

RESOLUTE™ absolute optical rotary angle encoder



RESOLUTE is a revolutionary new true absolute, fine pitch optical encoder system, with excellent dirt immunity, offering an impressive specification that breaks new ground in position feedback!

RESOLUTE combines 27 bit resolution with exceptionally high speed up to 36 000 rev/min (100 metres/second) and high accuracy angle encoder rings.

RESOLUTE uses a unique single optical absolute track (a world first) of 30 μm pitch, combined with sophisticated optics to ensure wide set-up tolerances and impressive low-noise performance. The detection method also intrinsically provides very low sub-divisional error of ± 40 nm and ultra-low noise (jitter) less than 10 nm RMS, resulting in better velocity control performance and rock solid positional stability.

Reliability is assured by **RESOLUTE**'s excellent dirt immunity, built-in separate position-checking algorithm, and IP64 sealed readhead with wipe-clean recovery.

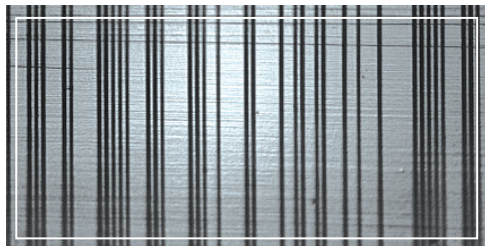
- True absolute non-contact optical encoder system: no batteries required!
- Wide set-up tolerances for quick and easy installation
- High dirt immunity to scratches and light oils
- Resolutions to 27 bits (or 32 bits with *BiSS*)
- 100 m/s maximum speed for all resolutions (to 36 000 rev/min)
- 30 μm scale pitch ensures exceptional motion control performance
- ± 40 nm sub-divisional error for smooth velocity control
- Less than 10 nm RMS jitter for improved positional stability
- Built-in separate position-checking algorithm provides inherent safety
- IP64 sealed readhead for high reliability in harsh environments
- Integral set-up LED enables easy installation and provides diagnostics at a glance
- RESA rings have high accuracy and a large through-hole for easy integration
- RESA rings feature a unique taper mount for quick installation and easy adjustment
- REXA ultra-high accuracy rings have ± 1 arc second total installed accuracy when used with dual readheads
- Wide range of rings from 52 to 550 mm, with larger sizes also available to order
- Readhead and rings are bolt-hole compatible with **SIGNUM**™
- Operates up to 80 °C
- Integral over-temperature alarm
- Variety of serial protocols available. Contact Renishaw for the latest list
- Angle encoder version also available, with ring diameters from 52 to 550 mm and system accuracy to ± 0.5 arc second
- Linear encoder versions also available, with tape scale and high-accuracy spar options

System features



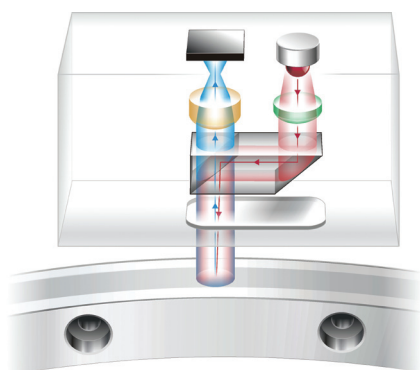
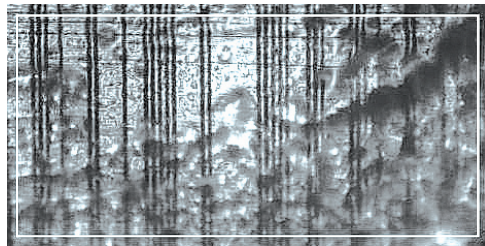
Unique single track absolute optical scale

- ▶ Absolute position is determined immediately upon switch-on
- ▶ No battery back-up
- ▶ Much higher tolerance to yaw de-phasing than dual-track systems
- ▶ Fine pitch (30 μm period) optical scale for superior motion control compared to inductive, magnetic or other non-contact optical absolute encoders
- ▶ High accuracy graduations marked directly onto tough engineering materials for outstanding metrology and reliability



High dirt immunity

- ▶ Filtering optics and embedded surplus code means **RESOLUTE** even reads dirty scale
- ▶ Absolute position can be determined in all three cases shown here; clean scale (left), grease contamination (below-left), particle contamination (below)



Unique detection method

- ▶ Readhead acts like an ultra fast miniature digital camera, taking photos of a coded scale
- ▶ Photos are analysed by a high-speed DSP to determine absolute position
- ▶ Built-in position-check algorithm constantly monitors calculations for ultimate safety and reliability
- ▶ Filtering optics and determination algorithms are designed to provide low noise (jitter <math><10\text{ nm RMS}</math>) and low sub-divisional error (SDE $\pm 40\text{ nm}</math>)$



