◪RLS®
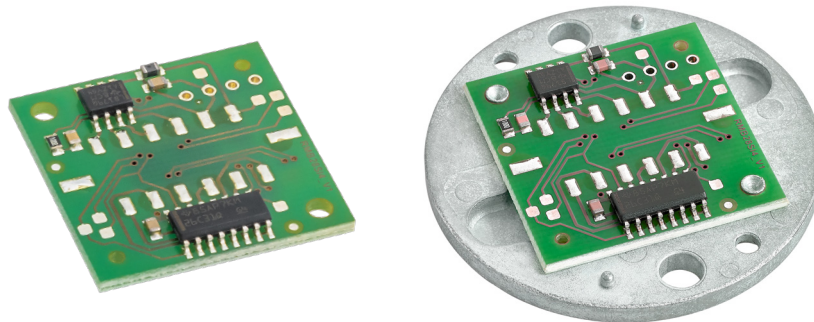
RMB28/RMF44 angular magnetic encoder module with AM4096

The images do not represent all variants.

The RMB28 encoder module is designed for direct integration into high volume OEM applications. The low cost 28 mm square PCB can also be supplied with a connector or as RMF44 on a 44 mm diameter metal flange for easy installation.

The encoder module consists of a magnetic actuator and a separate sensor board. The rotation of the magnetic actuator is detected by a custom encoder chip mounted on the sensor board and processed to produce the required output format. The output signals are provided in absolute and incremental industry standard output formats.

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

Product range

RMB28I / RMF44I
Incremental with 8 to 1,024 pulses per revolution (32 to 4,096 counts per revolution with x4 evaluation).

RMB28SC / RMF44SC
Synchro serial interface (SSI) with 32 to 4,096 positions per revolution.

RMB28SI / RMF44SI
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).

- **28 mm square module with the option of 44 mm diameter metal flange**
- **Low cost OEM integration**
- **5 V power supply versions**
- **High speed operation to 60,000 rpm**
- **Absolute - to 12 bit resolution (4,096 counts per revolution)**
- **Industry standard absolute and incremental output formats**
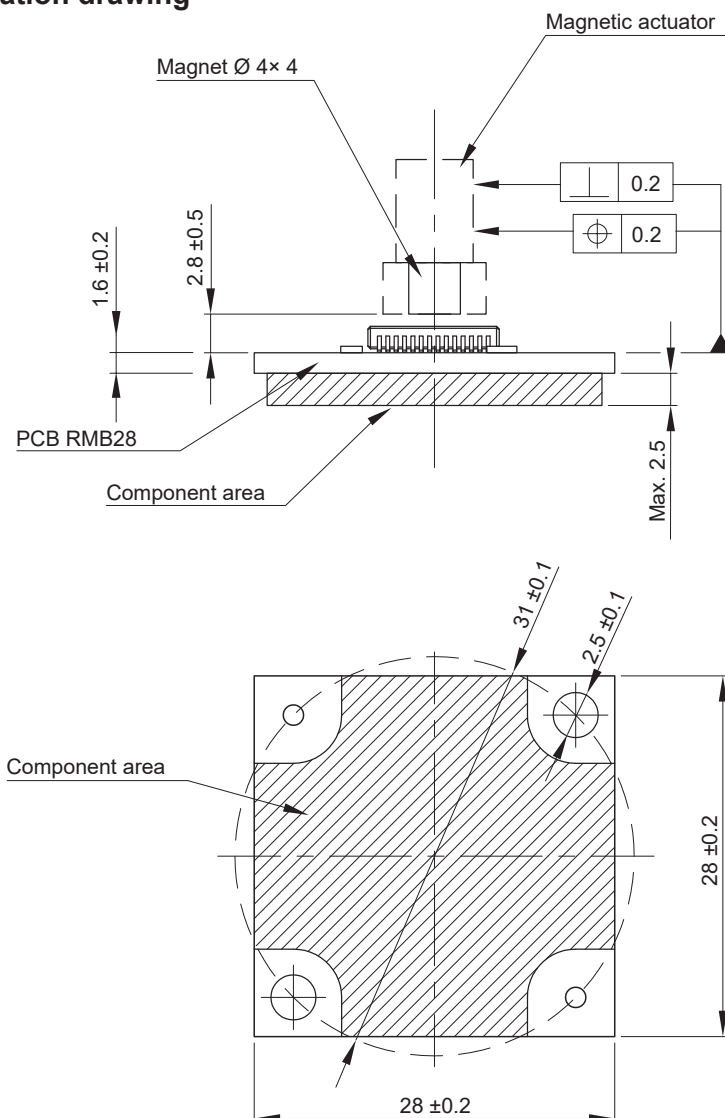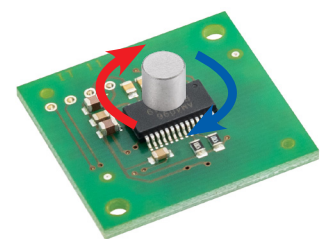- **RoHS compliant (lead-free) - see Declaration of conformity**

