

RMB28 angular magnetic encoder module



The RMB28 encoder module is designed for direct integration to high volume OEM applications. The low cost 28 mm square PCB can also be provided with a connector for easy installation.

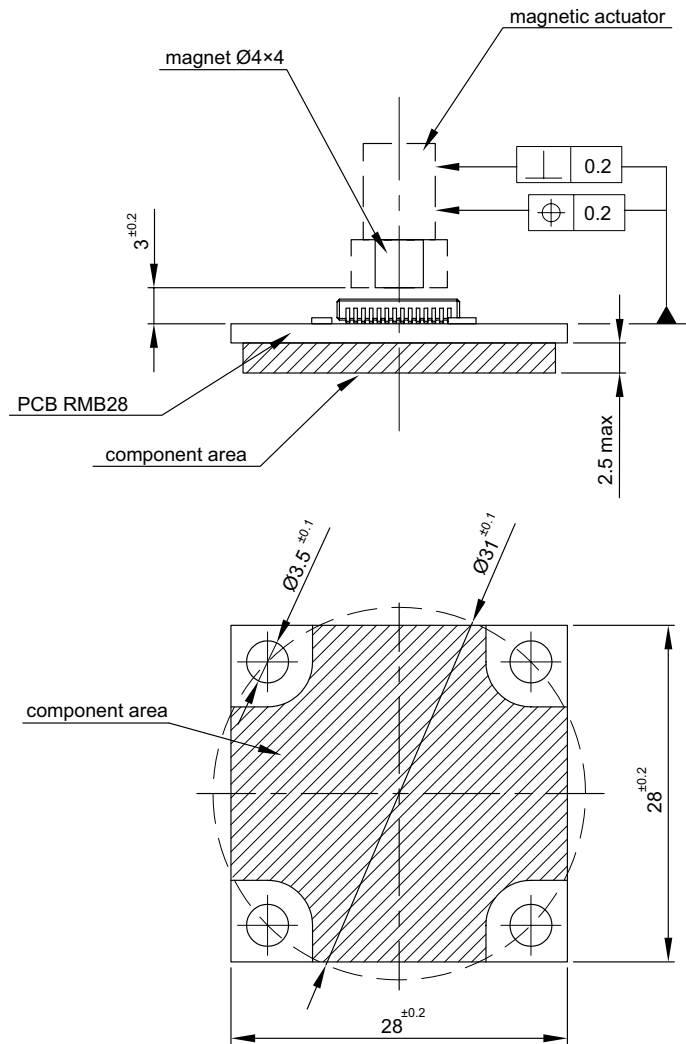
The encoder module consists of a magnetic actuator and a separate sensor board. Rotation of the magnetic actuator is sensed by a custom encoder chip mounted on the sensor board, and processed to give the required output format. Output signals are provided in industry standard absolute, incremental, analogue or linear formats.

The RMB28 can be used in a wide range of OEM applications including motor control and industrial automation.

- RMB28MD** - Sine/Cosine + Absolute binary synchro-serial + Incremental, 5 V
- RMB28IB** - Incremental, Open Collector, 24 V
- RMB28IE** - Incremental, Open Collector, 5 V
- RMB28IC** - Incremental, RS422A, 5 V
- RMB28SC** - Absolute binary synchro-serial, RS422A, 5 V
- RMB28SI** - Absolute binary synchro-serial (SSI) + Incremental, RS422A, 5 V
- RMB28V** - Linear voltage output, 5 V

- 28 mm square module
- Low cost for OEM integration
- 24 V and 5 V power supply versions
- High speed operation to 60,000 rpm
- Absolute - to 13 bit resolution (8,192 counts per revolution)
- Industry standard absolute, incremental, analogue and linear output formats
- Accuracy to $\pm 0.5^\circ$
- RoHS compliant (lead free)

