Data sheet
RM44D06_06
Issue 6, 20th January 2023

RM44/RM58 rotary magnetic encoder with AM4096

The RM44/RM58 is an encoder for integration onto electric motors or other devices for measuring shaft position and rotational speed.

The solid metal housing provides highest IP protection classes, high EMC immunity, extended operating temperature range and best possible shock and vibration resistance.

The output signals are provided in industry standard absolute, incremental, analogue sinusoidal and linear voltage formats. Available are resolutions of up to 12 bit absolute SSI and/or 4,096 counts per revolution incremental for 5 V or 24 V power supply.

A system accuracy of ±0.5° can be achieved with the supplied magnet. For easy integration onto or into the shaft, a range of magnetic actuators is also available.

Product range

RM44/RM58AC
Analogue sinusoidal output with a single sine/cosine period per revolution.

RM44/RM58BC
Analogue complementary sinusoidal output with a single sine/cosine period per revolution.

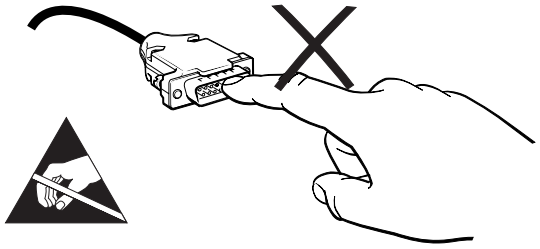
RM44/RM58I
Incremental with 80 to 2,048 pulses per revolution (320 to 4,096 counts per revolution with x 4 evaluation) and/or complementary analogue outputs with a single sine/cosine cycle per revolution.

RM44/RM58SC
Synchro serial interface (SSI) with 320 to 4,096 positions per revolution.

RM44/RM58SI
Synchro serial interface (SSI) with 320 to 4,096 positions per revolution and incremental with 80 to 2,048 pulses per revolution (320 to 4,096 counts per revolution with x 4 evaluation).

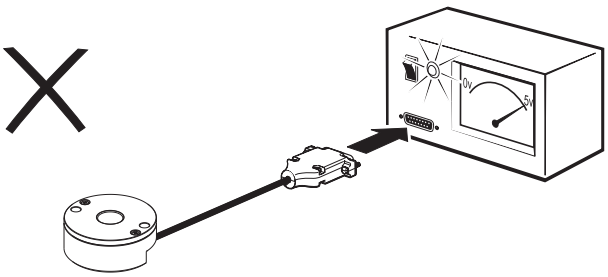
- **Easy to install – with self locating design**
- **Low cost for OEM integration**
- **Fully sealed to IP68**
- **High reliability from proven non-contact sensing technology**

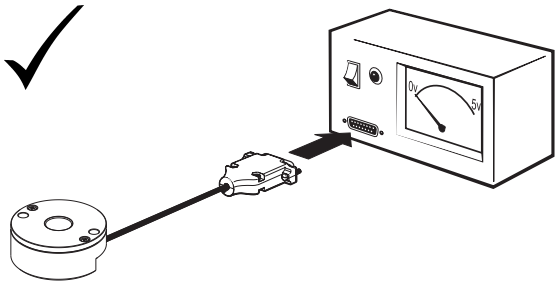
Storage and handling



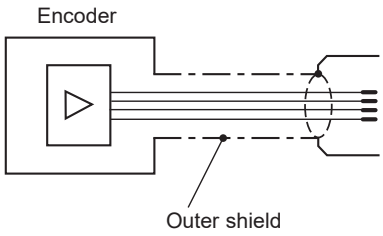
IMPORTANT: Power to RM44 encoders must be supplied from a DC SELV supply complying with the essential requirements of EN (IEC) 60950 or similar specification.

The RM44 series encoders have been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is critical.





