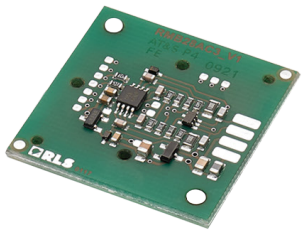
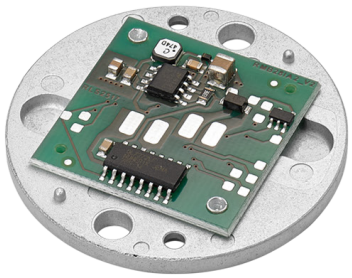
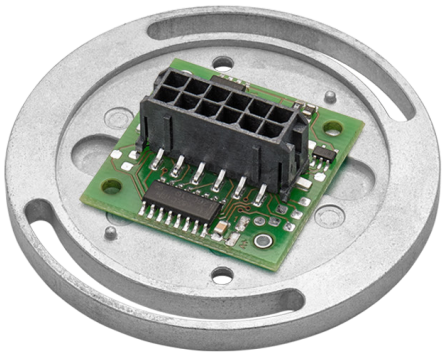
Data sheet
RMB28D03_04
Issue 4, 8th November 2021

RMB28/RMF44/RMF58 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 / RMF58 on a 44 mm diameter or 58 mm 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 / RMF58 encoder modules can be used in a variety of OEM applications, including motor control and industrial automation.

Product range

RMB28AC / RMF44AC / RMF58AC
Analogue sinusoidal output with a single sine/cosine period per revolution.

RMB28BC / RMF44BC / RMF58BC
Analogue complementary sinusoidal output with a single sine/cosine period per revolution.

RMB28I / RMF44I / RMF58I
Incremental with 8 to 1,024 pulses per revolution (32 to 4,096 counts per revolution with x4 evaluation).

RMB28SC / RMF44SC / RMF58SC
Synchro serial interface (SSI) with 32 to 4,096 positions per revolution.

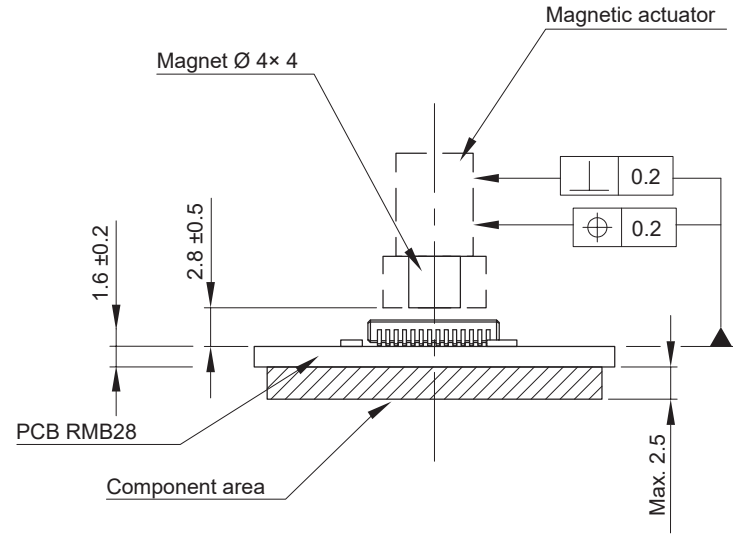
RMB28SI / RMF44SI / RMF58SI
Synchro serial interface (SSI) with 32 to 4,096 positions per revolution and incremental with 8 to 1,024 pulses per revolution (32 to 4,096 counts per revolution with x 4 evaluation).

