

# RMB28 / RMF44 / RMF58

## Magnetic Encoder Module with AM4096

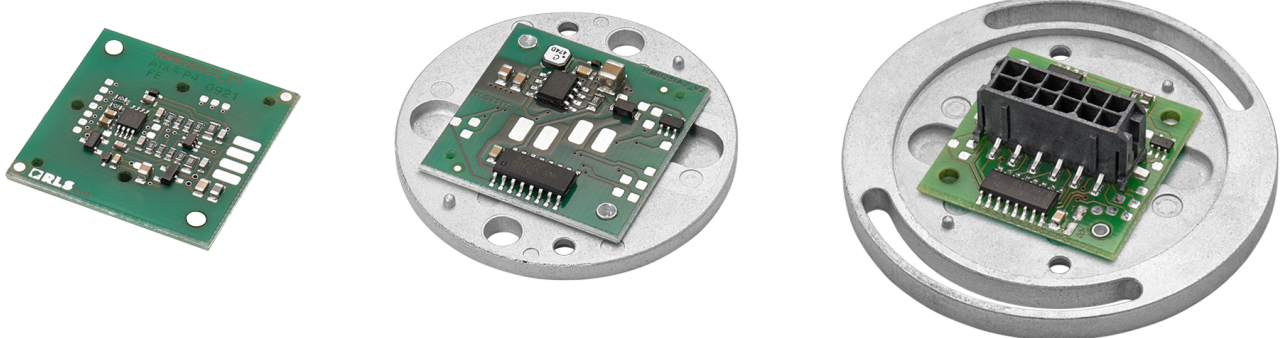
12 BIT

EASY  
MOUNTING

WIDE  
INSTALLATION  
TOLERANCES

The RMB28 and RMF44 / RMF58 encoder modules can be used in a variety of OEM applications, including motor control and industrial automation.

The cost-effective 28 mm square PCB can also be supplied with a connector or as RMF44/RMF58 on a 44 mm or 58 mm diameter metal flange for easy mounting.



### Features and benefits

- ▶ 5 V power supply versions
- ▶ High-speed operation up to 60,000 rpm
- ▶ Absolute - up to 12-bit resolution (4,096 counts per revolution)
- ▶ Low-cost solution for OEM integration
- ▶ Industry-standard absolute and incremental output formats
- ▶ Optimization after installation with SATI



MOTOR CONTROL



PRINTING



MARINE



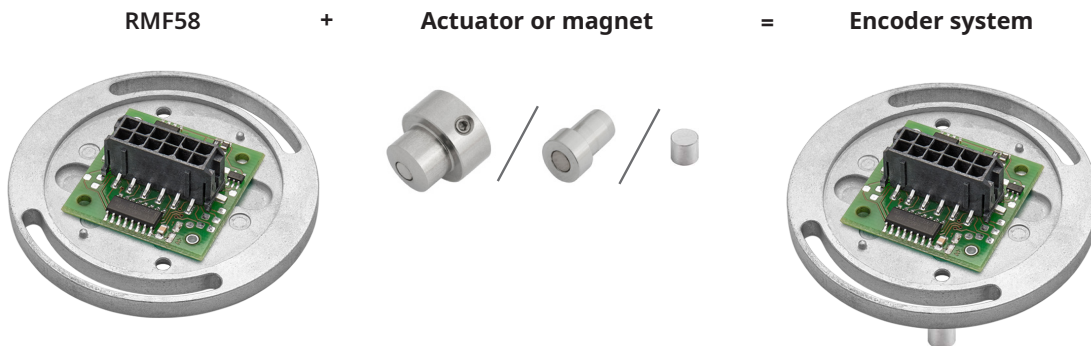
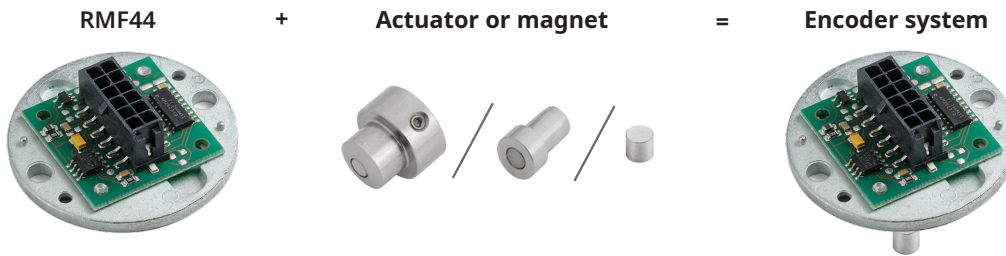
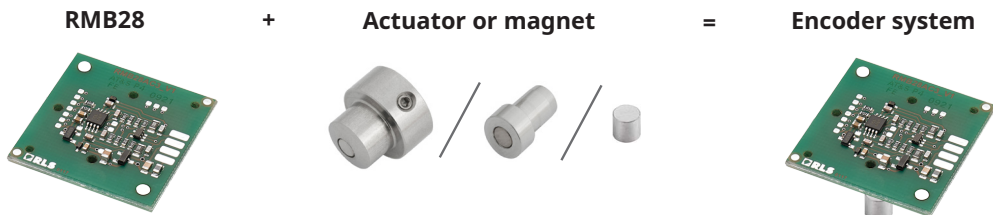
MEDICAL



INDUSTRIAL AUTOMATION

# General information

The encoder module consists of a magnet/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, analogue or linear voltage output formats.



