MR
Axial Incremental Magnetic Rings

The robust RLS axial magnetic incremental rings consist of an elasto-ferrite layer and a stainless steel hub. The elasto-ferrite layer is magnetised with 2 mm long alternating magnetic poles, which form an incremental magnetic pattern. A unique reference mark option can also be added to the incremental magnetic pattern. Axial magnetic rings offer reliable solutions for high performance applications.

Features and benefits

- Non-contact technology
- Compatible with RLS LM and RoLin family readheads
- High speed operation
- Easy mounting
- Different shaft diameters available
- Excellent resistance to dirt and dust
- Unique or periodic reference mark

MOTOR CONTROL | INDUSTRIAL AUTOMATION | ROBOTIC JOINTS | GIMBALS | ASSEMBLY LINES
Axial incremental rings are compatible with RLS standard LM encoder family or the component-level RoLin readheads, which provide reliable operation due to their non-contact design. Incremental or analogue output types are available according to industry standards.

Various inner diameters are supported ranging from 12 mm to 71 mm. Axial magnetic rings can be installed with adhesive tape, fasteners or by gluing.

### Selection guide

**Cross-section C**

<table>
<thead>
<tr>
<th>Ring</th>
<th>OD [mm]</th>
<th>ID [mm]</th>
<th>H [mm]</th>
<th>Compatibility with readheads</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR020C</td>
<td>19.5 ±0.1</td>
<td>12 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: No Ri, RLM2: No Ri</td>
</tr>
<tr>
<td>MR024C</td>
<td>24 ±0.1</td>
<td>15 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: No Ri, RLM2: No Ri</td>
</tr>
<tr>
<td>MR026C</td>
<td>26 ±0.1</td>
<td>12 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: No Ri, RLM2: No Ri</td>
</tr>
<tr>
<td></td>
<td>26 ±0.1</td>
<td>16 ±0.05</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: No Ri, RLM2: No Ri</td>
</tr>
<tr>
<td>MR034C</td>
<td>34 ±0.1</td>
<td>20.5 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: No Ri, RLM2: No Ri</td>
</tr>
<tr>
<td>MR045C</td>
<td>45 ±0.1</td>
<td>28.5 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: Ri, RLM2: Ri</td>
</tr>
<tr>
<td>MR049N</td>
<td>49 ±0.1</td>
<td>25 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: Ri, RLM2: Ri</td>
</tr>
<tr>
<td>MR050C</td>
<td>50 ±0.1</td>
<td>40 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: Ri, RLM2: Ri</td>
</tr>
<tr>
<td>MR061C</td>
<td>61.3 ±0.1</td>
<td>51.3 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: Ri, RLM2: Ri</td>
</tr>
<tr>
<td>MR080N</td>
<td>80 ±0.1</td>
<td>55 H7</td>
<td>2 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: Ri, RLM2: Ri</td>
</tr>
<tr>
<td>MR100S</td>
<td>100 ±0.1</td>
<td>71 H7</td>
<td>4 ±0.1</td>
<td>LM10: No Ri, LM13: No Ri, RLB2: No Ri, RLC2HD: No Ri, RLC2IC: Ri, RLM2: Ri</td>
</tr>
</tbody>
</table>

**RI** - Unique reference mark or only incremental track available  
**No RI** - No reference mark option, only incremental track available

For readhead specifications see data sheets available at [RLS media center](#).
Storage and handling

**Storage temperature**

<table>
<thead>
<tr>
<th>Material</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPE</td>
<td>-40 °C to 100 °C</td>
</tr>
<tr>
<td>HNBR</td>
<td>-40 °C to 160 °C</td>
</tr>
</tbody>
</table>

**Operating temperature**

<table>
<thead>
<tr>
<th>Material</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPE</td>
<td>-40 °C to 100 °C</td>
</tr>
<tr>
<td>HNBR</td>
<td>-40 °C to 160 °C</td>
</tr>
</tbody>
</table>

**Humidity**

- High resistance to humidity

**Chemical resistance**

The use of alcohol for cleaning is considered safe, but it is not allowed to immerse the ring in alcohol. Furthermore, the ring surface print and drawn reference mark may disappear if the ring is not carefully cleaned.

For more information on chemical resistance contact RLS.

**Packaging**

Depending on the quantity, the rings are packed either separately in boxes or in trays.

- Magnetic rings with VHB adhesive tape have 12 months shelf life and should be installed within this period.

**ACTION SUMMARY**

- **Handle with care!**
  - The use of industrial tools during installation or exposure to strong magnets such as a magnetic base is not recommended as it carries the risk of damaging parts of the system which as a result might not perform in accordance with specifications.
  - Use of tools such as drift, punch or similar are expressly forbidden and should not be used during installation to adjust run-out.

**WARNING!**

Improper assembly of the readhead and ring may impair function of the magnetic encoder system and lead to increased wear or damage to the system.

- All permissible distance and angle tolerances must be strictly complied with.
- The readhead may not come into contact with the ring over the entire revolution. The contact between the readhead and ring must also be avoided, to prevent ring from being damaged.
- Induction heating of the ring is expressly forbidden due to the possible damage of the magnetization pattern.
- The product should remain in the original packaging until ready for installation.

