Data sheet
L-9517-9399-04-B

RENISHAW
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RESA30 absolute angle encoder



RESA30 is a one-piece stainless steel ring with a single-track, true-absolute scale marked directly onto the periphery.

Read by Renishaw's absolute fine pitch encoder system, RESOLUTE™, it has high tolerance to dirt, scratches and greasy fingerprints that can cause other encoder systems to miscount.

The RESA30 offers impressive accuracy with resolution to 0.00030 arc second, suiting the most demanding precision applications.

The low-profile RESA30, with large internal diameter, is easy to design into most installations. Equally importantly, its low-mass, low-inertia design does not compromise system performance.

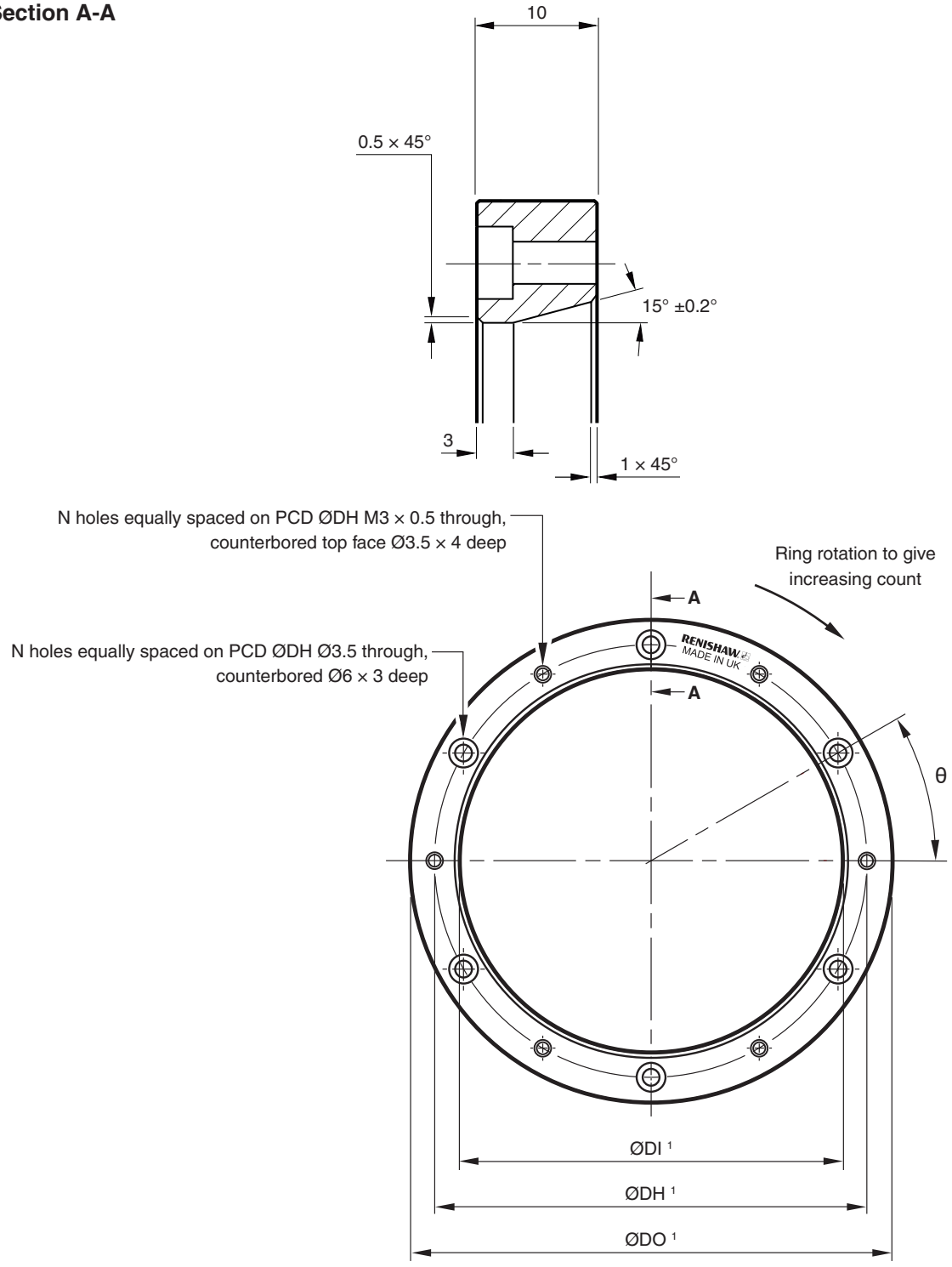
RESA30 is available in a wide range of sizes and line counts, providing compatibility with industry-standard controllers.