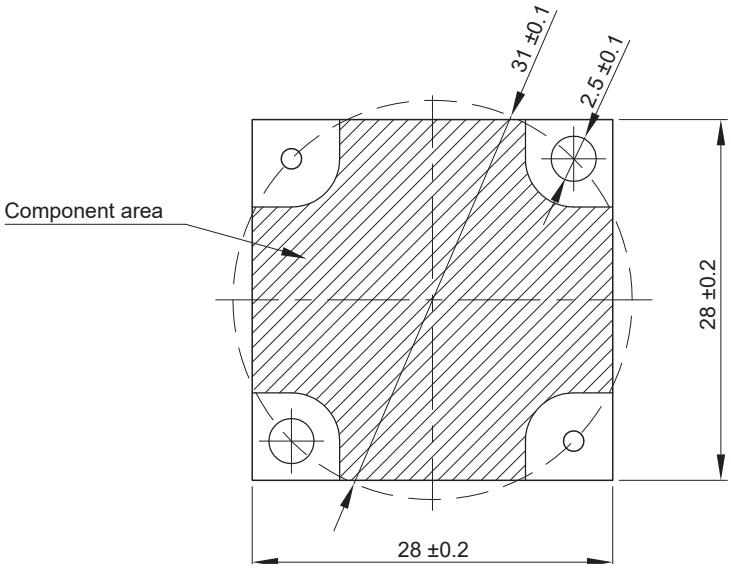
- **28 mm square module with the option of 44 mm or 58 mm diameter metal flange**
- **Low cost OEM integration**
- **5 V power supply versions**
- **High speed operation to 60,000 rpm**
- **Absolute - to 12 bit resolution (4,096 counts per revolution)**
- **Industry standard absolute and incremental output formats**

SATI03
Stand Alone Trimming Interface

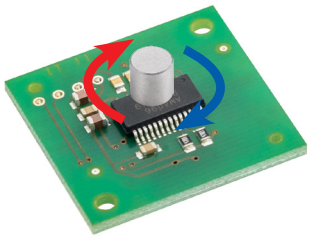
- Accuracy up to ±0.2°
- Additional information on SATI can be found in the “SATI user manual”, document SATI03D06, available for download from www.rls.si/sati03.

