

RMB28 / RMF44 / RMF58

Rotary Magnetic Encoders

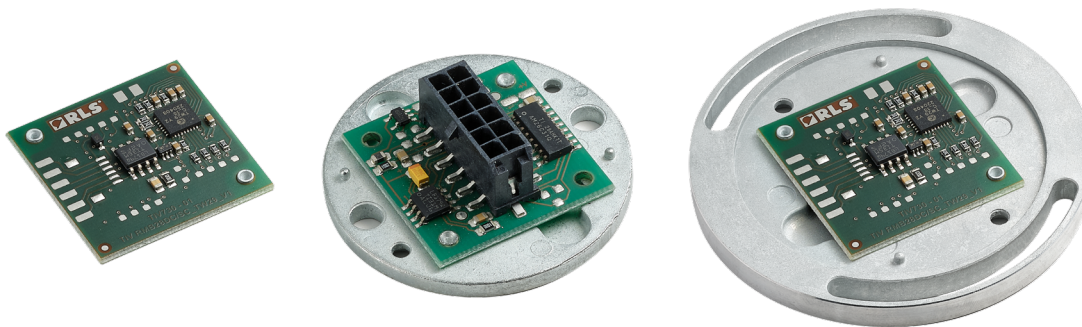
14 BIT

EASY
MOUNTING

NUMEROUS
OUTPUT
OPTIONS

The RMB28 encoder module is designed for direct integration into high volume OEM applications.

The inexpensive 28 mm square PCB can also be supplied with a connector or as RMF44/RMF58 on a metal flange with 44 mm or 58 mm diameters for easy mounting. The RMB28/RMF44/RMF58 encoder modules can be used in a wide range of OEM applications, including motor control and industrial automation.



Features and benefits

- ▶ 5 V and 24 V power supply versions
- ▶ High speed operation to 60,000 rpm
- ▶ Absolute - to 14 bit resolution (16,384 counts per revolution)
- ▶ Accuracy up to $\pm 0.5^\circ$
- ▶ Inexpensive solution for OEM integration
- ▶ Industry standard absolute, incremental, analogue, commutation and linear voltage output formats



MOTOR CONTROL



PRINTING



MARINE



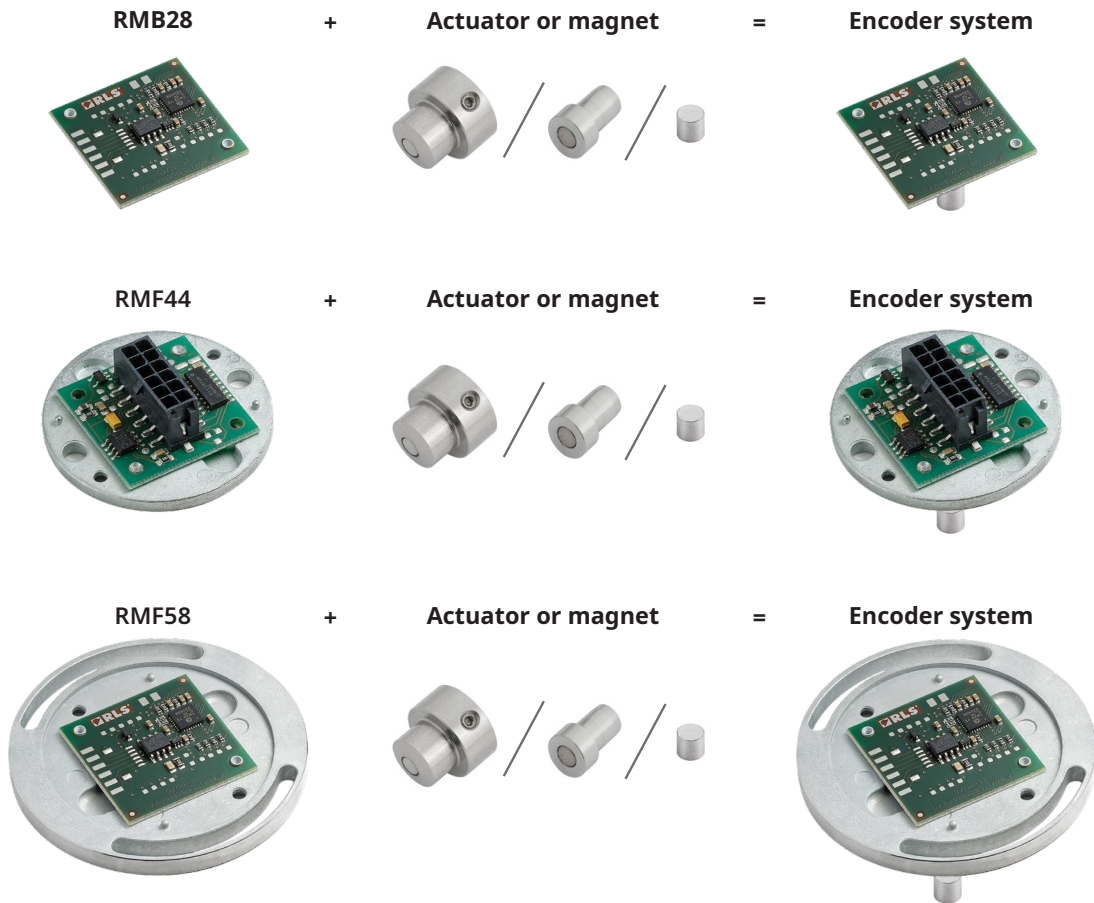
MEDICAL



INDUSTRIAL AUTOMATION

General information

The encoder module consists of a magnetic actuator and a separate sensor board. The rotation of the magnetic actuator is detected and processed by a custom encoder chip mounted on the sensor board to obtain the desired output format. The output signals are provided in industry standard absolute, incremental, analog or linear voltage output formats.



For commutation outputs please refer to [Commutation and incremental magnetic encoder solutions](#).

Product range

AC

Analogue sinusoidal output with a single sine/cosine period per revolution.

DC

BiSS-C interface with up to 16,384 positions per revolution and optional revolution counter.

