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 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 RLS 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

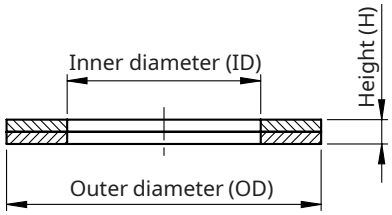
General information

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.

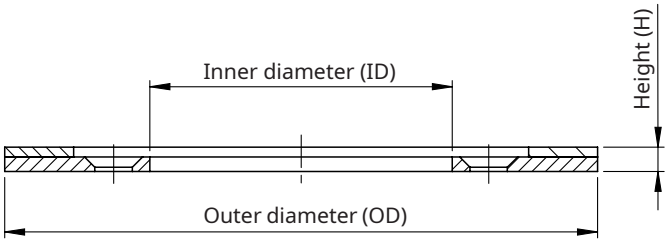
Various inner diameters are supported ranging from 12 mm to 71 mm. Axial magnetic rings can be installed with adhesive tape, fasteners or by gluing.

Selection guide

Cross-section C



Cross-section N and S (with attachment holes)



Ring	OD	ID	H	Compatibility with readheads						
				LM10	LM13	LM15	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 ID12	26 ±0.1	12 H7	2 ±0.1	No Ri	No Ri	-	No Ri	No Ri	No Ri	No Ri
MR026C ID16	26 ±0.1	16 ±0.1	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 ±0.02	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

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

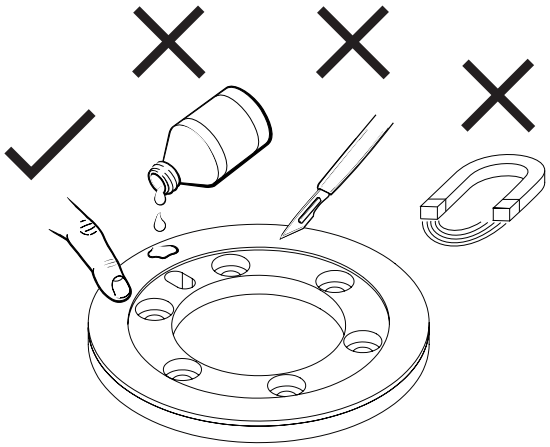
CPE: –40 °C to 100 °C
HNBR: –40 °C to 160 °C

Operating temperature

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

Humidity

Up to 100 % RH



The magnetic ring should not be exposed to magnetic field densities higher than 50 mT on its surface, as this can damage the ring.

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**.

Test performed with		Compatibility
Ethanol	Technical, ≥ 95 %	✔
Isopropanol	Technical, ≥ 95 %	✔
Cutting oil	Rezilol SCM BCL	✔
Brake fluid	DOT-4	✔
Grease	ISOFLEX® TOPAS NB 52	✔

The test samples were immersed in chemicals at 25 °C for four weeks according to standard ISO 175:2010. Changes in the mass and height of the elasto-ferrite layer were controlled during the test.

Packaging

Each magnetic ring is packed individually in an antistatic box.

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

Accuracy of linear encoder systems

The accuracy of the ring encoder measurement is influenced by **encoder-specific 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-specific 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		

* 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.

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.

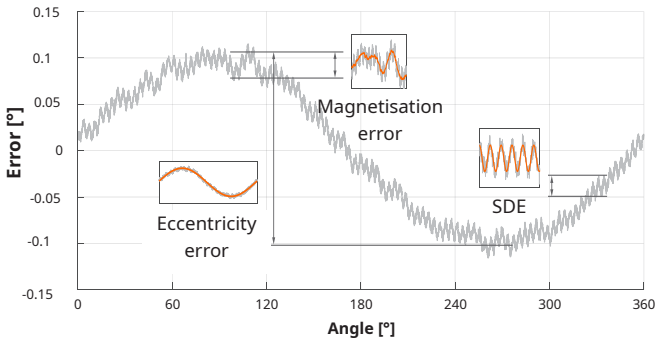


Fig. 1. Typical accuracy error plot.

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].

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.

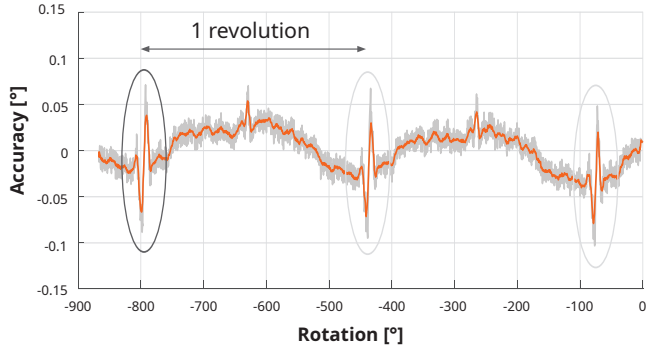


Fig. 2. Crosstalk representation. The crosstalk (Ri magnetisation) is circled.

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 oouter 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).

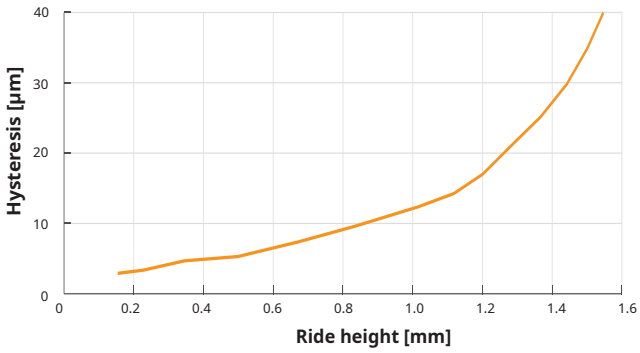


Fig. 3. Hysteresis vs. ride height (for encoder systems with 2 mm pole length).

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].

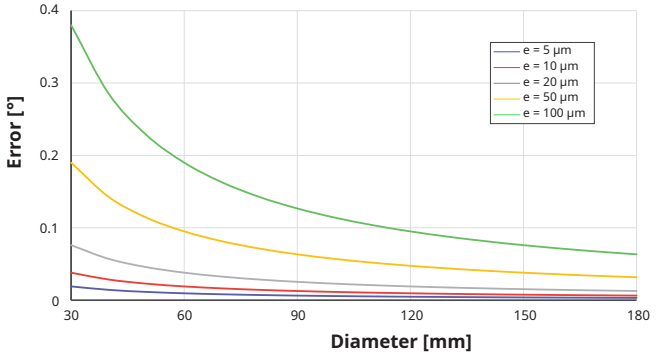


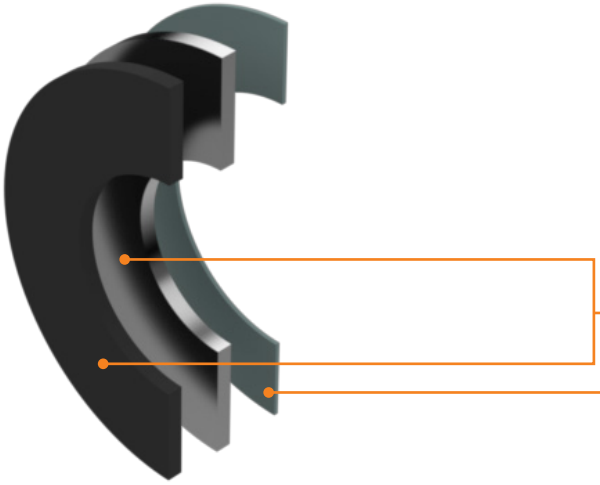
Fig. 4. Influence of installation eccentricity on accuracy.

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.

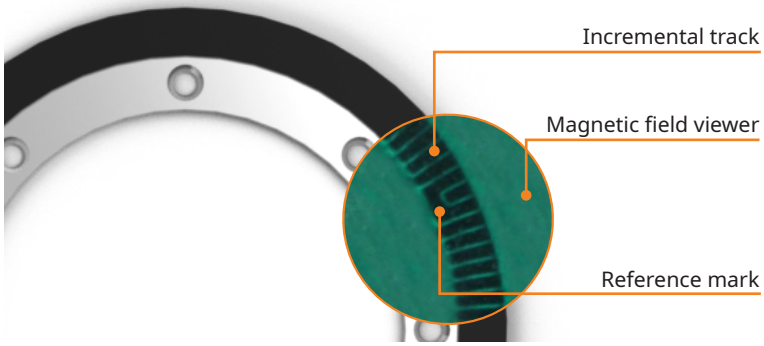
Magnetic ring design

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.

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

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	12H7	+0.018 0	12f7	-0.016 -0.034
MR024C	24	+0.1 -0.1	15H7	+0.018 0	15f7	-0.016 -0.034
MR026C ID16	26	+0.1 -0.1	16	+0.1 -0.1	15.9	-0.05 -0.15
MR026C ID12	26	+0.1 -0.1	12	+0.018 -0	12f7	-0.016 -0.034
MR034C	34	+0.1 -0.1	20.5H7	+0.021 0	20.5f7	-0.02 -0.041
MR045C	45	+0.1 -0.1	28.5H7	+0.021 0	28.5f7	-0.02 -0.041
MR049N	49	+0.1 -0.1	25H7	+0.021 0	25f7	-0.02 -0.041
MR050C	50	+0.1 -0.1	40	+0.02 -0.02	39.9	+0.05 0
MR061C	61.3	+0.1 -0.1	51.3H7	+0.1 -0.1	51.2 f7	-0.015 -0.025
MR080N	80	+0.1 -0.1	55H7	+0.030 0	55f7	-0.03 -0.06
MR0100S	100	+0.1 -0.1	71H7	+0.030 0	71f7	-0.03 -0.06

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

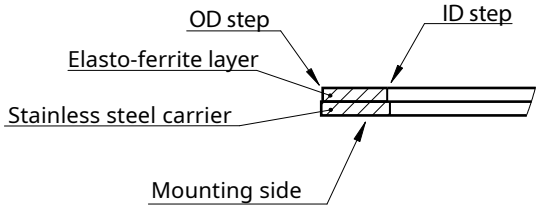
Recommended ride height table

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).

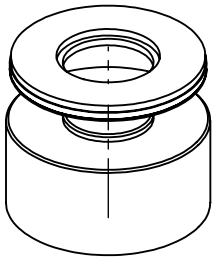
For additional information refer to “Surface Preparation for 3M™ VHB™ Tape Applications”.

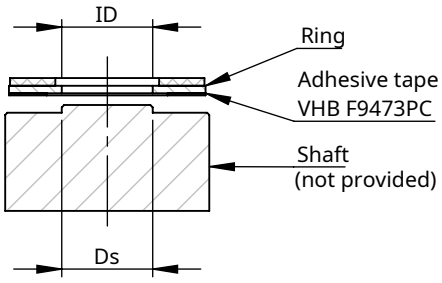
Application

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.

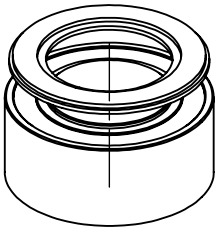


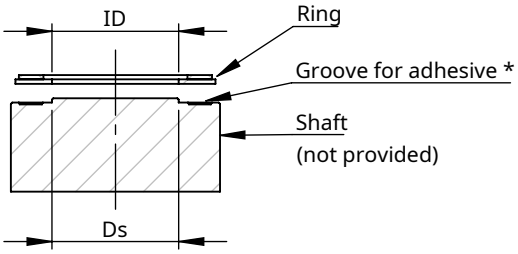


Installation by gluing

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.





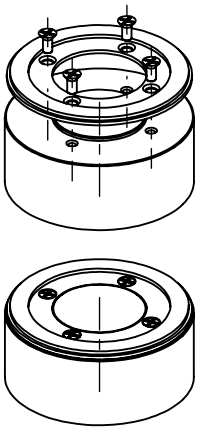
* Dimensions according to adhesive specification.

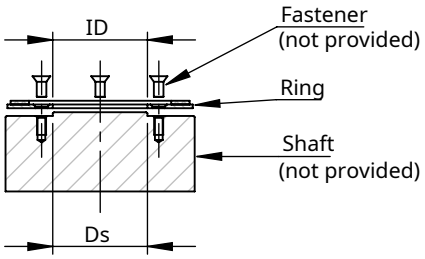
Installation with fasteners

Application

Installation with fasteners is possible for rings MR049N, MR080N 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





MR020C

Compatibility table

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

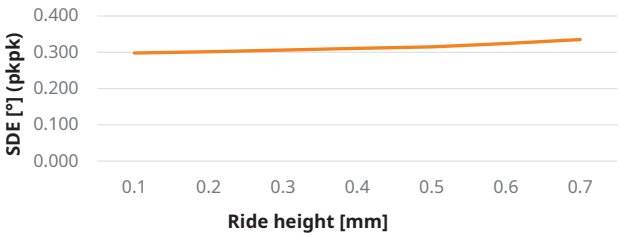
No Ri - No reference mark option, only incremental track available

Technical features

Outer diameter	19.5 ± 0.1 mm
Inner diameter	12 H7
Height	2 ± 0.1 mm
Mass	2 g
System error	±0.31°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	130 gmm^2
Material of magnetic layer	CPE
Hub material	EN1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

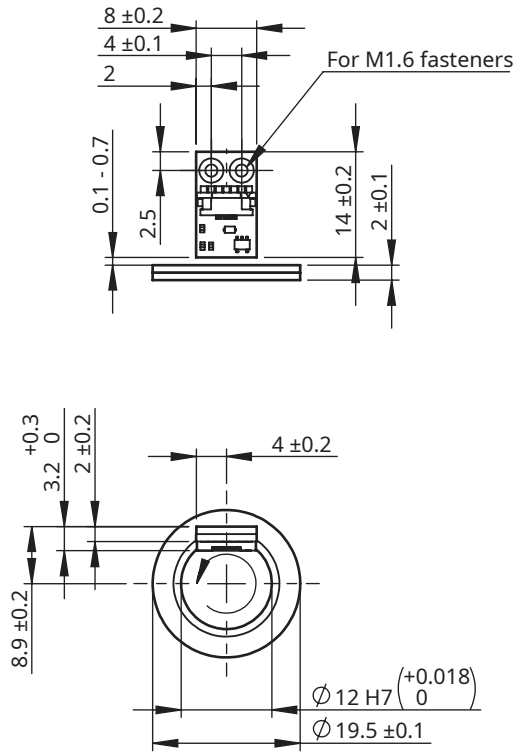
SDE (typical measured value)



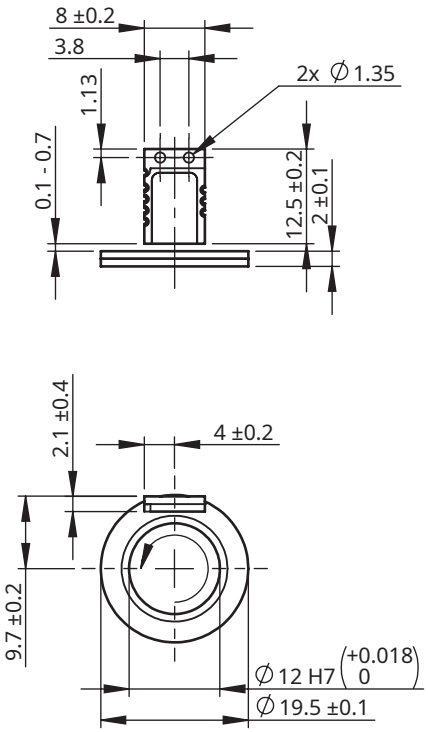
Dimensions and installation drawings

Dimensions and tolerances are in mm.

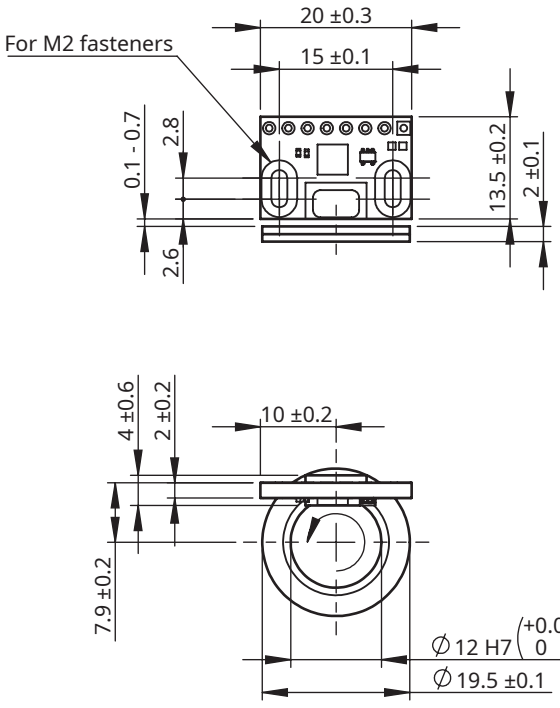
RLB



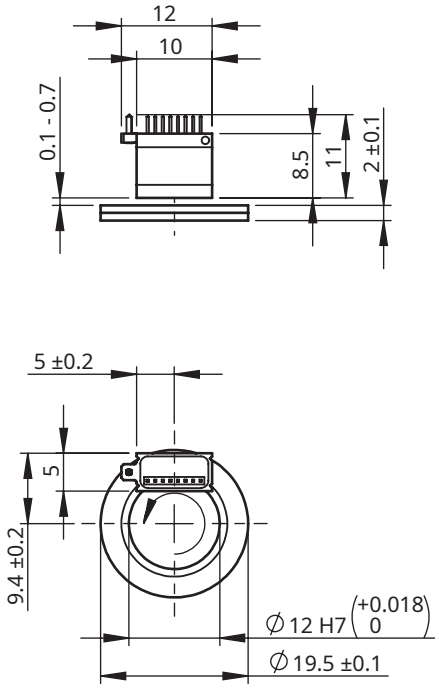
RLC2HD



RLC2IC



RLM



MR024C

Compatibility table

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

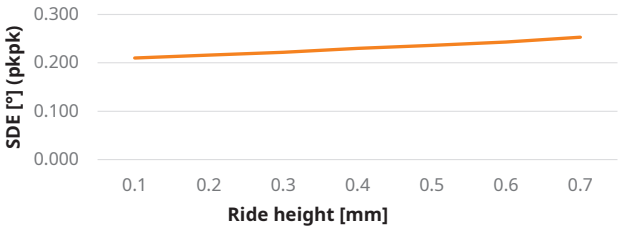
No Ri - No reference mark option, only incremental track available

Technical features

Outer diameter	24 ± 0.1 mm
Inner diameter	15 H7
Height	2 ± 0.1 mm
Mass	3 g
System error	±0.25°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	290 gmm^2
Material of magnetic layer	CPE
Hub material	EN1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

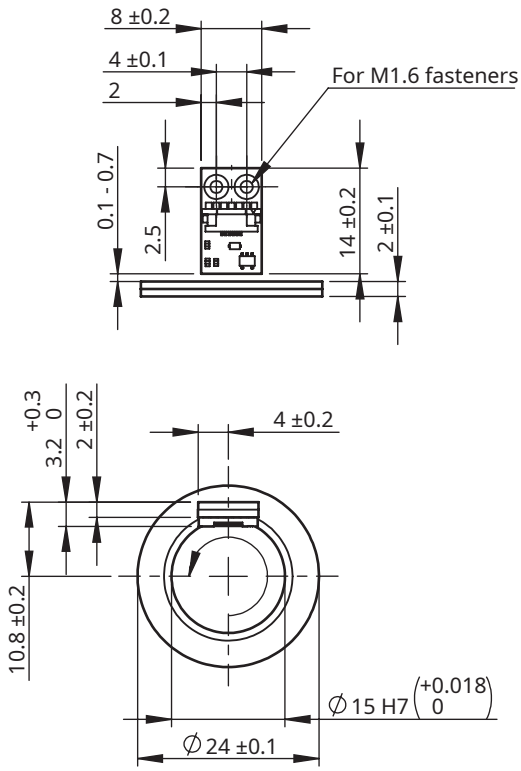
SDE (typical measured value)



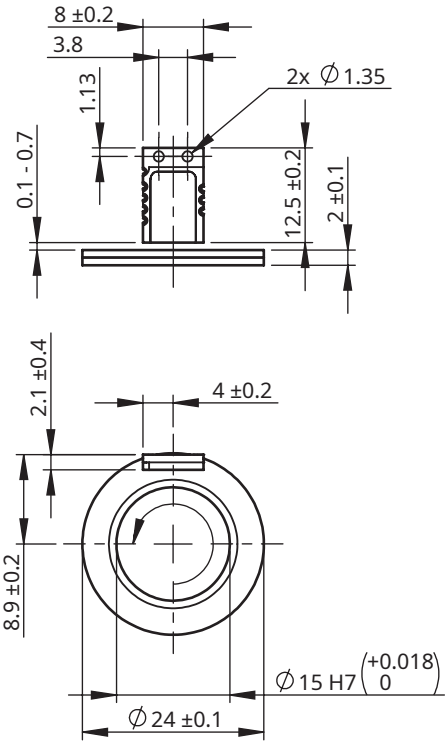
Dimensions and installation drawings

Dimensions and tolerances are in mm.