Connections



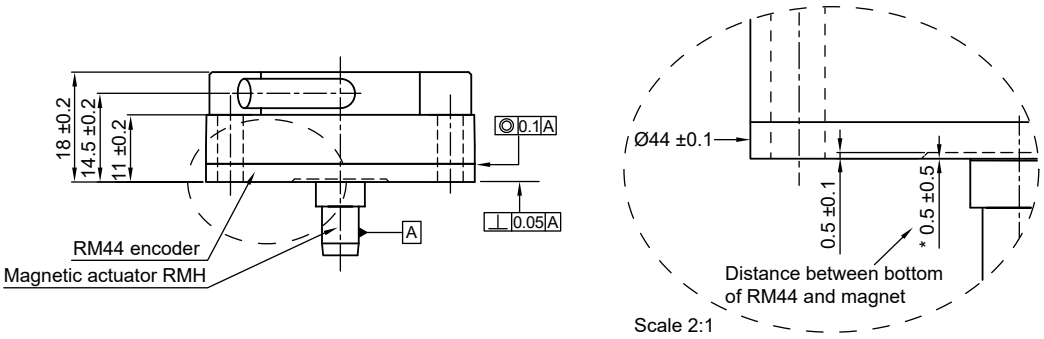
	RM44/RM58AC		RM44/RM58BC		RM44/RM58IA, IC		RM44/RM58IE		RM44/RM58SC		RM44/RM58SI	
Pin Nr.	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**
1	Shield - see connection diagram		Shield - see connection diagram				Shield - see connection diagram			Shield - see connection diagram		
2	V_A	Black	V_A	Green	Z+	White	Z	White	Clock	White	A+	Grey
3	V_B	Brown	V_B	Brown	B+	Green	B	Green	Clock–	Brown	A–	Pink
4	NC	-	NC	-	A+	Grey	A	Grey	NC	-	B+	Green
5	V_{dd}	Red	V_{dd}	Red	V_{dd}	Red	V_{dd}	Red	V_{dd}	Red	B–	Yellow
6	NC	-	$V_{A–}$	Yellow	Z–	Brown	NC	-	Data	Green	Z+	White
7	NC	-	$V_{B–}$	White	B–	Yellow	NC	-	Data–	Yellow	Z–	Brown
8	NC	-	NC	-	A–	Pink	NC	-	NC	-	V_{dd}	Red
9	GND	Orange	GND	Blue	GND	Blue	GND	Blue	GND	Blue	Clock+	Black
10											Clock–	Violet
11											NC	-
12											Data+	Grey/Pink
13											Data–	Red/Bue
14											NC	-
15											GND	Blue

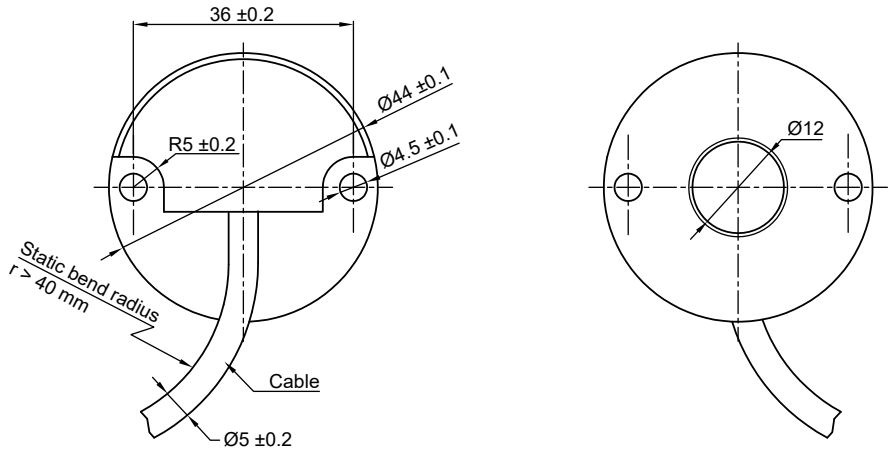
Operating and electrical specifications

EMC compliance	EN 61326
Cable	Outside diameter 5 mm
Mass	Encoder unit 1 m cable (no connector) IP64 112 g, IP68 129 g. Magnetic actuator <2 g
Environmental sealing	IP64 (IP68 optional) EN 60529

