

RMB30 angular magnetic encoder module



The RMB30 encoder module provides the functionality of the RM36 encoder in a component format for simple customer integration. With a large range of outputs and both 5 V and 24 V power supply variants the unit is easily integrated to existing electronics.

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 RMB30 can be used in a wide range of applications including marine, medical, print, converting, industrial automation, metal working, motor control and instrumentation.

RMB30IA - Incremental output, Push-Pull, 24 V

RMB30IB - Incremental output, Open Collector NPN, 24 V

RMB30IC - Incremental with 80 to 2,048 pulses per revolution (320 to 8,192 counts per revolution with x 4 evaluation), 5 V

RMB30SC - Synchro serial interface (SSI) with 320 to 8,192 positions per revolution, 5 V

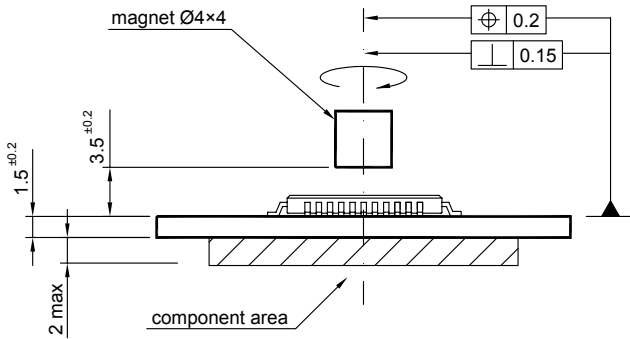
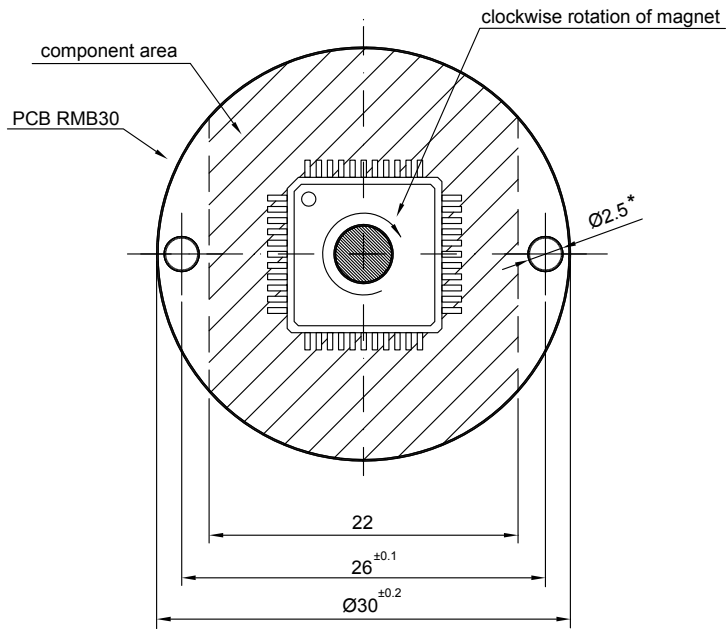
RMB30SI - Synchro serial interface (SSI) and incremental outputs, 5 V

RMB30C - Linear current output in a range of variants, 24 V

RMB30V - Linear voltage output in a range of variants, 24 V

- 30 mm diameter circular module
- 24 V and 5 V power supply versions
- High speed operation to 30,000 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)

RMB30 installation drawing

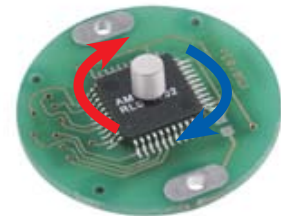


*** Mounting hole sizes**

24 V versions (9 bit resolutions only) - 2 mm

5 V versions - 2.5 mm

NOTE: For the accuracy specified the center 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 2 mounting holes).



Clockwise (CW) rotation of magnet

RMB30I – Incremental outputs, 24 V supply

Square wave output

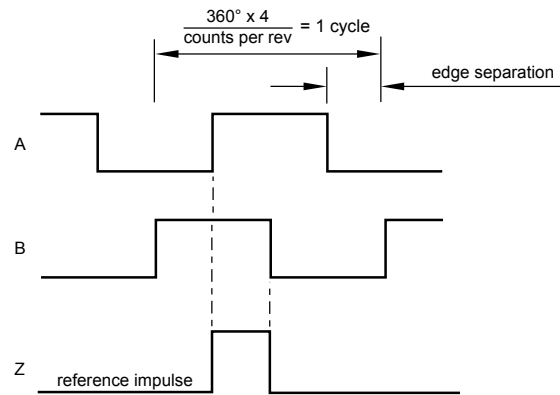
Power supply	$V_{dd} = 8\text{ V to }12\text{ V or }24\text{ V}$ (see NOTE 2)
Power consumption	(at 24 V) See table
Output signals	Variant IA: A, B, Z, A-, B-, Z- (RS422A) Variant IB: A, B, Z (open collector)
Resolution	128 pulses per revolution (512 counts per revolution with 4x evaluation)
Temperature	Operating -25 °C to +70 °C Storage -25 °C to +85 °C

