AksIM-2

Off-Axis Rotary Absolute Redundant Magnetic Encoder

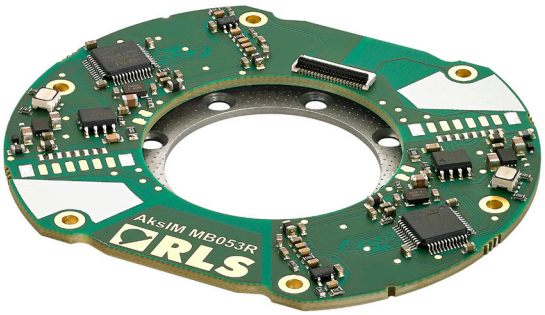
HIGH ACCURACY

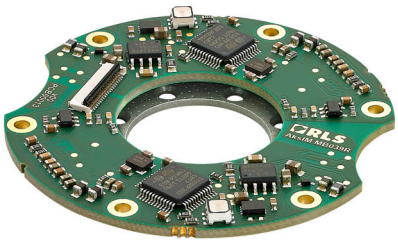
HIGH SPEED

HIGH SAFETY

The AksIM-2 redundant encoder is an advanced series of non-contact, high performance off-axis absolute encoders suitable for applications requiring a higher level of safety.

The AksIM-2 redundant encoder system consists of two identical, completely independent and electrically isolated encoder modules combined on one PCB and a separate axially magnetized ring.





The encoder is a redundant solution and part of the AksIM-2 absolute encoder range. For technical specifications not included in this document, refer to the latest version of MBD01 data sheet, available for download from the **AksIM-2 website**.

Features and benefits

- Proven AksIM-2 true absolute encoder technology
- Redundant version for higher safety applications
- Simple installation and easy connection
- Resolutions up to 20 bits
- BiSS communication interface
- Excellent price-performance ratio

COLLABORATIVE ROBOTS | AGVs | GIMBALS | ROBOTIC JOINTS | AGRICULTURAL AUTOMATION

General information

With its compact and innovative design, the AksIM-2 redundant encoder system allows easier installation and is available in two dimensions. Two encoder modules on one PCB give much more freedom in designing advanced motion control systems to monitor the encoder position via two independent channels.

The redundant AksIM-2 encoder is available with the advanced BiSS communication protocol with differential signaling (RS422).

With resolutions up to 20 bits and accuracy better than ±0.05°, high performance is assured when the encoder is installed within the required tolerance. Even better accuracy can be achieved by using the encoder's self-calibration function. The encoder operates from –40 °C to +85 °C (+105 °C for MB039xxxxxxRRT00).

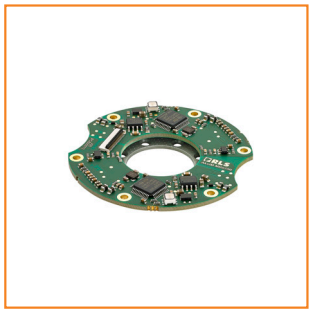
Like our proven series of standard AksIM-2 encoders, the redundant AksIM-2 encoder has a built-in advanced self-monitoring function that continuously checks several internal parameters. Error, warning and other status reports are available via BiSS register access and are indicated by LEDs.

For more information, please see the MBD01 at **RLS Media center.**

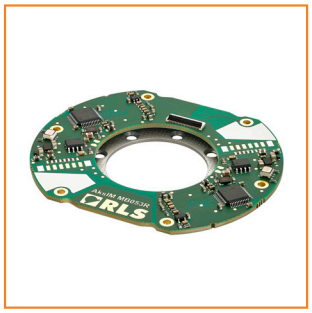
Choose your AksIM-2 redundant system

The redundant AksIM-2 encoders are compatible with the standard MRA039 and MRA053 AksIM-2 absolute magnetic rings, providing a reliable solution for a wide range of applications.