RMB28 installation drawing



Clockwise (CW) rotation of magnet

RMB28MD – Sine/Cosine + Absolute binary synchro-serial (SSI) + Incremental

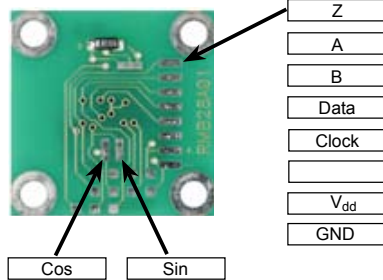
Complex feedback device for absolute position at start-up as well as during operation + incremental outputs

Power supply	$V_{dd} = 5 V \pm 5\%$
Resolution	8 bit + 64 ppr (256 cpr) + one period per revolution
Power consumption	13 mA – incremental and SSI (not loaded)
SSI output code	Natural binary
Data outputs	Serial data
Data inputs	Clock
Incremental outputs	A, B, Z
Sin/Cos outputs	Signal amplitude: $1.1 \pm 0.2 V$
Operating temperature	-40 °C to +125 °C
Maximum speed	60,000 rpm
Accuracy*	$\pm 0.7^\circ$
Hysteresis	0.45°

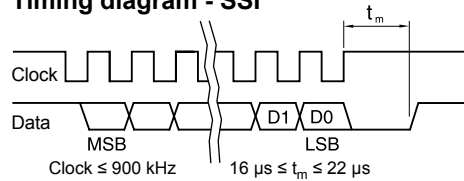
* Worst case within operational parameters including magnet position and temperature.

Connections

RMB28MD

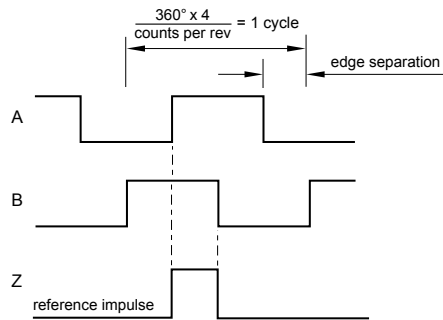


Timing diagram - SSI



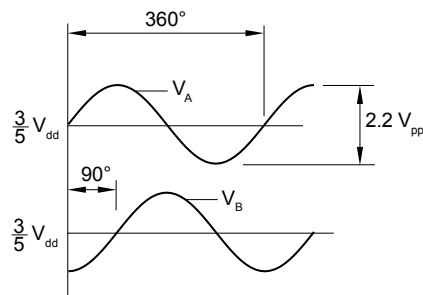
Position increases for clockwise rotation of magnet.

Timing diagram - Incremental



B leads A for clockwise rotation of magnet.

Timing diagram - Sine/Cosine



V_B leads V_A for clockwise rotation of magnet.

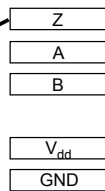
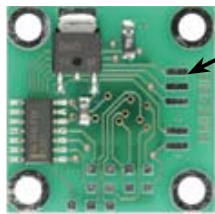
RMB28IB – Incremental, Open Collector, 24 V
Square wave output

Power supply	$V_{dd} = 8\text{ V to }26\text{ V}$
Resolution	32, 64 ppr (128, 256 cpr)
Power consumption	13 mA (not loaded)
Maximum output load	20 mA
Output signals	A, B, Z
Operating temperature	0 °C to +70 °C
Maximum speed	60,000 rpm
Accuracy*	$\pm 0.7^\circ$
Hysteresis	0.45°

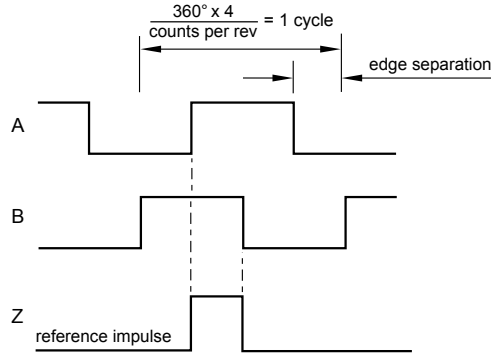
* Worst case within operational parameters including magnet position and temperature.