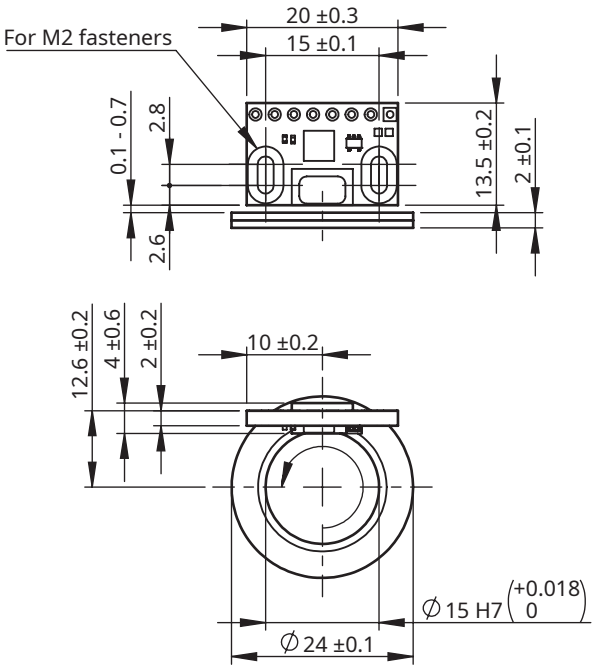
RLB



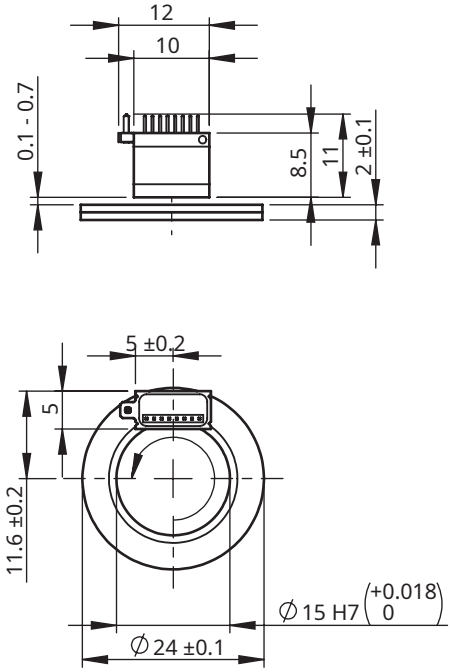
RLC2HD



RLC2IC



RLM



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

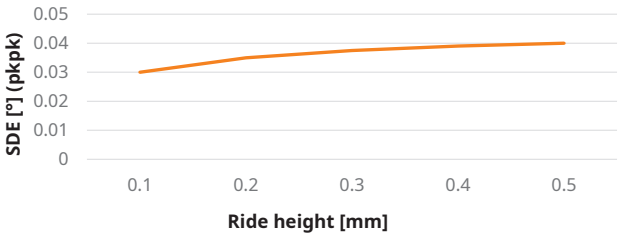
No Ri - No reference mark option, only incremental track available

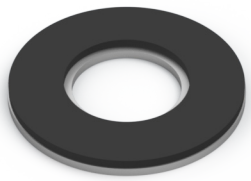
Technical features

Outer diameter	26 ± 0.1 mm
Inner diameter	12 ± 0.1 mm
Height	2 ± 0.1 mm
Mass	5 g
System error	±0.23°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	450 gmm^2
Material of magnetic layer	CPE
Hub material	EN1.4305 / AISI 303
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

SDE (typical measured value)

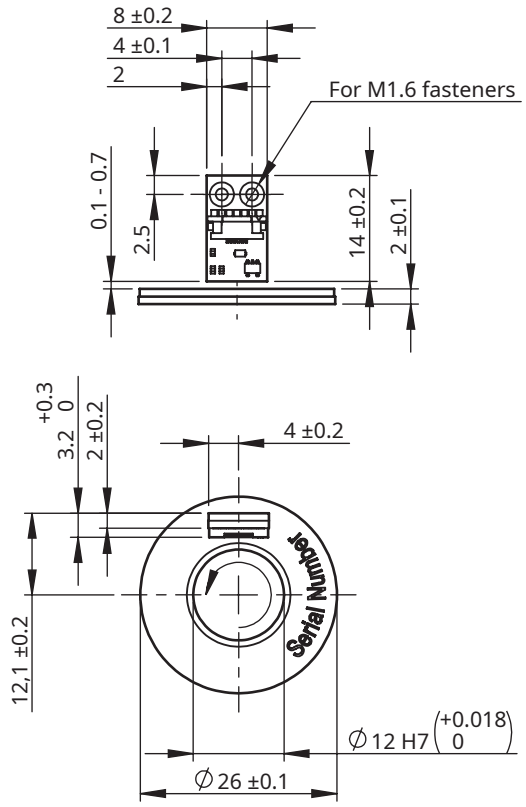




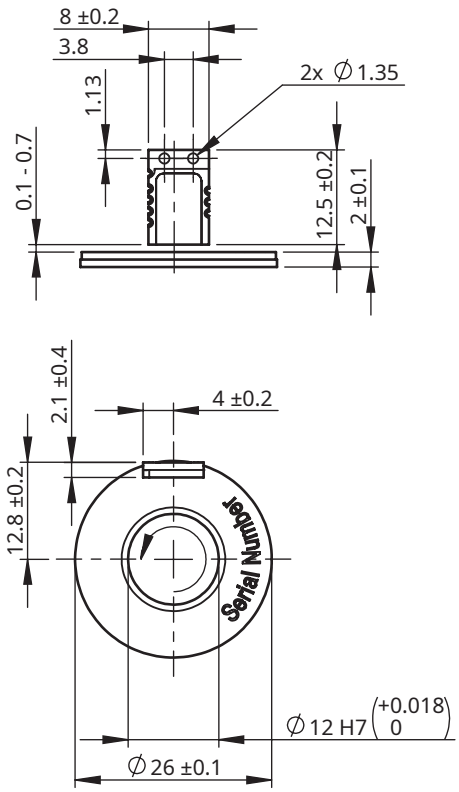
Dimensions and installation drawings

Dimensions and tolerances are in mm.

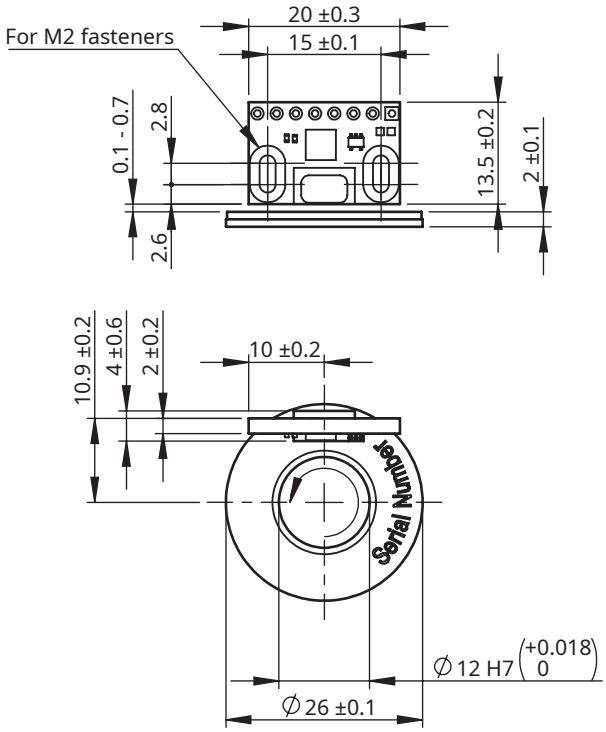
RLB



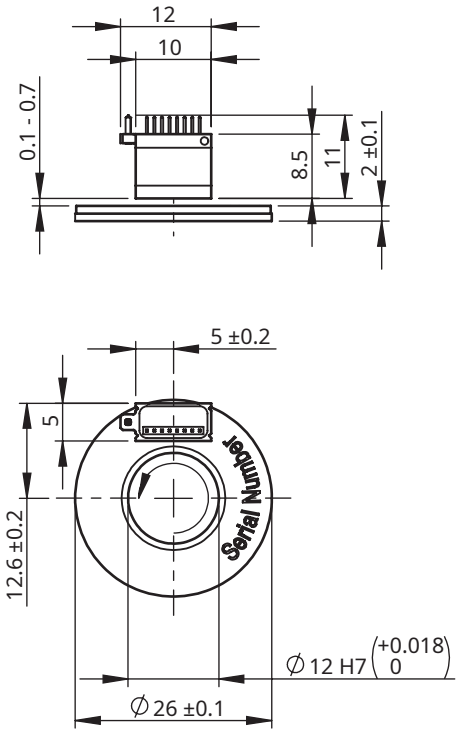
RLC2HD



RLC2IC



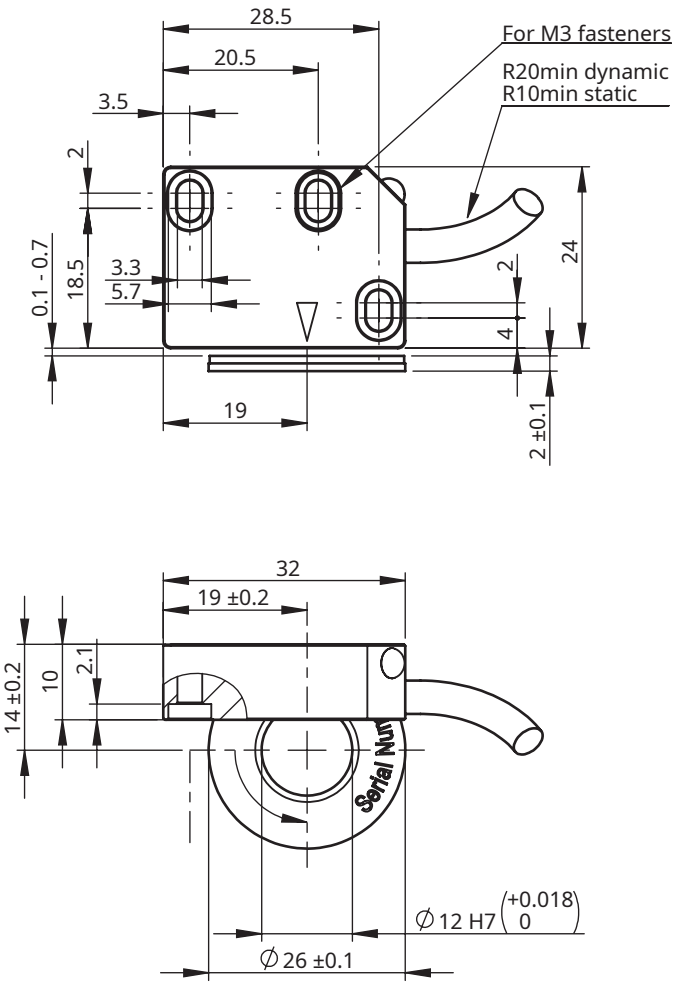
RLM



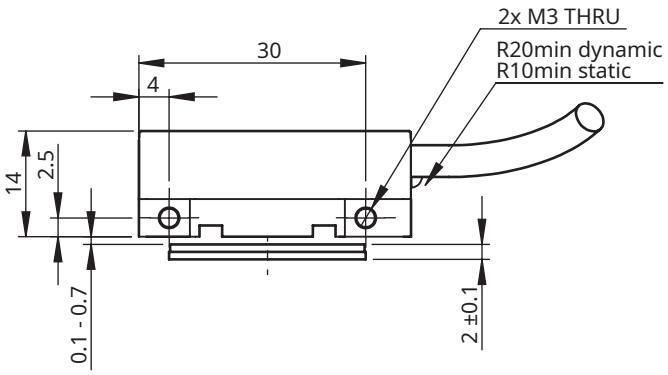
Dimensions and installation drawings

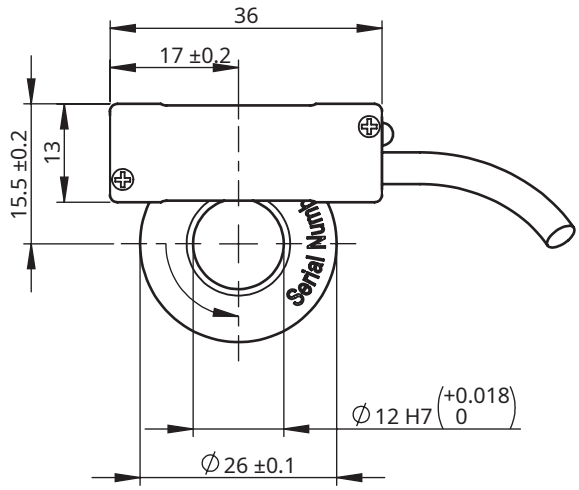
Dimensions and tolerances are in mm.

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

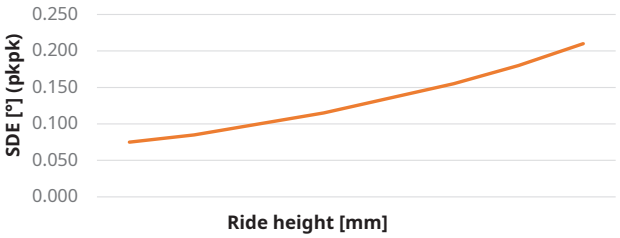
No Ri - No reference mark option, only incremental track available

Technical features

Outer diameter	26 ± 0.1 mm
Inner diameter	16 ± 0.1 mm
Height	2 ± 0.1 mm
Mass	4 g
System error	±0.23°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	450 gmm^2
Material of magnetic layer	HNBR + ferrite
Hub material	EN1.4305 / AISI 303
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

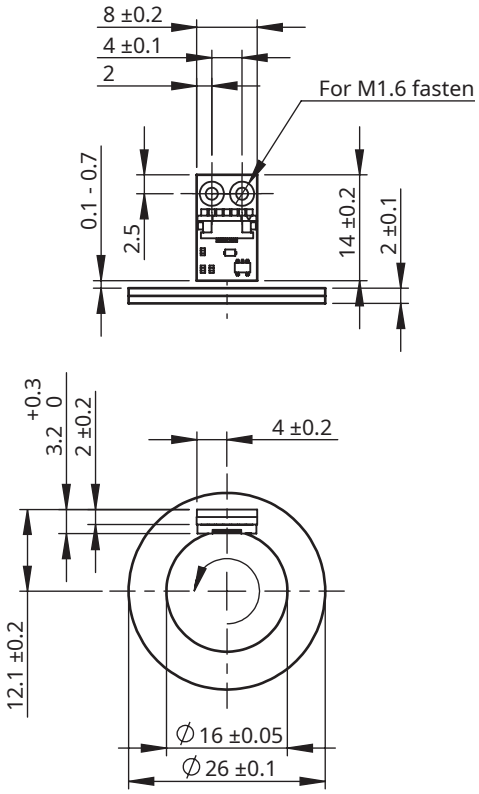
SDE (typical measured value)



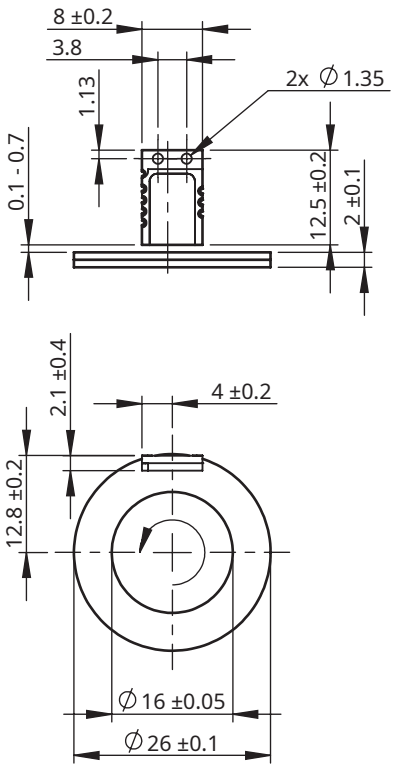
Dimensions and installation drawings

Dimensions and tolerances are in mm.

