MR
Axial Incremental Magnetic Rings

VARIOUS SIZES AND MOUNTING OPTIONS

ROBUST DESIGN

EASY TO MOUNT

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

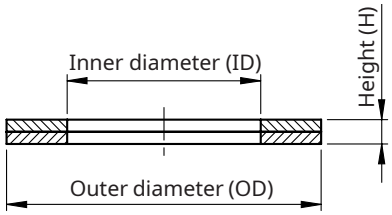
General information

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.

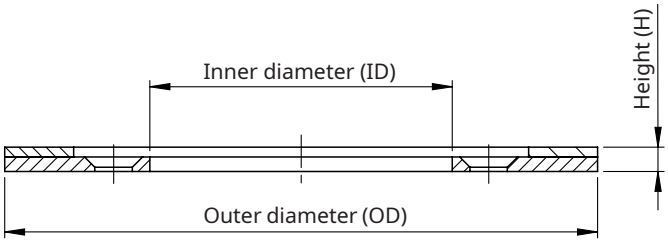
Various inner diameters are supported ranging from 12 mm to 257 mm. Axial magnetic rings can be installed with adhesive tape, fasteners or by gluing.

Selection guide

Cross-section C



Cross-section N and S (with attachment holes)



Ring	OD [mm]	ID [mm]	H [mm]	Compatibility with readheads					
				LM10	LM13	RLB2	RLC2HD	RLC2IC	RLM2
MR020C	19.5 ±0.1	12 H7	2 ±0.1	-	-	No Ri	No Ri	No Ri	No Ri
MR024C	24 ±0.1	15 H7	2 ±0.1	-	-	No Ri	No Ri	No Ri	No Ri
MR026C	26 ±0.1	12 H7	2 ±0.1	No Ri	No Ri	No Ri	No Ri	No Ri	No Ri
	26 ±0.1	16 ±0.05	2 ±0.1	No Ri	No Ri	No Ri	No Ri	No Ri	No Ri
MR034C	34 ±0.1	20.5 H7	2 ±0.1	-	-	No Ri	No Ri	No Ri	No Ri
MR045C	45 ±0.1	28.5 H7	2 ±0.1	No Ri	No Ri	No Ri	No Ri	Ri	Ri
MR049N	49 ±0.1	25 H7	2 ±0.1	No Ri	No Ri	No Ri	No Ri	Ri	Ri
MR050C	50 ±0.1	40 H7	2 ±0.1	No Ri	No Ri	No Ri	No Ri	Ri	Ri
MR061C	61.3 ±0.1	51.3 H7	2 ±0.1	No Ri	No Ri	No Ri	No Ri	Ri	Ri
MR080N	80 ±0.1	55 H7	2 ±0.1	No Ri	No Ri	No Ri	No Ri	Ri	Ri
MR100S	100 ±0.1	71 H7	4 ±0.1	No Ri	No Ri	No Ri	No Ri	Ri	Ri
MR282N	262 h6	257 ±0.2	3 ±0.1	-	-	-	-	-	Ri

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

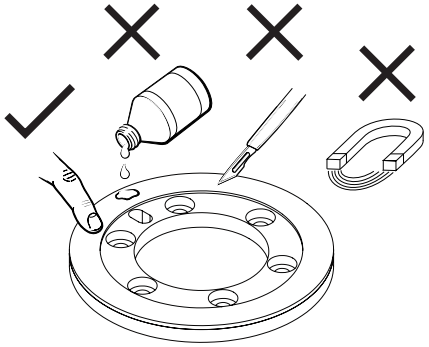
CPE: –40 °C to +100 °C
–40 °C to +85 °C (for MR282N)
HNBR: –40 °C to +160 °C

Operating temperature

CPE: –40 °C to +100 °C
HNBR: –40 °C to +160 °C

Humidity

High resistance to humidity



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

Important handling and installation notice

To ensure proper function and avoid damage, please observe the following precautions when handling and installing the magnetic encoder system:

Handle with care. Do not use industrial tools (e.g. magnetic bases or heavy-duty equipment) near the product, as strong magnetic fields or mechanical force can damage sensitive components.

Do not use impact tools. Tools such as drifts, punches, or similar are strictly prohibited during installation, especially for adjusting run-out.

Ensure proper alignment. Incorrect assembly of the readhead and ring can impair system performance and lead to premature wear or permanent damage.

Respect tolerances. Always follow the specified distance and angular alignment tolerances precisely.

Avoid contact. The readhead must not touch the ring at any point during rotation. Physical contact may damage the ring surface.

Do not heat the ring. Induction heating can alter the magnetic pattern and must not be used under any circumstances.

Keep packaged until use. Leave the product in its original packaging until it is ready for final installation to prevent contamination or accidental damage.

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.

Accuracy of ring encoder systems

The accuracy of the ring encoder measurement is influenced by **encoder accuracy errors** and i**nstallation-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.

Ring	System error [°]	Ring	System error [°]	Ring	System error [°]
	Over the entire RH		Over the entire RH		Over the entire RH
MR020C	±0.31	**MR034C**	±0.17	**MR061C***	±0.09
MR024C	±0.25	**MR045C**	±0.13	**MR080N**	±0.07
MR026C* ID12	±0.23	**MR049N**	±0.11	**MR100S**	±0.05
MR026C ID16	±0.23	**MR050C***	±0.11	**MR282N**	±0.05

* 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].

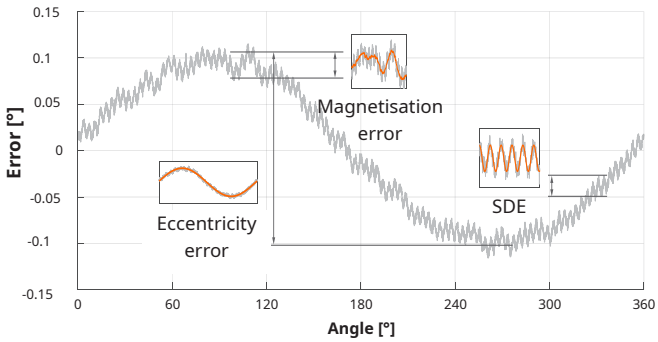


Fig. 1. Typical accuracy error plot.

D [mm]	A_M [°]
20	±0.229
40	±0.115
60	±0.076

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.

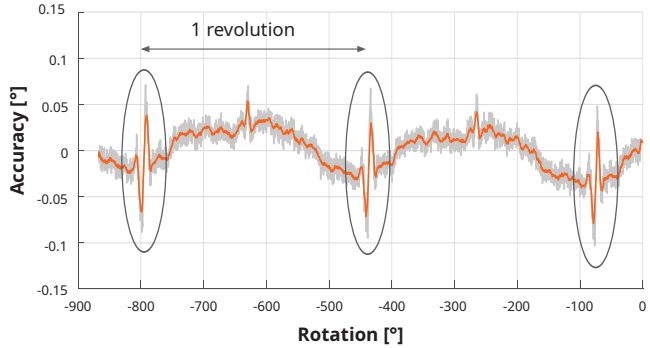


Fig. 2. Crosstalk representation. The crosstalk (Ri magnetisation) is circled.

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

OD [mm]	SDE [°]
20	±0.029
40	±0.014
60	±0.009

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).

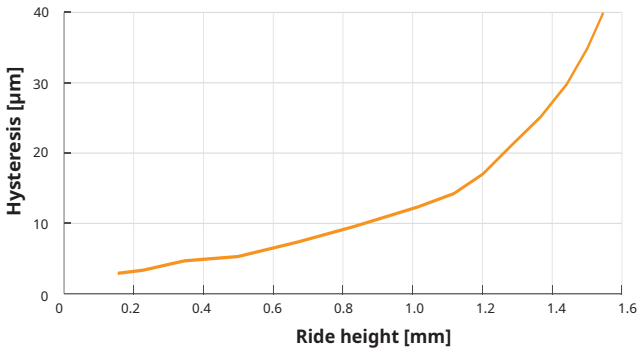


Fig. 3. Hysteresis vs. ride height (for encoder systems with 2 mm pole length).

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

$$E_{accuracy} = \pm 0.114 \frac{e}{D}$$

where $E_{accuracy}$ 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].

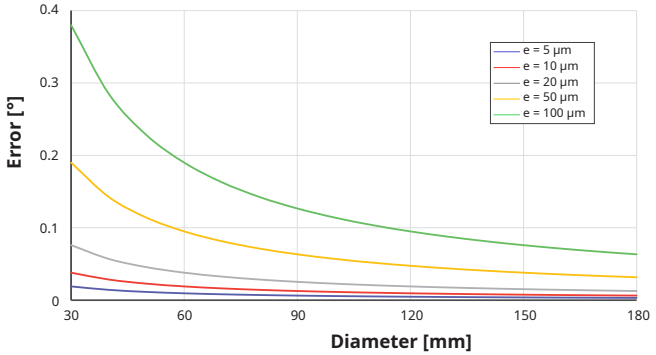


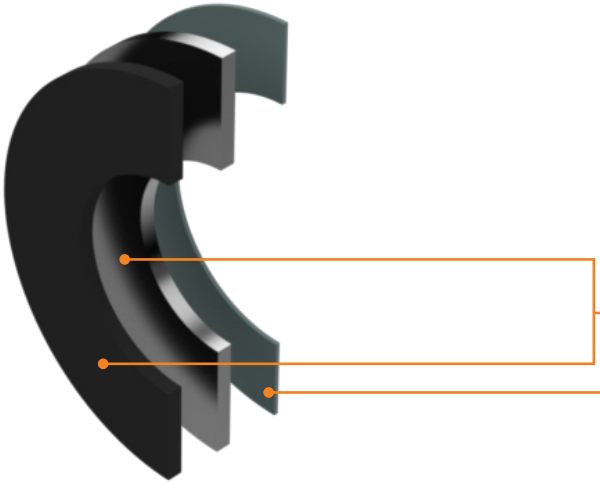
Fig. 4. Influence of installation eccentricity on accuracy.

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.

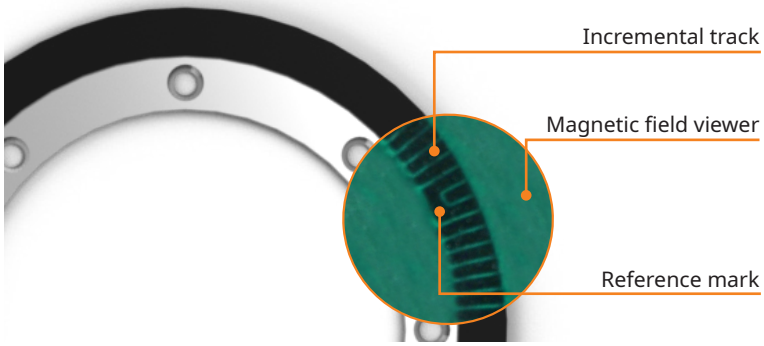
Magnetic ring design

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.



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

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.

Ring		Serial number	Reference mark	Logo	Part number
MR020C					
MR024C					
MR026C	ID12	✓			
MR026C	ID16				
MR034C		✓			
MR045C		✓	✓		
MR049N		✓	✓	✓	✓
MR050C		✓	✓		
MR061C		✓	✓		
MR080N		✓	✓	✓	✓
MR100S		✓	✓	✓	✓
MR282N		✓	✓	✓	✓

Reference mark sign

YD1B70

Serial number example - unique combination of six letters and digits

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:

Axial ring		Outer diameter - OD [mm]		Inner diameter - ID [mm]		Installation (shaft) diameter - Ds [mm]	
MR020C		19.5	+0.1 –0.1	12 H7	+0.018 0	12 f7	–0.016 –0.034
MR024C		24	+0.1 –0.1	15 H7	+0.018 0	15 f7	–0.016 –0.034
MR026C	**ID16**	26	+0.1 –0.1	16	+0.05 –0.05	15.9	–0.05 –0.15
MR026C	**ID12**	26	+0.1 –0.1	12 H7	+0.018 0	12 7	–0.016 –0.034
MR034C		34	+0.1 –0.1	20.5 H7	+0.021 0	20.5 f7	–0.02 –0.041
MR045C		45	+0.1 –0.1	28.5 H7	+0.021 0	28.5 f7	-0.02 –0.041
MR049N		49	+0.1 –0.1	25 H7	+0.021 0	25 f7	–0.02 –0.041
MR050C		50	+0.1 –0.1	40 H7	+0.025 0	39.9	+0.05 0
MR061C		61.3	+0.1 –0.1	51.3 H7	+0.1 –0.1	51.2 f7	–0.015 –0.025
MR080N		80	+0.1 –0.1	55 H7	+0.030 0	55 f7	–0.03 –0.06
MR0100S		100	+0.1 –0.1	71 H7	+0.030 0	71 f7	–0.03 –0.06
MR282N		282 h7	0 –0.052	257	+0.2 –0.2	282 G6	0.049 0.017

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

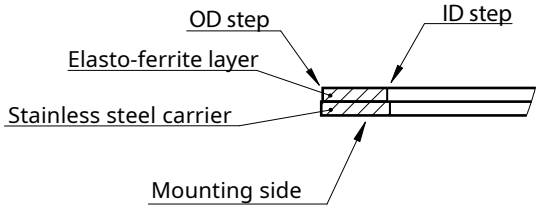
Recommended ride height table

Installation at the recommended ride height results in better encoder system performance, such as lower SDE and higher accuracy. Please refer to the table below for the recommended ride height values. The readheads are calibrated at these values. The maximum range of installation tolerances for the ride height is shown in the drawings of the individual rings and readheads.

Readhead	LM10	LM13	RLB	RLC2HD	RLC2IC	RLM
Recommended ride height [mm]	0.3	0.3	0.3	0.3	0.3	0.3

Mechanical details

When installing the readhead refer to the stainless steel carrier / hub, not the elasto-ferrite layer. This is particularly important for systems with reference mark which is always positioned on the inner edge of the ring.



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).

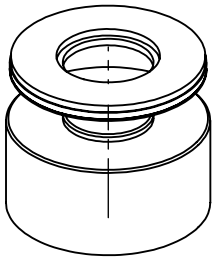
For additional information refer to “Surface Preparation for 3M™ VHB™ Tape Applications”, article available at **www.3m.com**.

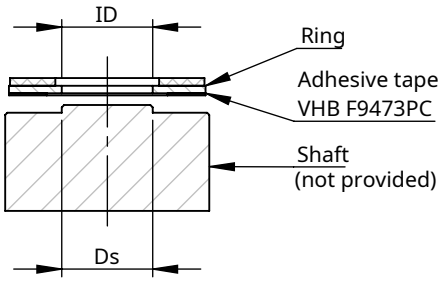
Application

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.

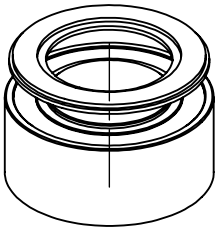


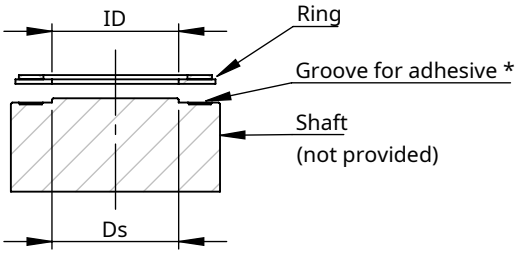


Installation by gluing

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.





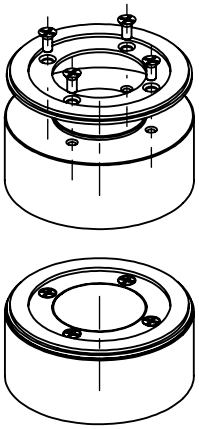
* Dimensions according to adhesive specification.

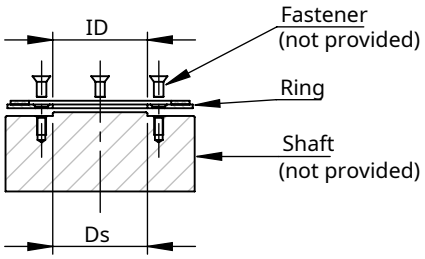
Installation with fasteners

Application

Installation with fasteners is possible for rings MR049N, MR080N, MR100S and MR282. 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:

- MR049N, MR080N, MR100S: fasteners M2.5 (DIN EN ISO 7046): 0.3 Nm
- MR282: fasteners M2 DIN912, T = 0.35 Nm





MR020C

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
26 poles, 2 mm width	-	-	-	No Ri	No Ri	No Ri	No Ri

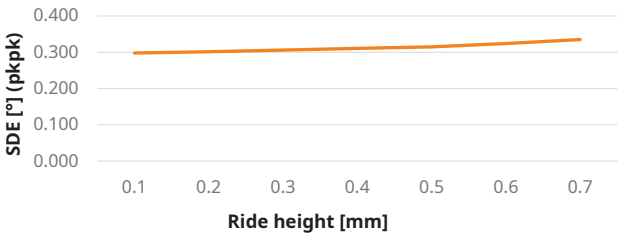
No Ri - No reference mark option, only incremental track available

Technical specifications

Outer diameter (mm)	19.5 ±0.1
Inner diameter (mm)	12 H7
Height (mm)	2 ±0.1
Mass (g)	2
System error (°)	±0.31
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	130
Material of magnetic layer	CPE
Hub material	EN1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	10×10^{-6} K^{-1}

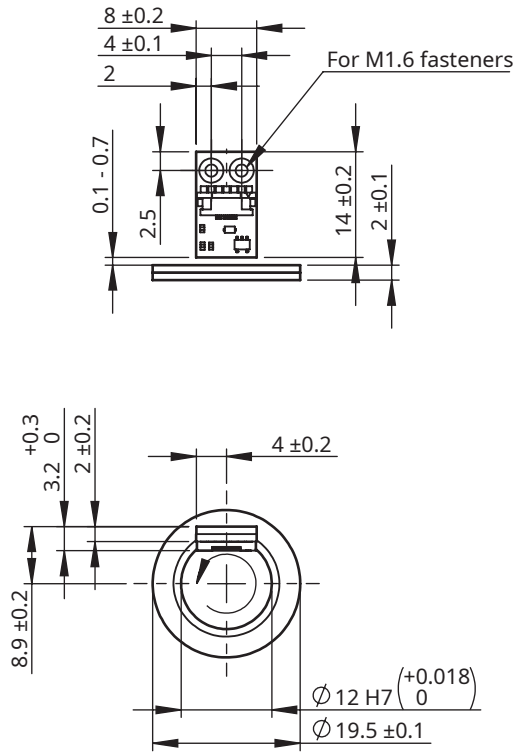
SDE (typical measured value)



