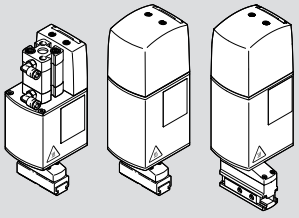
# EHMD-40-RE-...
## Rotary gripper module



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Operating instructions

8170303
2022-02b
[8170305]

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## 1 Applicable documents

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

## 2 Safety

### 2.1 General safety instructions

- Only use the product in original status without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe labelling on the product.
- 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 power supply and secure it against being switched on again.
- Observe the tightening torques. Unless otherwise specified, the tolerance is ± 20%.

### 2.2 Intended use

The intended use of the product is to grip, hold and rotate payloads, e.g. workpieces.

### 2.3 Foreseeable misuse

Do not grip the payload in the "Open" direction of movement.

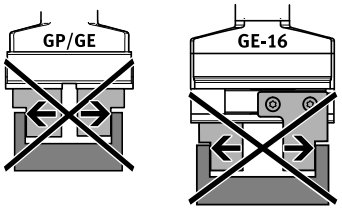


Fig. 1: Impermissible gripping

### 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 skills and experience in dealing with electropneumatic (open-loop) control technology.

## 3 Additional information

- Accessories ➔ www.festo.com/catalogue.

## 4 Product overview

### 4.1 Function

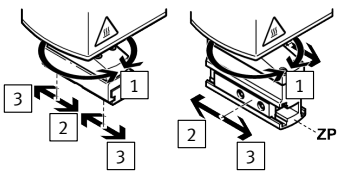


Fig. 2: Functional principle of rotating and gripping

1 "Rotate" gripper movement
2 "Close" jaw movement
3 "Open" jaw movement

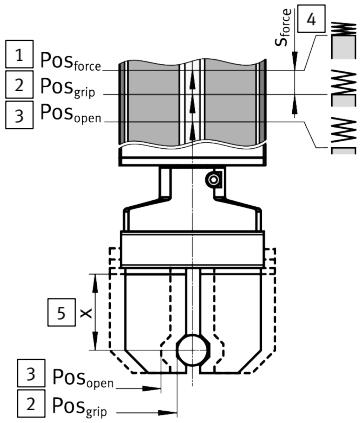


Fig. 3: Gripping force via spring deflection

1 Gripping force position
2 Gripping position
3 End position open
4 Additional path of gripping force
5 Lever arm to payload

The product is a combined rotating and gripping module.

- Electric rotary drive EHMD-...-RE:
  The rotary movement of the stepper motor is transmitted directly to the gripper via the motor shaft and can be freely positioned. The stepper motor incremental encoder can be used for closed loop control and outputs a zero pulse for homing per gripper revolution. The zero pulse ZP of the encoder and the longitudinal axis of the gripper are factory-aligned parallel to the mounting surface.
- Electric gripper drive EHMD-...-GE/-GE-16:
  The rotary movement of the stepper motor is transferred to the gripper jaws via a mechanism and can be freely positioned. The stepper motor incremental encoder can be used for closed loop control. A defined gripping force can be generated in closed loop control with servo drives with torque limitation. A defined gripping force can be generated in positioning mode by a spring in the gripper drive with servo drives without torque limitation. After the gripper fingers are in contact with the workpiece, the gripper drive is moved further by a defined distance $s_{force}$ and the spring is tensioned. If the power supply is interrupted, the gripping force may drop to the residual gripping force.
- Pneumatic gripper drive EHMD-...-GP:
  The linear movement of the pneumatic cylinder is transferred to the gripper jaws via a mechanism. Two positions on the pneumatic cylinder can be monitored with proximity switches. If the compressed air supply fails, the gripping force is not maintained. Gripping force can be backed up, e.g. by an uninterruptable compressed air supply.