- **Compatible with RESOLUTE true-absolute encoder**
- **Angular resolution to 0.00030 arc second**
- **System repeatability to 0.0075 arc second**
- **36 000 rev/min maximum speed for all resolutions**
- **Patented taper mount simplifies integration and minimises installation errors**
- **Large internal diameter for ease of integration**
- **Available in sizes from Ø52 mm to Ø550 mm**
- **Custom sizes also available**
- **Low mass and low inertia**
- **Ultra-low inertia versions also available**
- **Integral set-up LED on readhead for quick set-up and instant 'health check' at any time**
- **30 µm nominal scale pitch ensures exceptional motion control performance**
- **Operates down to –40 °C with RESOLUTE Extended Temperature Range (ETR) variant**

RESA30 installation drawing (‘A’ section)

Dimensions and tolerances in mm

Section A-A



NOTES:

- θ is the angle between one tapped hole and the adjacent clearance hole. For example, the angle between two clearance holes is 2θ.
- When using a RESOLUTE ETR, the hub should be made of a material with a CTE between 14 and 18 µm/m/°C. Contact your local Renishaw representative for more information.

[1] The dimensions DO, DI and DH for the RESA30 'A' section rings are listed on the following page.

RESA30 ‘A’ section ring dimensions

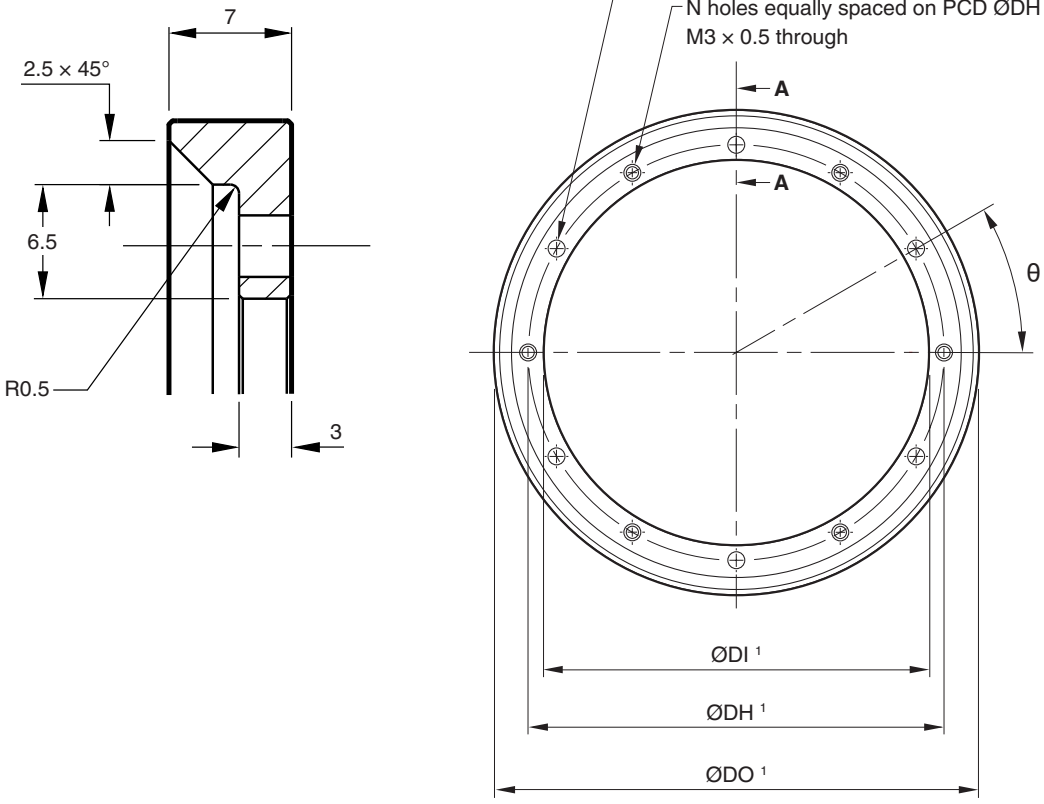
Nominal external diameter (mm)	DO (mm)	DI (mm)	Mounting holes		
			DH (mm)	N	θ
52	52.20 52.10	30.04 30.00	40	6	30°