MB039-R readhead and MRA039 magnetic ring



MB053-R readhead and MRA053 magnetic ring



Storage and handling

Storage temperature

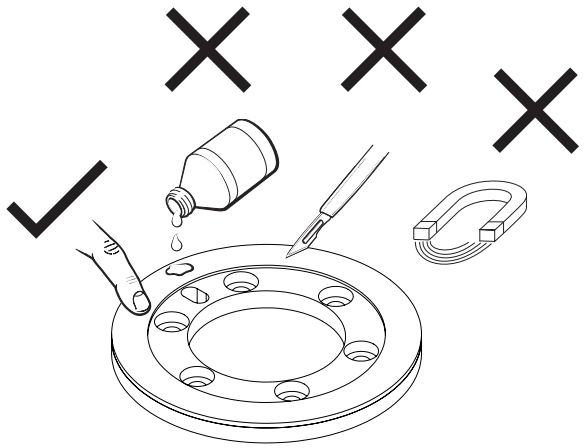
–40 °C to +85 °C
–40 °C to +105 °C (Extended temperature range)

Operating temperature

–40 °C to +85 °C
–40 °C to +105 °C (Extended temperature range)

Humidity

Up to 70 % non-condensing



This encoder system is a high performance metrology product and should be handled with the same care as any other precision instrument. The use of heavy duty industrial tools or exposure to strong magnets such as a magnetic base is unacceptable and carries the risk of irreparable damage to the product.

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

Readhead is ESD sensitive - handle with care.
Do not touch electronic circuit, wires or sensor area without proper ESD protection or outside of ESD controlled environment.

Packaging

There are two packaging variants. Up to 20 systems are packed individually in an antistatic box. In case the order quantity is larger than 20 systems, parts are packed in antistatic plastic trays. Magnetic rings and readheads are packed separately.

Bulk packaging:

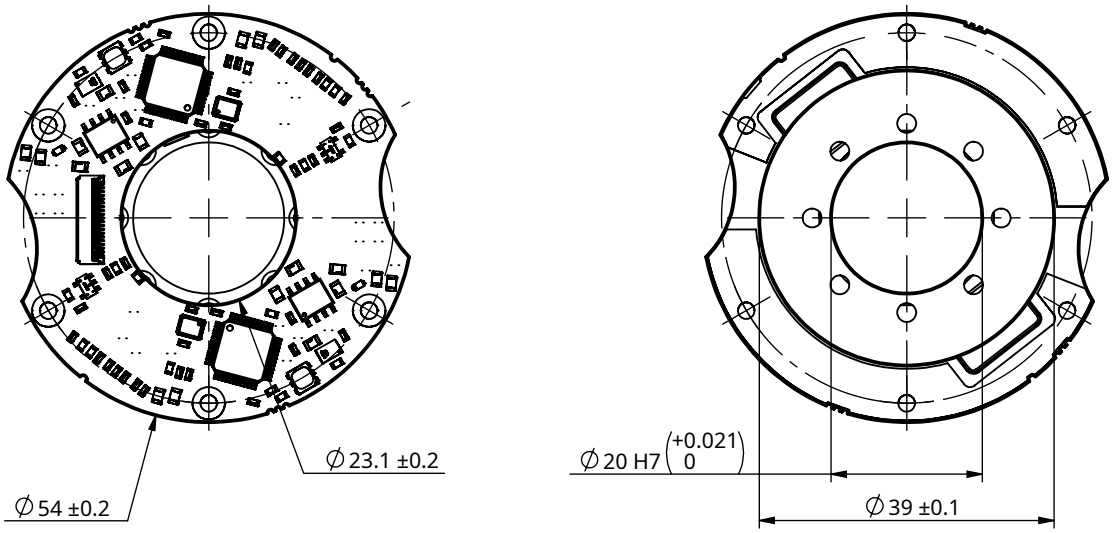
Readheads		
Part	**Tray size**	**Box size**
MB039-R	10 units per tray	10 trays per box
MB053-R	6 units per tray	