### 4.2 Product design

**Product overview EHMD-40-RE-...**

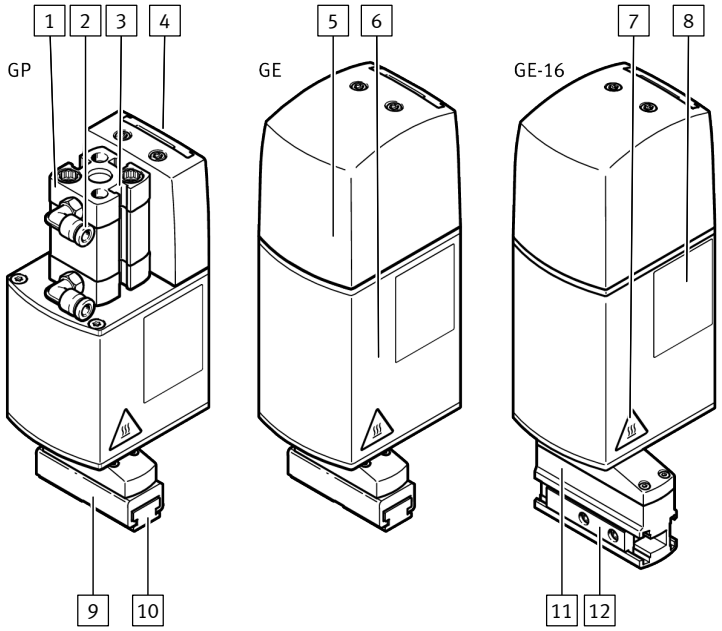


Fig. 4: Product design EHMD-40-RE-GP/-GE/-GE-16

1 Pneumatic gripper drive
2 Pneumatic port
3 Slot for sensor
4 Electrical connection: motor and encoder
5 Electric gripper drive with encoder
6 Electric rotary drive with encoder
7 Warning: hot surface
8 Product labelling
9 Rotating short-stroke gripper
10 Gripper jaw with bottom guide
11 Rotating long-stroke gripper
12 Gripper jaw with lateral guide

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**Loss of function of the gripper jaw movement**
Retaining screws that are too long for the gripper finger attachment cause the gripper jaws to jam.
- Observe the maximum screw-in depth.

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**Loss of function of the rotary movement**
Loosening the clamping screw on the gripper results in loss of referencing or can lead to failure of the gripper drive during continuing operation.
- Do not loosen the clamping screw on the gripper.

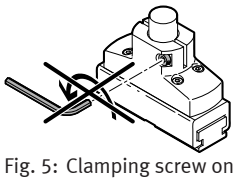
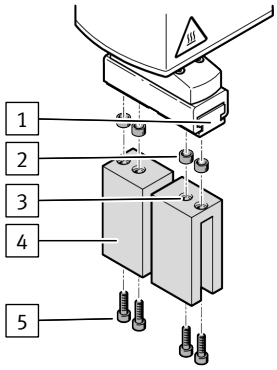


Fig. 5: Clamping screw on the gripper.

### 5.1 Mounting gripper fingers on EHMD-...-GE/-GP

**Included accessories**
– 4x M3 x 12 screws
– 4x ZBH-5 centring sleeves




1 Gripper jaw with threaded holes and centring holes
2 Centring sleeve
3 Through-hole with centring hole
4 Gripper fingers
5 Retaining screw

Fig. 6: Mounting gripper fingers directly, showing gripper jaw blank BUB-HGPT

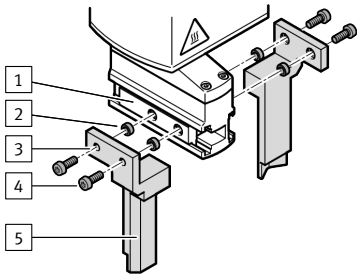
1. Position the centring sleeves 2 in the centring holes 3.
2. Apply medium-strength screw locking compound to the threads of the retaining screws 5.
3. Position the gripper fingers 4 on the gripper jaws 1.
4. Tighten the retaining screws 5.
   Observe the maximum tightening torque and screw-in depth.

| Type | | -GE/-GP |
|---|---|---|
| Screw | | M3 |
| Max. screw-in depth into the gripper jaw | [mm] | 8.3 |
| Max. tightening torque | [Nm] | 1.2 |
| Centring sleeve | | ZBH-5 |
| Centring hole and centring hole tolerance | [mm] | $5^{H9}$ |

