RE58
Rotary Magnetic Shaft Encoder

EXCELLENT PRICE PERFORMANCE RATIO

HIGHLY RELIABLE

EASY TO REPLACE PARTS

The RE58 is a robust industrial standard rotary magnetic encoder consisting of two parts: the RM44 magnetic encoder and various 58 mm flanges.
The solid metal housing of the RM44 encoder offers the highest IP protection class, high EMC immunity, an extended operating temperature range and the best possible shock and vibration resistance.

Features and benefits

- Robust modular design
- Industry standard absolute, incremental and analogue output options
- Accuracy to ±0.5°
- High reliability from proven non-contact encoder technology
- Easy to install
- Excellent price-performance

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General information

The RE58 is an encoder for position and speed control. A magnet is mounted within the shaft. Rotation of this magnet is sensed by the RM44 encoder.

The output signals are provided in industry standard absolute, incremental and analogue sinusoidal formats. Available are resolutions of up to 14 bit absolute SSI and/or 16,384 counts per revolution incremental for 5 V or 24 V power supply. A system accuracy of ±0.5° can be achieved.

RE58 rotary shaft encoder system

=

RM44 encoder
(available separately)

+

Mounting flange
(available separately)

Choose your RE58 system

The RE58 is a pre-assembled encoder system with a non-contact RM44 encoder attached to the back of the mounting flange. If one of the parts of the RE58 system needs to be replaced, this can easily be done without causing any damage to the other part of the RE58 system.

RE58-A encoder

RE58-B encoder

RE58-C encoder

Product range

AC

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

BC

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

DC

BiSS C interface with up to 16,384 positions per revolution and optional revolution counter.

I

Incremental with up to 4,096 pulses per revolution (320 to 16,384 counts per revolution with 4× evaluation).

SC

Synchro serial interface (SSI) with up to 16,384 positions per revolution.

SI

Synchro serial interface (SSI) with 320 to 8,192 positions per revolution and incremental with 80 to 2,048 pulses per revolution (320 to 8,192 counts per revolution with 4× evaluation).

Ux

Commutation single ended and incremental with line driver with up to 8 pole pairs and 4096 counts per revolution.

Vx

Linear voltage output in a range of variants.

Wx

Commutation with line driver and incremental with line driver with up to 8 pole pairs and 4096 counts per revolution.

Selection guide

		Power supply	
Product	**Available outputs**	**5 V**	**24 V**
RE58	AC - Analogue sinusoidal outputs	✓	-
	BC - Analogue complementary sinusoidal outputs	✓	-
	DC - Absolute natural binary BiSS-C interface, RS422	✓	-
	IA - Incremental, push-pull	-	✓
	IB - Incremental, open collector NPN	-	✓
	IC - Incremental, RS422	✓	-
	IE - Incremental, open collector	✓	-
	IG - Incremental, push-pull	-	✓
	SC - Absolute binary synchro-serial interface (SSI), RS422	✓	-
	SI - Absolute binary synchro-serial (SSI) + Incremental, RS422	✓	-
	Ux - Commutation single ended + incremental with line driver	✓	-
	Vx - Linear voltage output	✓	-
	Wx - Commutation with line driver + incremental with line driver	✓	-

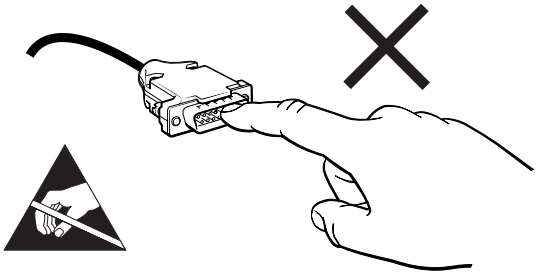
Storage and handling

Operating and storage temperature

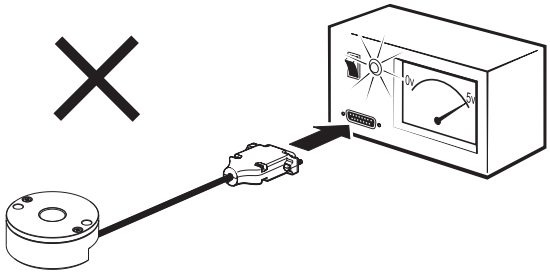
–40 °C to +125 °C (IP64)
–40 °C to +85 °C (IP68)
–30 °C to +80 °C (for AC and Vx output)

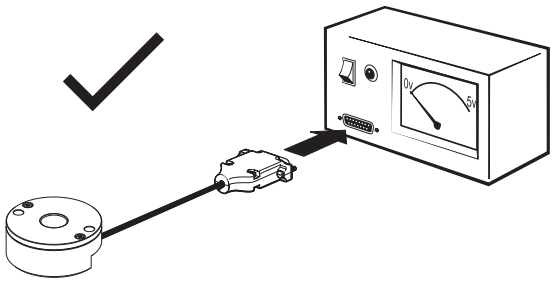
Humidity

Up to IP68



Power to RE58 encoders must be supplied from a DC SELV supply complying with the essential requirements of EN (IEC) 60950 or similar specification. The RE58 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.





Readhead is ESD sensitive - handle with care.
Do not touch electronic circuit, wires or sensor area without proper ESD protection or outside of ESD controlled environment.