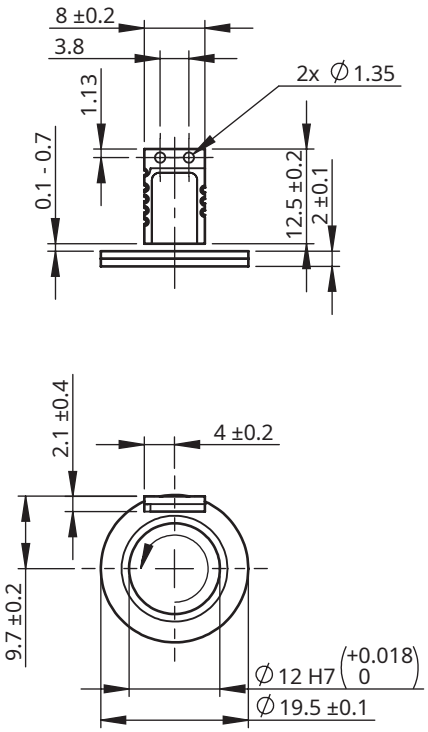
Dimensions and installation drawings

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

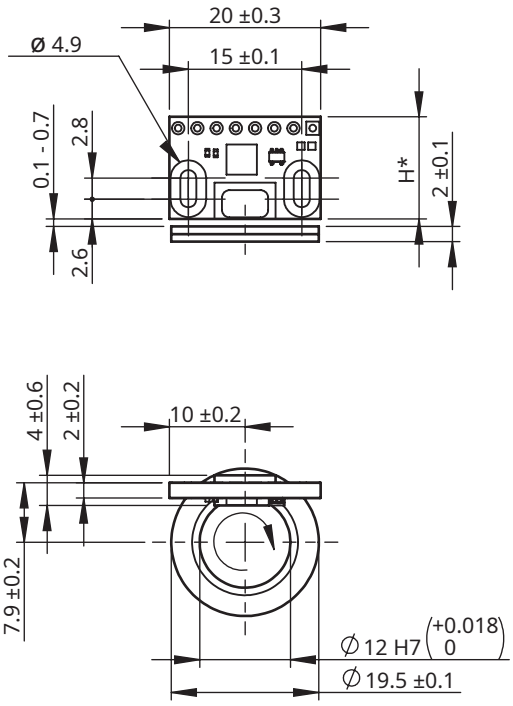
RLB



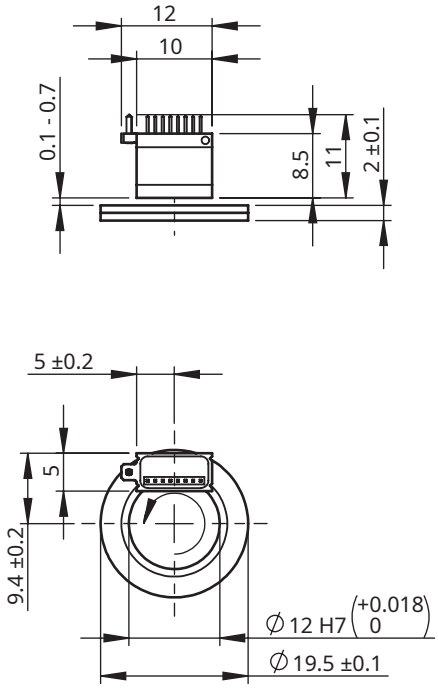
RLC2HD



RLC2IC



RLM



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

MR024C

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
32 poles, 2 mm width	-	-	-	No Ri	No Ri	No Ri	No Ri

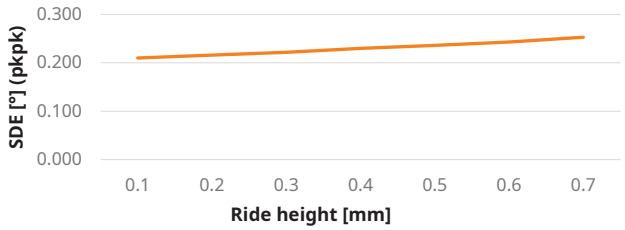
No Ri - No reference mark option, only incremental track available

Technical specifications

Outer diameter (mm)	24 ±0.1
Inner diameter (mm)	15 H7
Height (mm)	2 ±0.1
Mass (g)	3
System error (°)	±0.25
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	290
Material of magnetic layer	CPE
Hub material	EN1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	$10 \times 10^{-6}\ K^{-1}$

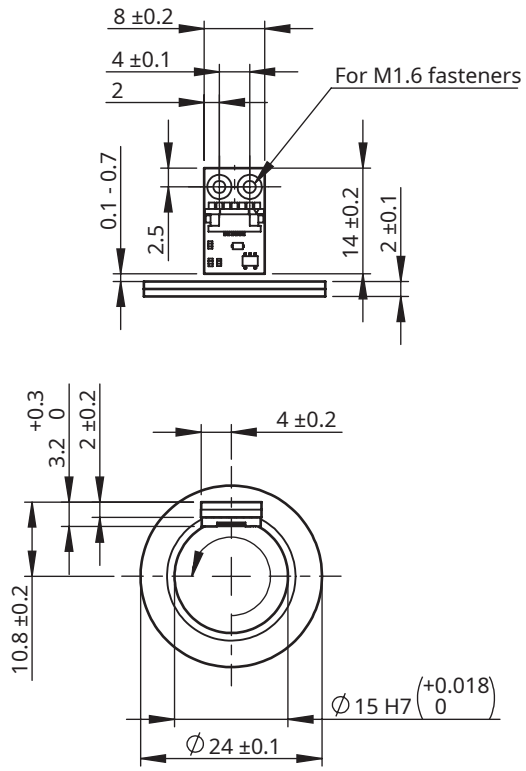
SDE (typical measured value)



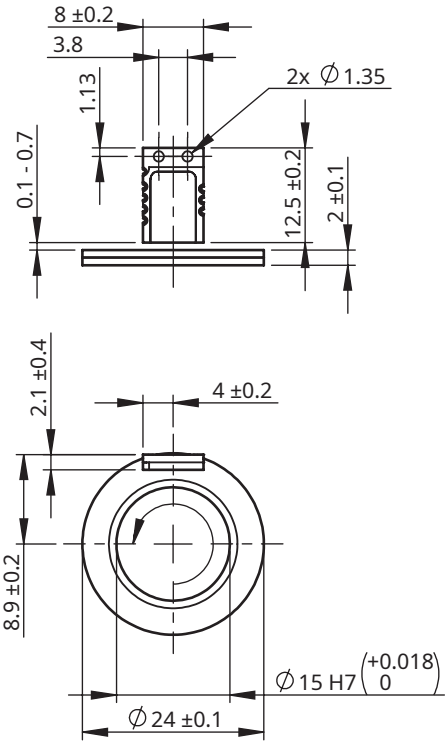
Dimensions and installation drawings

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

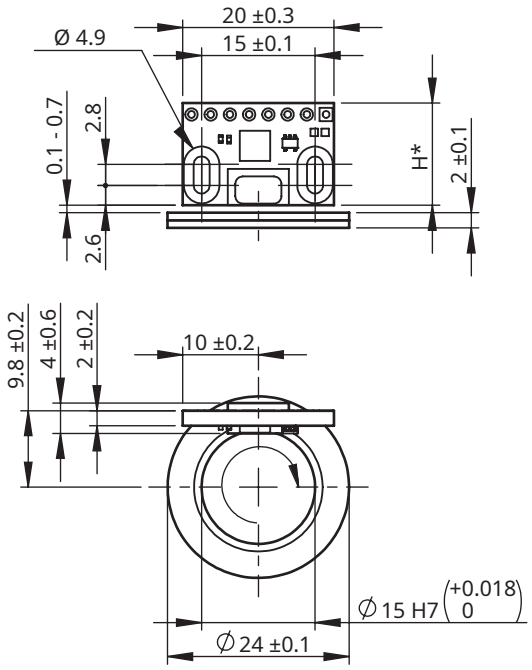
RLB



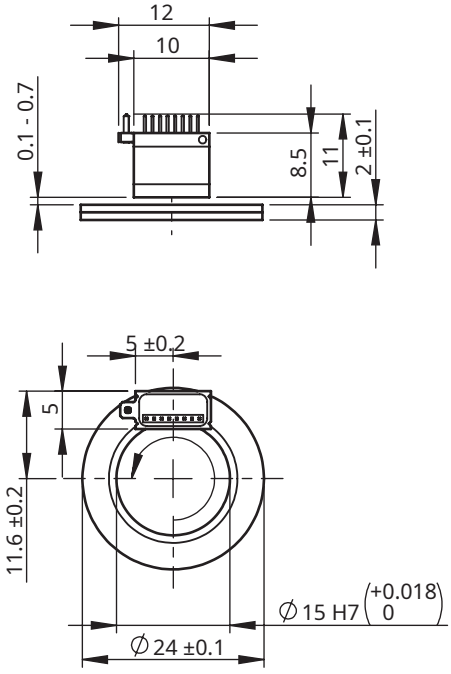
RLC2HD



RLC2IC



RLM



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

MR026C ID12

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
36 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	No Ri	No Ri

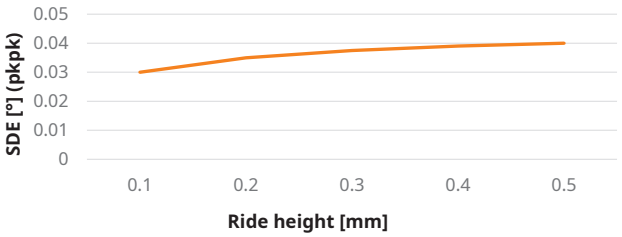
No Ri - No reference mark option, only incremental track available

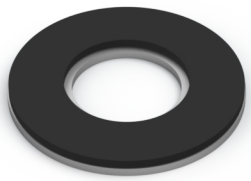
Technical specifications

Outer diameter (mm)	26 ±0.1
Inner diameter (mm)	12 H7
Height (mm)	2 ±0.1
Mass (g)	5
System error (°)	±0.23
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	450
Material of magnetic layer	CPE
Hub material	EN1.4305 / AISI 303
Hub thermal expansion coefficient (CTE)	$10 \times 10^{-6}\ K^{-1}$

SDE (typical measured value)

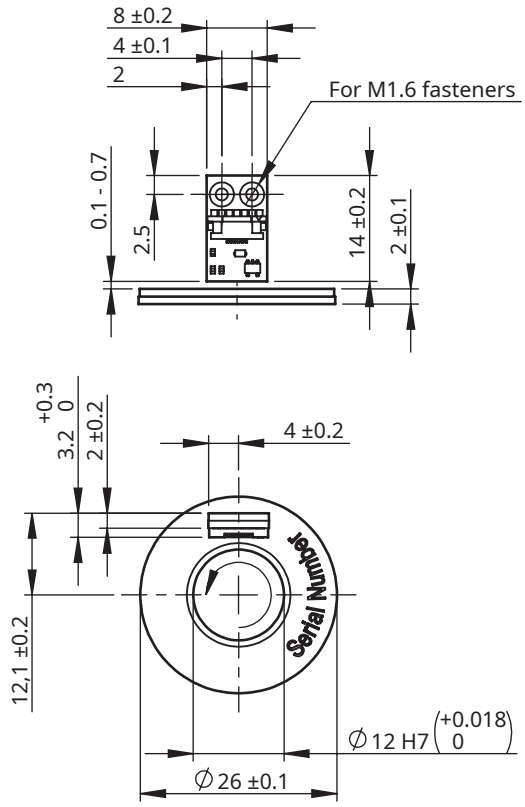




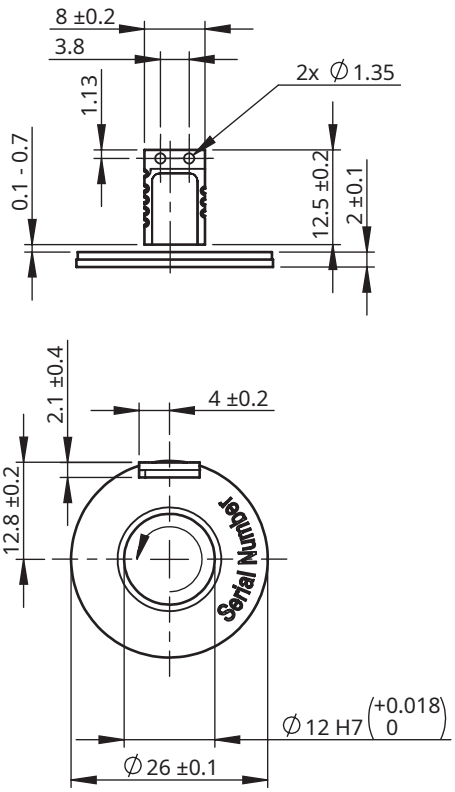
Dimensions and installation drawings

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

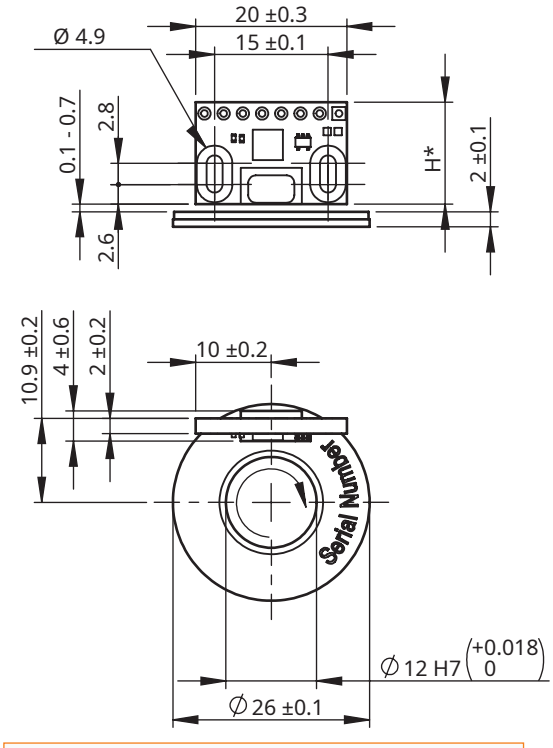
RLB



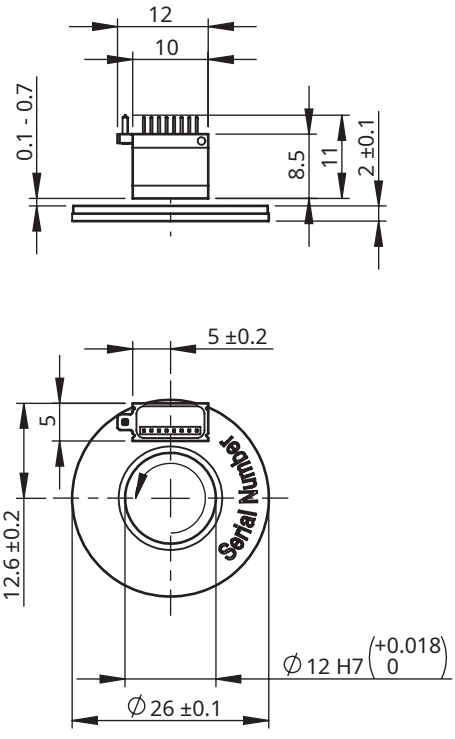
RLC2HD



RLC2IC



RLM

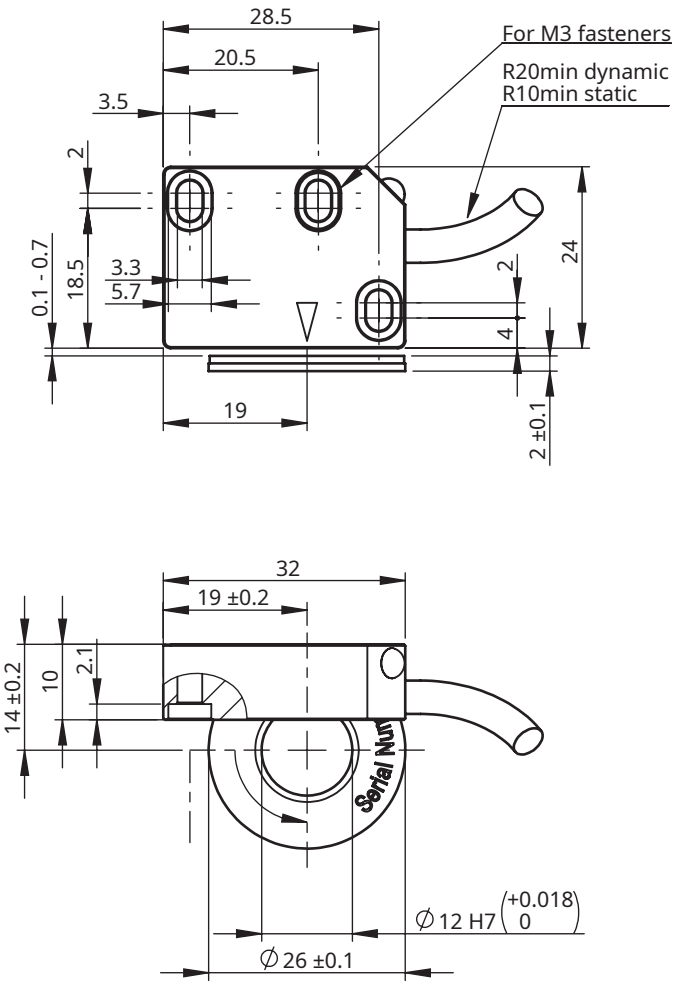


* For height dimensions see RLC2IC data sheet available at **RLS media center.**

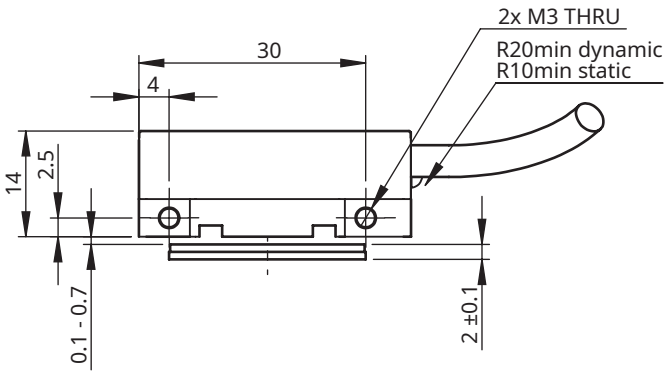
Dimensions and installation drawings

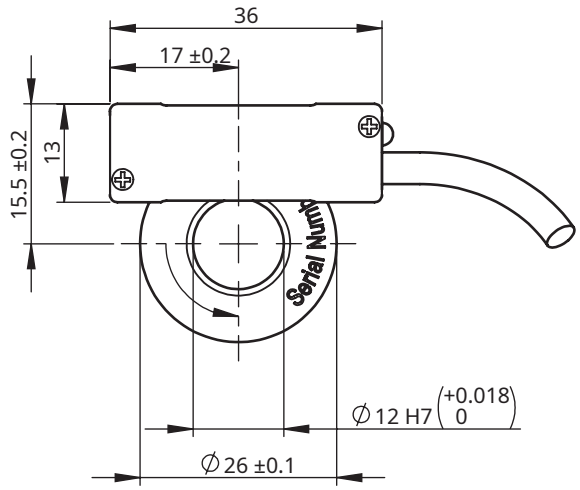
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

LM10



LM13





MR026C ID16

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
36 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	No Ri	No Ri

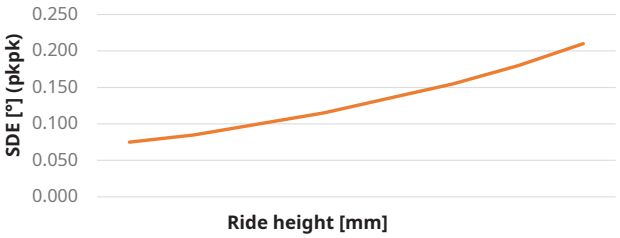
No Ri - No reference mark option, only incremental track available

Technical specifications

Outer diameter (mm)	26 ±0.1
Inner diameter (mm)	16 ±0.05
Height (mm)	2 ±0.1
Mass (g)	4
System error (°)	±0.23
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	450
Material of magnetic layer	HNBR + ferrite
Hub material	EN1.4305 / AISI 303
Hub thermal expansion coefficient (CTE)	$10 \times 10^{-6}\ K^{-1}$

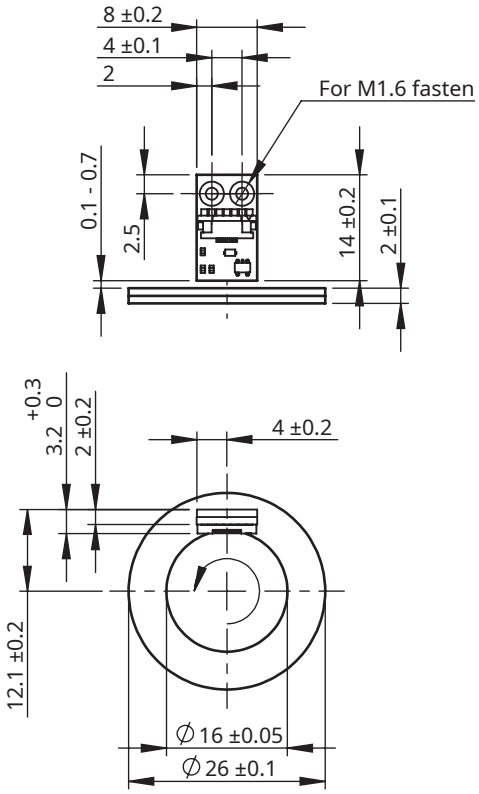
SDE (typical measured value)



