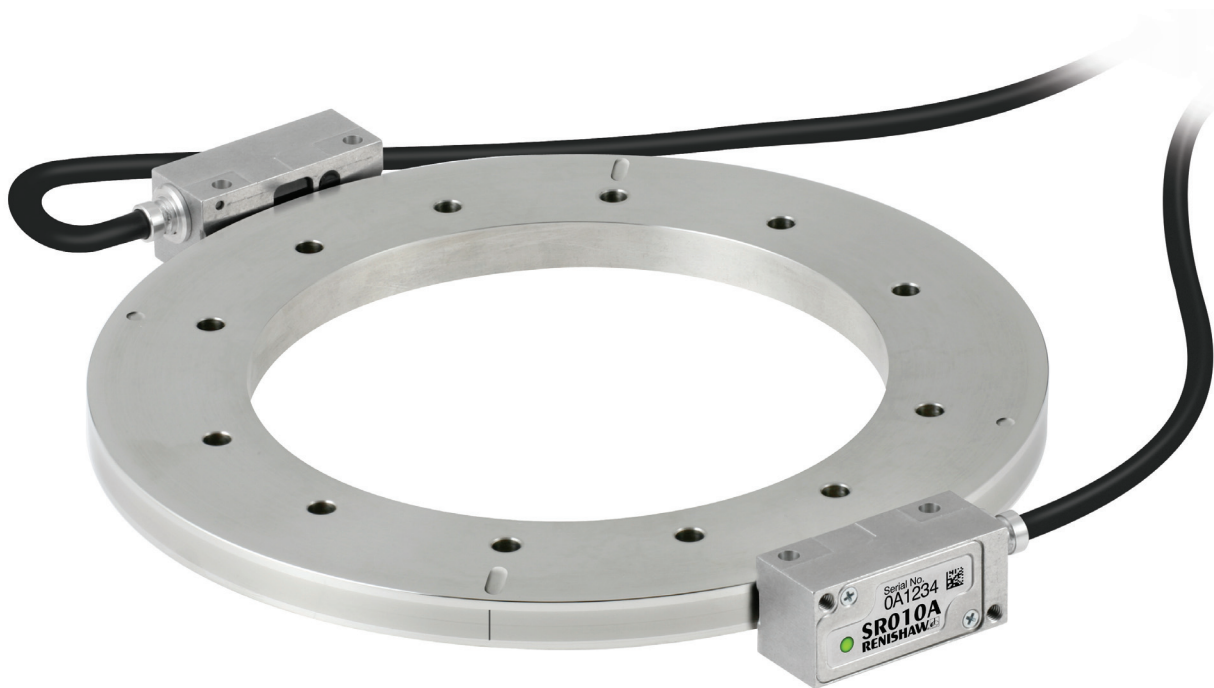


REXM/REXT ultra-high accuracy angle encoder



With zero coupling losses and exceptional repeatability, the REXM/REXT ultra-high accuracy angle encoder achieves better than ± 1 arc second total installed accuracy.

Like the RESM encoder, the REXM/REXT is a stainless steel ring with the scale graduations marked axially onto the periphery, but with a number of differences to improve upon RESM's already impressive accuracy.

REXM/REXT has a thicker cross-section, to ensure that the only significant installation error is eccentricity.

Eccentricity is easily removed using 2 readheads, either with Renishaw's **DSi** (Dual Signal interface), or by combining the signals inside the host controller. The only errors remaining are graduation errors and readhead SDE, both of which are so small they are often negligible.

As a non-contact encoder, REXM/REXT offers dynamic performance advantages,

eliminating coupling losses, oscillation, shaft torsion and other hysteresis errors that plague enclosed encoders.

Combining two readheads is easy with the **DSi**, which also offers an angularly repeatable reference position (*propoZ*™) which is unaffected by bearing wander or power cycling.

The REXM/REXT system operates at temperatures up to +85 °C (**SIGNUM**) and speeds to 4500 rev/min.

REXM/REXT total installed accuracy grades:

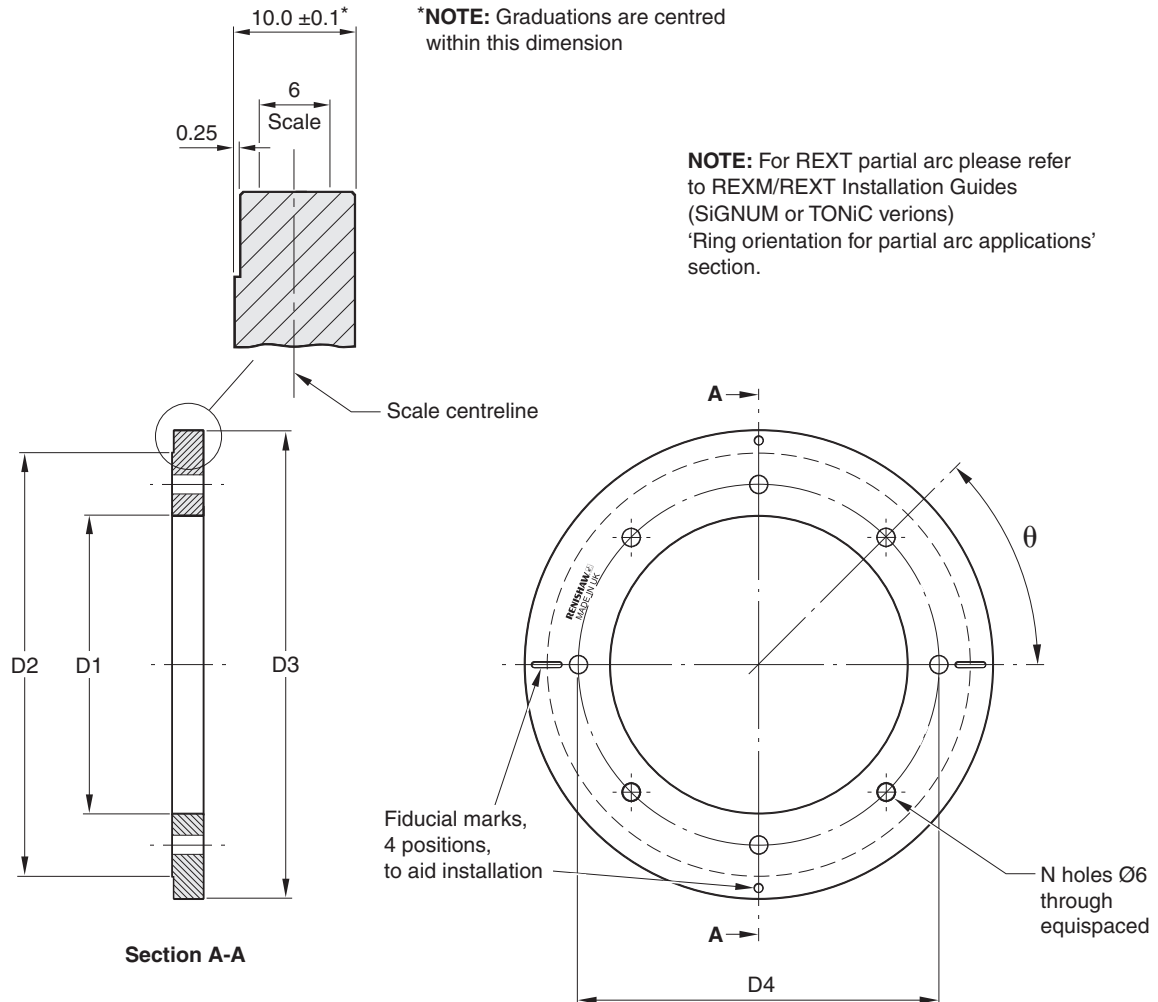
Ring diameter	Total installed accuracy
≥ 100 mm	± 1 arc second
75 mm	± 1.5 arc second
≤ 57 mm	± 2 arc second

Designed for axes that are limited to partial rotation, REXT rings have two reference marks, oriented diametrically opposed, for use with partial arc versions of DSi. DSi processes these reference marks to give a single, angularly-repeatable *propoZ* reference output.

- Use with two **SIGNUM** or **TONIC** encoders, combined with **DSi** to give ultra-high accuracy
- Installed accuracy to ± 1 arc second with dual readheads
- Sub-divisional error to ± 0.03 arc second
- Resolutions to 0.001 arc second
- Repeatability to 0.003 arc second
- Wide range of standard sizes from 52 mm to 417 mm
- Large internal diameter for ease of integration
- Flange mounted with easy 4-point adjustment method
- Angularly repeatable *propoZ* reference position is unaffected by bearing wander or power cycling

