

RE22 rotary magnetic shaft encoder



The RE22 is a compact, high-speed rotary magnetic encoder designed for use in harsh environments. The traditional design allows for easy integration to existing machines.

A magnet is mounted to the shaft within the encoder body. Rotation of this magnet is sensed by a custom encoder chip within the body, and processed to give the required output format.

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

The compact encoder body is just 22 mm in diameter and provides dirt immunity up to IP68.

The RE22 can be used in a wide range of applications including marine, medical, print, converting, industrial automation, metal working and instrumentation.

Product range

RE22AC

Analogue with a single sine/cosine cycle per revolution

RE22BC

Complementary analogue outputs with a single sine/cosine cycle per revolution

RE221C

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

RE22SC

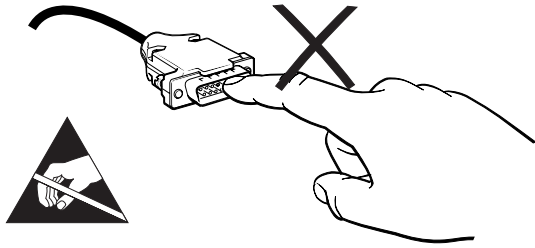
Synchro serial interface (SSI) with 320 to 8,192 positions per revolution

RE22Vx

Linear voltage output in a range of variants

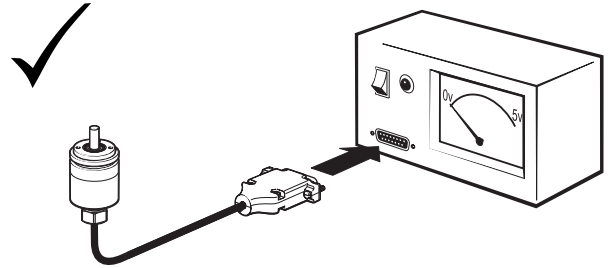
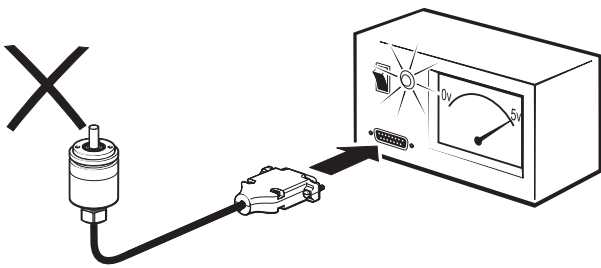
- Excellent immunity to IP68
- High speed operation to 30,000 rpm
- Compact - 22 mm diameter body
- Absolute - to 13 bit (8,192 ppr)
- Industry standard absolute, incremental, analogue and linear output formats
- Accuracy to $\pm 0.3^\circ$
- Simple integration

Storage and handling

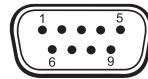
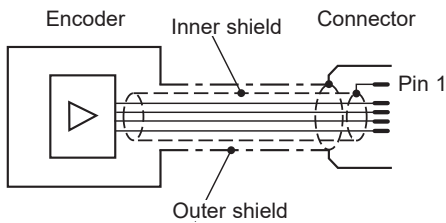


IMPORTANT: Power to RE22 encoders must be supplied from a DC SELV supply complying with the essential requirements of EN (IEC) 60950 or similar specification.

The RE22 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



D' type connector - 9 way

	RE22AC		RE22BC		RE22IC		RE22SC		RE22V	
Pin nr.	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	Green	V_{A+}	Green	Z	White	Clock	White	NC	–
3	V_B	Brown	V_{B+}	Brown	B	Green	Clock–	Brown	V_{out}	Green
4	NC	–	NC	–	A	Grey	NC	–	NC	–
5	V_{dd}	Red	V_{dd}	Red	V_{dd}	Red	V_{dd}	Red	V_{dd}	Red
6	NC	–	V_{A-}	Yellow	Z–	Brown	Data	Green	NC	–
7	NC	–	V_{B-}	White	B–	Yellow	Data–	Yellow	NC	–
8	NC	–	NC	–	A–	Pink	NC	–	NC	–
9	GND	Blue	GND	Blue	GND	Blue	GND	Blue	GND	Blue