**The magnetic ring should not be exposed to magnetic field densities higher than 25 mT on its surface, as this can damage the ring.**

For more information on chemical resistance contact RLS.
Accuracy of ring encoder systems

The accuracy of the ring encoder measurement is influenced by encoder accuracy errors and installation-dependent errors. In order to evaluate the total accuracy, each of the significant errors must be considered. Fig. 1 shows a typical accuracy error plot with marked particular influences.

Encoder accuracy errors

System error consists of a magnetisation error, crosstalk and SDE.

<table>
<thead>
<tr>
<th>Ring</th>
<th>System error [°]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR020C</td>
<td>±0.31</td>
</tr>
<tr>
<td>MR024C</td>
<td>±0.25</td>
</tr>
<tr>
<td>MR026C* ID12</td>
<td>±0.23</td>
</tr>
<tr>
<td>MR026C ID16</td>
<td>±0.23</td>
</tr>
<tr>
<td>MR034C</td>
<td>±0.17</td>
</tr>
<tr>
<td>MR045C</td>
<td>±0.13</td>
</tr>
<tr>
<td>MR049N</td>
<td>±0.11</td>
</tr>
<tr>
<td>MR061C*</td>
<td>±0.09</td>
</tr>
<tr>
<td>MR080N</td>
<td>±0.07</td>
</tr>
<tr>
<td>MR100S</td>
<td>±0.05</td>
</tr>
</tbody>
</table>

* Significant installation error expected due to coarse inner diameter tolerance.

Magnetisation error

The magnetisation error is caused by imperfections in the elasto-ferrite material and possible deviations resulting from the magnetisation process. This error does not include eccentricity of mounting of the ring.

The following factors influence the result:

- the magnetic inhomogeneity of the elasto-ferrite layer,
- the ring installation tolerances during the magnetisation process,
- the measurement uncertainty of the magnetisation system during manufacturing process
- the quality of the magnetisation system.

The magnetisation accuracy $A_M$ can be calculated by the following formula:

$$ A_M = \pm \frac{4.6}{D} $$

where $D$ is the outer ring diameter in [mm].

Crosstalk

Crosstalk is an undesirable effect of reference mark magnetisation on the incremental track magnetisation, which leads to accuracy peaks. It depends on both the ride height and the lateral offset.

An example of crosstalk is shown in Fig. 2.

Fig. 1 to Fig. 4 are for representation purpose only.
Sub divisional error (SDE) or interpolation error

The sub divisional or interpolation error is a periodical accuracy error. It is influenced by the following factors:

- the length of poles,
- the homogeneity and cycle definition of magnetic poles,
- the sensing distance (ride height) of the installed readhead,
- the quality of the signal processing,
- the characteristics of the internal AMR sensor.

The SDE leads to speed ripples in applications where the encoder is used as speed feedback, e.g. in speed control loops. For axial rings, SDE is strongly influenced by ride height.

The maximum SDE at optimal sensing distance can be calculated by the following formula:

\[
SDE = \pm \frac{0.58 \times K}{OD}
\]

where:

- \( SDE \) is Sub divisional error (°)
- \( OD \) is the outer ring diameter in (mm)
- \( K = 1 \) for magnetic rings with outer diameter >30
- \( K = 2 \) for magnetic rings with outer diameter <30

### Hysteresis

Hysteresis is the difference in result of measuring the same point when approached from different directions.

It is known that ferromagnetic materials maintain their magnetised state in response to external fields, trying to change their direction.

The hysteresis in encoder systems depends on the strength of the magnetic field. A stronger magnetic field leads to a smaller hysteresis and vice versa. Therefore the hysteresis is strongly influenced by the ride height at which the readhead is installed (Fig. 3).

![Fig. 3. Hysteresis vs. ride height (for encoder systems with 2 mm pole length).](image)

### Installation-dependent errors

Installation and adjustment of the ring and the readhead, in addition to the given encoder-specific error, normally have a significant effect on the overall accuracy of a system. Of particular importance are the installation eccentricity and the effect of deformations resulting from the ring installation.

#### Installation eccentricity

Eccentricity can be caused by the misalignment of the ring’s center towards the rotational axis, as can be seen on Fig. 4. The error caused by eccentricity can be calculated by the following formula

\[
E_{\text{accuracy}} = \pm 0.114 \frac{e}{D}
\]

where \( E_{\text{accuracy}} \) is eccentricity error in [°], \( e \) is misalignment of ring’s center towards the rotational axis in [µm] and \( D \) is the outer ring diameter in [mm].

![Fig. 4. Influence of installation eccentricity on accuracy.](image)

#### Deformations of the ring during installation

By installing a ring to a non-ideally circular shaft, possible deformations can occur. These can have a significant influence on the system accuracy error.
Magnetic ring design

Structure

Appearance and markings

The position of the magnetised reference mark is always the same, on the inner side of the ring as shown in the figure below.