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 www.rls.si/sati03.

A **RENISHAW** associate company

RMB28 installation drawing

Magnetic actuator

Magnet Ø 4× 4

⊥ | 0.2

⊕ | 0.2

1.6 ±0.2

2.8 ±0.5

Max. 2.5

PCB RMB28

Component area

31 ±0.1

2.5 ±0.1
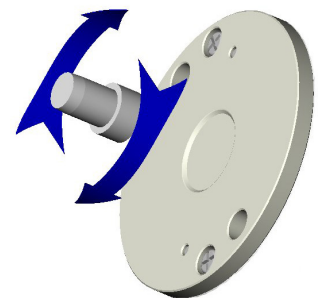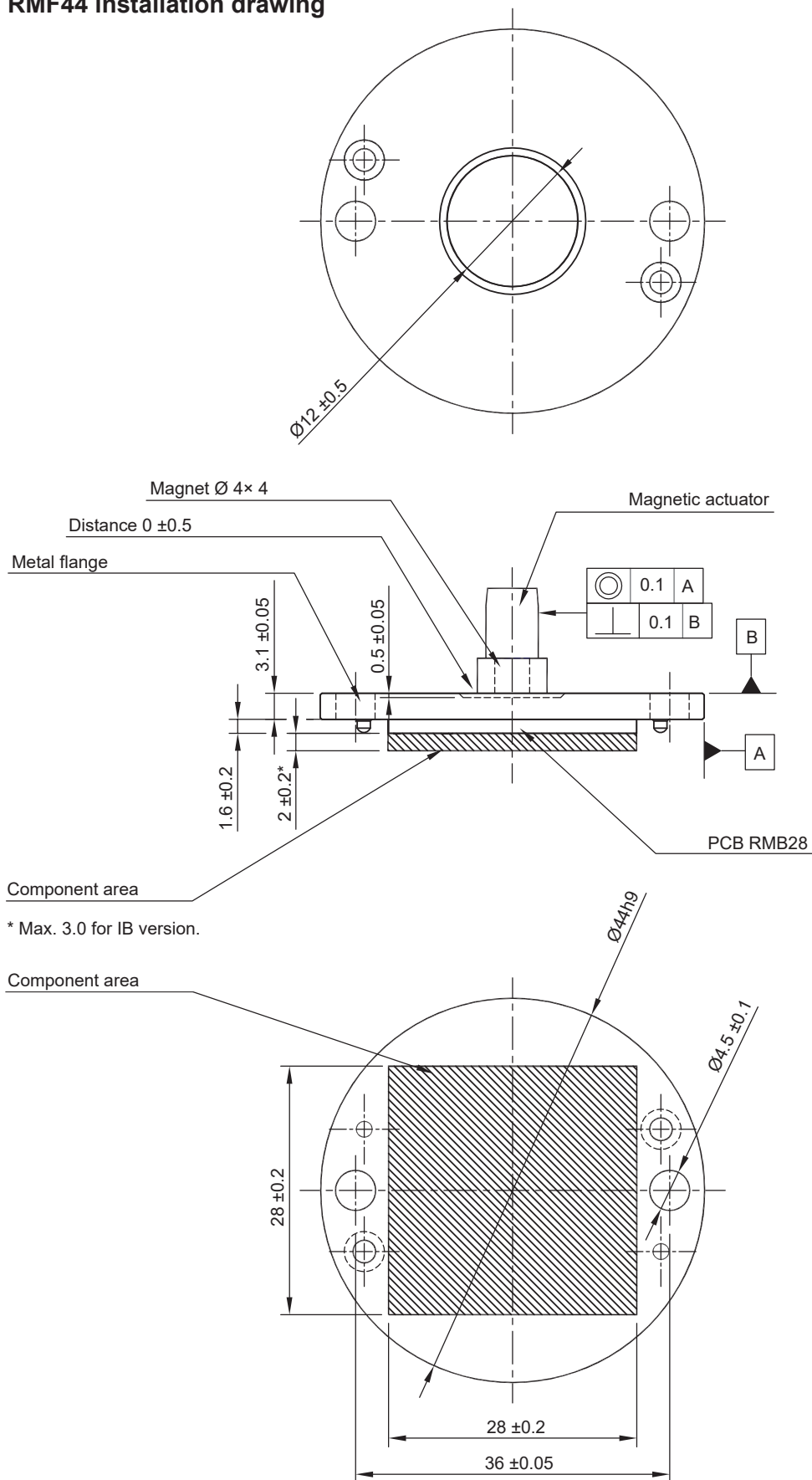
Component area