Connections

RMB28IB

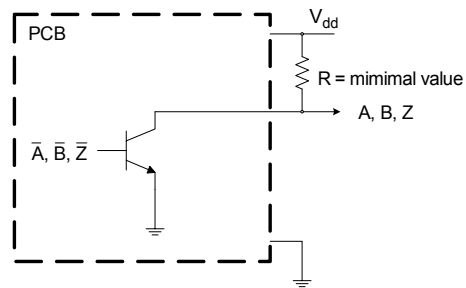


Timing diagram



B leads A for clockwise rotation of magnet.

Recommended signal termination



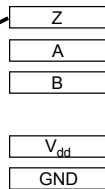
RMB28IE – Incremental, Open Collector, 5 V
Low cost alternative for ball bearing encoders

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Resolution	32, 64 ppr (128, 256 cpr)
Power consumption	13 mA (not loaded)
Maximum output load	20 mA
Output signals	A, B, Z
Operating temperature	-40 °C to +125 °C
Maximum speed	60,000 rpm
Accuracy*	$\pm 0.7^\circ$
Hysteresis	0.45°

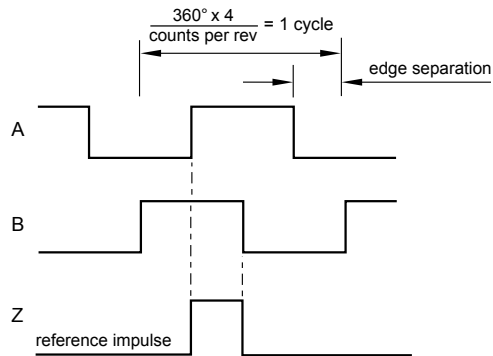
* Worst case within operational parameters including magnet position and temperature.

Connections

RMB28IE

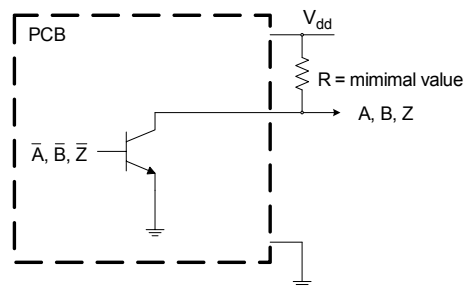


Timing diagram



B leads A for clockwise rotation of magnet.

Recommended signal termination



RMB28IC – Incremental, RS422A, 5 V

Alternative for optical encoders

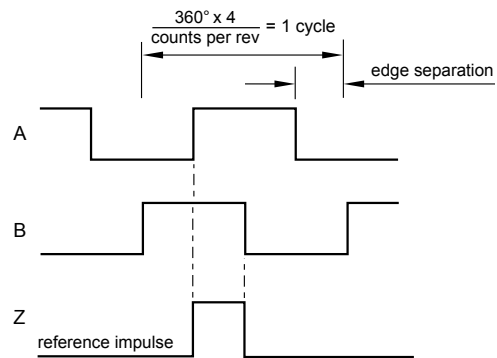
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	13 mA for 7, 8 bit resolutions 35 mA for all other resolutions
Output signals	A, B, Z, A-, B-, Z- (RS422A)
Operating temperature	-25 °C to +85 °C (-40 °C to +125 °C option 18)
Edge separation	1 μs minimum

Resolution options (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
128, 256	60,000	$\pm 0.7^\circ$	0.45°
320, 400, 500, 512	30,000	$\pm 0.7^\circ$	0.18°
800, 1,000, 1,024	20,000	$\pm 0.5^\circ$	0.18°
1,600, 2,000, 2,048	10,000	$\pm 0.5^\circ$	0.18°
4,096	5,000	$\pm 0.5^\circ$	0.18°
8,192	2,500	$\pm 0.5^\circ$	0.18°

* Worst case within operational parameters including magnet position and temperature.

