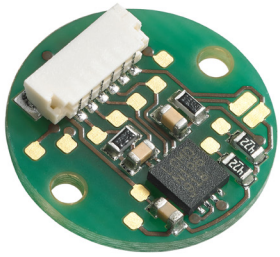
RMB14
Angular Magnetic Encoder Module

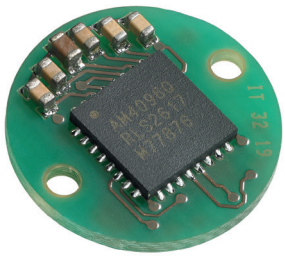
MINIATURE SIZE

HIGH SPEED

NON-CONTACT

The RMB14 is a compact, absolute high-speed encoder module. With a PCB diameter of only 14 mm, the module fits into miniature designs. Output signals are provided in industry standard absolute and incremental formats. The RMB14 can be used in a variety of applications including robotic grippers, marine, medical, printing, assembly lines, industrial automation, motor control and metrology devices.





The image does not represent all variants.

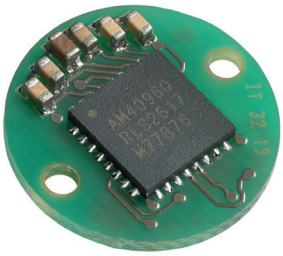
Features and benefits

- 14 mm diameter circular module
- 3.3 V and 5 V power supply
- High speed operation up to 30,000 rpm
- Absolute - up to 12 bit resolution (4,096 counts per revolution)
- Industry standard absolute, incremental and linear voltage output formats
- Accuracy up to ±0.5°
- RoHS compliant - see Declaration of conformity

MOTOR CONTROL | MEDICAL | PRINTING | MARINE | INDUSTRIAL AUTOMATION

General information

The encoder module consists of a magnetic actuator and a separate sensor board. The rotation of the magnetic actuator is read and processed by a custom encoder chip on the sensor board to obtain the required output format.



RMB14 encoder module

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A magnet for direct recessing in non-ferrous shafts

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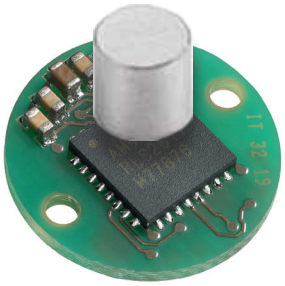
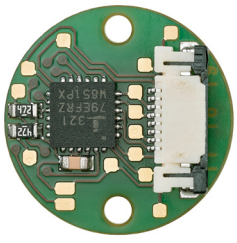


RMB14 system

Choose your RMB14 angular magnetic encoder module

RMB14IC

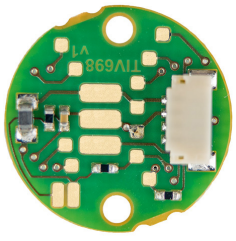


With FFC connector

RMB14SC

With FFC or header connector

RMB14Vx



With soldering pads or header connector

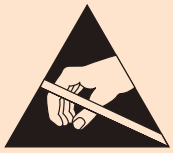
Storage and handling

Operating and storage temperature range

With FFC connector: –40 °C to +85 °C
With header connector: –25 °C to +85 °C
With soldering pads: –40 °C to +125 °C

Humidity

Up to 70 % non-condensing



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.

Chemical resistance

RLS products are often used in industrial applications and exposed to chemicals that can affect their internal and external components. While our products are designed to be resistant to many harsh chemicals and environments, long-term resistance will depend on exposure, temperature, and concentration. Most chemicals our products are exposed to are not in continuous contact. Therefore, a material that might not be resistant when submerged in a chemical will last indefinitely when wiped down by that same chemical once a day.