28 ±0.2

28 ±0.2

NOTE: For the accuracy specified, the central line of the magnet needs to be square to the chip within 2° and aligned within the center of the board ±0.1 mm (mid point between the two mounting holes).

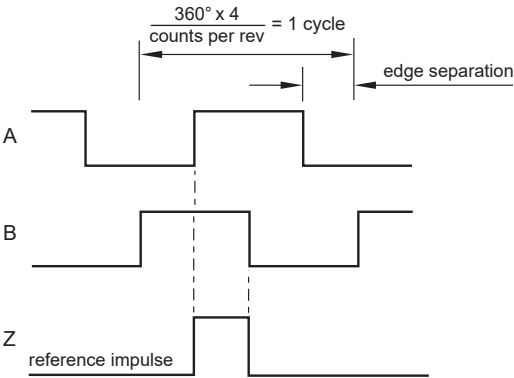Clockwise (CW) rotation of magnet

RMF44 installation drawing

Ø12 ±0.5

Magnet Ø 4× 4

Distance 0 ±0.5

Metal flange

Magnetic actuator

3.1 ±0.05

0.5 ±0.05

| ◎ | 0.1 | A |
| ⊥ | 0.1 | B |

B

A

1.6 ±0.2

2 ±0.2*

PCB RMB28

Component area

* Max. 3.0 for IB version.

Component area

Ø44h9

Ø4.5 ±0.1

28 ±0.2

28 ±0.2

36 ±0.05

Clockwise (CW) rotation of magnet

RMB28IA / RMF44IA – Incremental, Open Collector, NPN

Square wave output

Power supply	V_{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z, A–, B–, Z– (RS422)
Maximum output load	30 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr
	30,000 rpm for 2,048 and 4,096 cpr
Temperature Operating and storage	–40 °C to +125 °C (IP64) –40 °C to +85 °C (IP68)

Timing diagram

$$\frac{360° \times 4}{\text{counts per rev}} = 1 \text{ cycle}$$

B leads A for clockwise rotation of magnet.

Connections

V_{dd}

GND

Z-
Z+
A-
A+
B+
B-

RMB28IC / RMF44IC– Incremental, RS422

Square wave differential line driver to RS422

Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 35 mA
Output signals	A, B, Z, A–, B–, Z– (RS422)
Accuracy	±0.5°
with SATI	±0.2°
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr
	30,000 rpm for 2,048 and 4,096 cpr
Temperature Operating and storage	–40 °C to +125 °C –40 °C to +105 °C (with connector)

Connections

RMB28IC / RMF44IC for trimming with SATI:
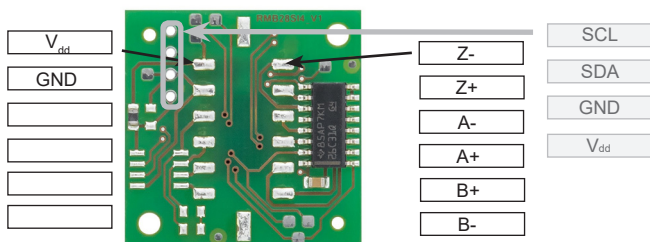
TWI connections to encoder