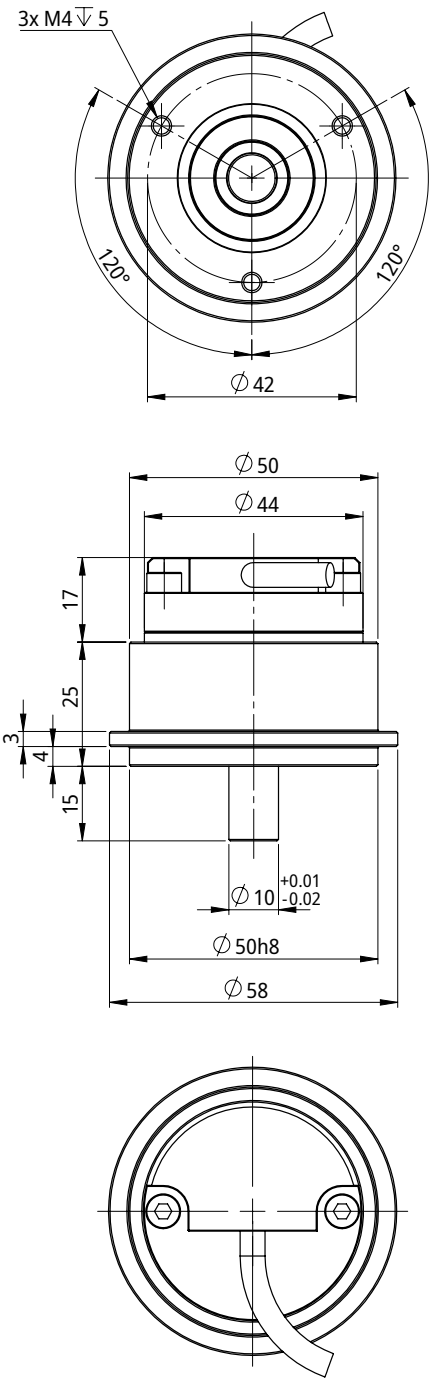
Packaging

Each encoder is packed individually in an antistatic bag.

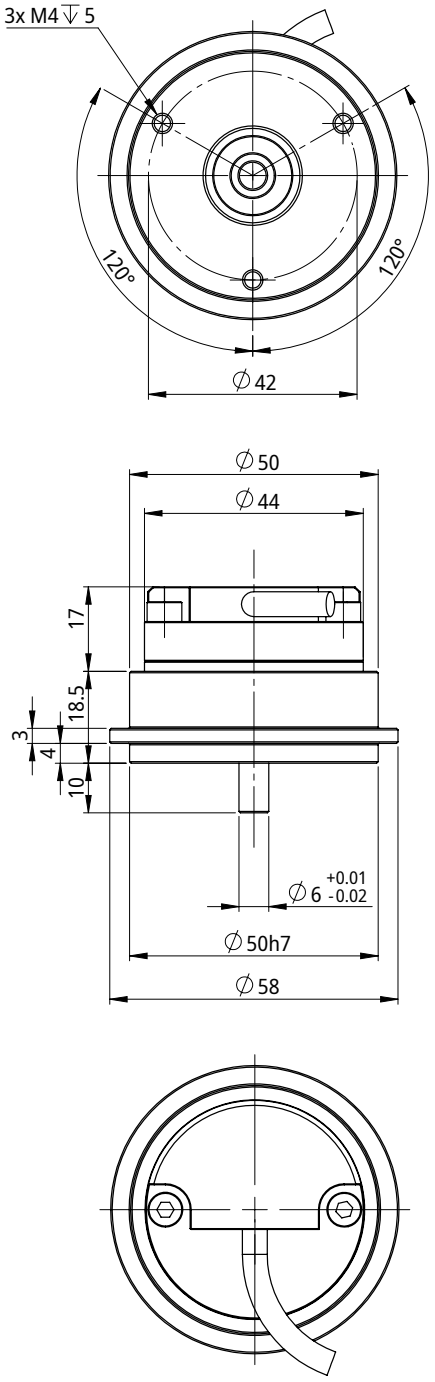
Dimensions and installation drawings

Dimensions and tolerances are in mm.

RE58-A encoder (with RE58A10 mounting flange)



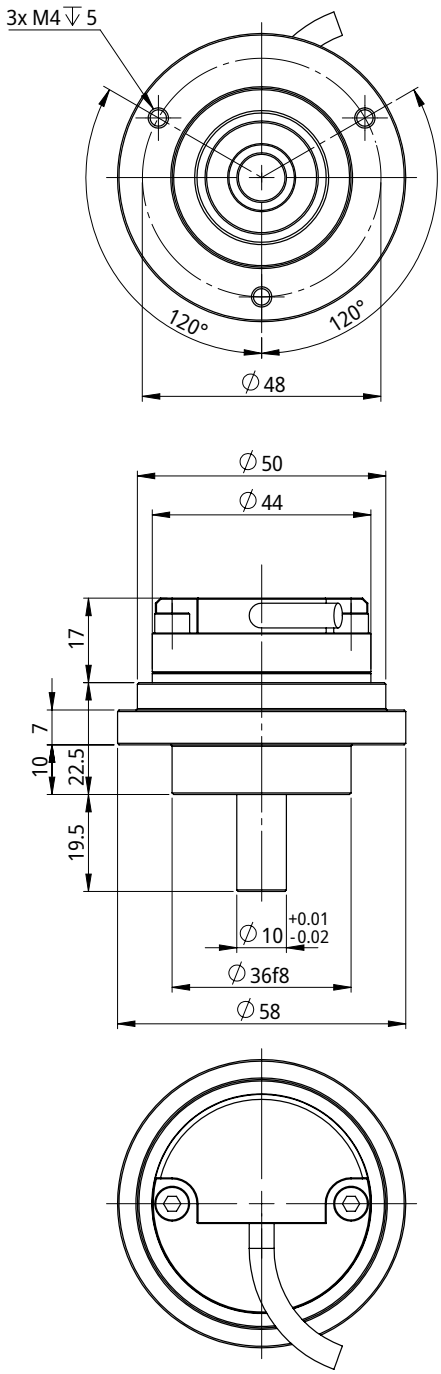
RE58-B encoder (with RE58B06 mounting flange)