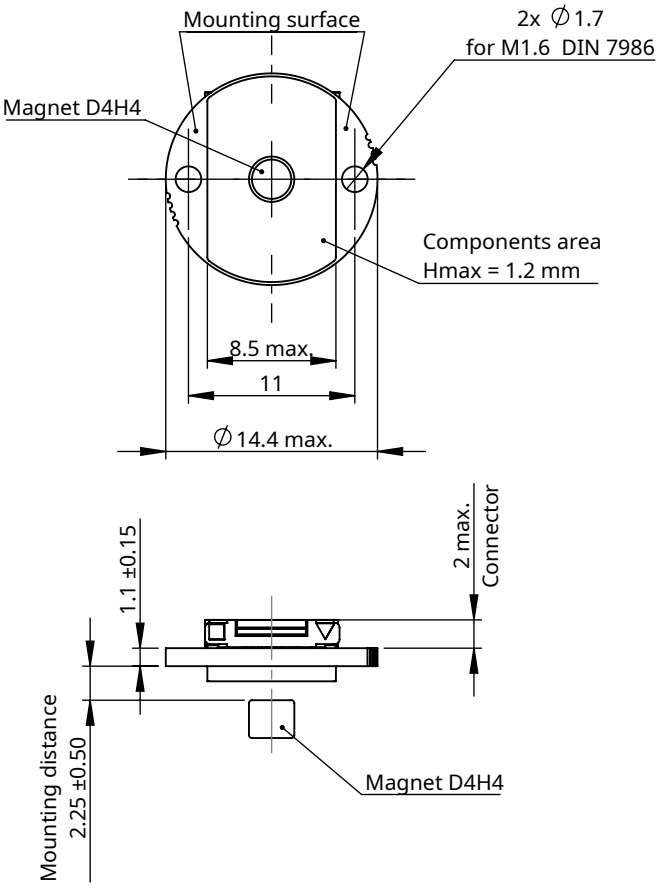
For further information or to confirm compatibility with a chemical in your environment, **contact RLS**.

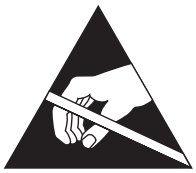
Packaging

Less than 20 products are packed individually in an antistatic box or an antistatic bag. If the order quantity is 20 systems or more, the products are packed in antistatic plastic trays or tubes. Magnets and readheads are packed separately.

Dimensions and installation drawings

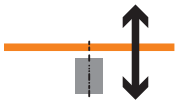
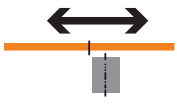
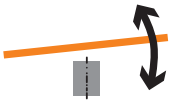
Dimensions and tolerances are in mm.





Installation tolerances

Installation tolerances for RMB14

Mounting distance	2.25 ±0.50 mm	
Radial displacement (concentricity)	±0.2 mm	
Perpendicularity	±0.3°	

- Encoder - Magnet

Output types

Incremental, RS422

RMB14IC

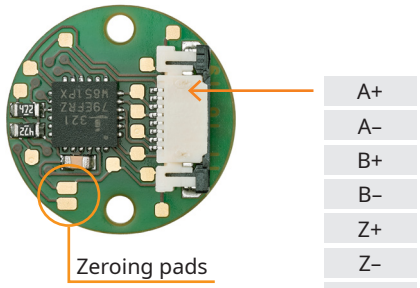
Specifications

Power supply	V_{dd} = 3.3 V or 5 V ±5%
Current consumption	Max. 35 mA
Output signals	A+, B+, Z+, A–, B– Z– (RS422)
Accuracy*	±0.5° *
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1024, 2048, 4096 cpr
Maximum speed	30,000 rpm
Temperature Operating and storage	–40 °C to +85 °C (limited by FFC connector)

* Valid for Ø4 × 4 mm magnets only.

Connections

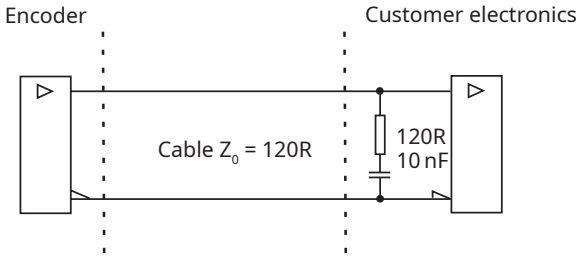
RMB14IC with FFC connector



Connector type
JST_08FKZ-SM1-1-TB

Recommended signal termination

For data output lines only



Setting the zero position

The zero position of the encoder can be easily adjusted by shortening the zeroing pads on the board. After locking the motor in the mechanical zero position, the two zeroing pads are shorted.
The output angle position data can be zeroed at any angle with a resolution of 0.0879°.