With Molex connector
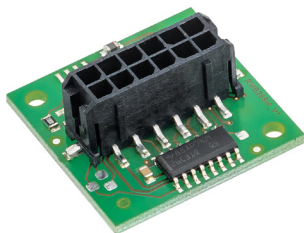
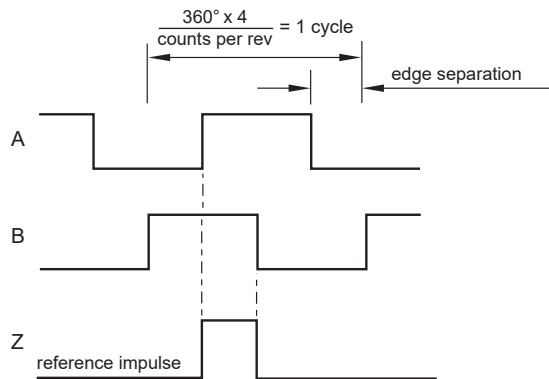**Connector type**
Molex 501568-0607

Mating connector
Molex 501330-0600 (not provided)

Crimp terminal
501334-0000 (not provided)

Timing diagram

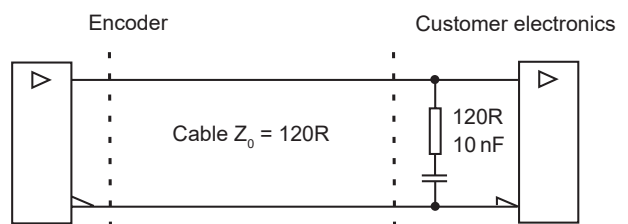Complementary signals not shown

B leads A for clockwise rotation of magnet.

Recommended signal termination

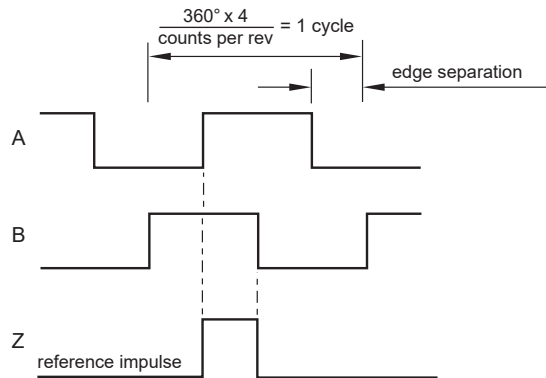For data output lines only

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 www.rls.si/sati03.

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RMB28IE / RMF44IE – Incremental, Open Collector, NPN

Low cost alternative for ball bearing encoders

Power supply	V_{dd} = 5 V ±5 %
Current consumption	35 mA (not loaded)
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr
	30,000 rpm for 2,048 and 4,096 cpr
Temperature Operating and storage	–40 °C to +125 °C

Timing diagram

B leads A for clockwise rotation of magnet.

Connections

Z
B
A
GND
V_{dd}
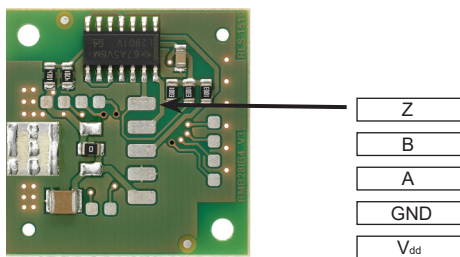
Recommended signal termination
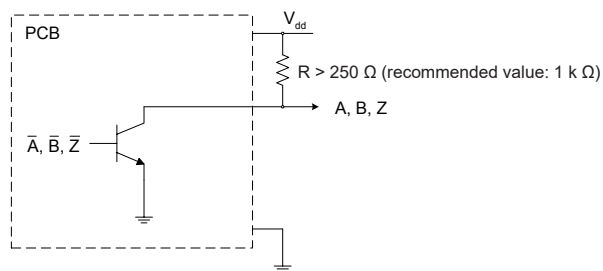
RMB28SC / RMF44SC – Absolute binary synchro-serial (SSI), RS422

