

RM36 series non-contact rotary encoders



The RM36 is a high-speed magnetic rotary encoder designed for use in harsh industrial environments. The non-contact two-part design removes the need for seals or bearings ensuring long-term reliability and simple installation.

The encoder comprises a magnetic actuator and a separate encoder body. Rotation of the magnetic actuator is sensed by a custom encoder chip within the body, and processed to the required output.

The encoder chip processes the signals received to provide resolutions to 13 bit (8,192 positions per revolution) with high operational speeds. Resolution options include binary and decimal. Output signals are provided in industry standard absolute, incremental or linear formats.

The compact encoder body is 36 mm in diameter and provides dirt immunity up to IP68.

The RM36 can be used in a wide range of applications including marine, medical, print, converting, industrial automation, metal working, motor control and instrumentation.

5 V power supply version

RM36I-incremental with 80 to 2,048 pulses per revolution (320 to 8,192 counts per revolution with x 4 evaluation)

RM36S-synchro serial interface (SSI) with 320 to 8,192 positions per revolution

24 V power supply version

RM36P-absolute parallel interface with 512 positions per revolution

RM36I-incremental with 80 to 2,048 pulses per revolution (320 to 8,192 counts per revolution with x 4 evaluation)

RM36V-linear voltage output in a range of variants

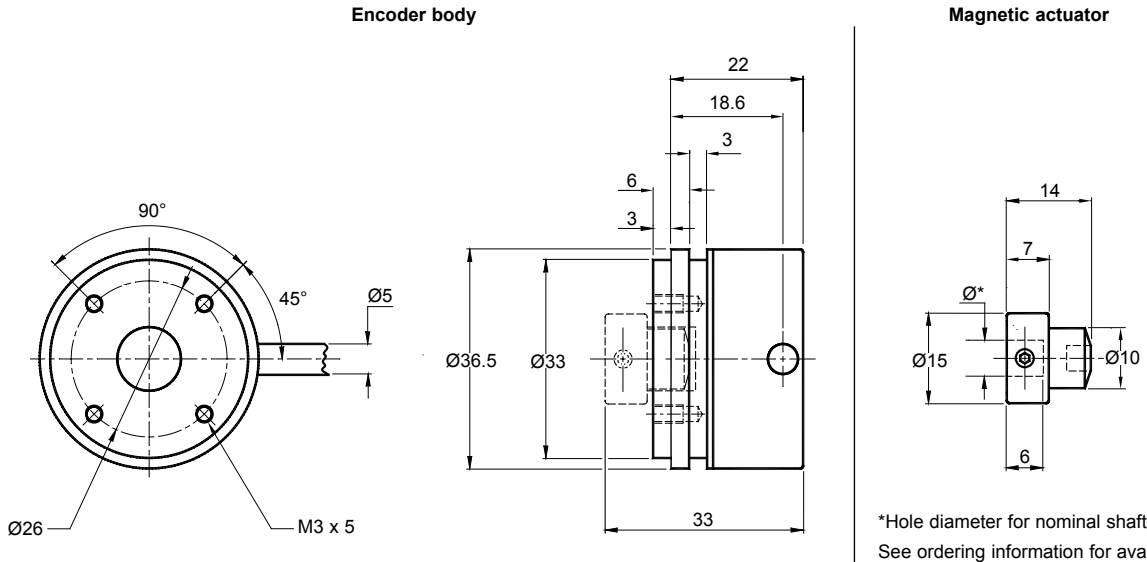
RM36C-linear current output in a range of variants

System features:

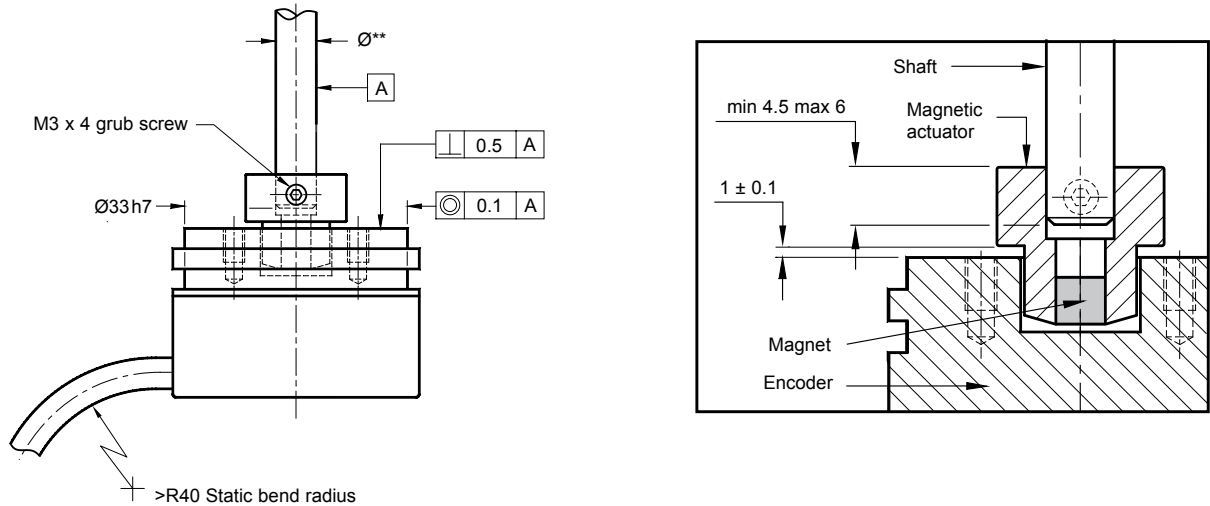
- Excellent immunity to IP68
- Non-contact, frictionless design
- High speed operation to 30,000 rpm
- 36 mm diameter body
- Industry standard absolute, incremental and linear output formats
- Binary and decimal resolution options
- Accuracy $\pm 0.5^\circ$
- Simple installation
- Low inertia
- Stainless steel body option

RM36 dimensions

Dimensions and tolerances in mm



RM36 installation drawing



**Nominal shaft size with tolerance h7.

Operating and electrical specifications

Humidity (for IP64 version)	Storage 95% maximum relative humidity (non-condensing) (IEC 61010-1) Operating 80% maximum relative humidity (non-condensing) (IEC 61010-1)
Acceleration	Operating 500 m/s ² BS EN 60068-2-7:1993 (IEC 68-2-7:1983)
Shock (non-operating)	1000 m/s ² , 6 ms, 1/2 sine BS EN 60068-2-27:1993 (IEC 68-2-27:1987)
Vibration (operating)	100 m/s ² max at 55 to 2000 Hz BS EN 60068-2-6:1996 (IEC 68-2-6:1995)
EMV compliance	BS EN 61326
Cable	Outside diameter 5 mm
Mass	Encoder unit 1 m cable (no connector) 85 g. Stainless steel variant 160 g. Magnetic actuator 12 g
Environmental sealing	IP64 (IP68 optional) BS EN 60529

Output specifications - 5 V supply

RM36I – Incremental outputs

Square wave differential line driver to RS422A

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	23 mA for 9 bit resolution 35 mA for all other resolutions
Output signals	A, B, Z, A-, B-, Z- (RS422A)
Max. cable length	50 m
Connector options	9 pin 'D' type plug (standard) Flying lead
Temperature	Operating -25 °C to +85 °C (-40 °C to +125 °C option 08)* Storage -40 °C to +85 °C

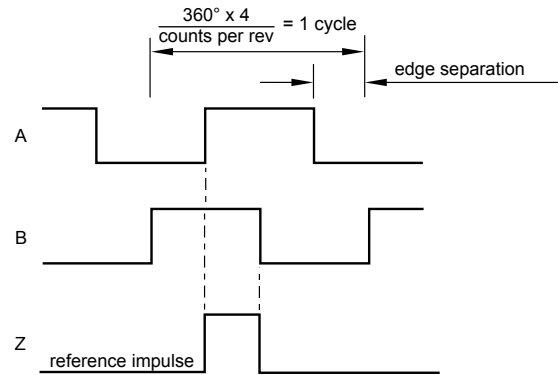
* Only available with IP64 sealing

Resolution options (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
320, 400, 500	30,000	$\pm 0.7^\circ$	0.18°
512	30,000	$\pm 0.7^\circ$	0.45°
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°