I

Incremental with up to 4,096 pulses per revolution (320 to 16,384 counts per revolution with 4× evaluation).

SC

Synchro serial interface (SSI) with up to 16,384 positions per revolution.

SI

Synchro serial interface (SSI) with 320 to 8,192 positions per revolution and incremental with 80 to 2,048 pulses per revolution (320 to 8,192 counts per revolution with x 4 evaluation).

Vx

Linear voltage output in a range of variants.

Selection guide

Product	Available outputs	Power supply	
		5 V	24 V
RMB28 / RMF44 / RMF58	AC - Analogue sinusoidal outputs	✓	-
	DC - Absolute natural binary BiSS-C interface, RS422	✓	-
	IB - Incremental, open collector NPN	-	✓
	IC - Incremental, RS422	✓	-
	IE - Incremental, open collector	✓	-
	SC - Absolute binary synchro-serial interface (SSI), RS422	✓	-
	SI - Absolute binary synchro-serial (SSI) + Incremental, RS422	✓	-
	Vx - Linear voltage output	✓	-

Storage and handling

Operating and storage temperature

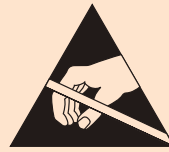
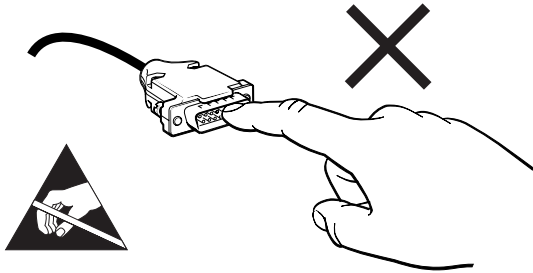


-40 °C to +125 °C
-40 °C to +105 °C (with connector)

Humidity

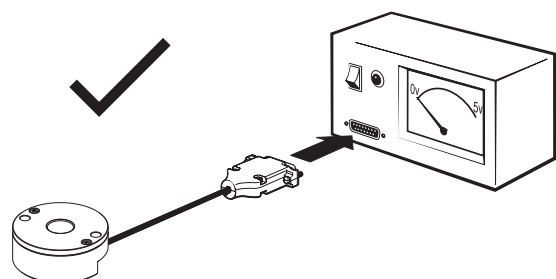
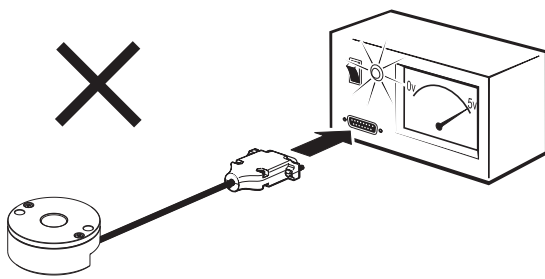


Up to 70 % non-condensing



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.



Packaging

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

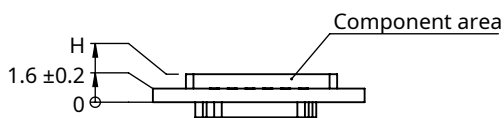
Dimensions and installation drawings

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

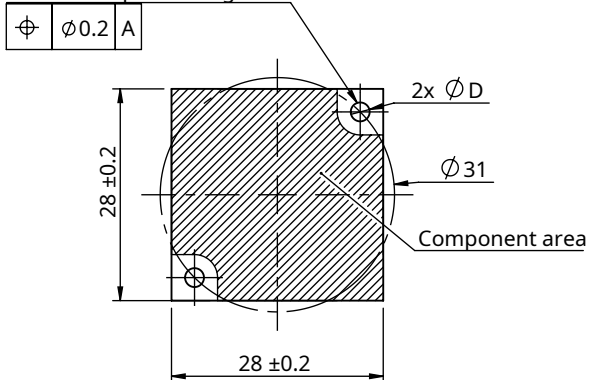


RMB28

Dimensions



Only mounting holes should be used for positioning.



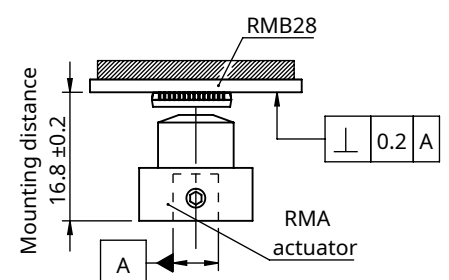
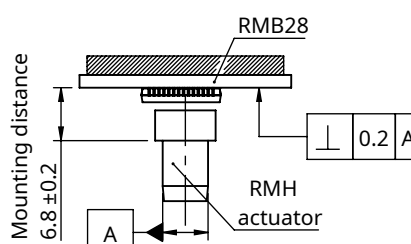
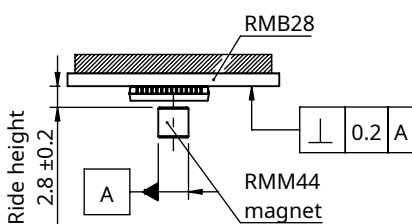
Output type	Hole diameter (D)
AC	2.5 ± 0.1
DC	2.5 ± 0.1
IC	2.5 ± 0.1
IB	3.5 ± 0.1
IE	3.5 ± 0.1
SC	2.5 ± 0.1
SI	2.5 ± 0.1
Vx	3.5 ± 0.1

	Height (H) [mm]
No connector	Max 4.5
Horizontal connector	Max. 7
Vertical connector	Max 12.5



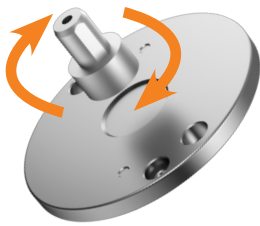
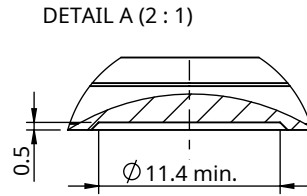
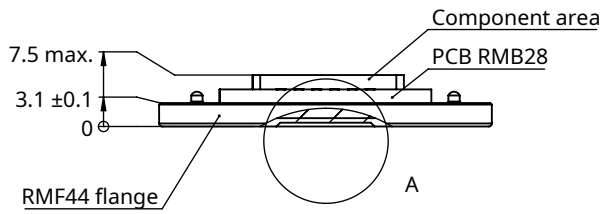
Clockwise (CW) rotation of magnet