## Product range

### AC

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

### BC

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

### I

Incremental with 8 to 1,024 pulses per revolution (32 to 4,096 counts per revolution with x4 evaluation).

### SC

Synchro serial interface (SSI) with 32 to 4,096 positions per revolution.

### SI

Synchro serial interface (SSI) with 32 to 4,096 positions per revolution and incremental with 8 to 1,024 pulses per revolution (32 to 4,096 counts per revolution with x 4 evaluation).

## Selection guide

Product	Available outputs	Power supply	
		5 V	24 V
RMB28 / RMF44 / RMF58	AC - Analogue sinusoidal outputs	✓	-
	BC - Analogue complementary sinusoidal outputs	✓	-
	IA - Incremental, Push-pull	-	✓
	IB - Incremental, open collector, NPN	-	✓
	IC - Incremental, RS422	✓	-
	IE - Incremental, open collector, NPN	✓	-
	SC - Absolute binary synchro-serial interface (SSI), RS422	✓	-
	SI - Absolute binary synchro-serial (SSI) + Incremental, RS422	✓	-

## Storage and handling

### Operating and storage temperature

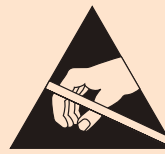
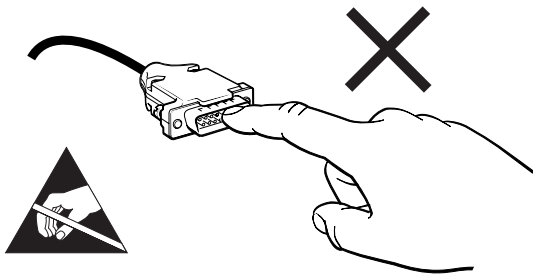


-40 °C to +125 °C  
-40 °C to +105 °C (with connector)

### Humidity

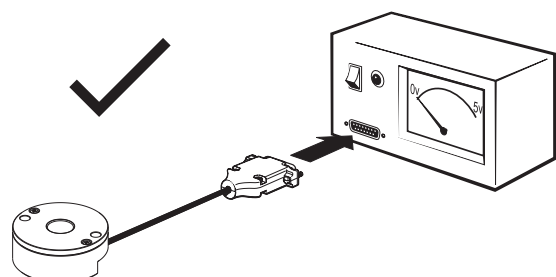
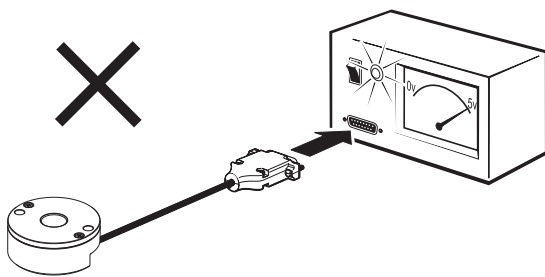


Up to 70 % non-condensing



**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

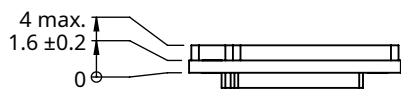
Dimensions and tolerances are in mm. Dimensions without tolerance values are in accordance with ISO 2768-m.



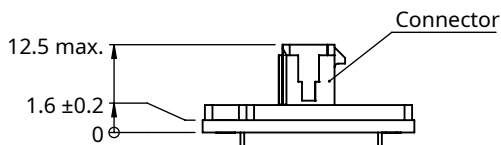
## RMB28

### Dimensions

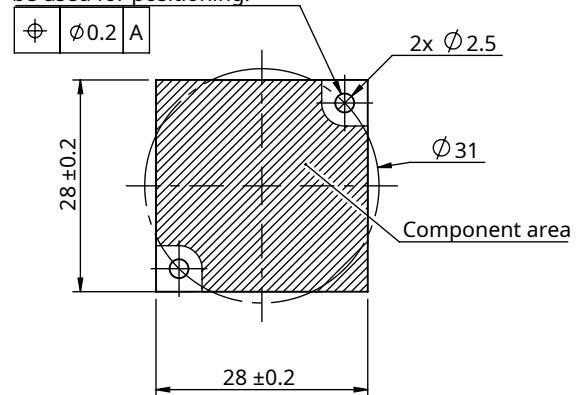
RMB28 without connector



RMB28 with straight connector (top entry)

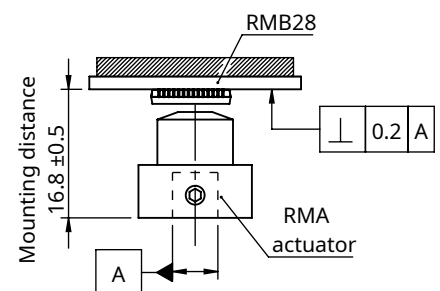
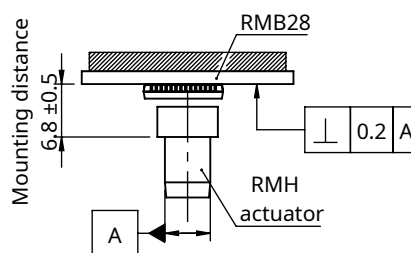
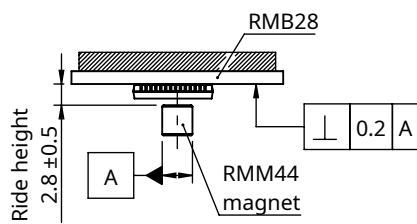


Only mounting holes should be used for positioning.