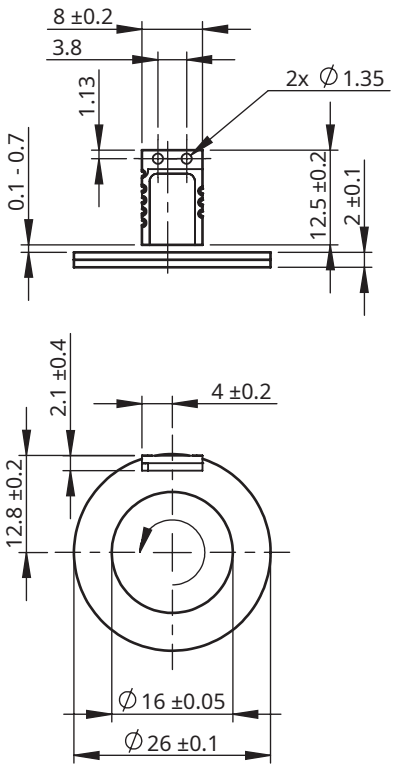
Dimensions and installation drawings

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

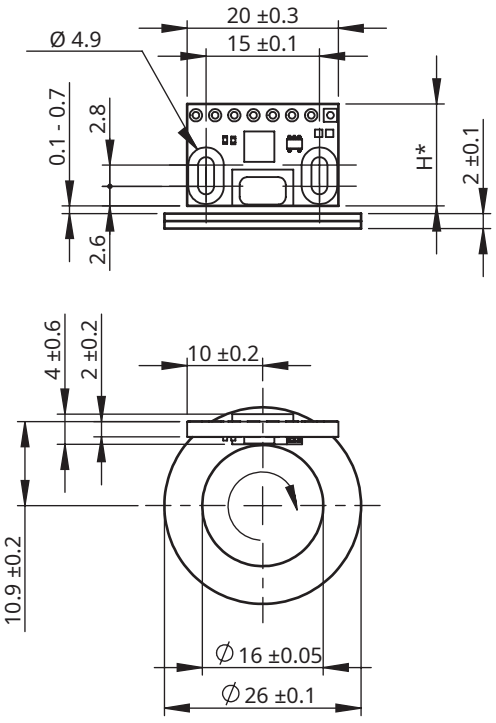
RLB



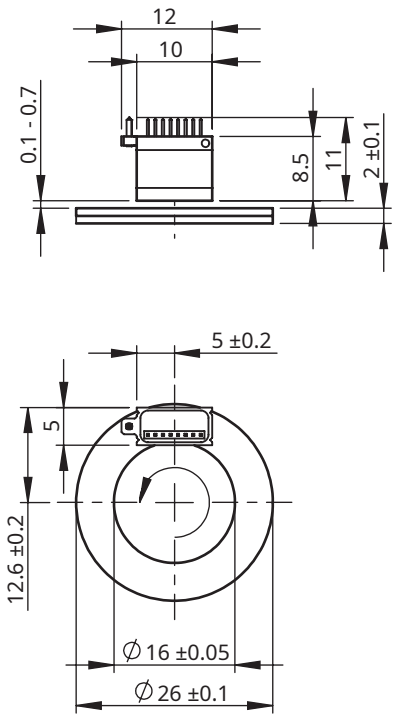
RLC2HD



RLC2IC



RLM

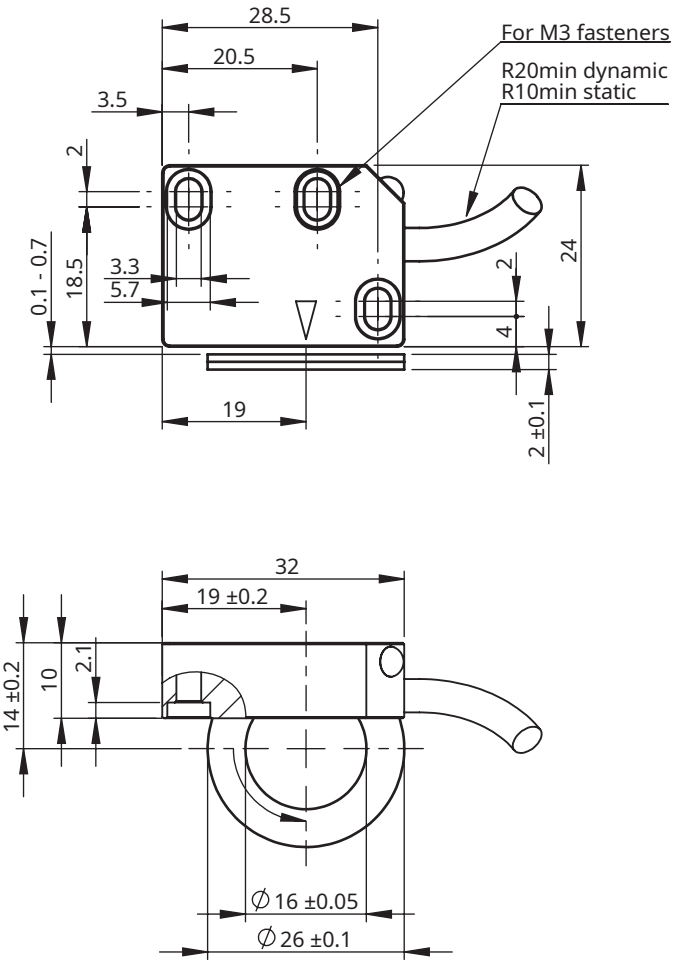


* For height dimensions see RLC2IC data sheet available at **RLS media center.**

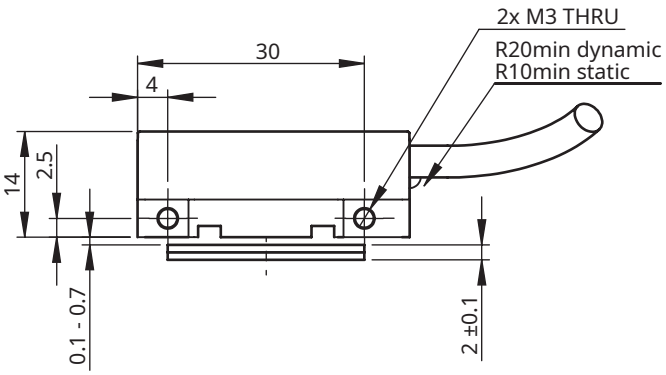
Dimensions and installation drawings

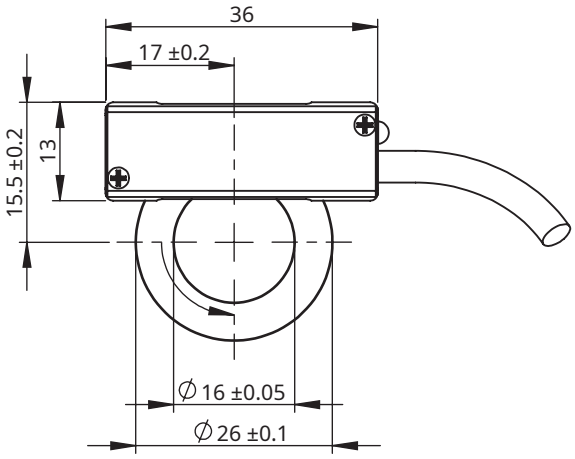
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

LM10



LM13





MR034C

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
48 poles, 2 mm width	-	-	-	No Ri	No Ri	No Ri	No Ri

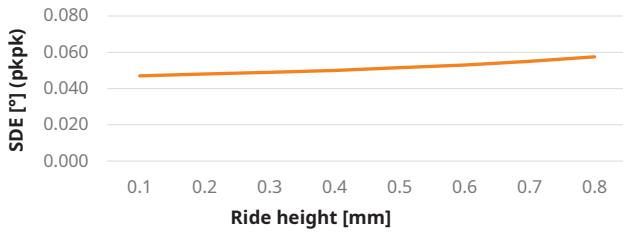
No Ri - No reference mark option, only incremental track available

Technical specifications

Outer diameter (mm)	34 ±0.1
Inner diameter (mm)	20.5 H7
Height (mm)	2 ±0.1
Mass (g)	6
System error (°)	±0.17
Maximum speed	Go to **Maximum speed calculator**

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

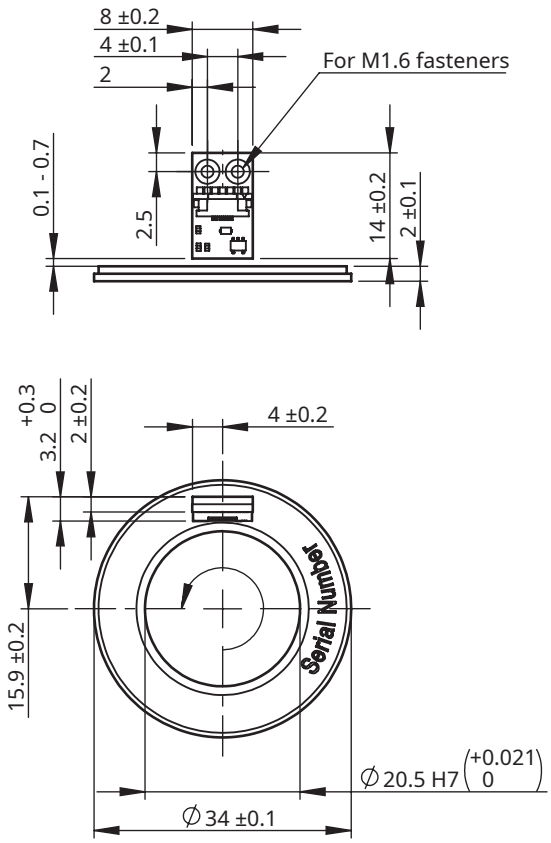
SDE (typical measured value)



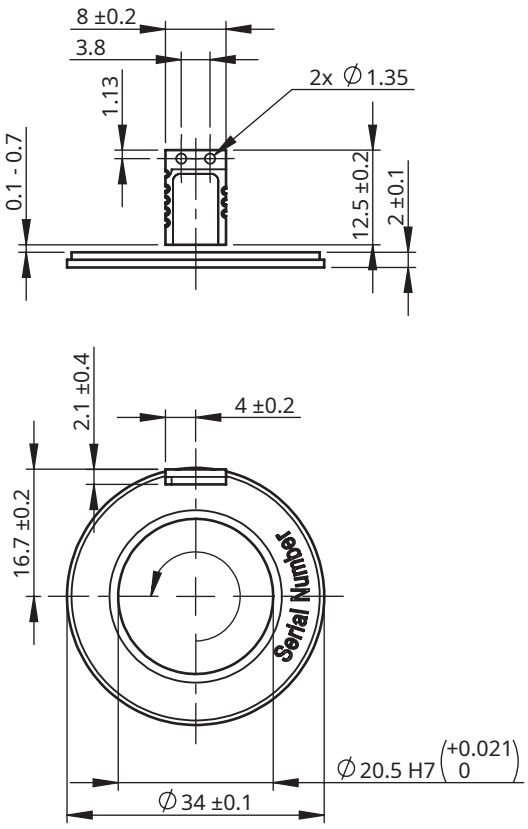
Dimensions and installation drawings

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

RLB



RLC2HD

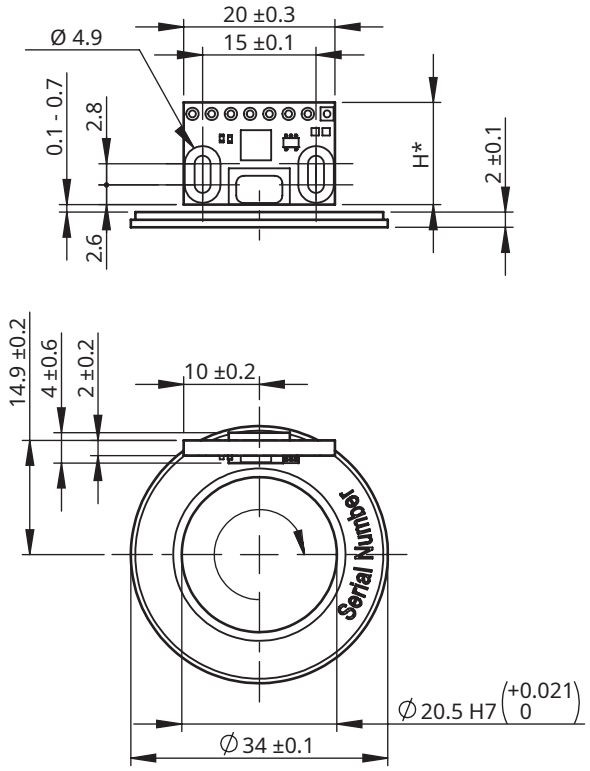


Dimensions and installation drawings

MR034C

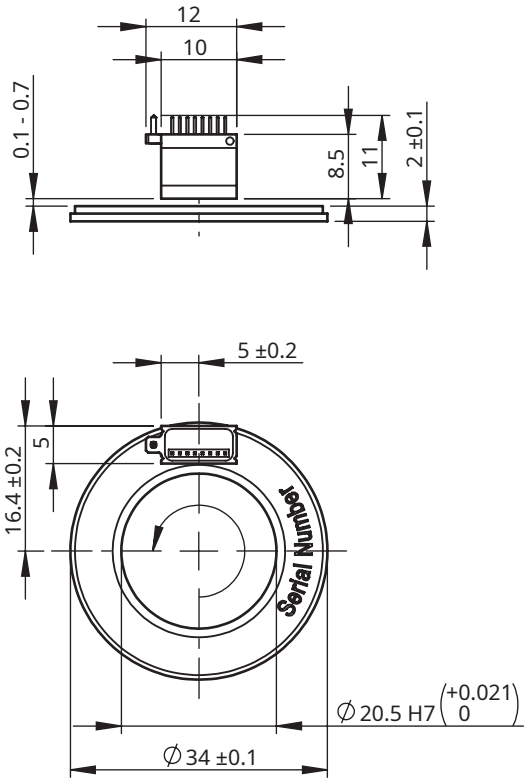
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

RLC2IC



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

RLM



MR045C

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
64 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	Ri	Ri

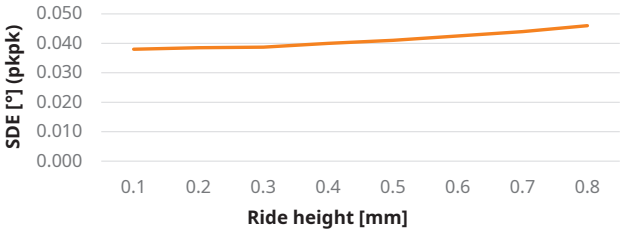
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

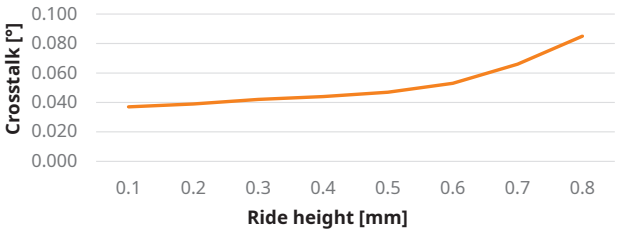
Technical specifications

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	Go to **Maximum speed calculator**

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

SDE and crosstalk (typical measured value)

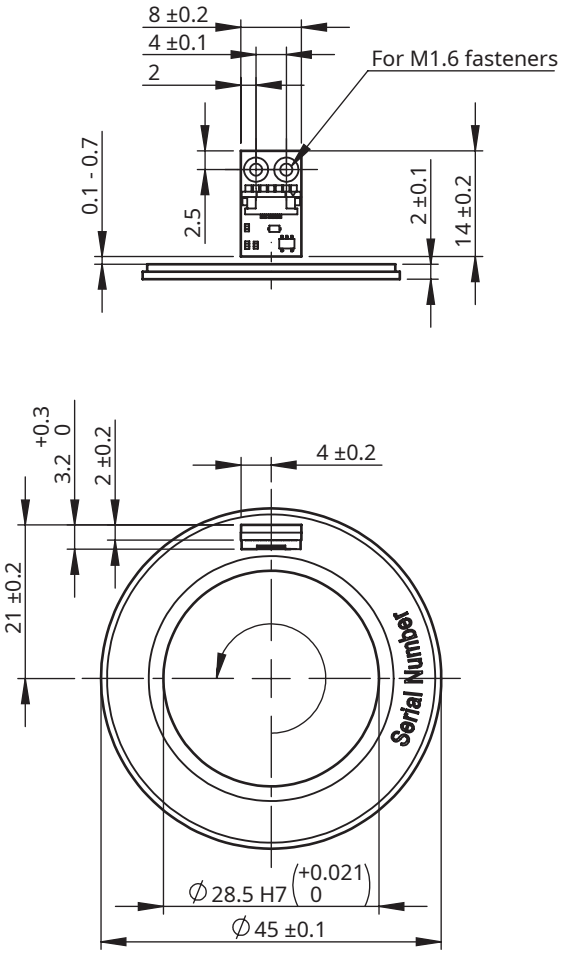




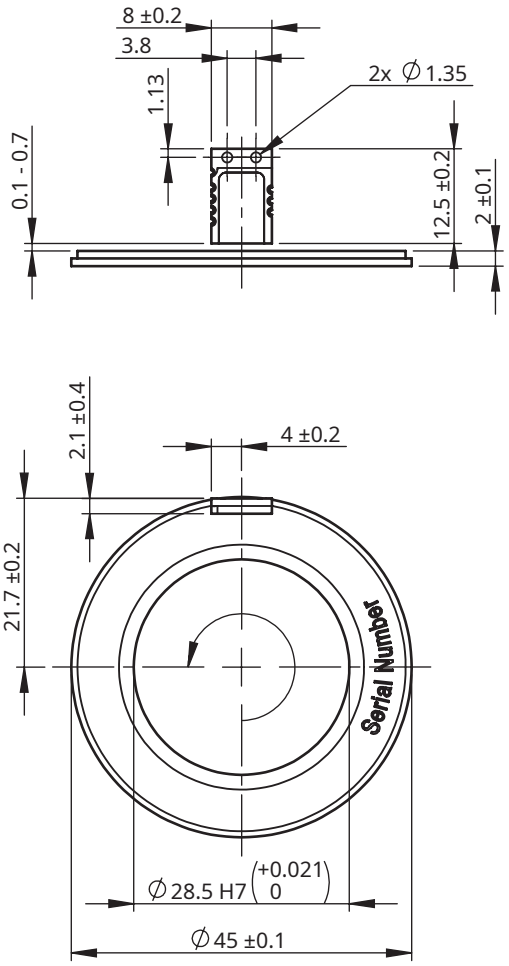
Dimensions and installation drawings

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

RLB



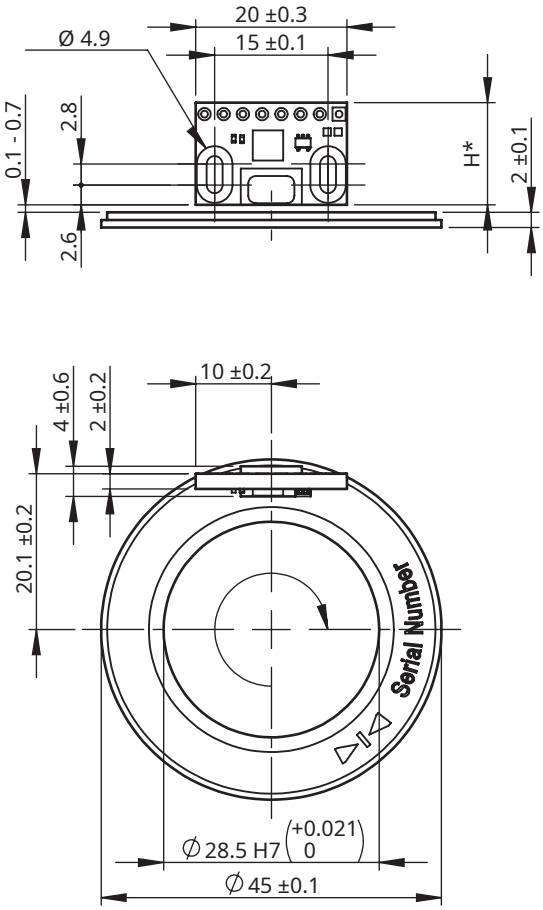
RLC2HD



Dimensions and installation drawings

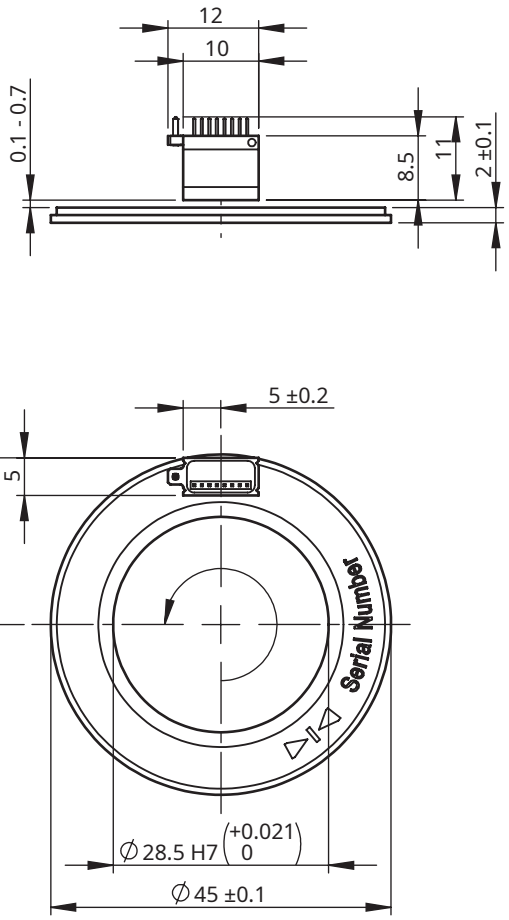
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