RMB28 installation drawing



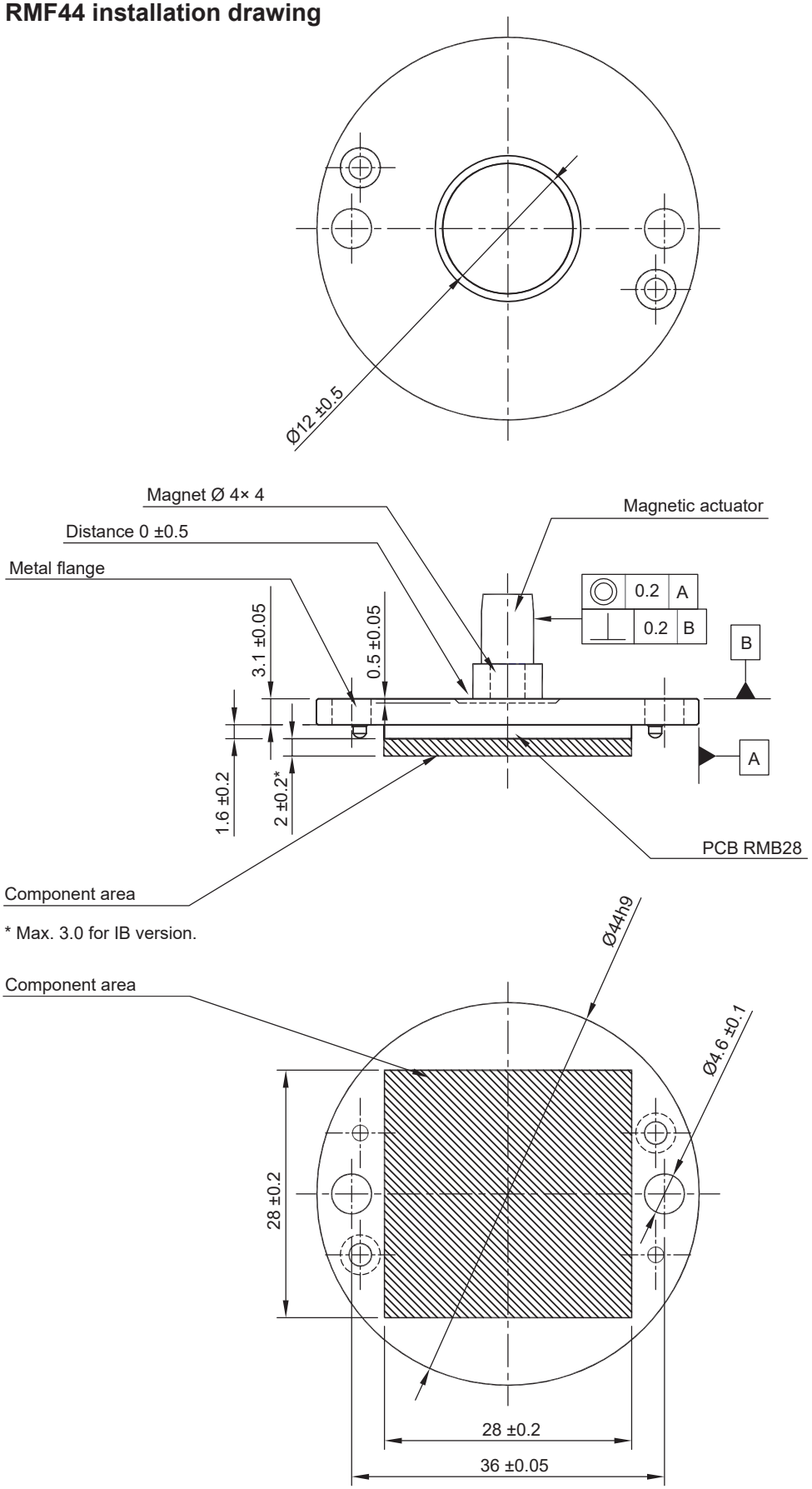


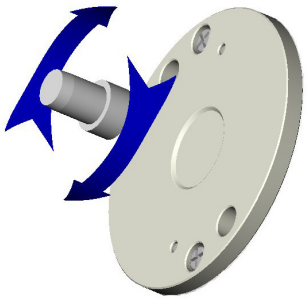
NOTE: For the accuracy specified, the central line of the magnet needs to be square to the chip within 2° and aligned within the center of the board ±0.1 mm (mid point between the two mounting holes).