Range of rotary (angle) and linear scales

- ▶ RESA ring with unique taper mount has large through-hole for easy integration
- ▶ REXA ultra-high accuracy ring with ± 1 arc second total installed accuracy
- ▶ Tough RELA high-precision INVAR spars with $\pm 1\ \mu\text{m}$ accuracy available up to 1130 mm length
- ▶ Shatter-proof RSLA high-precision stainless steel scale, offering higher accuracy than glass scales and long lengths up to 10 metres, with $\pm 4\ \mu\text{m}$ accuracy over a complete 5 metre length
- ▶ *FASTRACK* with RTLA tape scale, for the fastest and easiest installation, with $\pm 5\ \mu\text{m/m}$ accuracy

Resolution

RESOLUTE is available with a variety of resolutions, to meet the needs of a wide range of applications. The choice of resolutions depends on the serial protocol being used, but there are no limitations due to ring size, eg, FANUC 27 bit resolution is available on all ring sizes.

BiSS **RESOLUTE** resolution options:

- 18 bits (262 144 counts per revolution, \approx 4.94 arc second)
- 26 bits (67 108 864 counts per revolution, \approx 0.019 arc second)
- 32 bits (4 294 967 296 counts per revolution, \approx 0.00030 arc second)

Note that 32 bit resolution is below the noise floor of the **RESOLUTE** encoder.

FANUC **RESOLUTE** resolution options:

- 23 bits (8 388 608 counts per revolution, \approx 0.15 arc second)
- 27 bits (134 217 728 counts per revolution, \approx 0.0097 arc second)

For resolution options on other protocols, please contact Renishaw.

Speed and accuracy

RESA diameter (mm)	Maximum reading speed (rev/min)	System accuracy (arc second)
52	36 000	\pm 4.3
75	25 000	\pm 3.0
104	18 000	\pm 2.1
115	16 500	\pm 1.9
150	12 000	\pm 1.5
209	9000	\pm 1.1
229	8300	\pm 1.0
255	7400	\pm 0.87
300	6300	\pm 0.74
350	5400	\pm 0.64
417	4500	\pm 0.53
489	3900	\pm 0.46
550	3400	\pm 0.41

Graduation accuracy is the maximum difference between the angle measured by a single readhead and the true rotation of the encoder as graduated. Application disturbances such as eccentricity are not included.

System accuracy is graduation accuracy plus SDE. Effects such as eccentricity influence installed accuracy; for application advice, please contact your local representative.

Caution: Very high speed motion axes require additional design consideration. For applications that will exceed 50% of the rated maximum operating speed of the ring, please contact Renishaw for further advice.

Operating and electrical specifications

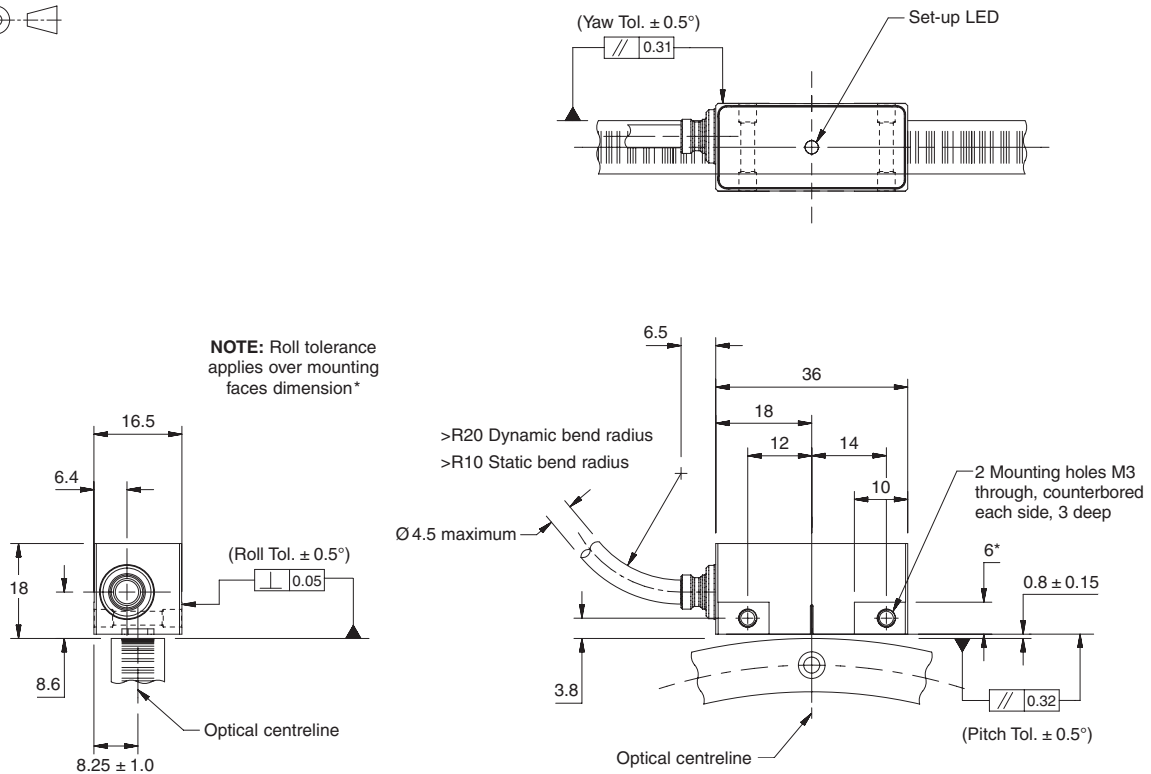
Power supply	5 V \pm 10%	250 mA (typical)
	Ripple	200 mVpp maximum @ frequency up to 500 kHz maximum
Temperature	Storage	-20 °C to +85 °C
	Operating	0 °C to +80 °C
Humidity	Storage	95% maximum relative humidity (non-condensing)
	Operating	80% maximum relative humidity (non-condensing)
Sealing		IP64
Acceleration	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, ½ sine BS EN 60068-2-27:1993 (IEC 68-2-27:1987)
Vibration	Operating	300 m/s ² max @ 55 Hz to 2000 Hz BS EN 60068-2-6:1996 (IEC 68-2-6:1995)
Mass	Readhead	18 g
	Cable	32 g/m
EMC compliance		BS EN 61326-1: 2006
Cable		Double-shielded, outside diameter 4.5 mm maximum Flex life >20 x 10 ⁶ cycles at 20 mm bend radius UL approved