RLC2IC



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

RLM

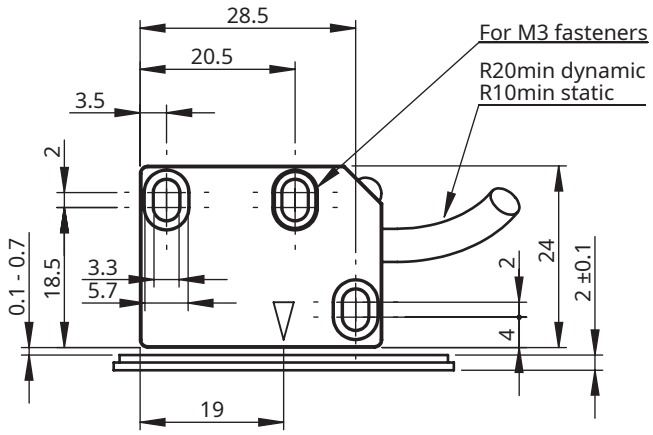


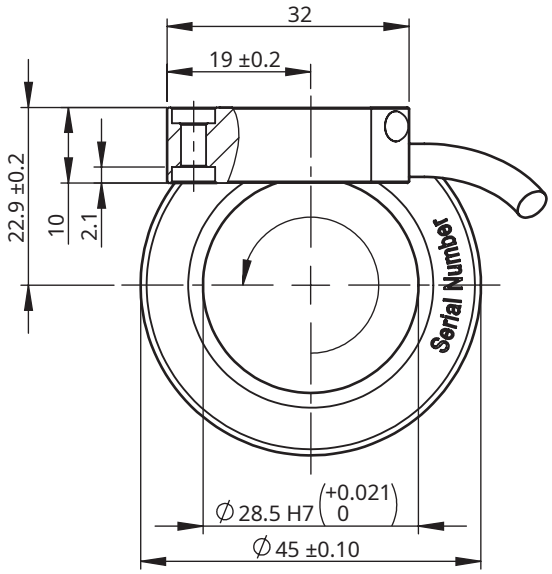
Dimensions and installation drawings

MR045C

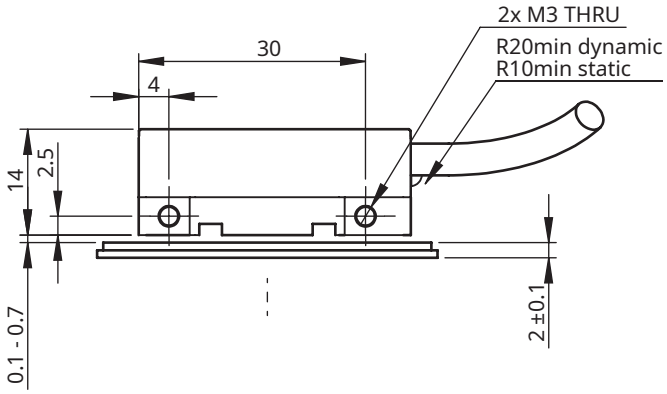
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

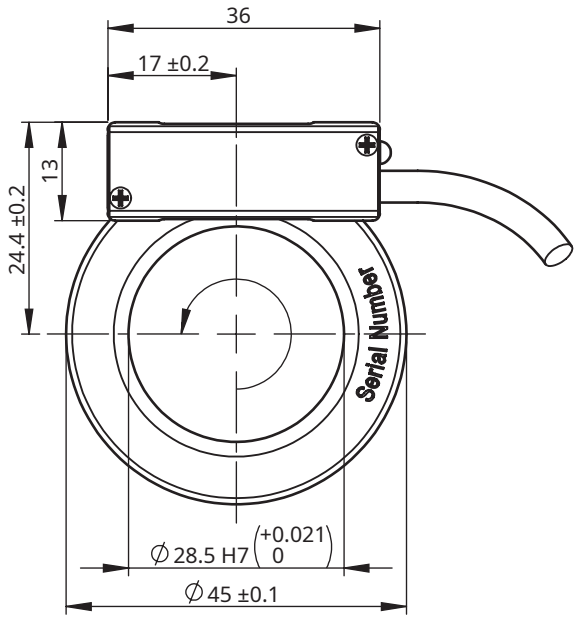
LM10





LM13





MR049N

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
72 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	Ri	Ri

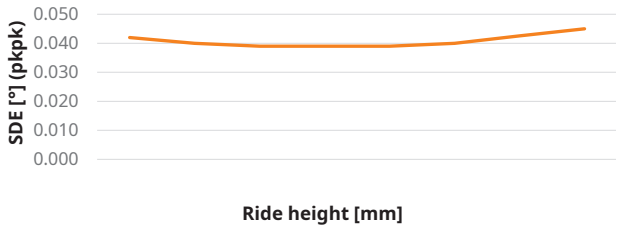
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

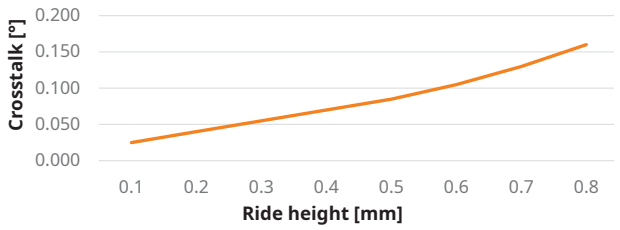
Technical specifications

Outer diameter (mm)	49 ±0.1
Inner diameter (mm)	25 H7
Height (mm)	2 ±0.1
Mass (g)	13
System error (°)	±0.11
Maximum speed	Go to **Maximum speed calculator**

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)



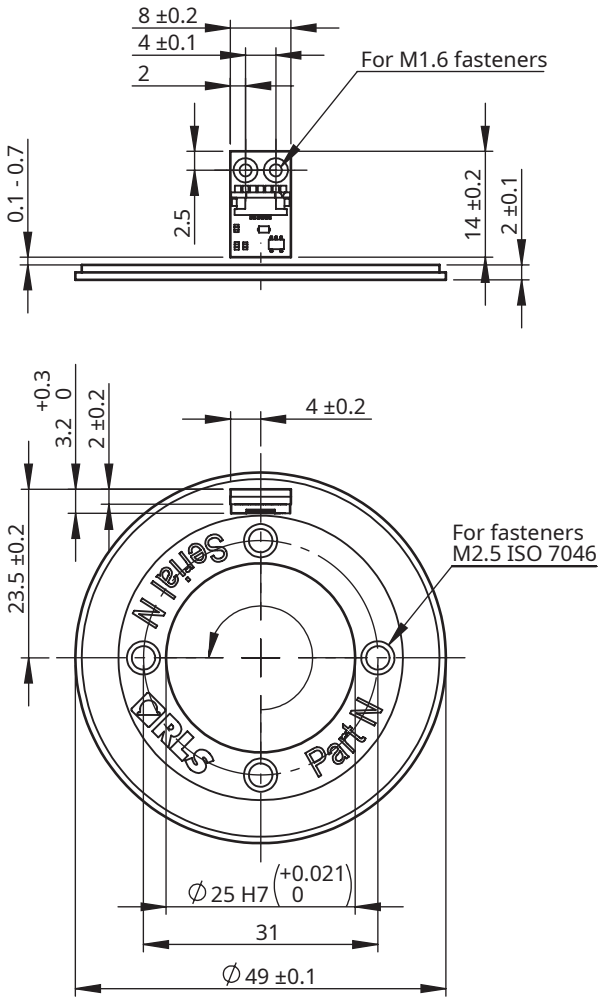


Dimensions and installation drawings

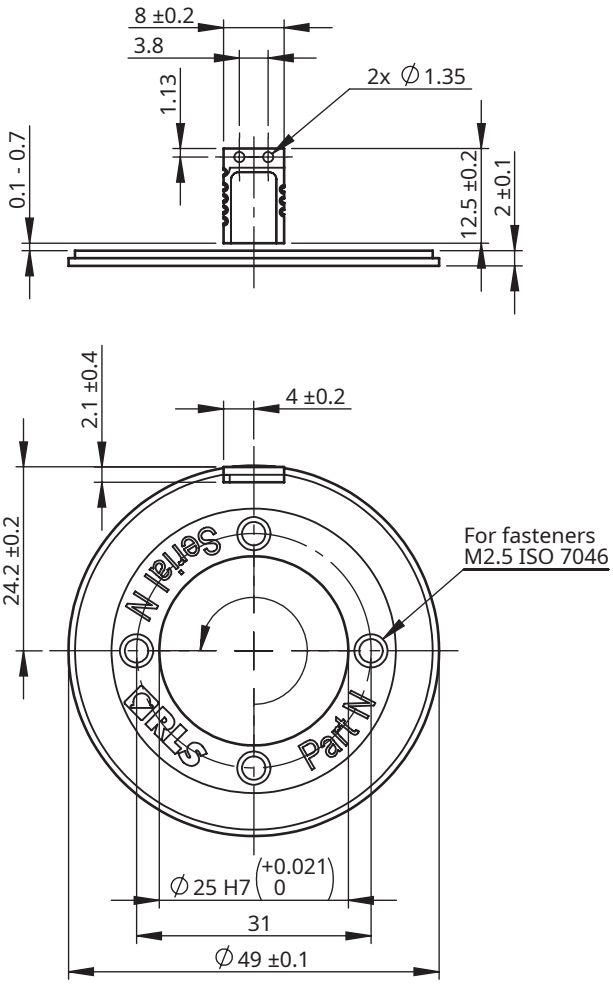
MR049N

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

RLB



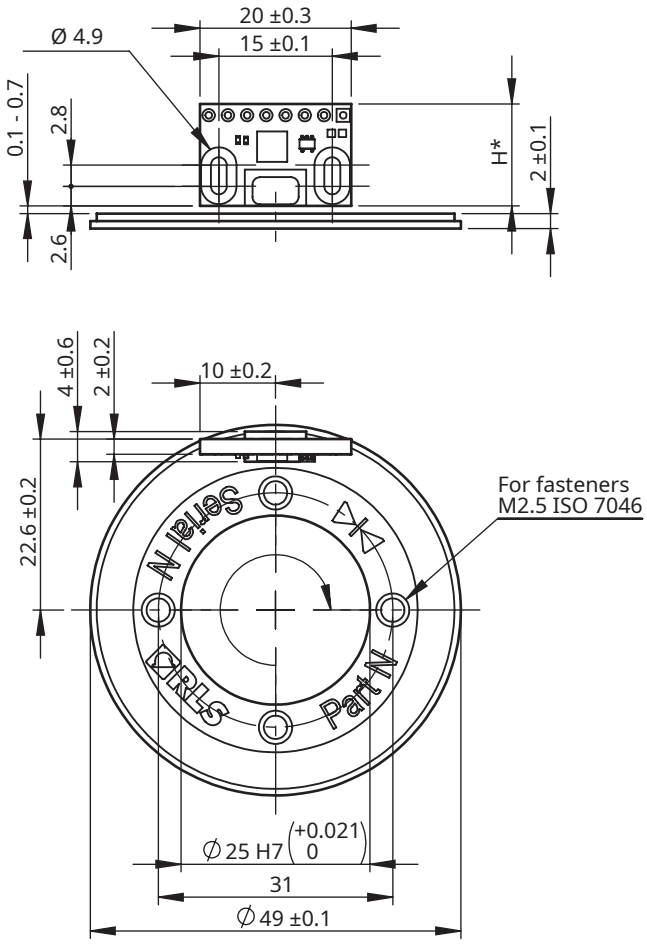
RLC2HD



Dimensions and installation drawings

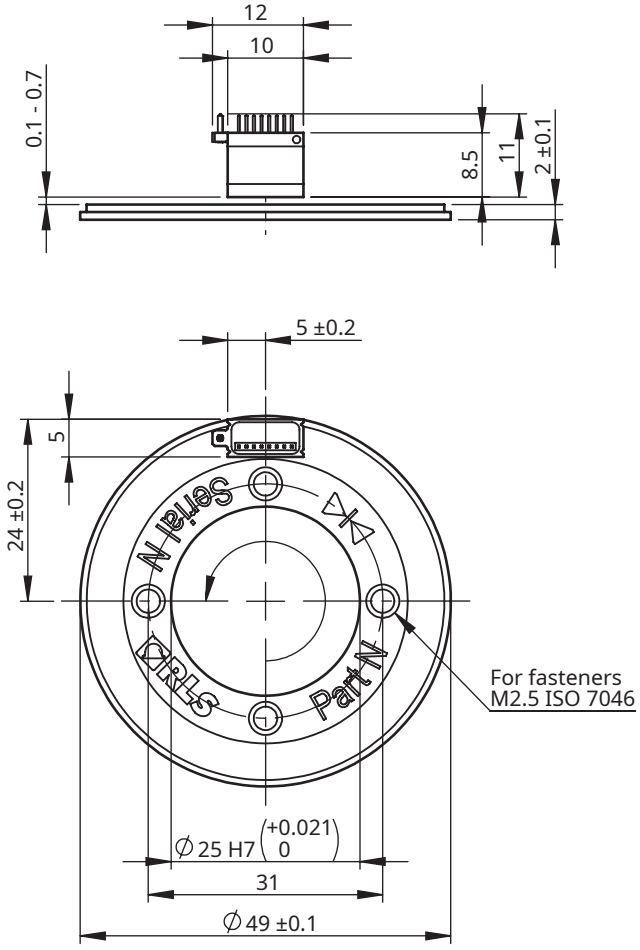
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

RLC2IC



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

RLM

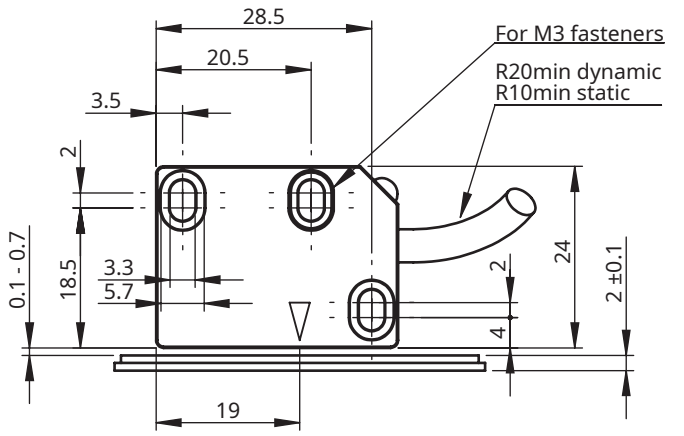


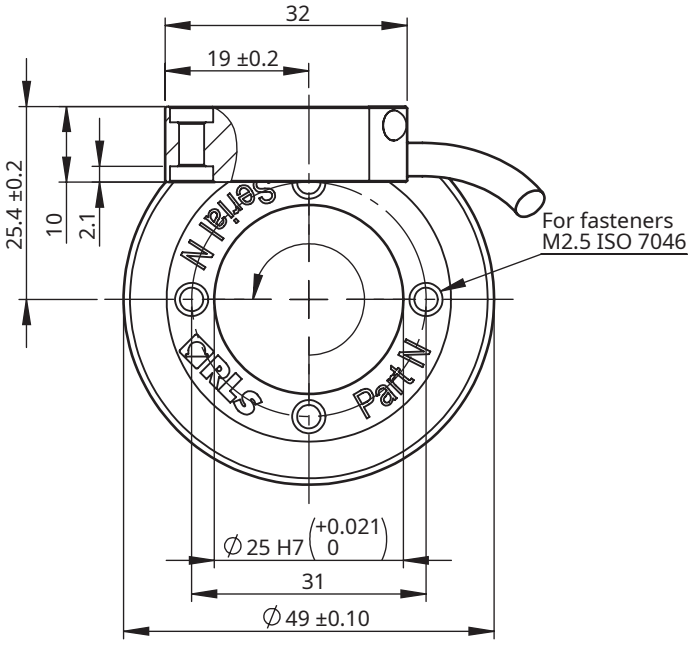
Dimensions and installation drawings

MR049N

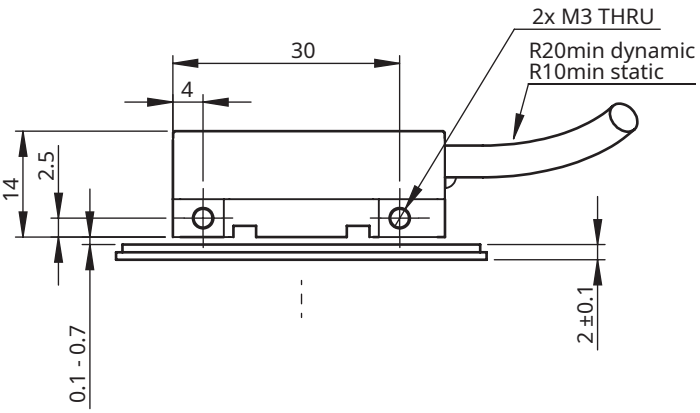
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

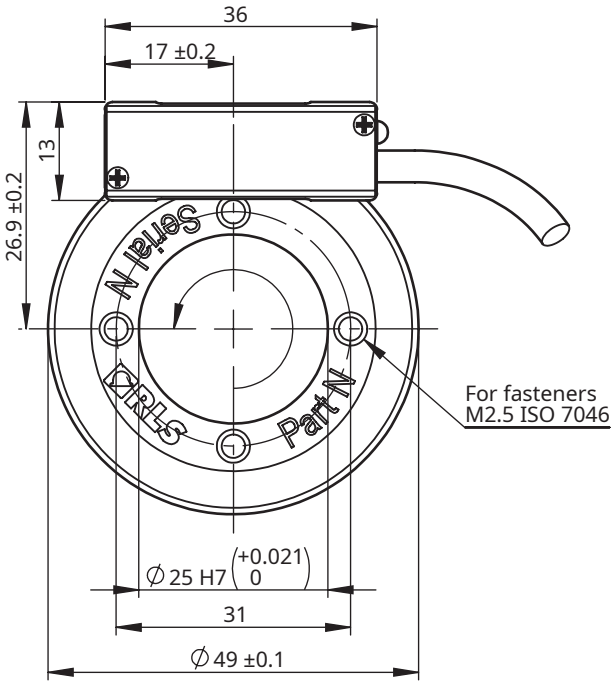
LM10





LM13





MR050C

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
72 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	Ri	Ri

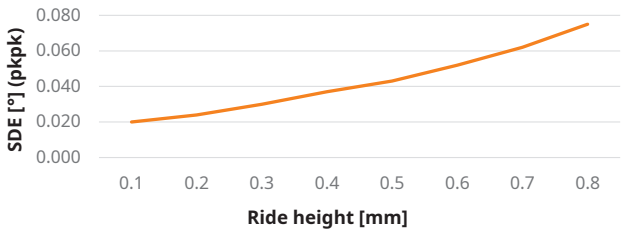
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