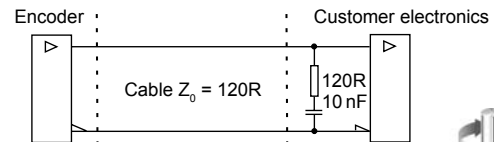
* Worst case within operational parameters including magnet position and temperature.

Timing diagram

(complementary signals not shown)



Recommended signal termination



B leads A for clockwise rotation of magnetic actuator



RM36S – Absolute binary synchro-serial interface (SSI)

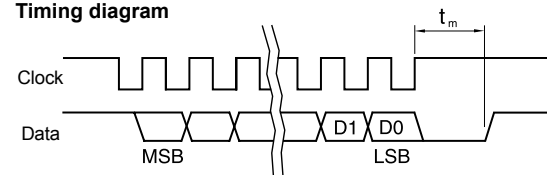
Serial encoded absolute position measurement

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)
Max. cable length	100 m (at 1 MHz)
Connector options	9 pin 'D' type plug (standard) Flying lead
Temperature	Operating -40 °C to +125 °C (IP64) -40 °C to +85 °C (IP68) Storage -40 °C to +85 °C

Resolution options (positions per revolution)	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.

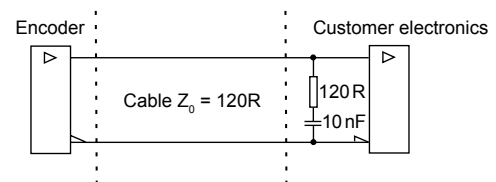
Timing diagram



Clock $\leq 4\text{ MHz}$ $12.5\ \mu\text{s} \leq t_m \leq 20.5\ \mu\text{s}$

Recommended signal termination

(For data output lines only)



Position increases for clockwise rotation of magnetic actuator



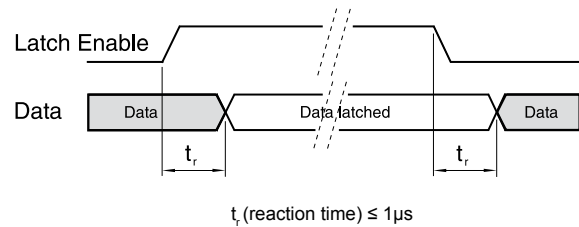
Output specifications - 24 V supply

RM36P – Absolute binary parallel interface

Parallel absolute position measurement

Output code	Natural binary
Power supply	8 V to 26 V = V_{supply}
Power consumption	(at 24 V) See table
Output voltage	$V_H \geq (V_{supply} - 1)$ at $-I_H \leq 10$ mA $V_L \leq 1$ V at $I_L \leq 10$ mA
Resolution	9 bit (512 positions per revolution)
Hysteresis	0.45°
Accuracy	±0.7°
Repeatability	≤ 0.07°
Data outputs	D0 (LSB) - D8 (MSB)
Data inputs	LE - latch enable input signal, active high Maximum sampling rate 500 kHz
Max. cable length	10 m
Connector options	15 pin 'D' type plug (standard) Flying lead
Temperature	Operating -25 °C to +125 °C (IP64) -25 °C to +85 °C (IP68) (0 °C to +70 °C variant PB) Storage -25 °C to +85 °C
Maximum speed	30,000 rpm

Timing diagram



Output type and electrical variant

Variant	Type	Power consumption	Max. load
PA	Push-Pull	40 mA	30 mA
PB	Open Collector NPN	25 mA	20 mA