NOTE: Class 1 LED product. LED radiation. Do not view directly with optical instruments.

RESOLUTE installation drawing



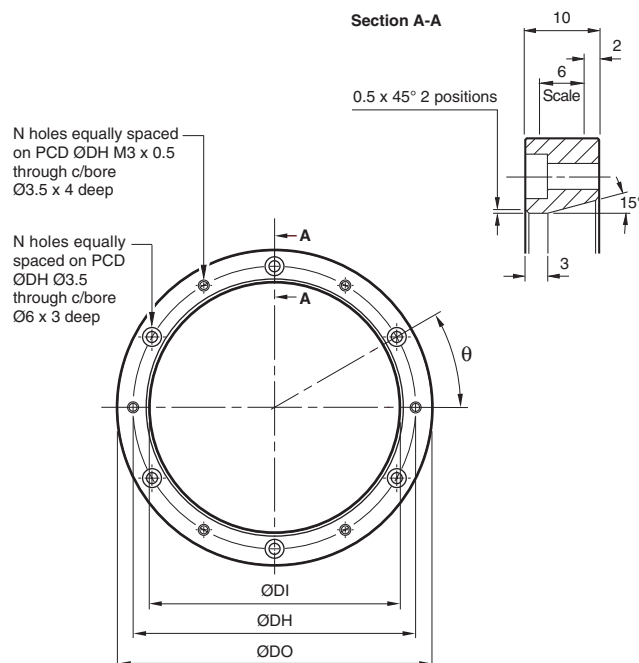
Dimensions and tolerances in mm



RESOLUTE installation drawing (on RSLA/RELA scale)

Dimensions and tolerances in mm

For details of REXA ultra-high accuracy ring, please refer to the RESOLUTE rotary (angle) encoder installation guide



Nominal external diameter (mm)	DO (mm)	DI (mm)	DH (mm)	N	θ
52	52.20 52.10	30.04 30.00	40	6	30°
75	75.40 75.30	55.04 55.00	65	6	30°
104	104.40 104.20	80.04 80.00	90	6	30°
115	114.70 114.50	95.04 95.00	105	6	30°
150	150.40 150.20	130.04 130.00	140	9	20°
209	208.80 208.40	186.05 186.00	196	12	15°
229	229.40 229.00	209.05 209.00	219	12	15°
255	254.80 254.40	235.06 235.00	245	12	15°
300	300.40 300.20	280.06 280.00	290	16	11.25°
350	350.40 350.20	330.06 330.00	340	16	11.25°
417	417.40 417.00	380.10 380.00	390	18	10°
489	489.12 488.72	451.10 450.90	462	20	18°*
550	550.20 549.80	510.10 510.00	520	20	9°

*Note: There are no tapped holes on the 489 mm ring

For worldwide contact details, please visit our main website at www.renishaw.com/contact

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