Magnetic ring surface markings (printed or engraved)

Magnetic ring markings depend on ring size and design. They are either printed on the magnetic layer or engraved on the carrier/hub. The reference mark engraving can deviate from the actual position of the reference mark magnetization for ±5°. The engraving is for orientation purposes only.

<table>
<thead>
<tr>
<th>Ring</th>
<th>Serial number</th>
<th>Reference mark</th>
<th>Logo</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR020C</td>
<td></td>
<td></td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR024C</td>
<td></td>
<td></td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR026C</td>
<td>ID12</td>
<td>✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR026C</td>
<td>ID16</td>
<td>✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR034C</td>
<td></td>
<td>✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR045C</td>
<td></td>
<td>✔ ✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR049N</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR050C</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR061C</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR080N</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔</td>
<td></td>
<td>YD1B70</td>
</tr>
<tr>
<td>MR100S</td>
<td>✔ ✔</td>
<td>✔ ✔ ✔</td>
<td></td>
<td>YD1B70</td>
</tr>
</tbody>
</table>

The shape of the reference mark may vary. The image is for representation purposes only.
Reference mark

Unique reference mark
The readhead must be ordered with reference mark option A (see corresponding readhead data sheet). The magnetic ring must be ordered with reference mark option A (see Part numbering).

The shape and position of the magnetised reference mark are critical so this option is only available as factory order.

Periodic reference mark
The readhead must be ordered with reference mark option C (see corresponding readhead data sheet). The magnetic ring must be ordered without reference mark option B (see Part numbering). The position information is output in incremental quadrature format with periodic reference pulses. The periodic reference pulses correspond to the magnetic pole length.

Installation instructions

Machine the mounting shaft according to the dimensions given in the table below:

<table>
<thead>
<tr>
<th>Axial ring</th>
<th>Outer diameter - OD [mm]</th>
<th>Inner diameter - ID [mm]</th>
<th>Installation (shaft) diameter - Ds [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR020C</td>
<td>19.5</td>
<td>+0.1</td>
<td>12 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR024C</td>
<td>24</td>
<td>+0.1</td>
<td>15 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR026C</td>
<td>26</td>
<td>+0.1</td>
<td>16</td>
</tr>
<tr>
<td>ID16</td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR026C</td>
<td>26</td>
<td>+0.1</td>
<td>12 H7</td>
</tr>
<tr>
<td>ID12</td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR034C</td>
<td>34</td>
<td>+0.1</td>
<td>20.5 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR045C</td>
<td>45</td>
<td>+0.1</td>
<td>28.5 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR049N</td>
<td>49</td>
<td>+0.1</td>
<td>25 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR050C</td>
<td>50</td>
<td>+0.1</td>
<td>40 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR061C</td>
<td>61.3</td>
<td>+0.1</td>
<td>51.3 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR080N</td>
<td>80</td>
<td>+0.1</td>
<td>55 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
<tr>
<td>MR0100S</td>
<td>100</td>
<td>+0.1</td>
<td>71 H7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.1</td>
<td></td>
</tr>
</tbody>
</table>

For improved accuracy (lower eccentricity error) clearance fit H7/g6 is recommended.
Installation with adhesive tape

Axial rings are standardly equipped with a VHB back adhesive tape. Most substrates are best prepared by cleaning with a 50:50 mixture of isopropyl alcohol and water prior to applying to the magnetic ring.

Exceptions to the general procedure that may require additional surface preparation include:

- **Heavy oils**: A degreaser or solvent-based cleaner may be required to remove heavy oil or grease from a surface and should be followed by cleaning with IPA/water.
- **Abrasion**: Abrading a surface, followed by cleaning with IPA/water, can remove heavy dirt or oxidation and can increase surface area to improve adhesion.
- **Adhesion promoters**: Priming a surface can significantly improve initial and ultimate adhesion to many materials such as plastics and paints.
- **Porous surfaces**: Most porous and fibered materials such as wood, particleboard, concrete, etc. need to be sealed to provide a unified surface.
- **Unique materials**: Special surface preparation may be needed for glass and glass-like materials, copper and copper-containing metals, and plastics or rubber that contain components that migrate (e.g. plasticizers).

For additional information refer to “Surface Preparation for 3M™ VHB™ Tape Applications”.

**Application**

Good surface contact can be attained by applying enough pressure to ensure that the tape experiences approximately 100 kPa pressure. At room temperature approximately 50% of ultimate bond strength will be achieved after 20 minutes, 90% after 24 hours and 100% after 72 hours. Dynamic overlap shear (Peak force to separate is measured after 72 hours dwelling): 830 kPa

**Shelf life**

All MR magnetic rings with back adhesive tape have 12 months shelf life and should be installed within this period.
Installation by gluing

**Application**
The surfaces to be stuck together must be cleaned very thoroughly before the adhesive is applied. It is worth first using abrasive cloth (abrasive rating 150-200) then degreasing using cellulose moistened with a grease solvent.
The adhesive should be applied to the parts to be stuck together as soon as possible after mixing, to ensure the best possible bond. The parts to be assembled usually need to be fixed under pressure. It is not necessary to apply extreme pressure.
At temperatures below room temperature, the hardening process takes somewhat longer. After the parts to be stuck together have been prepared, the adhesive is dosed. The adhesive should be very thoroughly mixed.
For more information see adhesive manufacturer’s datasheet.