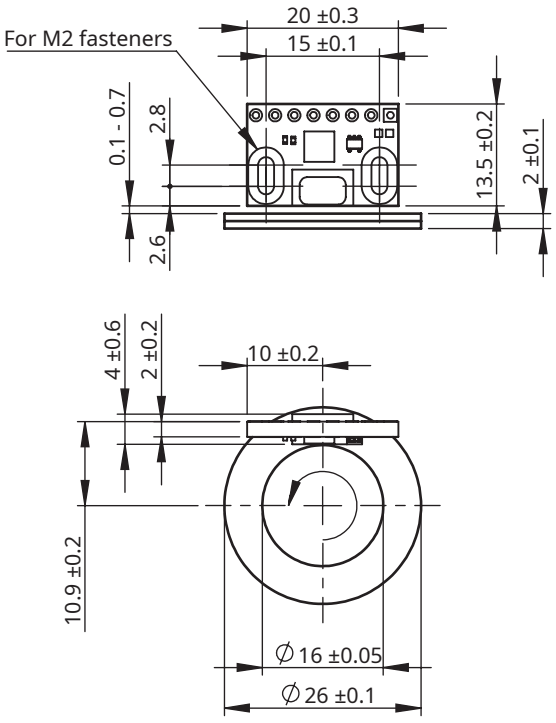
RLB



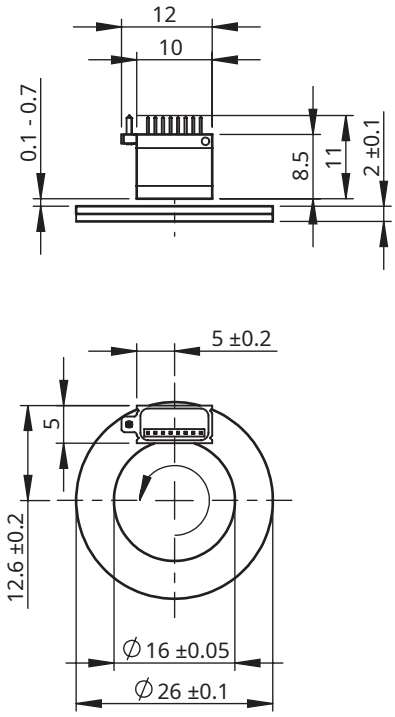
RLC2HD



RLC2IC



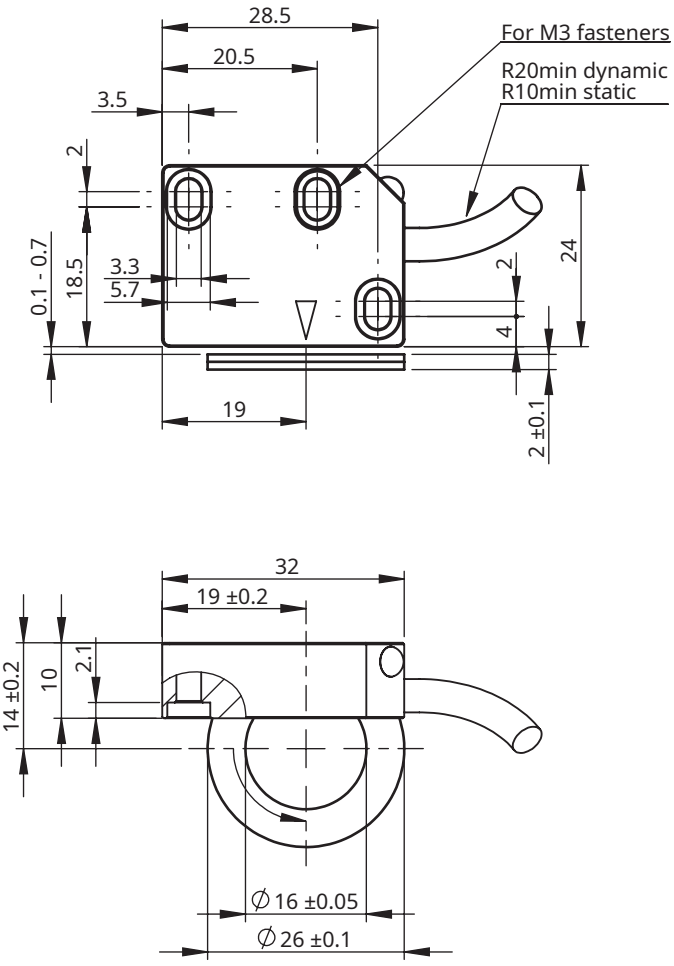
RLM



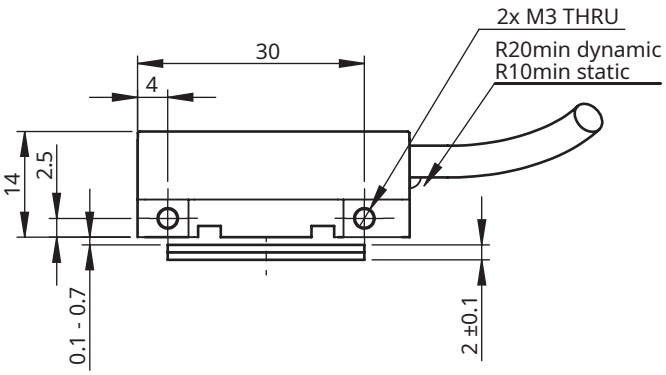
Dimensions and installation drawings

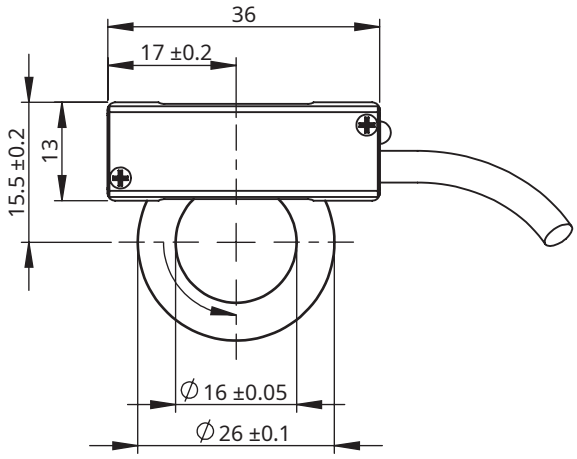
Dimensions and tolerances are in mm.

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

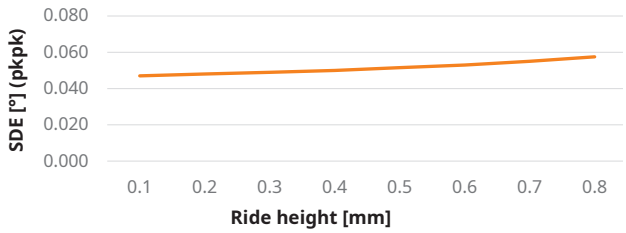
No Ri - No reference mark option, only incremental track available

Technical features

Outer diameter	34 ± 0.1 mm
Inner diameter	20.5 H7
Height	2 ±0.1 mm
Mass	6 g
System error	±0.17°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	450 gmm^2
Material of magnetic layer	CPE
Hub material	EN1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

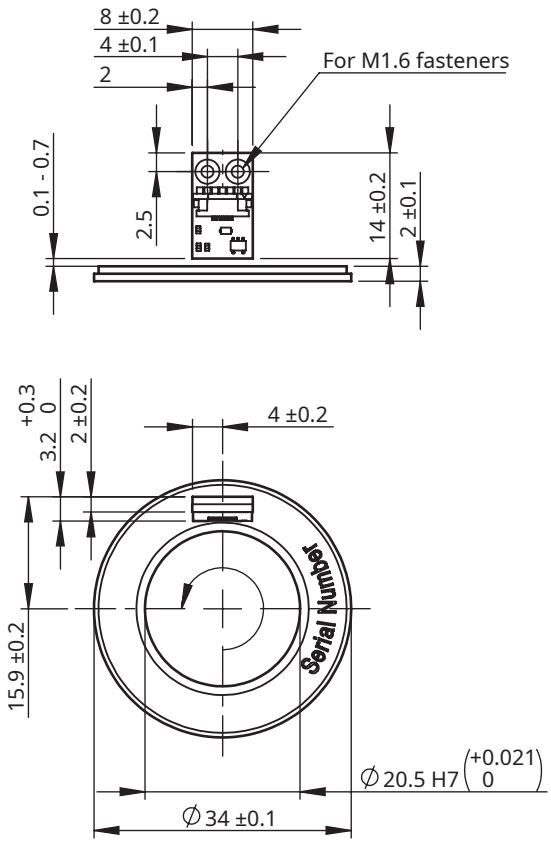
SDE (typical measured value)



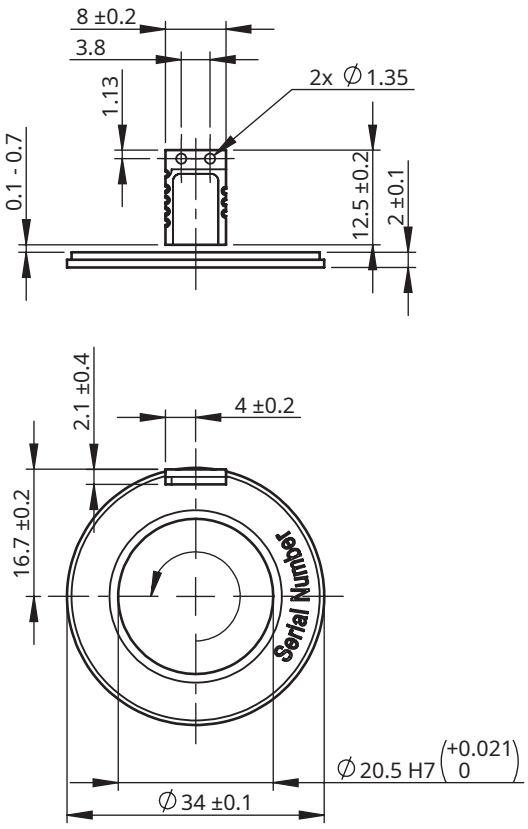
Dimensions and installation drawings

Dimensions and tolerances are in mm.

RLB



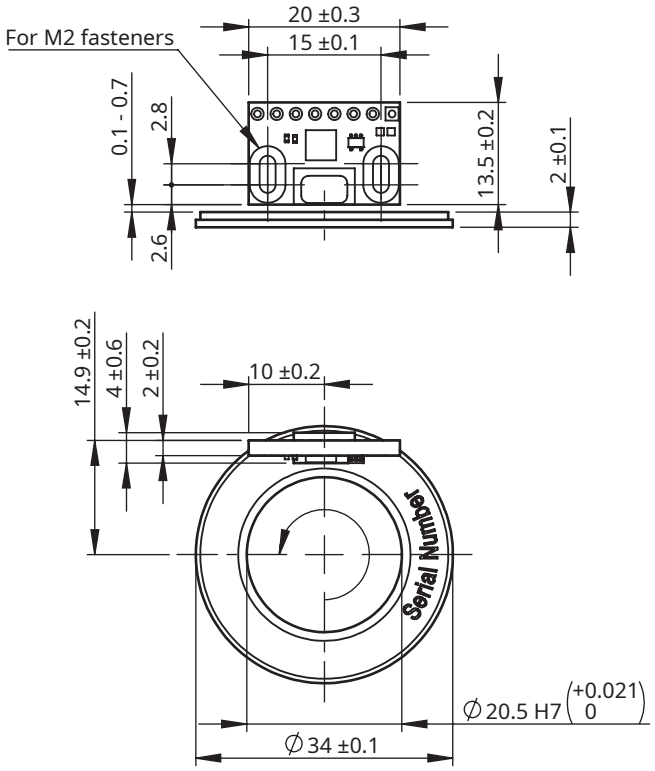
RLC2HD



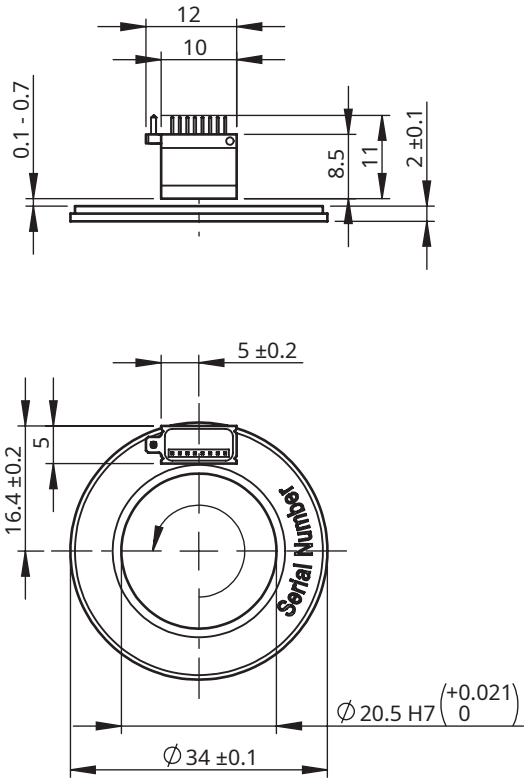
Dimensions and installation drawings

Dimensions and tolerances are in mm.

RLC2IC



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

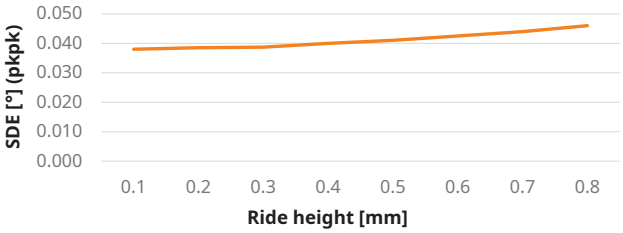
No Ri - No reference mark option, only incremental track available

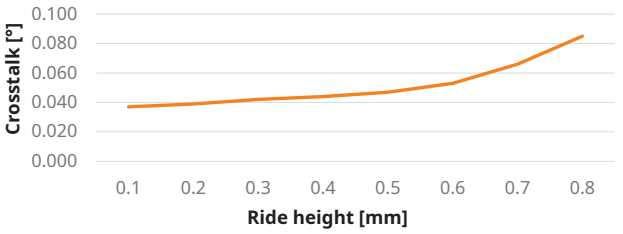
Technical features

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

Moment of inertia	450 gmm^2
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)

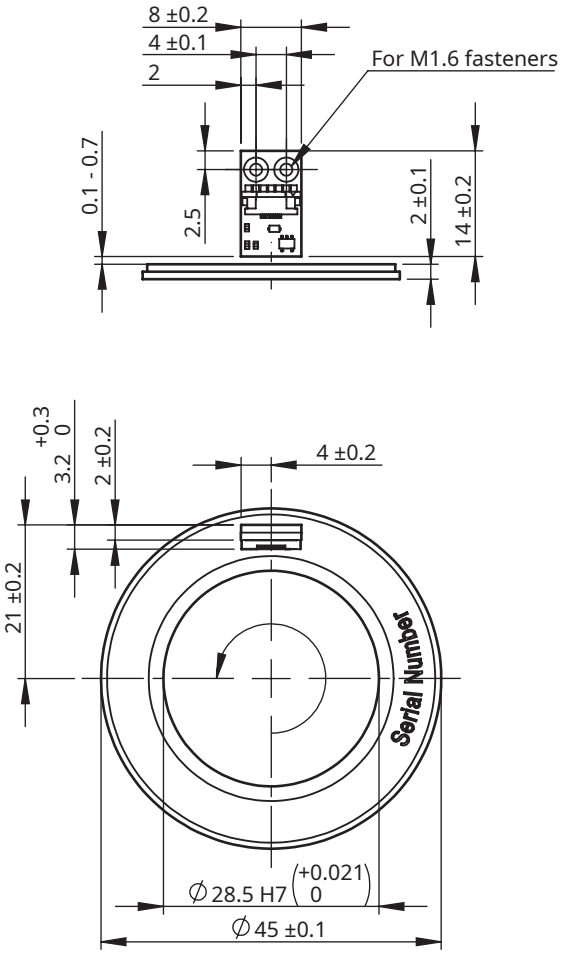




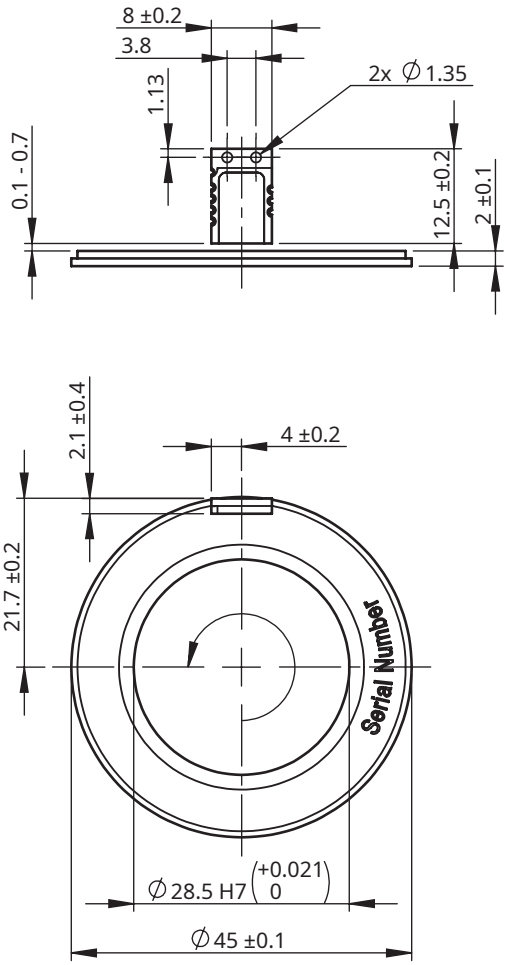
Dimensions and installation drawings

Dimensions and tolerances are in mm.

RLB



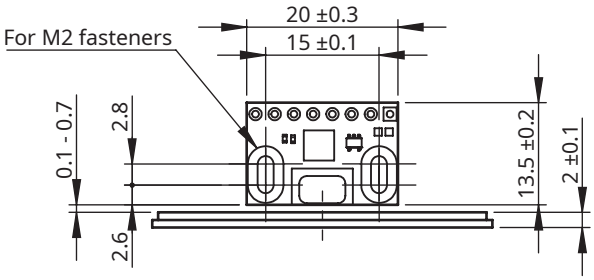
RLC2HD

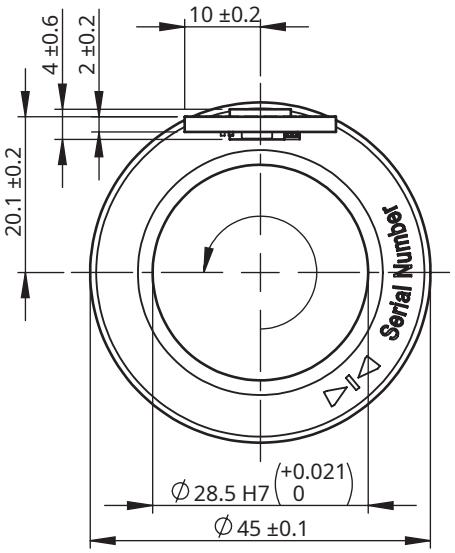


Dimensions and installation drawings

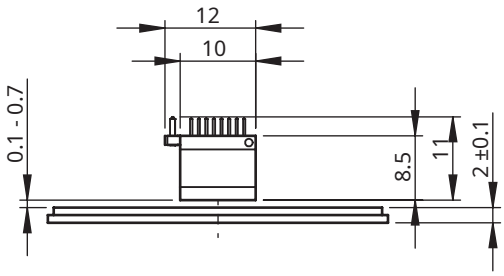
Dimensions and tolerances are in mm.