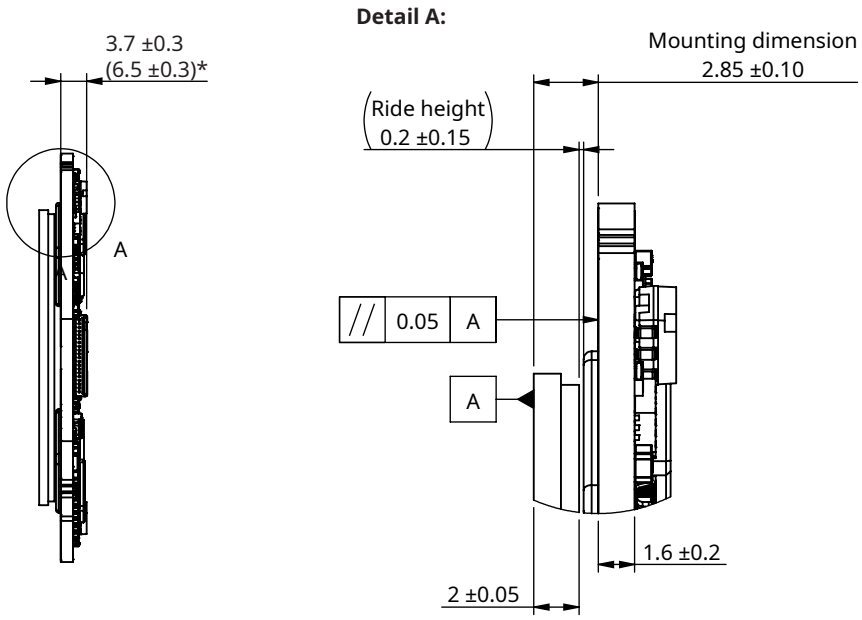
Magnetic rings		
Part	**Tray size**	**Box size**
MRA039	10 units per tray	12 trays per box
MRA053		

Dimensions and installation drawings

Dimensions and tolerances are in mm. Dimensions without tolerance values are in accordance with ISO 2768-m.

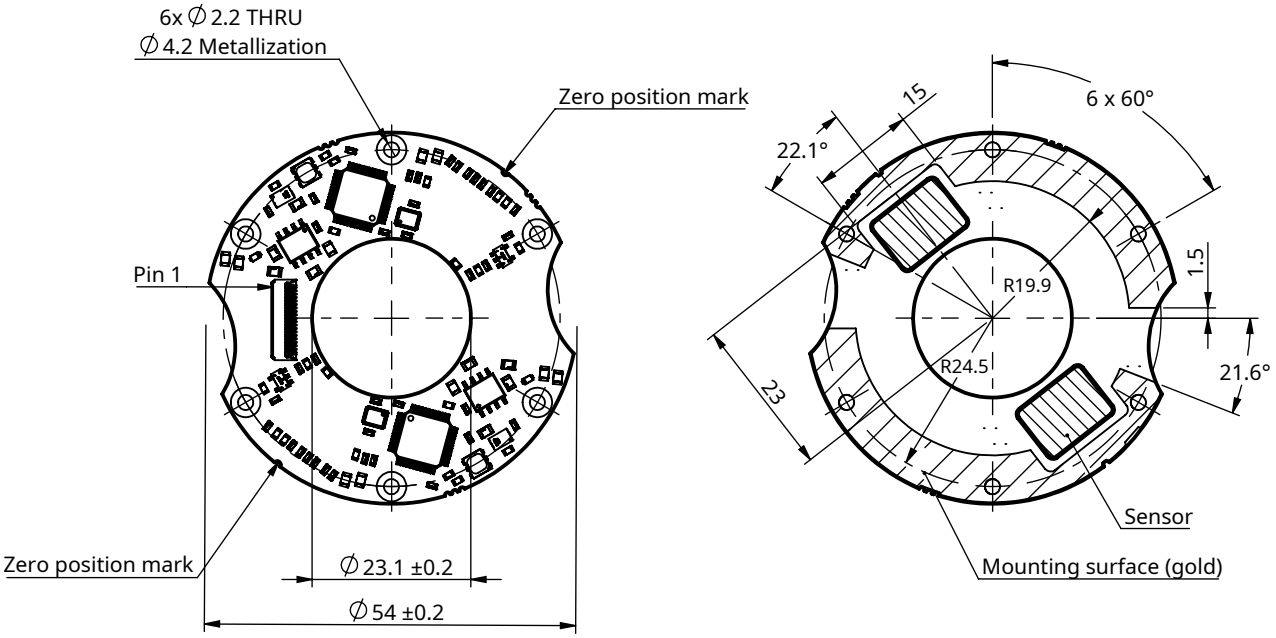
AksIM-2 redundant encoder assembly size 039