Installation drawing

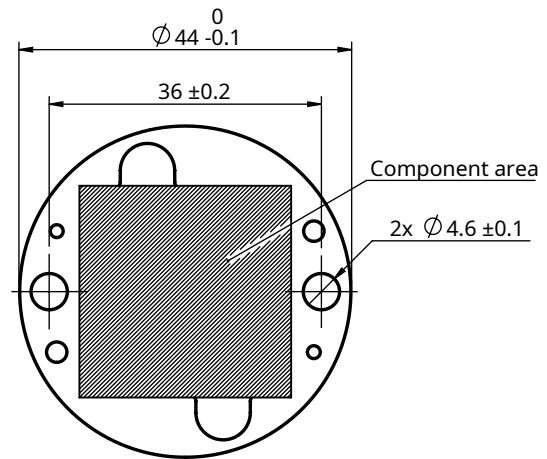


RMF44

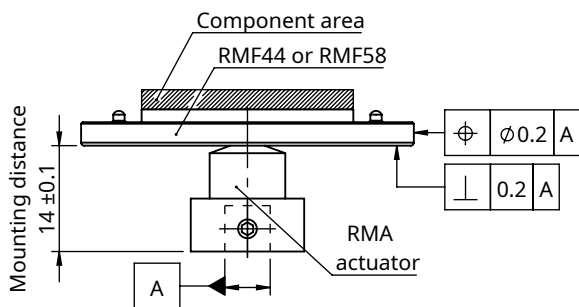
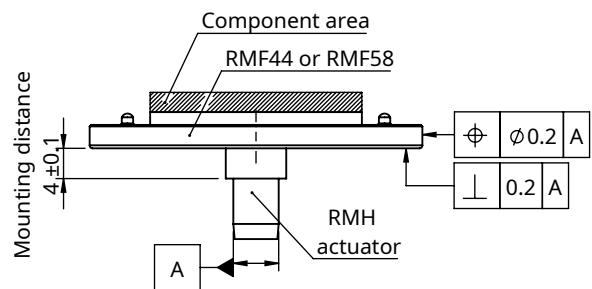
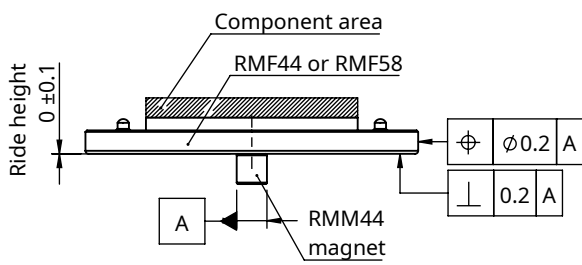
Dimensions



Clockwise (CW) rotation of magnet

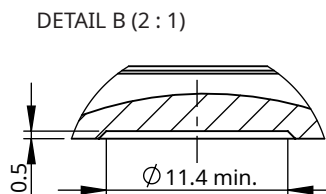
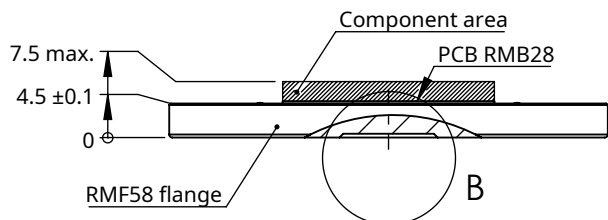


Installation drawing

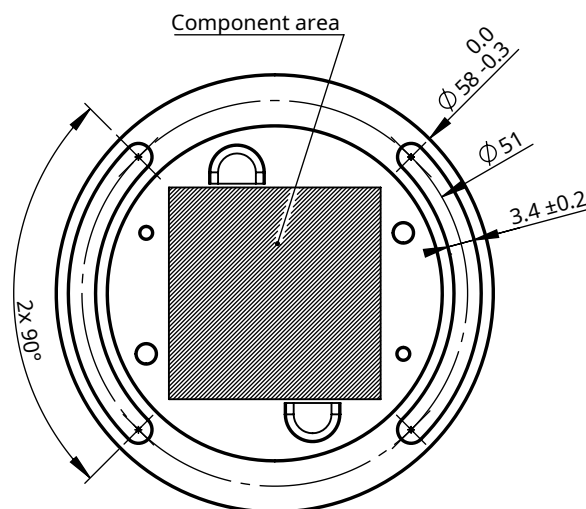


RMF58

Dimensions



Clockwise (CW) rotation of magnet



Installation dimensions are identical to RMF44. Refer to RMF44 installation drawing on [page 6](#).

Technical specifications

Mechanical data

Mass	Encoder unit <20 g Magnetic actuator <2 g
Magnet material	Sm2Co17 with Ni-Cu-Ni protective layer
Actuator material	RMH: Aluminium RMA: Stainless steel

Environmental data

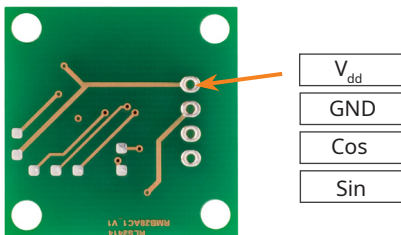
EMC compliance	EN 61326
Shock	100 G (6 ms, standard EN 60068-2-27:2009)
Vibration	40 G (55 Hz–2000 Hz, standard EN 60068-2-6:2008)
Temperature drift error	0.004°/°C

Output types

AC – Analogue sinusoidal outputs

2 channels V_A V_B sinusoids (90° phase shifted, single ended)