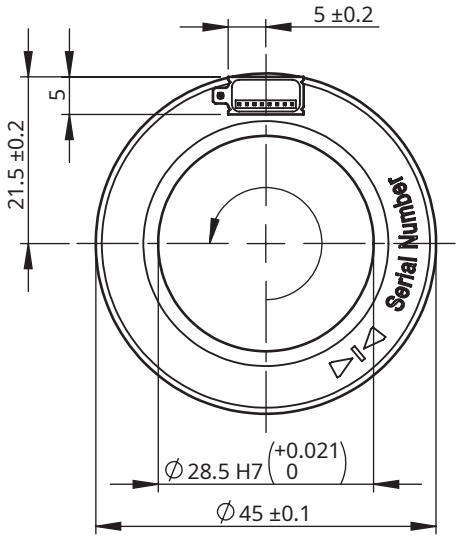
RLC2IC





RLM

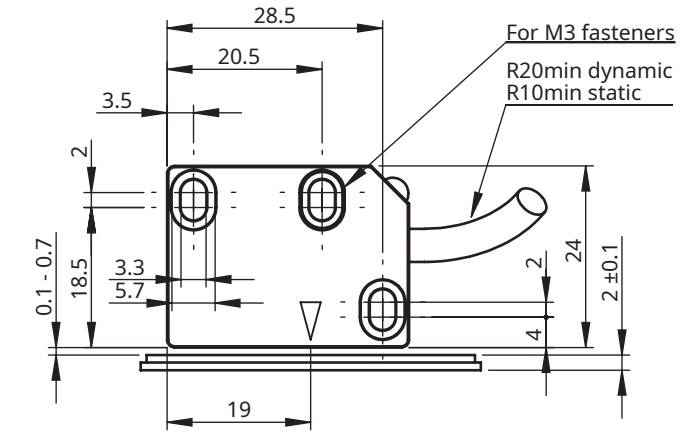


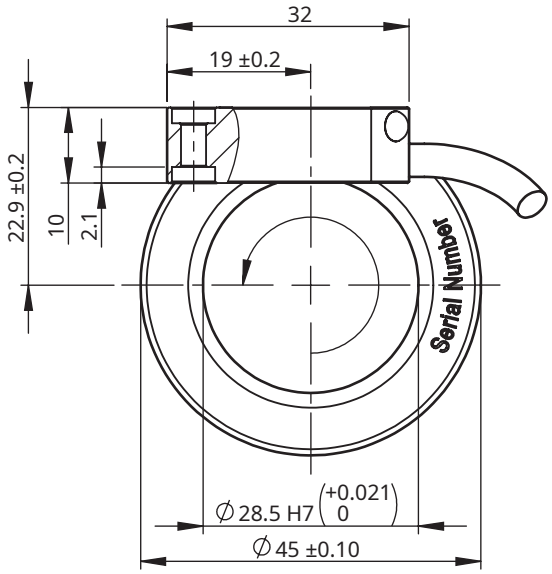


Dimensions and installation drawings

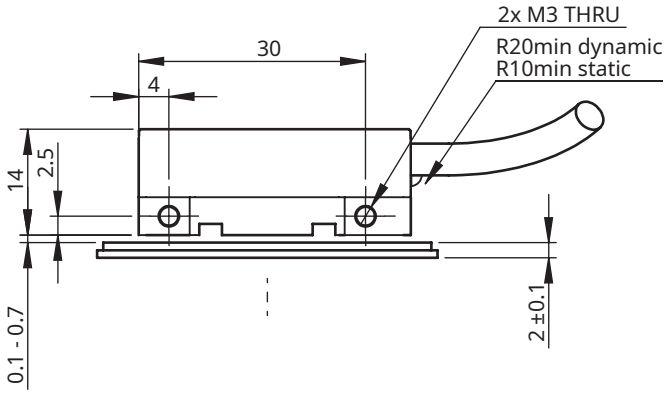
Dimensions and tolerances are in mm.

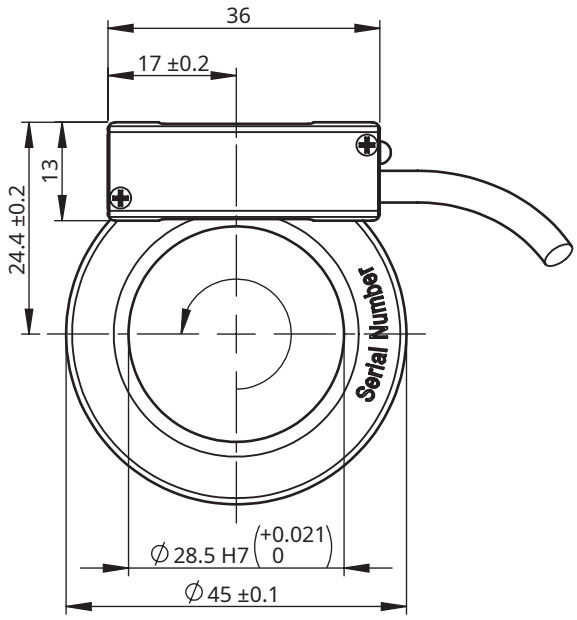
LM10





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

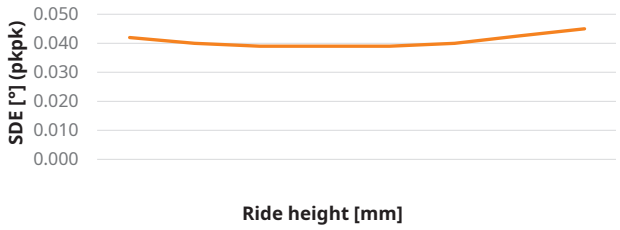
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

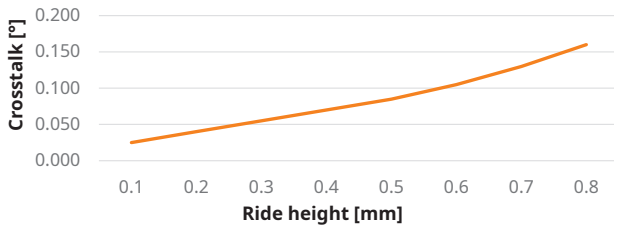
Technical features

Outer diameter	49 ± 0.1 mm
Inner diameter	25 H7
Height	2 ±0.1 mm
Mass	13 g
System error	±0.11°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	3.500 gmm^2
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)

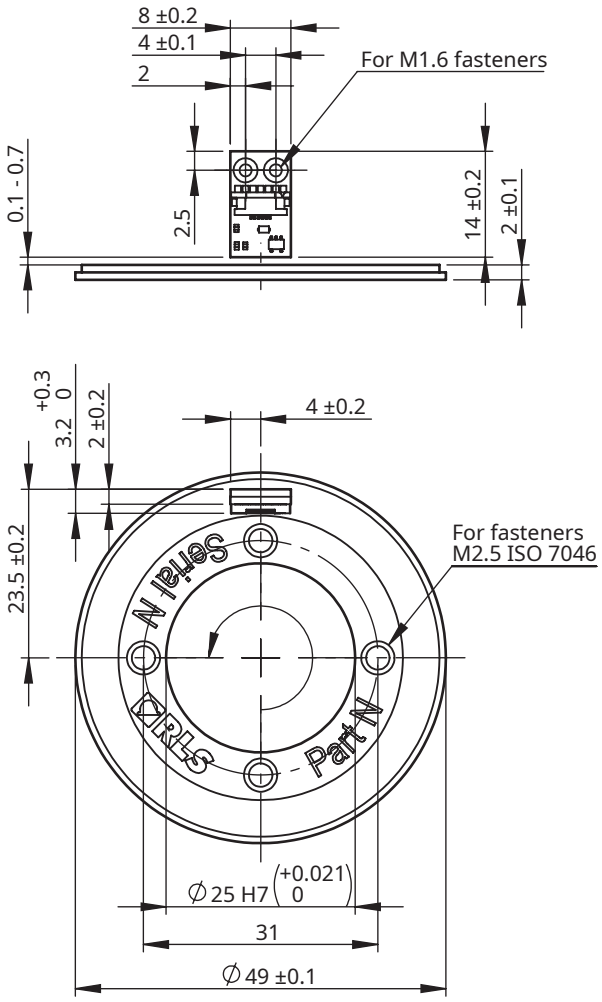




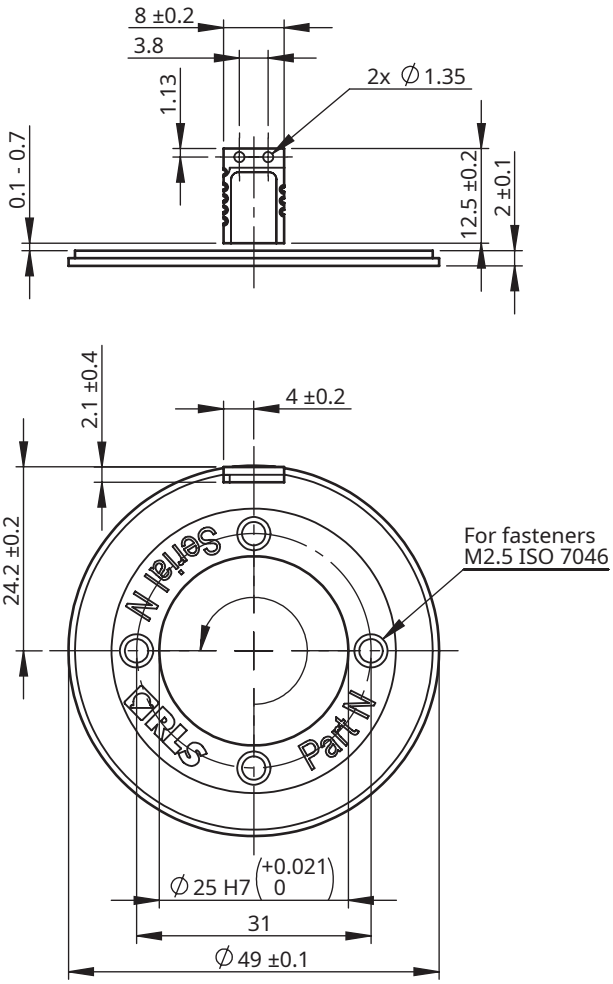
Dimensions and installation drawings

Dimensions and tolerances are in mm.

RLB



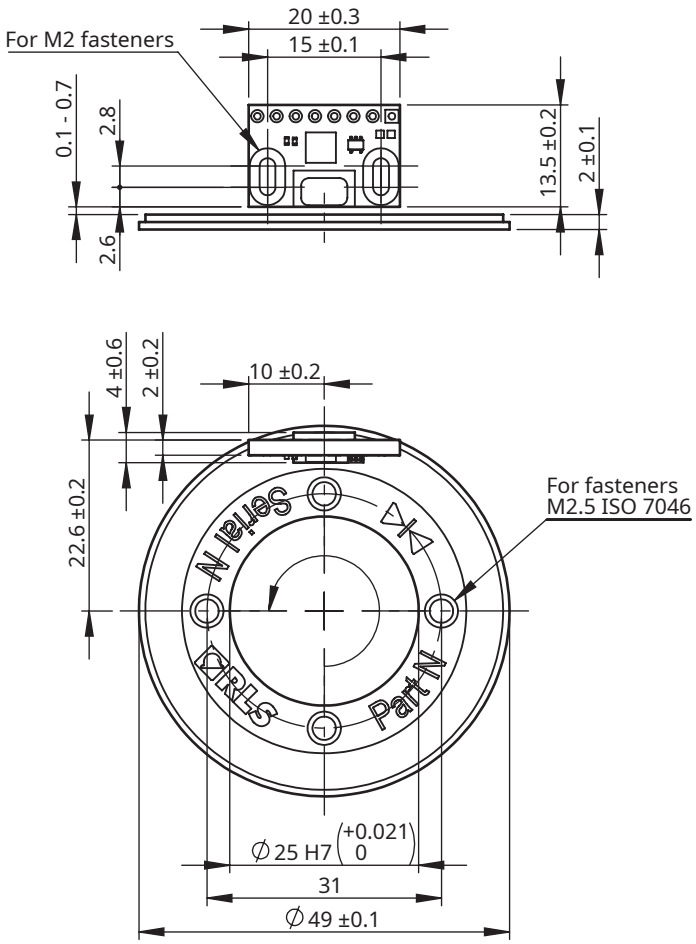
RLC2HD



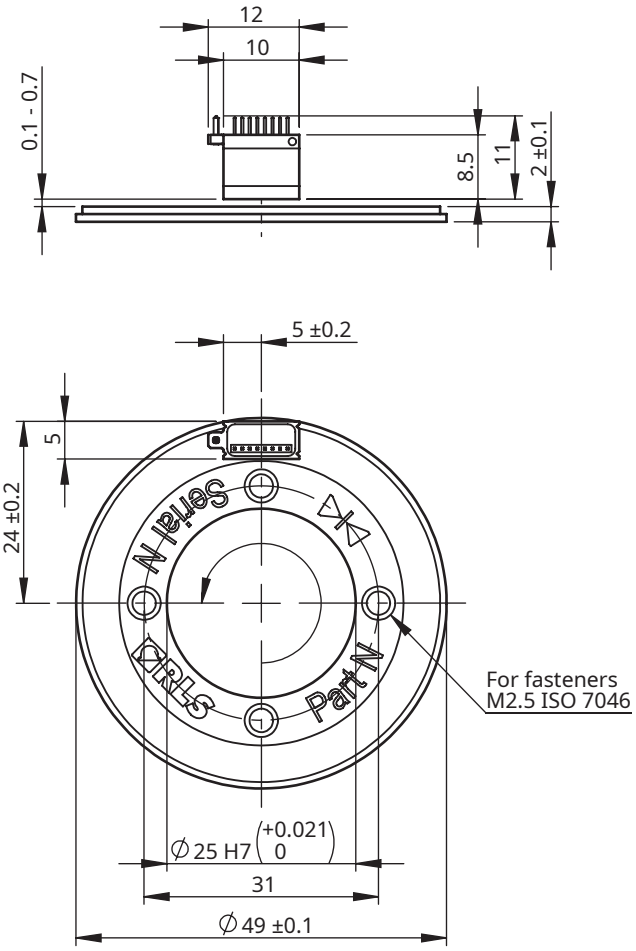
Dimensions and installation drawings

Dimensions and tolerances are in mm.

RLC2IC



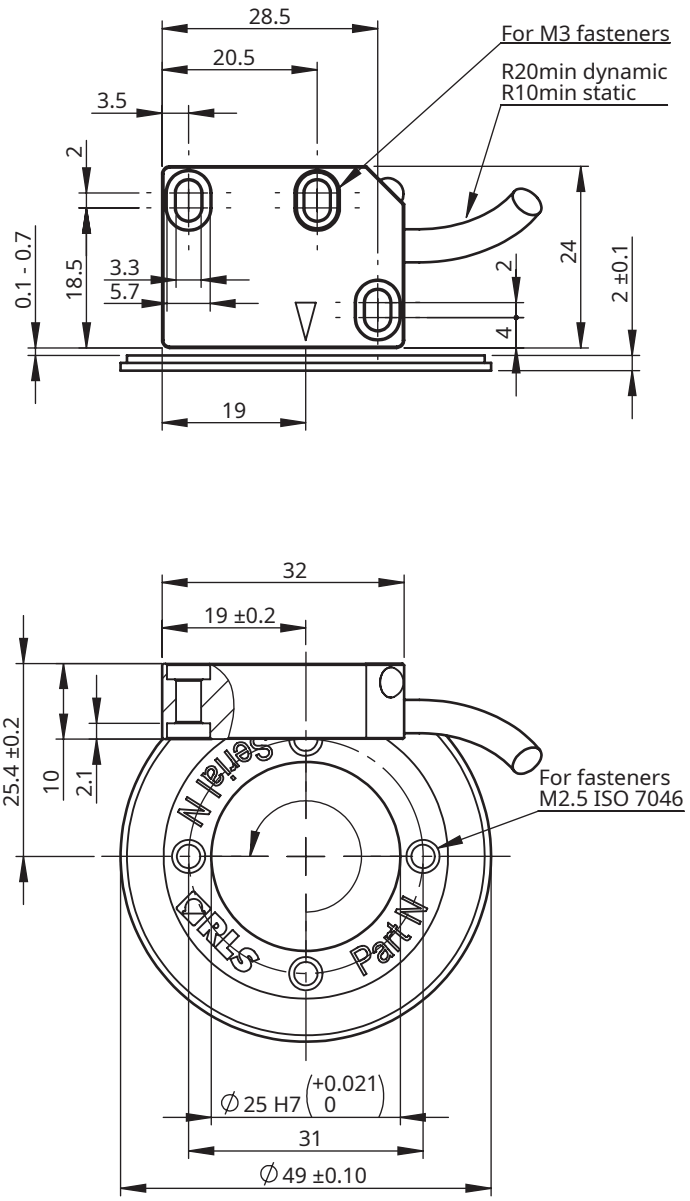
RLM



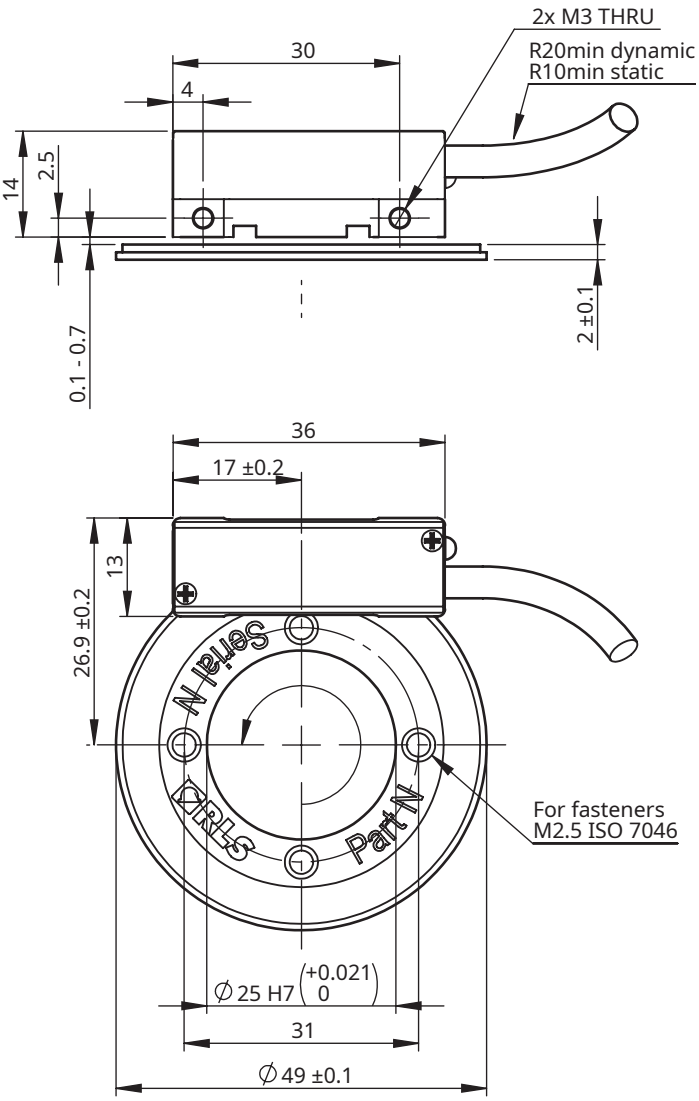
Dimensions and installation drawings

Dimensions and tolerances are in mm.