Dimensions and installation drawings continued

Dimensions and tolerances are in mm.

RE58-C encoder (with RE58C10 mounting flange)



Technical specifications

System data

Resolution	Up to 14 bits
Maximum speed	17,000 rpm
Hysteresis	0.18°
System accuracy	Typ. ± 0.5°
Set-up time	100 ms (first data ready after supply voltage is in range), worst case: 200 ms

Mechanical data

Cable	Outside diameter 5 mm
Mass (encoder with 1 m cable, no connector)	IP64: RE58-A: 292 g, RE58-B: 227 g; RE58-C: 245 g IP68: RE58-A: 309 g, RE58-B: 244 g; RE58-C: 262 g

Environmental data

Temperature	Operating and storage	–40 °C to +125 °C (IP64), –40 °C to +85 °C (IP68) –30 °C to +80 °C (AC and Vx output)
EMC compliance		EN 61326
Environmental sealing		IP64 (IP68 optional), EN 60529
Shock		100 G (6 ms, standard EN 60068-2-27:2009)
Vibration		40 G (55 Hz–2000 Hz, standard EN 60068-2-6:2008)
Temperature drift error		0.004°/°C

Electrical connections

Output type

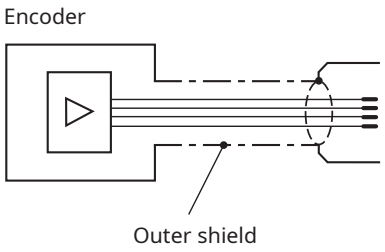
AC		BC		DC		IA, IC, IG		IB, IE	
Function	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**
Shield - see connection diagram									
V_A	Black	V_A	Green	Vdd	Red	V_{dd}	Red	Vdd	Red
V_B	Brown	V_B	Brown	GND	Blue	GND	Blue	GND	Blue
V_{dd}	Red	V_{dd}	Red	MA+	White	A+	Grey	A+	Grey
GND	Orange	V_{A-}	Yellow	SLO+	Green	B+	Green	B+	Green
-	-	V_{B-}	White	MA–	Brown	Z+	White	Z+	White
-	-	GND	Blue	SLO–	Yellow	A–	Pink	-	-
-	-	-	-	-	-	B–	Yellow	-	-
-	-	-	-	-	-	Z–	Brown	-	-

Output type

SC		SI		Ux		Vx		Wx	
Function	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**	**Function**	**Wire colour**
Shield - see connection diagram									
V_{dd}	Red	V_{dd}	Red	V_{dd}	Red	V_{out}	Black	V_{dd}	Red
GND	Blue	GND	Blue	GND	Blue	V_{dd}	Red	GND	Blue
Clock+	White	A+	Grey	A+	Grey	GND	Orange	U–	Green/Black
Data+	Green	B+	Green	A–	Pink	-	-	U+	Black
Clock–	Brown	Z+	White	B+	Green	-	-	V–	Brown/ Black
Data–	Yellow	A–	Pink	B–	Yellow	-	-	V+	Violet
-	-	B–	Yellow	Z+	White	-	-	W–	White/Black
-	-	Z–	Brown	Z–	Brown	-	-	W+	Yellow/Black
-	-	Clock+	Black	U	Black	-	-	A–	Pink
-	-	Data+	Grey/Pink	V	Violet	-	-	A+	Grey
-	-	Clock–	Violet	W	Grey/Violet	-	-	B–	Yellow
-	-	Data–	Red/Blue	-	-	-	-	B+	Green
-	-	-	-	-	-	-	-	Z–	Brown
-	-	-	-	-	-	-	-	Z+	White

Shield connection

Figure below shows a recommended shield termination in order to ensure electromagnetic compatibility.