Tab. 1: Information for mounting components

### 5.2 Mounting gripper fingers on EHMD-...-GE-16

**Included accessories**
– 4x ZBH-5 centring sleeves




1 Gripper jaw with threaded holes and centring holes
2 Centring sleeve
3 Through-hole with centring hole
4 Retaining screw
5 Gripper fingers

Fig. 7: Mounting gripper fingers directly

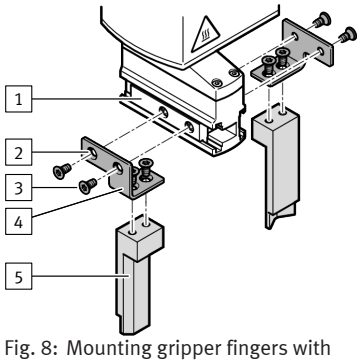
1. Position the centring sleeves 2 in the centring holes 3.
2. Apply medium-strength screw locking compound to the threads of the retaining screws 4.
3. Position the gripper fingers 5 on the gripper jaws 1.
4. Tighten the retaining screws 4.
   Observe the maximum tightening torque and screw-in depth.

| Type | | -GE-16 |
|---|---|---|
| Screw | | M3 |
| Max. screw-in depth into the gripper jaw | [mm] | 4.6 |
| Max. tightening torque | [Nm] | 1.2 |
| Centring sleeve | | ZBH-5 |
| Centring hole and centring hole tolerance | [mm] | $5^{H9}$ |

Tab. 2: Information for mounting components

### 5.3 Mounting gripper fingers on EHMD-40-RE-GE-16 with bracket

**Included accessories**
– 2x brackets
– 8x M3 x 6 countersunk screws




1 Gripper jaw with threaded holes and centring holes
2 Through-hole with recess
3 Retaining screw
4 Bracket
5 Gripper fingers

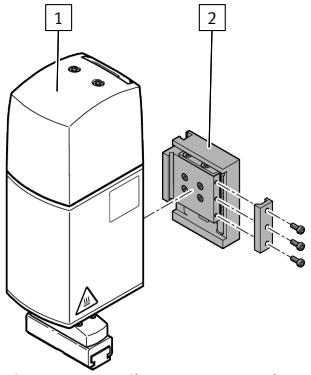
Fig. 8: Mounting gripper fingers with brackets

1. Apply medium-strength screw locking compound to the threads of the retaining screws 3.
2. Position the gripper fingers 5 on the brackets 4.
3. Tighten the retaining screws 3.
4. Position the brackets 4 on the gripper jaws 1.
5. Tighten the retaining screws 3.
   Observe the maximum tightening torque and screw-in depth.

| Type | | -GE-16 |
|---|---|---|
| Countersunk screw | | M3 x 6 |
| Max. screw-in depth into the gripper jaw | [mm] | 4.6 |
| Max. tightening torque | [Nm] | 1.2 |

Tab. 3: Information for mounting components

### 5.4 Mounting rotary gripper module

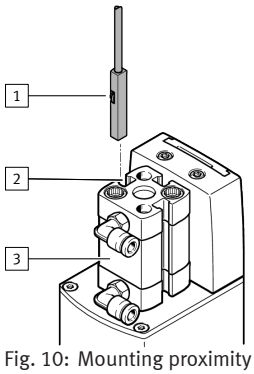



1 Rotary gripper module EHMD with dovetail profile
2 Mounting EHAM-E20-... with dovetail profile

Fig. 9: Dovetail mount, example mounting EHAM-E20-40-Z

Additional information on the dovetail mounting ➔ Instruction manual, ➔ www.festo.com/sp.

### 5.5 Mounting proximity switches




1 Proximity switch
2 Profile groove
3 Pneumatic cylinder

Fig. 10: Mounting proximity switches

Additional information on mounting the proximity switch ➔ Instruction manual, ➔ www.festo.com/sp.

## 6 Installation

### 6.1 Installation, pneumatic

**Overview of the pneumatic control with regulation of force and speed**

**Backing up gripping force**
Ensure that the gripping force is maintained if the compressed air supply fails, e.g. use an uninterruptible compressed air supply.