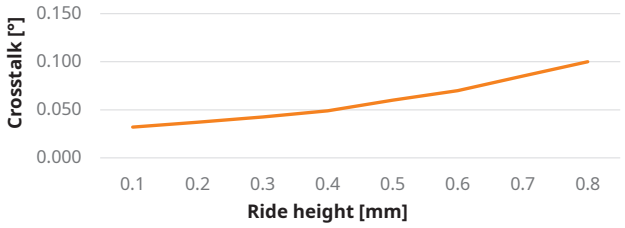
Technical specifications

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	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	3.880
Material of magnetic layer	CPE
Hub material	EN 1.4305 / AISI 303
Hub thermal expansion coefficient (CTE)	$10 \times 10^{-6}\ K^{-1}$

SDE and crosstalk (typical measured value)

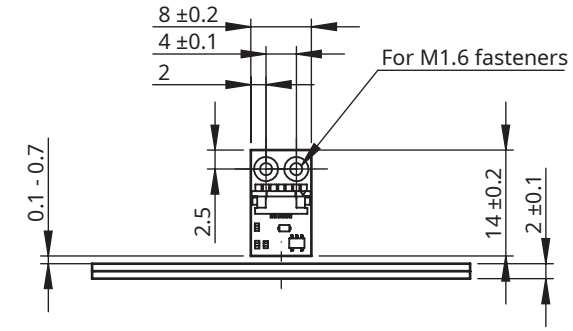


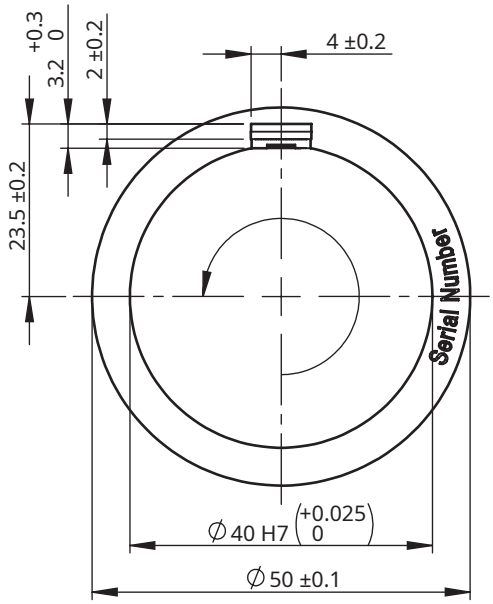


Dimensions and installation drawings

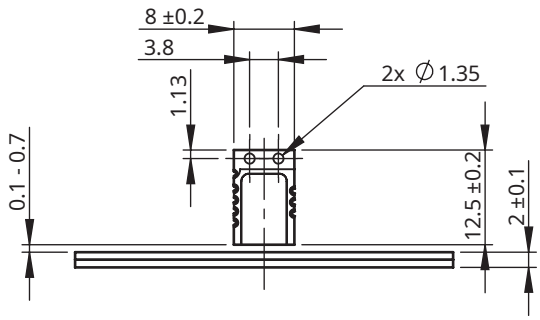
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

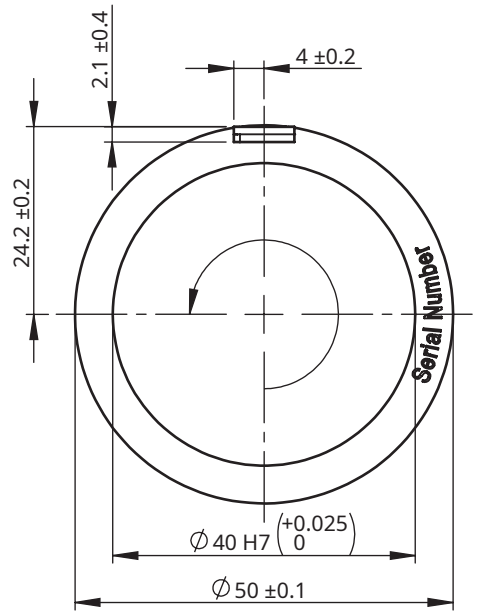
RLB





RLC2HD

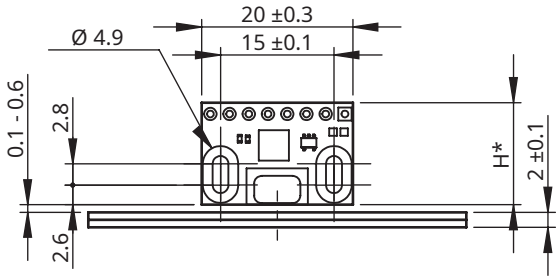


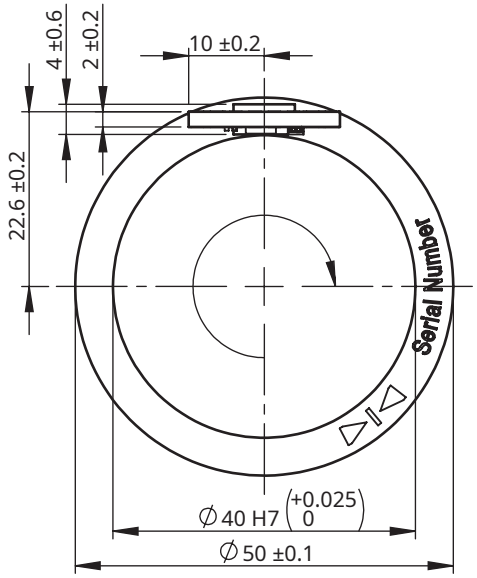


Dimensions and installation drawings

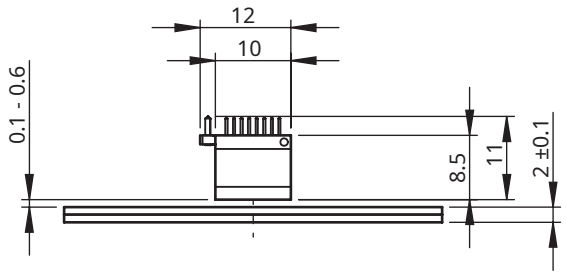
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

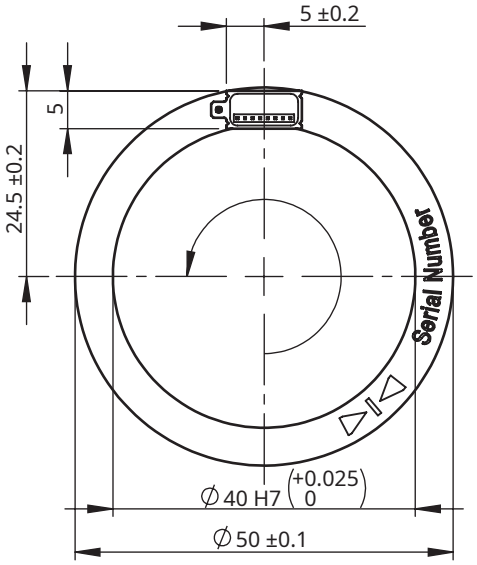
RLC2IC





RLM





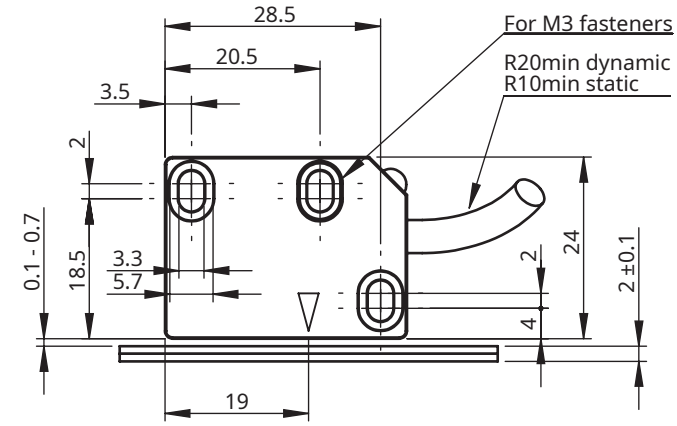
* For height dimensions see RLC2IC data sheet available at **RLS media center.**

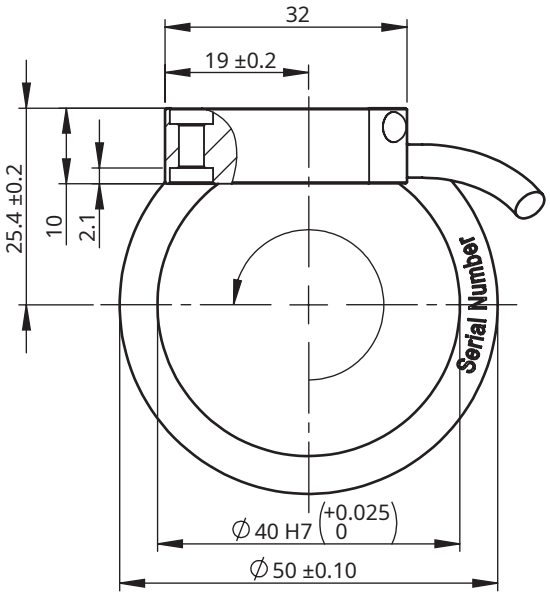
Dimensions and installation drawings

MR050C

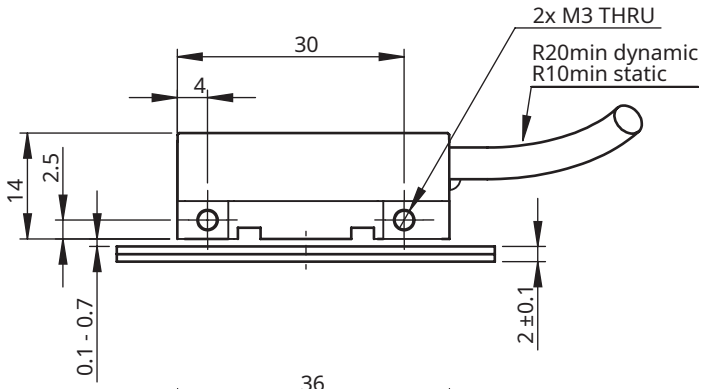
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

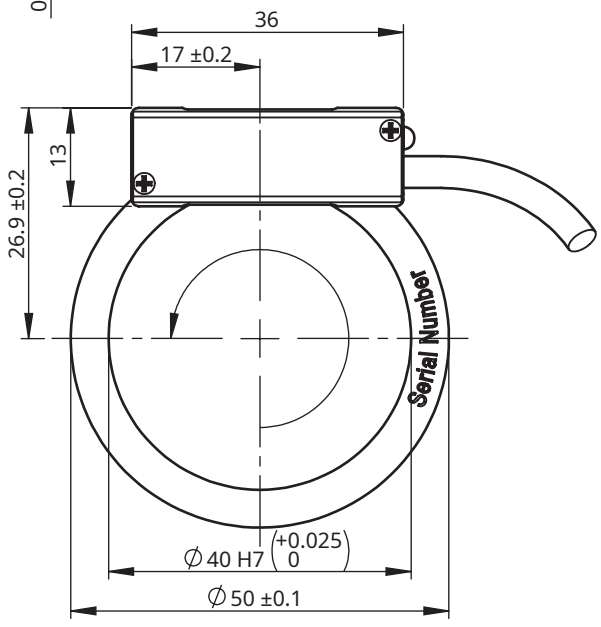
LM10





LM13





MR061C

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
92 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	Ri	Ri

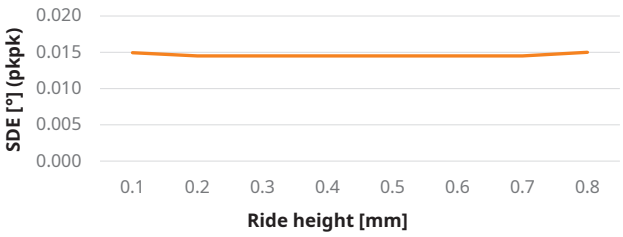
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

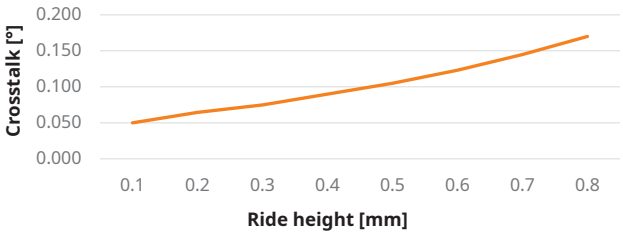
Technical specifications

Outer diameter (mm)	61.3 ±0.1
Inner diameter (mm)	51.3 H7
Height (mm)	2 ±0.1
Mass (g)	10
System error (°)	±0.09
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	7.560
Material of magnetic layer	CPE
Hub material	EN 1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	$10 \times 10^{-6}\ K^{-1}$

SDE and crosstalk (typical measured value)

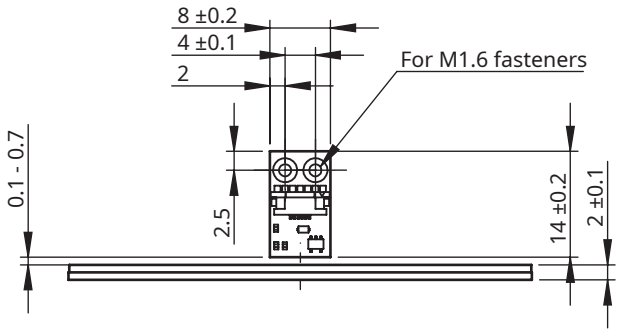


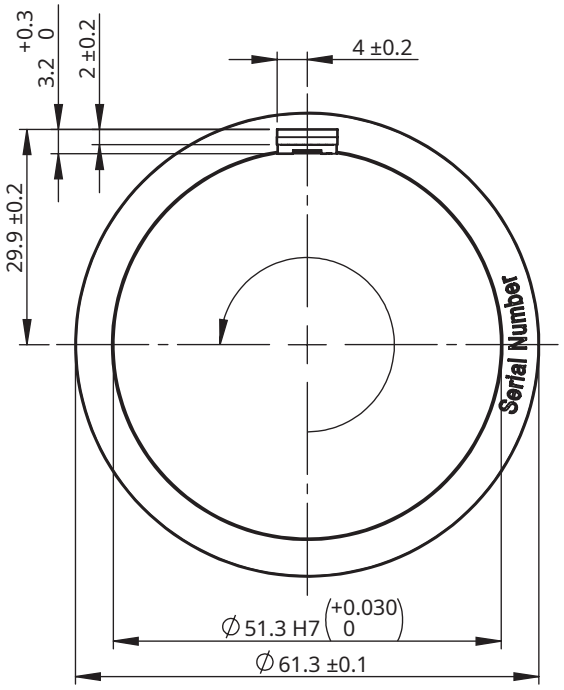


Dimensions and installation drawings

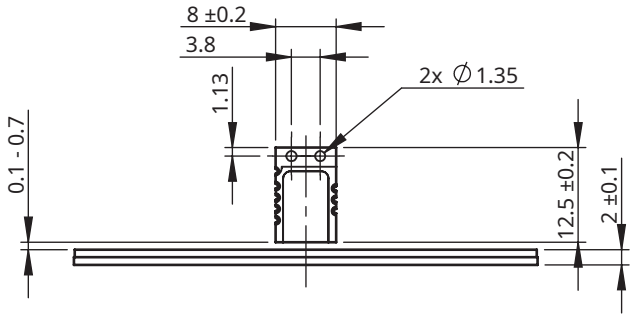
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

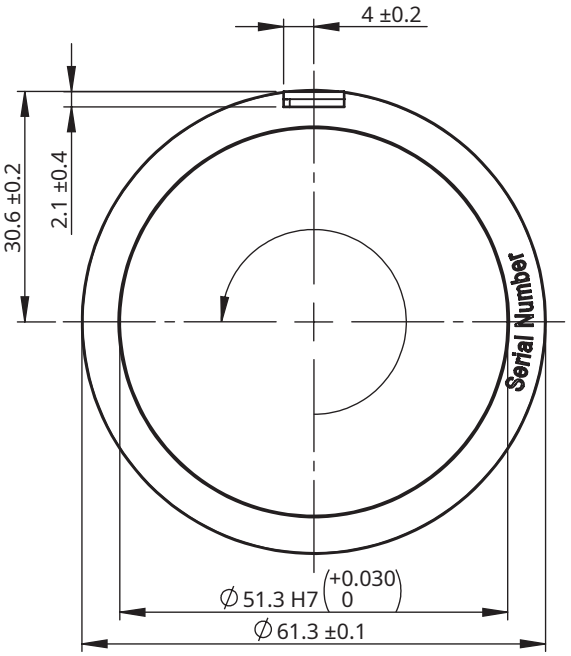
RLB





RLC2HD

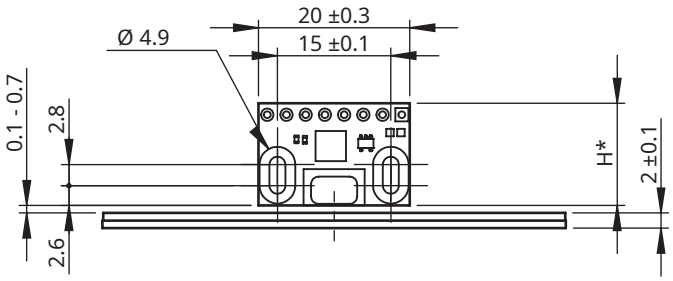


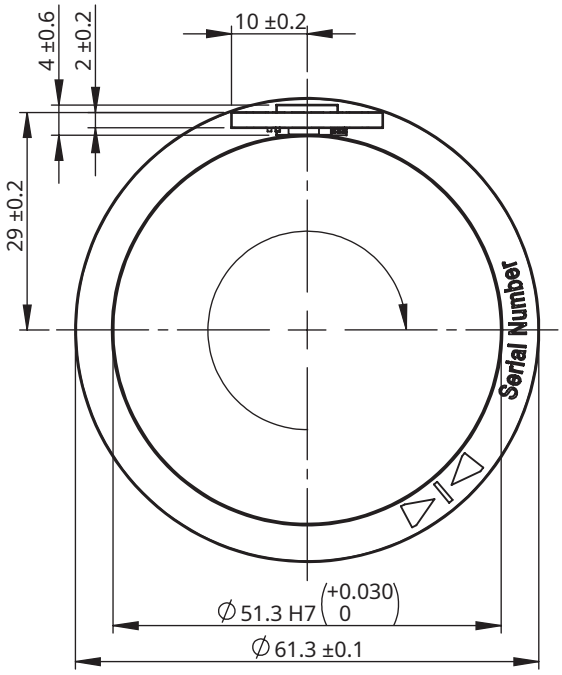


Dimensions and installation drawings

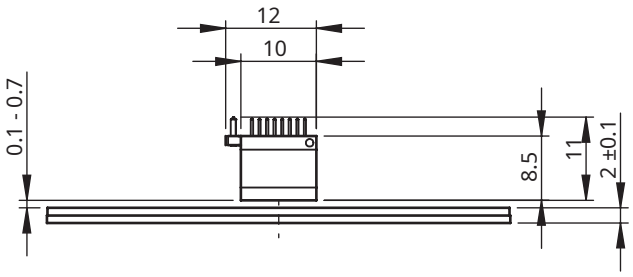
Dimensions and tolerances are in mm. **Drawings show the positive direction of rotation of the ring and not the readhead.**