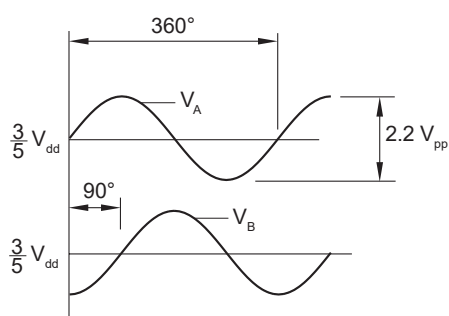
Connections



Specifications

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Resolution	One sine/cosine wave per revolution
Current consumption	13 mA
Sin/Cos outputs	Signal amplitude: $1.1\text{ V} \pm 0.2\text{ V}$ Signal offset: $\frac{3}{5} V_{dd} \pm 5\text{ mV}$
Maximum speed	60,000 rpm
Operating temperature	-40 °C to +125 °C

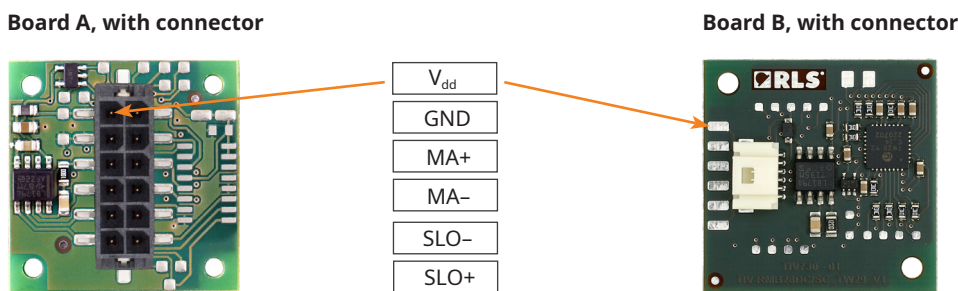
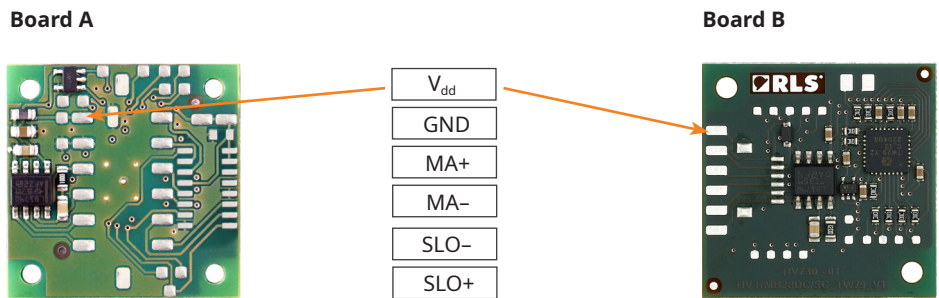
Timing diagram



V_A leads V_B by 90° for clockwise rotation of magnetic actuator.

DC – Absolute encoder with BiSS-C interface

Connections



Connector type

Molex 43045-1219

Mating connector (Not provided)

Shell: Molex 43025-1200

Crimp terminal: Molex 43030-xxxx

Connector type

Molex 501568-0607

Mating connector (Not provided)

Shell: Molex 501330-0600

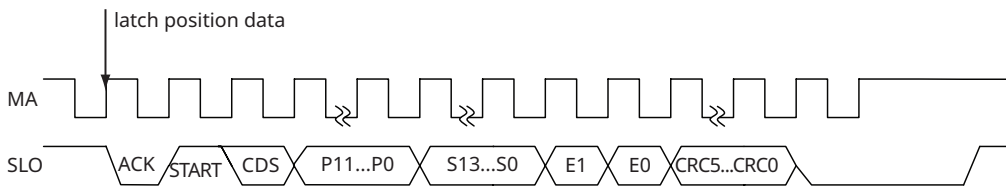
Crimp terminal: Molex 501334-xxxx

Specifications

Output code	Natural binary
Power supply	V _{dd} = 5 V ±5 %
Current consumption	Board A: 35 mA Board B: 65 mA
Clock input	MA (RS422)
Data output	SLO (RS422)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	Board A: 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 positions per revolution Board B: 360, 3600, 4000, 8000, 10000, 16000, 16384 positions per revolution*
Revolution counter	12 bit (4,096 revolutions)
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C -40 °C to +105 °C (with connector)
Max MA frequency	8 MHz

* For other resolutions **contact RLS**.

Timing diagram - BiSS C



Data	Length	Description
P11 - P0	0 or 12 bit	Revolution counter value when enabled (see Part numbering/resolution)*
S13 - S0	7 to 14 bit	Position inside the revolution (length depends on the resolution)
E1 - E0	2 bit	Error data
CRC5 - CRC0	6 bit	Cyclic redundancy check data; polynomial 0x43; inverted bit output

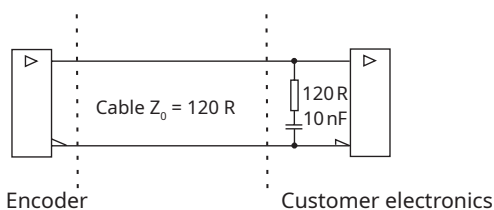
* The revolution counter counts the number of mechanical revolutions of the shaft or magnet of the encoder. Counting is possible only when the encoder is powered. When the encoder is powered off, the revolution counter is reset to 0.

Error	E0	E1
No error	1	1
Amplitude error	0	1
Too high velocity	1	0
Undervoltage; Configuration; System error	0	0

For more information on BiSS C protocol please visit www.biss-interface.com.