Serial encoded absolute position measurement

Output code	Natural binary
Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 35 mA
Data output	Serial data (RS422)
Data input	Clock (RS422)
Accuracy	Typ. ±0.5°
with SATI	±0.2°
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr
	30,000 rpm for 2,048 and 4,096 cpr
Temperature Operating and storage	–40 °C to +125 °C –40 °C to +105 °C (with connector)

Timing diagram

Clock ≤ 4 MHz   12.5 µs ≤ t_m ≤ 20 µs

Position increases for clockwise rotation of magnet.

Recommended signal termination

For data output lines only

Connections

RMB28SC / RMF44SC for trimming with SATI:
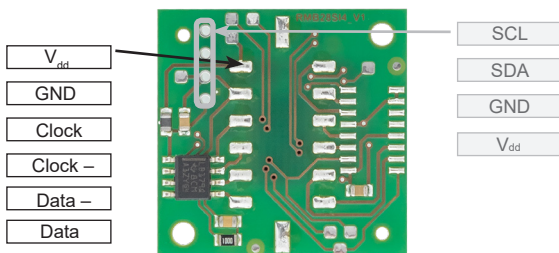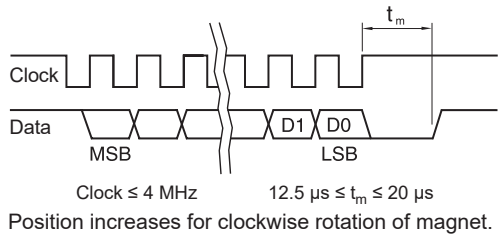
TWI connections to encoder

V_{dd} · GND · Clock · Clock – · Data – · Data

SCL · SDA · GND · V_{dd}
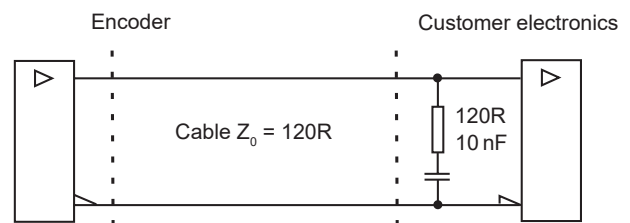
With Molex connector
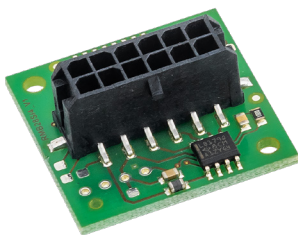
Connector type
Molex 501568-0607

Mating connector
Molex 501330-0600 (not provided)

Crimp terminal
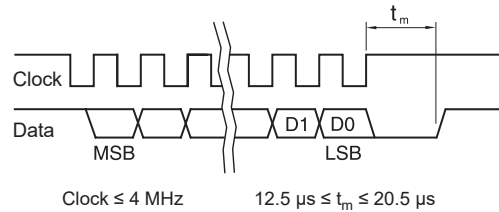501334-0000 (not provided)

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 www.rls.si/sati03.

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RMB28SI / RMF44SI – 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.

|	
Output code	Natural binary
Power supply	V_{dd} = 5 V ±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. ±0.5°
with SATI	±0.2°
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr
	30,000 rpm for 2,048 and 4,096 cpr
Temperature Operating and storage	–40 °C to +125 °C –40 °C to +105 °C (with connector)

Timing diagram - SSI

Clock ≤ 4 MHz   12.5 μs ≤ t_m ≤ 20.5 μs

Position increases for clockwise rotation of magnetic actuator.