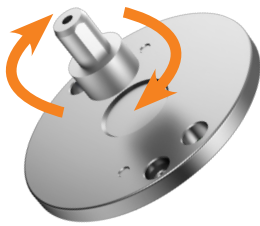
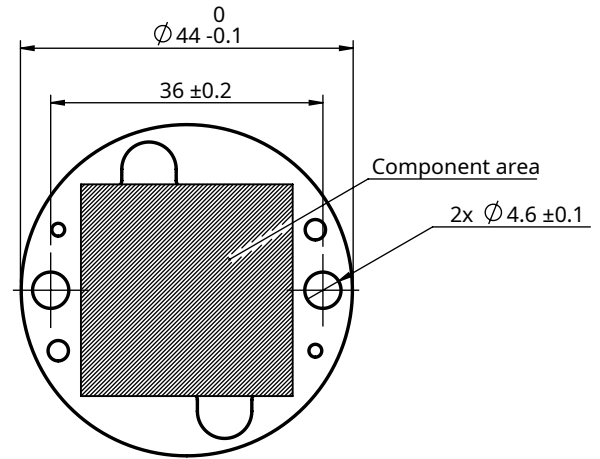
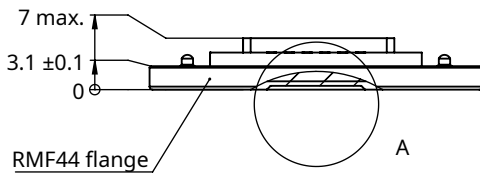
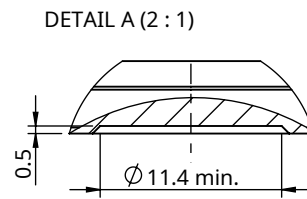
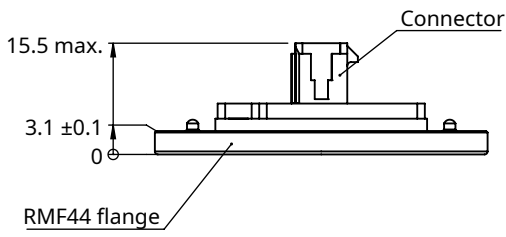
Clockwise (CW) rotation of magnet

### Installation drawing



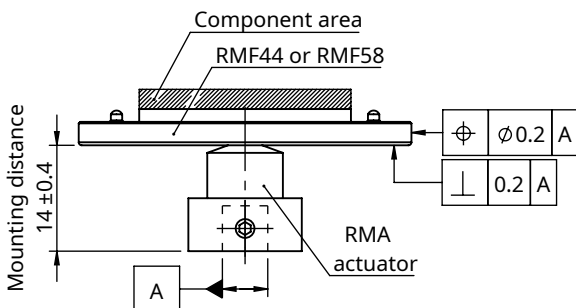
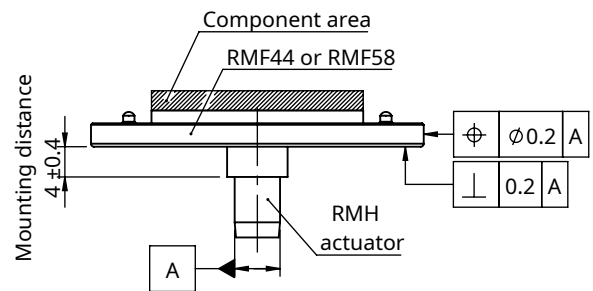
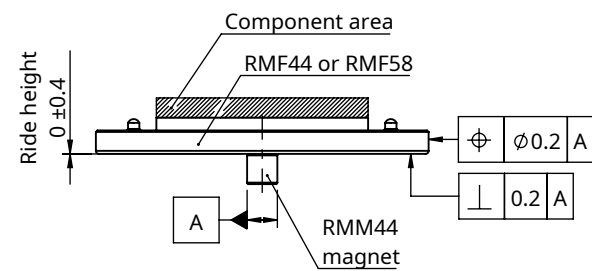
# RMF44