57	57.35 57.25	37.04 37.00	47	6	30°
75	75.40 75.30	55.04 55.00	65	6	30°
100	100.30 100.20	80.04 80.00	90	6	30°
101	101.30 102.20	80.04 80.00	90	6	30°
103	103.20 103.00	80.04 80.00	90	6	30°
104	104.40 104.20	80.04 80.00	90	6	30°
115	114.70 114.50	95.04 95.00	105	6	30°
124	124.10 123.90	104.04 104.00	114	6	30°
150	150.40 150.20	130.04 130.00	140	9	20°
172	172.04 171.84	152.04 152.00	162	9	20°
183	183.45 183.25	163.04 163.00	173	9	20°
200	200.40 200.20	180.04 180.00	190	12	15°
206	206.50 206.10	186.05 186.00	196	12	15°
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°
280	280.30 279.90	260.06 260.00	270	12	15°
300	300.40 300.20	280.06 280.00	290	16	11.25°
330	350.40 350.20	310.06 310.00	320	16	11.25°
350	350.40 350.20	330.06 330.00	340	16	11.25°
413	412.70 412.30	392.08 392.00	402	18	10°
417	417.40 417.00	380.10 380.00	390	18	10°
489 [1]	489.12 488.72	451.10 450.90	462	20	18°
550	550.20 549.80	510.10 510.00	520	20	9°

[1] There are no tapped holes on the 489 mm ring.

RESA30 installation drawing (‘B’ section)

Dimensions and tolerances in mm

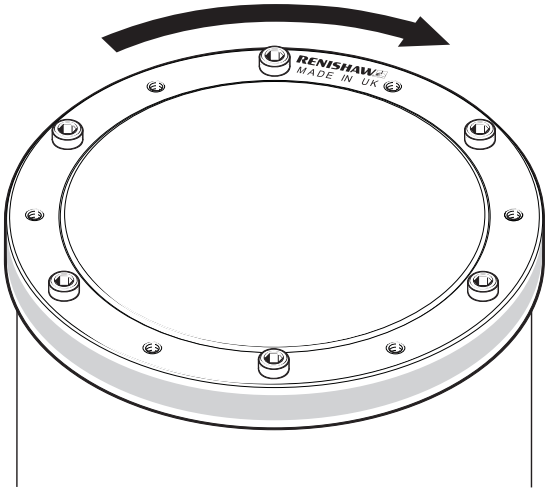
Section A-A



NOTES:

- θ is the angle between one tapped hole and the adjacent clearance hole. For example, the angle between two clearance holes is 2θ.
- When using a RESOLUTE ETR, the hub should be made of a material with a CTE between 14 and 18 µm/m/°C. Contact your local Renishaw representative for more information.