Clockwise (CW) rotation of magnet

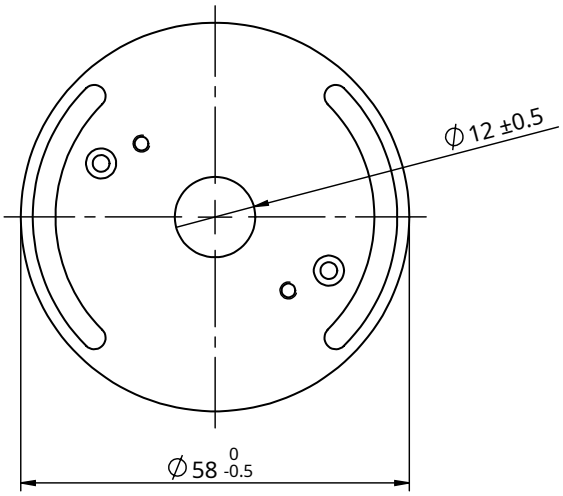
RMF44 installation drawing

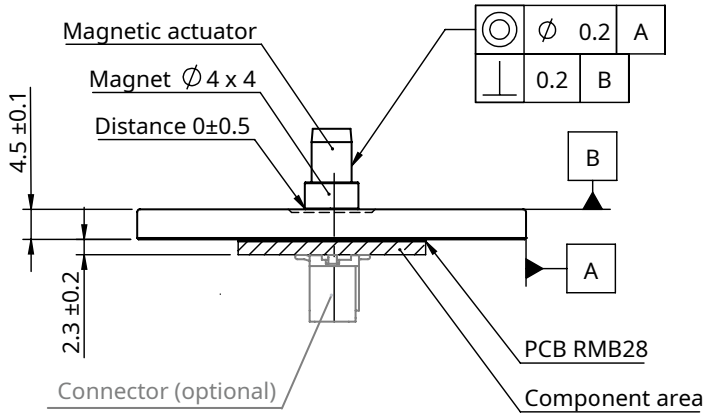


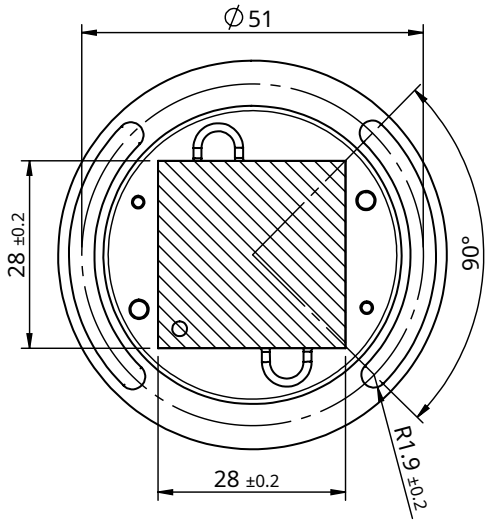


Clockwise (CW) rotation of magnet

RMF58 installation drawing







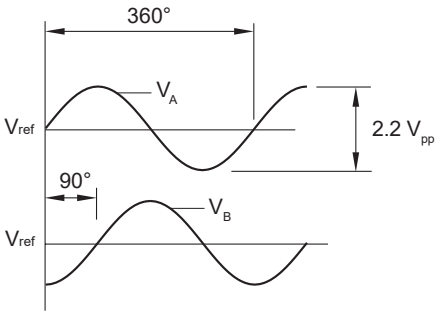
Clockwise (CW) rotation of magnet

RMB28AC / RMF44AC / RMF58AC – Analogue sinusoidal outputs

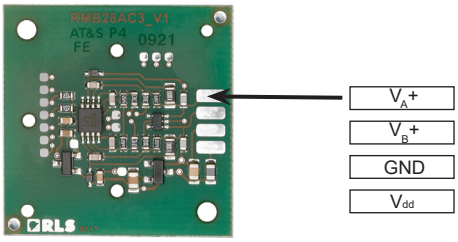
2 channels V_A V_B sinusoids (90° phase shifted, single ended)

Power supply	V_{dd} = 5 V ±5 % Reverse polarity protection
Current consumption	Max. 30 mA
Outputs	Single ended, short circuit protection
Internal serial impedance	100 Ω
Signal amplitude	2.2 ±0.2 V_{pp}
Signal offset (V_{ref})	2.5 V ±1 %
Maximum speed	30,000 rpm
Temperature Operating and storage	–40 °C to +125 °C

Timing diagram



Connections

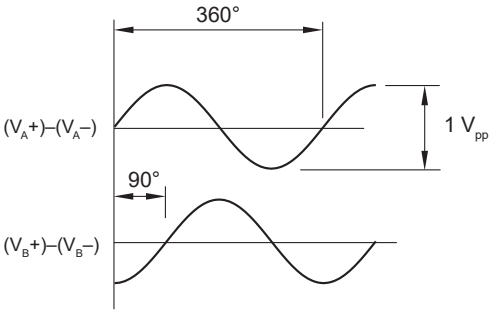


RMB28BC / RMF44BC / RMF58BC – Analogue complementary sinusoidal outputs

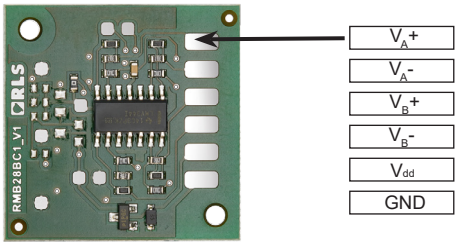
4 channels V_A+, V_A-,V_B+, V_B- sinusoids (90° phase shifted, single ended)

Power supply	V_{dd} = 5 V ±5 % Reverse polarity protection
Current consumption	Max. 30 mA
Outputs	Differential, short circuit protection
Internal serial impedance	10 Ω
Signal amplitude	0.5 ±0.1 V_{pp}
Signal offset (V_{ref})	0 ±5 mV
Maximum speed	30,000 rpm
Temperature Operating and storage	–40 °C to +125 °C

