is completely exhausted.

**Remove connecting plate**

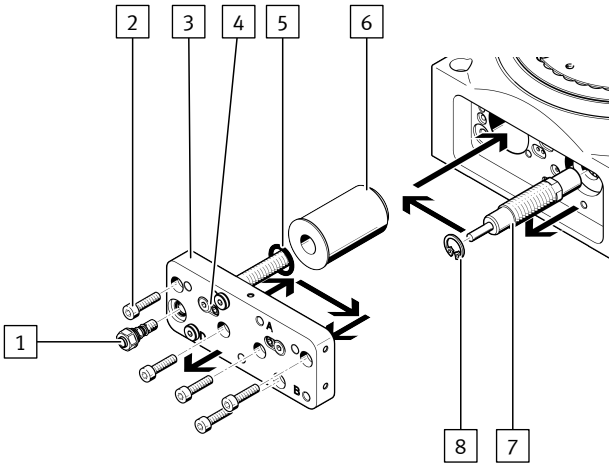



Fig. 13: Removal and mounting of connecting plate

| | | | |
|---|---|---|---|
| 1 | One-way flow control valve | 5 | O-ring |
| 2 | Retaining screw (5x) | 6 | Distance piece |
| 3 | Connecting plate | 7 | Shock absorber |
| 4 | Adjusting screw with clamping component | 8 | Retaining ring |

1. Unscrew the clamping component one revolution.
2. Unscrew the adjusting screw a few revolutions.
3. Unscrew the one-way flow control valve from the connecting plate.
4. Unscrew the retaining screws of the connecting plate and remove the connecting plate.
5. Remove the retaining ring on the shock absorber.
6. Remove the shock absorber.
   Not applicable for DHTG-...-2 and DHTG-...-3
7. Remove the distance piece.
8. Remove the O-ring.
   For DHTG-65: remove the buffer.

**Mounting connecting plate**

1. Insert the shock absorber into the piston bore next to it.
2. Mount the retaining ring on the shock absorber.
3. Insert the O-ring.
   For DHTG-65: insert the buffer.

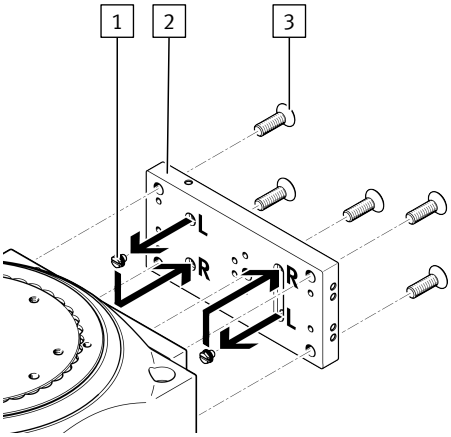
4. Insert the distance piece.
   Not applicable for DHTG-...-2 and DHTG-...-3
5. Position the connecting plate correctly and screw in and tighten the retaining screws.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 2.9 ± 20% | | 9.9 ± 20% | |

6. Screw in the one-way flow control valve and tighten it.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 1.5 ± 20% | | 5.5 ± 20% | |

**Removing stop plate**




1 Plug screw (2x)
2 Stop plate
3 Retaining screw (5x)

Fig. 14: Removal and mounting of stop plate

1. Unscrew the retaining screws of the stop plate and remove the stop plate.
2. Unscrew both plug screws on the back of the stop plate.

**Mounting stop plate**

1. Screw both plug screws into the other drilled hole and tighten them. Tightening torque 0.5 Nm ± 20%.
   ⇨ Clockwise rotation: drilled hole R opened.
   ⇨ Anticlockwise rotation: drilled hole L opened.
2. Position the stop plate correctly, screw in the retaining screws and tighten them.