Absolute binary synchro-serial (SSI), RS422

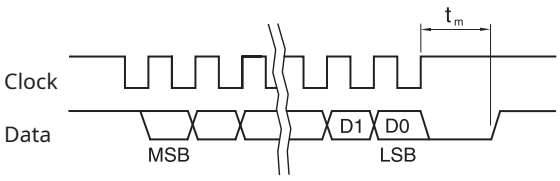
RMB14SC

Specifications

Power supply	V_{dd} = 3.3 V or 5 V ±5 %
Current consumption	Max. 35 mA
Data output	Serial data (RS422)
Data input	Clock (RS422)
Accuracy*	Typ. ±0.5° *
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	30,000 rpm
Temperature Operating and storage	–25 °C to +85 °C (limited by SMD connector) –40 °C to +85 °C (limited by FFC connector)

* Valid for Ø4 × 4 mm magnets only.

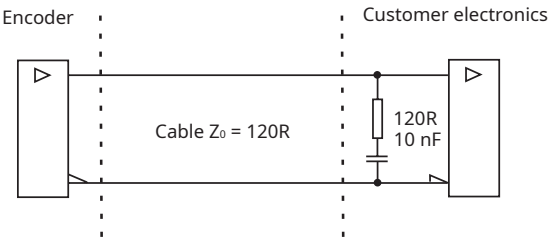
Timing diagram



Clock ≤ 1 MHz 20 µs ≤ tm ≤ 40 µs

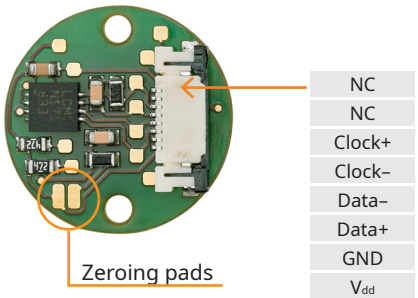
Recommended signal termination

For data output lines only



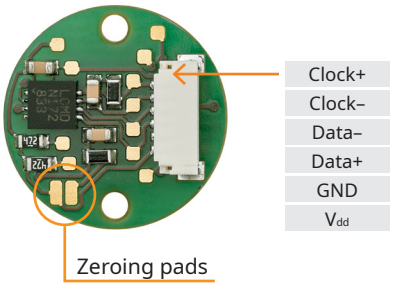
Connections

RMB14SC with FFC connector



Connector type
JST_08FKZ-SM1-1-TB

RMB14SC with header connector



Connector type
JST SM06B-SURS-TF
Mating connector
JST 06SUR-32S (not provided)

Zero position setting

The zero position of the encoder can be easily adjusted by shortening the zeroing pads on the board. After locking the motor in the mechanical zero position, the two zeroing pads are shorted.
The output angle position data can be zeroed at any angle with a resolution of 0.0879°.

Linear voltage output

RMB14Vx

Specifications

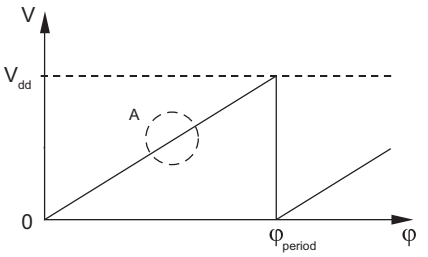
Power supply	V_{dd} = 5 V ±5 %
Current consumption	Typ. 26 mA
Output voltage	0 V to V_{dd}
Output load	Max. 2 mA
Nonlinearity	1 %
Maximum speed	30,000 rpm
Temperature Operating and storage	–25 °C to +85 °C (limited by connector) –40 °C to +125 °C (limited by soldering pads)