Timing diagram



Connections

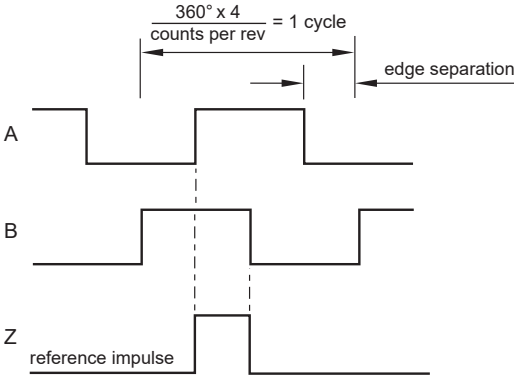


RMB28IA / RMF44IA / RMF58IA – Incremental, Push-pull

Square wave output

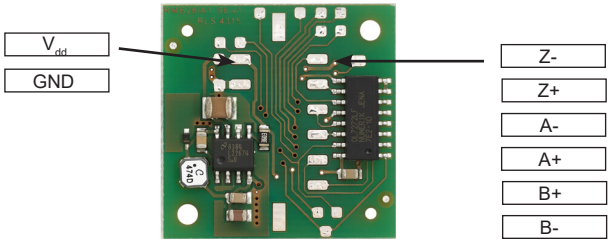
Power supply	V_{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z, A–, B–, Z– (RS422)
Maximum output load	30 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048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

Timing diagram



B leads A for clockwise rotation of magnet.

Connections

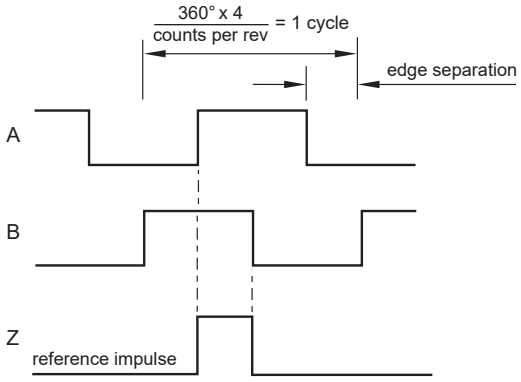


RMB28IB / RMF44IB / RMF58IB – Incremental, open collector NPN

Square wave output

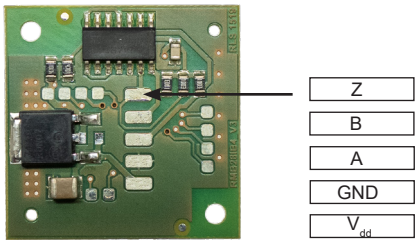
Power supply	V_{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
Operating temperature	–40 °C to +125 °C

Timing diagram

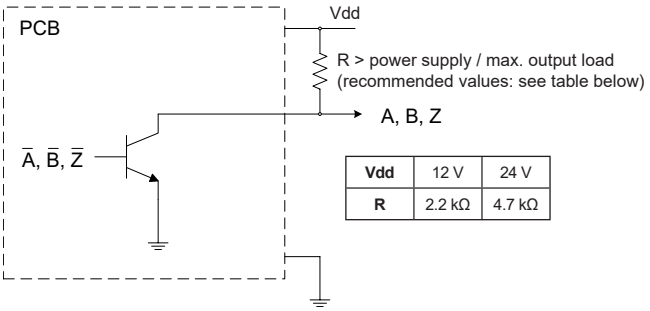


B leads A for clockwise rotation of magnet.

Connections



Recommended signal termination



Vdd	12 V	24 V
R	2.2 kΩ	4.7 kΩ

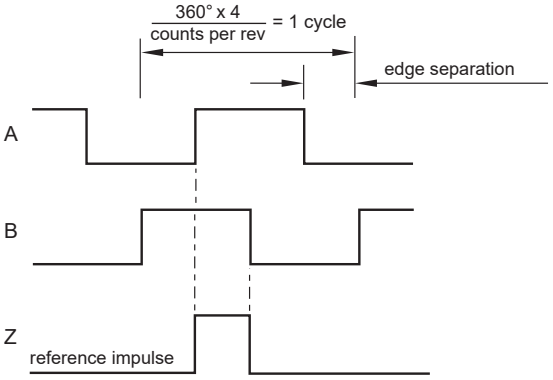
RMB28IC / RMF44IC / RMF58IC – Incremental, RS422

