MRD-S
Electrical · Rotary Actuators · Miniature Rotary Actuators

Sizes
4 .. 12

Weight
1.2 kg .. 1.8 kg

Max. torque
0.4 Nm .. 1.2 Nm

Max. speed
Max. speed 600 rpm

Max. useful load
1 kg .. 3 kg

Application example

Rotary Gripping Combination with Z-stroke for the rapid handling of workpieces

1. Miniature Rotary Actuators
2. 2-Finger Parallel Gripper MPG 20 with attachment-fingers
3. Short-stroke Module with linear direct drive
Miniature Rotary Actuator
Powerful torque motor with electric and pneumatic rotary feed-through

Area of application
For all applications with exceptional requirements in terms of achievable repeatability, rotary speed, acceleration and tool life.

Your advantages and benefits
- **Brushless synchronous motor with permanent magnet** for maximum positioning accuracy
- **Integrated pneumatic and electric rotary feed-through** for modest space requirements and minimized interfering contours
- **Large number of pole pairs** for a powerful torque even at low speeds
- **Special motor geometry** for superior dynamics and acceleration
- **Virtually no wearing parts** for a highly reliable system with long service life
- **EcoDrive CS drive system** with various standard communication interfaces for easy integration and start-up (Simodrive system available on request)

Information about the series
**Drive**
- 3-phase, electronically commutated AC synchronous motor. The primary part (stator) is a 3-phase Cu coil, the secondary part (rotor) is an iron support with integrated permanent magnet

**Measuring system**
- Non-contact, optical incremental measuring system with extremely high resolution and integrated reference track with reference mark

**Media feed-through**
- 4 electric (max. 60 V / 1 A)
- 2 pneumatic (max. 8 bar)

**Bearing arrangement**
- Preloaded precision ball bearings, free from play, with life-time lubrication

**Material**
- Anodized motor housing, hard-coated rotary table

**Operating temperature**
- From 10 °C to 40 °C

**Accessories**
- EcoDrive CS controllers from Rexroth (other manufacturers on request)
- Ready-made cable sets in various lengths

**Scope of delivery**
- Centering sleeves, assembly and operating manual with manufacturer’s declaration

**Warranty**
- 24 months
**Function**

The unit is driven by a 3-phase brushless synchronous motor with permanent magnet. Mechanical transmission elements such as gears can be completely eliminated. The high positioning accuracy is achieved by means of an incremental, optical shaft encoder with reference mark.

**Function description**

An electric and pneumatic rotary feed-through is integrated as special equipment.

**Options and special information**

1. Housing
   - anodized, double-sided mating flange surface with centering rings

2. Rotary table
   - with centering collar

3. Input rotary transmission leadthrough
   - (4x) electrical and (2x) pneumatic

4. Motorplug

5. Connection incremental optical rotary encoder

6. Output rotary transmission leadthrough
   - (4x) electrically pluggable and (2x) pneumatic
Repeat accuracy

Repeat accuracy is defined as the spread of the target position after 100 consecutive positioning cycles. The target position remains unchanged during these cycles, and is always approached from the same direction.

For the exact size of the required accessories, availability of this size and the designation and ID, please refer to the additional views at the end of the size in question. You will find more detailed information on our accessory range in the „Accessories“ catalog section.

General information on the series
Drive system
For control of the Miniature Rotary Actuator MRD the proven Rexroth components are used.

Your advantage at a glance:
- Control and adjustment electronics as well as supply unit in one housing
- Four standard communication interfaces as an option
- Comfortable parameterization with a Rexroth-Drive-Top-Software
- World-wide support of Rexroth

Standard Interfaces EcoDrive CS
- Parallel interface
- Sercos
- Profibus
- CANopen

Customer specific environment
Start-up software DriveTop

The parameterized software DriveTop allows a fast and easy start-up of the actuation system EcoDrive CS from Rexroth. Operating instructions and a basic parameter file for Miniature Swivel Units with torque motor is be supplied on a data carrier.

Easy optimization of the control loop adjustment since all the relevant data are visible on a window. Moreover, all parameters can be stored easily for back up in a file. The upload and download of data sets is possible via the RS-232 interface or Feldbus.

Integrated multi-channel oscilloscope for fine adjustment and signal tracing.

Actuation control unit

The actuation control units are offered together with the necessary cables and matching programming module as well as the suitable firmware.
Calculation of the mass moment of inertia

The geometry of customized attachments influence dynamics and seating of the MRD-module. Below and on the following page please find the most important standard formulas for calculation of the additional mass moment of inertia. If we should carry out this calculation check for you, please contact us.