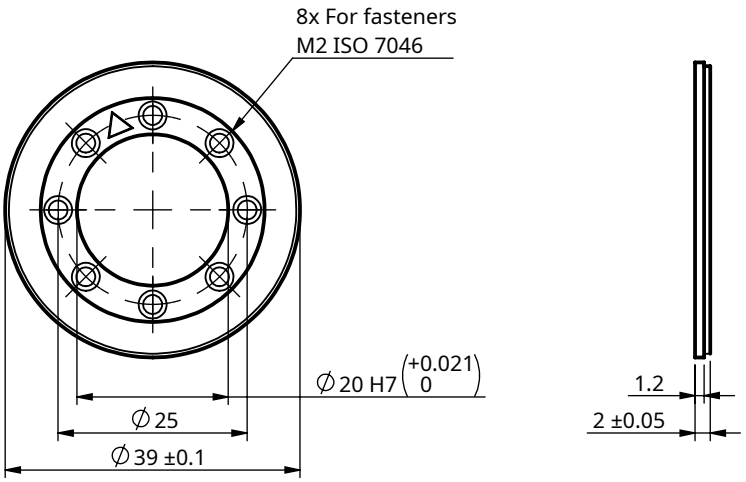


* For MB039xxxxxxRRT00 only.

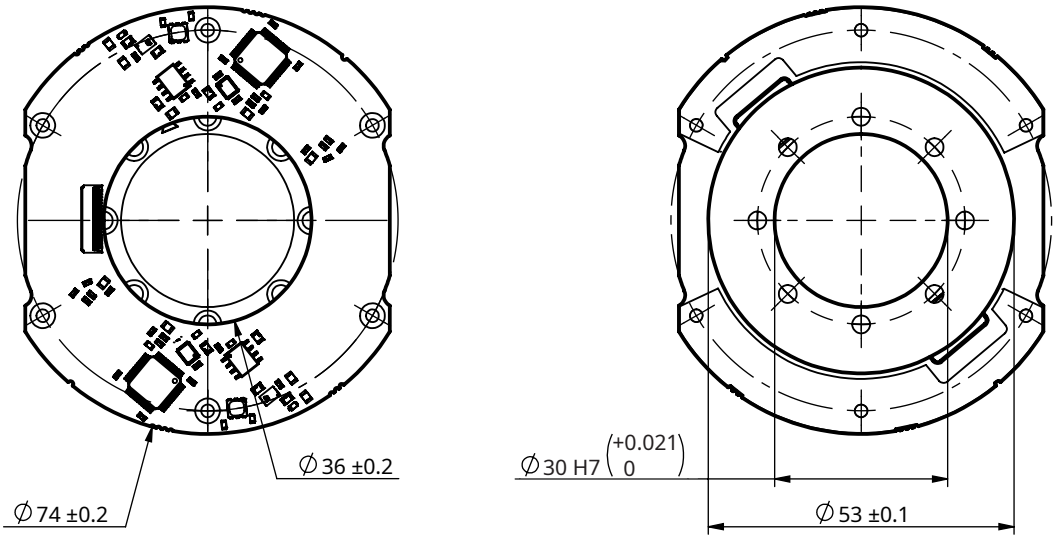
Readhead MB039 redundant