Recommended signal termination

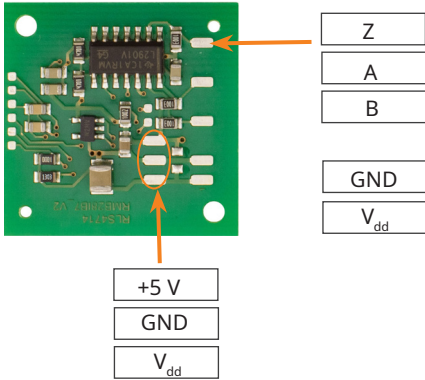
For data output lines only



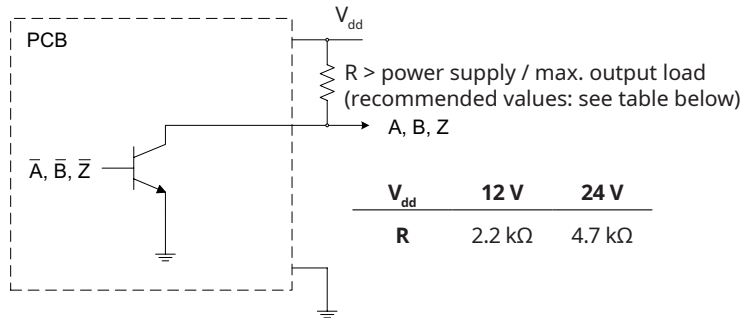
IB – Incremental, open collector NPN

Square wave output

Connections



Recommended signal termination

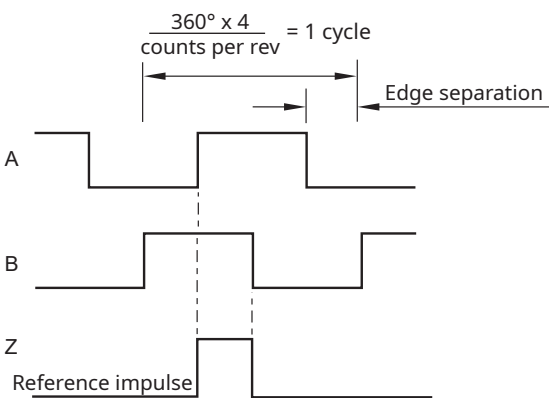


RMB28IB / RMF44IB boards need 2 power supplies; pad V_{dd} and pad +5 V. Pads V_{dd}, GND and +5 V have been provided to allow easy connection to a 3 terminal voltage regulator to generate 5 V from V_{dd}.

Specifications

Power supply	V _{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	80 to 2,048 pulses per revolution (320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution)
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C

Timing diagram



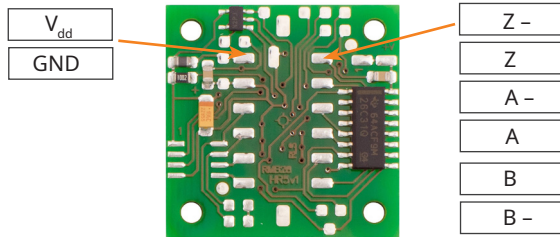
B leads A for clockwise rotation of magnetic actuator.

IC – Incremental, RS422

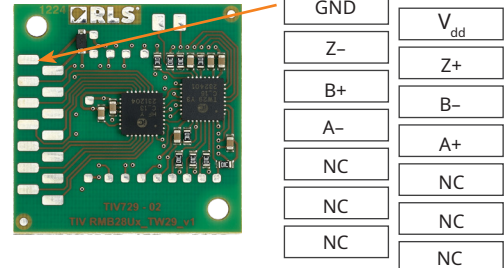
Square wave differential line driver to RS422

Connections

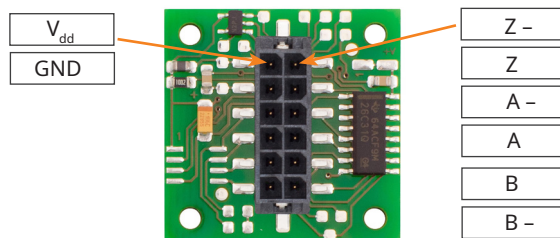
Board A



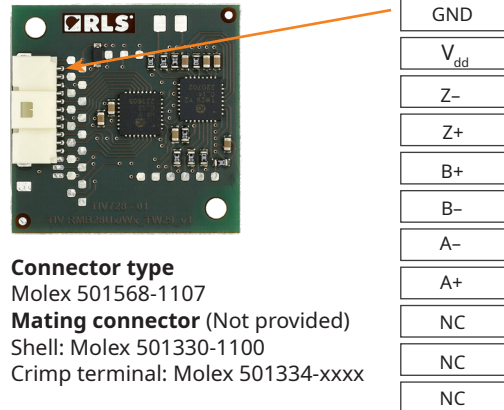
Board B



Board A, with connector



Board B, with connector



Connector type
Molex 43045-1219
Mating connector (Not provided)
Shell: Molex 43025-1200
Crimp terminal: Molex 43030-xxxx

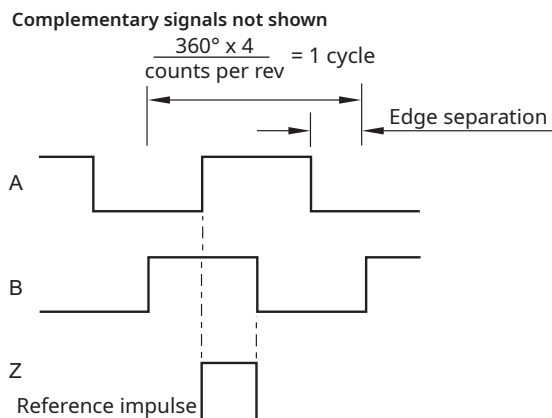
Connector type
Molex 501568-1107
Mating connector (Not provided)
Shell: Molex 501330-1100
Crimp terminal: Molex 501334-xxxx

Specifications

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Current consumption	Board A: 35 mA Board B: 65 mA
Output signals	A, B, Z, A-, B-, Z- (RS422)
Accuracy	Typ. $\pm 0.5^\circ$
Hysteresis	0.18°
Resolution	Board A: 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution Board B: 360, 3600, 4000, 8000, 10000, 16000, 16384 counts per revolution*
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C -40 °C to +105 °C (with connector)

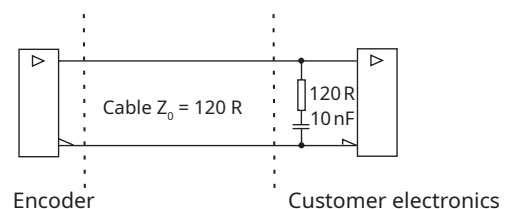
* For other resolutions **contact RLS.**

Timing diagram



B leads A for clockwise rotation of magnetic actuator.