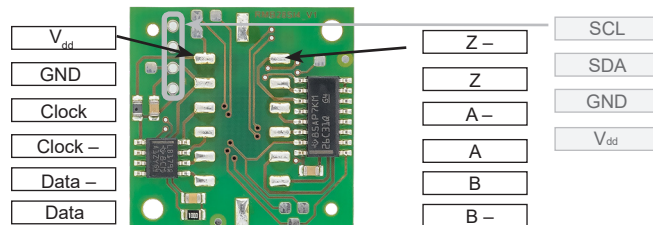### Timing diagram - Incremental
Complementary signals not shown

$$\frac{360° \times 4}{\text{counts per rev}} = 1 \text{ cycle}$$
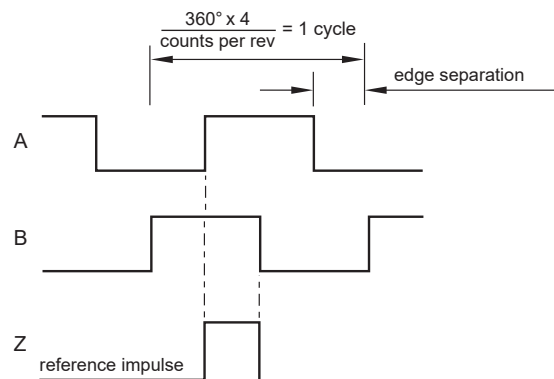
B leads A for clockwise rotation of magnet.

Connections
RMB28SI / RMF44SI for trimming with SATI:
TWI connections to encoder
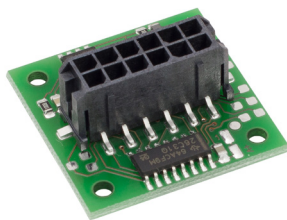
V_{dd}	
GND	
Clock	
Clock –	
Data –	
Data	

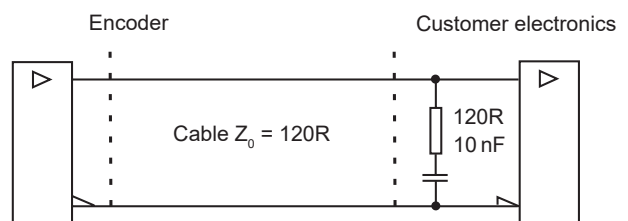|	
Z –	SCL
Z	SDA
A –	GND
A	V_{dd}
B	
B –	

With Molex connector

Connector type
Molex 501568-0607

Mating connector
Molex 501330-0600 (not provided)

Crimp terminal
501334-0000 (not provided)

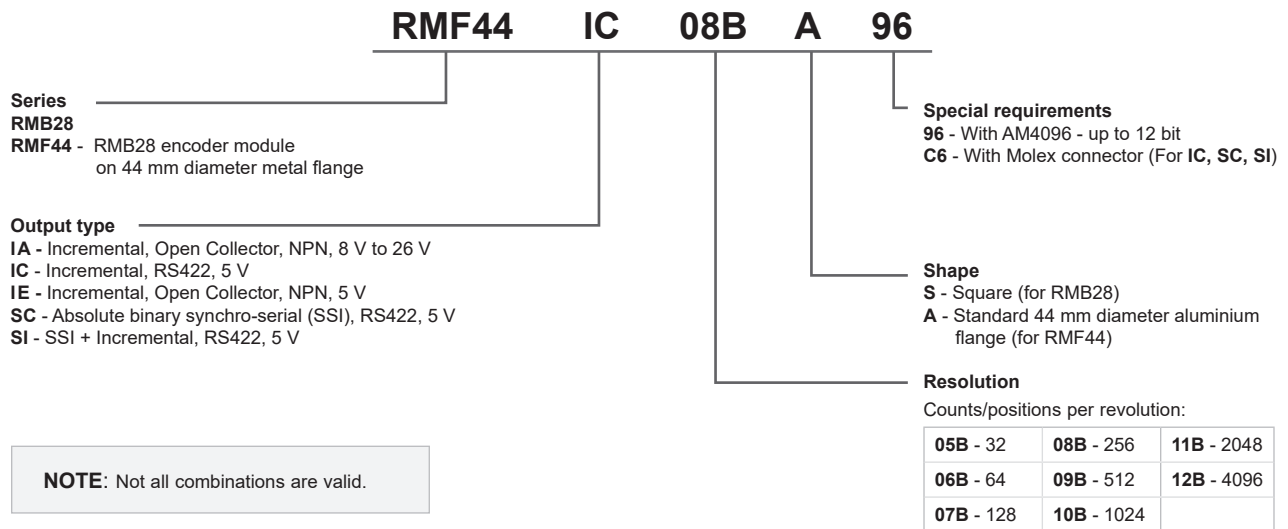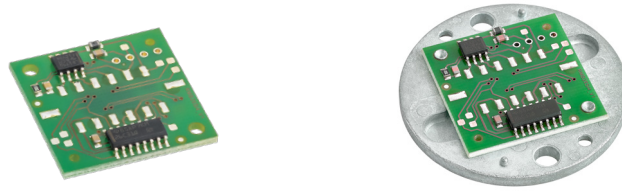### Recommended signal termination
For data output lines only