RM44 dimensions

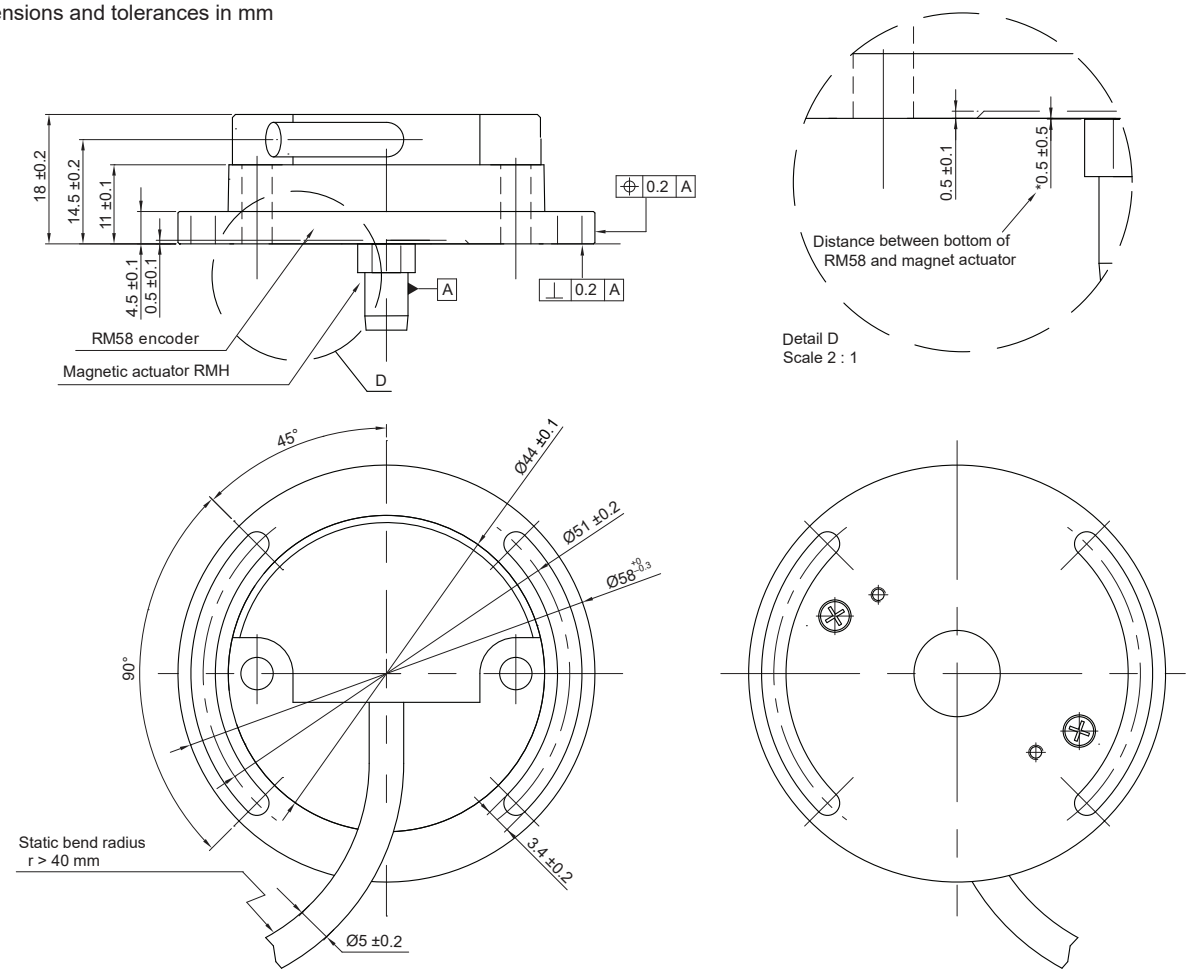
Dimensions and tolerances in mm





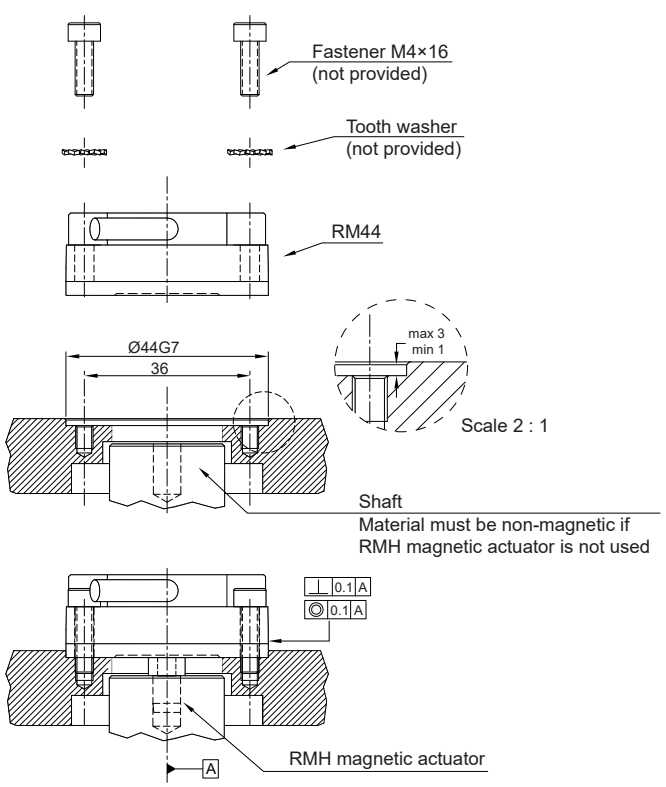
RM58 dimensions

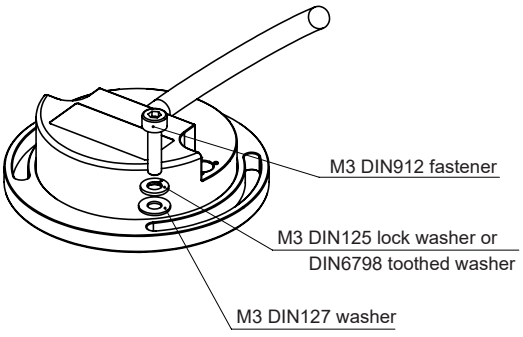
Dimensions and tolerances in mm



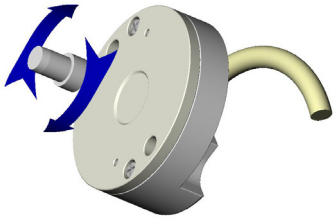
RM44 / RM58 installation drawing

Dimensions and tolerances in mm





Clockwise (CW) rotation of magnetic actuator

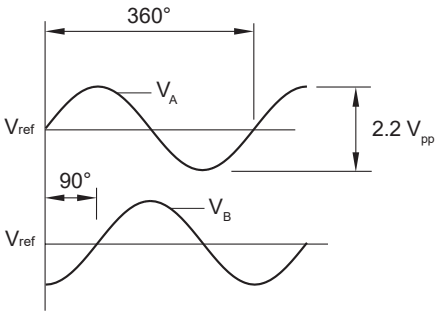


RM44AC / RM58AC – Analogue sinusoidal outputs

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

Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 30 mA
Outputs	Single ended