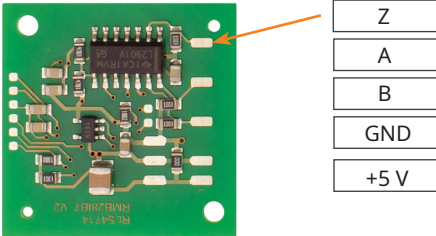
Recommended signal termination



IE – Incremental, open collector, NPN

Low cost alternative for ball bearing encoders

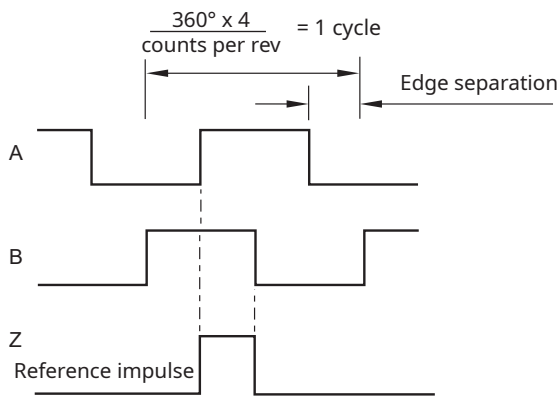
Connections



Specifications

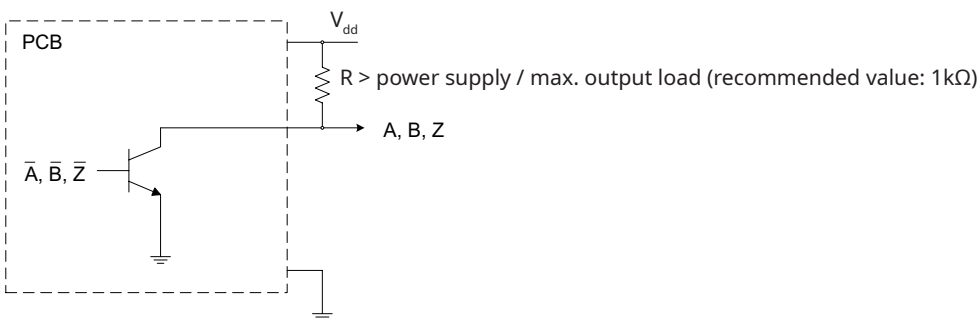
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Current consumption	35 mA (not loaded)
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. $\pm 0.5^\circ$
Hysteresis	0.18°
Resolution	320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C

Timing diagram



B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination

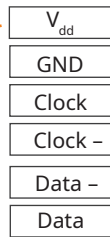
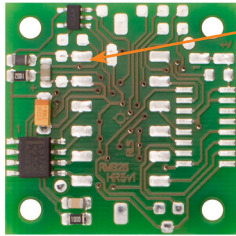


SC – Absolute binary synchro-serial (SSI), RS422

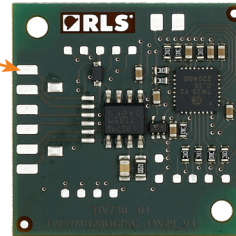
Serial encoded absolute position measurement

Connections

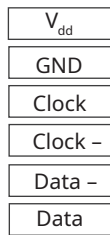
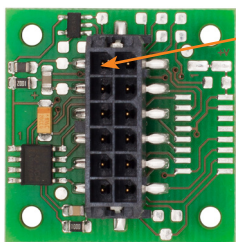
Board A



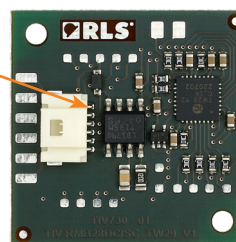
Board B



Board A, with connector



Board B, with connector



Connector type
Molex 501568-0607
Mating connector (Not provided)
Shell: Molex 501330-0600
Crimp terminal: Molex 501334-xxxx

Connector type

Molex 43045-1219

Mating connector

(Not provided)
Shell: Molex 43025-1200

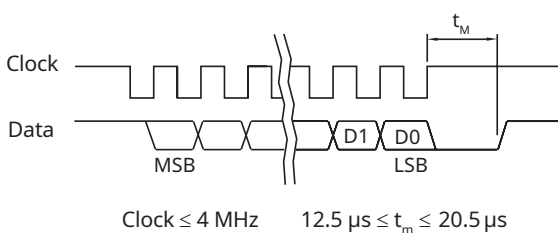
Crimp terminal: Molex 43030-xxxx

Specifications

Output code	Natural binary
Power supply	V _{dd} = 5 V ±5 %
Current consumption	Board A: 35 mA Board B: 65 mA
Data output	Serial data (RS422)
Data input	Clock (RS422)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	Board A: 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 positions per revolution Board B: 360, 3600, 4000, 8000, 10000, 16000, 16384 positions per revolution*
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C -40 °C to +105 °C (with connector)

* For other resolutions **contact RLS.**

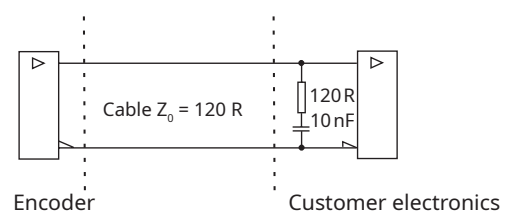
Timing diagram



Position increases for clockwise rotation of magnetic actuator.