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Tightening torque | [Nm] | 1.5 ± 20% | 2.9 ± 20% | 5.9 ± 20% | |

3. Set the desired cushioning ➔ 8.2 Adjusting cushioning.

# 12 Technical data

## 12.1 Technical data, general

| DHTG | |
|---|---|
| Certificates, declaration of conformity | ➔ www.festo.com/sp |
| Mode of operation | Double-acting twin-piston drive |
| Mounting position | Any |
| Degree of protection | IP54 |
| Cushioning | Adjustable shock absorber stroke, hard characteristic curve |
| Operating medium | Compressed air in accordance with ISO 8573-1:2010 [7:4:4] |

| DHTG | | |
|---|---|---|
| Operating medium | | Inert gases |
| Information on the operating medium | | Lubricated operation possible, in which case lubricated operation will always be required |
| Ambient temperature | [°C] | +5 ... +60 |
| Storage temperature | [°C] | –20 ... +80 |
| Temperature of medium | [°C] | –5 ... +60 |

Tab. 3: Technical data, general

## 12.2 Technical data, mechanical

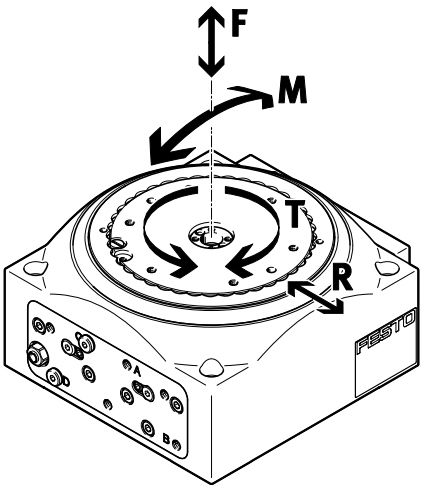



Fig. 15: Technical data, mechanical

| DHTG | | -65 | -90 | -140 | -220 |
|---|---|---|---|---|---|
| Max. axial force (F) | [N] | 1000 | 2000 | 4000 | 5000 |
| Max. radial force (R) | [N] | 2000 | 5000 | 6000 | 8000 |
| Max. breakdown torque (M) | [Nm] | 100 | 150 | 300 | 500 |
| Max. tangential torque (T) | [Nm] | 100 | 150 | 200 | 500 |
| Parallelism of plates | [mm] | ≤ 0.04 | | | |
| Axial runout of plates | [mm] | ≤ 0.02 | | | |
| Concentricity of plates | [mm] | ≤ 0.02 | | | |
| Interchangeability | [mm] | < 0.2 | | | |
| Repetition accuracy of swivel angle | [°] | ≤ 0.03 | | | |
| Max. inertia with open flow control valve | [kgm²] | 0.015 | 0.03 | 0.3 | 2.5 |
| Theoretical torque | | | | | |
| 0.4 MPa | [Nm] | 1.4 | 2.9 | 12.1 | 39.3 |
| 0.6 MPa | [Nm] | 2.1 | 4.4 | 18.1 | 58.9 |
| 0.8 MPa | [Nm] | 2.8 | 5.9 | 24.1 | 78.5 |
| Maximum permissible frequency at 0.6 MPa | | | | | |
| DHTG-...-2 | [1/sec] | 3.4 | 1.9 | – | – |
| DHTG-...-4 | [1/sec] | 4.7 | 3.1 | 1.8 | 1 |
| DHTG-...-6 | [1/sec] | 5.5 | 4.3 | 2.4 | 1.3 |
| DHTG-...-8 | [1/sec] | 7.7 | 5.6 | 3.1 | 1.8 |
| DHTG-...-12 | [1/sec] | 10 | 5.8 | | 2.3 |
| DHTG-...-24 | [1/sec] | 14.2 | 6.6 | | 3.5 |

Tab. 4: Technical data, mechanical

## 12.3 Technical data, pneumatic

| DHTG | | -65 | -90 | 140 | 220 |
|---|---|---|---|---|---|
| Operating pressure | [MPa] | 0.4 ... 0.8 | | | |
| | [bar] | 4 ... 8 | | | |
| | [psi] | 58.02 ... 116.03 | | | |
| Leakage at 0.6 MPa | [SLPM] | <2 | | | |
| Pneumatic ports | | | | | |
| Pneumatic port (A) | | M5 | | G 1/8 | |
| Pneumatic port (B) | | M5 | | G 1/8 | |
| Pneumatic port (C) | | M5 | | G 1/8 | |
| Pneumatic port (D) | | M5 | | G 1/8 | |

Tab. 5: Technical data, pneumatic

## 12.4 Characteristic curves

The following characteristic curves show the switching frequency (f) as a function of the mass moment of inertia (J).