Housing of the encoder is galvanically connected with the housing of the connector via the cable outer shield. The encoder system must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

Cable

Output type	**BC, DC, IA, IB, IC, IE, IG, SC**	**AC, Vx**	**SI**
Configuration	4 × 2 × 0.14 mm² (Twisted pairs)	4 × 0.20 mm²	12 × 0.14 mm²
Outer diameter		Approx. 5 mm	
Wires AWG	AWG 26	AWG 24	AWG 26
Rated voltage	250 V	300 V	150 V
Mass	38 g/m	38 g/m	40 g/m

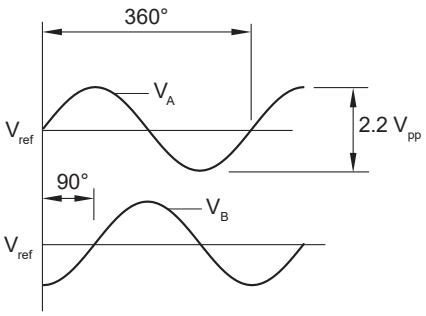
Output types

AC – Analogue sinusoidal output

Specifications

Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 30mA
Outputs	Single ended
Signal amplitude	2.2 ±0.2 V_{pp}
Signal offset (V_{ref})	2.5 V ±1 %
Internal serial impedance	100 Ω
Maximum cable length	3 m

Timing diagram

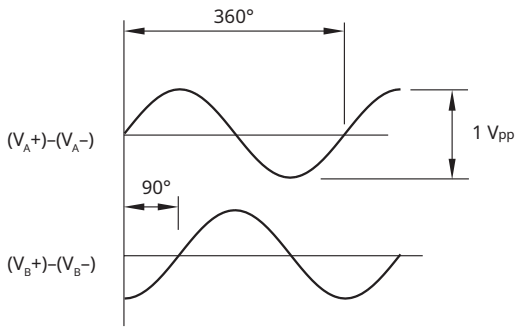


BC – Analogue sinusoidal output

Specifications

Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 30 mA
Outputs	Differential V_{A+}, V_{B+}, V_{A-}, V_{B-}
Internal serial impedance	10 Ω
Signal amplitude	0.5 ±0.1 V_{pp}
Signal offset (Vref)	0 ±5 mV

Timing diagram

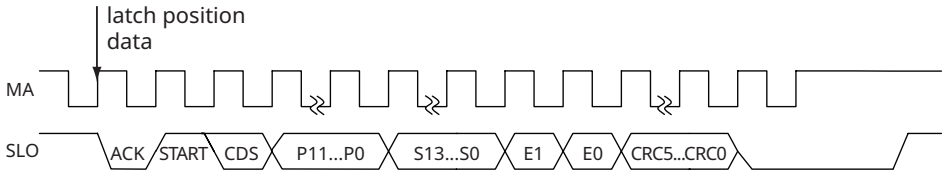


DC – Absolute natural binary BiSS C interface

Specifications

Output code	Natural binary
Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 65 mA
Clock input	MA (RS422)
Data output	SLO (RS422)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4000, 4096, 8000, 8192, 16000, 16384 positions per revolution
Max MA frequency	8 MHz

Timing diagram

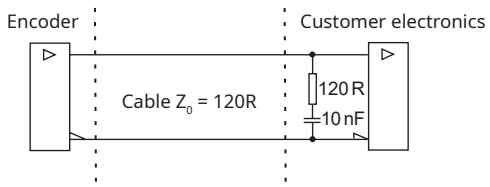


Data	Length	Description
P11 – P0	0 to 12 bit	Revolution counter value (length depends on the settings chosen)
S13 – S0	7 to 14 bit	Position inside the revolution (length depends on the resolution)
E1 – E0	2 bit	Error data
CRC5 – CRC0	5 to 6 bit	Cyclic redundancy check data; polynomial 0x43; inverted bit output

Error	E0	E1
No error	1	1
Amplitude error	0	1
Too high velocity	1	0
Undervoltage; Configuration; System error	0	0

For more information on BiSS C protocol please visit **www.biss-interface.com.**

Recommended signal termination



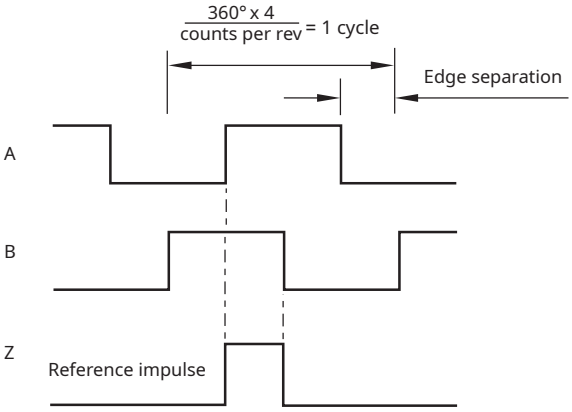
IA – Incremental, push-pull

Specifications

Power supply	V_{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z, A–, B–, Z–
Maximum output load	30 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32 to 2,048 pulses per revolution (128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution)
Maximum cable length	20 m

Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

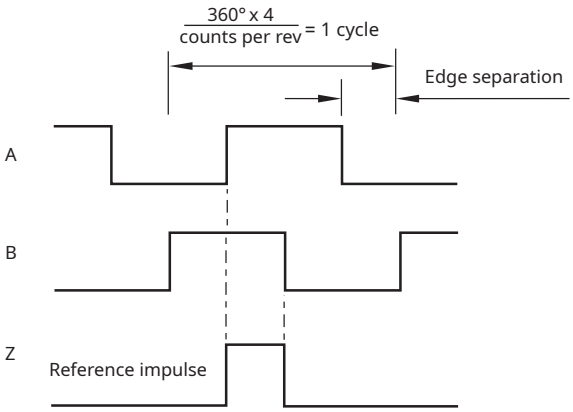
IB – Incremental, open collector NPN

Specifications

Power supply	V_{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z
Maximum output load	20 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32 to 2,048 pulses per revolution (128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution)
Maximum cable length	20 m