1. Solid cylinder or flat disk, turning around the own axis
   \[ I = \frac{D^2}{6} \times m \]

2. Solid cylinder, turning around a cylinder axis vertical and centric to the axis
   \[ I = \left( \frac{L}{12} + \frac{D^2}{16} \right) \times m \]

3. Rectangular plate of any thickness, turning around a centered axis
   \[ I = \frac{A^2}{12} \times m \]

4. Ball, turning around the own axis
   \[ I = \frac{2 \times R^2}{5} \times m \]

5. Long and thin stick of any cross section, turning around a centered axis
   \[ I = \frac{L^2}{12} \times m \]

6. Solid cylinder, turning around a cylinder axis vertical to an eccentric axis
   \[ I = \left( \frac{L_1^2}{3} + \frac{D^2}{16} \right) \times m_1 + \left( \frac{L_2^2}{3} + \frac{D^2}{16} \right) \times m_2 \]
Caption

\[ I = \frac{4A_1^2 + B_1^2}{12} \times m_1 + \frac{(4A_2^2 + B_2^2)}{12} \times m_2 \]

Rectangular plate of any thickness, turning around an excentric axis

\[ I = \frac{L_1^2}{3} \times m_1 + \frac{L_2^2}{3} \times m_2 \]

Long and thin stick of any cross section, turning around an excentric axis

\[ I = \frac{L_1^2}{3} \times m_1 + L_2^2 \times m_2 + K \]

Long and thin stick with an additional mass, turning around an excentric axis

(As value K, the corresponding mass moment of inertia of the additional mass has to be used, as per example 1 to 5. The picture shows example 4)

\[ I = \text{Mass moment of inertia} \quad [\text{kgm}^2] \]
\[ m = \text{Mass of payload} \quad [\text{kg}] \]
\[ A, B, D, L, R = \text{Dimensions} \quad [\text{m}] \]
Technical data

<table>
<thead>
<tr>
<th>Description</th>
<th>MRD-S 12 IP 40 ED</th>
<th>MRD-S 12 IP 40</th>
<th>MRD-S 12 IP 54 ED</th>
<th>MRD-S 12 IP 54</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with rotary transmission leadthrough</td>
<td>without transmission leadthrough</td>
<td>with rotary transmission leadthrough</td>
<td>on request</td>
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<tr>
<td>ID</td>
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**Mechanical operating data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MRD-S 12 IP 40 ED</th>
<th>MRD-S 12 IP 40</th>
<th>MRD-S 12 IP 54 ED</th>
<th>MRD-S 12 IP 54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. torque (Nm)</td>
<td>3.6</td>
<td>3.6</td>
<td>3.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Nominal torque (with rotary feed-through) (Nm)</td>
<td>1.2</td>
<td>1.2</td>
<td>0.9</td>
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<tr>
<td>Max. speed (°/s)</td>
<td>600.0</td>
<td>600.0</td>
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<tr>
<td>Max. acceleration (°/s²)</td>
<td>4500.0</td>
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<td>45000.0</td>
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<td>Max. additional moment of inertia (kg mm²)</td>
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<td>900.0</td>
<td>900.0</td>
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<tr>
<td>Rotor moment of inertia (kg mm²)</td>
<td>113.0</td>
<td>113.0</td>
<td>113.0</td>
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</tr>
<tr>
<td>Weight (kg)</td>
<td>1.8</td>
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<tr>
<td>Repeat accuracy (°)</td>
<td>0.001</td>
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<tr>
<td>Measuring system resolution (arcsec)</td>
<td>0.038</td>
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<td>0.038</td>
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<td>Max. surface temperature (°C)</td>
<td>70.0</td>
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<td>Max. ambient temperature (°C)</td>
<td>40.0</td>
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**Electrical operating data**

<table>
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<th>Parameter</th>
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<th>MRD-S 12 IP 40</th>
<th>MRD-S 12 IP 54 ED</th>
<th>MRD-S 12 IP 54</th>
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<tbody>
<tr>
<td>Permissible power loss (W)</td>
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<tr>
<td>Max. current (A)</td>
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<td>Nominal power current (A)</td>
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<tr>
<td>Nominal voltage (VDC)</td>
<td>230.0</td>
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<tr>
<td>Phase-phase resistance at 25 °C (Ω)</td>
<td>16.9</td>
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<tr>
<td>Phase-phase inductance (mH)</td>
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<tr>
<td>Tightness according to</td>
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<td>IP 40</td>
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<td>IP 54</td>
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</tbody>
</table>

Feed-through: 4 electric / 2 pneumatic

- Max. current (A): 1
- Maximum voltage (V): 60
- Max. operating pressure (bar): 8

(*) The repeat accuracy stated here applies at constant ambient temperatures!
Main views

The scope of delivery of the cable set includes:
- 1 power cable
- 1 shaft encoder cable
- 1 cable for connecting the electric rotary feed-through

Cable sets

<table>
<thead>
<tr>
<th>ID</th>
<th>Cable length</th>
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<tbody>
<tr>
<td>KSRD 5</td>
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<td>KSRD 15</td>
<td>0331332</td>
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<tr>
<td>KSRD 20</td>
<td>0331333</td>
</tr>
</tbody>
</table>

Plug connector

- Version without electric through
- Version with electric through (angle plug)
- Version with electric through (straight line plug)

ID
- straight 9940786
- angulate 9941590

manufacturable connectors for electrical rotary feed-through