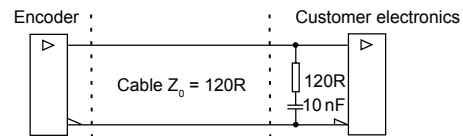
Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnet.

Recommended signal termination



Connections

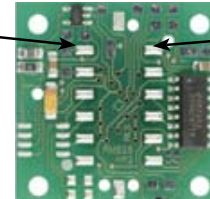
RMB28IC - 32, 64 positions per revolution (128, 256 cpr)



B
B-
A
A-
Z-
Z
V _{dd}
GND

RMB28IC - all other resolutions

V _{dd}
GND



Z-
Z
A-
A
B
B-

RMB28SC – Absolute binary synchro-serial (SSI), RS422A, 5 V

Alternative for optical encoders

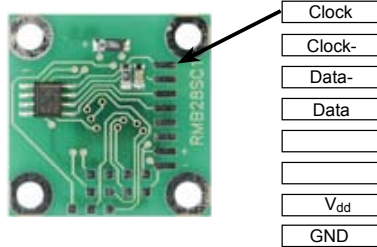
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	13 mA for 8 bit resolution 35 mA for all other resolutions
SSI output code	Natural binary
Data outputs	Serial data (RS422A)
Data inputs	Clock (RS422A)
Operating temperature	-40 °C to +125 °C
Maximum speed	60,000 rpm

Resolution options (positions per rev)	Maximum speed (rpm)	Accuracy*	Hysteresis
256	60,000	±0.7°	0.45°
320, 400, 500, 512	30,000	±0.7°	0.18°
800, 1,000, 1,024	20,000	±0.5°	0.18°
1,600, 2,000, 2,048	10,000	±0.5°	0.18°
4,096	5,000	±0.5°	0.18°
8,192	2,500	±0.5°	0.18°

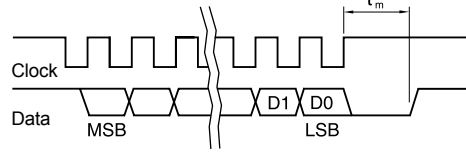
* Worst case within operational parameters including magnet position and temperature.

Connections

RMB28SC - 256 positions per revolution



Timing diagram

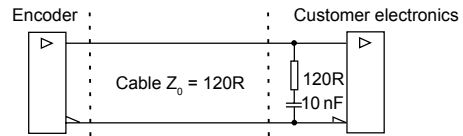


Clock ≤ 900 kHz $16\ \mu\text{s} \leq t_m \leq 22\ \mu\text{s}$ for 8 bit resolution
 Clock ≤ 4 MHz $12.5\ \mu\text{s} \leq t_m \leq 20\ \mu\text{s}$ for all other resolutions

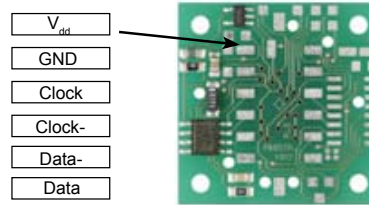
Position increases for clockwise rotation of magnet.

Recommended signal termination

For data output lines only



RMB28SC - all other resolutions



RMB28SI – Absolute binary synchro-serial (SSI) + Incremental, RS422A, 5 V

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.

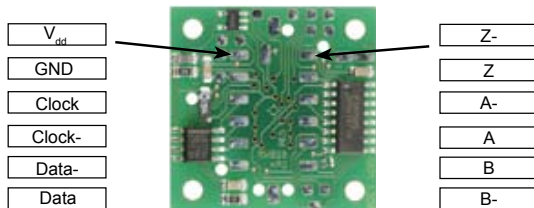
Power supply	$V_{dd} = 5 V \pm 5\%$
Power consumption	35 mA
SSI output code	Natural binary
Data outputs	Serial data (RS422A)
Data inputs	Clock (RS422A)
Incremental outputs	A, B, Z, A-, B-, Z- (RS422A)
Operating temperature	-25 °C to +85 °C (-40 °C to +125 °C option 18)