## Dimensions



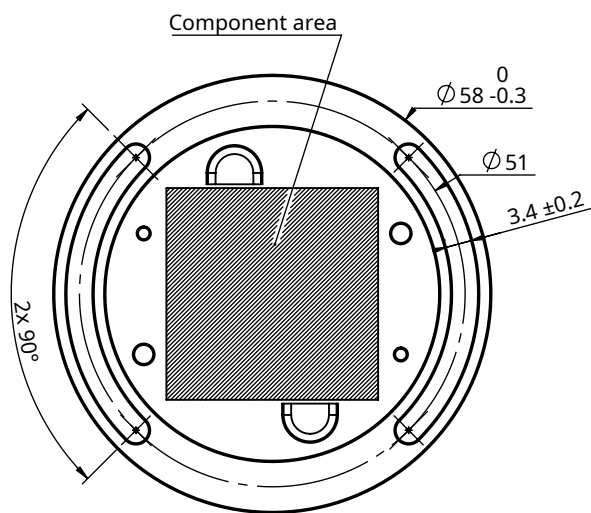
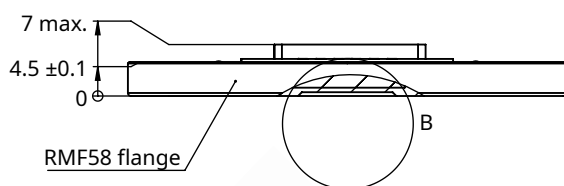
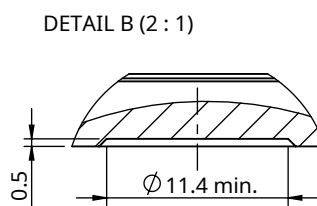
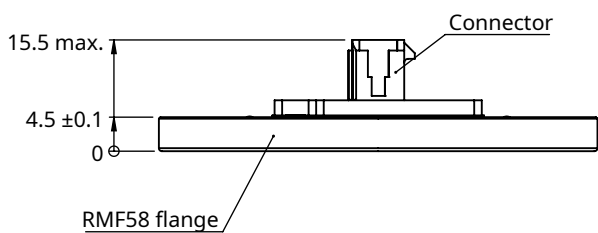
Clockwise (CW) rotation of magnet

## 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

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### Mechanical data

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<b>Mass</b>	RMB28: 5 g, RMF44: 24 g, RMF58: 46 g RMA: 12 g, RMH: 1.4 g, RMM: 0.5 g
<b>Magnet material</b>	Sm2Co17 with Ni-Cu-Ni protective layer
<b>Actuator material</b>	RMH: Aluminium RMA: Stainless steel

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### Environmental data

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<b>Shock</b>	100 G (6 ms, standard EN 60068-2-27:2009)
<b>Vibration</b>	40 G (55 Hz–2000 Hz, standard EN 60068-2-6:2008)
<b>Temperature drift error</b>	0.004°/°C
<b>ESD protection HBM</b>	Max. ±2 kV

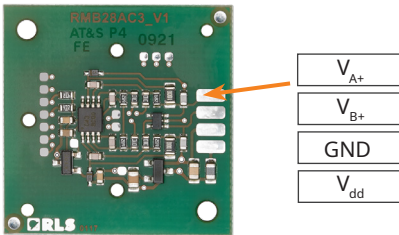
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# Output types

## AC – Analogue sinusoidal outputs

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

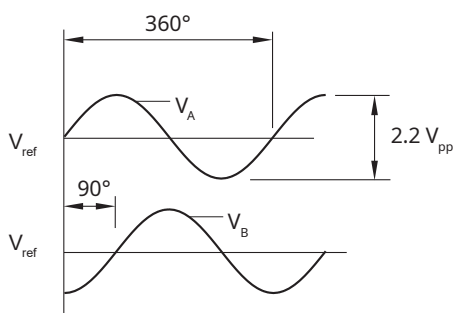
### Connections



### Specifications

<b>Power supply</b>	$V_{dd} = 5\text{ V} \pm 5\%$
<b>Current consumption</b>	Max. 30 mA
<b>Outputs</b>	Single ended, short circuit protection
<b>Reverse polarity protection</b>	Yes
<b>Internal serial impedance</b>	100 $\Omega$
<b>Signal amplitude</b>	$2.2 \pm 0.2 V_{pp}$
<b>Signal offset (<math>V_{ref}</math>)</b>	$2.5\text{ V} \pm 1\%$
<b>Maximum speed</b>	30,000 rpm
<b>Operating temperature</b>	-40 °C to +125 °C

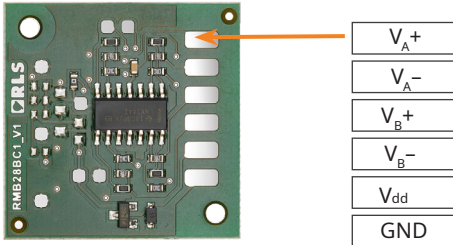
### Timing diagram



## BC – Analogue complementary sinusoidal outputs

4 channels  $V_{A+}$ ,  $V_{A-}$ ,  $V_{B+}$ ,  $V_{B-}$  sinusoids (90° phase shifted, single ended)

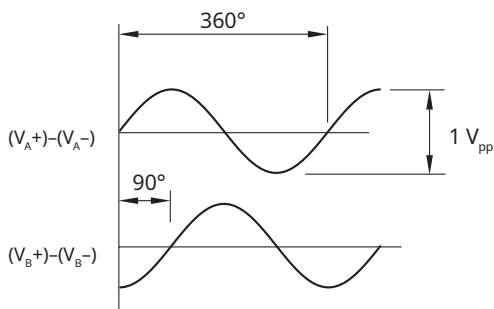
### Connections



### Specifications

<b>Power supply</b>	$V_{dd} = 5\text{ V} \pm 5\%$
<b>Current consumption</b>	Max. 30 mA
<b>Outputs</b>	Differential, short circuit protection
<b>Reverse polarity protection</b>	Yes
<b>Internal serial impedance</b>	10 $\Omega$
<b>Signal amplitude</b>	$0.5 \pm 0.1\text{ V}_{pp}$
<b>Signal offset (<math>V_{ref}</math>)</b>	$0 \pm 5\text{ mV}$
<b>Maximum speed</b>	30,000 rpm
<b>Operating temperature</b>	-40 °C to +125 °C