Output type and electrical variant

Variant	Type	Power consumption	Max. load
IA	Push-Pull	30 mA	30 mA
IB	Open Collector NPN	25 mA	20 mA

Timing diagram

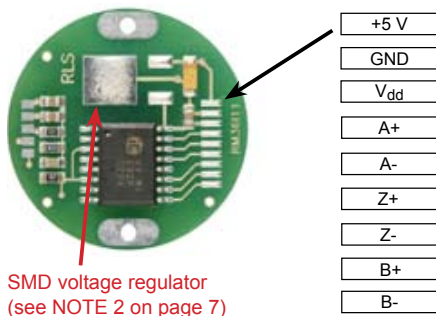
Complementary signals not shown



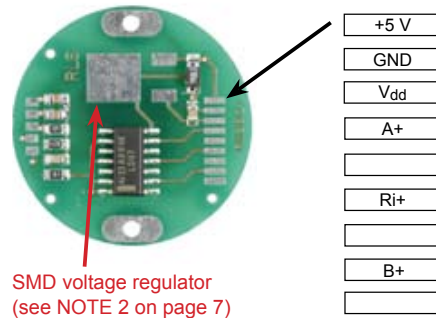
B leads A for clockwise rotation of magnet.

Connections

RMB30IA



RMB30IB



RMB30IC – Incremental outputs, 5 V supply

Square wave differential line driver to RS422A

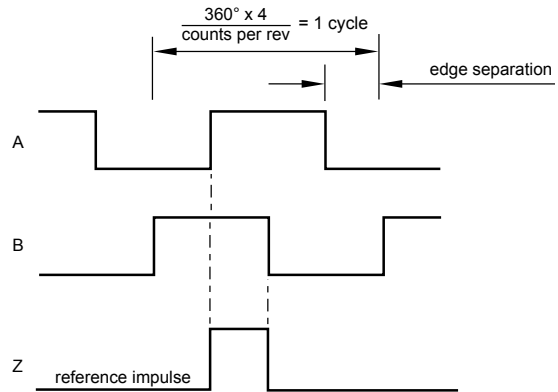
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	35 mA
Output signals	A, B, Z, A-, B-, Z- (RS422A)
Temperature	Operating -25 °C to +85 °C -40 °C to +125 °C (option 1B) Storage -40 °C to +125 °C

Resolution options (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.

Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnet.

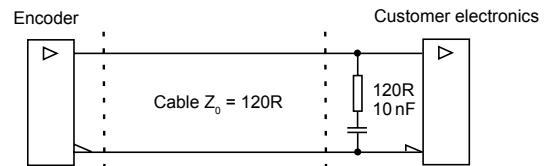
Connections

RMB30IC



A-
A
Z
Z-
B-
B
GND
V_{dd}

Recommended signal termination



RMB30SC – Absolute binary synchro-serial interface (SSI)

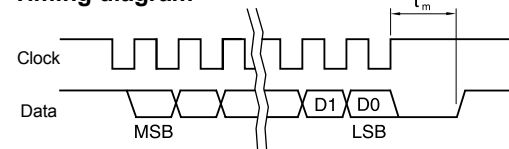
Serial encoded absolute position measurement

Output code	Natural binary
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	35 mA
Repeatability	$\leq 0.07^\circ$
Data outputs	Serial data (RS422A)
Data inputs	Clock (RS422A)
Temperature	Operating -40 °C to +125 °C Storage -40 °C to +125 °C

Resolution options (positions 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°

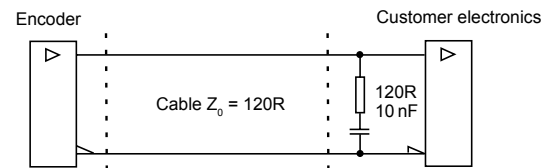
* Worst case within operational parameters including magnet position and temperature.

Timing diagram



Clock $\leq 4\text{ MHz}$ $12.5\ \mu\text{s} \leq t_m \leq 20.5\ \mu\text{s}$
Position increases for clockwise rotation of magnet.