**Rotating gripper**
Do not rotate the gripper if the pneumatic cylinder is pressurised in the opening direction.

- Before rotating the gripper, depressurise the open gripper, e.g. use a 3/5-way valve with exhausted normal position.
- Or before rotation pressurise the pneumatic cylinder in the closing direction.

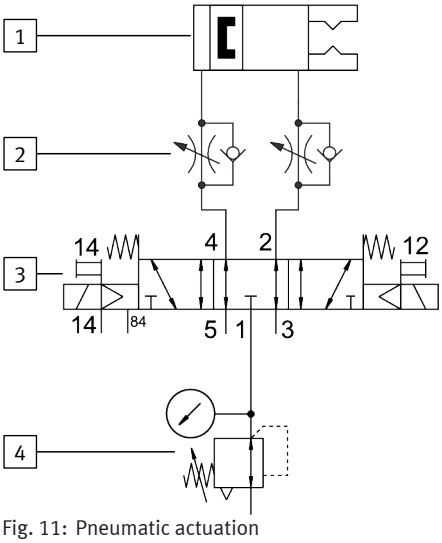



Fig. 11: Pneumatic actuation

| | | | |
|---|---|---|---|
| 1 | Pneumatic cylinder, double-acting | 3 | External 5/3 valve with exhausted normal position |
| 2 | External throttle valves | 4 | External pressure regulator |

**Connecting pneumatic gripper drive EHMD-...-GP**

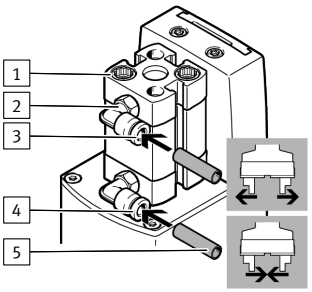



Fig. 12: Pneumatic ports on the EHMD-...-GP

| | |
|---|---|
| 1 | Pneumatic cylinder, double-acting |
| 2 | Rotating angle fitting QS-4 with integrated fixed flow restrictor |
| 3 | "Open gripper" supply port |
| 4 | "Close gripper" supply port |
| 5 | Plastic tubing with 4 mm outer ∅ |

### 6.2 Installation, electrical

**EMC-compliant installation**
A non-EMC-compliant installation can lead to signal interference on the encoder cable, motor cable or communication cables.

**Safe reference potential at the power supply of the servo drive**
Use PELV circuits in accordance with EN 60204-1 for the electrical power supply. The secondary reference potential of the PELV power pack for the servo drive must be connected to the protective conductor system.

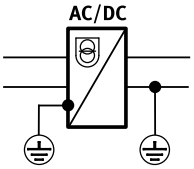



Fig. 13: Connecting the secondary reference potential of the PELV power pack

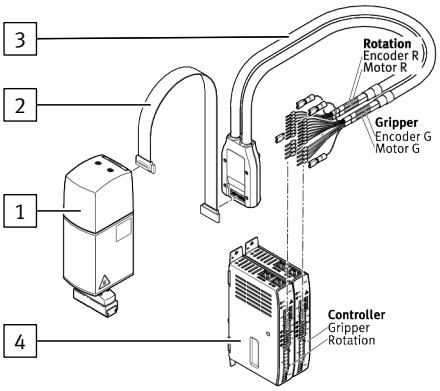



Fig. 14: System overview of the electrical interfaces, example EHMD-40-RE-GE

| | | | |
|---|---|---|---|
| 1 | Rotary gripper module EHMD | 3 | Motor cable NEBM-SF1W31-... |
| 2 | Motor cable NEBM-F1W31-... | 4 | Servo drive |