Encoder   Customer electronics

Cable Z_0 = 120R   120R 10 nF


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 www.rls.si/sati03.

Part numbering

RMF44   IC   08B   A   96

Series
RMB28
RMF44 - RMB28 encoder module
           on 44 mm diameter metal flange

Output type
IA - Incremental, Open Collector, NPN, 8 V to 26 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

Special requirements
96 - With AM4096 - up to 12 bit
C6 - With Molex connector (For **IC, SC, SI**)

Shape
S - Square (for RMB28)
A - Standard 44 mm diameter aluminium
      flange (for RMF44)

Resolution
Counts/positions per revolution:

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

NOTE: Not all combinations are valid.

* For sample quantities of RMB28 supplied
with a magnet please add "KIT" to the end
of the required RMB28 part number, eg.
RMB28IC09BS96KIT.

Series	Output type	Resolution	Shape	Special requirements
RMB28 / RMF44	IA	05B / 06B/ 07B / 08B / 09B / 10B / 11B / 12B	S / A	96
	IC			96 / C6
	IE			96
	SC			96 / C6
	SI			

Accessories part numbering

Stand alone trimming interface

Part number: SATI03

Additional information on SATI can be found in the "SATI user
manual", document SATI03D06, available for download from
www.rls.si/sati03.

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Magnetic actuator and magnet ordering information

Actuator for integration onto shaft
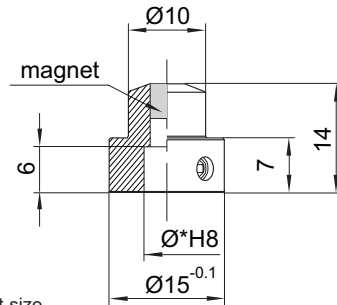
Shaft = Ø*h7
Fixing: Grub screw provided

* 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 – Ø4 mm shaft   **RMA10A2A00** – Ø10 mm shaft
RMA05A2A00 – Ø5 mm shaft   **RMA19A2A00** – Ø3/16" shaft
RMA06A2A00 – Ø6 mm shaft   **RMA25A2A00** – Ø1/4" shaft
RMA08A2A00 – Ø8 mm shaft   **RMA37A2A00** – Ø3/8" shaft

For resolutions from 10 bit absolute (800 cpr incremental) and above
RMA04A3A00 – Ø4 mm shaft   **RMA10A3A00** – Ø10 mm shaft
RMA05A3A00 – Ø5 mm shaft   **RMA19A3A00** – Ø3/16" shaft
RMA06A3A00 – Ø6 mm shaft   **RMA25A3A00** – Ø1/4" shaft
RMA08A3A00 – Ø8 mm shaft   **RMA37A3A00** – Ø3/8" shaft

Actuator for integration into shaft
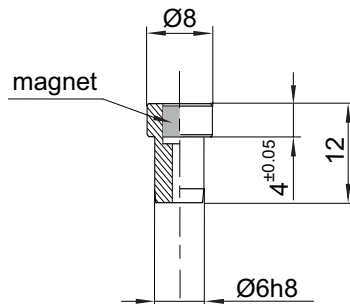
**with N-pole
marker**

Hole = Ø6G7
Fixing: Glue (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
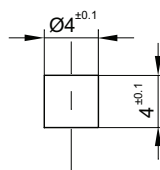
Fixing: Glue (recommended – LOCTITE 648 or 2701)

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)

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Document issues

Issue	Date	Page	Amendments done
1	29. 10. 2019	-	New document
2	30. 1. 2020	6	Signal termination detail added
3	29. 5. 2020	1, 5, 7, 8, 9	SATI01 replaced with SATI03 interface