![Diagram of glued ring](image)

* Dimensions according to adhesive specification.

Installation with fasteners

**Application**
Installation with fasteners is possible for rings MR049N, MR080N and MR100S. Make sure the installation surface is clean and free of debris. Rings need to be attached with fasteners as per the installation drawings (see appropriate ring page).
Recommended tightening torque:
- fasteners M2.5 (DIN EN ISO 7046): 0.3 Nm

![Diagram of fastened ring](image)
MR020C

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 poles, 2 mm width</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
</tr>
</tbody>
</table>

No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter (mm)</td>
<td>19.5 ± 0.1</td>
</tr>
<tr>
<td>Inner diameter (mm)</td>
<td>12 H7</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>2 ± 0.1</td>
</tr>
<tr>
<td>Mass (g)</td>
<td>2</td>
</tr>
<tr>
<td>System error (*)</td>
<td>±0.31</td>
</tr>
<tr>
<td>Maximum speed table</td>
<td>Refer to MR01D04</td>
</tr>
<tr>
<td>Moment of inertia (gmm²)</td>
<td>130</td>
</tr>
<tr>
<td>Material of magnetic layer</td>
<td>CPE</td>
</tr>
<tr>
<td>Hub material</td>
<td>EN1.4016 / AISI 430</td>
</tr>
<tr>
<td>Hub thermal expansion coefficient (CTE)</td>
<td>$10 \times 10^{-6}$ K$^{-1}$</td>
</tr>
</tbody>
</table>

SDE (typical measured value)

![SDE graph]

Ride height [mm]  | SDE [°] (pkpk) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.000</td>
</tr>
<tr>
<td>0.2</td>
<td>0.000</td>
</tr>
<tr>
<td>0.3</td>
<td>0.000</td>
</tr>
<tr>
<td>0.4</td>
<td>0.000</td>
</tr>
<tr>
<td>0.5</td>
<td>0.000</td>
</tr>
<tr>
<td>0.6</td>
<td>0.000</td>
</tr>
<tr>
<td>0.7</td>
<td>0.000</td>
</tr>
</tbody>
</table>
Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

For M1.6 fasteners

* For height dimensions see RLC2IC data sheet available at RLS media center.
MR024C

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 poles, 2 mm width</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
</tr>
</tbody>
</table>

No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
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<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
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<tr>
<td>Outer diameter (mm)</td>
<td>24 ± 0.1</td>
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<tr>
<td>Inner diameter (mm)</td>
<td>15 H7</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>2 ± 0.1</td>
</tr>
<tr>
<td>Mass (g)</td>
<td>3</td>
</tr>
<tr>
<td>System error (*)</td>
<td>±0.25</td>
</tr>
<tr>
<td>Maximum speed table</td>
<td>Refer to MR01D04</td>
</tr>
<tr>
<td>Moment of inertia (gmm²)</td>
<td>290</td>
</tr>
<tr>
<td>Material of magnetic layer</td>
<td>CPE</td>
</tr>
<tr>
<td>Hub material</td>
<td>EN1.4016 / AISI 430</td>
</tr>
<tr>
<td>Hub thermal expansion coefficient (CTE)</td>
<td>$10 \times 10^{-6}$ K⁻¹</td>
</tr>
</tbody>
</table>

SDE (typical measured value)

![Graph of SDE (°) vs. Ride height [mm]](attachment://graph.png)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

* For height dimensions see RLC2IC data sheet available at RLS media center.
MR026C ID12

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 poles, 2 mm width</td>
<td>No Ri</td>
<td>No Ri</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
</tr>
</tbody>
</table>

No Ri - No reference mark option, only incremental track available

Technical specifications

- Outer diameter (mm): 26 ± 0.1
- Inner diameter (mm): 12H7
- Height (mm): 2 ± 0.1
- Mass (g): 5
- System error (°): ±0.23

Maximum speed table: Refer to MR01D04

Moments of inertia (gmm²)

<table>
<thead>
<tr>
<th></th>
<th>450</th>
</tr>
</thead>
</table>

Material of magnetic layer

<table>
<thead>
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</thead>
</table>

Hub material

<table>
<thead>
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<th>EN1.4305 / AISI 303</th>
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</thead>
</table>

Hub thermal expansion coefficient (CTE)

<table>
<thead>
<tr>
<th></th>
<th>10 × 10⁻⁶ K⁻¹</th>
</tr>
</thead>
</table>

SDE (typical measured value)

![SDE graph]

Ride height [mm]

SDE [° (pkpk)]

0.05

0.04

0.03

0.02

0.01

0.00

0.1

0.2

0.3

0.4

0.5
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

For M1.6 fasteners

* For height dimensions see RLC2IC data sheet available at RLS media center.
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