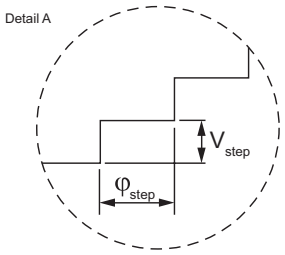
The digital relative angular position information is converted to a linear voltage using a built-in 10-bit D/A converter. The linear output voltage swing ranges from 0 V and V_{dd} (5 V). The number of periods within a revolution (N_{Period}) can be 1, 2, 4, or 8, corresponding to a full revolution over an angle (φ_{Period}) of 360°, 180°, 90°, or 45°, respectively. The signal is composed of steps representing the angular movement required to register a change in position (φ_{step}) and the resulting change in output voltage (V_{step}). The number of steps in a period (N_{step}) is given in the table below.
When the magnetic actuator is rotated clockwise, the output voltage increases. When the magnetic actuator is rotated counterclockwise, the output voltage decreases.

Output type and electrical variant

	φ_{period}			
Rotation	360°	180°	90°	45°
Clockwise	VA	VB	VC	VD
Counterclockwise	VE	VF	VG	VH

Timing diagram





φ_{period}	N_{period}	N_{step}	φ_{step}
360°	1	1024	0.35°
180°	2	1024	0.18°
90°	4	1024	0.09°
45°	8	512	0.09°

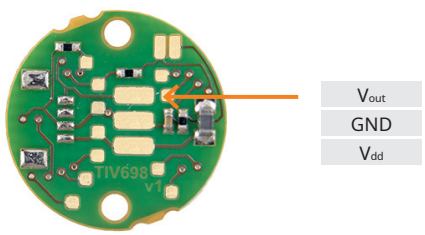
$$\varphi_{step} = \frac{\varphi_{period}}{N_{step}}$$

$$V_{step} = \frac{V_{dd}}{N_{step}}$$

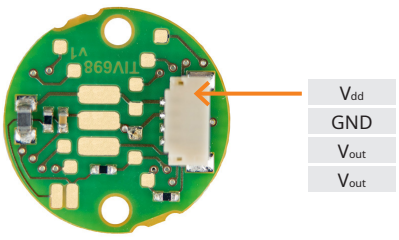
φ_{period}	Angle covered in one period (one sawtooth)
V_{period}	Output voltage range for one period
φ_{step}	Step angle (angular movement needed to register a change in the position)
V_{step}	Output voltage range for one step
N_{period}	Number of periods in one revolution

Connections

RMB14Vx



RMB14Vx with header connector



Connector type

JST-04SUR-32S

Part numbering

RMB14 IC 09B E 10

Output type

IC - Incremental, RS422
SC - Absolute binary synchro-serial (SSI), RS422
Vx - Linear voltage

Linear voltage output 0 - 5 V, supply 5 V DC

	360°	180°	90°	45°
CW	**VA**	**VB**	**VC**	**VD**
CWW	**VE**	**VF**	**VG**	**VH**

Resolution

For **IC** and **SC** (counts/positions per revolution):

05B	32	**09B**	512
06B	64	**10B**	1024
07B	128	**11B**	2048
08B	256	**12B**	4096

For **Vx** - **10B** (1024 positions per revolution)

Shape and connector

C - Circular, soldering pads (for **Vx** output only)
E - Circular, FFC connector (for **IC** and **SC** output)
F - Circular, header connector (for **SC** and **Vx** output)

Power supply

10 - 5 V power supply
33 - 3.3 V power supply (for **IC** and **SC** output)

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

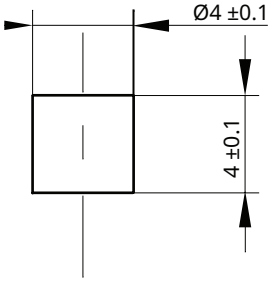
Table of available combinations

Series	Output type	Resolution	Shape and connector	Power supply
RMB14	IC	05B / 06B / 07B / 08B / 09B / 10B / 11B / 12B	E	10 / 33
	SC		E / F	
	Vx	10B	C / F	10

Magnet ordering information

Magnet for direct recessing in non-ferrous shafts

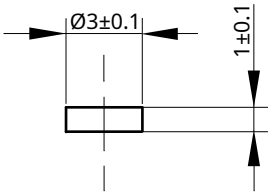
Fixing: Glue (recommended - LOCTITE 648 or LOCTITE 2701)



Part numbers:

For resolutions up to 9 bit absolute (512 cpr incremental)
RMM44A2A00 (individually packed) – for sample quantities only
RMM44A2C00 (packed in tubes)

For resolutions from 10 bit absolute (800 cpr incremental) and above
RMM44A3A00 (individually packed) – for sample quantities only
RMM44A3C00 (packed in tubes)



Part number:

RMM3010A1B00

RMM3010 magnets are only tested (not graded). Specified accuracy cannot be achieved by using magnet RMM3010.