DHTG-65

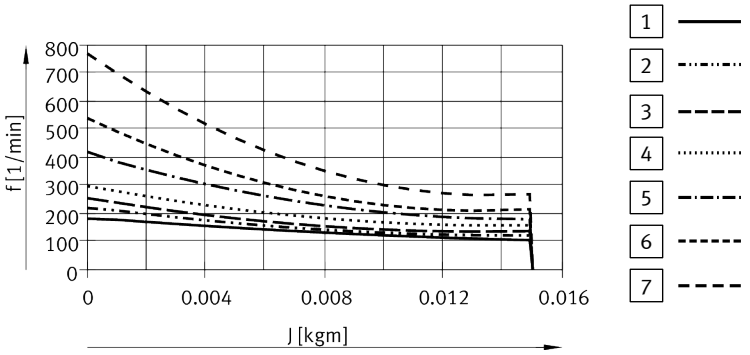



Fig. 16: DHTG-65

1 2-point indexing
2 3-point indexing
3 4-point indexing
4 6-point indexing
5 8-point indexing
6 12-point indexing
7 24-point indexing

DHTG-90

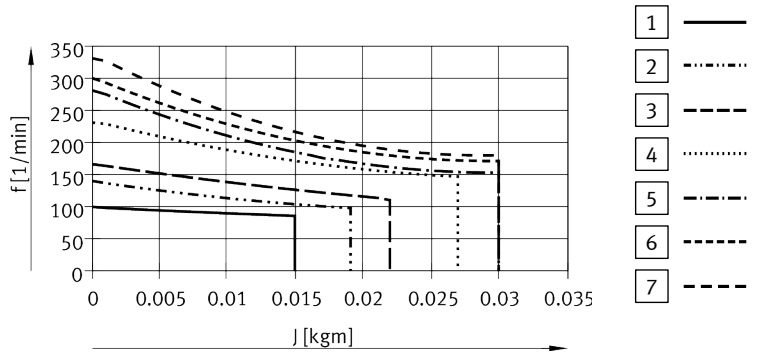



Fig. 17: DHTG-90

1 2-point indexing
2 3-point indexing
3 4-point indexing
4 6-point indexing
5 8-point indexing
6 12-point indexing
7 24-point indexing

DHTG-140

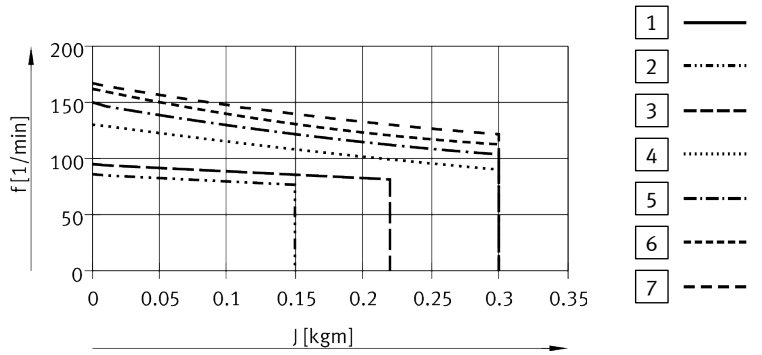



Fig. 18: DHTG-140

1 2-point indexing
2 3-point indexing
3 4-point indexing
4 6-point indexing
5 8-point indexing
6 12-point indexing
7 24-point indexing

DHTG-220

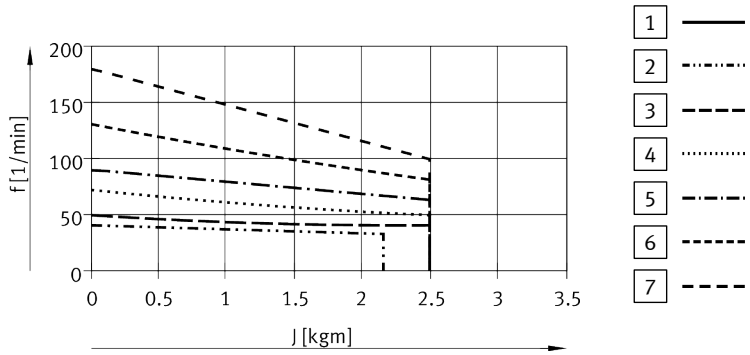



Fig. 19: DHTG-220

1 2-point indexing
2 3-point indexing
3 4-point indexing
4 6-point indexing
5 8-point indexing
6 12-point indexing
7 24-point indexing

The following characteristic curves show the maximum permissible cycle frequency (f) as a function of the mass moment of inertia (J).