Operating and electrical specifications

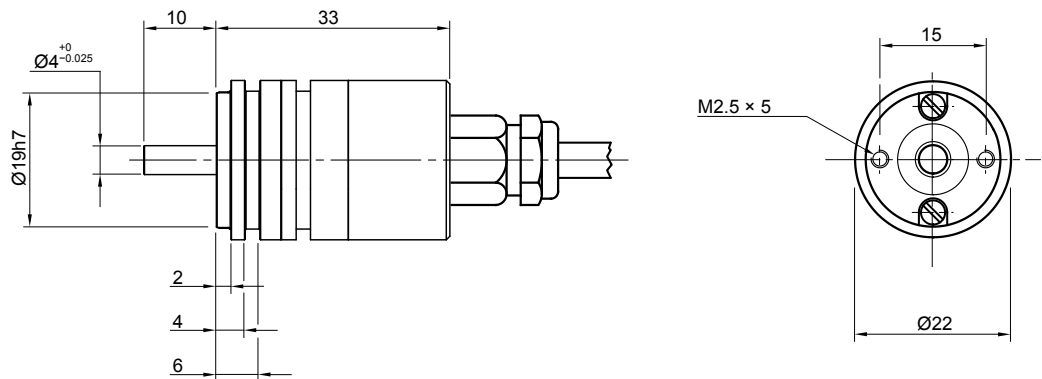
EMC compliance	EN 61326
Cable	Outside diameter 5 mm
Connector options	'D' type connector - 9 way Flying lead
Mass	Encoder unit 1 m cable (no connector) IP53 axial cable 68 g, side cable 60 g, IP64/IP68 axial cable 73 g.
Environmental sealing	IP53 (IP64/IP68 optional) EN 60529:1992
NOTE:	IP68 version must be operated immersed in fluid

Installation drawing

Dimensions and tolerances in mm

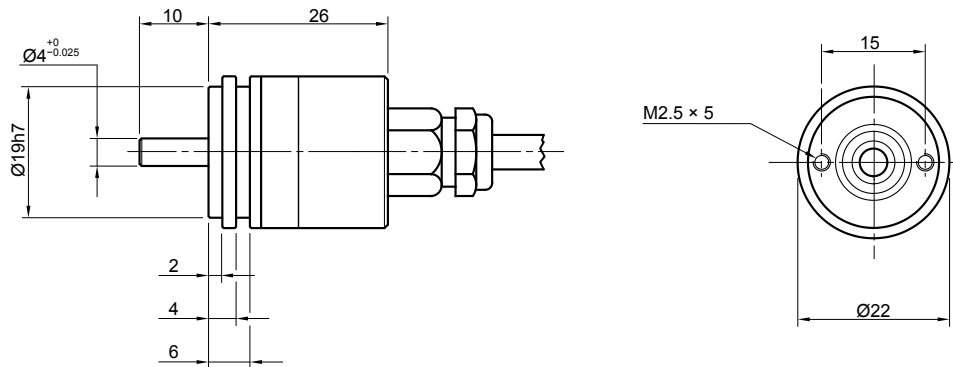
IP64 / IP68

Axial cable exit

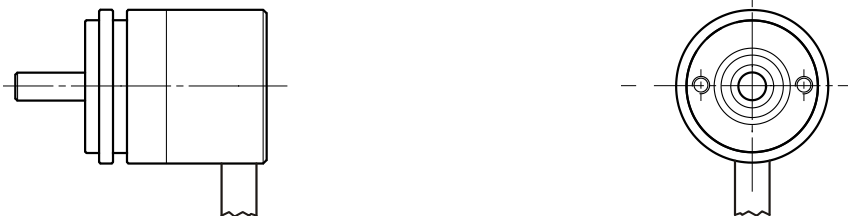


IP53

Axial cable exit



Radial cable exit



Special option 06

Flat, D-shaped shaft

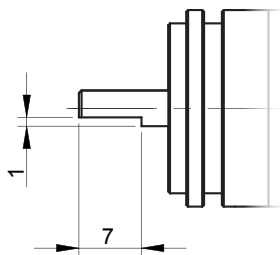


Table of expected bearing life ratings in hours

Speed (rpm)	Rad. load 5 N	Rad. load 10 N	Rad. load 15 N	Rad. load 20 N
500	205,401	98,455	54,569	33,333
1,000	102,700	49,227	27,285	16,667
2,000	51,350	24,613	13,642	8,333
5,000	20,540	9,845	5,457	3,333
10,000	10,270	4,923	2,728	1,667
15,000	6,847	3,282	1,819	1,111
30,000	5,135	2,461	1,364	833