For M3 fasteners
R20min dynamic
R10min static

2 ±0.1
17 ±0.2
15.5 ±0.2

16 ±0.2
10 ±0.2
2.1

29 ±0.1

36 ±0.2
13 ±0.2

2 ±0.1

26 ±0.1

2 ±0.1

For M3 fasteners
R20min dynamic
R10min static

2 ±0.1
30 ±0.1

2 ±0.1

18 ±0.2

20 ±0.2

32 ±0.2
19 ±0.2

2 ±0.1

0.1 - 0.7
0.1 - 0.7

5.7
3.3
18.5

0.1 - 0.7
0.1 - 0.7

30
14

2 ±0.1

14 ±0.2
10 ±0.2
2.1

14 ±0.2
10 ±0.2
2.1

18 ±0.5
3.5
28.5
20.5

0.1 - 0.7
0.1 - 0.7

2 ±0.1

18 ±0.5
3.5
28.5
20.5
MR026C ID16

Compatibility table

| Outer diameter (mm) | 26 ± 0.1 |
| Inner diameter (mm) | 16 ± 0.05 |
| Height (mm)         | 2 ± 0.1   |
| Mass (g)            | 4         |
| System error (*)    | ±0.23     |

No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
<thead>
<tr>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Ri</td>
<td>No Ri</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
</tr>
</tbody>
</table>

Moment of inertia (gmm²) 450
Material of magnetic layer HNBR + ferrite
Hub material EN1.4305 / AISI 303
Hub thermal expansion coefficient (CTE) 10 × 10⁻⁶ K⁻¹

Maximum speed table Refer to MR01D04

SDE (typical measured value)

![Graph showing relationship between SDE and ride height](image_url)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**RLB**

For M1.6 fasteners

- **Dimensions:**
  - \(16 \pm 0.05\)
  - \(26 \pm 0.1\)
  - \(3.2\)
  - \(+0.3\)
  - \(0\)
  - \(2 \pm 0.2\)
  - \(12.1 \pm 0.2\)
  - \(4 \pm 0.2\)

**RLC2HD**

- **Dimensions:**
  - \(8 \pm 0.2\)
  - \(3.8\)
  - \(1.13\)
  - \(2 \pm 0.1\)
  - \(12.5 \pm 0.2\)
  - \(0.1 - 0.7\)
  - \(4 \pm 0.1\)

**RLC2IC**

- **Dimensions:**
  - \(4 \pm 0.6\)
  - \(2 \pm 0.2\)
  - \(10 \pm 0.2\)
  - \(10.9 \pm 0.2\)
  - \(\phi 16 \pm 0.05\)
  - \(\phi 26 \pm 0.1\)

**RLM**

- **Dimensions:**
  - \(5 \pm 0.2\)
  - \(12.8 \pm 0.2\)
  - \(8.5\)

*For height dimensions see RLC2IC data sheet available at [RLS media center.](#)*
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

### LM10

- For M3 fasteners
- R20min dynamic
- R10min static

### LM13

- 2x M3 THRU
- R20min dynamic
- R10min static

---

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MR034C

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 poles, 2 mm width</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
</tr>
</tbody>
</table>

No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Outer diameter (mm)</td>
<td>34 ± 0.1</td>
</tr>
<tr>
<td>Inner diameter (mm)</td>
<td>20.5 H7</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>2 ± 0.1</td>
</tr>
<tr>
<td>Mass (g)</td>
<td>6</td>
</tr>
<tr>
<td>System error (°)</td>
<td>±0.17</td>
</tr>
<tr>
<td>Moment of inertia (gmm²)</td>
<td>450</td>
</tr>
<tr>
<td>Material of magnetic layer</td>
<td>CPE</td>
</tr>
<tr>
<td>Hub material</td>
<td>EN1.4016 / AISI 430</td>
</tr>
<tr>
<td>Hub thermal expansion coefficient (CTE)</td>
<td>$10 \times 10^{-6}$ K⁻¹</td>
</tr>
</tbody>
</table>

Maximum speed table

Refer to MR01D04

SDE (typical measured value)

![SDE Graph](image-url)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**RLB**

- 8 ±0.2
- 4 ±0.1
- For M1.6 fasteners

**RLC2HD**

- 8 ±0.2
- 3.8
- 2x Ø1.35

- 2 ±0.1
- 0.1 - 0.7

- 3.2 ±0.3
- 2 ±0.2

- 15.9 ±0.2
- Ø20.5 H7 (+0.021)
- 34 ±0.1

- 16 ±0.2
- Ø20.5 H7 (+0.021)
- 34 ±0.1
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

* For height dimensions see RLC2IC data sheet available at RLS media center.
MR045C

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 poles, 2 mm width</td>
<td>No Ri</td>
<td>No Ri</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
</tr>
</tbody>
</table>

Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

- **Outer diameter (mm)**: 45 ± 0.1
- **Inner diameter (mm)**: 28.5 H7
- **Height (mm)**: 2 ±0.1
- **Mass (g)**: 10
- **System error (°)**: ±0.13
- **Maximum speed table**: Refer to MR01D04

