RM36

RM22 & RM36

RM36 ABSOLUTE & INCREMENTAL MAGNETIC ENCODER

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.

Product range

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

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

- **Excellent immunity to IP68**
- **Non-contact, frictionless design**
- **High speed operation to 30,000 rpm**
- **36 mm diameter body**
- **Accuracy ± 0.5°**
- **Simple installation**
- **Low inertia**
- **Stainless steel body option**
- **CE compliant, including RoHS - see Declaration of conformity**

ELECTRICAL & OPERATING 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 EN 60068-2-7:1993 (IEC 68-2-7:1983)
Shock (non-operating)	1000 m/s^2, 6 ms, 1/2 sine EN 60068-2-27:1993 (IEC 68-2-27:1987)
Vibration (operating)	100 m/s^2 max at 55 to 2000 Hz EN 60068-2-6:1996 (IEC 68-2-6:1995)
EMC compliance	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) EN 60529

SUPPLY VOLTAGE 5 Vdc

RM36IC – Incremental, RS422, 5 V

Square wave differential line driver to RS422

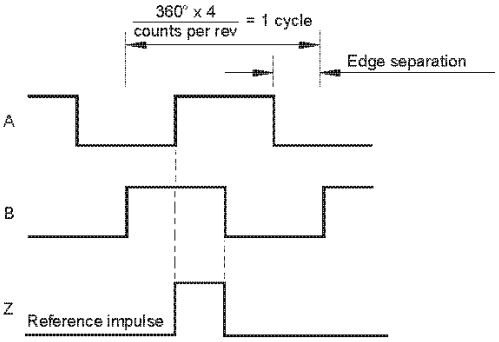
Power supply	V_{dd} = 5 V ± 5 %	
Power consumption	35 mA	
Output signals	A, B, Z, A–, B–, Z– (RS422)	
Maximum cable length	50 m	
Connector options	9 pin 'D' type plug (standard) Flying lead	
Temperature	Operating	–40 °C to +125 °C (IP64) –40 °C to +85 °C (IP68)
	Storage	–40 °C to +85 °C

Resolution options (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
128, 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.

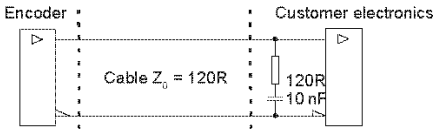
Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination



RM36SC – Absolute binary synchro-serial interface (SSI)

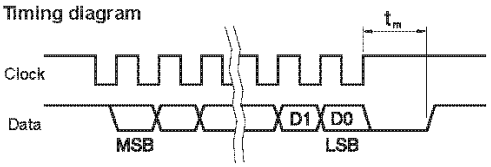
Serial encoded absolute position measurement

Power supply	V_{dd} = 5 V ± 5 %	
Power consumption	35 mA	
SSI output code	Natural binary	
Data output	Serial data (RS422)	
Data input	Clock (RS422)	
Repeatability	≤ 0.07°	
Maximum 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 (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
128, 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.

Timing diagram

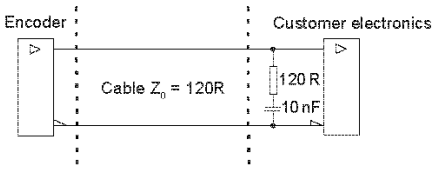


Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20.5 µs

Position increases for clockwise rotation of magnetic actuator.

Recommended signal termination

For data output lines only



RM36SI – Absolute binary synchro-serial (SSI) + Incremental, RS422, 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.

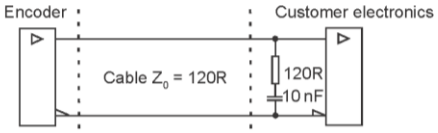
Power supply	V_{dd} = 5 V ± 5 %	
Power consumption	35 mA	
SSI output code	Natural binary	
Data output	Serial data (RS422)	
Data input	Clock (RS422)	
Incremental outputs	A, B, Z, A–, B–, Z– (RS422)	
Connector options	15 pin 'D' type plug (standard) Flying lead	
Maximum cable length	50 m	
Temperature	Operating	–40 °C to +125 °C (IP64) –40 °C to +85 °C (IP68)
	Storage	–40 °C to +85 °C

Resolution options (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
128, 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°

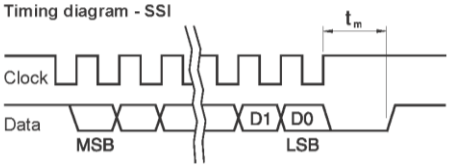
* Worst case within operational parameters including magnet position and temperature.