Recommended signal termination



Connections

RMB30SC



-
-
-
-
-
-
-
- Data-
- Data
- Clock-
- Clock
- GND
- V_{dd}
-

RMB30SI – Absolute binary synchro-serial interface (SSI) + incremental

Serial encoded absolute position measurement

Output code	Natural binary
Power supply	$V_{dd} = 5 V \pm 5\%$
Power consumption	35 mA
Repeatability	$\leq 0.07^\circ$
Data outputs	Serial data (RS422A)
Data inputs	Clock (RS422A)
Temperature	Operating -40 °C to +125 °C Storage -40 °C to +125 °C

Resolution options (positions 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.

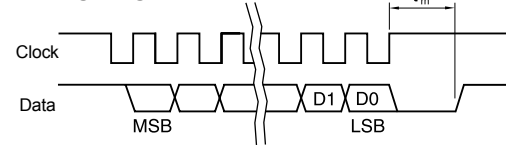
Connections

RMB30SI



- A-
- A
- Z
- Z-
- B-
- B
- Data-
- Data+
- Clock-
- Clock+
- GND
- V_{dd}
-

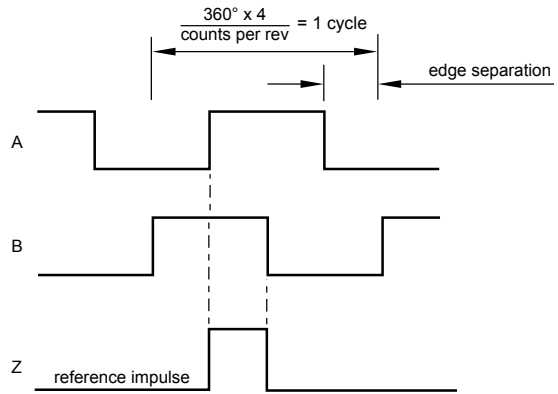
Timing diagram - SSI



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

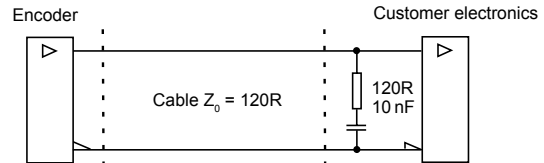
Timing diagram incremental

Complementary signals not shown



B leads A for clockwise rotation of magnet.

Recommended signal termination



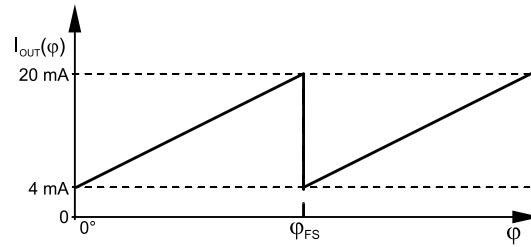
RMB30C – Linear current output

Power supply	$V_{dd} = +20 \text{ V to } +30 \text{ V DC}$
Power consumption	50 mA plus output current
Output current	4 mA to 20 mA
Output loading	$R_L = 0 \text{ to } \frac{V_{dd}}{I_{outmax}}$
Nonlinearity	1 %
Temperature	Operating -25 °C to +70 °C Storage -25 °C to +125 °C
Maximum speed	30,000 rpm

Output type and electrical variant

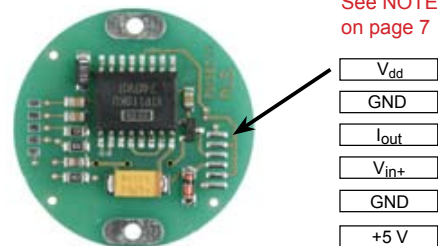
φ_{FS}	360°	180°	90°	45°
CW	CA	CB	CC	CD
CCW	CE	CF	CG	CH

Electrical output/shaft position



Connections

RMB30C



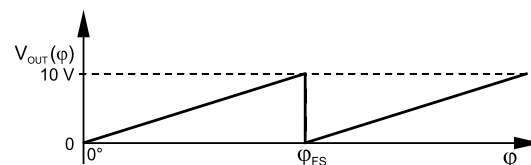
RMB30V – Linear voltage output

Power supply	$V_{dd} = +20 \text{ V to } +30 \text{ V DC}$
Power consumption	40 mA typical
Output voltage	0 V to 10 V DC
Output loading	Max. 10 mA
Nonlinearity	1 %
Temperature	Operating -25 °C to +70 °C Storage -25 °C to +125 °C
Maximum speed	30,000 rpm

Output type and electrical variant

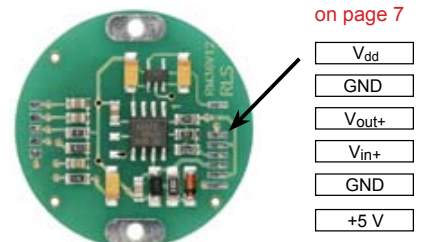
φ_{FS}	360°	180°	90°	45°
CW	VA	VB	VC	VD
CCW	VE	VF	VG	VH