- **Moment of inertia (gmm²)**: 450
- **Material of magnetic layer**: CPE
- **Hub material**: EN1.4016 / AISI 430
- **Hub thermal expansion coefficient (CTE)**: $10 \times 10^{-6} \text{K}^{-1}$

SDE and crosstalk (typical measured value)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**RLB**

- 8 ±0.2
- 4 ±0.1
- 2
- 28.5 H7
- +0.021
- 0
- 45 ±0.1
- For M1.6 fasteners

**RLC2HD**

- 8 ±0.2
- 3.8
- 11.3
- 2x Ø1.35
- 0.1 - 0.7
- 12.5 ±0.2
- 2 ±0.1
- 0.1 ±0.7
- 2 ±0.2
- 4 ±0.2
- 3.8
- 2 ±0.2
- 21 ±0.2
- 3 ±0.3
- 2 ±0.2
- 21.7 ±0.2
- 4 ±0.2
- 2 ±0.4
- Ø28.5 H7 (+0.021)
- Ø45 ±0.1
- Ø28.5 H7 (+0.021)
- Ø45 ±0.1
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

* For height dimensions see RLC2IC data sheet available at RLS media center.
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.
MR049N

Compatibility table

<table>
<thead>
<tr>
<th>Outer diameter (mm)</th>
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<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner diameter (mm)</td>
<td>25 H7</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
<td></td>
</tr>
<tr>
<td>Height (mm)</td>
<td>2 ±0.1</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
<td></td>
</tr>
<tr>
<td>Mass (g)</td>
<td>13</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
<td></td>
</tr>
<tr>
<td>System error (°)</td>
<td>±0.11</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
<td></td>
</tr>
<tr>
<td>Maximum speed table</td>
<td>Refer to MR01D04</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
<td></td>
</tr>
</tbody>
</table>

Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

- Outer diameter (mm): 49 ± 0.
- Inner diameter (mm): 25 H7
- Height (mm): 2 ±0.1
- Mass (g): 13
- System error (°): ±0.11

- Moment of inertia (gmm²): 3.500
- Material of magnetic layer: CPE
- Hub material: EN1.4016 / AISI 430
- Hub thermal expansion coefficient (CTE): 10 × 10⁻⁶ K⁻¹

SDE and crosstalk (typical measured value)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**RLB**

- 8 ±0.2
- 4 ±0.1
- 2
- 0.1 - 0.7
- 2.5
- 14 ±0.2
- 2 ±0.1
- 23.5 ±0.2
- 3.2 ±0.2
- 4 ±0.2
- \( \varnothing 25 \text{ H7} +0.021 \) 0
- \( \varnothing 49 \pm 0.1 \)

For fasteners
M2.5 ISO 7046

**RLC2HD**

- 8 ±0.2
- 3.8
- 2x \( \varnothing 1.35 \)
- 3 ±0.2
- 4 ±0.2
- 21 ±0.4
- \( \varnothing 25 \text{ H7} +0.021 \) 0
- \( \varnothing 49 \pm 0.1 \)

For fasteners
M2.5 ISO 7046

For M1.6 fasteners

2 ±0.1

8 ±0.2

3.2

8 ±0.2

Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**RLC2IC**

- Ø 4.9
- 20 ±0.3
- 15 ±0.1
- H ±0.1
- 0.1 - 0.7
- 4 ±0.6
- 2 ±0.2
- 22.6 ±0.2
- 4 ±0.6
- 10 ±0.2
- Ø 25 H7
- 31
- Ø 49 ±0.1

For fasteners M2.5 ISO 7046

**RLM**

- 0.1 - 0.7
- 12
- 10
- 8.5
- 1.1 ±0.1
- 5 ±0.2
- 24 ±0.2
- 5

For fasteners M2.5 ISO 7046

* For height dimensions see RLC2IC data sheet available at [RLS media center](#).

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Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

For M3 fasteners

R20min dynamic
R10min static

For fasteners
M2.5 ISO 7046

LM10

LM13
MR050C

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>72 poles, 2 mm width</td>
<td>No Ri</td>
<td>No Ri</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
</tr>
</tbody>
</table>

Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

- **Outer diameter (mm)**: 50 ± 0.1
- **Inner diameter (mm)**: 40 H7 (+0.025/0)
- **Height (mm)**: 2 ±0.1
- **Mass (g)**: 8
- **System error (°)**: ±0.11
- **Maximum speed table**: Refer to MR01D04
- **Moment of inertia (gmm²)**: 3.880
- **Material of magnetic layer**: CPE
- **Hub material**: EN 1.4305 / AISI 303
- **Hub thermal expansion coefficient (CTE)**: $10 \times 10^{-6} \text{ K}^{-1}$

SDE and crosstalk (typical measured value)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

For M1.6 fasteners
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

For height dimensions see RLC2IC data sheet available at RLS media center.
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**LM10**

- For M3 fasteners
- R20min dynamic
- R10min static

**LM13**

- 2x M3 THRU
- R20min dynamic
- R10min static
MR061C

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>92 poles, 2 mm width</td>
<td>No Ri</td>
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<td>-</td>
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<td>Ri</td>
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</table>

Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter (mm)</td>
<td>61.3 ±0.1</td>
<td>51.3 H7</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Inner diameter (mm)</td>
<td>51.3 H7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (mm)</td>
<td>2 ±0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass (g)</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>System error (*)</td>
<td>±0.09</td>
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<td></td>
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<tr>
<td>Maximum speed table</td>
<td>Refer to MR01D04</td>
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</tr>
<tr>
<td>Moment of inertia (gmm²)</td>
<td>7.560</td>
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<tr>
<td>Material of magnetic layer</td>
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<td></td>
</tr>
<tr>
<td>Hub material</td>
<td>EN 1.4016 / AISI 430</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hub thermal expansion coefficient (CTE)</td>
<td>$10 \times 10^{-6}$ K$^{-1}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SDE and crosstalk (typical measured value)

![Graph of SDE and crosstalk vs. ride height](image-url)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLB

RLC2HD

For M1.6 fasteners

2x 1.35

8 ±0.2

3.8

2 ±0.2

2 ±0.1

12.5 ±0.2

2 ±0.1

20.6 ±0.2

2 ±0.4

61.3 ±0.1

51.3 H7

H ±0.030

0
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**RLC2IC**

- Ø 4.9
- 20 ±0.3
- 2.8
- 15 ±0.1
- 2.6
- 0.1 - 0.7

**RLM**

- 12
- 10
- 8.5
- 11
- 2 ±0.1
- 0.1 - 0.7

* For height dimensions see RLC2IC data sheet available at RLS media center.
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**LM10**
- For M3 fasteners
- R20min dynamic R10min static

**LM13**
- 2x M3 THRU
- R20min dynamic R10min static
MR080N

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>122 poles, 2 mm width</td>
<td>No Ri</td>
<td>No Ri</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
</tr>
</tbody>
</table>

Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter (mm)</td>
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<tr>
<td>Inner diameter (mm)</td>
<td>55 H7</td>
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<tr>
<td>Height (mm)</td>
<td>2 ± 0.1</td>
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<tr>
<td>Mass (g)</td>
<td>24</td>
</tr>
<tr>
<td>System error (*)</td>
<td>± 0.07</td>
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<tr>
<td>Moment of inertia (gmm²)</td>
<td>32.700</td>
</tr>
<tr>
<td>Material of magnetic layer</td>
<td>CPE</td>
</tr>
<tr>
<td>Hub material</td>
<td>EN 1.4016 / AISI 430</td>
</tr>
<tr>
<td>Hub thermal expansion coefficient (CTE)</td>
<td>$10 \times 10^{-6} \text{ K}^{-1}$</td>
</tr>
</tbody>
</table>

Maximum speed table Refer to MR01D04

SDE and crosstalk (typical measured value)

![SDE and Crosstalk Graphs]
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLB

For fasteners

M2.5 ISO 7046

For M1.6 fasteners
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLC2HD

For fasteners M2.5 ISO 7046
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLC2IC

* For height dimensions see RLC2IC data sheet available at RLS media center.
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLM

For fasteners
M2.5 ISO 7046
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**LM10**

- **For M3 fasteners**
  - R20min dynamic
  - R10min static

For fasteners M2.5 ISO 7046

- **Part-Nr.**

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**MR080N**
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

LM13

For fasteners M2.5 ISO 7046

R20min dynamic
R10min static
MR100S

Compatibility table

<table>
<thead>
<tr>
<th></th>
<th>LM10</th>
<th>LM13</th>
<th>LM15</th>
<th>RLB</th>
<th>RLC2HD</th>
<th>RLC2IC</th>
<th>RLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>152 poles, 2 mm width</td>
<td>No Ri</td>
<td>No Ri</td>
<td>-</td>
<td>No Ri</td>
<td>No Ri</td>
<td>Ri</td>
<td>Ri</td>
</tr>
</tbody>
</table>

Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter (mm)</td>
<td>100 ±0.1</td>
</tr>
<tr>
<td>Inner diameter (mm)</td>
<td>71 H7</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>4 ±0.1</td>
</tr>
<tr>
<td>Mass (g)</td>
<td>95</td>
</tr>
<tr>
<td>System error (°)</td>
<td>±0.05</td>
</tr>
<tr>
<td>Maximum speed table</td>
<td>Refer to MR01D04</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moment of inertia (gmm²)</td>
<td>180.000 gmm²</td>
</tr>
<tr>
<td>Material of magnetic layer</td>
<td>CPE</td>
</tr>
<tr>
<td>Hub material</td>
<td>EN 1.4021 / AISI 420</td>
</tr>
<tr>
<td>Hub thermal expansion coefficient (CTE)</td>
<td>11 × 10⁻⁶ K⁻¹</td>
</tr>
</tbody>
</table>

SDE and crosstalk (typical measured value)

![Graph showing SDE and crosstalk](image-url)
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLB

For M1.6 fasteners

A RENISHAW® associate company
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLC2HD
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLC2IC

* For height dimensions see RLC2IC data sheet available at RLS media center.
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

RLM
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

**LM10**

For M3 fasteners
R20min dynamic
R10min static
Dimensions and installation drawings

Dimensions and tolerances are in mm. Drawings show the positive direction of rotation of the ring and not the readhead.