Accessories

Cable assembly 6 pin, 1 m or 0.5 m
ACC031
ACC032

Compatible with RMB14SC with header connector.

Cable assembly, 4 pin, 1 m or 0.5 m
ACC075
ACC076

Compatible with RMB14Vx with header connector.

Molex Premo-Flex™ FFC Jumper, 8 Circuits, 203 mm
ACC038

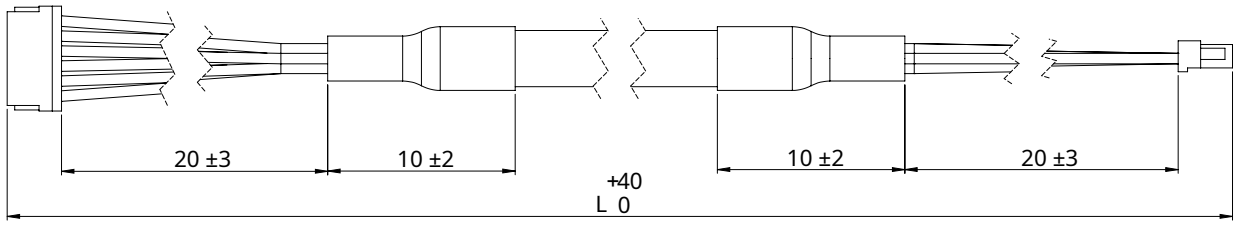
Compatible with RMB14IC and RMB14SC.

For more information, see chapter **Cable assemblies**.

Cable assemblies

Cables with crimped connectors

Part number	Length (L)	Connectors	Compatible with
ACC031	1 m	Dual ended JST connectors, 6 pins	RMB14SC with header connector.
ACC032	0.5 m		
ACC075	0.5 m	Dual ended JST connectors, 4 pins	RMB14Vx with header connector.
ACC076	1 m		



Dimensions and tolerances in mm.

Cable specifications

Connector type	**ACC031, ACC032**	JST 06SUR-32S
	ACC075, ACC076	JST-04SUR-32S
Configuration		10 × 0.0320 mm²
Sheath color		Black
Rated voltage		30 V
Temperature range		From –40 °C to +90 °C

	Pin number		Output types			
				Absolute binary synchro-serial (SSI), RS422		
Wire color	**ACC031 / ACC032**	**ACC075 / ACC076**	**Incremental, RS422**	with FFC connector	with header connector	**Linear voltage output**
Red	1	4	V_{dd}	V_{dd}	-	V_{dd}
Blue	2	3	GND	GND	-	GND
Green	3	2	B–	Clock–	Data+	V_{out}
Yellow	4	-	B+	Clock+	Data–	-
Brown	5	1	Z–	Data–	V_{dd}	V_{out}
White	6	-	Z+	Data+	GND	-
Grey	-	-	A+	NC	Clock+	-
Violet	-	-	A–	NC	Clock–	-

Head office

RLS Merilna tehnika d. o. o.

Poslovna cona Žeje pri Komendi
Pod vrbami 2
SI-1218 Komenda
Slovenia

T +386 1 5272100
E mail@rls.si

www.rls.si

Global support

Visit our **website** to contact your nearest sales representative.

Document issues

Issue	Date	Page	Description
4	19. 7. 2023	-	New design od the document
		4	Installation tolerances added
		2, 7, 8	RMB14Vx Linear output voltage added
		9, 10	ACC037 removed
			ACC075 and ACC076 added
5	28. 8. 2024	2	Dimensions drawing amended

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