Electrical output/shaft position



Connections

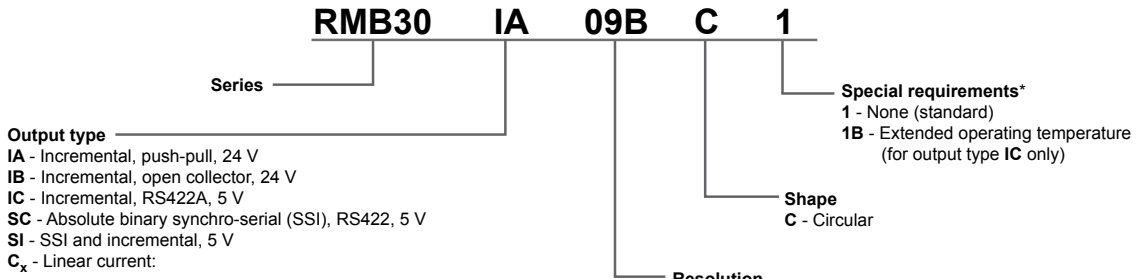
RMB30V



NOTE 1: RMB30C and RMB30V boards need 2 power supplies; pin 6 (V_{dd}) needs 24 V and pin 1 (+5 V) 5 V. However, pins 1, 2 and 3 have been provided to allow easy connection to a 3 terminal regulator to generate 5 V from 24 V. Pin 2 (GND) is connected on the PCB to pin 5 (GND), and pin 6 (V_{dd}) is connected via a diode on the board to pin 3, for reverse voltage protection.

NOTE 2: The SMD regulator supplied on these boards limits the supply voltage (V_{dd}) to 12 V ($V_{dd} = 8 \text{ V to } 12 \text{ V}$). If operation is required at 24 V supply, then this regulator must be replaced by a more powerful off-board device (TO220 package) mounted to a suitable heatsink.

RMB30 ordering code



Output type
IA - Incremental, push-pull, 24 V
IB - Incremental, open collector, 24 V
IC - Incremental, RS422A, 5 V
SC - Absolute binary synchro-serial (SSI), RS422, 5 V
SI - SSI and incremental, 5 V
C_x - Linear current:

Linear current output 4 - 20 mA, supply +20 V to +30 V DC				
	360°	180°	90°	45°
CW	CA	CB	CC	CD
CCW	CE	CF	CG	CH

V_x - Linear voltage:

Linear voltage output 0 - 10 V, supply +20 V to +30 V DC				
	360°	180°	90°	45°
CW	VA	VB	VC	VD
CCW	VE	VF	VG	VH

Resolution
09B - 512 counts or positions per revolution
IC, SC and SI only

Decimal
D32 - 320 **D80** - 800 **2D0** - 2,000
D40 - 400 **1D0** - 1,000
D50 - 500 **1D6** - 1,600

Binary
08B - 256 **10B** - 1,024 **12B** - 4,096
09B - 512 **11B** - 2,048 **13B** - 8,192

NOTE: Not all combinations are valid.



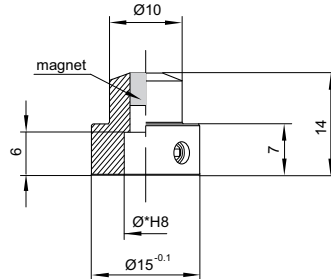
* For sample quantities of RMB30 supplied with a magnet please add "KIT" to the end of the required RMB30 part number, eg. **RMB30IA09BC1KIT**

Magnetic actuator and magnet ordering information

Actuator for integration onto shaft



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

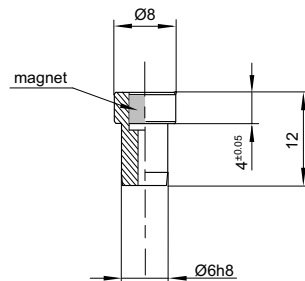


Part numbers:

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



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:

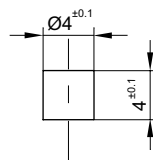
For resolutions up to 9 bit absolute (512 cpr incremental)
RMH06A2A02

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

Hole = Ø6G7

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	19. 11. 2004	-	New document
02	24. 11. 2004	1	Minor text changes done
03	6. 5. 2005	-	New layout with new installation drawing and connections images
04	10. 5. 2005	3	IC and SC output types added to Electrical variant table
05	12. 1. 2006	-	13 bit resolution added
		3	SI output type and new 5 V variants added, magnet part numbering changed
06	10. 4. 2006	1	New installation drawing
07	24. 11. 2008	-	New layout with new connection images
08	14. 1. 2009	-	New layout

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