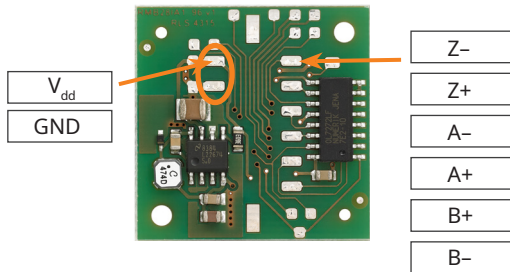
### Timing diagram



## IA – Incremental, Push-pull

Square wave output

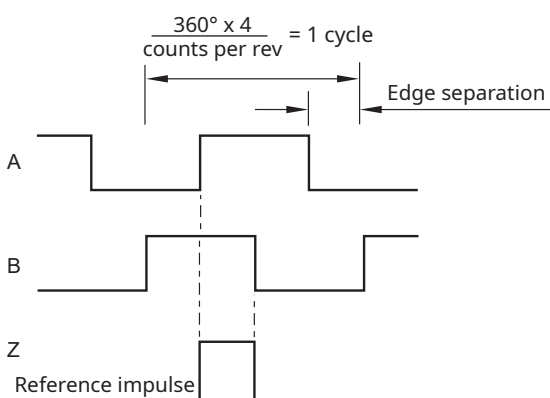
### Connections



### Specifications

<b>Power supply</b>	$V_{dd} = 8\text{ V to }26\text{ V}$
<b>Current consumption</b>	50 mA
<b>Outputs</b>	A+, B+, Z+, A-, B-, Z- (RS422)
<b>Maximum output load</b>	30 mA
<b>Accuracy</b>	Typ. $\pm 0.5^\circ$
<b>Hysteresis</b>	0.18°
<b>Resolution</b>	32, 64, 128, 256, 512, 1024, 2048, 4096 counts per revolution
<b>Maximum speed</b>	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
<b>Operating temperature</b>	-40 °C to +125 °C

### Timing diagram

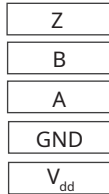
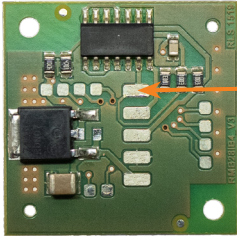


B leads A for clockwise rotation of magnetic actuator.

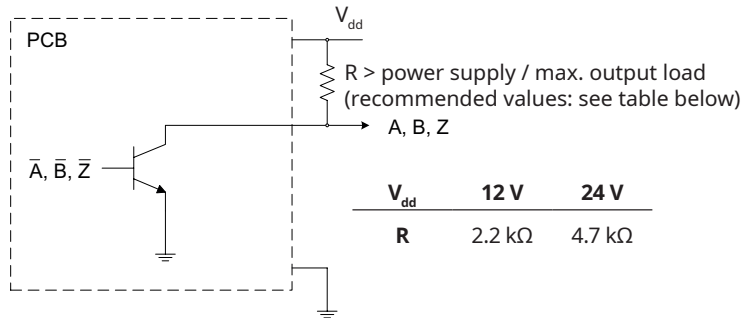
## IB – Incremental, open collector NPN

Square wave output

### Connections



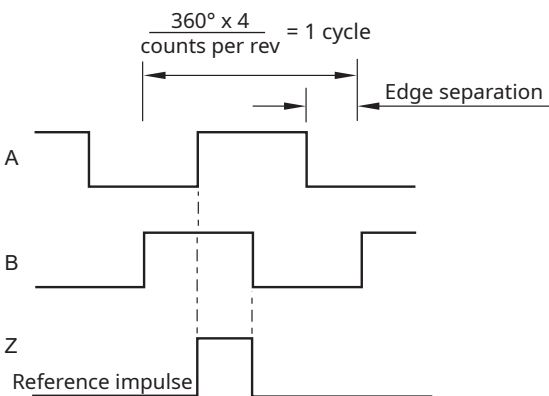
### Recommended signal termination



### Specifications

<b>Power supply</b>	V <sub>dd</sub> = 8 V to 26 V
<b>Current consumption</b>	50 mA
<b>Outputs</b>	A, B, Z
<b>Maximum output load</b>	20 mA
<b>Accuracy</b>	Typ. ±0.5°
<b>Hysteresis</b>	0.18°
<b>Resolution</b>	32, 64, 128, 256, 512, 1024, 2048, 4096 counts per revolution
<b>Maximum speed</b>	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
<b>Operating temperature</b>	-40 °C to +125 °C

### Timing diagram



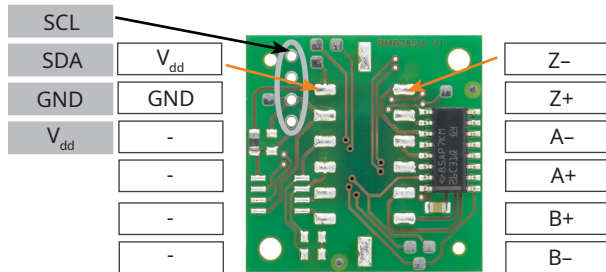
B leads A for clockwise rotation of magnetic actuator.