Resolution options (positions/counts per rev)	Maximum speed (rpm)	Accuracy*	Hysteresis
320, 400, 500, 512	30,000	$\pm 0.7^\circ$	0.18°
800, 1,000, 1,024	20,000	$\pm 0.5^\circ$	0.18°
1,600, 2,000, 2,048	10,000	$\pm 0.5^\circ$	0.18°
4,096	5,000	$\pm 0.5^\circ$	0.18°
8,192	2,500	$\pm 0.5^\circ$	0.18°

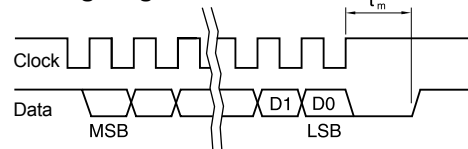
* Worst case within operational parameters including magnet position and temperature.

Connections

RMB28SI



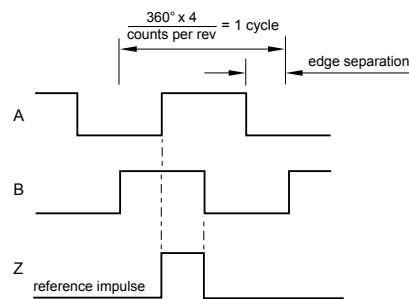
Timing diagram - SSI



Clock ≤ 4 MHz $12.5 \mu s \leq t_m \leq 20.5 \mu s$
Position increases for clockwise rotation of magnetic actuator.

Timing diagram - Incremental

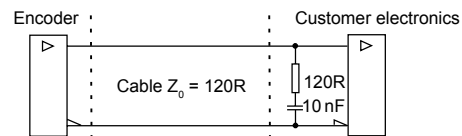
Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination

For incremental signals + SSI data output lines only



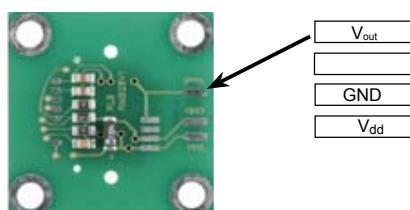
RMB28V – Linear voltage output

Alternative for potentiometers

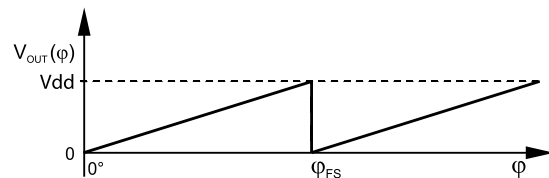
Power supply	$V_{dd} = 5 V \pm 5\%$
Power consumption	20 mA (not loaded)
Output voltage	0 V to V_{dd}
Output loading	Max. 10 mA
Nonlinearity	1 %
Operating temperature	-40 °C to +125 °C
Maximum speed	30,000 rpm