Recommended signal termination

For data output lines only

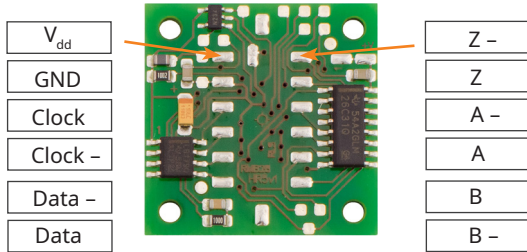


SI – Absolute binary synchro-serial (SSI) + Incremental, RS422

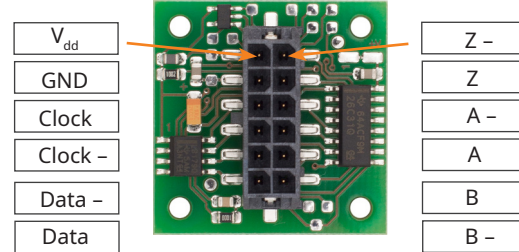
Complex feedback device for absolute position at start up as well as during operation + incremental outputs.
Both the incremental and the SSI output always have the same fixed resolution.

Connections

Without connector



With connector



Connector type

Molex 43045-1219

Mating connector (Not provided)

Shell: Molex 43025-1200

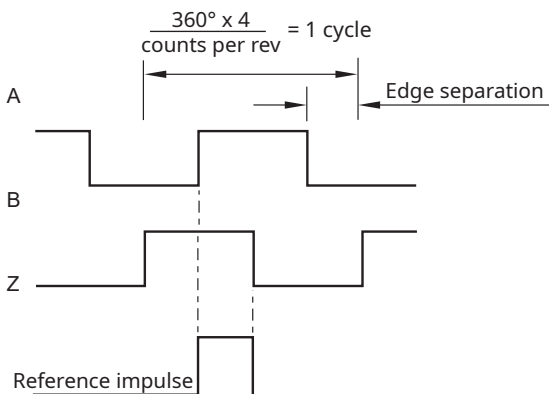
Crimp terminal: 43030-xxxx

Specifications

Output code	Natural binary
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Current consumption	Max. 35 mA
Incremental outputs	A, B, Z, A-, B-, Z- (RS422)
Data output	Serial data (RS422)
Data input	Clock (RS422)
Accuracy	Typ. $\pm 0.5^\circ$
Hysteresis	0.18°
Resolution	320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C -40 °C to +105 °C (with connector)

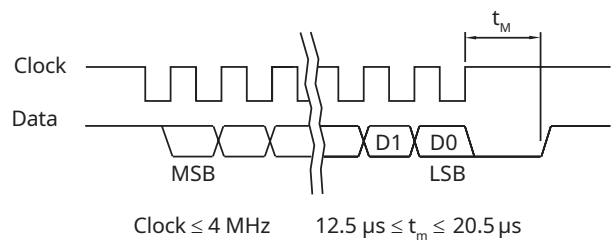
Timing diagram - Incremental

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

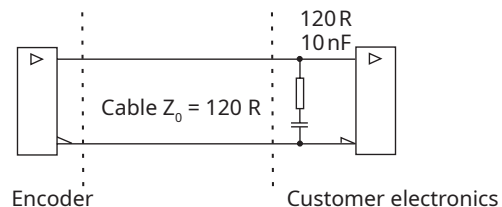
Timing diagram - SSI



Position increases for clockwise rotation of magnetic actuator.

Recommended signal termination

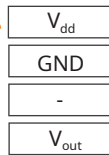
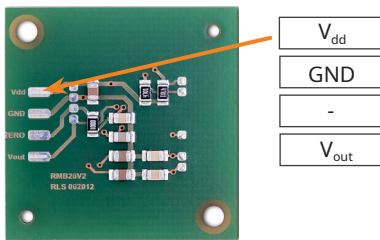
For incremental signals + SSI data output lines only



Vx – Linear voltage output

Alternative for potentiometers

Connections



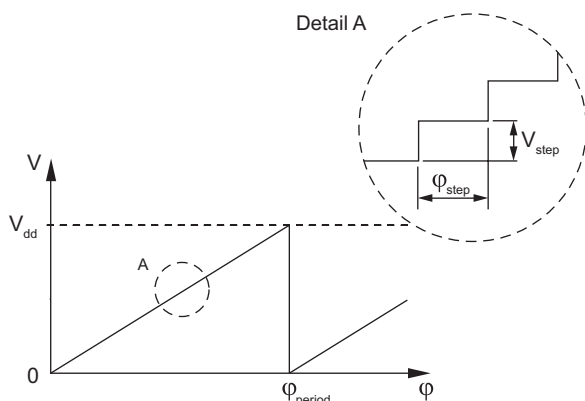
Specifications

Power supply	V _{dd} = 5 V ± 5 %
Current consumption	Typ. 26 mA
Output voltage	0 V to V _{dd}
Output loading	Max. 2 mA
Nonlinearity	1 %
Resolution of DAC	10 bit
Maximum speed	30,000 rpm
Operating temperature	-40 °C to +125 °C

The digital relative angular position information is converted into linear voltage with 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 one revolution (N_{period}) can be 1, 2, 4 or 8, representing one full swing over an angle (φ_{period}) of 360°, 180°, 90° or 45° respectively. The signal is made up of steps which represent the angular movement needed to register a change in the position (φ_{step}) and the resulting change in the output voltage (V_{step}). The number of steps in one period (N_{step}) is given in the table below.

For clockwise rotation of the magnetic actuator, the output voltage increases. For counterclockwise rotation, the output voltage decreases.

Timing diagram



φ _{period}	N _{period}	N _{step}	φ _{step}
360°	1	1,024	0.35°
180°	2	1,024	0.18°
90°	4	1,024	0.09°
45°	8	512	0.09°

$$\phi_{\text{step}} = \frac{\phi_{\text{period}}}{N_{\text{step}}} \quad V_{\text{step}} = \frac{V_{\text{dd}}}{N_{\text{step}}}$$

- 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
- N_{step} = Number of steps in one period

Output type and electrical variant

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

Part numbering

RMF44 IC 08B A 10

Series

- RMB28** - RMB28 encoder module
- RMF44** - RMB28 encoder module on 44 mm diameter metal flange
- RMF58** - RMB28 encoder module on 58 mm diameter metal flange