Recommended signal termination

For incremental signals + SSI data output lines only



Timing diagram - SSI

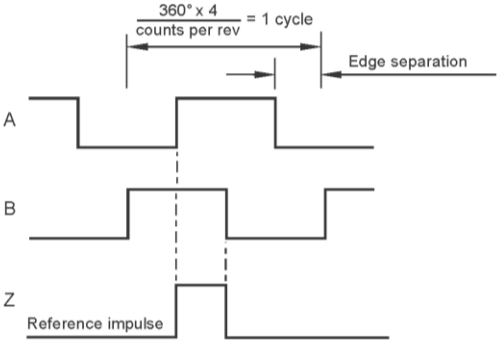


Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20.5 µs

Position increases for clockwise rotation of magnetic actuator.

Timing diagram - Incremental

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

RM36IA – Incremental, push-pull, 24 V

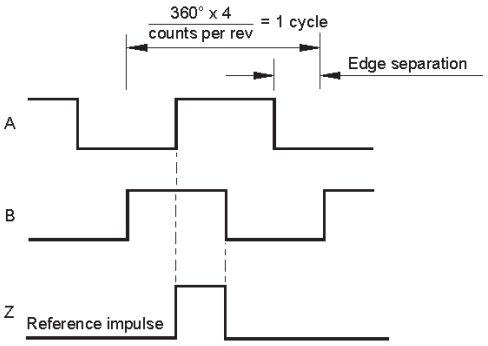
Power supply	V_{dd} = 8 V to 26 V	
Power consumption	50 mA	
Maximum output load	30 mA	
Output signals	A, B, Z, A–, B–, Z– (RS422)	
Resolution	80 to 2,048 pulses per revolution (320, 400, 500, 512, 800, 1,000, 1,024, 1,600, 2,000, 2,048, 4,096, 8,192 counts per revolution)	
Maximum cable length	20 m	
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 (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.

Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

RM36IB – Incremental, open collector NPN, 24 V

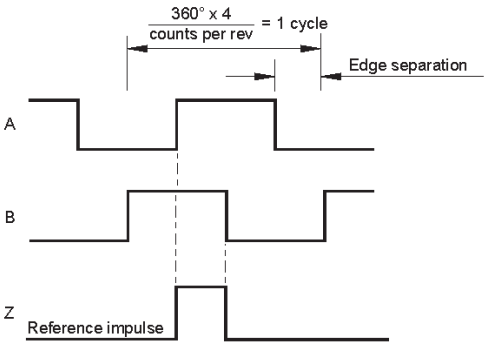
Square wave output

Power supply	V_{dd} = 8 V to 26 V	
Power consumption	50 mA	
Maximum output load	20 mA	
Output signals	A, B, Z	
Maximum cable length	20 m	
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

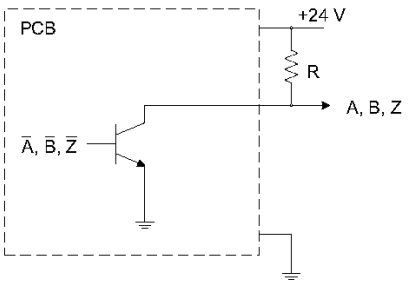
Resolution options (counts per revolution)	Maximum speed (rpm)	Accuracy*	Hysteresis
320, 400, 500	30,000	±0.7°	0.18°
512	30,000	±0.7°	0.45°
800, 1,000, 1,024	20,000	±0.5°	0.18°
1,600, 2,000, 2,048	10,000	±0.5°	0.18°
4,096	5,000	±0.5°	0.18°
8,192	2,500	±0.5°	0.18°