Connections

RMB28V



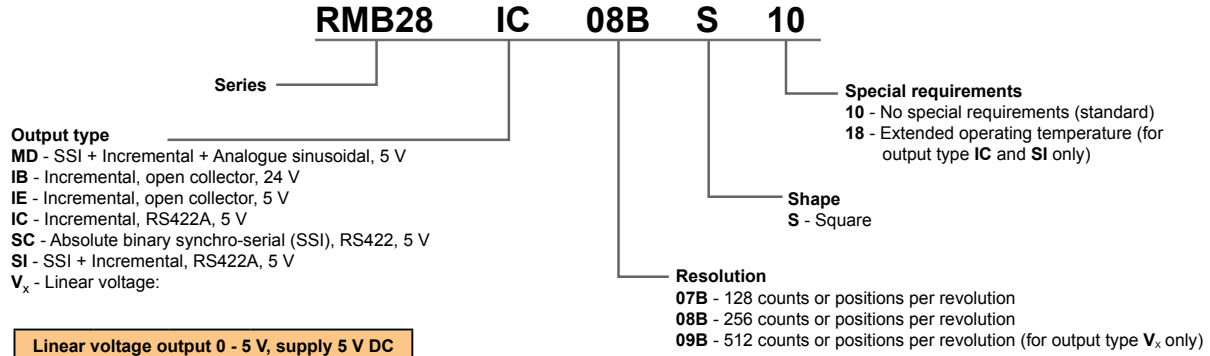
Electrical output



Output type and electrical variant

Φ_{FS}	360°	180°	90°	45°
CW	VA	VB	VC	VD
CCW	VE	VF	VG	VH

RMB28 ordering code



Output type
MD - SSI + Incremental + Analogue sinusoidal, 5 V
IB - Incremental, open collector, 24 V
IE - Incremental, open collector, 5 V
IC - Incremental, RS422A, 5 V
SC - Absolute binary synchro-serial (SSI), RS422, 5 V
SI - SSI + Incremental, RS422A, 5 V
V_x - 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

For output types **IC**, **SC** and **SI**:

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

NOTE: Not all combinations are valid.



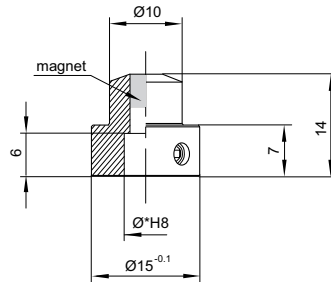
* For sample quantities of RMB28 supplied with a magnet please add "**KIT**" to the end of the required RMB28 part number, eg. **RMB28IC09BS10KIT**

Magnetic actuator and magnet ordering information

Actuator for integration onto shaft



Shaft = $\varnothing \cdot h7$
Fixing: Grub screw provided

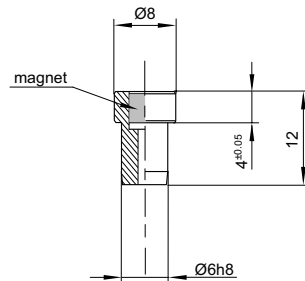


Part numbers:

For resolutions up to 9 bit absolute (512 cpr incremental)
RMA04A2A00 – $\varnothing 4$ mm shaft **RMA10A2A00** – $\varnothing 10$ mm shaft
RMA05A2A00 – $\varnothing 5$ mm shaft **RMA19A2A00** – $\varnothing 3/16''$ shaft
RMA06A2A00 – $\varnothing 6$ mm shaft **RMA25A2A00** – $\varnothing 1/4''$ shaft
RMA08A2A00 – $\varnothing 8$ mm shaft **RMA37A2A00** – $\varnothing 3/8''$ shaft

For resolutions from 10 bit absolute (800 cpr incremental) and above
RMA04A3A00 – $\varnothing 4$ mm shaft **RMA10A3A00** – $\varnothing 10$ mm shaft
RMA05A3A00 – $\varnothing 5$ mm shaft **RMA19A3A00** – $\varnothing 3/16''$ shaft
RMA06A3A00 – $\varnothing 6$ mm shaft **RMA25A3A00** – $\varnothing 1/4''$ shaft
RMA08A3A00 – $\varnothing 8$ mm shaft **RMA37A3A00** – $\varnothing 3/8''$ shaft

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

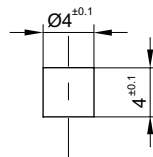
With N-pole marker scribed to a $\pm 5^\circ$ accuracy:

For resolutions up to 9 bit absolute (512 cpr incremental)
RMH06A2A02

For resolutions from 10 bit absolute (800 cpr incremental) and above
RMH06A3A02

Hole = $\varnothing 6G7$
Fixing: Glue (recommended – LOCTITE 648)

Magnet for direct recessing in non-ferrous shafts



Fixing: Glue (recommended – LOCTITE 648)

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
01	5. 12. 2006	-	New document
02	1. 2. 2008	-	New layout with outputs IB and V _x , minor amendments
03	25. 11. 2008	2	Power consumption for IB output type changed to 13 mA
		-	New connection images with high resolution data added
04	14. 1. 2009	-	New layout

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