**Connecting NEBM-F1W31-... motor cable**

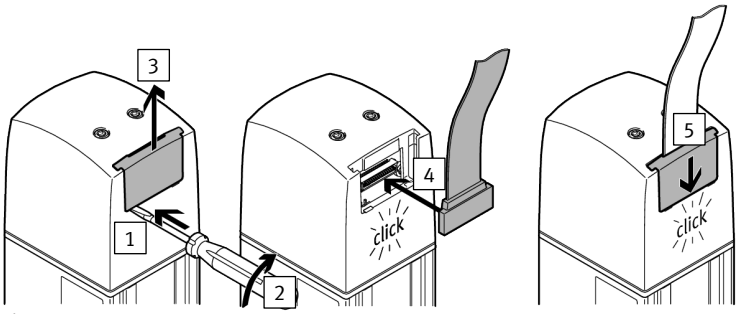



Fig.15

1. Place the screwdriver in a cover groove 1 and turn 2.
2. Push the unlocked cover up 3.
3. Press the motor cable plug into the electrical connection until it clicks into place 4.
4. Push the cover down until it clicks 5.

**Electrical connection of motor and encoder**

| Plug, 31-pin | Pin | Function | Description | |
|---|---|---|---|---|
| | | | EHMD-...-GP | EHMD-...-GE<br>EHMD-...-GE-16 |
|  | 1 | I | Encoder for rotation | |
| | 2 | B | | |
| | 3 | A | | |
| | 4 | I | – | Encoder for gripper |
| | 5 | B | | |
| | 6 | A | | |
| | 7 | Shielding | Shielding | |
| | 8 | +5 V DC | – | Encoder for gripper |
| | 9 | +5 V DC | Encoder for rotation | |
| | 10 | Shielding | Shielding | |
| | 11 | Phase B | Motor rotation | |
| | 12 | | | |
| | 13 | Phase A | | |
| | 14 | | | |
| | 15 | Phase B | – | Motor gripper |
| | 16 | Phase A | | |
| | 17 | Phase A/ | | |
| | 18 | Phase B/ | | |
| | 19 | Phase A/ | Motor rotation | |
| | 20 | | | |
| | 21 | Phase B/ | | |
| | 22 | | | |
| | 23 | Shielding | Shielding | |
| | 24 | GND | Encoder | |
| | 25 | Shielding | Shielding | |
| | 26 | A/ | – | Encoder for gripper |
| | 27 | B/ | | |
| | 28 | I/ | | |
| | 29 | A/ | Encoder for rotation | |
| | 30 | B/ | | |
| | 31 | I/ | | |

Tab. 4: Pin allocation

## 7 Commissioning

**Pneumatic gripper drive EHMD-...-GP**

Optional settings.

1. Set the gripping force with the operating pressure at the pressure regulator.
2. Set the gripping speed at the external throttle valves.
3. Adjust proximity switch to the query position.

**Electrical rotary drive and gripper drive EHMD-...-RE-GE/-GE-16**

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**Homing**

- Move to the stop in the opening direction.
- Move at reduced velocity.

– All application notes for commissioning ➔ www.festo.com/sp.

## 8 Operation

**⚠ WARNING**

**Danger of burns from hot housing surfaces.**

Metallic housing parts can reach high temperatures during operation.
Contact with metal housing parts can cause burn injuries.

- Do not touch metallic housing parts.
- After the power supply is switched off, let the device cool down to room temperature.

## 9 Maintenance

### 9.1 Cleaning

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**Approved cleaning agents.**

Observe protection class.

- Ethanol, maximum 96%
- Hydrogen peroxide, maximum 5%

Clean the product with a clean and soft cloth.

### 9.2 Lubrication

The product is delivered with initial lubrication. Subsequent lubrication is not required.

## 10 Malfunctions

### 10.1 Fault clearance

| Error description | Cause | Remedy |
|---|---|---|
| The gripper does not hold the payload securely. | The operating pressure is too low. | Increase the operating pressure. Observe the max. permissible value. |
| | The gripping force is too low. | Increase gripping force. |
| | The payload is too heavy. | Select a different product. |
| The gripper does not open and close. | EHMD-...-GP: no compressed air. | Check the compressed air supply and the supply ports. |
| | The gripper or the gripper mechanism is defective. | Replace the rotary gripper module ➔ www.festo.com/catalogue. |
| | The clamping screw on the gripper was loosened and homing was run. | |
| | The retaining screws in the gripper jaws are too long. | Use shorter retaining screws. Observe the maximum screw-in depth. |
| The rotary drive does not rotate. | The stepper motor or the rotary mechanism is defective. | Replace the rotary gripper module ➔ www.festo.com/catalogue. |
| The query position on the pneumatic cylinder is not recognised. | The proximity switch is incorrectly adjusted. | Check and readjust the position of the proximity switch. |
| | The proximity switch is faulty. | Replace the proximity switch ➔ www.festo.com/catalogue. |