## IC – Incremental, RS422

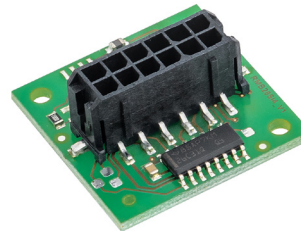
Square wave differential line driver to RS422

### Connections

IC for trimming with SATI, TWI connections to the encoder



With Molex connector



#### Connector type

Molex 43045-1219

#### Mating connector

Molex 43025-1200 (not provided)

#### Crimp terminal

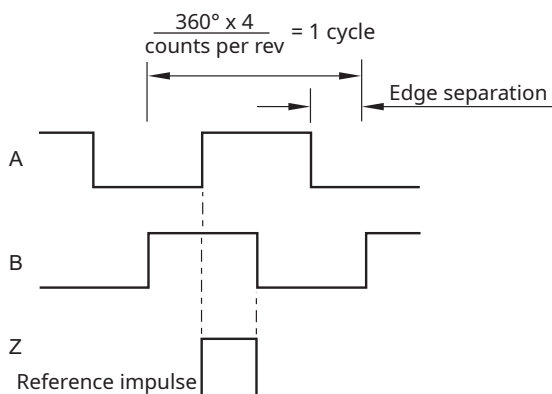
43030-xxxx (not provided)

### Specifications

<b>Power supply</b>	V <sub>dd</sub> = 5 V ±5 %
<b>Current consumption</b>	Max. 35 mA
<b>Outputs</b>	A+, B+, Z+, A-, B-, Z- (RS422)
<b>Accuracy</b>	Typ. ±0.5° <b>With SATI ±0.2°</b>
<b>Hysteresis</b>	0.18°
<b>Resolution</b>	32, 64, 128, 256, 512, 1024, 2048, 4096 counts per revolution
<b>Maximum speed</b>	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
<b>Operating temperature</b>	-40 °C to +125 °C -40 °C to +105 °C (with connector)

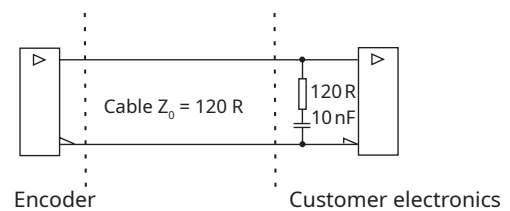
### Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

### Recommended signal termination



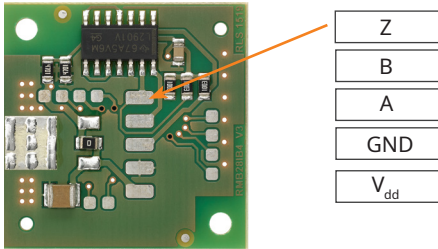
#### SATI03 Stand Alone Trimming Interface

- Accuracy up to ±0.2°
- Additional information on SATI can be found in the SATI user manual (document SATI03D06), available for download from [RLS Media center](#).

## IE – Incremental, open collector, NPN

Low cost alternative for ball bearing encoders

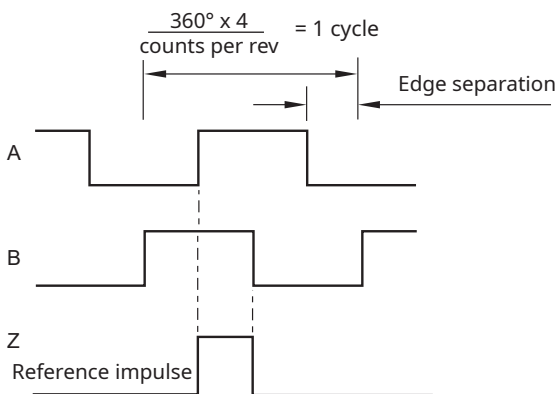
### Connections



### Specifications

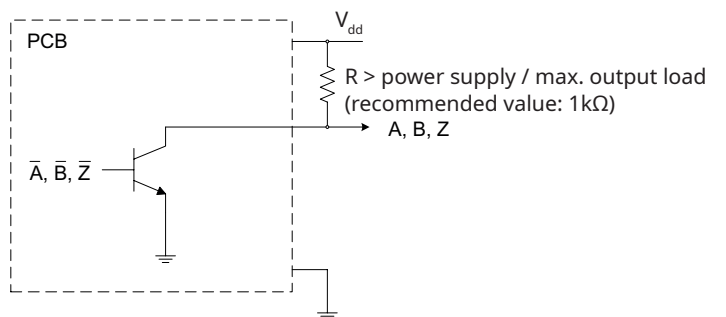
<b>Power supply</b>	$V_{dd} = 5\text{ V} \pm 5\%$
<b>Current consumption</b>	35 mA (not loaded)
<b>Output signals</b>	A, B, Z
<b>Maximum output load</b>	20 mA
<b>Accuracy</b>	Typ. $\pm 0.5^\circ$
<b>Hysteresis</b>	$0.18^\circ$
<b>Resolution</b>	32, 64, 128, 256, 512, 1024, 2048, 4096 counts per revolution
<b>Maximum speed</b>	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
<b>Operating temperature</b>	$-40^\circ\text{C}$ to $+125^\circ\text{C}$

### Timing diagram



B leads A for clockwise rotation of magnetic actuator.