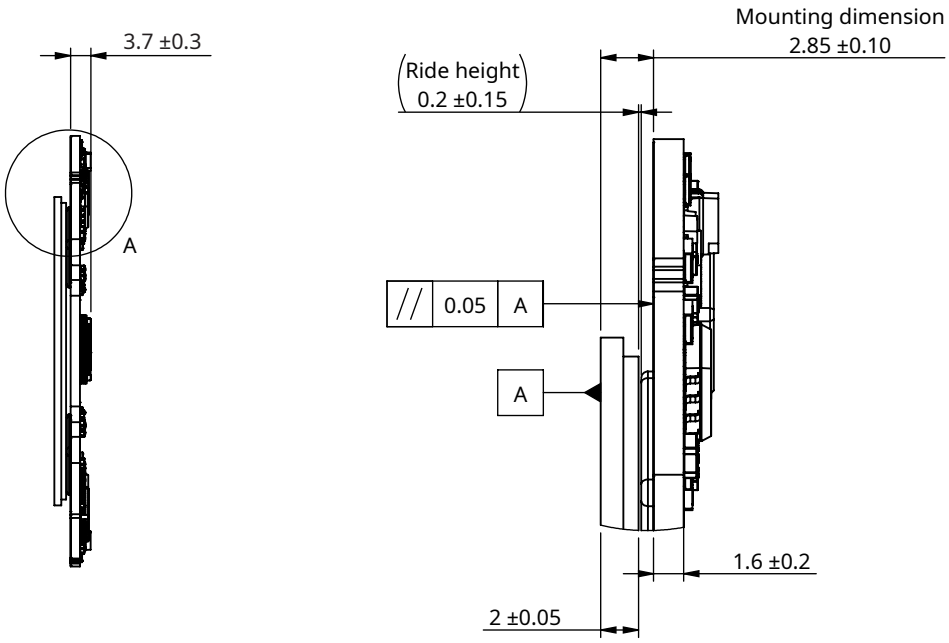
Magnetic ring MRA039



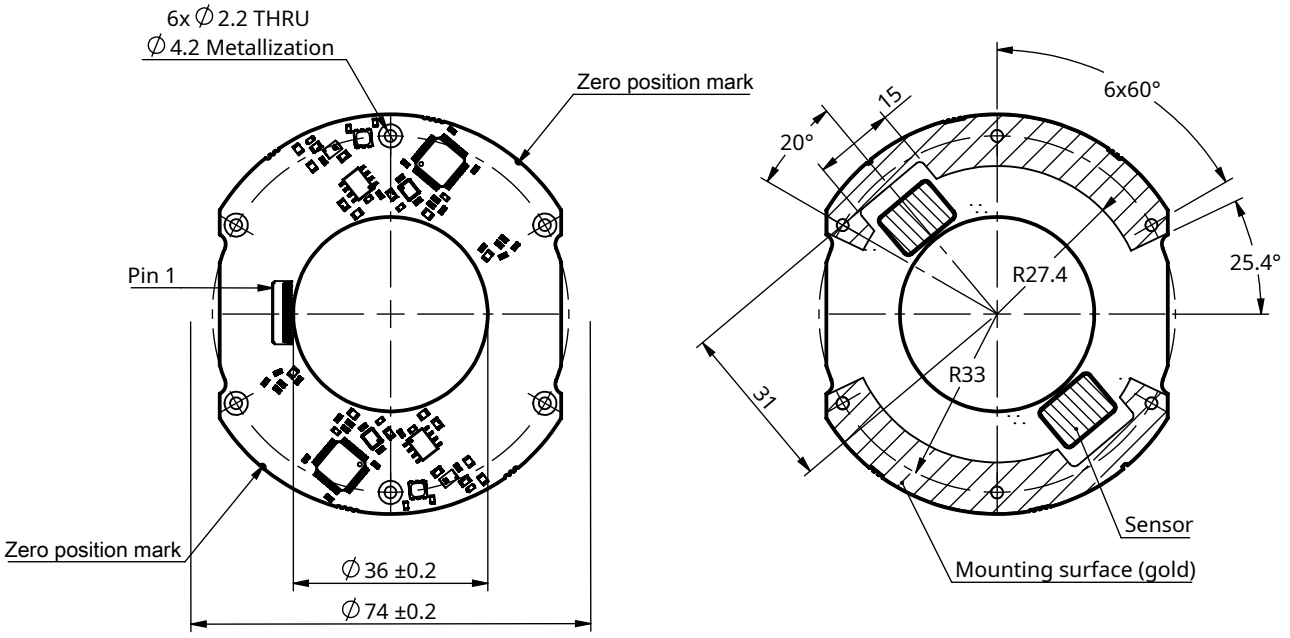
AksIM-2 redundant encoder assembly size 053