Tab. 5: Fault clearance

## 11 Demounting

1. Switch off the electrical and pneumatic power supplies and lock them to prevent them from being switched on again.
2. EHMD-...- GP: exhaust the compressed air lines.
3. Disconnect the electrical and pneumatic installations.
4. Loosen the mounting attachment and remove the product.
5. Remove the attachment elements, e.g. attached gripper fingers.

## 12 Technical data

### 12.1 Technical data, general EHMD-...-GP/-GE/-GE-16

| Type | | -GE | -GE-16 | -GP |
|---|---|---|---|---|
| Design | | electric rotary drive | | |
| | | electric gripper | | pneumatic gripper |
| Mounting position | | any | | |
| Rated load with gripper fingers | [g] | 250 | 250 | 250 |
| Product weight | [g] | 681 | 724 | 577 |
| Operating and environmental conditions | | | | |
| Ambient temperature | [°C] | 0 ... +40 | | |
| Transport conditions and storage conditions | [°C] | –20 ... +70 | | |
| Relative humidity | [%] | 0 ... 85, non-condensing | | |
| Degree of protection | | IP20 | | |
| Corrosion resistance class | | CRC1[1] | | |
| Continuous sound level LpAeq in accordance with DIN 45635-01 Cl.2 | [dBA] | < 60 | | |
| Severity level for vibration and shock | | Severity level 1[2] | | |
| Materials | | | | |
| Housing and cover:<br>– Gripper drive | | PA, reinforced | | |
| Housing:<br>– Gripper<br>– Rotary drive<br>– Pneumatic cylinder | | Anodised aluminium | | |
| Gripper jaw | | PEEK, reinforced | | |

1) Low corrosion resistance. Dry indoor use or transport protection and storage protection. Also applies to parts behind covers in non-visible internal areas, or parts that are covered during application, e.g. drive trunnions.
2) The information only applies to mountings without Z compensation, e.g. EHAM-E20-40.

Tab. 6: Technical data, general EHMD-...-GP/-GE/-GE-16

| Type of severity level (SL) | | | | | |
|---|---|---|---|---|---|
| Vibration load | | | | | |
| Frequency range [Hz] | | Acceleration [m/s²] | | Deflection [mm] | |
| SL1 | SL2 | SL1 | SG2 | SL1 | SL2 |
| 2 ... 8 | 2 ... 8 | – | – | ±3.5 | ±3.5 |
| 8 ... 27 | 8 ... 27 | 10 | 10 | – | – |
| 27 ... 58 | 27 ... 60 | – | – | ±0.15 | ±0.35 |
| 58 ... 160 | 60 ... 160 | 20 | 50 | – | – |
| 160 ... 200 | 160 ... 200 | 10 | 10 | – | – |
| Shock load | | | | | |
| Acceleration [m/s²] | | Duration [ms] | | Shocks per direction | |
| SL1 | SL2 | SL1 | SL2 | SL1 | SL2 |
| ±150 | ±300 | 11 | 11 | 5 | 5 |
| Continuous shock load | | | | | |
| Acceleration [m/s²] | | Duration [ms] | | Shocks per direction | |
| ±150 | | 6 | | 1000 | |

Tab. 7: Type of severity level (SL)