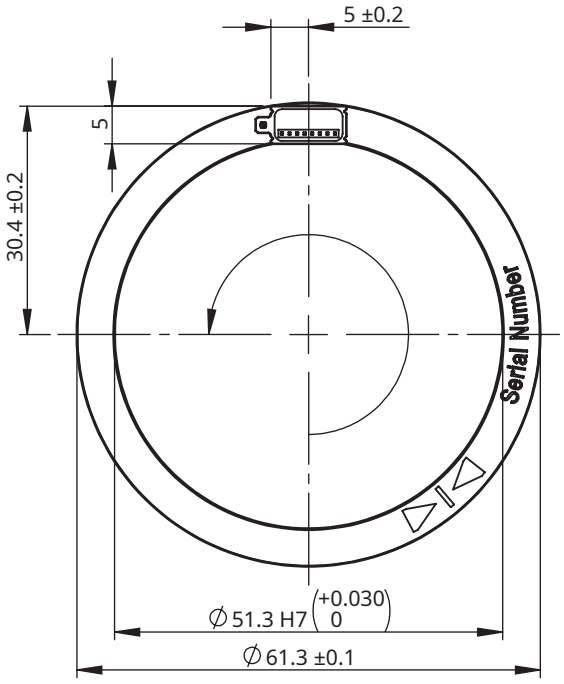
RLC2IC





RLM





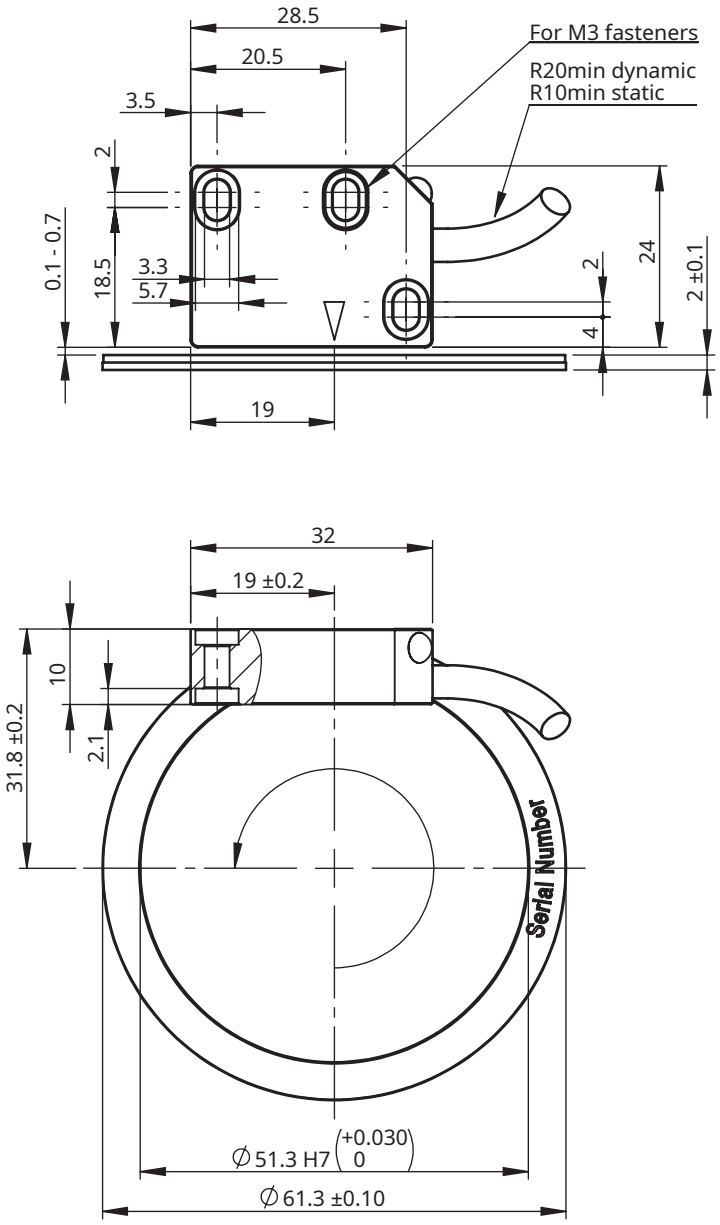
* For height dimensions see RLC2IC data sheet available at **RLS media center.**

Dimensions and installation drawings

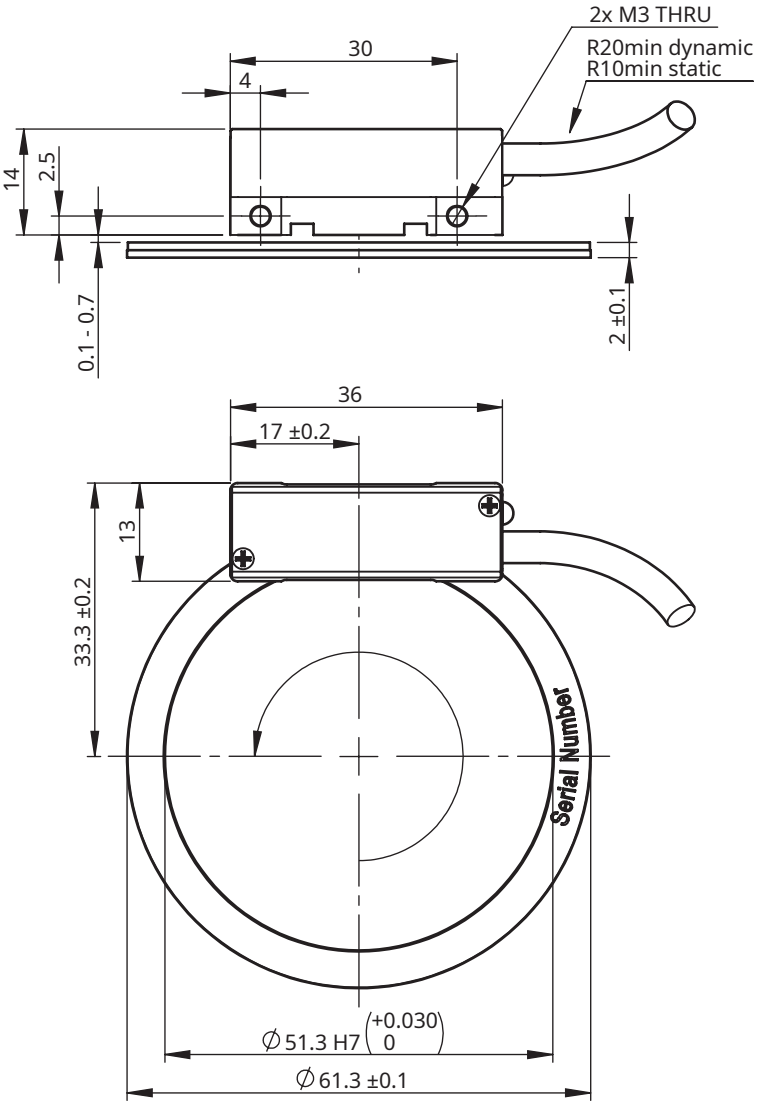
MR061C

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

LM10



LM13



MR080N

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
122 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	Ri	Ri

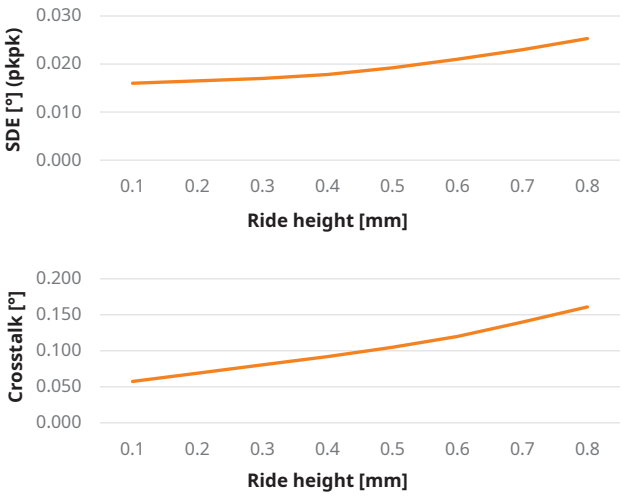
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical specifications

Outer diameter (mm)	80 ±0.1
Inner diameter (mm)	55 H7
Height (mm)	2 ±0.1
Mass (g)	24
System error (°)	±0.07
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	32.700
Material of magnetic layer	CPE
Hub material	EN 1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	$10 \times 10^{-6}\ K^{-1}$

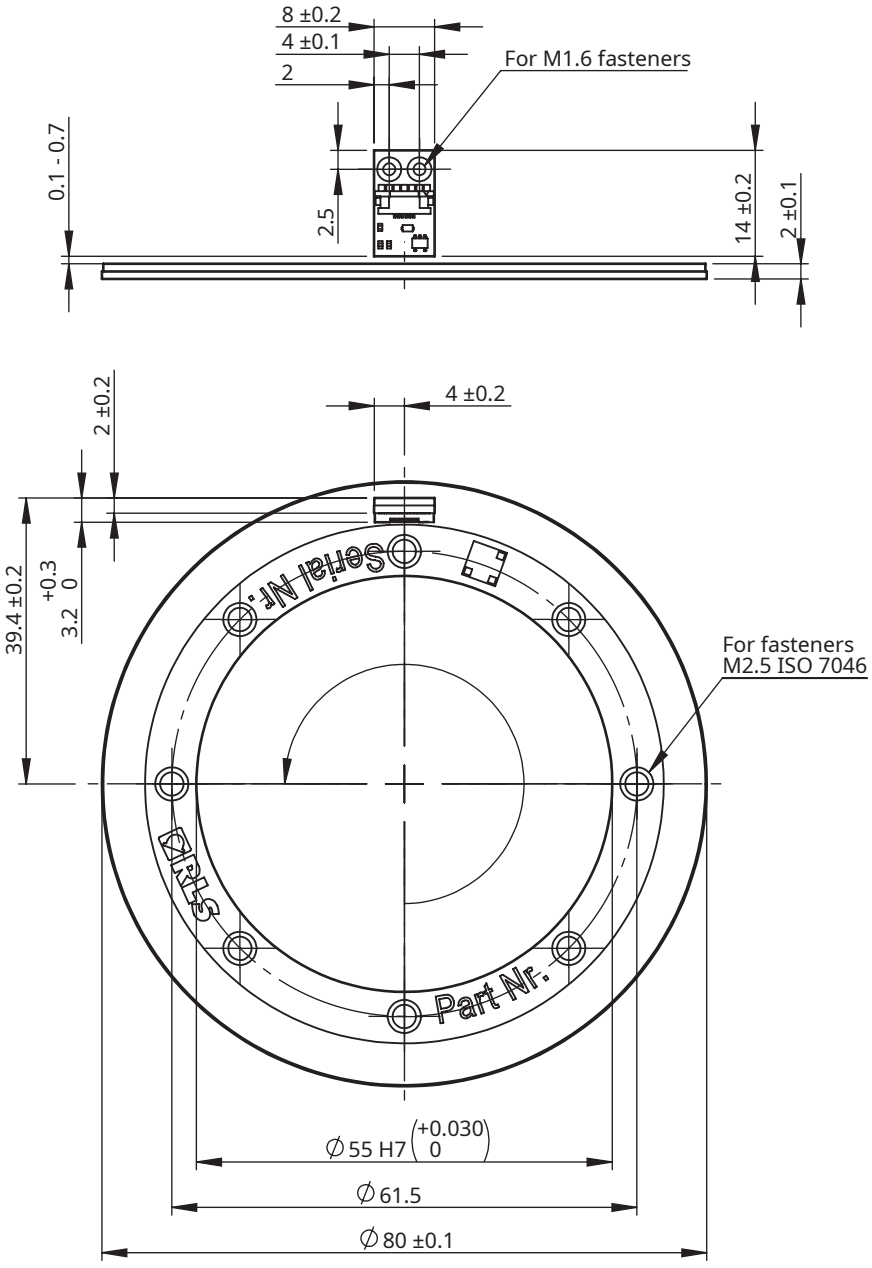
SDE and crosstalk (typical measured value)