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

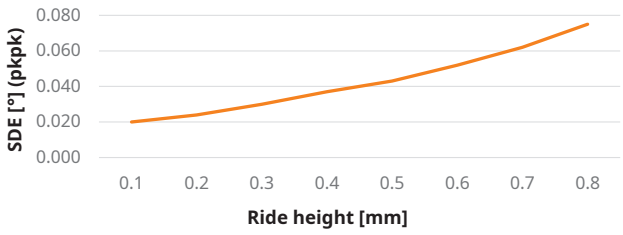
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

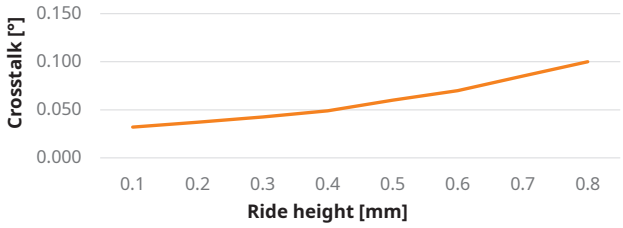
Technical features

Outer diameter	50 ± 0.1 mm
Inner diameter	40 ± 0.02 mm
Height	2 ±0.1 mm
Mass	8 g
System error	±0.11°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	3.880 gmm^2
Material of magnetic layer	CPE
Hub material	EN 1.4305 / AISI 303
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

SDE and crosstalk (typical measured value)

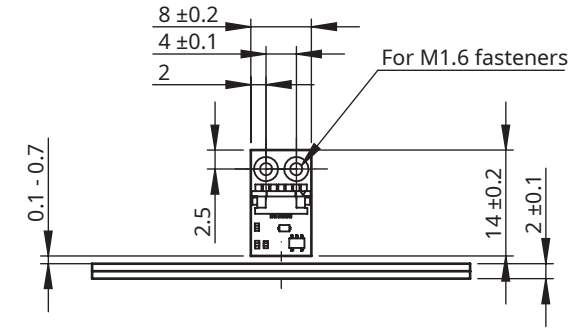


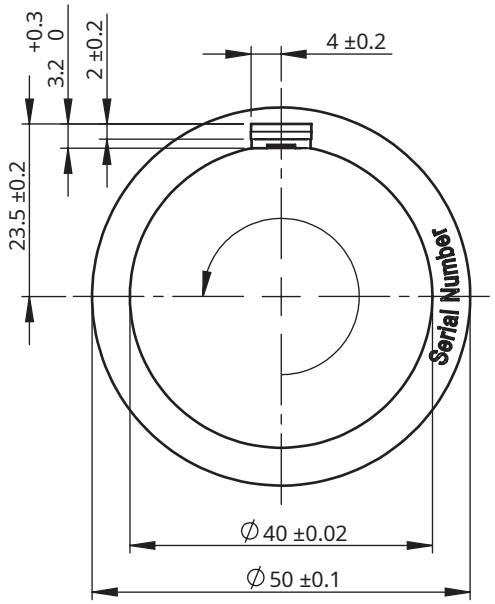


Dimensions and installation drawings

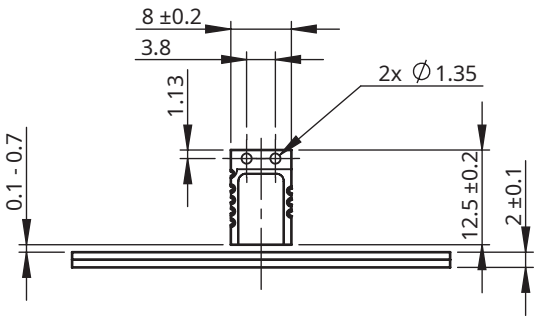
Dimensions and tolerances are in mm.

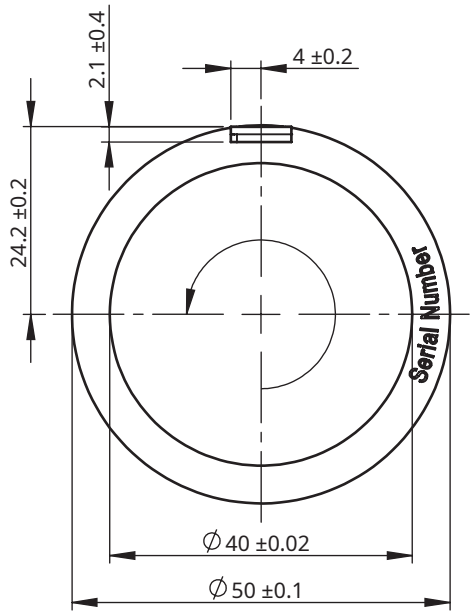
RLB





RLC2HD

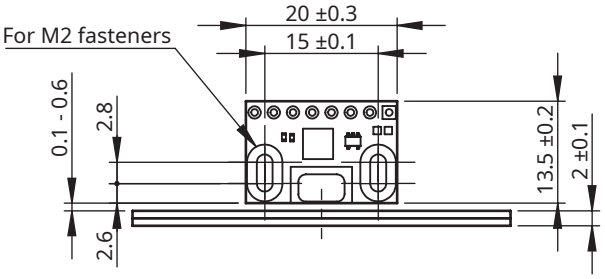


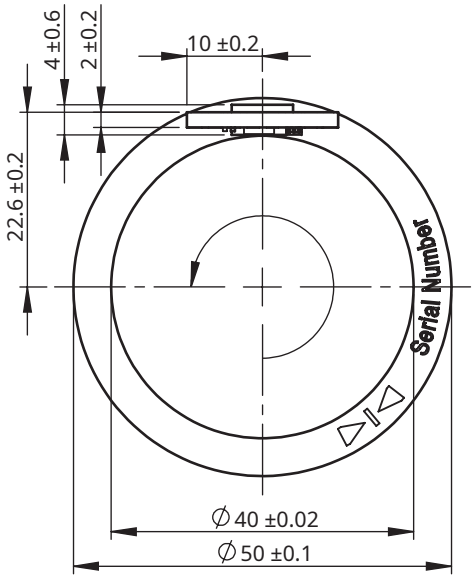


Dimensions and installation drawings

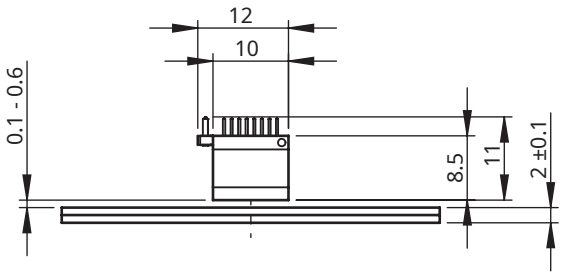
Dimensions and tolerances are in mm.

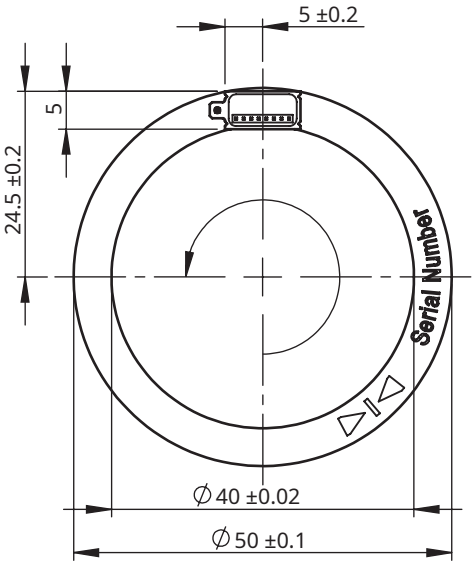
RLC2IC





RLM

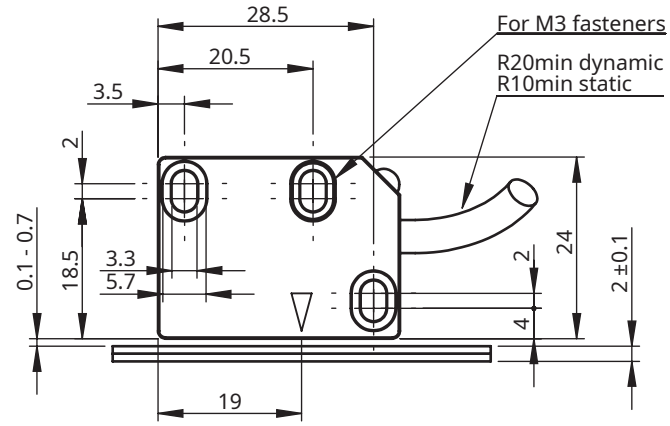


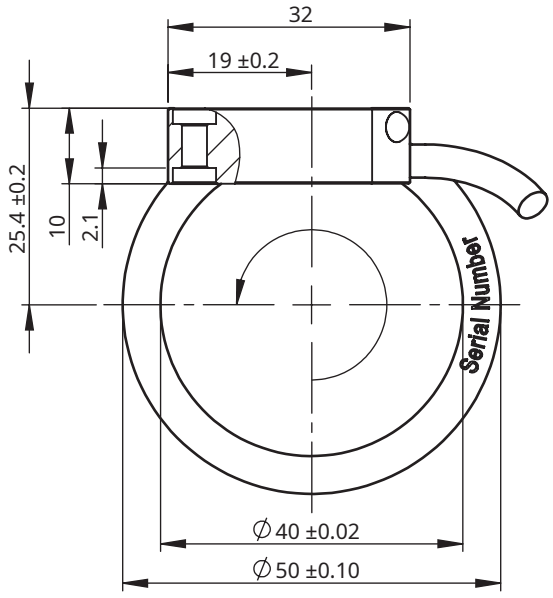


Dimensions and installation drawings

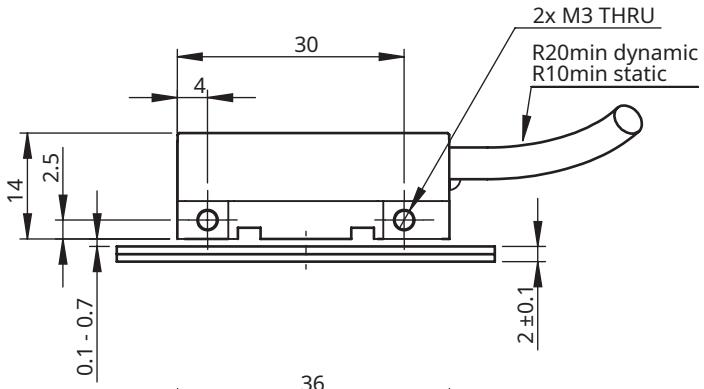
Dimensions and tolerances are in mm.

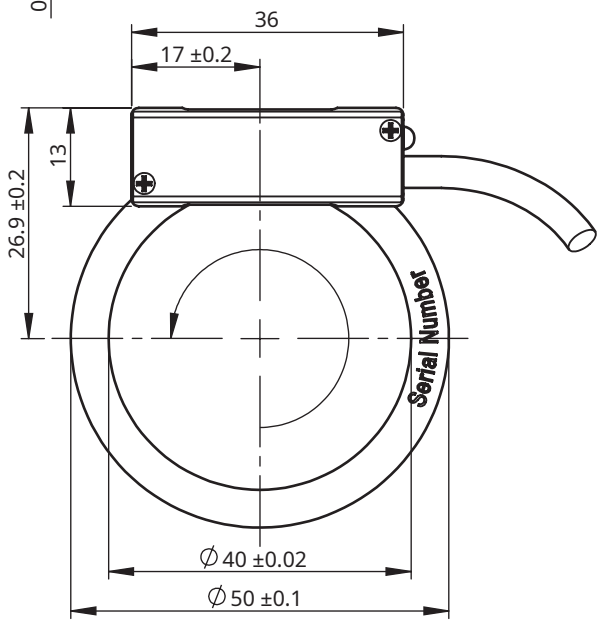
LM10





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

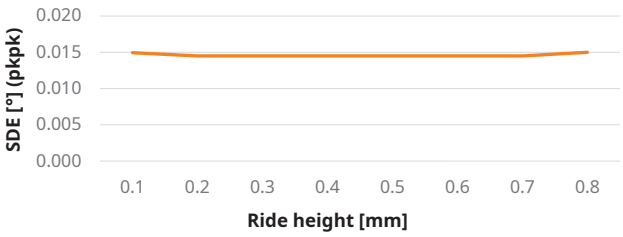
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

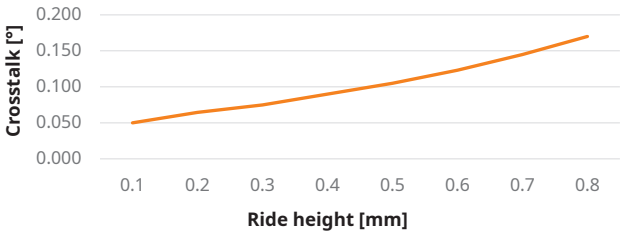
Technical features

Outer diameter	61.3 ±0.1 mm
Inner diameter	51.3 H7 mm
Height	2 ±0.1 mm
Mass	10 g
System error	±0.09°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	7.560 gmm^2
Material of magnetic layer	CPE
Hub material	EN 1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

SDE and crosstalk (typical measured value)

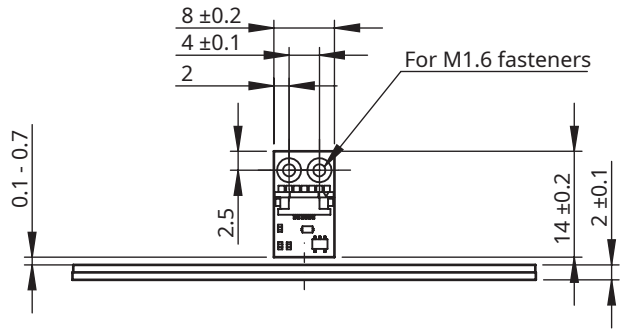


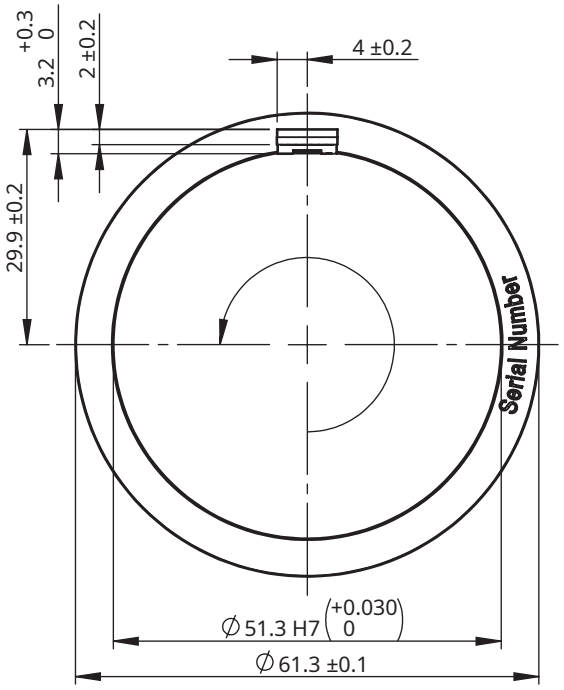


Dimensions and installation drawings

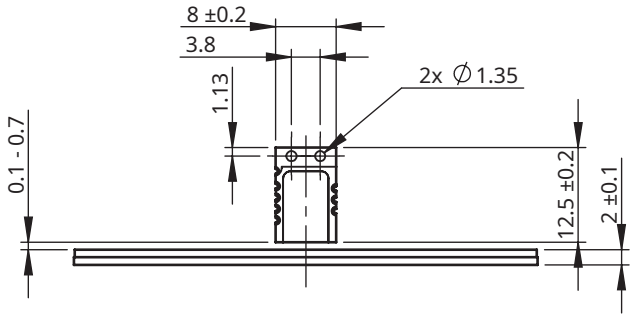
Dimensions and tolerances are in mm.

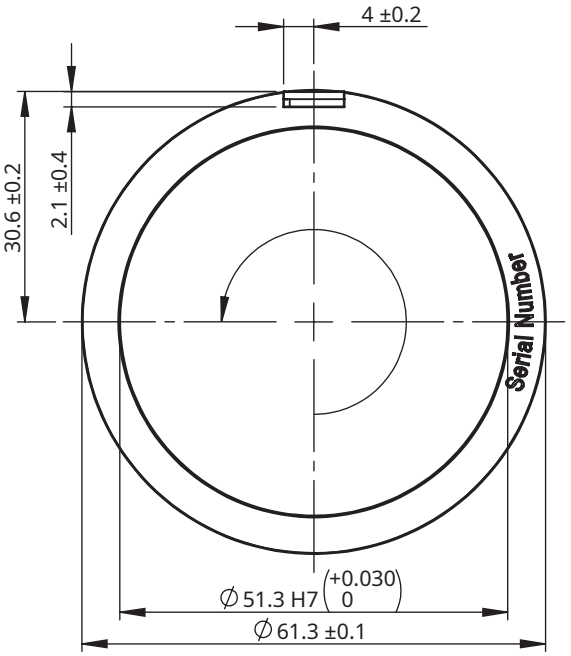
RLB





RLC2HD

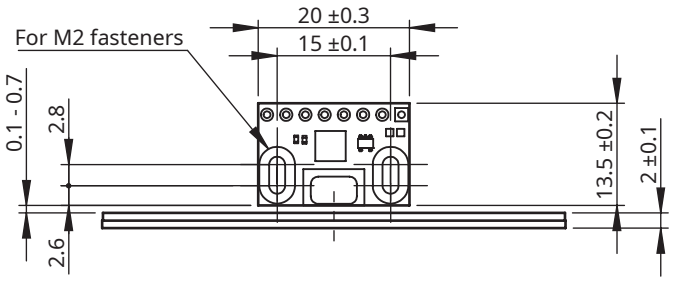


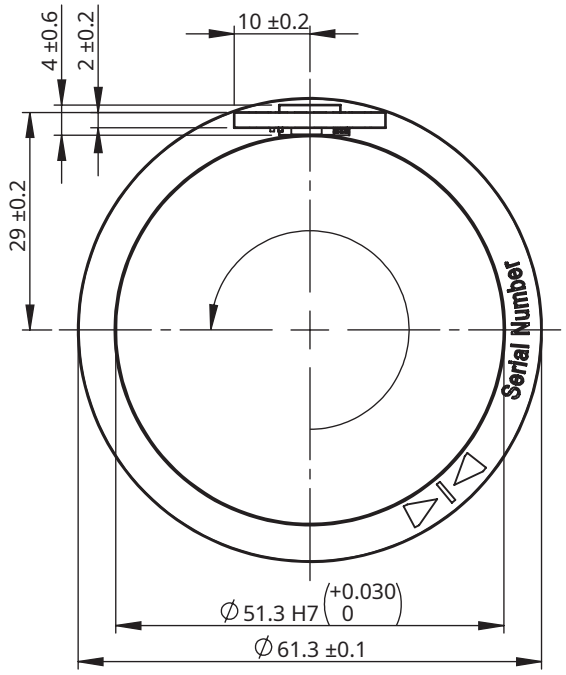


Dimensions and installation drawings

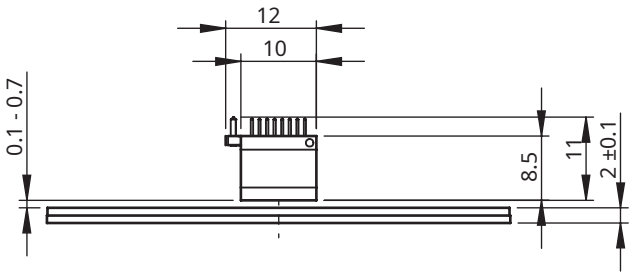
Dimensions and tolerances are in mm.