### 12.2 Technical data, pneumatic drive

**Pneumatic gripper EHMD-...-GP**

| Type | | -GP |
|---|---|---|
| Gripper | | |
| Functional principle | | Gripper with two parallel gripper jaws |
| Stroke per gripper jaw | [mm] | 5 |
| Closing gripping force per gripper jaw at 6 bar | [N] | 25 |
| Residual gripping force in the event of a pressure failure | [N] | > 10 |
| Cylinder | | |
| Design | | Pneumatic cylinder, double-acting |
| Operating pressure | [MPa]<br>([psi]<br>[bar]) | 0.15 ... 0.8<br>(21.755 ... 116.03)<br>(1.5 ... 8) |
| Operating medium | | Compressed air in accordance with ISO 8573-1:2010 [7:4:4] |

Tab. 8: Technical data, pneumatic gripper EHMD-...-GP

### 12.3 Technical data, electric drives

**Electric gripper EHMD-...-GE/-GE-16**

| Type | | -GE | -GE-16 |
|---|---|---|---|
| Gripper | | | |
| Functional principle | | Gripper with two parallel gripper jaws | |
| Stroke per gripper jaw | [mm] | 0 ... 5 | 0 ... 15 |
| Gripping force | [N] | 7 ... 35 | 3 ... 14 |
| Max. gripping force in closed-loop control | [N] | 35 | 14 |
| Max. gripping force in open-loop control | [N] | 20 ... 25 | 6 ... 8 |
| Residual gripping force in the event of a power failure | [N] | > 10 | > 4 |
| Feed constant of a gripper jaw | [mm/rev] | 1.478 | 4.4 |
| Max. velocity per gripper jaw | [mm/s] | 25 | 70 |

| Type | | -GE | -GE-16 |
|---|---|---|---|
| Max. permissible velocity during homing to stop | [mm/s] | 2 | 5 |
| Reversing backlash | [mm] | 0.3 | 0.8 |
| Motor | | | |
| Functional principle | | Hybrid stepper motor with lead screw, 2-phase, bipolar | |
| Nominal voltage | [V DC] | 24 | |
| Nominal current | [A] | 0.5 | |
| Holding torque at nominal current | [Nm] | 0.043 | |
| Resistance per phase | [Ω] | 5.6 ± 15% | |
| Inductance per phase | [mH] | 4.0 ± 20% | |
| Step angle | [°] | 1.8 ± 5% | |
| Insulation class | | B | |
| Moment of inertia based on motor shaft | [kgm²] | $90 \times 10^{-6}$ | |
| Encoder | | | |
| Functional principle | | Incremental encoder with optical measuring principle, track A, B and zero index | |
| Electrical interface | | RS422, TTL | |
| Operating voltage | [V DC] | 5 ± 10% | |
| Pulses/revolution | [1/r] | 500 | |
| Current consumption, no load | [mA] | 30 | |

Tab. 9: Technical data, electric gripper EHMD-...-GE/-GE-16

**Electric rotary drive EHMD-...-RE-...**

| Type | | -GE | -GE-16 | -GP |
|---|---|---|---|---|
| Motor | | | | |
| Functional principle | | Hybrid stepper motor, 2-phase, bipolar | | |
| Nominal voltage | [V DC] | 24 | | |
| Nominal current | [A] | 0.9 | | |
| Holding torque at nominal current | [Nm] | 0.3 | | |
| Max. output speed | [rpm] | 240 | | |
| Resistance per phase | [Ω] | 5.8 ± 15% | | |
| Inductance per phase | [mH] | 11 ± 20% | | |
| Step angle | [°] | 1.8 ± 5% | | |
| Insulation class | | B | | |
| Gear ratio | | Direct drive 1:1 | | |
| Moment of inertia with gripper | [kgm²] | $1.25 \times 10^{-5}$ | $2.34 \times 10^{-5}$ | $1.25 \times 10^{-5}$ |
| Permissible shaft load, radial | [N] | 5 | | |
| Permissible shaft load, axial | [N] | 5 | | |
| Encoder | | | | |
| Functional principle | | Incremental encoder with optical measuring principle, track A, B and zero index | | |
| Electrical interface | | RS422, TTL | | |
| Operating voltage | [V DC] | 5 ± 10% | | |
| Pulses/revolution | [1/r] | 500 | | |
| Current consumption, no load | [mA] | < 60 | | |

Tab. 10: Technical data, electric rotary drive