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	–30 °C to +80 °C

Timing diagram

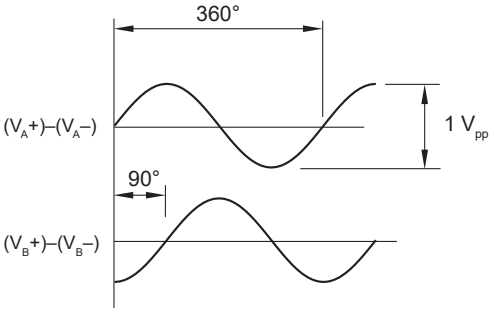


RM44BC / RM58BC – Analogue complementary sinusoidal outputs

2 channels V_A and V_B differential sinusoids

Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 30 mA
Outputs	Differential
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

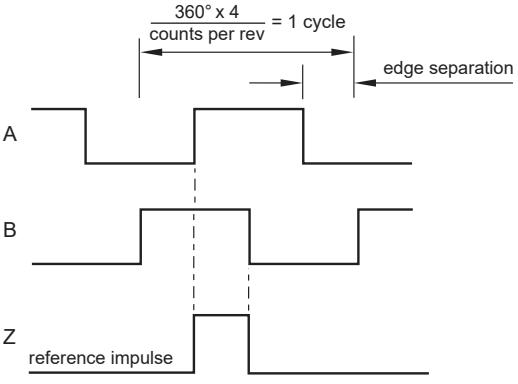


RM44IA / RM58IA – Incremental, Push-pull

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 (IP64) –40 °C to +85 °C (IP68)

Timing diagram



B leads A for clockwise rotation of magnet.