### Recommended signal termination

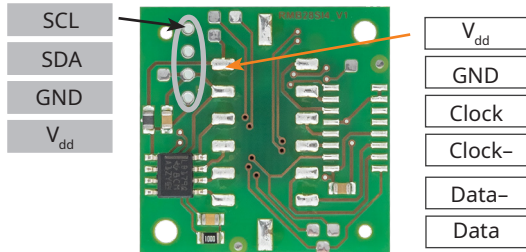


## SC – Absolute binary synchro-serial (SSI), RS422

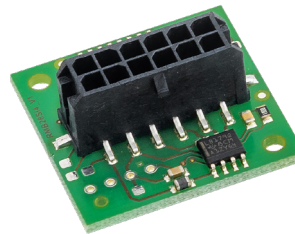
Serial encoded absolute position measurement

### Connections

SC for trimming with SATI, TWI connections to the encoder



With Molex connector



**Connector type**

Molex 43045-1219

**Mating connector**

Molex 43025-1200 (not provided)

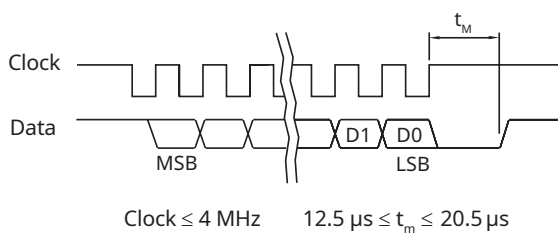
**Crimp terminal**

43030-xxxx (not provided)

### Specifications

<b>Output code</b>	Natural binary
<b>Power supply</b>	V <sub>dd</sub> = 5 V ±5 %
<b>Current consumption</b>	Max. 35 mA
<b>Data output</b>	Serial data (RS422)
<b>Data input</b>	Clock (RS422)
<b>Accuracy</b>	Typ. ±0.5° <b>With SATI ±0.2°</b>
<b>Hysteresis</b>	0.18°
<b>Resolution</b>	32, 64, 128, 256, 512, 1024, 2048, 4096 counts per revolution
<b>Maximum speed</b>	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
<b>Operating temperature</b>	-40 °C to +125 °C -40 °C to +105 °C (with connector)

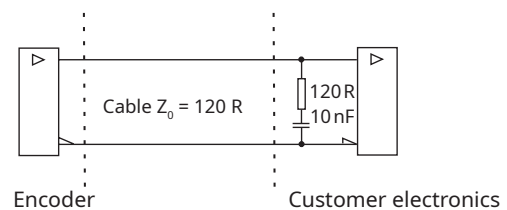
### Timing diagram



Position increases for clockwise rotation of magnet.

### Recommended signal termination

For data output lines only



### SATI03 Stand Alone Trimming Interface

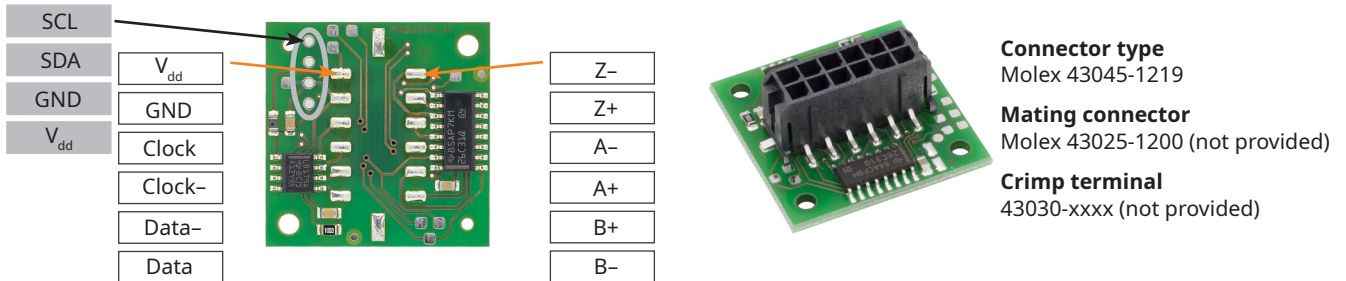
- Accuracy up to ±0.2°
- Additional information on SATI can be found in the SATI user manual (document SATI03D06), available for download from [RLS Media center](#).