Installation drawing

Dimensions and tolerances in mm



Nominal external diameter (mm)	Line count	Dimensions			Mounting holes		
		D1	D2	D3	N	D4	θ
52*	8 192	26	50	52.1 – 52.2	4	38	90°
57*	9 000	26	50	57.25 – 57.35	4	38	90°
75	11 840	40.5	64.5	75.3 – 75.4	8	52.5	45°
100	15 744	57.5	97.5	100.2 – 100.3	8	77.5	45°
103	16 200	57.5	97.5	103.0 – 103.2	8	77.5	45°
104	16 384	57.5	97.5	104.2 – 104.4	8	77.5	45°
115	18 000	68	108	114.5 – 114.7	8	88	45°
150	23 600	96	136	150.2 – 150.4	8	116	45°
183	28 800	122.5	162.5	183.2 – 183.4	12	142.5	30°
200	31 488	136	176	200.2 – 200.4	12	156	30°
206	32 400	140.5	180.5	206.1 – 206.5	12	160.5	30°
209	32 768	140.5	180.5	208.4 – 208.8	12	160.5	30°
229	36 000	160.5	200.5	229.0 – 229.4	12	180.5	30°
255	40 000	180.5	220.5	254.4 – 254.8	12	200.5	30°
300	47 200	216	256	300.2 – 300.4	12	236	30°
350	55 040	256	296	350.2 – 350.4	16	276	22.5°
417	65 536	305	345	417.0 – 417.4	16	325	22.5°

*52 mm and 57 mm rings have dimple fiducial features and no slots.

Maximum speed (rev/min) For 20 MHz clocked option.

For details of maximum speeds for other clocked options, please contact your local representative.

SIGNUM system

Nominal external diameter (mm)	Line count	Output resolution									Analogue*	
		Si-NN-0004 5 µm	Si-NN-0020 1 µm	Si-NN-0040 0.5 µm	Si-NN-0100 0.2 µm	Si-NN-0200 0.1 µm	Si-NN-0400 50 nm	Si-NN-1000 20 nm	Si-HN-2000 10 nm	Si-HN-4000 5 nm	Si-NN-0000 1 Vpp	Si-NN-0001 1 Vpp
52	8 192	4 591	4 591	2 387	992	459	220	92	50	25	4 591	1 102
57	9 000	4 188	4 188	2 178	905	419	201	84	45	23	4 188	1 005
75	11 840	3 183	3 183	1 655	688	318	153	64	34	17	3 183	764
100	15 744	2 387	2 387	1 241	516	239	115	48	26	13	2 387	573
103	16 200	2 318	2 318	1 205	501	232	111	46	25	13	2 318	556
104	16 384	2 296	2 296	1 194	496	230	110	46	25	12	2 296	551
115	18 000	2 076	2 076	1 079	448	208	100	42	22	11	2 076	498
150	23 600	1 592	1 592	828	344	159	76	32	17	8.7	1 592	382
183	28 800	1 305	1 305	678	282	130	63	26	14	7.1	1 305	313
200	31 488	1 194	1 194	621	258	119	57	24	13	6.5	1 194	286
206	32 400	1 159	1 159	603	250	116	56	23	13	6.3	1 159	278
209	32 768	1 142	1 142	594	247	114	55	23	12	6.2	1 142	274
229	36 000	1 042	1 042	542	225	104	50	21	11	5.7	1 042	250
255	40 000	936	936	487	202	94	45	19	10	5.1	936	225
300	47 200	796	796	414	172	80	38	16	8.6	4.3	796	191
350	55 040	682	682	355	147	68	33	14	7.4	3.7	682	164
417	65 536	572	572	298	124	57	27	11	6.2	3.1	572	137

***NOTE:**

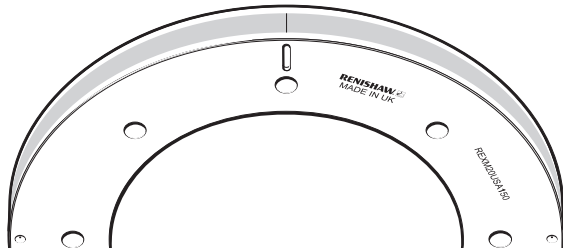
Currently Renishaw do not offer an analogue Dual Head summing box, customer would have to do their own summing.

Si-NN-0000 is the high-speed version of the 1 Vpp analogue interface, suitable for both high-speed and general applications.

Si-NN-0001 is the low-noise version of the 1 Vpp analogue interface, incorporating additional noise filtering to provide even better positional stability and smoother velocity control. To achieve this, the maximum speed is limited.

Si-NN-0001 is suitable for advanced applications requiring the most precise motion control and it is also suitable for general applications that do not require high-speed operation.

Reference mark position



REXM

IN-TRAC reference mark is embedded in the scale, radially aligned to the line fiducial mark to the left of the 'Renishaw' logo. No external actuators or physical adjustment are required.

REXT

The second reference mark is 180° from the first.

On-scale limits - SiGNUM only

For applications such as partial arc, dual on-scale limits can be used on REXM/REXT rings having an external diameter of 100 mm or more.