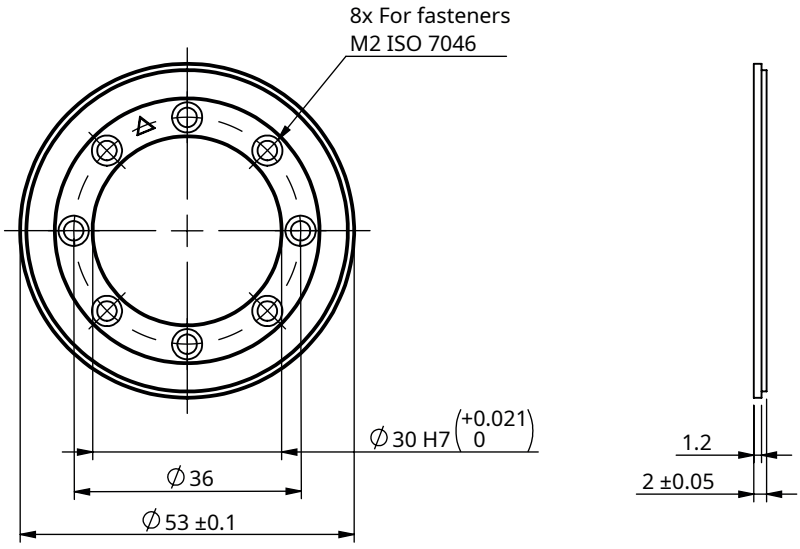
Detail A:



Readhead MB053 redundant



Magnetic ring MRA053



Technical specifications

System data

Reading type		Axial reading
Resolution	**MB039**	19 bit
	MB053	20 bit
Maximum speed	**MB039**	10,000 rpm
	MB053	7,500 rpm
Accuracy		±0.05°

Electrical data

Supply voltage (V_{dd})	4.5 V to 5.5 V at the connector. Rise time should be shorter than 20 ms.
Current consumption	2 × 135 mA (typ.)
Isolation	250 V_{AC}
Connection	Molex 503480-2000 (Right-Angle, with Flip Lock) FFC, 20-pin, 0.5 mm pitch, contacts on top and bottom side*
	Molex 202396-1207 Pico-Clasp, 12-pin, 1 mm pitch (encoder variant MB039xxxxxxRRT00 only)

* Cable can be flipped, in such case Primary and Secondary encoders are interchanged.

Environmental data

Operating and storage temperature		–40 °C to +105 °C (with Pico-Clasp locking connector) –40 °C to +85 °C (with FFC connector)
Mass, inertia	**MB039**	8.6 g
	MB053	13.2 g
	MRA039	9.2 g; 2.3 kg × mm^2
	MRA053	16 g; 7.4 kg × mm^2

For more information, please see the MBD01 at **RLS Media center.**

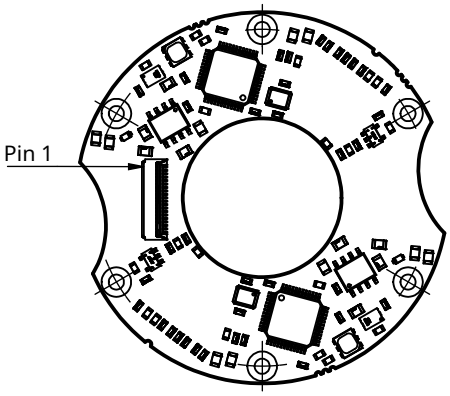
Electrical connections

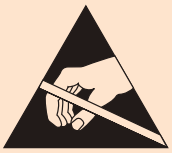
For all configurations (except MB039xxxxxxRRT00):