DHTG-65

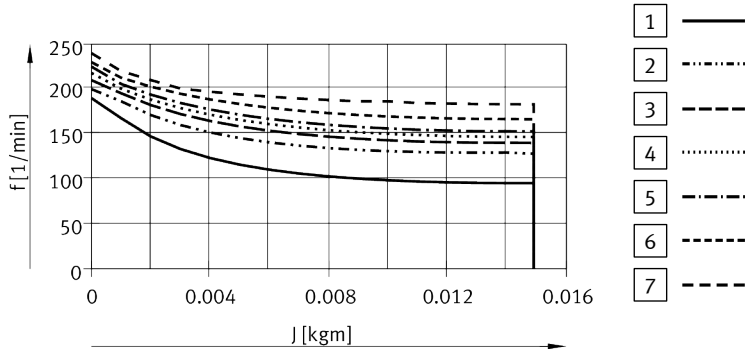



Fig. 20: DHTG-65

1 2-point indexing
2 3-point indexing
3 4-point indexing
4 6-point indexing
5 8-point indexing
6 12-point indexing
7 24-point indexing

DHTG-90

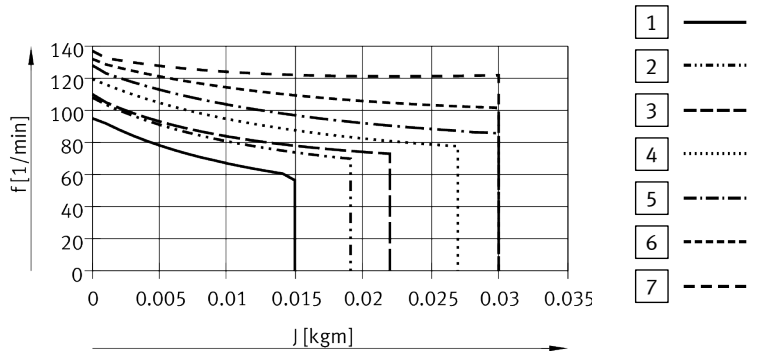



Fig. 21: DHTG-90

1 2-point indexing
2 3-point indexing
3 4-point indexing
4 6-point indexing
5 8-point indexing
6 12-point indexing
7 24-point indexing

DHTG-140

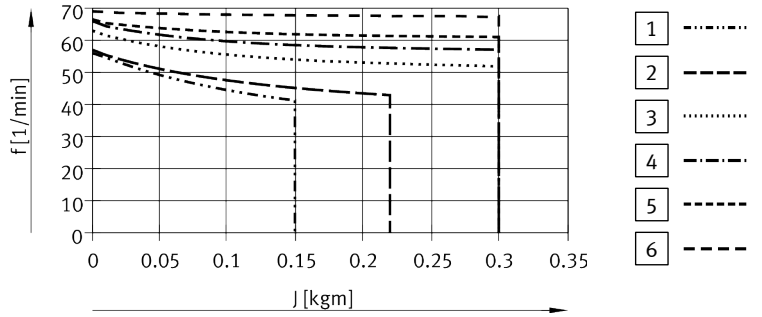



Fig. 22: DHTG-140

1 3-point indexing
2 4-point indexing
3 6-point indexing
4 8-point indexing
5 12-point indexing
6 24-point indexing

DHTG-220

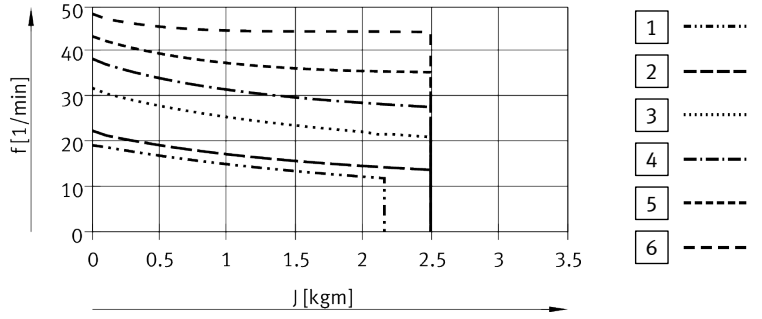



Fig. 23: DHTG-220

1 3-point indexing
2 4-point indexing
3 6-point indexing
4 8-point indexing
5 12-point indexing
6 24-point indexing

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