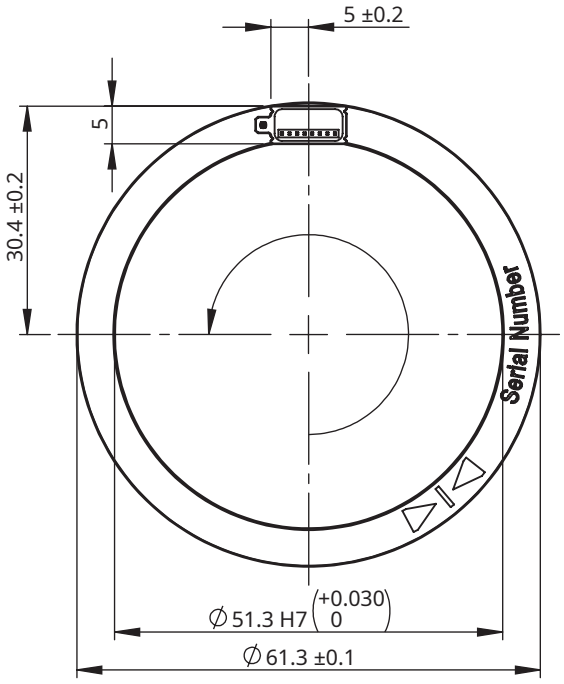
RLC2IC





RLM



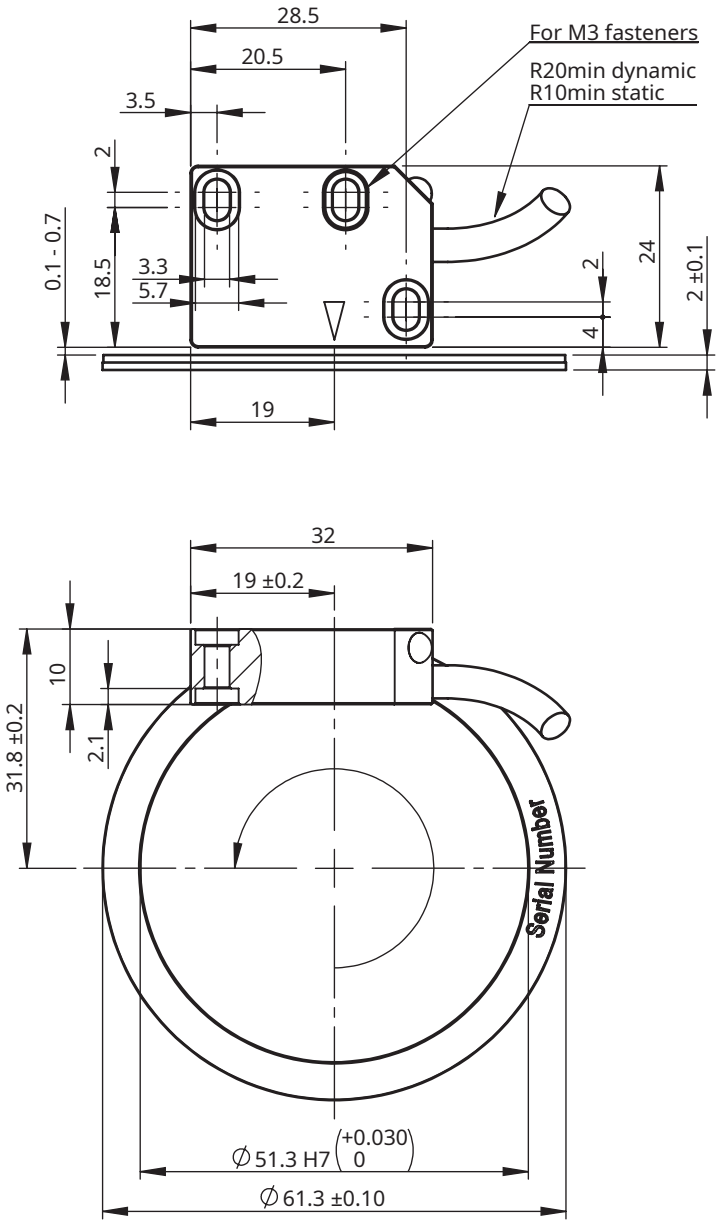


Dimensions and installation drawings

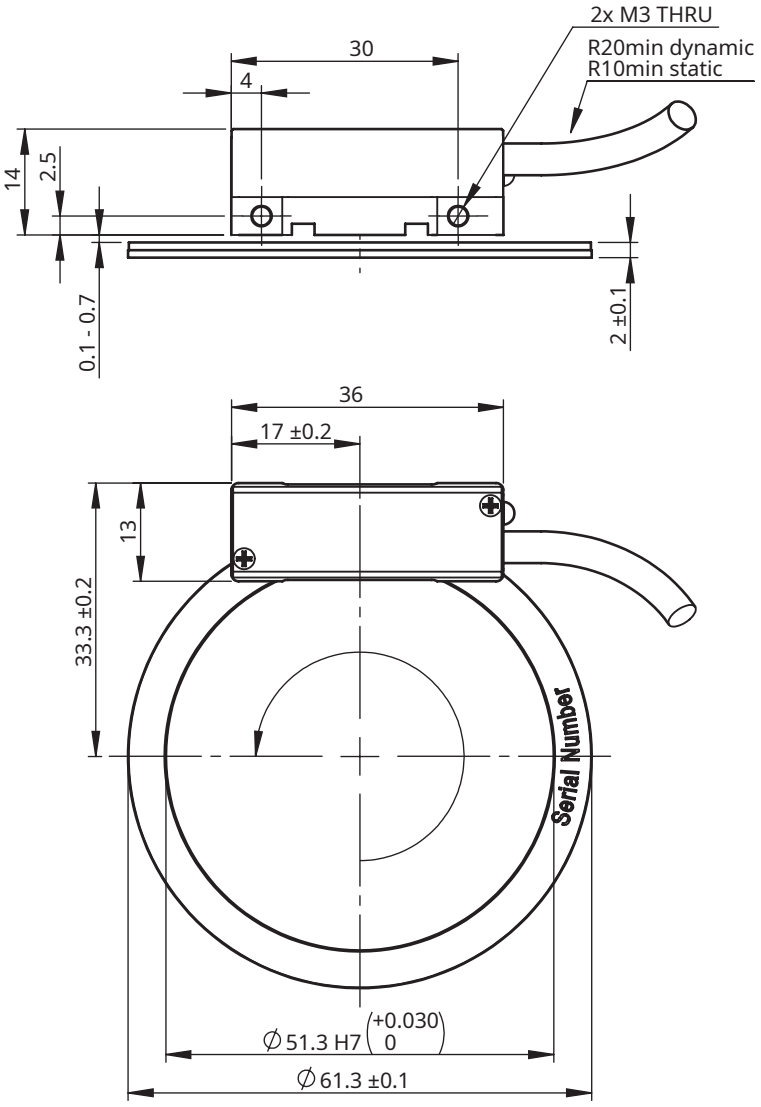
MR061C

Dimensions and tolerances are in mm.

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

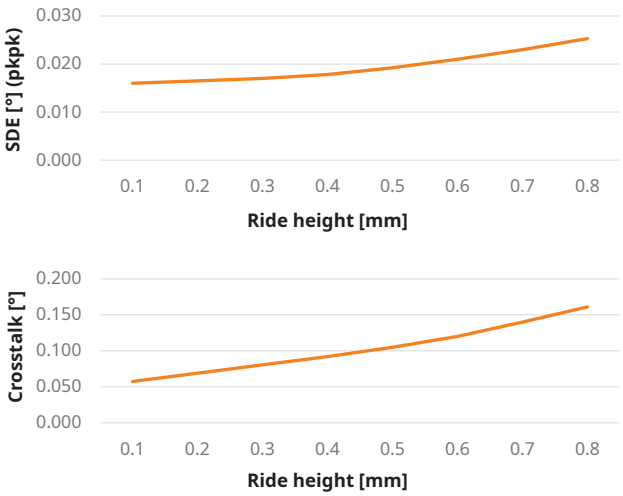
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

Technical features

Outer diameter	80 ±0.1 mm
Inner diameter	55 H7 mm
Height	2 ±0.1 mm
Mass	24 g
System error	±0.07°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	32.700 gmm^2
Material of magnetic layer	CPE
Hub material	EN 1.4016 / AISI 430
Hub thermal expansion coefficient (CTE)	10 × 10^{-6} K^{-1}

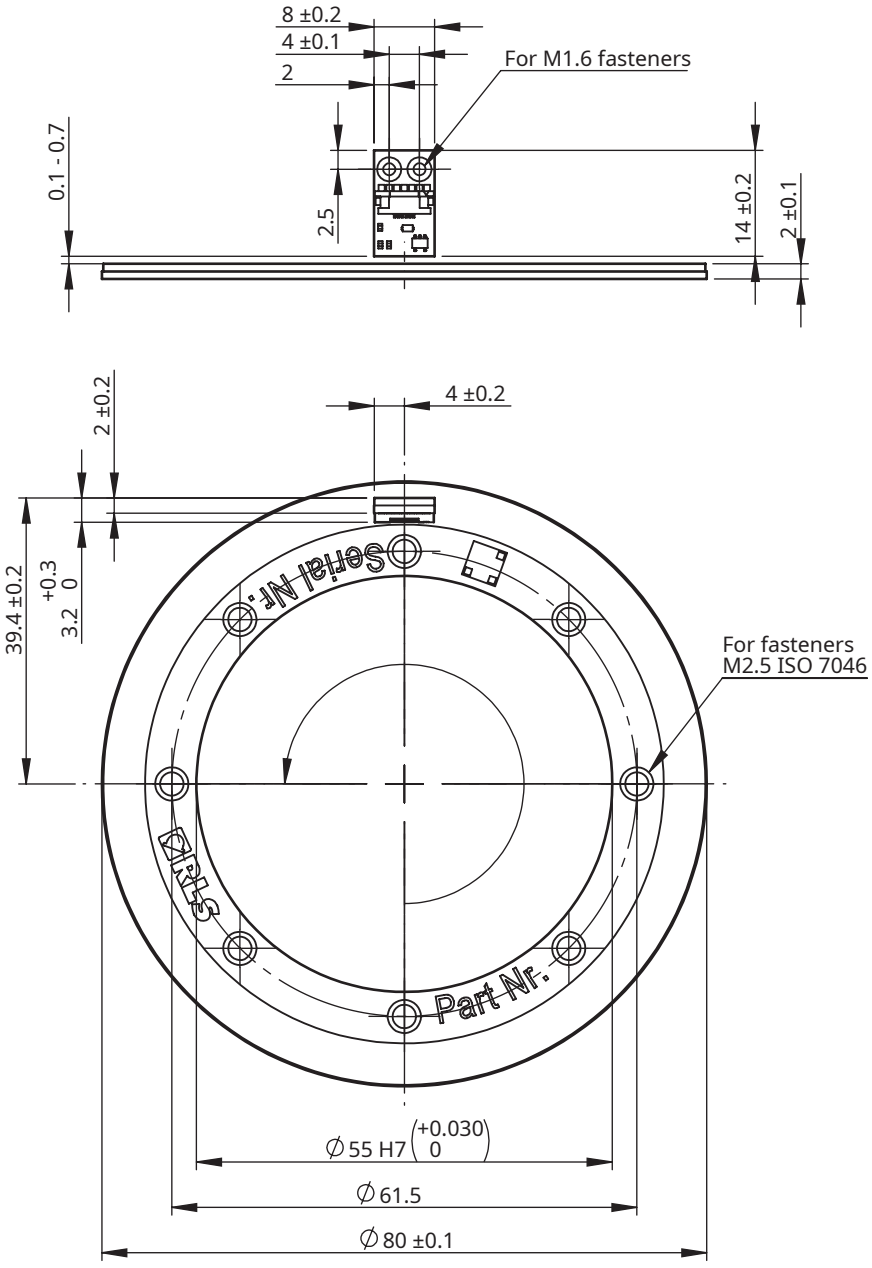
SDE and crosstalk (typical measured value)



Dimensions and installation drawings

Dimensions and tolerances are in mm.

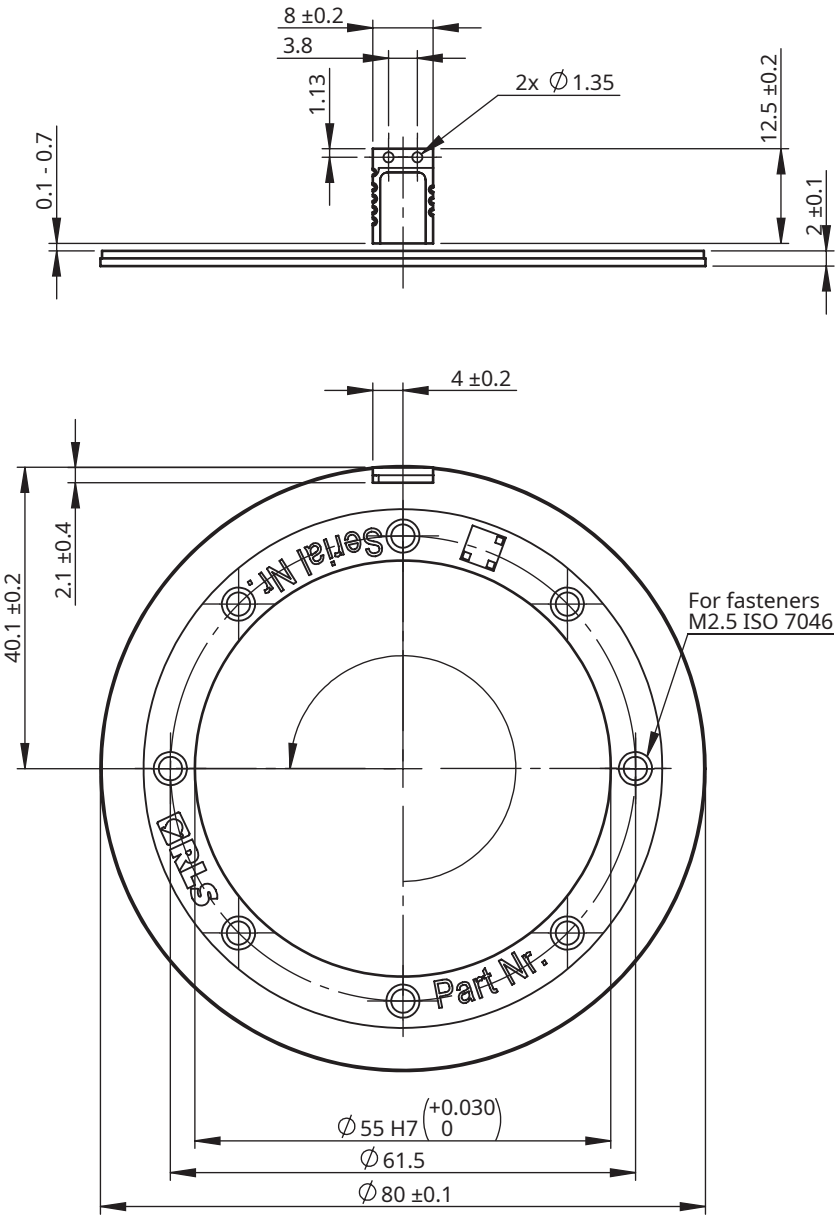
RLB



Dimensions and installation drawings

Dimensions and tolerances are in mm.

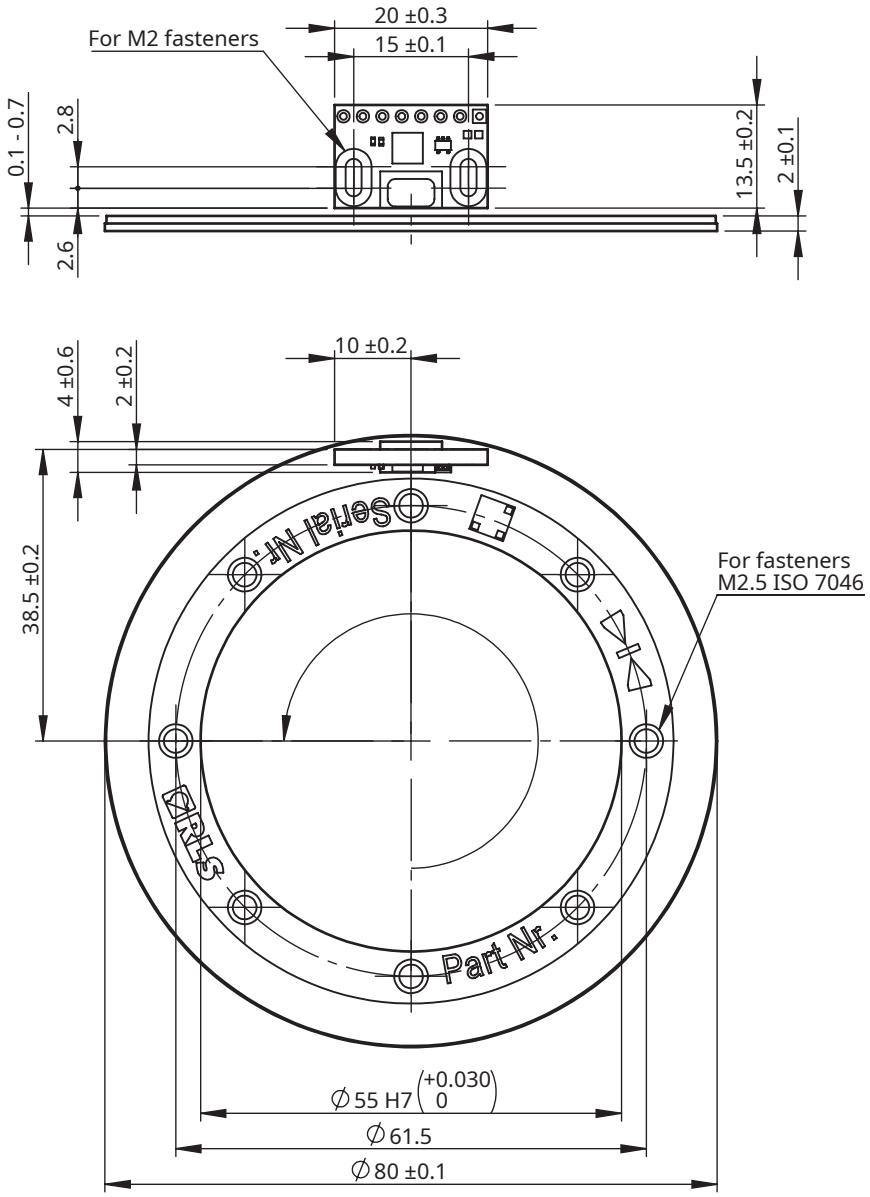
RLC2HD



Dimensions and installation drawings

Dimensions and tolerances are in mm.