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)

Timing diagram

Complementary signals not shown

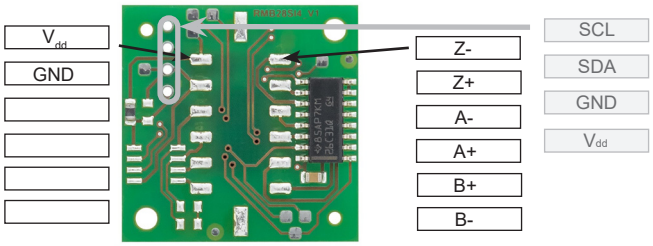


B leads A for clockwise rotation of magnet.

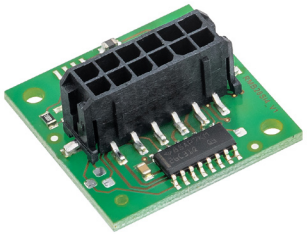
Connections

RMB28IC / RMF44IC / RMF58IC for trimming with SATI:

TWI connections to encoder



With Molex connector



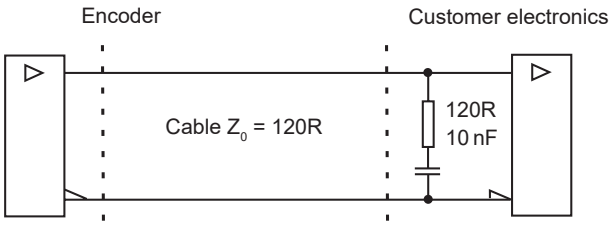
Connector type
Molex 43045-1219

Mating connector
Molex 43025-1200 (not provided)

Crimp terminal
43030-xxxx (not provided)

Recommended signal termination

For data output lines only



SATI03
Stand Alone Trimming Interface

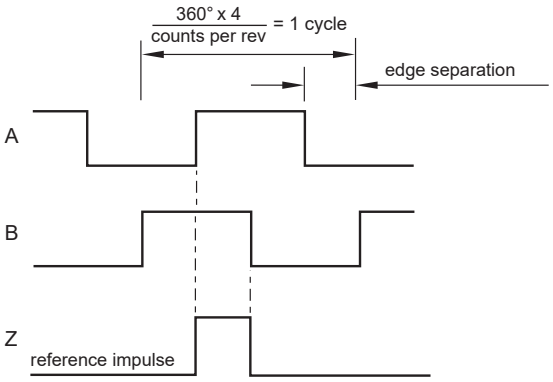
- Accuracy up to ±0.2°
- Additional information on SATI can be found in the “SATI user manual”, document SATI03D06, available for download from www.rls.si/sati03.

RMB28IE / RMF44IE / RMF58IE – Incremental, Open Collector, NPN

Low cost alternative for ball bearing encoders

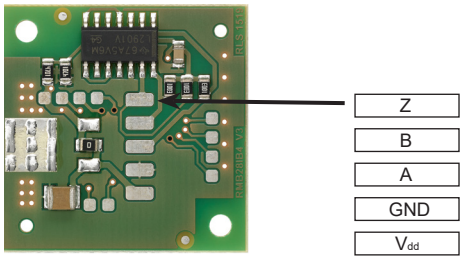
Power supply	V_{dd} = 5 V ±5 %
Current consumption	35 mA (not loaded)
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096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

Timing diagram

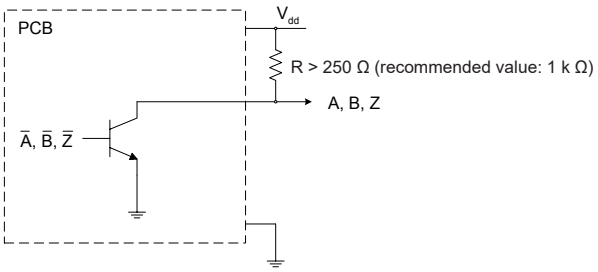


B leads A for clockwise rotation of magnet.