Ring rotation to give increasing count

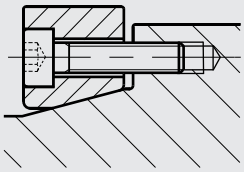
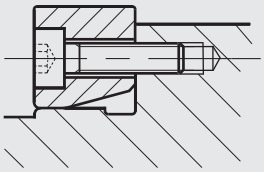
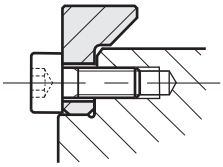


1 The dimensions DO, DI and DH for the RESA30 'B' section rings are listed on the following page.

RESA30 ‘B’ section ring dimensions

Nominal external diameter (mm)	DO (mm)	DI (mm)	Mounting holes		
			DH (mm)	N	θ
52	52.20 52.10	32.04 32.00	38	6	30°
57	57.35 57.25	37.04 37.00	43	6	30°
75	75.40 75.30	55.04 55.00	61	6	30°
100	100.30 100.20	80.04 80.00	86	6	30°
115	114.70 114.50	95.04 95.00	101	6	30°
150	150.40 150.20	130.04 130.00	136	9	20°
165	165.10 164.90	145.04 145.00	151	9	20°
200	200.40 200.20	180.04 180.00	186	12	15°

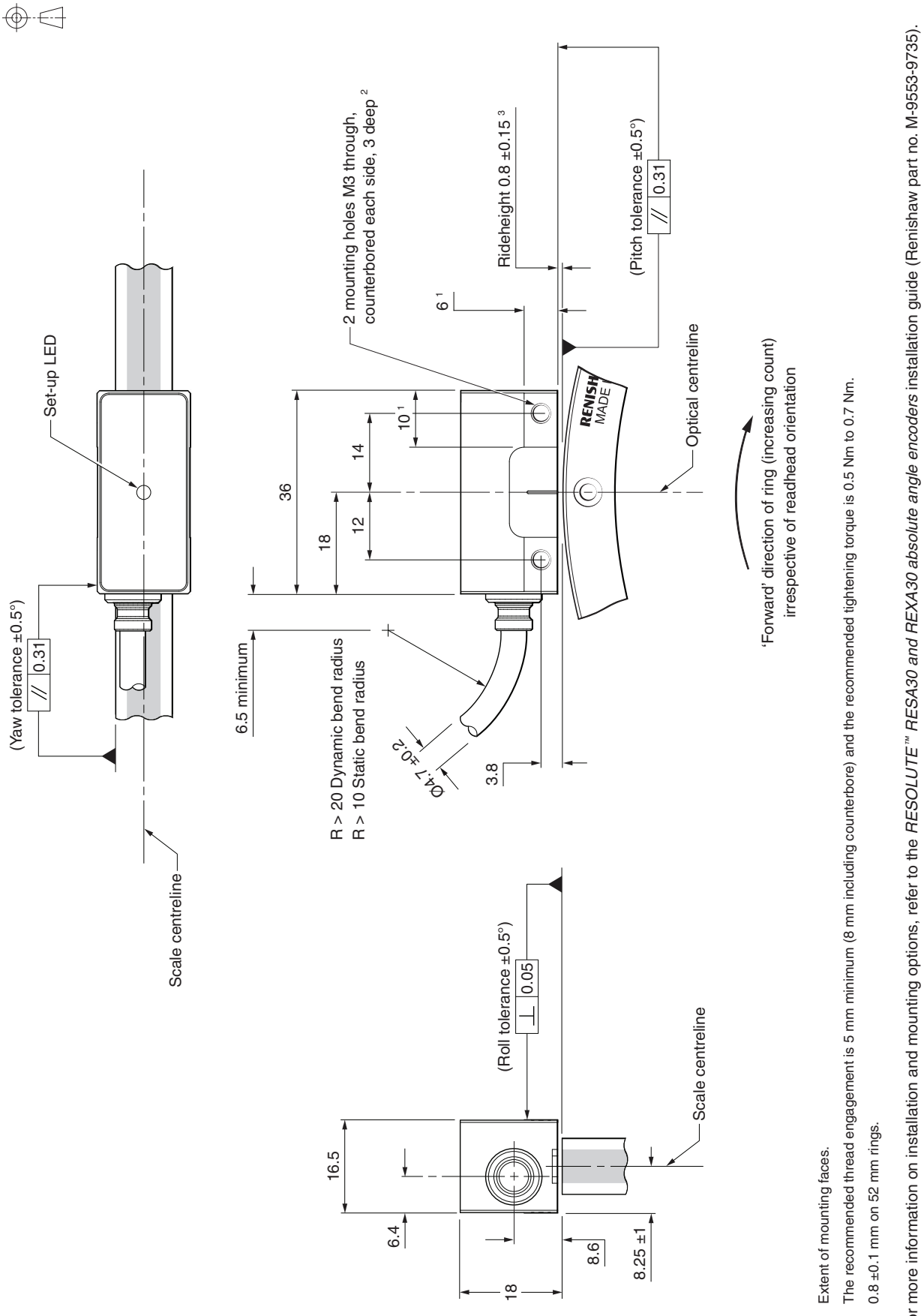
RESA30 mounting methods

	Taper mount	Interference fit
'A' section		
'B' section	Not applicable	
Notes	**Recommended for all installations** • Enables simplest adjustment. • Offers highest accuracy. • Enables eccentricity to be compensated. • Offers excellent mechanical stability against thermal cycling, shock and vibration. • Minimises cost of substrate preparation.	**Alternative installation** • Will not correct eccentricity of the supporting shaft.

For further information on installation and mounting options, refer to the *RESOLUTE™ RESA30 and REXA30 absolute angle encoders* installation guide (Renishaw part no. M-9553-9735) which is available from your local Renishaw representative, or can be downloaded from: **www.renishaw.com/resolutedownloads**.