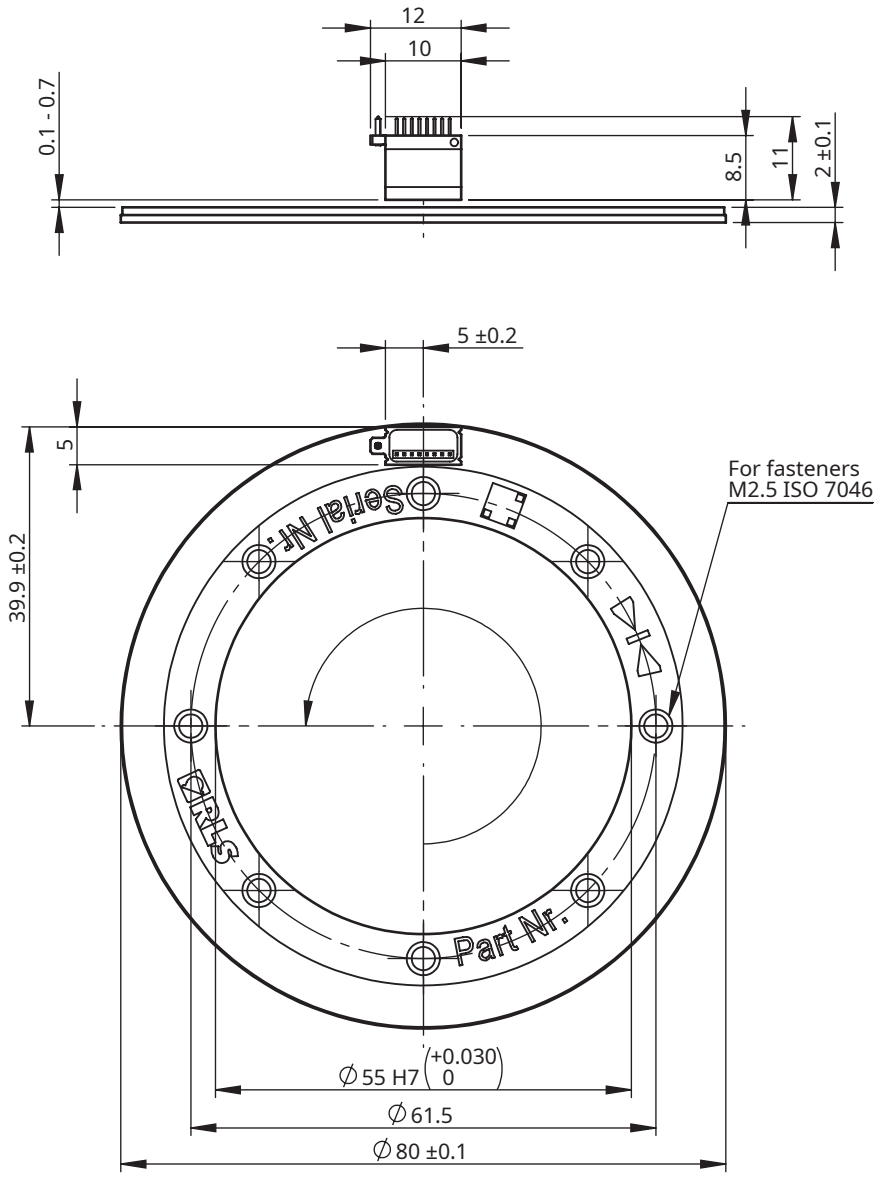
RLC2IC



Dimensions and installation drawings

Dimensions and tolerances are in mm.

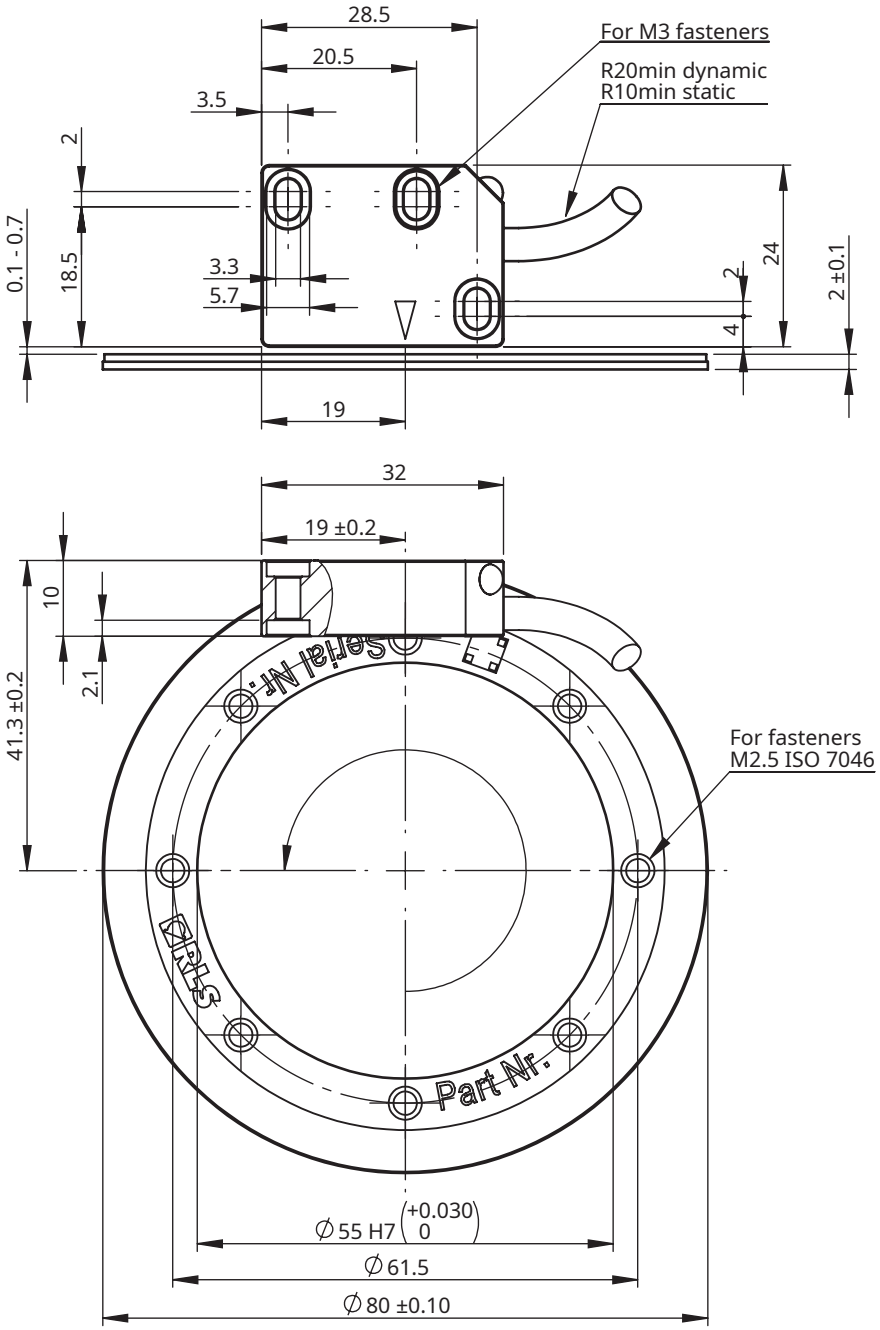
RLM



Dimensions and installation drawings

Dimensions and tolerances are in mm.

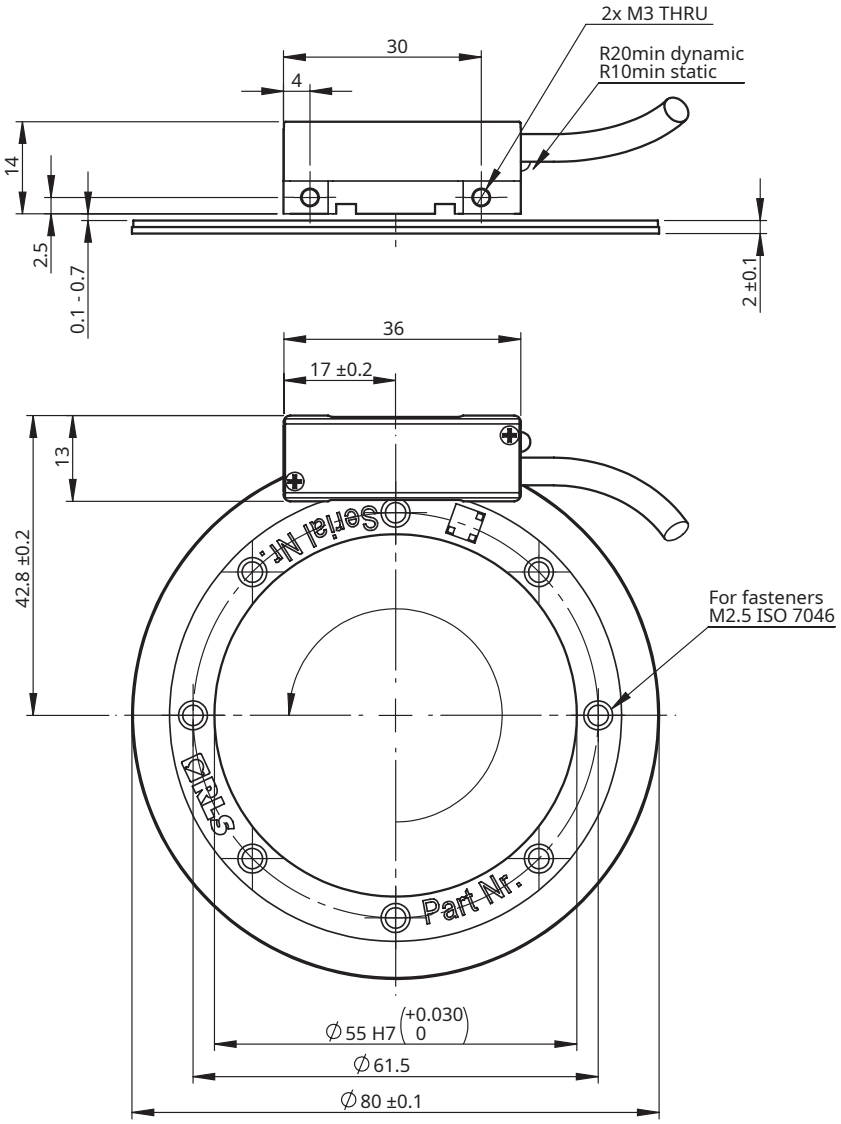
LM10



Dimensions and installation drawings

Dimensions and tolerances are in mm.

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

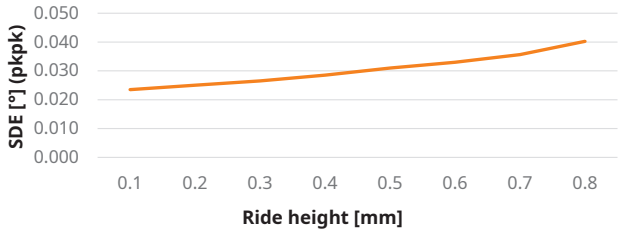
Ri - Unique reference mark or only incremental track available
No Ri - No reference mark option, only incremental track available

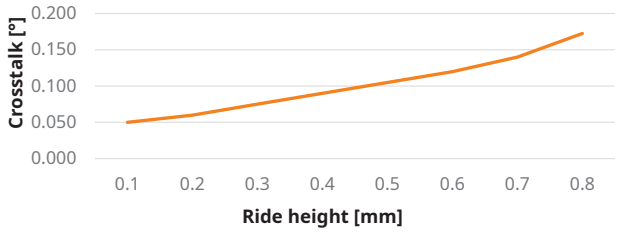
Technical features

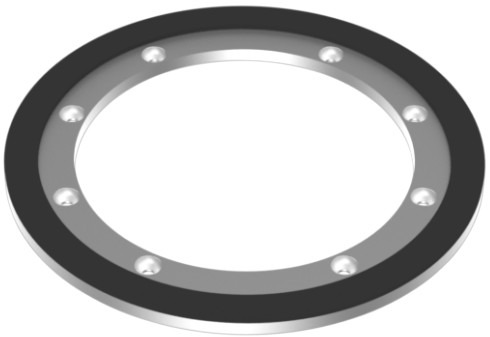
Outer diameter	100 ±0.1 mm
Inner diameter	71 H7 mm
Height	4 ±0.1 mm
Mass	95 g
System error	±0.05°
Maximum speed table	Refer to **MR01D04**

Moment of inertia	180.000 gmm^2
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)



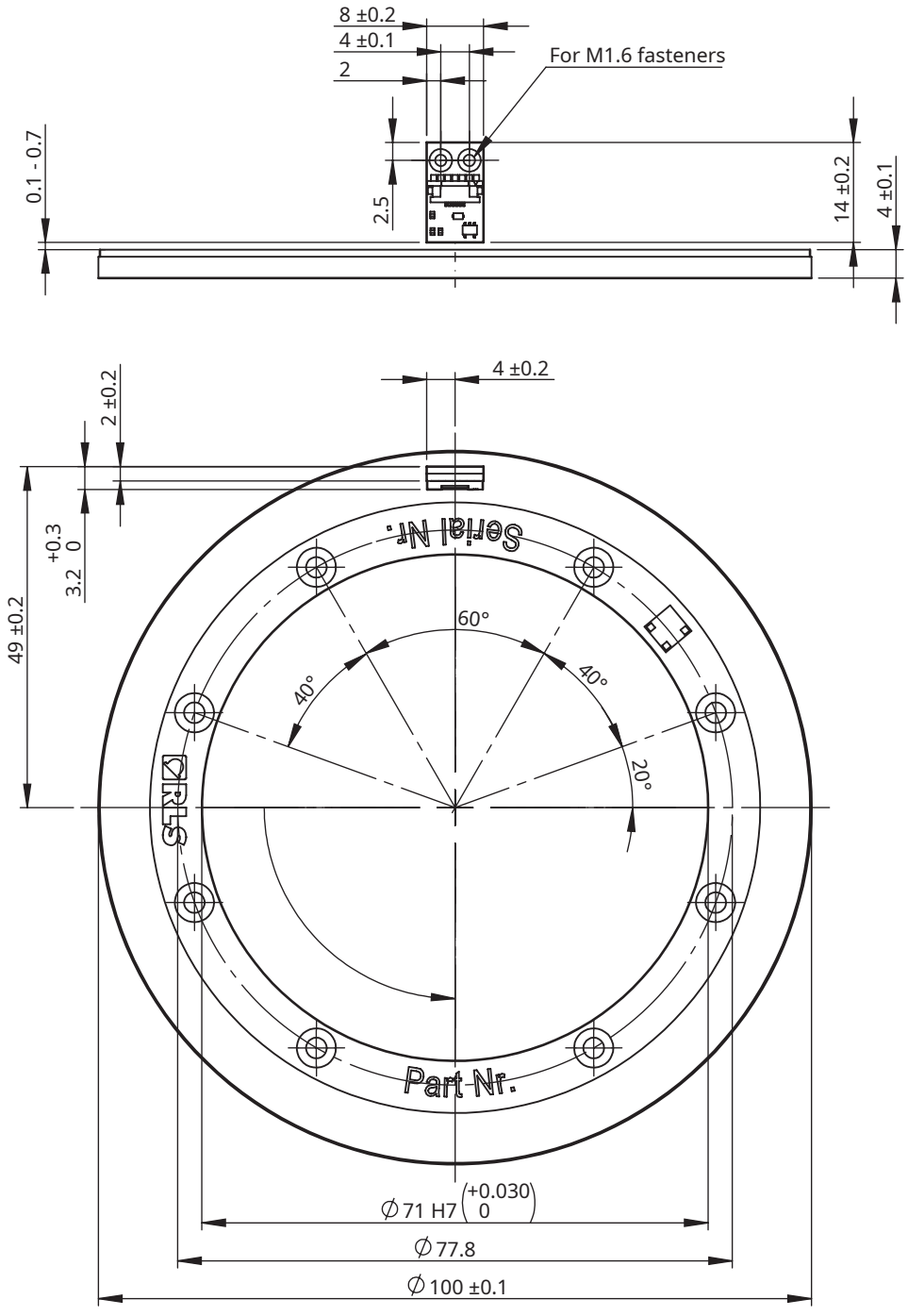




Dimensions and installation drawings

Dimensions and tolerances are in mm.