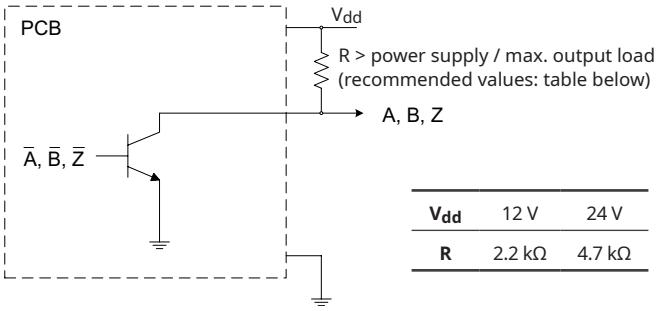
Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination



V_{dd}	12 V	24 V
R	2.2 kΩ	4.7 kΩ

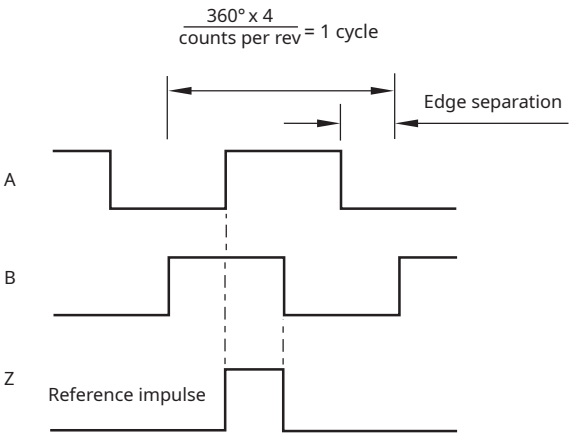
IC – Incremental, RS422 output

Specifications

Power supply	V_{dd} = 5 V ±5 %
Current consumption	65 mA
Output signals	A, B, Z, A–, B–, C– (RS422)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32 to 4,096 pulses per revolution (128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4000, 4096, 8000, 8192, 16000, 16384 counts per revolution)
Maximum cable length	50 m

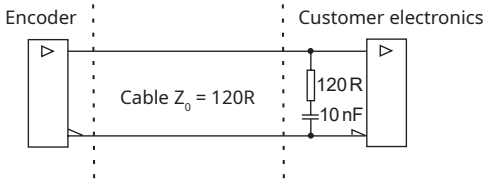
Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination



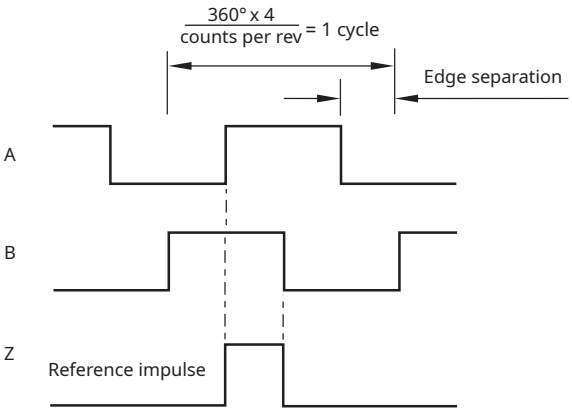
IE – Incremental, open collector

Specifications

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°
Resolution	32 to 2,048 pulses per revolution (128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution)
Maximum cable length	20 m

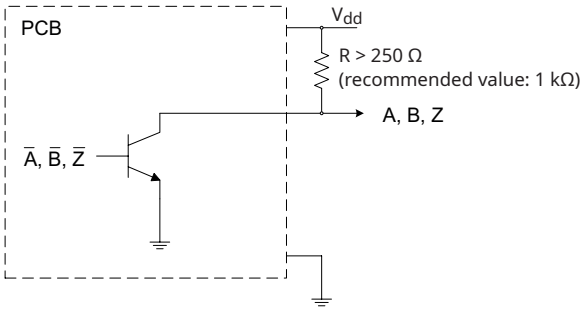
Timing diagram

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination



IG – Incremental, push-pull

Specifications

Power supply	V_{dd} = 8 V to 26 V
Current consumption	50 mA
Output signals	A, B, Z, A–, B–, Z– (5 V RS422)
Maximum output load	30 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32 to 2,048 pulses per revolution (128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192 counts per revolution)
Maximum cable length	20 m

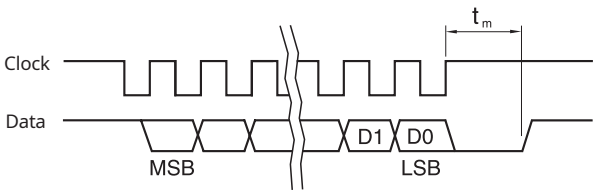
For the timing diagram and recommended signal termination please see the **RE58IC output**.

SC – Absolute binary synchro-serial interface (SSI)

Specifications

Output code	Natural binary
Power supply	V_{dd} = 5 V ±5 %
Current consumption	Max. 65 mA
Data output	Serial data (RS422)
Data input	Clock (RS422)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192, 16000, 16384 positions per revolution
Maximum cable length	100 m (at 1MHz)

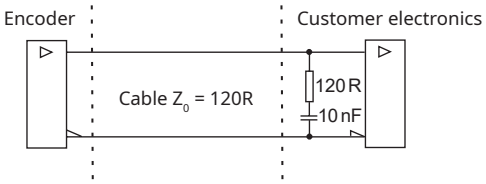
Timing diagram



Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20.5 µs

Position increases for clockwise rotation of magnetic actuator.