RESOLUTE readhead installation drawing

Dimensions and tolerances in mm



1 Extent of mounting faces.

2 The recommended thread engagement is 5 mm minimum (8 mm including counterbore) and the recommended tightening torque is 0.5 Nm to 0.7 Nm.

3 0.8 ±0.1 mm on 52 mm rings.

For more information on installation and mounting options, refer to the *RESOLUTE™ RESA30 and REXA30 absolute angle encoders* installation guide (Renishaw part no. M-9553-9735). This can be downloaded from our website **www.renishaw.com/resolutedownloads** or contact your local Renishaw representative.

Operating specifications

Material			303/304 stainless steel
Coefficient of thermal expansion (at 20 °C)			15.5 ±0.5 µm/m/°C
Temperature	**(system)**	Storage	Standard readhead: –20 °C to +80 °C
			ETR readhead: –40 °C to +80 °C
			UHV readhead: 0 °C to +80 °C
	(readhead)	Operating	Standard readhead: 0 °C to +80 °C
			ETR readhead: –40 °C to +80 °C
			UHV readhead: 0 °C to +75 °C
	(interface)		DRIVE-CLIQ interface: 0 °C to +55 °C

Nominal external diameter (mm)		**52**	**57**	**75**	**100**	**101**	**103**	**104**
Nominal internal diameter (mm)		30 [1]	37	55	80	80	80	80
Mass (kg)	‘A’ section	0.098	0.1	0.15	0.2	0.22	0.24	0.26
	‘B’ section	0.043	0.049	0.068	0.094	-	-	-
Moment of inertia (kgmm²)	‘A’ section	46	61	161	425	477	519	561
	‘B’ section	22	31	79	202	-	-	-