Dimensions and installation drawings

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

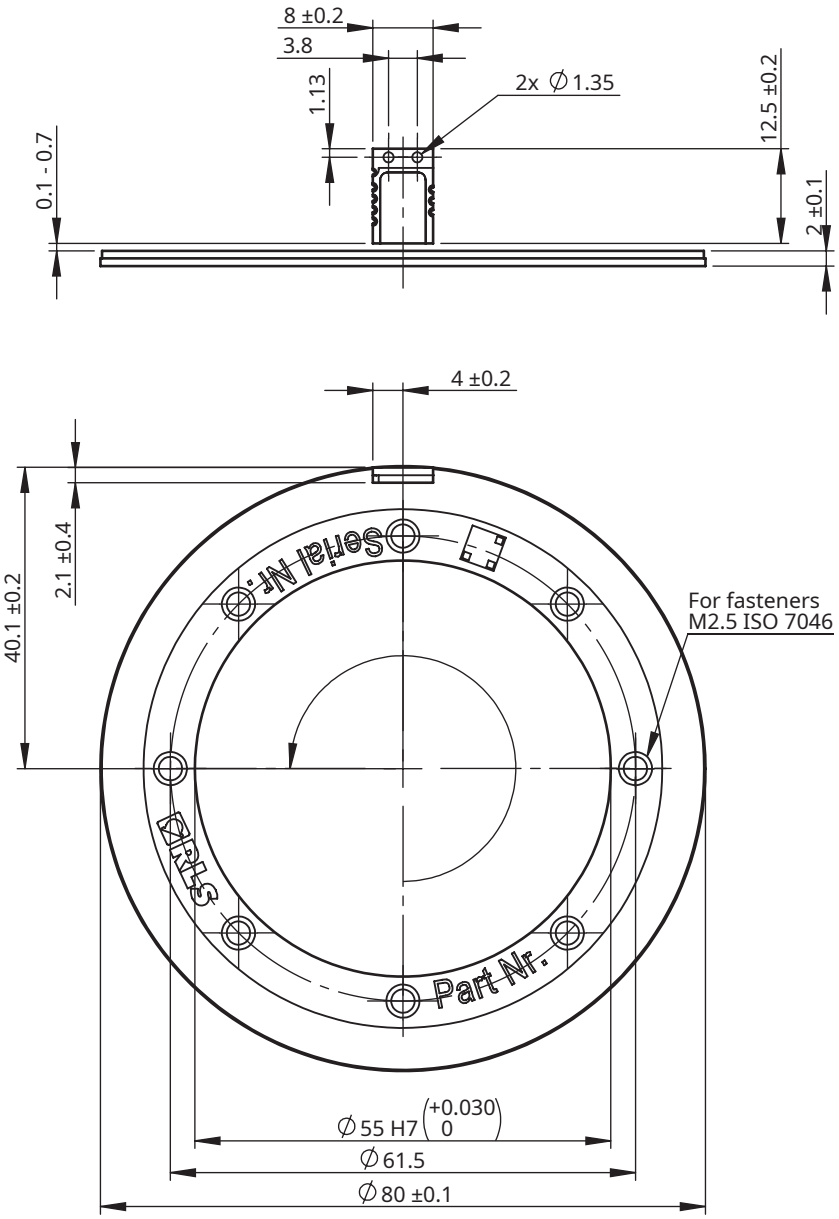
RLB



Dimensions and installation drawings

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

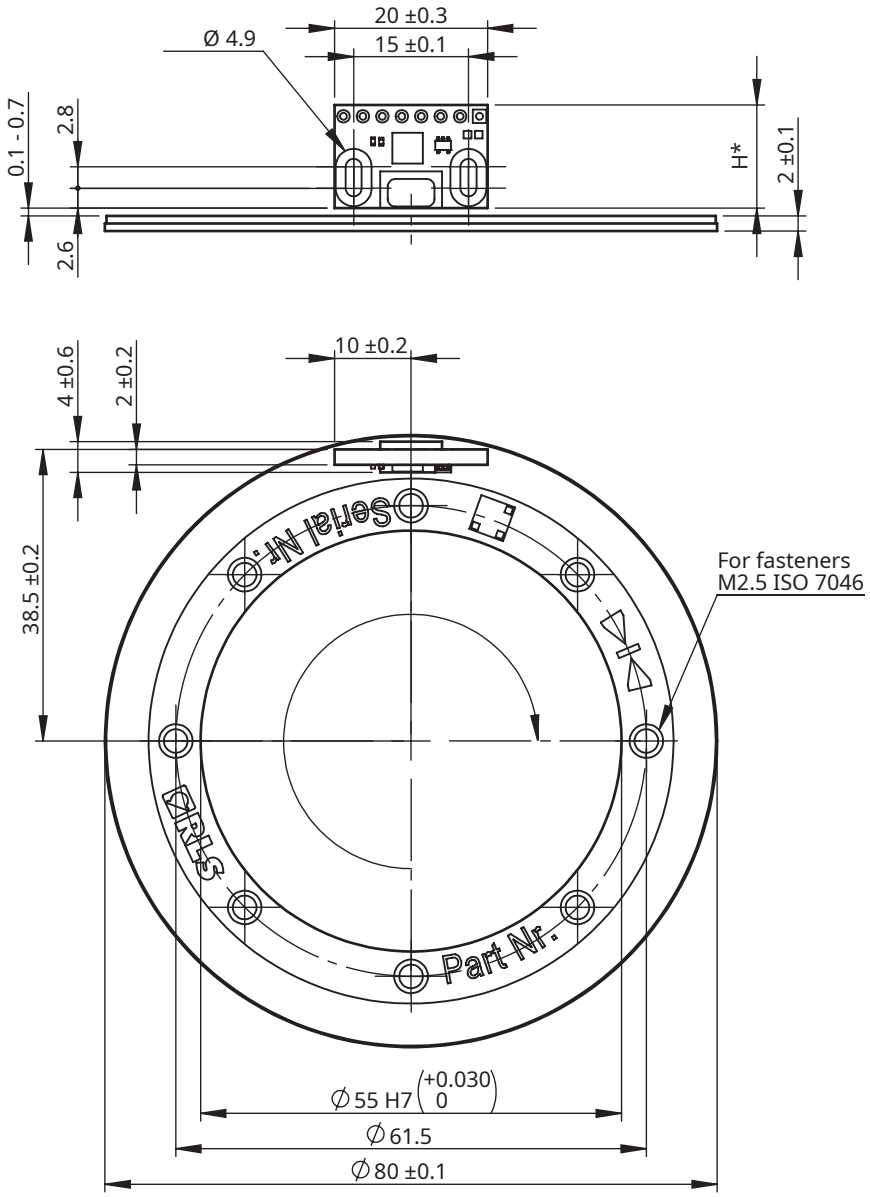
RLC2HD



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

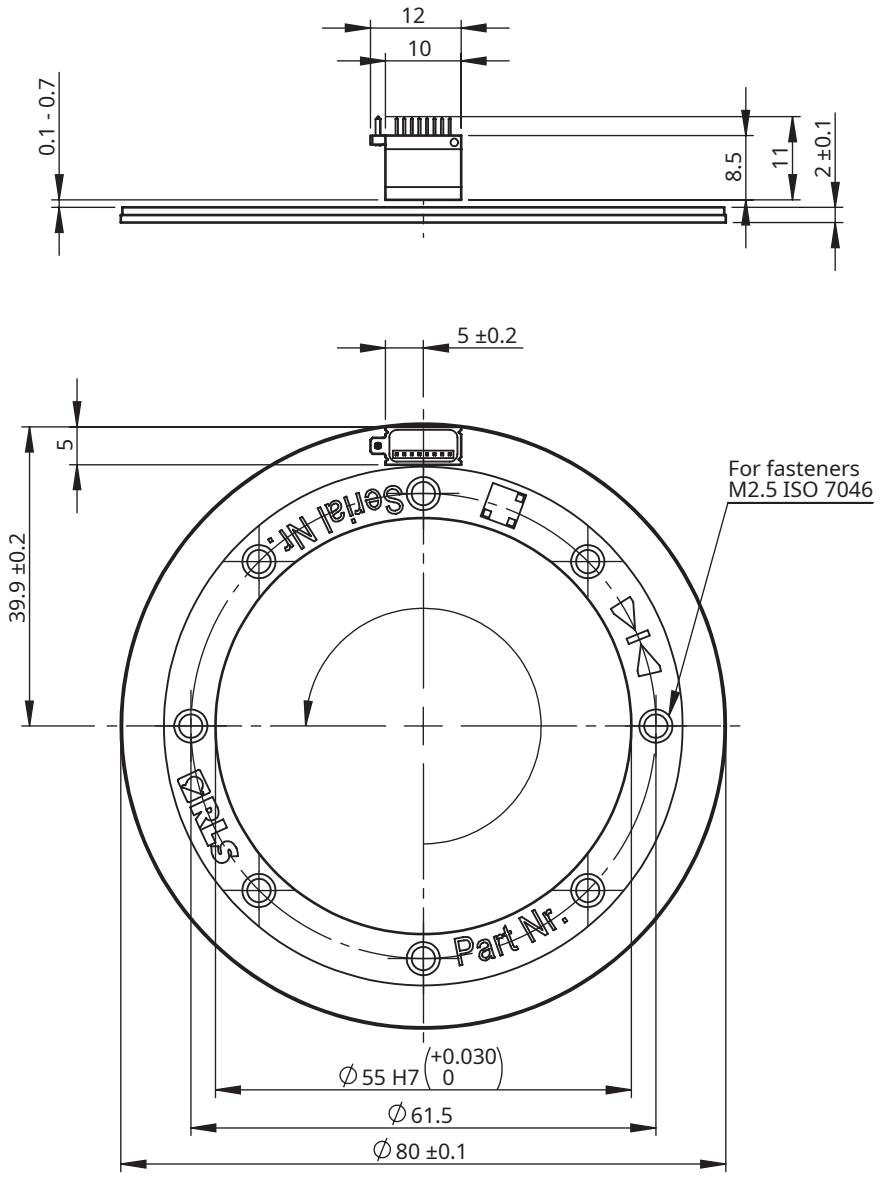


* For height dimensions see RLC2IC data sheet available at **RLS media center.**

Dimensions and installation drawings

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

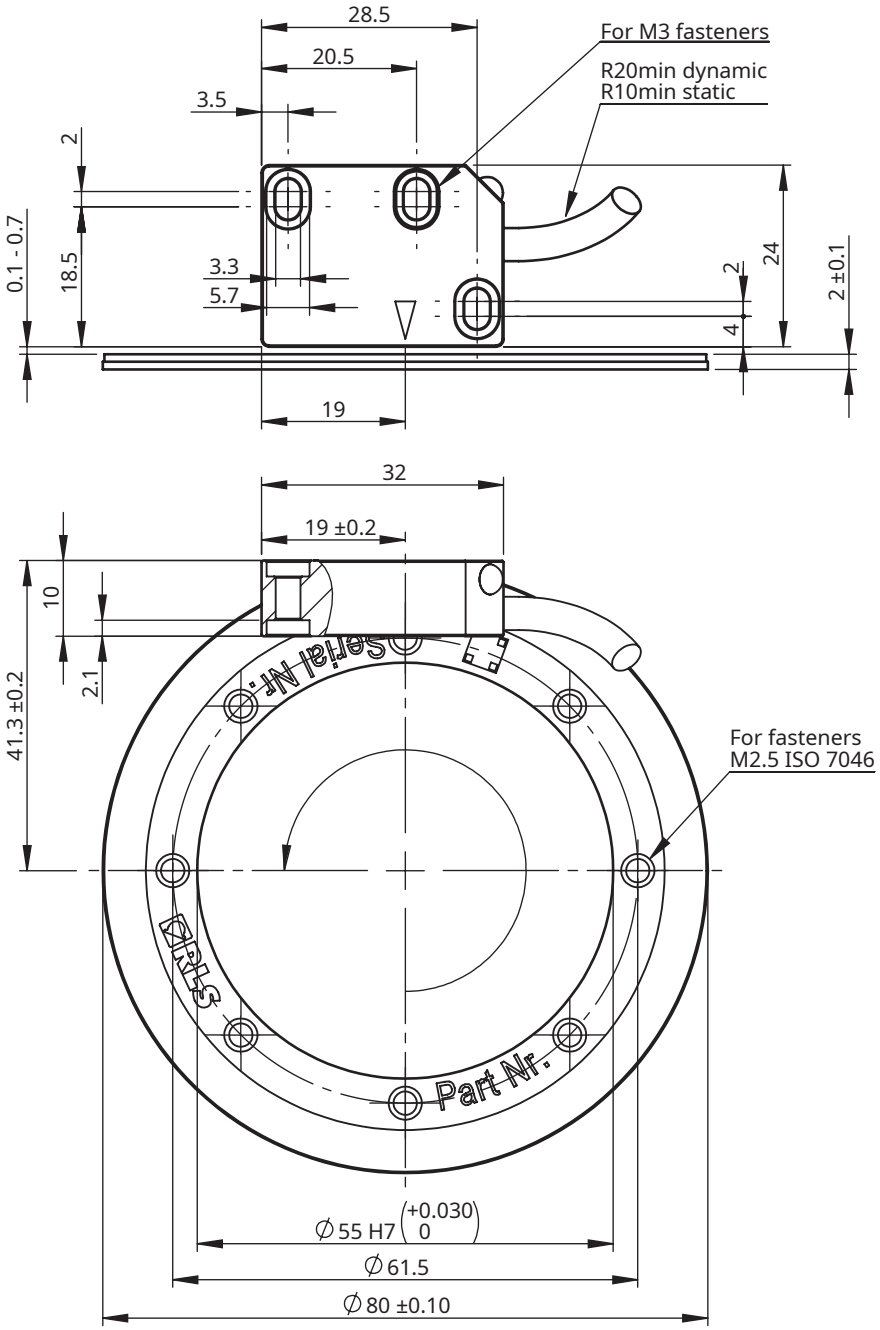
RLM



Dimensions and installation drawings

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

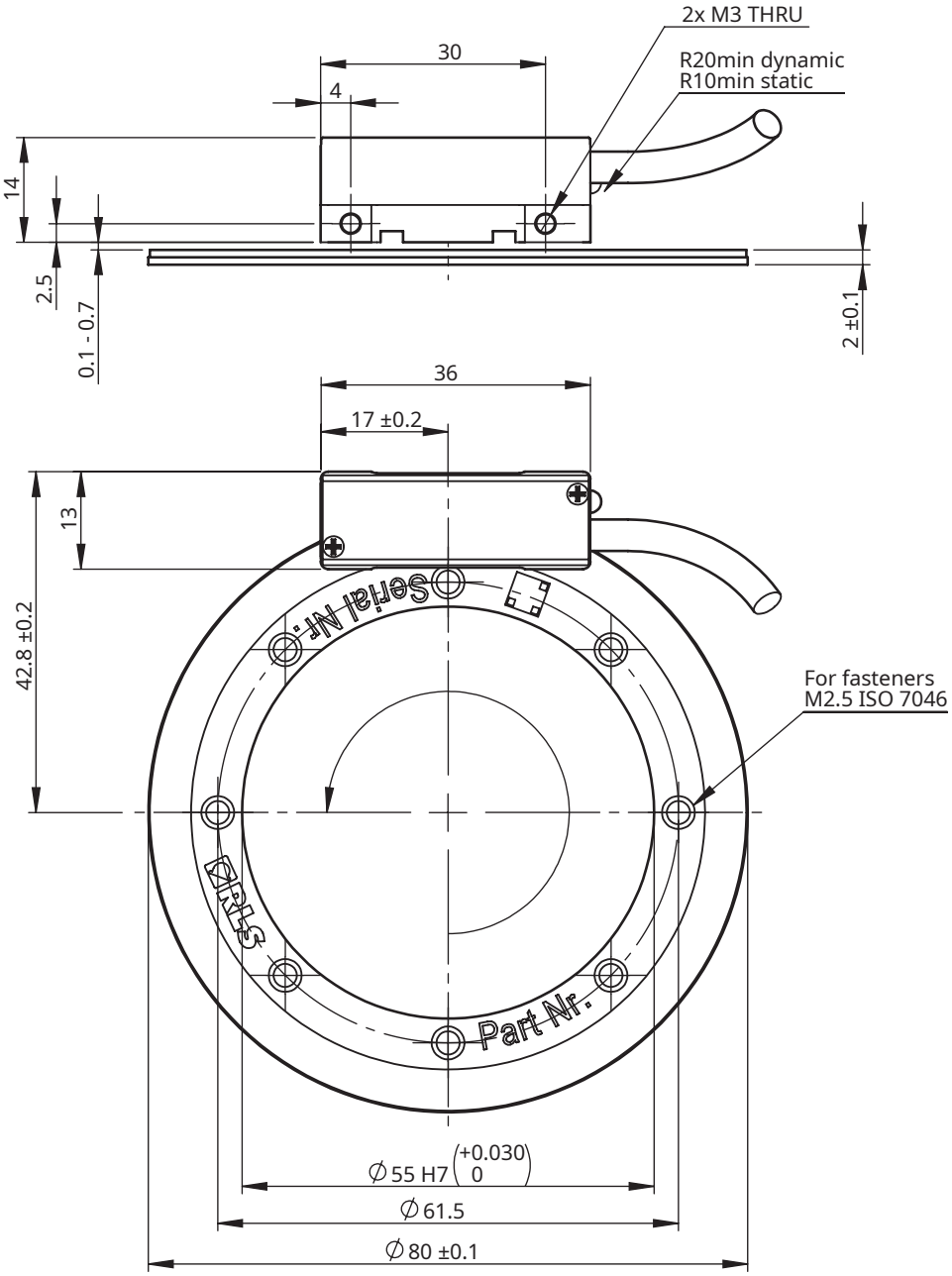
LM10



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



MR100S

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
152 poles, 2 mm width	No Ri	No Ri	-	No Ri	No Ri	Ri	Ri

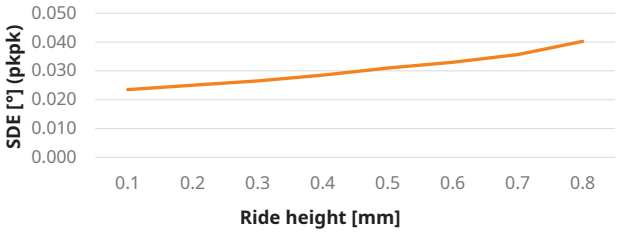
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

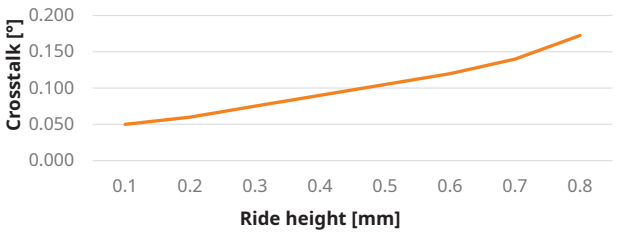
Technical specifications

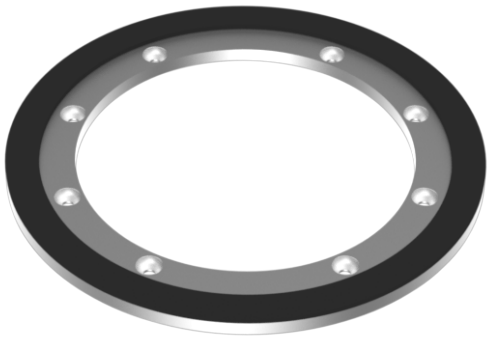
Outer diameter (mm)	100 ±0.1
Inner diameter (mm)	71 H7
Height (mm)	4 ±0.1
Mass (g)	95
System error (°)	±0.05
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	180.000 gmm²
Material of magnetic layer	CPE
Hub material	EN 1.4021 / AISI 420
Hub thermal expansion coefficient (CTE)	11 × 10^{-6} K^{-1}

SDE and crosstalk (typical measured value)