Position increases for clockwise rotation of magnetic actuator

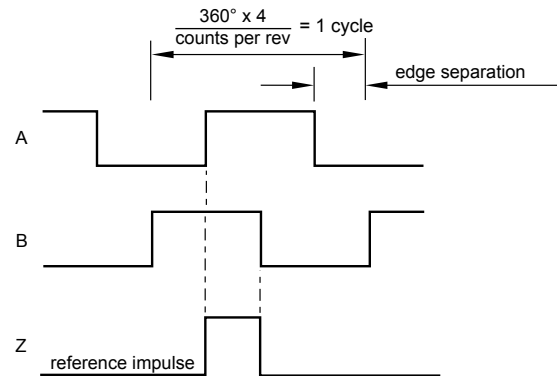
RM36I – Incremental outputs

Square wave output

Power supply	8 V to 26 V = V_{supply}
Power consumption	(at 24 V) See table
Output signals	Variant IA: A, B, Z, A-, B-, Z- (RS422A) Variant IB: A, B, Z
Resolution	Variant IB: 128 pulses per revolution (512 counts per revolution with 4x evaluation) Variant IA: 80 to 2,048 pulses per revolution (320, 400, 500, 512, 800, 1,000, 1,024, 1,600, 2,000, 2,048, 4,096, 8,192 counts per revolution)
Max. cable length	20 m
Connector options	9 pin 'D' type plug (standard) Flying lead
Temperature	Operating -25 °C to +70 °C (0 °C to +70 °C variant IB) Storage -25 °C to +85 °C

Timing diagram

(complementary signals not shown)



Output type and electrical variant

Variant	Type	Power consumption	Max. load
IA	Push-Pull	30 mA - 9-bit 50 mA - other resolutions	30 mA
IB	Open Collector NPN	25 mA	20 mA



B leads A for clockwise rotation of magnetic actuator

Resolution options (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
320, 400, 500	30,000	±0.7°	0.18°
512	30,000	±0.7°	0.45°
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°

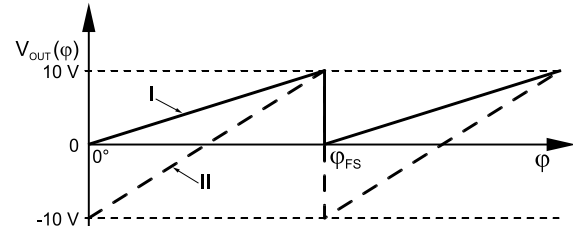
* Worst case within operational parameters including magnet position and temperature.

Output specifications - 24 V supply

RM36V – Linear voltage output

Power supply	Type I: +20 V to +30 V DC Type II: ± 12 V to ± 16 V DC
Power consumption	40 mA typical
Output voltage	Type I: 0 V to 10 V DC Type II: -10 V to +10 V DC
Output loading	Max. 10 mA
Nonlinearity	1 %
Max. cable length	20 m
Connector options	9 pin 'D' type plug (standard) Flying lead
Temperature	Operating -25 °C to +70 °C Storage -25 °C to +125 °C
Maximum speed	30,000 rpm

Electrical output/shaft position



Output type and electrical variant

ϕ_{FS}	Type I				Type II			
	360°	180°	90°	45°	360°	180°	90°	45°
CW	VA	VB	VC	VD	VM	VN	VP	VQ
CCW	VE	VF	VG	VH	VR	VS	VT	VV

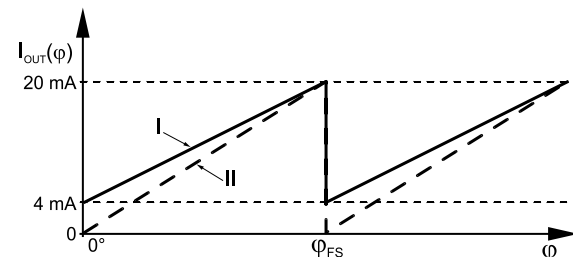


Image shows clockwise rotation of magnetic actuator

RM36C - Linear current output

Power supply	$V_{dd} = +20$ V to +30 V DC
Power consumption	50 mA plus output current
Output current	Type I: 4 mA to 20 mA Type II: 0 mA to 20 mA
Output loading	$R_L = 0$ to $\frac{V_{dd}}{I_{OUTmax}}$
Nonlinearity	1 %
Max. cable length	20 m
Connector options	9 pin 'D' type plug (standard) Flying lead
Temperature	Operating -25 °C to +70 °C Storage -25 °C to +125 °C
Maximum speed	30,000 rpm