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

Timing diagram



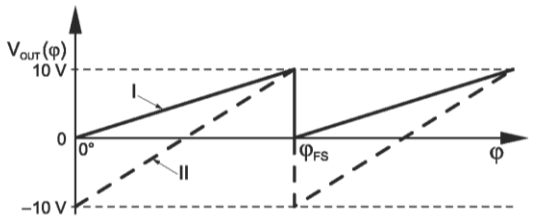
Recommended signal termination



RM36Vx – 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 %
Maximum cable length	20 m
Connector options	9 pin 'D' type plug (standard) Flying lead
Temperature	Operating –25 °C to +70 °C Storage –40 °C to +85 °C
Maximum speed	30,000 rpm

Electrical output/shaft position



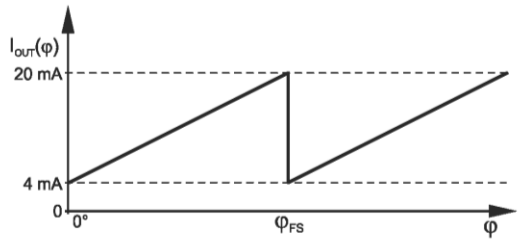
Output type and electrical variant

	Type I				Type II			
φ_{FS}	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**

RM36Cx - Linear current output

Power supply	V_{dd} = +20 V to +30 V DC
Power consumption	50 mA plus output current
Output current	4 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 –40 °C to +85 °C
Maximum speed	30,000 rpm

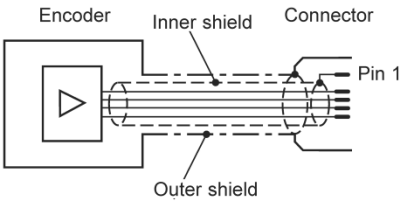
Electrical output/shaft position



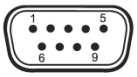
Output type and electrical variant

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

CONNECTIONS



RM36 S/I/V/C



D type connector - 9 way

Pin Nr.	RM36SC		RM36Ix		RM36Vx		RM36Cx		RM36SI	
	Function	Wire colour	Function	Wire colour	Function	Wire colour	Function	Wire colour	Function	Wire colour
1	Shield - see connection diagram				Shield - see connection diagram		Shield - see connection diagram			
2	Clock	White	Z	White	NC	-	NC	-	A+	Gray
3	Clock–	Brown	B	Green	V_{out}	Green	I_{out}	Green	A–	Pink
4	NC	-	A+	Grey	NC	-	NC	-	B+	Green
5	V_{dd}	Red	V_{dd}	Red	V_{dd}+	Red	V_{dd}	Red	B–	Yellow
6	Data	Green	Z– [1]	Brown	V_{dd}– [2]	Brown	NC	-	Ri+	White
7	Data–	Yellow	B– [1]	Yellow	NC	-	NC	-	Ri–	Brown
8	NC	-	A– [1]	Pink	NC	-	NC	-	V_{dd}	Red
9	GND	Blue	GND	Blue	0 V	Blue	0 V	Blue	Clock+	Black
10									Clock–	Violet
11									NC	-
12									Data+	Orange
13									Data–	Clear
14									NC	-
15									GND	Blue

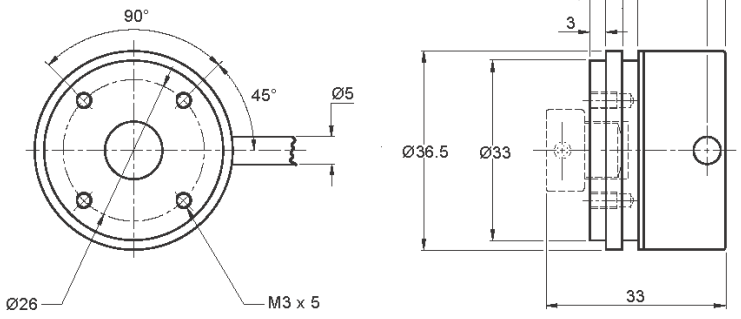
[1] Not available for IB variant

[2] For variants VM, VN, VP, VQ, VR, VS, VT, and VV only

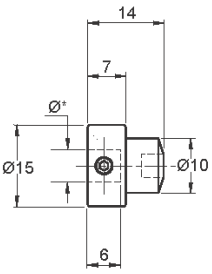
DIMENSIONS

Dimensions and tolerances in mm

Encoder body



Magnetic actuator



* Hole diameter for nominal shaft size.

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