Recommended signal termination



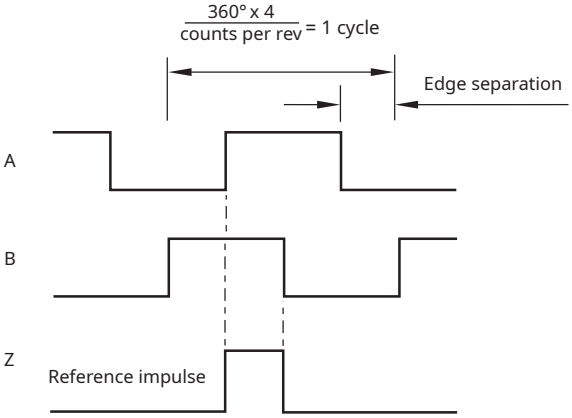
SI – Absolute binary synchro-serial interface (SSI) + Incremental, RS422

Specifications

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)
Incremental outputs	A, B, Z, A–, B–, Z– (RS422)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Resolution	32 to 2048 pulses per revolution (128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096, 8192, 16000, 16384 counts per revolution)
Maximum cable length	50 m

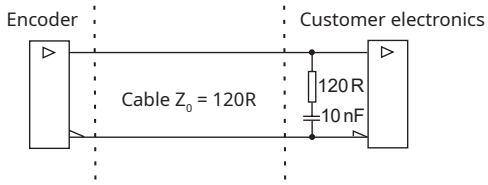
Timing diagram

Complementary signals not shown

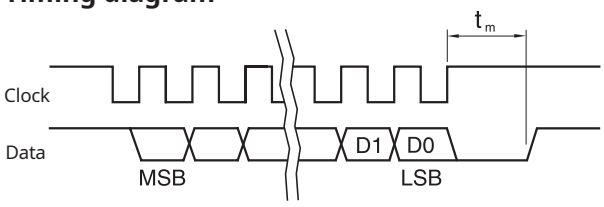


B leads A for clockwise rotation of magnetic actuator.

Recommended signal termination



Timing diagram



Clock ≤ 4 MHz 12.5 µs ≤ t_m ≤ 20.5 µs

Position increases for clockwise rotation of magnetic actuator.

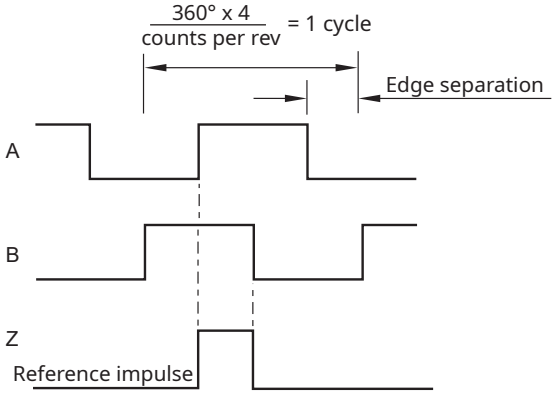
Ux – Commutation single ended + incremental with line driver

Specifications

Power supply	V_{dd} = 5 V ±10 %
Current consumption	30 mA (not loaded)
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Incremental outputs	A, B, Z, A–, B–, Z– (5 V RS422)
Incremental resolutions	128, 256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096 counts per revolution
Commutation outputs	U, V, W (±24 mA output drive)
Number of poles for commutation outputs	2, 4, 6, 8, 10, 12, 14, 16

Timing diagram - Incremental

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

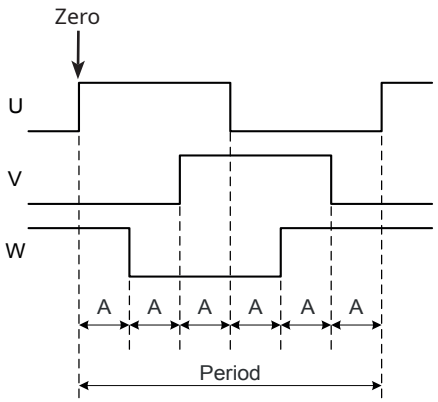
UVW outputs

Pole	A	Period	Pole pairs*
2	60°	360°	1
4	30°	180°	2
6	20°	120°	3
8	15°	90°	4
10	12°	72°	5
12	10°	60°	6
14	8.57°	51.42°	7
16	7.50°	45°	8

* Number of pole pairs equals number of periods per revolution.