Pin number	BISS signal
1	Chassis
2	V_{dd}
3	GND
4	Clock+
5	Clock–
6	GND
7	Data+
8	Data–
9	GND
10	Not connected
11	
12	GND
13	Data–
14	Data+
15	GND
16	Clock–
17	Clock+
18	GND
19	V_{dd}
20	Chassis

For MB039xxxxxxRRT00 (connector 202396-1207):

Pin number	BISS signal	ACC023 wire color
1	V_{dd}	Grey
2	Clock+	Pink
3	Clock–	Red
4	Data+	Blue
5	Data–	Yellow
6	GND	Green
7	GND	White
8	Data–	Brown
9	Data+	Red / Blue
10	Clock–	Grey / Pink
11	Clock+	Black
12	V_{dd}	Violet





Readhead is ESD sensitive - handle with care.
Do not touch electronic circuit, wires or sensor area without proper ESD protection or outside of ESD controlled environment.

Part numbering

Readhead

MB 039 DC C 19B R C L 00

Series
MB - AksIM board-level readhead

MRA ring compatibility
039 - For use with MRA039 ring
053 - For use with MRA053 ring

Communication interface
DC - BiSS C, RS422

Communication interface variant
C - BiSS C, bidirectional, 13 ACK bits, with register access

Resolution
19B - 19 bits per revolution
20B - 20 bits per revolution

Multiturn counter options
19M - 19 bits per revolution + 16 bits multiturn counter
20M - 20 bits per revolution + 16 bits multiturn counter

Shape and connector orientation
R - Redundant dual readhead

Connector option
C - FFC, 20-pin, 0.5 mm pitch, Molex 503480-2000
R - Pico-Clasp, 12-pin, 1 mm pitch, Molex 202396-1207

Option
L - Temperature range –40 °C to +85 °C (for connector type “C”)
T - Temperature range –40 °C to +105 °C (for connector type “R”)

Special requirements
00 - No special requirements (standard)

Not all part number combinations are valid. Please refer to the table of available combinations below.

Series	Ring Compatibility	Communication Interface	Variant	Resolution	Shape	Connector	Option	Special requirements
MB	039	DC	C	19B	R	C	L	00
						R	T	
				19M		C	L	
	053			20B				
				20M				

Magnetic ring

MRA 039 B C 020 D S E 00

Series
MRA - AksIM magnetic ring

Outer diameter and readhead compatibility
039 - 39 mm
053 - 53 mm

Thickness
B - 2.0 mm

Installation type
C - Countersunk fasteners

Inner diameter
020 - 20 mm
030 - 30 mm

Accuracy grade
D - ±0.1°

Material
S - Stamped metal plate with CPE rubber

Zero marking
E - Engraved

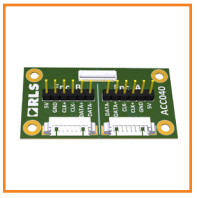
Special requirements
00 - No special requirements (standard)

Not all part number combinations are valid. Please refer to the table of available combinations below.

Series	Outer diameter and readhead compatibility	Thickness	Installation type	Inner diameter	Accuracy grade	Material	Zero marking	Special requirements
MRA	039	B	C	020	D	S	E	00
	053			030				

Accessories

Cable assembly
ACC039



Breakout board
ACC040

Cable assembly, 1 m
ACC065 (to use with ACC040)

Cable assembly, 1 m
ACC049 (to use with ACC040)
ACC023 (to use with MB039xxxxxxRRT00 only)

Magnet viewer
MM0001

Cable assembly, 3 m
ACC070 (to use with ACC040)

USB interface
E201-9B

For technical details about cable assemblies and pinout see chapter **Cable assemblies**.