## 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

SI for trimming with SATI, TWI connections to the encoder

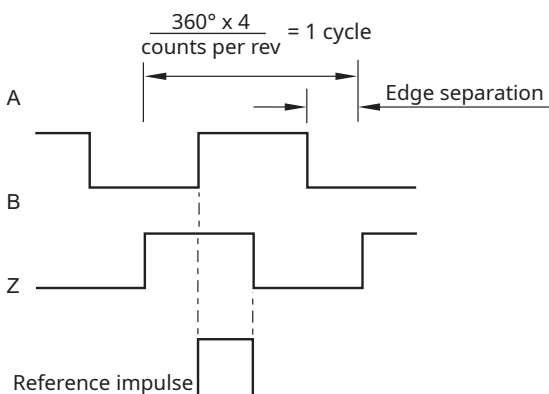


### Specifications

<b>Output code</b>	Natural binary
<b>Power supply</b>	$V_{dd} = 5\text{ V} \pm 5\%$
<b>Current consumption</b>	Max. 35 mA
<b>Incremental outputs</b>	A+, B+, Z+, A-, B-, Z- (RS422)
<b>Data output</b>	Serial data (RS422)
<b>Data input</b>	Clock (RS422)
<b>Accuracy</b>	Typ. $\pm 0.5^\circ$ <b>With SATI <math>\pm 0.2^\circ</math></b>
<b>Hysteresis</b>	$0.18^\circ$
<b>Resolution</b>	32, 64, 128, 256, 512, 1024, 2048, 4096 counts per revolution
<b>Maximum speed</b>	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
<b>Operating temperature</b>	$-40^\circ\text{C}$ to $+125^\circ\text{C}$ $-40^\circ\text{C}$ to $+105^\circ\text{C}$ (with connector)

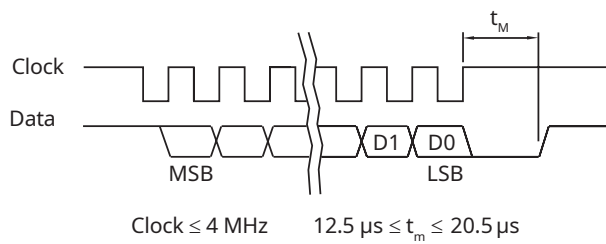
### Timing diagram - Incremental

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

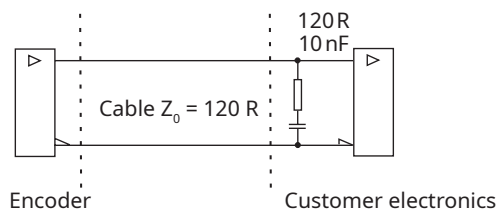
### Timing diagram - SSI



Position increases for clockwise rotation of magnetic actuator.

### Recommended signal termination

For incremental signals + SSI data output lines only



#### SATI03 Stand Alone Trimming Interface

- Accuracy up to  $\pm 0.2^\circ$
- Additional information on SATI can be found in the SATI user manual (document SATI03D06), available for download from [RLS Media center](#).

# Part numbering

RMF44    IC    08B    A    96

**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                      **IC** - Incremental, RS422, 5 V
- BC** - Analogue complementary sinusoidal    **IE** - Incremental, open collector, NPN, 5 V
- IA** - Incremental, Push-pull, 8 V to 26 V    **SC** - Absolute binary synchro-serial (SSI), RS422, 5 V
- IB** - Incremental, open collector, NPN, 24 V **SI** - SSI + Incremental, RS422, 5 V

**Resolution**

For **AC** and **BC**:

**01S** - One sine/cosine wave per revolution

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

<b>05B</b> - 32	<b>08B</b> - 256	<b>11B</b> - 2048
<b>06B</b> - 64	<b>09B</b> - 512	<b>12B</b> - 4096
<b>07B</b> - 128	<b>10B</b> - 1024	

**Shape**

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

**Special requirements**

- 96** - Standard with AM4096
- C6** - With Molex connector (optional for output types **IC**, **SC** and **SI**)

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

## Table of available combinations

Series	Output type	Resolution	Shape	Special requirements
<b>RMB28 / RMF44 / RMF58</b>	AC	01S	S / A	96
	BC			
	IA	05B / 06B / 07B / 08B / 09B / 10B / 11B / 12B		96 / C6
	IB			96
	IC			96 / C6
	IE			96
	SC			96 / C6
	SI			96 / C6

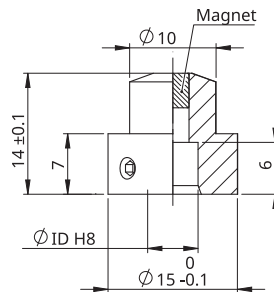
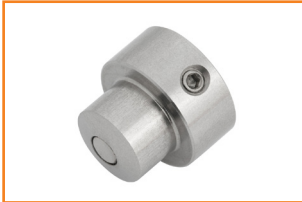
## Accessories



Stand alone trimming interface  
**SATI03**

# 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:**

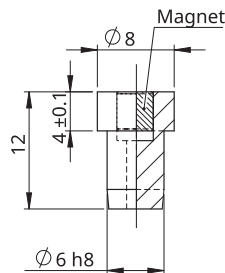
For resolutions up to 9 bit absolute (512 cpr incremental)

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

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

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

## Actuator for integration into shaft



**with N-pole marker**



**Hole** = Ø6G7

**Fixing:** Adhesive (recommended – LOCTITE 648 or 2701)

**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 scribed to a ±5° accuracy:**

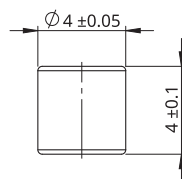
For resolutions up to 9 bit absolute (512 cpr incremental)

**RMH06A2A02**

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

**RMH06A3A02**

## Magnet for direct recessing in non-ferrous shafts



**Fixing:** Adhesive (recommended – LOCTITE 648 or 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)

## Head office

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## Global support

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Visit our [website](#) to contact your nearest sales representative.

## Document issues

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Issue	Date	Page	Description
1	18. 2. 2026	General	Redesign of RMB28D03

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