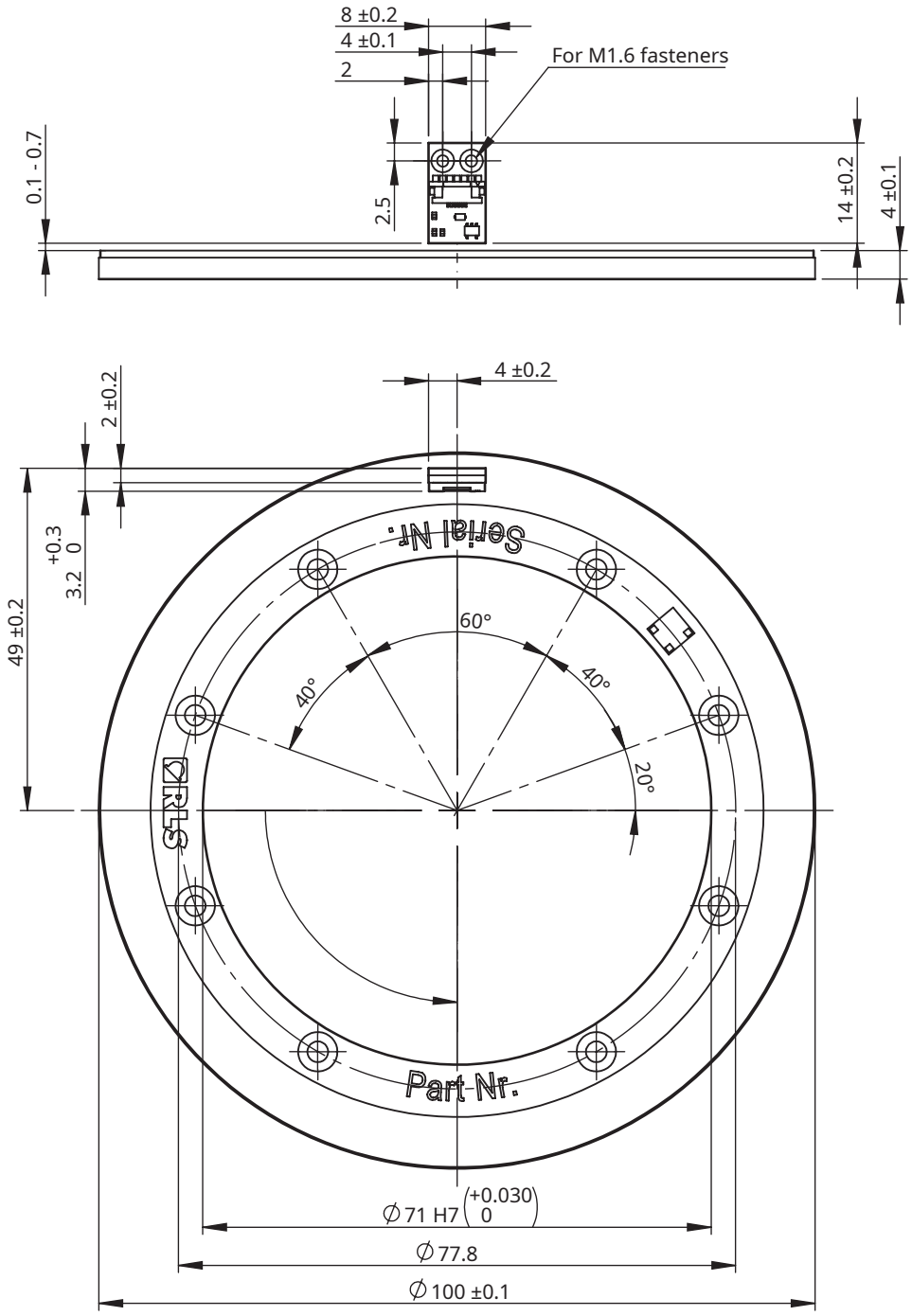




Dimensions and installation drawings

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

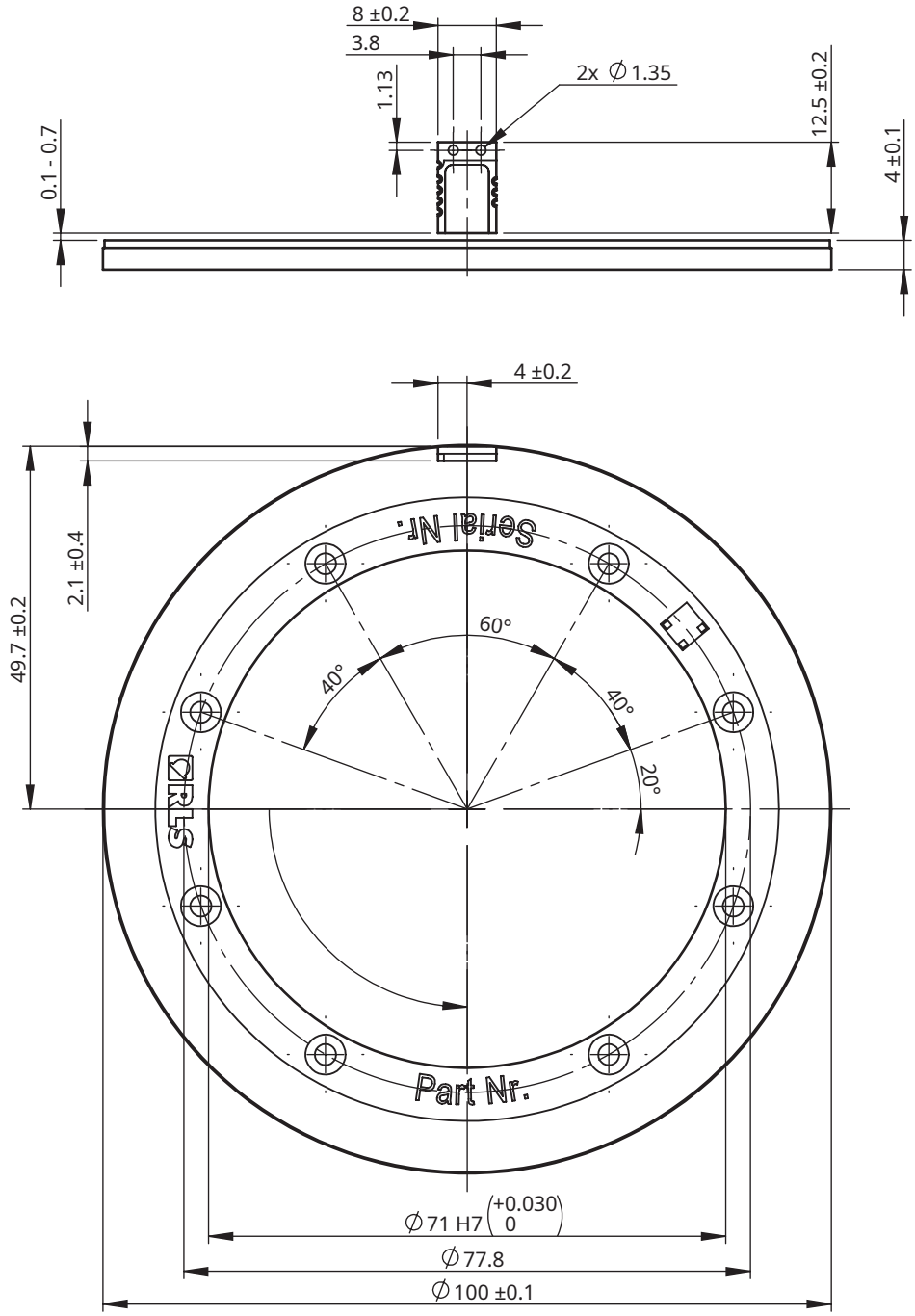
RLB



Dimensions and installation drawings

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

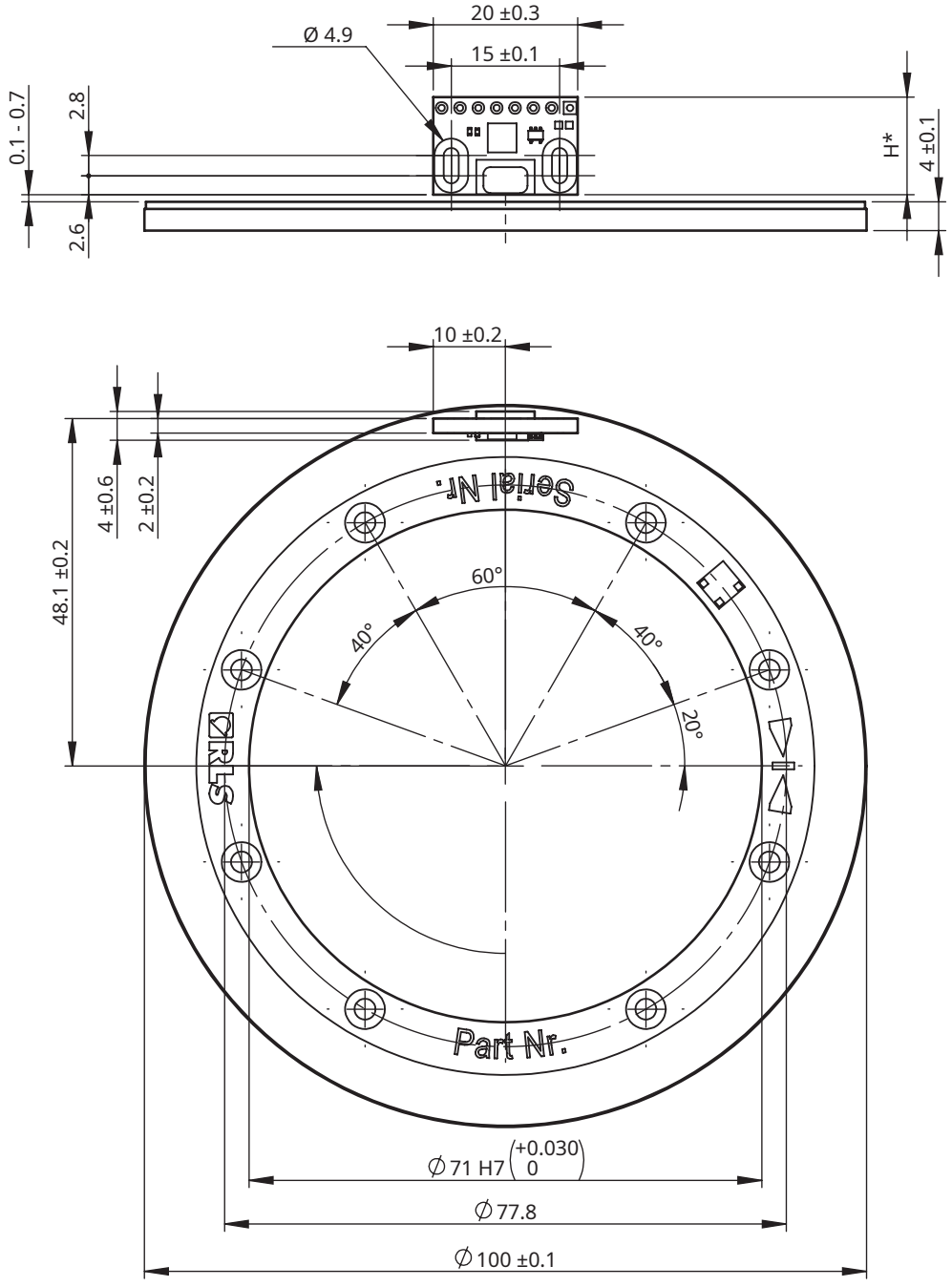
RLC2HD



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

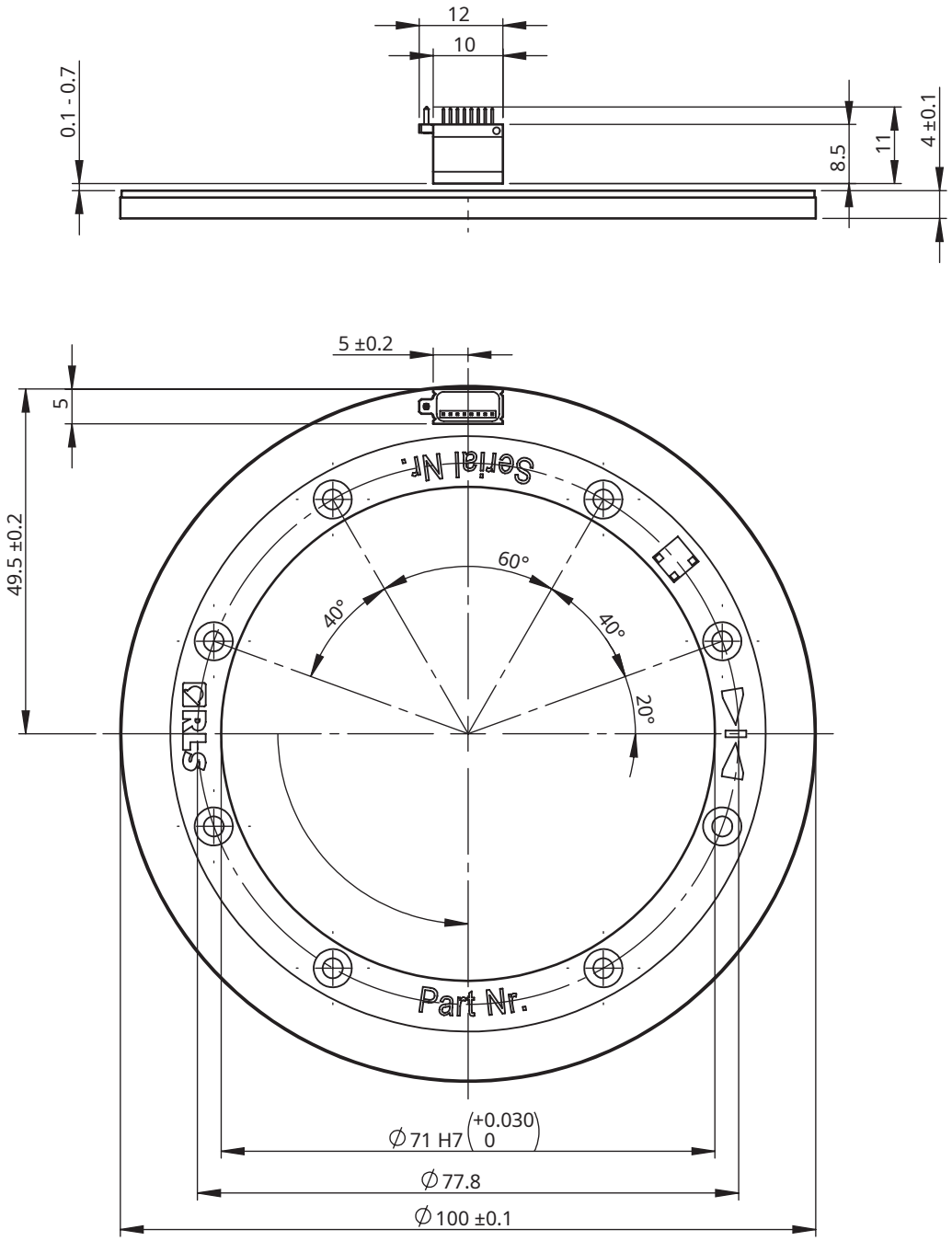


* For height dimensions see RLC2IC data sheet available at **RLS media center.**

Dimensions and installation drawings

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

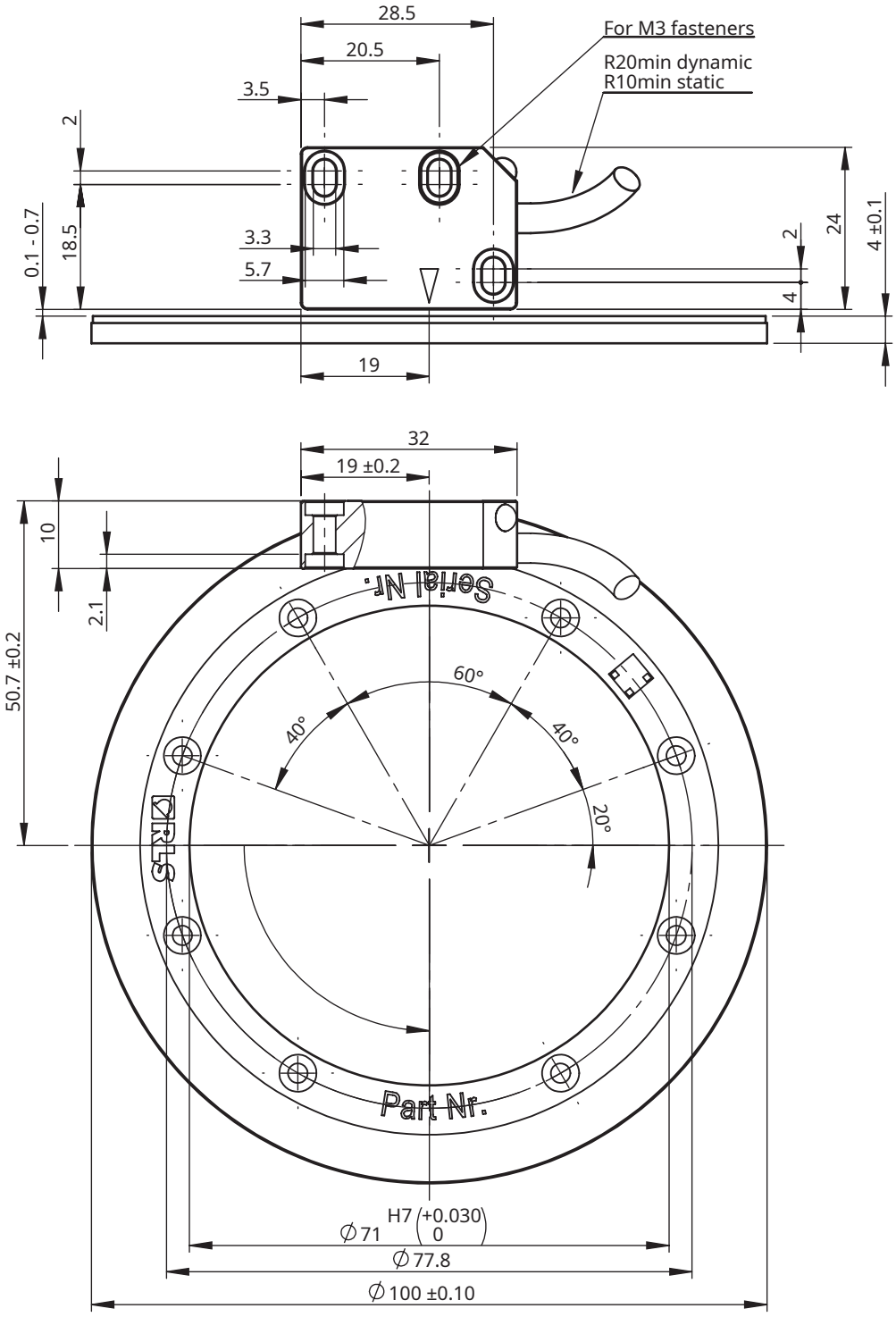
RLM



Dimensions and installation drawings

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

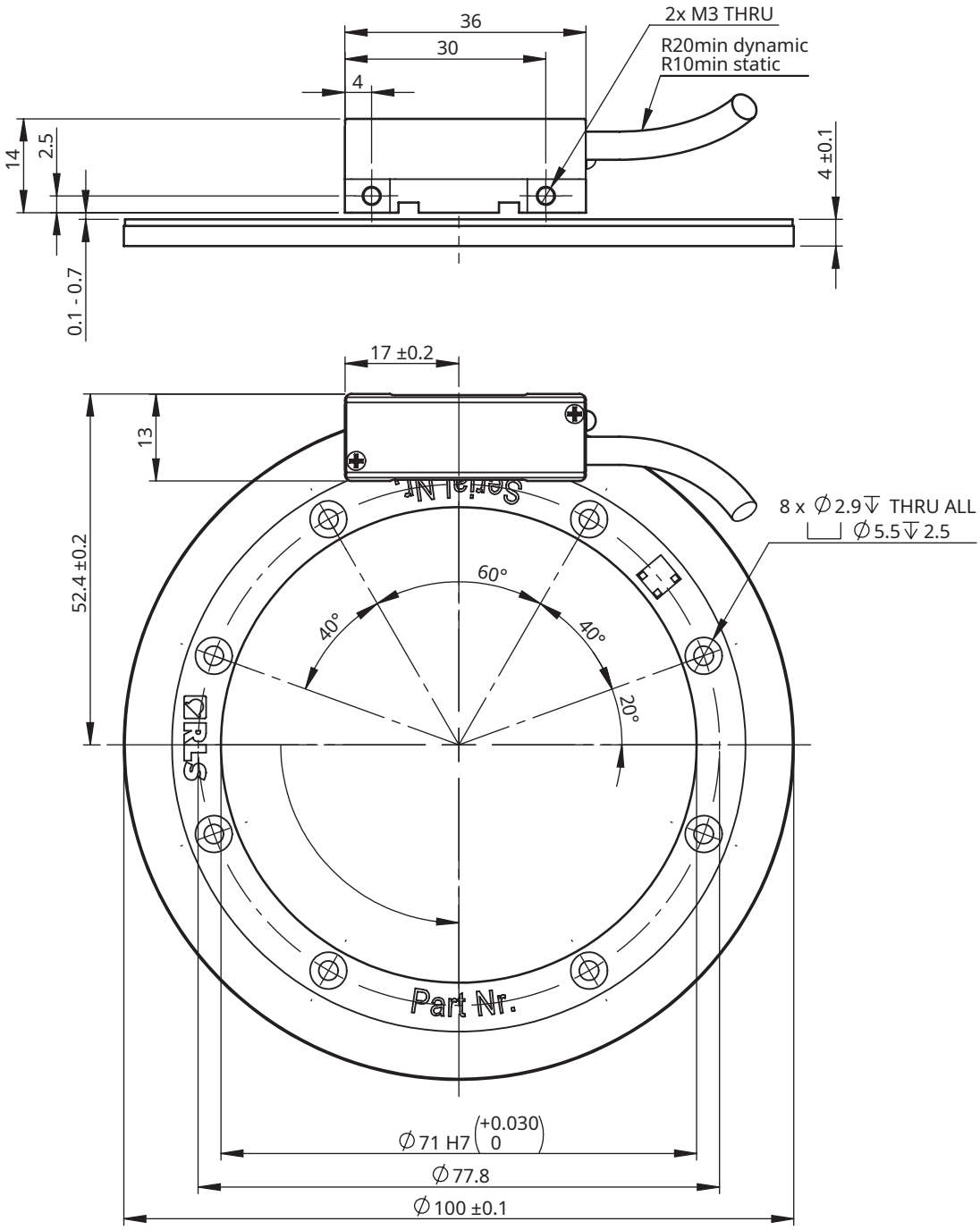
LM10



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



MR282N

Compatibility table

	LM10	LM13	LM15	RLB	RLC2HD	RLC2IC	RLM
406 poles, 2 mm width	-	-	-	-	-	-	Ri

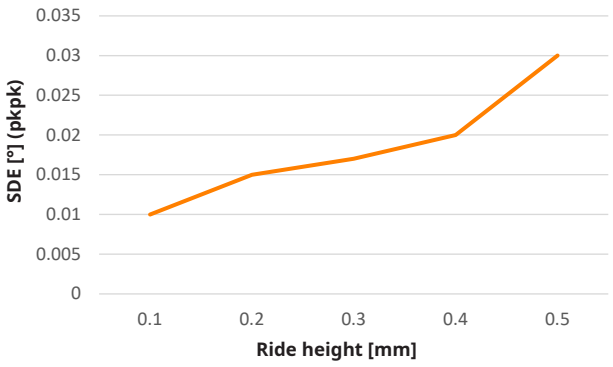
Ri - Unique reference mark or only incremental track available

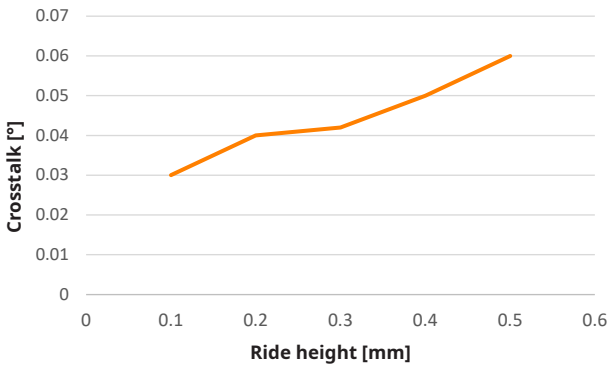
Technical specifications

Outer diameter (mm)	282
Inner diameter (mm)	257
Height (mm)	3
Mass (g)	174
System error (°)	±0.05
Maximum speed	Go to **Maximum speed calculator**

Moment of inertia (gmm²)	3125563 gmm²
Material of magnetic layer	Flexible Ferrite Magnet Strip, NBR
Hub material	1.4016 (X6Cr17)
Hub thermal expansion coefficient (CTE)	10.5×10^{-6} °C^{-1}

SDE and crosstalk (typical measured value)

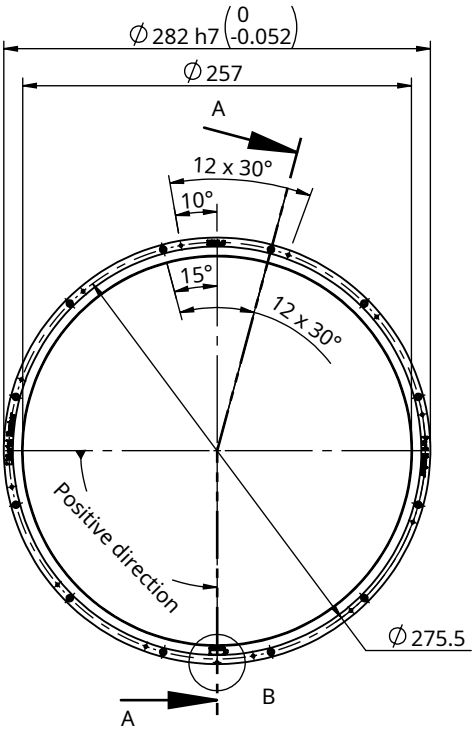


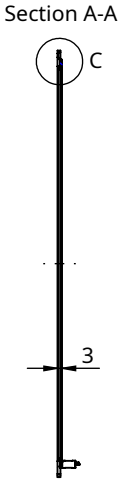


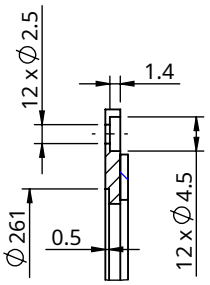
Dimensions and installation drawings

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

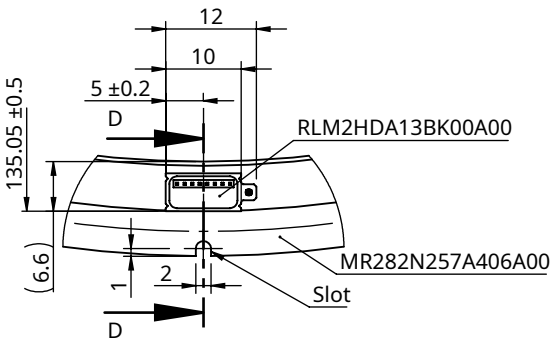
RLM



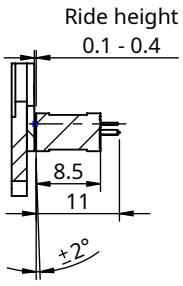




Detail C



Detail B



Angular orientation

Section D-D

Part numbering

MR 034 C 020 B 048 A 00

Series

MR - Magnetic incremental ring

Outer diameter

020 - 20 mm	**049** - 49 mm	**282** - 282 mm
024 - 24 mm	**050** - 50 mm	
026 - 26 mm	**061** - 61 mm	
034 - 34 mm	**080** - 80 mm	
045 - 45 mm	**100** - 100 mm	

Cross section

C - Height 2 mm, axial magnetisation

N - Height 2 or 3 mm (MR282), axial magnetisation (installation with fasteners)

S - Height 4 mm, axial magnetisation (installation with fasteners)

Inner diameter

012 - 12 mm	**028** - 28 mm	**257** - 257 mm
015 - 15 mm	**040** - 40 mm	
016 - 16 mm	**051** - 51 mm	
020 - 20 mm	**055** - 55 mm	
025 - 25 mm	**071** - 71 mm	

Reference mark

A - With reference mark

B - Without reference mark

Number of poles

026 - 26 poles	**072** - 72 poles
032 - 32 poles	**092** - 92 poles
036 - 36 poles	**122** - 122 poles
048 - 48 poles	**152** - 152 poles
064 - 64 poles	**406** - 406 poles

Material

A - Stainless steel hub with bonded rubber tape (–40 °C to +100 °C, except MR282: –40 °C to +85 °C)

B - Stainless steel hub with vulcanised elasto-ferrite layer (–40 °C to +160 °C)

Special requirements

00 - No special requirements

02 - With back adhesion tape

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

Series	Outer diameter	Cross section	Inner diameter	Reference mark	Number of poles	Material	Special requirements
MR	020	C	012	B	026	A	00 / 02
	024		015		032		
	026		016		036	B	
	026		012		036	A	
	034		020		048		
	045		028	A / B	064		
	049	N	025		072		00
	050	C	040				00 / 02
	061		051		092		
	080	N	055		122		00
	100	S	071		152		
	282	N	257		406		

Accessories

Magnet viewer
MM0001

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Document issues

Issue	Date	Page	Description
04	4. 8. 2021	General	Humidity amended, RLC2IC amended
05	14.3.2023	2	Selection guide table amended
		6	Reference mark engraving note added
		13	RLC2IC installation drawings for MR024C amended
		General	Inner diameter for MR050C amended
06	3. 7. 2023	10 – 46	Link to maximum speed calculator added.
07	12. 2. 2024	General	RLC2IC positive direction amended
08	19. 5. 2025	2, 4, 6-7, 53-56	MR282N added