Nominal external diameter (mm)		**115**	**124**	**150**	**165**	**172**	**183**	**200**
Nominal internal diameter (mm)		95	104	130	145	152	163	180
Mass (kg)	‘A’ section	0.23	0.26	0.32	-	0.36	0.40	0.43
	‘B’ section	0.10	-	0.15	0.16	-	-	0.2
Moment of inertia (kgmm²)	‘A’ section	644	849	1 581	-	2 400	3 006	3 928
	‘B’ section	296	-	740	970	-	-	1 822

Nominal external diameter (mm)		**206**	**209**	**229**	**255**	**280**	**300**	**330**
Nominal internal diameter (mm)		186	186	209	235	260	280	310
Mass (kg)	‘A’ section	0.44	0.5	0.5	0.54	0.61	0.66	0.72
	‘B’ section	-	-	-	-	-	-	-
Moment of inertia (kgmm²)	‘A’ section	4 315	4 960	6 000	8 112	11 233	13 962	18 476
	‘B’ section	-	-	-	-	-	-	-

Nominal external diameter (mm)		**350**	**413**	**417**	**489**	**550**
Nominal internal diameter (mm)		330	392	380	451	510
Mass (kg)	‘A’ section	0.78	0.93	1.76	2.13	2.53
	‘B’ section	-	-	-	-	-
Moment of inertia (kgmm²)	‘A’ section	22 606	37 945	70 386	118 244	178 598
	‘B’ section	-	-	-	-	-

[1] 32 mm for ‘B’ section ring.

Accuracy

Nominal external diameter	Typical installed accuracy [2]			
	'A' section [1]		'B' section	
mm	arc second	µm	arc second	µm
52	±12.7	±1.6	±21.1	±2.7
57	±11.8	±1.6	±19.5	±2.7
75	±9.5	±1.7	±14.9	±2.7
100	±7.5	±1.8	±11.3	±2.7
101	±7.5	±1.8	-	-
103	±7.4	±1.8	-	-
104	±7.3	±1.8	-	-
115	±6.8	±1.9	±9.9	±2.8
124	±6.3	±1.9	-	-
150	±5.5	±2.0	±7.7	±2.8
165	-	-	±7.0	±2.8
172	±5.0	±2.1	-	-
183	±4.7	±2.1	-	-
200	±4.3	±2.1	±5.8	±2.8
206	±4.2	±2.1	-	-
209	±4.2	±2.1	-	-
229	±3.9	±2.2	-	-
255	±3.6	±2.2	-	-
280	±3.4	±2.3	-	-
300	±3.1	±2.3	-	-
330	±2.9	±2.3	-	-
350	±2.8	±2.4	-	-
413	±2.4	±2.4	-	-
417	±2.4	±2.4	-	-
489	±2.1	±2.5	-	-
550	±1.9	±2.6	-	-

NOTE: Installation errors will dominate accuracy; typical figures cannot be assumed.

[1] Taper mounted installations recommend an installation of ±3 µm at the bolt hole locations; adjustments are not possible for bore mounted systems.

[2] 'Typical' installations are a result of graduation and installation errors combining and, to some magnitude, cancelling.

All rings supplied are tested to ensure a minimum installed accuracy grade. The manufactured installed accuracy limit is dependent on the ring type:

- A section rings : ±5 µm (±7.5 µm for Ø413 mm ring)
- B section rings : ±8 µm

$$\text{Minimum installed accuracy in arc seconds} = \frac{\text{Minimum installed accuracy (µm)}}{\text{Ring diameter (mm)}} \times 412.5$$

Refer to Appendix for system accuracy figures.

Speed

Nominal external diameter (mm)	Maximum reading speed (rev/min)
52	36 000
57	33 000
75	25 000
100	19 000
101	19 000
103	18 500
104	18 000
115	16 500
124	15 000
150	12 000
165	11 500
172	11 000
183	10 400
200	9 500
206	9 200
209	9 000
229	8 300
255	7 400
280	6 800
300	6 300
330	5 700
350	5 400
413	4 600
417	4 500
489	3 900
550	3 400

CAUTION: Very high speed motion axes require additional design consideration. For applications that will exceed 50% of the rated maximum reading speed of the ring, contact your local Renishaw representative for further advice.