LM13
# Part numbering

<table>
<thead>
<tr>
<th>Series</th>
<th>MR - Magnetic incremental ring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter</td>
<td></td>
</tr>
<tr>
<td>020</td>
<td>20 mm</td>
</tr>
<tr>
<td>024</td>
<td>24 mm</td>
</tr>
<tr>
<td>026</td>
<td>26 mm</td>
</tr>
<tr>
<td>034</td>
<td>34 mm</td>
</tr>
<tr>
<td>045</td>
<td>45 mm</td>
</tr>
<tr>
<td>Cross section</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Height 2 mm, axial magnetisation</td>
</tr>
<tr>
<td>N</td>
<td>Height 2 mm, axial magnetisation (installation with fasteners)</td>
</tr>
<tr>
<td>S</td>
<td>Height 4 mm, axial magnetisation (installation with fasteners)</td>
</tr>
<tr>
<td>Inner diameter</td>
<td></td>
</tr>
<tr>
<td>012</td>
<td>12 mm</td>
</tr>
<tr>
<td>015</td>
<td>15 mm</td>
</tr>
<tr>
<td>016</td>
<td>16 mm</td>
</tr>
<tr>
<td>020</td>
<td>20 mm</td>
</tr>
<tr>
<td>025</td>
<td>25 mm</td>
</tr>
<tr>
<td>Reference mark</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>With reference mark</td>
</tr>
<tr>
<td>B</td>
<td>Without reference mark</td>
</tr>
<tr>
<td>Number of poles</td>
<td></td>
</tr>
<tr>
<td>026</td>
<td>26 poles</td>
</tr>
<tr>
<td>032</td>
<td>32 poles</td>
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<tr>
<td>036</td>
<td>36 poles</td>
</tr>
<tr>
<td>048</td>
<td>48 poles</td>
</tr>
<tr>
<td>064</td>
<td>64 poles</td>
</tr>
<tr>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Stainless steel hub with bonded rubber tape (–40 °C to +100 °C)</td>
</tr>
<tr>
<td>B</td>
<td>Stainless steel hub with vulcanised elasto-ferrite layer (–40 °C to +160 °C)</td>
</tr>
<tr>
<td>Special requirements</td>
<td></td>
</tr>
<tr>
<td>00</td>
<td>No special requirements</td>
</tr>
<tr>
<td>02</td>
<td>With back adhesion tape</td>
</tr>
</tbody>
</table>

Not all part number combinations are valid. The inner diameter of rings is related to the outer diameter and cannot be randomly selected. Please refer to the table of available combinations on the next page.
### Table of available combinations

<table>
<thead>
<tr>
<th>Series</th>
<th>Outer diameter</th>
<th>Cross section</th>
<th>Inner diameter</th>
<th>Reference mark</th>
<th>Number of poles</th>
<th>Material</th>
<th>Special requirements</th>
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</thead>
<tbody>
<tr>
<td>MR</td>
<td>020</td>
<td>C</td>
<td>012</td>
<td>B</td>
<td>026</td>
<td>A</td>
<td>00 / 02</td>
</tr>
<tr>
<td></td>
<td>024</td>
<td></td>
<td>015</td>
<td></td>
<td>032</td>
<td>B</td>
<td></td>
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<td>026</td>
<td></td>
<td>016</td>
<td></td>
<td>036</td>
<td>A</td>
<td>00</td>
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<tr>
<td></td>
<td>026</td>
<td></td>
<td>012</td>
<td></td>
<td>036</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>034</td>
<td></td>
<td>020</td>
<td></td>
<td>048</td>
<td>A</td>
<td>00 / 02</td>
</tr>
<tr>
<td></td>
<td>045</td>
<td></td>
<td>028</td>
<td></td>
<td>064</td>
<td>A</td>
<td></td>
</tr>
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<td></td>
<td>049</td>
<td>N</td>
<td>025</td>
<td>A / B</td>
<td>072</td>
<td>A</td>
<td>00</td>
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<td>C</td>
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<td></td>
<td></td>
<td></td>
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<td>100</td>
<td>S</td>
<td>071</td>
<td></td>
<td>152</td>
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</tbody>
</table>

### Accessories

- **Magnet viewer**
- **MM0001**
Head office

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Slovenia

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Document issues

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>4. 8. 2021</td>
<td>General</td>
<td>Humidity amended, RLC2IC amended</td>
</tr>
<tr>
<td>05</td>
<td>14.3.2023</td>
<td>2</td>
<td>Selection guide table amended</td>
</tr>
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<td></td>
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<td>6</td>
<td>Reference mark engraving note added</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>RLC2IC installation drawings for MR024C amended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>General</td>
<td>Inner diameter for MR050C amended</td>
</tr>
</tbody>
</table>

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