Timing diagram - Commutation

Complementary signals not shown

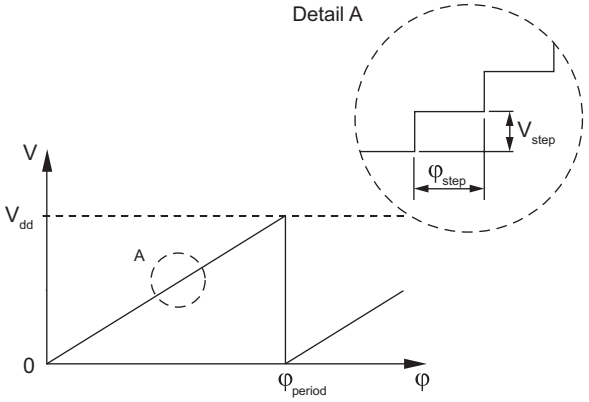


Vx – Linear voltage output

Specifications

Power supply	V_{dd} = 5 V ±5 %
Current consumption	Typ. 26 mA
Output voltage	0 V to V_{dd}
Output loading	Max. 10 mA
Nonlinearity	1 %
Maximum cable length	20 m

Timing diagram



$$\varphi_{step} = \frac{\varphi_{period}}{N_{step}} \qquad V_{step} = \frac{V_{dd}}{N_{step}}$$

φ_{period}	N_{period}	N_{step}	φ_{step}
360°	1	1,024	0.35°
180°	2	1,024	0.18°
90°	4	1,024	0.09°
45°	8	512	0.09°

φ_{period} = Angle covered in one period (one sawtooth)

V_{period} = Output voltage range for one period

φ_{step} = Step angle (angular movement needed to register a change in the position)

V_{step} = Output voltage range for one step

N_{period} = Number of periods in one revolution

N_{step} = Number of steps in one period

Output type and electrical variant

Rotation \ φ_{period}	360°	180°	90°	45°
Clockwise	VA	VB	VC	VD
Counterclockwise	VE	VF	VG	VH

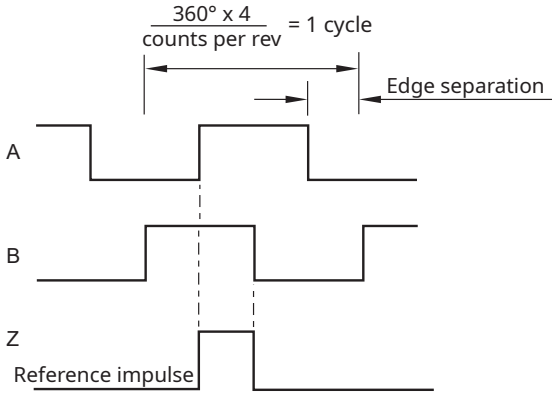
Wx – Commutation with line driver + incremental with line driver

Specifications

Power supply	V_{dd} = 5 V ±5 %
Current consumption	30 mA
Accuracy	Typ. ±0.5°
Hysteresis	0.18°
Incremental outputs	A, B, Z, A–, B–, Z– (5 V RS422)
Incremental resolutions	256, 320, 400, 500, 512, 800, 1000, 1024, 1600, 2000, 2048, 4096 counts per revolution
Commutation outputs	U, V, W, U–, V–, W– (RS422)
Number of poles for commutation outputs	2, 4, 6, 8, 10, 12, 14, 16

Timing diagram - Incremental

Complementary signals not shown



B leads A for clockwise rotation of magnetic actuator.

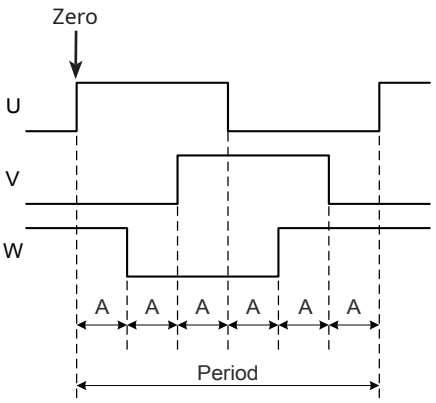
UVW outputs

Pole	A	Period	Pole pairs*
2	60°	360°	1
4	30°	180°	2
6	20°	120°	3
8	15°	90°	4
10	12°	72°	5
12	10°	60°	6
14	8.57°	51.42°	7
16	7.50°	45°	8

* Number of pole pairs equals number of periods per revolution.

Timing diagram - Commutation

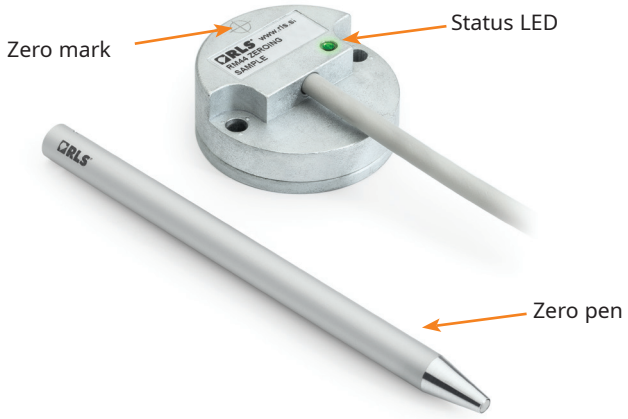
Complementary signals not shown



Zero position setting procedure

External zeroing

The RE58 with external zeroing is designed for setting the encoder zero position by using zero pen. It is designed for power supply voltage of 5 V only.



Status indicator LED

LED	Status
Green	Normal operation
Red	Zero position
No light	Presence of Zero pen

1. Install the RE58 encoder.
2. Set the mechanical zero position.
3. Use the zero pen to set the encoder zero position (see image):
   3.1 Touch the Zero mark with the apex of the Zero pen - the status LED goes off.
   3.2 Hold the Zero pen for 3 seconds.
   3.3 The new Zero position is set when status LED goes RED.