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, for example, FANUC 27 bit resolution is available on all ring sizes.

BiSS RESOLUTE resolution options:

Resolution	Counts per revolution	Arc second
18 bit	262 144	≈ 4.94
26 bit	67 108 864	≈ 0.019
32 bit	4 294 967 296	≈ 0.00030

NOTE: 32 bit resolution is below the noise floor of the RESOLUTE encoder.

FANUC RESOLUTE resolution options:

Resolution	Counts per revolution	Arc second
27 bit	134 217 728	≈ 0.0097
31 bit	2 147 483 648	≈ 0.0006

Mitsubishi RESOLUTE resolution options:

Resolution	Counts per revolution	Arc second
23 bit	8 388 608	≈ 0.15
27 bit	134 217 728	≈ 0.0097

Panasonic RESOLUTE resolution options:

Resolution	Counts per revolution	Arc second
23 bit	8 388 608	≈ 0.15
32 bit	4 294 967 296	≈ 0.0003

Siemens DRIVE-CLiQ RESOLUTE resolution options:

Resolution	Counts per revolution	Arc second
26 bit	67 108 864	≈ 0.019
29 bit	536 870 912	≈ 0.0024

Yaskawa RESOLUTE resolution options:

	Resolution	Counts per revolution	Arc second
Rotary servomotors:	24 bit	16 777 216	≈ 0.077
Fully closed loop control:	23 bit	8 388 608	≈ 0.154
	26 bit	67 108 864	≈ 0.019
	30 bit	1 073 741 824	≈ 0.0012

Angle encoder part numbers

RESA 30U S A 300 B

Scale code

B = Standard

Scale code

052 = 52 mm	115 = 115 mm	206 = 206 mm	350 = 350 mm
057 = 57 mm	124 = 124 mm	209 = 209 mm	413 = 413 mm
075 = 75 mm	150 = 150 mm	229 = 229 mm	417 = 417 mm
100 = 100 mm	165 = 165 mm	255 = 255 mm	489 = 489 mm
101 = 101 mm	172 = 172 mm	280 = 280 mm	550 = 550 mm
103 = 103 mm	183 = 183 mm	300 = 300 mm	
104 = 104 mm	200 = 200 mm	330 = 330 mm	

Form

A = Tapered internal diameter

B = Low inertia (only available in 52 mm, 57 mm, 75 mm, 100 mm, 115 mm, 150 mm, 165 mm and 200 mm diameters)

Material

S = Stainless steel

Pitch

30U = 30 µm

Absolute angle encoder series

Appendix

Graduation and system accuracy

Nominal external diameter (mm)	Graduation accuracy (arc second)	System accuracy (arc second)
52	±1.7	±2.4
57	±1.7	±2.3
75	±1.6	±2.1
100	±1.5	±1.9
101	±1.5	±1.9
103	±1.5	±1.9
104	±1.5	±1.8
115	±1.5	±1.8
124	±1.4	±1.7
150	±1.4	±1.6
165	±1.4	±1.6
172	±1.4	±1.7
183	±1.4	±1.6
200	±1.5	±1.7
206	±1.3	±1.4
209	±1.3	±1.4
229	±1.2	±1.4
255	±1.2	±1.3
280	±1.1	±1.3
300	±1.1	±1.3
330	±1.1	±1.2
350	±1.1	±1.2
413	±1.0	±1.1
417	±1.0	±1.1
489	±1.0	±1.1
550	±1.0	±1.1

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. For application advice, contact your local Renishaw representative.

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Compatible products

RESA30





RESOLUTE standard readheads



RESOLUTE UHV
(Ultra-High Vacuum) readheads



RESOLUTE ETR
(Extended Temperature Range) readheads



RESOLUTE FS
(Functional Safety) readheads

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#renishaw

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