Output type

- AC** - Analogue sinusoidal, 5 V
- DC** - Absolute natural binary BiSS, RS422, 5 V
- IB** - Incremental, open collector, NPN, 24 V
- IC** - Incremental, RS422, 5 V
- IE** - Incremental, open collector, NPN, 5 V
- SC** - Absolute binary synchro-serial (SSI), RS422, 5 V
- SI** - SSI + Incremental, RS422, 5 V

Vx - Linear voltage:

Linear voltage output 0 - 5 V, supply 5 V DC				
	360°	180°	90°	45°
CW	VA	VB	VC	VD
CCW	VE	VF	VG	VH

Resolution

For **AC**:

01S - One sine/cosine wave per revolution

For **IA**, **IB**, **IE** and **SI** (counts/positions per revolution):

Decimal			Binary		
2D0 - 2000	D80 - 800	D32 - 320	13B - 8192	10B - 1024	07B - 128
1D6 - 1600	D50 - 500		12B - 4096	09B - 512	
1D0 - 1000	D40 - 400		11B - 2048	08B - 256	

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

Decimal				Binary		
16D - 16000	4D0 - 4000	1D6 - 1600	D50 - 500	D32 - 320	14B - 16384	11B - 2048
10D - 10000	3D6 - 3600	1D0 - 1000	D40 - 400		13B - 8192	10B - 1024
8D0 - 8000	2D0 - 2000	D80 - 800	D36 - 360		12B - 4096	09B - 512

For **DC** with enabled 12 bit revolution counter:

Binary		
14M - 16384	11M - 2048	08M - 256
13M - 8192	10M - 1024	07M - 128
12M - 4096	09M - 512	

For other resolutions **contact RLS.**

For **Vx**:

10B - 1,024 counts/positions per revolution

Shape

- S** - Square (for RMB28)
- A** - Standard 44 mm or 58 mm flange (for RMF44 and RMF58)

Special requirements

- 10** - No special requirements (standard)
- 11** - With Molex connector – top entry, board A (for output types **IC**, **SC**, **DC** and **SI**)
- 12** - With Molex connector – side entry, board B (for output types **IC**, **SC**, **DC**)

For commutation outputs please refer to **Commutation and incremental magnetic encoder solutions.**

Not all combinations are valid. Please refer to the table of available combinations on the next page.

Table of available combinations

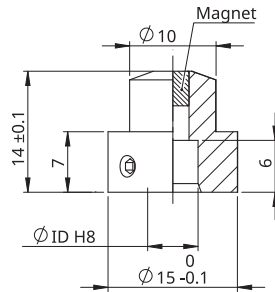
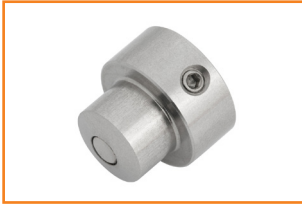
Series	Output type	Resolution	Shape	Special requirements	
RMB28 / RMF44 / RMF58	AC	01S	S / A*	10	
	Vx	10B		10	
	IB	2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B			10
					11
	IC	2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B			10
					11
					12
	IE	2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B			10
					11
	SC	2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B			10
					11
					12
	SI	2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B			10
					11
	DC	2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B / 13M / 12M / 11M / 10M / 09M / 08M / 07M			10
					11
12					
		D36 / 3D6 / 4D0 / 8D0 / 10D / 16D / 14B		10	
		D36 / 3D6 / 4D0 / 8D0 / 10D / 16D / 14B		12	

* S for RMB28
A for RMF44 and RMF58

For commutation outputs please refer to [Commutation and incremental magnetic encoder solutions](#).

Magnetic actuator and magnet ordering information

Actuator for integration onto shaft



Shaft = Ø ID h7

Fixing: Grub screw provided

* Hole diameter for nominal shaft size.

See table on the right for more information on available shaft sizes.

Part numbers:

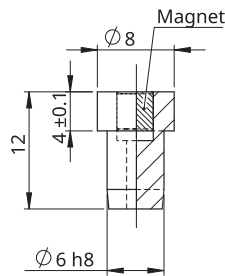
For resolutions up to 9 bit absolute (512 cpr incremental)

RMA04A2A00 - ID = Ø4 mm	RMA10A2A00 - ID = Ø10 mm
RMA05A2A00 - ID = Ø5 mm	RMA19A2A00 - ID = Ø3/16" mm
RMA06A2A00 - ID = Ø6 mm	RMA25A2A00 - ID = Ø1/4" mm
RMA08A2A00 - ID = Ø8 mm	RMA37A2A00 - ID = Ø3/8" mm

For resolutions from 10 bit absolute (800 cpr incremental) and above

RMA04A3A00 - ID = Ø4 mm	RMA10A3A00 - ID = Ø10 mm
RMA05A3A00 - ID = Ø5 mm	RMA19A3A00 - ID = Ø3/16" mm
RMA06A3A00 - ID = Ø6 mm	RMA25A3A00 - ID = Ø1/4" mm
RMA08A3A00 - ID = Ø8 mm	RMA37A3A00 - ID = Ø3/8" mm

Actuator for integration into shaft



Part numbers:

For resolutions up to 9 bit absolute (512 cpr incremental)

RMH06A2A00

For resolutions from 10 bit absolute (800 cpr incremental) and above

RMH06A3A00

with N-pole marker



With N-pole marker scribed to a ±5° accuracy:

For resolutions up to 9 bit absolute (512 cpr incremental)

RMH06A2A02

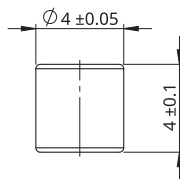
For resolutions from 10 bit absolute (800 cpr incremental) and above

RMH06A3A02

Hole = Ø6G7

Fixing: Adhesive (recommended – LOCTITE 648 or 2701)

Magnet for direct recessing in non-ferrous shafts



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)

Fixing: Adhesive (recommended – LOCTITE 648 or 2701)

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Document issues

Issue	Date	Page	Description
1	29. 11. 2024	General	Redesign of RMB28D01
2	17. 7. 2025	10, 13, 15, 16 18	Pictures of boards with connectors added Special requirements amended
3	18. 2. 2026	5 - 7	Dimensions drawings amended

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