Cable assemblies

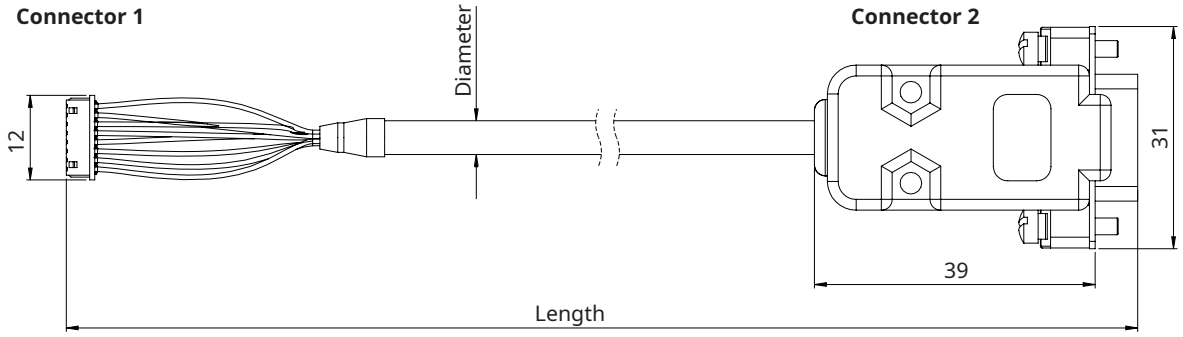
Encoder with locking Molex connector (MB039xxxxxxRRT00) can be used with ACC023 for connection to other electronic systems. Encoder with FFC connector (flat cable) can be used with ACC039 flat cable for connection to other electronic systems with FFC connector.

Part number	Length	Diameter	Connector 1	Connector 2	Notes
ACC023*	1.0 m	5 mm	Molex 501568-1207	Flying leads	Twisted pairs, shielded, up to +90 °C
ACC039	152 mm	-	FFC, 20 Cores, 0.5 mm pitch	FFC, 20 Cores, 0.5 mm pitch	Contacts on the same side

* For MB039xxxxxxRRT00 only.

For testing, the FFC can be extended with an additional breakout board ACC040 and two cables with flying leads or terminated with a DSUB-9 connector (suitable for direct connection to the USB interface E201).

Part number	Length	Diameter	Connector 1	Connector 2	Notes
ACC040	PCB board	-	FFC, 20 Cores, 0.5 mm pitch	2x FCI 10114830-11108LF	For direct connection of following cables with 8-pin FCI connector
ACC049	1.0 m	6.2 mm	FCI 10114826-00008LF and 10114827-002LF	Flying leads	Twisted pairs, shielded, up to +75 °C
ACC065				DSUB-9 M	
ACC070	3.0 m			Flying leads	



Dimensions in mm.

Connector 1 FCI / AMP 10114826-00008LF	Connector 2 DSUB-9 M		
Pin number		**Wire color**	**BiSS signal**
	1	Shield	
1	5	Brown	5 V supply
2	9	White	0 V (GND)
3	8	Pink	Temperature sensor pin 1
4	4	Grey	Temperature sensor pin 2
5	2	Red	MA+
6	3	Blue	MA–
7	6	Green	SLO+
8	7	Yellow	SLO–

For more information, please see the MBD01 at **RLS Media center**.

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Document issues

Issue	Date	Page	Description
1	10. 4. 2020	-	New document
2	24. 9. 2021	5, 7	Dimensions of the fasteners amended
		12	ACC039, ACC040 and ACC061 added
3	1. 3. 2022	3	Cable assemblies amended
4	4. 7. 2023	10, 11	Connector option amended, multiturn variant added
		12, 13	Cable added
5	6. 5. 2024	8	Maximum speed amended, mass and inertia added
		4, 6	Connector dimensions amended
		12-13	ACC023 amended