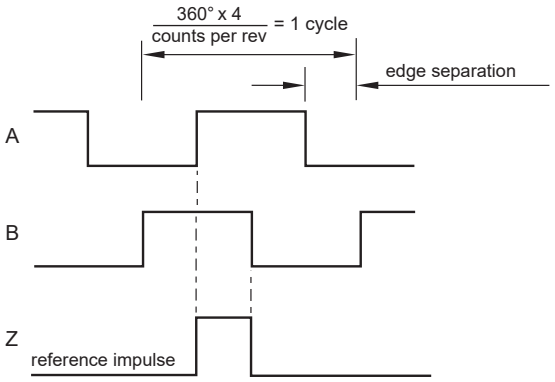
RM44IC / RM58IC– Incremental, RS422

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°
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 (IP64) –40 °C to +85 °C (IP68)

Timing diagram

Complementary signals not shown



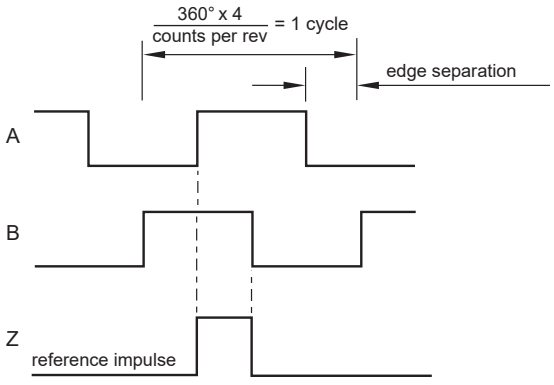
B leads A for clockwise rotation of magnet.

RM44IE / RM58IE – Incremental, Open Collector, NPN

Low cost alternative for ball bearing encoders

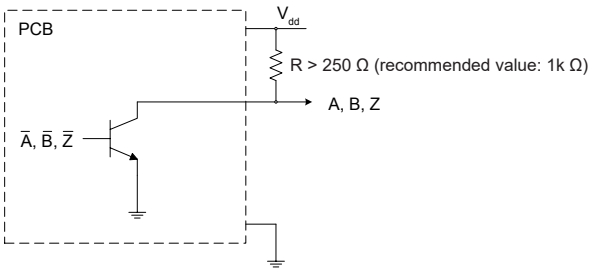
Power supply	V_{dd} = 5 V ±5 %
Current consumption	35 mA (not loaded)
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolutions	32, 64, 128, 256, 512, 1,024, 2,048, 4,096 cpr
Maximum speed	60,000 rpm for resolutions up to 1,024 cpr 30,000 rpm for 2,048 and 4,096 cpr
Temperature Operating and storage	–40 °C to +125 °C (IP64) –40 °C to +85 °C (IP68)

Timing diagram



B leads A for clockwise rotation of magnet.

Recommended signal termination

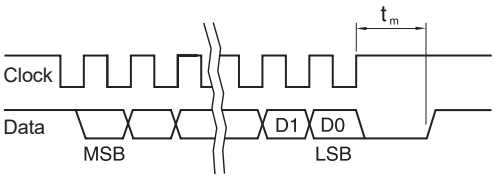


RM44SC / RM58SC – Absolute binary synchro-serial (SSI), RS422

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°
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 (IP64) –40 °C to +85 °C (IP68)

Timing diagram



Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20 µs

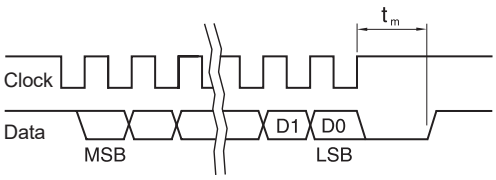
Position increases for clockwise rotation of magnet.

RM44SI / RM58SI – 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°
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 (IP64) –40 °C to +85 °C (IP68)

Timing diagram - SSI

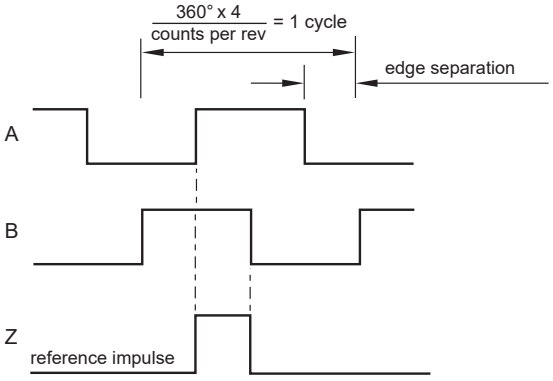


Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20.5 µs

Position increases for clockwise rotation of magnetic actuator.