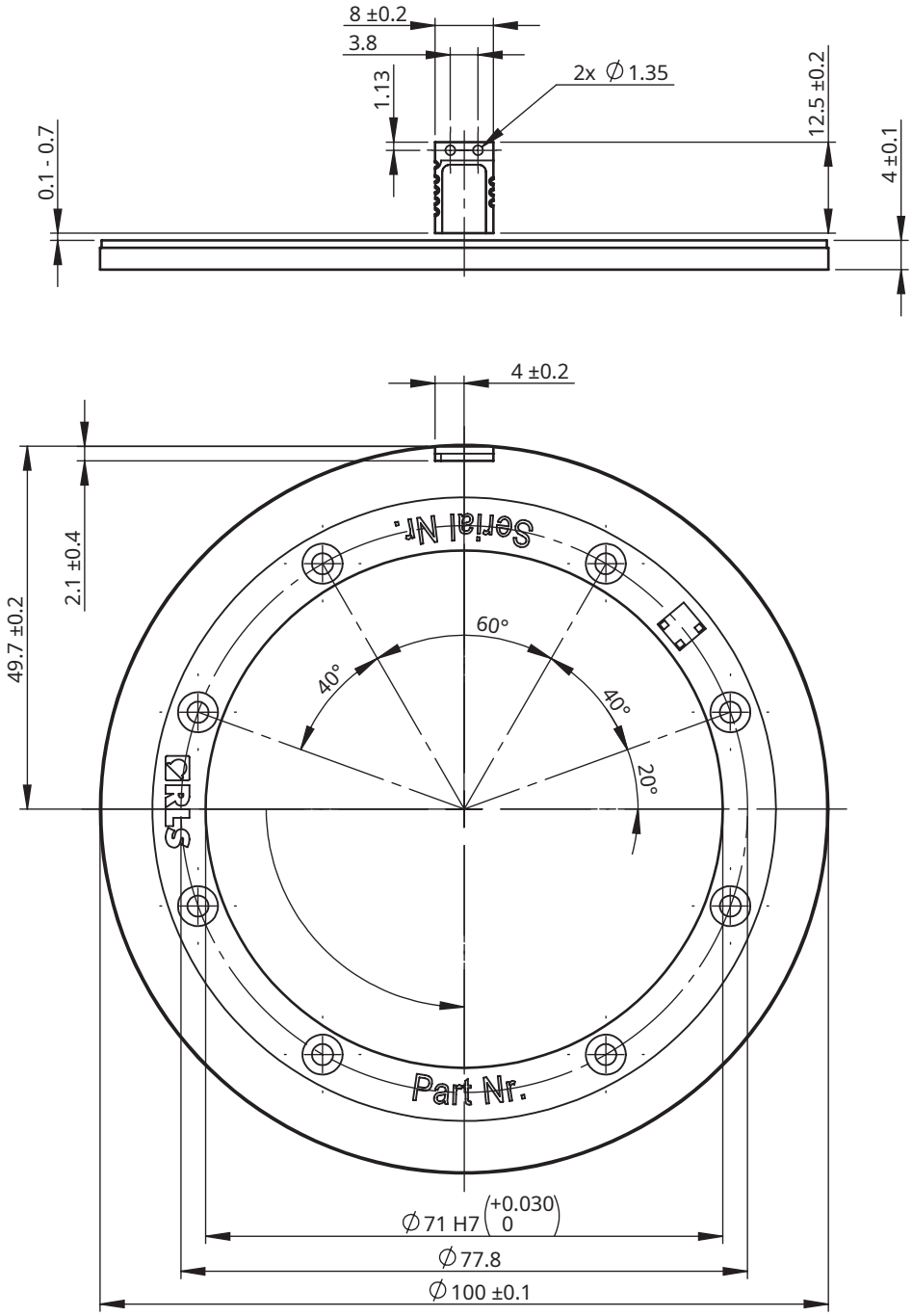
RLB



Dimensions and installation drawings

Dimensions and tolerances are in mm.

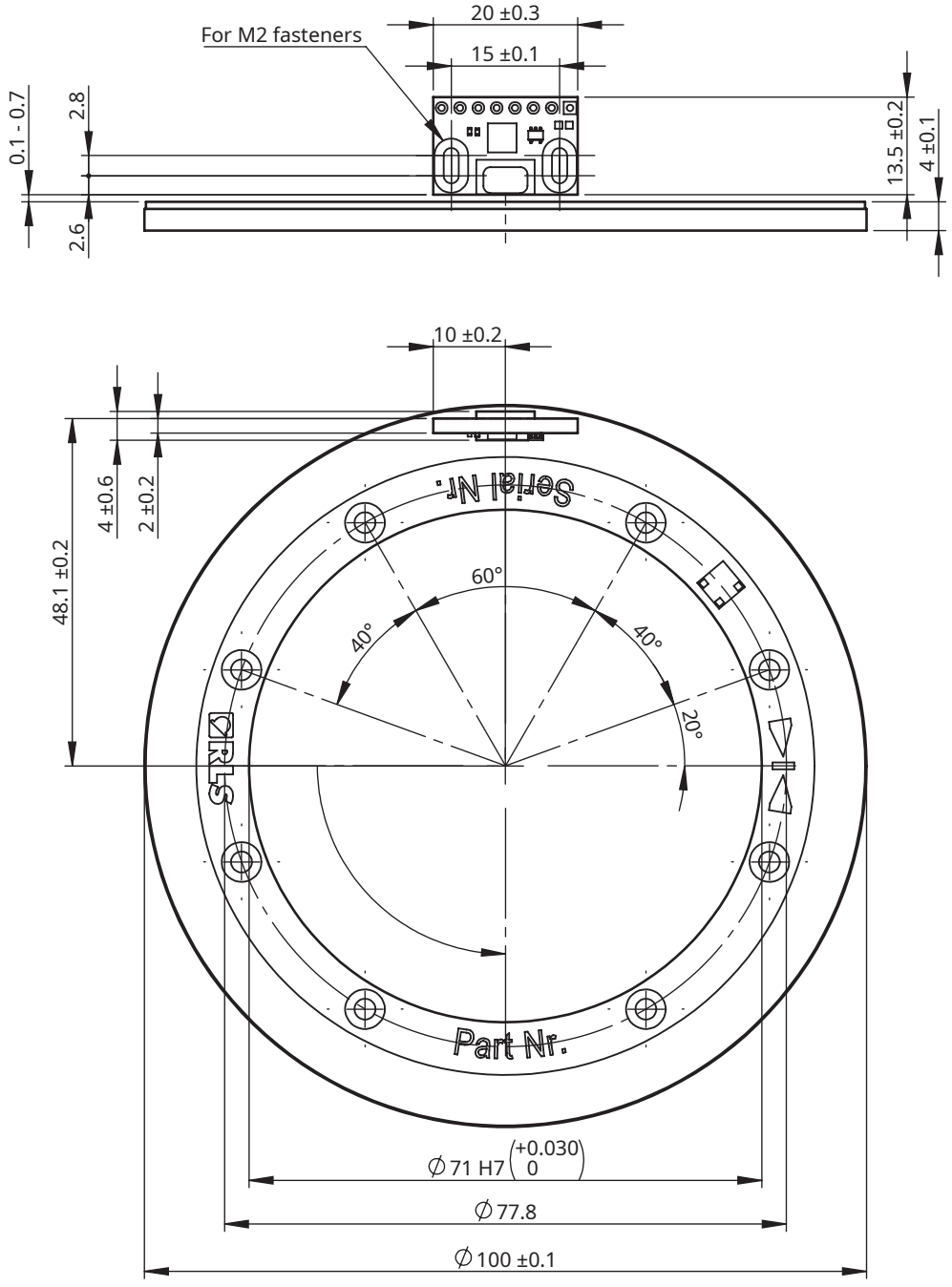
RLC2HD



Dimensions and installation drawings

Dimensions and tolerances are in mm.

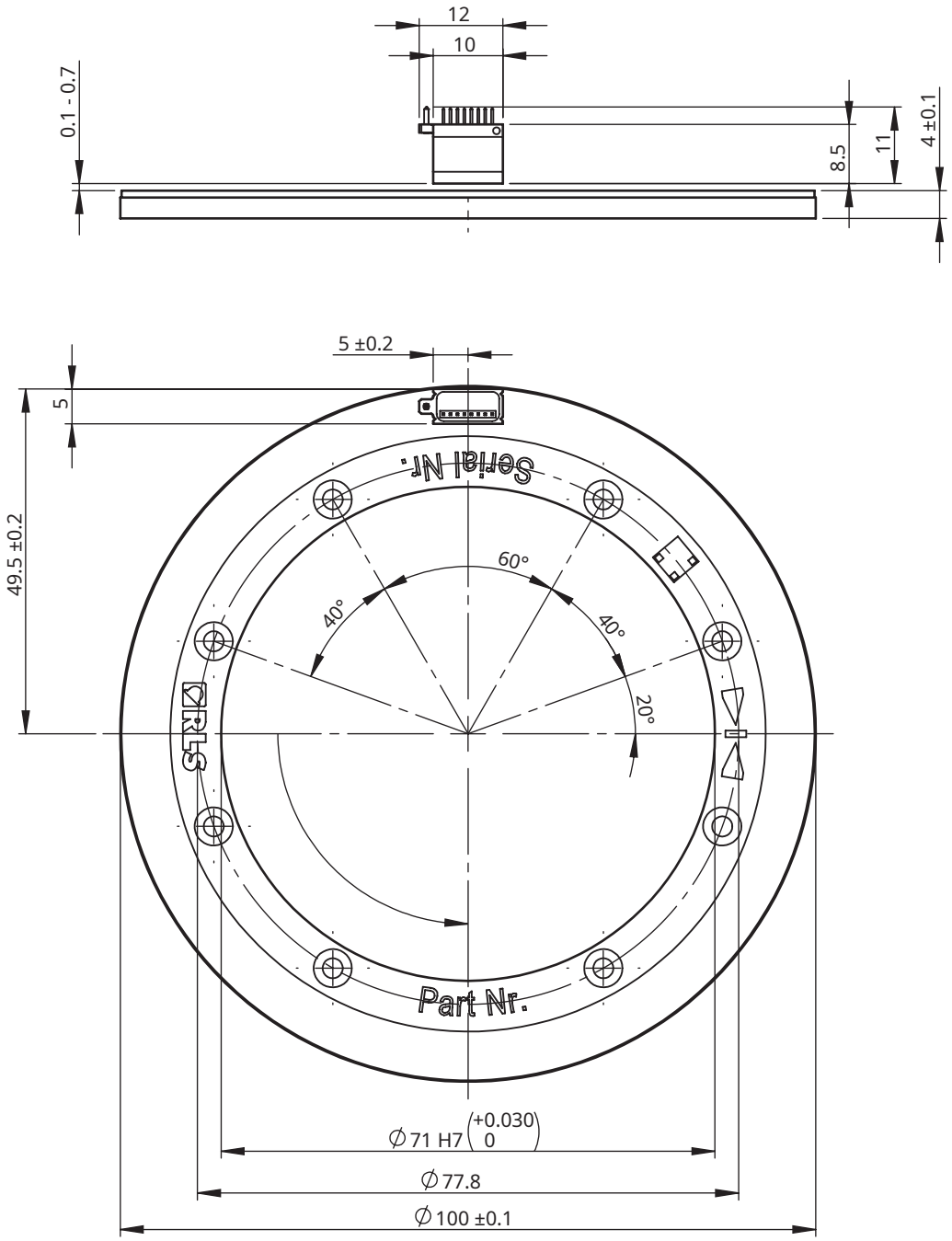
RLC2IC



Dimensions and installation drawings

Dimensions and tolerances are in mm.

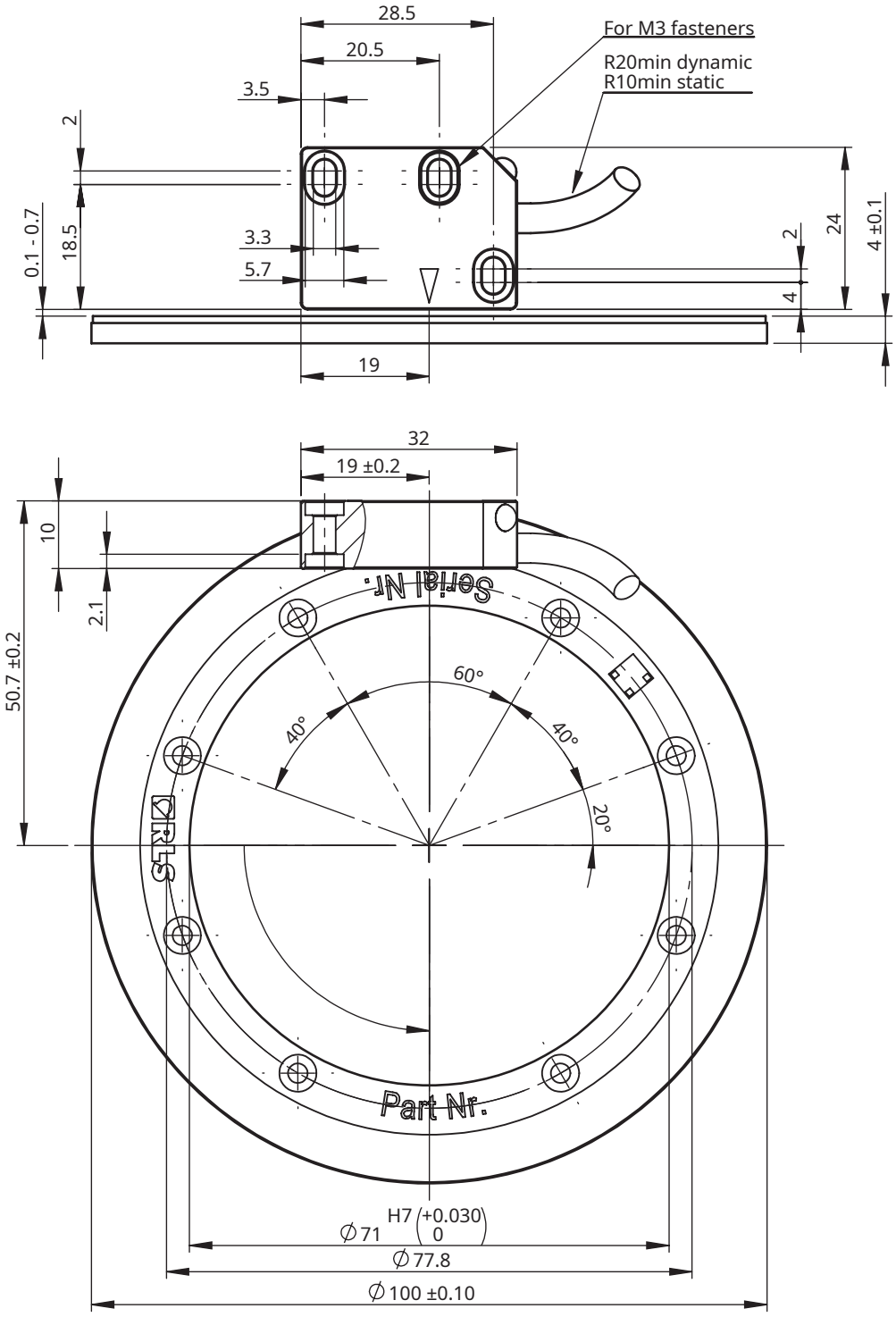
RLM



Dimensions and installation drawings

Dimensions and tolerances are in mm.

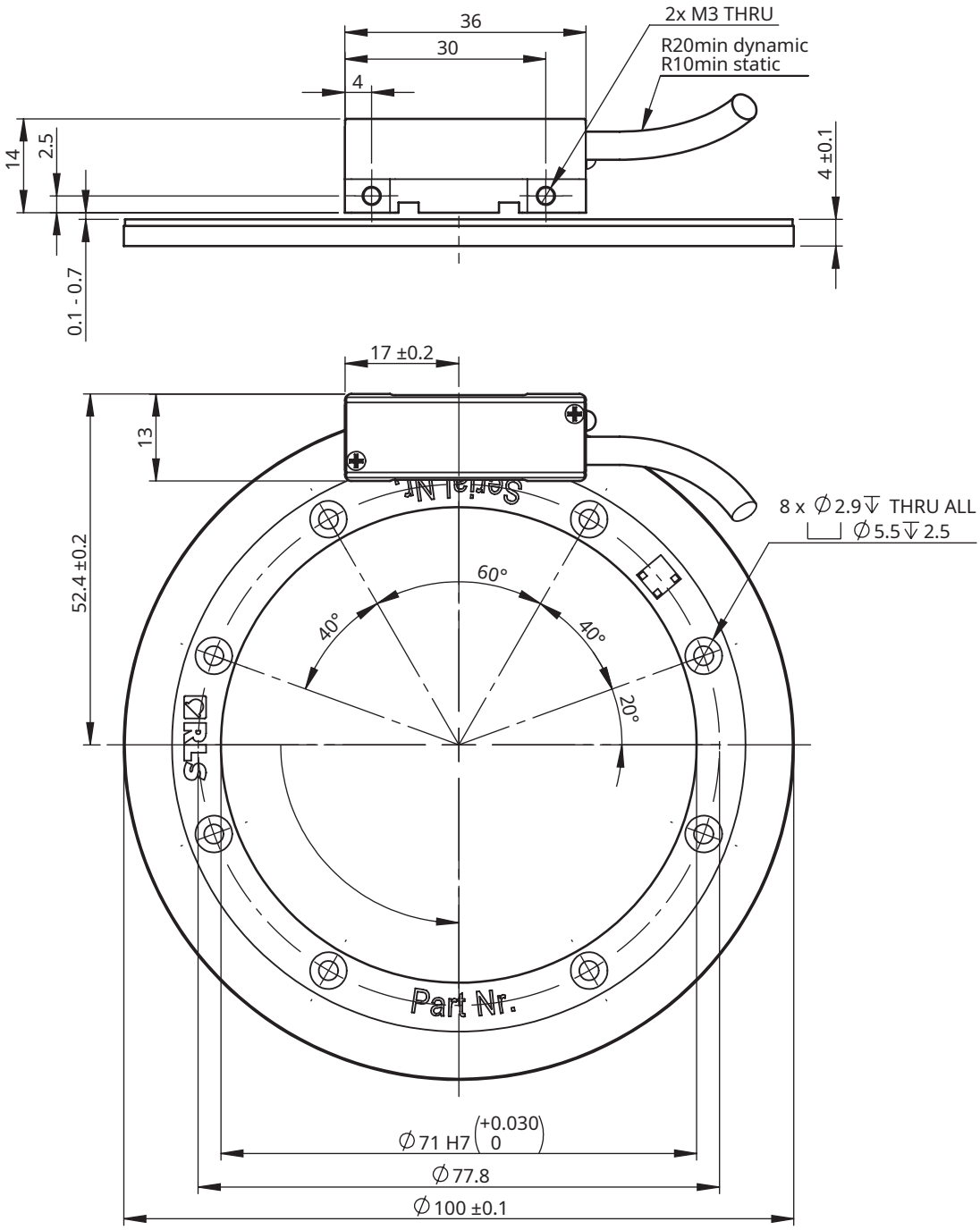
LM10



Dimensions and installation drawings

Dimensions and tolerances are in mm.

LM13



Part numbering

MR 034 C 020 B 048 A 00

Series

MR - Magnetic incremental ring

Outer diameter

020	20 mm	**049**	49 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 mm, axial magnetisation (installation with fasteners)
S - Height 4 mm, axial magnetisation (installation with fasteners)

Inner diameter

012	12 mm	**028**	28 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		

Material

A - Stainless steel hub with bonded rubber tape (–40 °C to +100 °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		

Accessories

Magnet viewer
MM0001

Head office

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