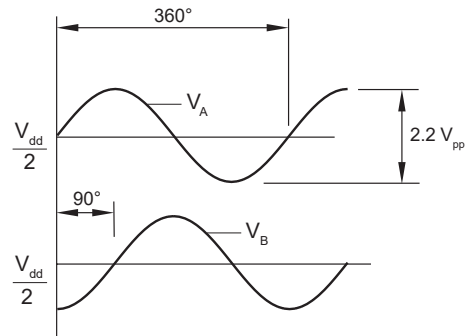
Maximum recommended shaft loads: radial 20N, axial 10N

RE22AC – Analogue sinusoidal outputs

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

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	20 mA
Outputs	Signal amplitude $1,1 \pm 0,2 V_{pp}$ Signal offset $\frac{V_{dd}}{2} \pm 5\text{ mV}$
Internal serial impedance	720 Ω
Maximum speed	30,000 rpm
Maximum cable length	3 m
Operating temperature	-40 °C to +120 °C

Timing diagram

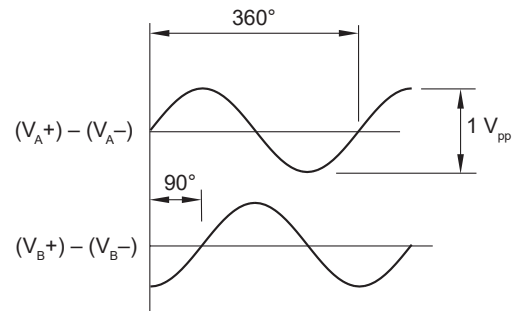


RE22BC – Analogue complementary sinusoidal outputs

2 channels V_A and V_B differential sinusoids in quadrature (90° phase shifted)

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	20 mA
Outputs	Signal amplitude $0,5 \pm 0,1 V_{pp}$ Signal offset $\frac{V_{dd}}{2} \pm 5\text{ mV}$
Internal serial impedance	100 Ω
Maximum speed	30,000 rpm
Maximum cable length	20 m
Operating temperature	-40 °C to +85 °C

Timing diagram



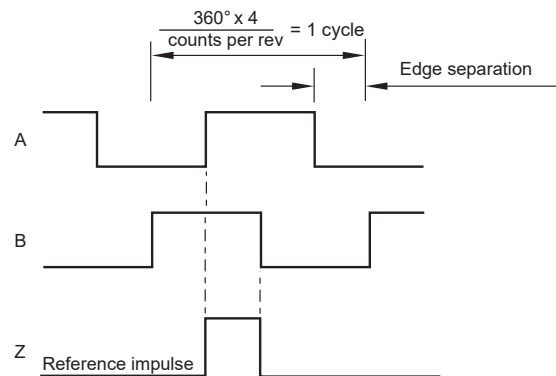
RE22IC – Incremental outputs

Square wave differential line driver to RS422

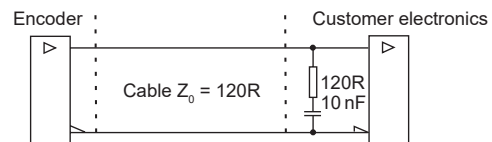
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	Max. 35 mA
Output signals	A, B, Z, A-, B-, Z- (RS422)
Accuracy	Typ. $\pm 0.5^\circ$
Hysteresis	0.18°
Resolution	80 to 2,048 pulses per revolution (320, 400, 500, 512, 800, 1,000, 1,024, 1,600, 2,000, 2,048, 4,096, 8,192 counts per revolution)
Maximum speed	30,000 rpm
Maximum cable length	50 m
Operating temperature	-40 °C to +120 °C

Timing diagram

Complementary signals not shown



Recommended signal termination

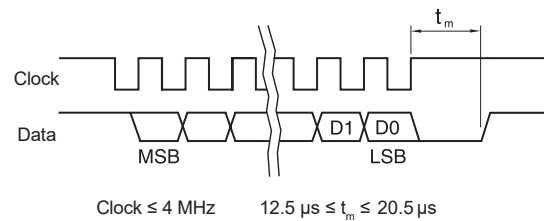


RE22SC – Absolute binary synchro-serial interface (SSI)

Serial encoded absolute position measurement

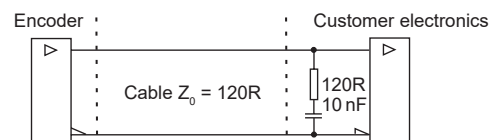
Output code	Natural binary
Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	Max. 35 mA
Data output	Serial data (RS422)
Data input	Clock (RS422)
Accuracy	Typ. $\pm 0.5^\circ$
Hysteresis	0.18°
Resolution	320, 400, 500, 512, 800, 1,000, 1,024, 1,600, 2,000, 2,048, 4,096, 8,192 positions per revolution
Maximum speed	30,000 rpm
Maximum cable length	100 m (at 1 MHz)
Operating temperature	-40 °C to +120 °C