Timing diagram - Incremental

Complementary signals not shown



B leads A for clockwise rotation of magnet.

Part numbering

Encoder system = Encoder body + Magnetic actuator or flange

RM44 encoder-sensor unit
eg. **RM44IC0013B10F2E10**

Magnetic actuator
eg **RMA06A3A00**

Flange
eg **RE58A10**

RM44 IC 00 12B 10 F 2 E 96

Series
RM44 - Ø44 mm body
RM58 - Ø58 mm body

Output type
AC - Absolute analogue single ended, 5 V
BC - Absolute analogue differential, 5 V
IA - Incremental, Push-pull, 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

Shaft size
00 - n/a

Resolution
For AC/BC: 01S - one sine/cosine period per revolution

For Ix, Sx output types: counts/positions per revolution:

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

Cable length
10 - 1.0 meter (or 10 meters if **1M** special requirement is chosen)

Connector options
A - 'D' type connector - 9 way
B - 'D' type connector - 15 way (for output type SI only)
F - Flying lead (no connector)

Body style and cable exit
2 - Cylindrical body, radial cable exit

Environment and material
E - IP64, die-cast body (Zinc alloy), standard EMC grade (standard)
F - IP68, die-cast body (Zinc alloy), standard EMC grade

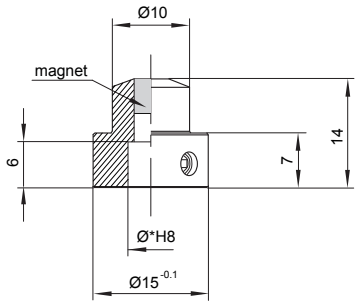
Special requirements
9M - With AM4096 and cable length in meters
96 - With AM4096 - up to 12 bit

NOTE: Not all combinations are valid.

Series	Output type	Shaft	Resolution	Cable length	Connector options	Body style and cable exit	Environment and material	Special requirements
RM44 / RM58	AC	00	01S	10	F	2	E / F	9M / 96
	BC							
	IA		05B / 06B/ 07B / 08B / 09B / 10B / 11B / 12B					
	IC							
	IE							
	SC							
	SI							

Magnetic actuators and magnets ordering information

Actuator for integration onto shaft



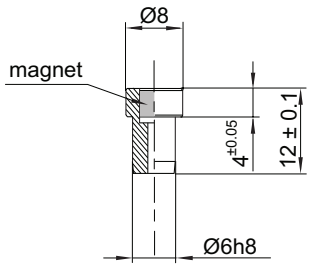
Shaft = Ø*h7
Fixing: Grub screw provided

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



Hole = Ø6G7
Fixing: Adhesive (recommended – LOCTITE 648 or LOCTITE 2701)

Part numbers:

For resolutions up to 9 bit absolute (512 cpr incremental)
RMH06A2A00

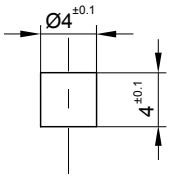
For resolutions from 10 bit absolute (800 cpr incremental) and above
RMH06A3A00

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: Adhesive (recommended – LOCTITE 648 or LOCTITE 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)

RE58 flange part numbering

Refer to RE58 datasheet for further details.

Part numbers:

RE58A10 - Ø58 mm, 10 mm shaft

RE58B06 - Ø58 mm, 6 mm shaft

RE58C10 - Ø58 mm, 10 mm shaft

All RE58 flanges are supplied with required washer and M4 fasteners for RM44 encoder attachment.

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Document issues

Issue	Date	Page	Amendments done
1	19. 12. 2019	General	New document
2	22. 9. 2020	1, 2, 5, 8	RM44/RM58AC and RM44/RM58BC outputs added
		3, 4	Dimensions drawing amended
		5, 8	RM44/RM58IA description amended
3	6. 9. 2021	5	RM44AC/RM58AC temperature range amended
4	14. 2. 2022	2, 8	Connections description amended and connector added
5	14. 6. 2022	2	Connections description amended
6	20. 1. 2023	3, 4	Dimensions drawing amended
		5	Temperature data amended