Part numbering

RE58 IC 0A 13B 10 F 2 E 10

Output type

AC - Analogue sinusoidal, 5 V
BC - Analogue complementary sinusoidal, 5 V
DC - Absolute BiSS C, 5 V
IA - Incremental, push pull, 24 V
IB - Incremental, open collector NPN, 24 V
IC - Incremental, RS422, 5 V
IE - Incremental, open collector, 5 V
IG - Incremental, RS422, 5 V, supply 24 V
SC - Absolute binary synchro-serial (SSI), RS422, 5 V
SI - SSI + Incremental, RS422, 5 V

Ux - Commutation single ended + incremental with line driver
Wx - Commutation with line driver + incremental with line driver

A - One period per revolution (2 poles)
B - Two periods per revolution (4 poles)
C - Three periods per revolution (6 poles)
D - Four periods per revolution (8 poles)
E - Five periods per revolution (10 poles)
F - Six periods per revolution (12 poles)
G - Seven periods per revolution (14 poles)
H - Eight periods per revolution (16 poles)

Vx - Linear voltage 0–5 V, supply 5 V

A - Clockwise, 360°
B - Clockwise, 180°
C - Clockwise, 90°
D - Clockwise, 45°
E - Counterclockwise, 360°
F - Counterclockwise, 180°
G - Counterclockwise, 90°
H - Counterclockwise, 45°

Shaft size

0A - With RE58A10 flange
0B - With RE58B06 flange
0C - With RE58C10 flange

Resolution

For **AC**, **BC**: **01S** - One sine/cosine period per revolution
For **Vx: 10B / 10Z -** 1024 counts or positions per revolution
For **DC, IC and SC** (counts/positions per revolution):

Decimal				
16D - 16000	4D0 - 4000	1D6 - 1600	D50 - 500	D32 - 320
10D - 10000	3D6 - 3600	1D0 - 1000	D40 - 400	
8D0 - 8000	2D0 - 2000	D80 - 800	D36 - 360	

Binary		
14B - 16384	11B - 2048	08B - 256
13B - 8192	10B - 1024	
12B - 4096	09B - 512	

For **IA, IB, IE, IG, SI, Ux, Wx** (counts/positions per revolution):

Decimal	Binary	Zeroing binary (only for IC, SC, Ux, Vx)	
D32 - 320	**07B** - 128	**05Z** - 32	**09Z** - 512
D40 - 400	**08B** - 256	**06Z** - 64	**10Z** - 1024
D50 - 500	**09B** - 512	**07Z** - 128	**11Z** - 2048
D80 - 800	**10B** - 1024	**08Z** - 256	**12Z** - 4096
1D0 - 1000	**11B** - 2048		
1D6 - 1600	**12B** - 4096		
2D0 - 2000	**13B** - 8192		

Not all part number combinations are valid. Please refer to the table on the next page for available options.

Cable length

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

Connector options

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

10 - No special requirements
1M - Cable length in meters
96 - With AM4096 (for output types **AC**, **BC**, **IA**, **IB**, **IC**, **IE**, **SC** and **SI** only)
9M - With AM4096 (for output types **AC**, **BC**, **IA**, **IB**, **IC**, **IE**, **SC** and **SI** only) and cable length in meters

Table of available combinations

Series	Output type	Shaft size	Resolution	Cable length	Connector options	Body style and cable exit	Environment and material	Special requirements
RE58	AC	0A / 0B / 0C	01S	10	F	2	E / F	96 / 9M
	BC							
	IG		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B					10 / 1M
	DC		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12B / 11B / 10B / 09B / 08B / 07B / 14B / D36 / 3D6 / 4D0 / 8D0 / 10D / 16D					10 / 1M
	IA / IB		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B					10 / 1M
			12B / 11B / 10B / 09B / 08B / 07B					96 / 9M
	IC		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12Z / 11Z / 10Z / 09Z / 08Z / 07Z / 06Z / 05Z / 14B / D36 / 3D6 / 4D0 / 8D0 / 10D / 16D					10 / 1M
			12B / 11B / 10B / 09B / 08B / 07B					96 / 9M
	IE		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B					10 / 1M
			12B / 11B / 10B / 09B / 08B / 07B					96 / 9M
	SC		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B / 12Z / 11Z / 10Z / 09Z / 08Z / 07Z / 06Z / 05Z / 14B / D36 / 3D6 / 4D0 / 8D0 / 10D / 16D					10 / 1M
			12B / 11B / 10B / 09B / 08B / 07B					96 / 9M
	SI		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B					10 / 1M
			12B / 11B / 10B / 09B / 08B / 07B					96 / 9M
	Ux		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 13B					10 / 1M
			12B / 11B / 10B / 09B / 08B / 12Z / 11Z / 10Z / 09Z / 08Z / 07Z / 06Z / 05Z					
	Vx		10B / 10Z					10 / 1M
	Wx		2D0 / 1D6 / 1D0 / D80 / D50 / D40 / D32 / 12B / 11B / 10B / 09B / 08B					10 / 1M

Accessories

Zeroing pen
ZEROPEN00

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Document issues

Issue	Date	Page	Description
2	16. 5. 2022	All	Accuracy, AC/BC pinout and high speed data amended
3	19. 5. 2023	19	BC output type description amended
4	30. 6. 2023	13	Timing diagram and recommended signal termination rearranged.
5	11. 12. 2025	-	14 bits resolution added
		8	Vx output amended
		9	Cable chapter added
		21	Zero position chapter added
		22, 23	Part numbering amended

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