Timing diagram



Recommended signal termination

For data output lines only



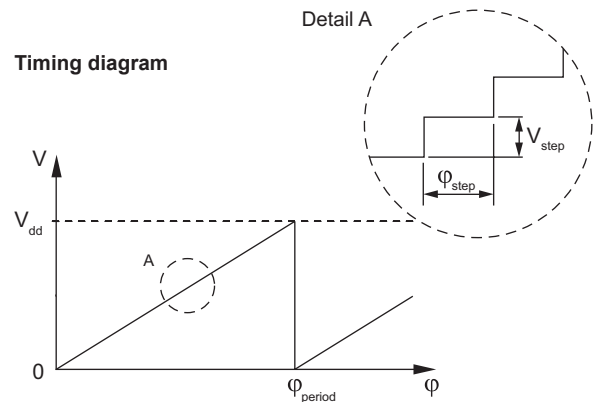
RE22Vx – Linear voltage output

Power supply	$V_{dd} = 5\text{ V} \pm 5\%$
Power consumption	Typ. 26 mA
Output voltage	0 V to V_{dd}
Output loading	Max. 10 mA
Nonlinearity	1 %
Maximum speed	30,000 rpm
Maximum cable length	20 m
Operating temperature	-40 °C to +120 °C

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°

Output type and electrical variant

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



$$\Phi_{\text{step}} = \frac{\Phi_{\text{period}}}{N_{\text{step}}} \quad V_{\text{step}} = \frac{V_{dd}}{N_{\text{step}}}$$

- 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

Part numbering



Encoder part number
eg **RE22SC0409B10A3A00**

RE22 SC 04 09B 10 A 3 A 00

Output type

- AC** - Analogue sinusoidal 2 V_{pp}
- BC** - Analogue complementary sinusoidal
- IC** - Incremental, RS422
- SC** - Absolute binary synchro-serial (SSI), RS422
- Vx** - Linear voltage:

Linear voltage output 0 - 5 V, supply 5 V DC				
	360°	180°	90°	45°
CW	VA	VB	VC	VD
CCW	VE	VF	VG	VH

Shaft size
04 - 4 mm

Resolution

For output types **AC** and **BC**:
01S - One sine/cosine wave per revolution

For output type **Vx**:
10B - 1,024 positions per revolution

For output types **IC** and **SC** (counts or positions per revolution):

Decimal			Binary	
D32 - 320	D80 - 800	2D0 - 2000	09B - 512	12B - 4096
D40 - 400	1D0 - 1000		10B - 1024	13B - 8192
D50 - 500	1D6 - 1600		11B - 2048	

NOTE: Not all combinations are valid.

Special requirements

- 00** - None
- 06** - With flat, D-shaped shaft
- 0M** - Cable length in meters

Environment and material

- A** - IP53, aluminium body (standard)
- B** - IP64, aluminium body (for Body style 3 only)
- C** - IP68, aluminium body (for Body style 3 only)

Body style and cable exit

- 2** - Cylindrical body, radial cable exit
- 3** - Cylindrical body, axial cable exit

Connector option

- A** - 'D' type connector - 9 way
- F** - Flying lead (no connector)

Cable length

- 10** - 1.0 meter (10 meters if **0M** is chosen)

Series	Output type	Shaft size	Resolution	Cable length	Connector option	Body style and cable exit	Environment	Special requirements
RE22	AC	04	01S	10	A / F	2 / 3	A / B / C	00 / 06 / 0M
	BC							
	IC		09B / D50 / D40 / D32 / 10B / 1D0 / D80 / 11B / 2D0 / 1D6 /13B / 12B					
	SC							
	Vx							

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Document issues

Issue	Date	Page	Corrections made
1	13. 1. 2011	-	New document
2	9. 7. 2015	2	Storage and handling info added; connections diagram and table added
		3	Installation drawing tolerances updated, flat D-shaped shaft drawing added
		4-6	Temperature range amended
		6	Parallel output removed
		7	Parallel output removed, resolution options updated and special option 06 added
3	18. 5. 2018	5	Resolutions amended
4	4. 7. 2018	General	Resolutions amended
5	28. 2. 2019	3	IP64/68 radial cable exit drawing removed
6	2. 10. 2019	1	Speed changed

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