Electrical output/shaft position



Output type and electrical variant

ϕ_{FS}	Type I				Type II			
	360°	180°	90°	45°	360°	180°	90°	45°
CW	CA	CB	CC	CD	CM	CN	CP	CQ
CCW	CE	CF	CG	CH	CR	CS	CT	CV



Image shows clockwise rotation of magnetic actuator

RM36 ordering code

Encoder system = Encoder body + Magnetic actuator



Encoder part number
eg RM36SC0012B10A2B00

Magnetic actuator part number
eg RMA06A3A00

RM36 SC 00 12B 10 A 2 B 00

Output type and electrical variant

Incremental, push-pull, 24 V	IA
Incremental, open collector, 24 V	IB
Incremental, 5 V	IC
Absolute binary synchro-serial (SSI), 5 V	SC
Absolute parallel, push-pull, 24 V	PA
Absolute parallel, open collector, 24 V	PB
Linear voltage output 0 V to 10 V, supply +20 V to +30 V DC	
	360° 180° 90° 45°
Clockwise	VA VB VC VD
Counter clockwise	VE VF VG VH
Linear voltage output ±10 V, supply ±12 V to ±16 V DC	
	360° 180° 90° 45°
Clockwise	VM VN VP VQ
Counter clockwise	VR VS VT VV
Linear current output 4 mA to 20 mA, supply +20 V to +30 V DC	
	360° 180° 90° 45°
Clockwise	CA CB CC CD
Counter clockwise	CE CF CG CH
Linear current output 0 mA to 20 mA, supply +20 V to +30 V DC	
	360° 180° 90° 45°
Clockwise	CM CN CP CQ
Counter clockwise	CR CS CT CV

Shaft size
00 - N/A

Special requirements

00 - None
08 - Extended operating temperature range
(for output type IC and IP64 only)

Environment and material

B - IP64, Aluminium body (standard)
C - IP68, Aluminium body
J - IP68, Stainless steel body

Body style and cable exit

2 - Cylindrical body, radial cable exit

Connector option

A - 'D' type connector - 9 way
B - 'D' type connector - 15 way (for output types PA and PB only)
F - Flying lead (no connector)

Cable length

10 - 1 metre

Resolution

All output types
09B - 512 counts or positions per revolution

Output types IA, IC, SC

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

Binary

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

NOTE: Not all combinations are valid.

For output resolutions of 9-bit (512 count per rev), please select one of the following magnetic actuators:

- | | |
|-----------------------------|------------------------------|
| RMA04A2A00 - 4 mm dia shaft | RMA10A2A00 - 10 mm dia shaft |
| RMA05A2A00 - 5 mm dia shaft | RMA19A2A00 - 3/16" dia shaft |
| RMA06A2A00 - 6 mm dia shaft | RMA25A2A00 - 1/4" dia shaft |
| RMA08A2A00 - 8 mm dia shaft | RMA37A2A00 - 3/8" dia shaft |

For output resolutions of 10-bit (1024 count per rev) or higher, please select one of the following magnetic actuators:

- | | |
|-----------------------------|------------------------------|
| RMA04A3A00 - 4 mm dia shaft | RMA10A3A00 - 10 mm dia shaft |
| RMA05A3A00 - 5 mm dia shaft | RMA19A3A00 - 3/16" dia shaft |
| RMA06A3A00 - 6 mm dia shaft | RMA25A3A00 - 1/4" dia shaft |
| RMA08A3A00 - 8 mm dia shaft | RMA37A3A00 - 3/8" dia shaft |

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Document issues

Issue	Date	Page	Corrections made
1	13. 1. 2009	-	New layout

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