Connections



Recommended signal termination

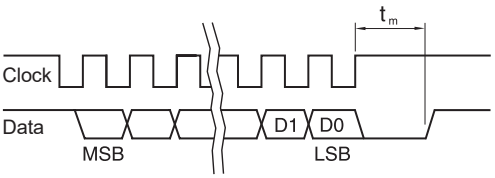


RMB28SC / RMF44SC / RMF58SC– Absolute binary synchro-serial (SSI), RS422

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)

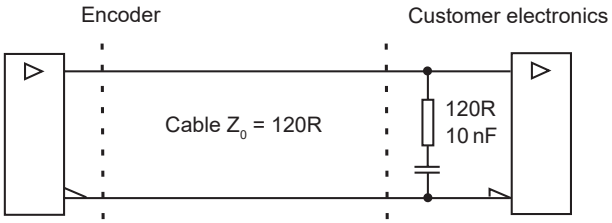
Timing diagram



Position increases for clockwise rotation of magnet.

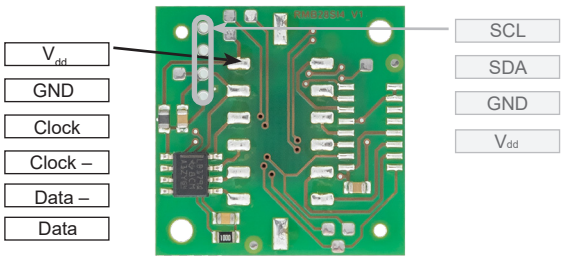
Recommended signal termination

For data output lines only

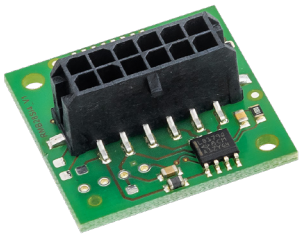


Connections

RMB28SC / RMF44SC / RMF58SC for trimming with SATI:
TWI connections to encoder



With Molex connector



Connector type
Molex 43045-1219

Mating connector
Molex 43025-1200 (not provided)

Crimp terminal
43030-xxxx (not provided)

SATI03
Stand Alone Trimming Interface

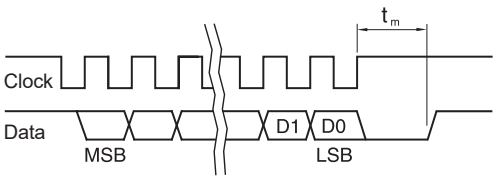
- Accuracy up to ±0.2°
- Additional information on SATI can be found in the “SATI user manual”, document SATI03D06, available for download from www.rls.si/sati03.

RMB28SI / RMF44SI / RMF58SI – 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

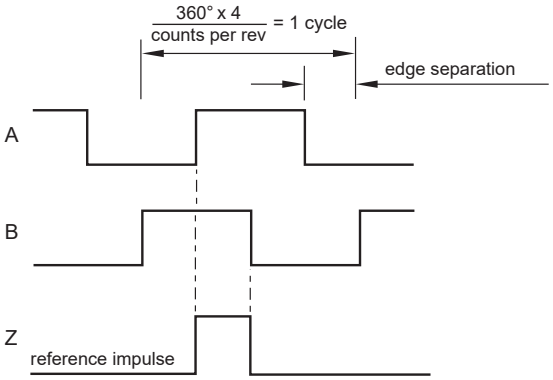


Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20.5 µs

Position increases for clockwise rotation of magnetic actuator.

Timing diagram - Incremental

Complementary signals not shown

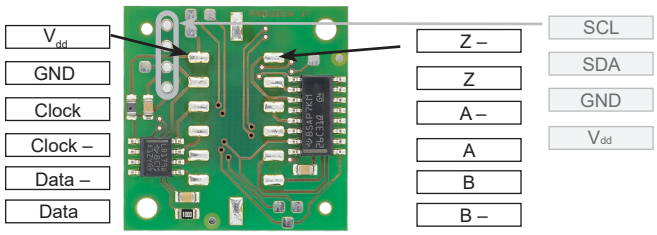


B leads A for clockwise rotation of magnet.

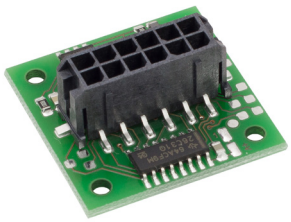
Connections

RMB28SI / RMF44SI / RMF58SI for trimming with SATI:

TWI connections to encoder

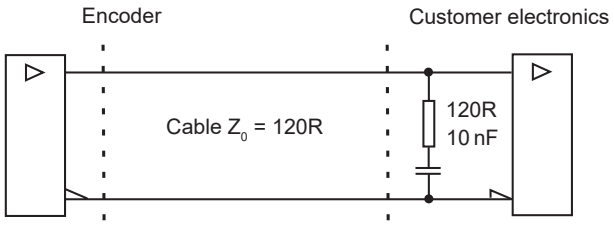


With Molex connector



Recommended signal termination

For data output lines only



Connector type
Molex 43045-1219

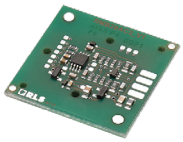
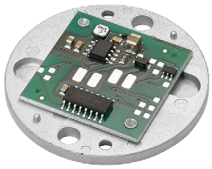
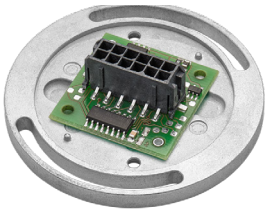
Mating connector
Molex 43025-1200 (not provided)

Crimp terminal
43030-xxxx (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.

Part numbering

RMF44 IC 08B A 96

Series
RMB28
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
BC - Analogue complementary sinusoidal
IA - Incremental, Push-pull, 8 V to 26 V
IB - Incremental, Open Collector, 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

NOTE: Not all combinations are valid.

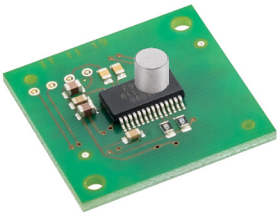
Special requirements
96 - Standard with AM4096
C6 - With Molex connector (Optional for **IC, SC, SI**)

Shape
S - Square (for RMB28)
A - Standard aluminium flange (for RMF44 and RMF58)

Resolution
For **AC** and **BC**
01S - One sine/cosine wave per revolution

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

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



* 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 / RMF58	AC	01S	S / A	96
	BC			
	IA	05B / 06B/ 07B / 08B / 09B / 10B / 11B / 12B		
	IB			
	IC			96 / C6
	IE			96
	SC			96 / C6
	SI			

Accessories part numbering

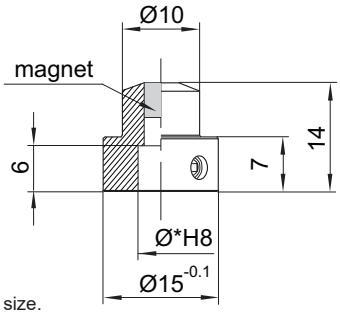
Stand alone trimming interface

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.

Magnetic actuator and magnet ordering information

Actuator for integration onto shaft



Shaft = Ø*h7
Fixing: Grub screw provided

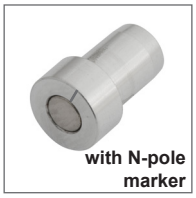
* Hole diameter for nominal shaft size. See table on the right for more information on available shaft sizes.

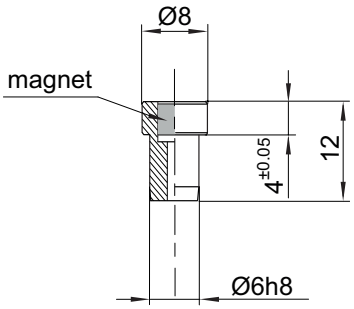
Part numbers:

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

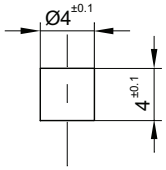
For resolutions from 10 bit absolute (800 cpr incremental) and above
RMH06A3A00

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
4	8. 11. 2021	5, 7, 8	Molex amended, RMF58 added