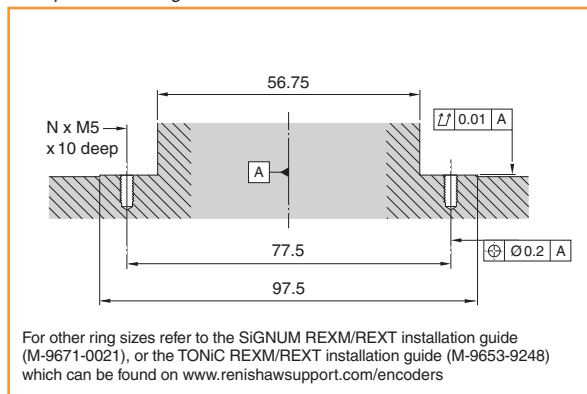
Self-adhesive limit markers are available in 10 mm, 20 mm and 50 mm lengths as pre-aligned pairs on backing paper.

Mounting method (Important: flange mount only. Do NOT interference fit)

Mounting surface preparation

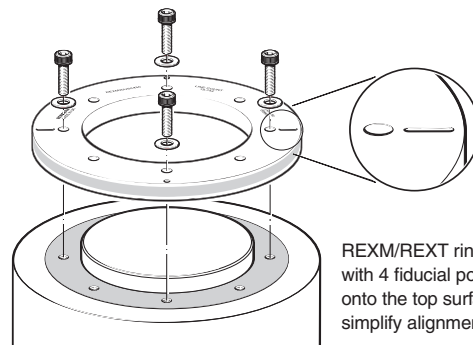
The mounting surface should have an axial run-out of 10 µm. This tolerance only needs to be held over the region where the flat surface of the ring mates to the mounting surface.

Example of mounting surface for 100 mm REXM/REXT



Installation technique

(Please refer to the REXM/REXT installation guide for full details).



REXM/REXT rings are made with 4 fiducial points engraved onto the top surface, which simplify alignment.

Using a suitable dial test indicator, positioned so that the stylus ball touches directly onto the scale surface, the ring only needs to be adjusted for run-out at the 4 fiducial points.

Operating specifications

Material	303/304 stainless steel		
Coefficient of expansion	17 µm/m/°C (ppm/°C)		
Temperature	Storage	System	-20 °C to +70 °C
	Operating	SiGNUM	0 °C to +85 °C
		TONIC	0 °C to +70 °C

Ring mass and inertia

Ring diameter (mm)	52	57	75	100	103	104	115	150	183
Mass (kg)	0.13	0.17	0.26	0.43	0.47	0.48	0.54	0.85	1.18
Inertia (kg-cm ²)	0.55	0.82	2.3	7.2	8.1	8.5	12	34	71

Ring diameter (mm)	200	206	209	229	255	300	350	417
Mass (kg)	1.37	1.44	1.50	1.69	2.03	2.74	3.59	5.09
Inertia (kg-cm ²)	100	113	120	165	250	470	845	1700

Resolution

The REXM/REXT offers a range of standard ring diameters, as well as sizes that offer line counts that provide 2ⁿ counts per revolution or resolutions that are precise sub-divisions of degrees or arc seconds.

NOTE: 1 arc second resolution = 2.778 x 10⁻⁴ degree resolution = 1.296 x 10⁶ counts per revolution.

	Nominal external diameter (line count)	SIGNUM or TONiC digital resolution (interpolation factor)								TONiC digital resolution (interpolation factor)		
		5 μm (x4)	1 μm (x20)	0.5 μm (x40)	0.2 μm (x100)	0.1 μm (x200)	50 nm (x400)	20 nm (x1 000)	10 nm (x2 000)	5 nm (x4 000)	2 nm (x1 0000)	1 nm (x2 0000)
Standard outside diameters	75 mm (11 840)	≈ 27.4"	≈ 5.47"	≈ 2.74"	≈ 1.1"	≈ 0.55"	≈ 0.27"	≈ 0.11"	≈ 0.055"	≈ 0.028"	≈ 0.011"	≈ 0.0055"
	100 mm (15 744)	≈ 20.6"	≈ 4.12"	≈ 2.06"	≈ 0.82"	≈ 0.41"	≈ 0.21"	≈ 0.082"	≈ 0.041"	≈ 0.021"	≈ 0.0082"	≈ 0.0041"
	150 mm (23 600)	≈ 13.7"	≈ 2.75"	≈ 1.37"	≈ 0.55"	≈ 0.27"	≈ 0.14"	≈ 0.055"	≈ 0.028"	≈ 0.014"	≈ 0.0055"	≈ 0.0027"
	183 mm (28 800)	≈ 11.2"	≈ 2.25"	≈ 1.13"	≈ 0.45"	≈ 0.23"	≈ 0.11"	≈ 0.045"	≈ 0.023"	≈ 0.011"	≈ 0.0045"	≈ 0.0023"
	200 mm (31 488)	≈ 10.3"	≈ 2.06"	≈ 1.03"	≈ 0.41"	≈ 0.21"	≈ 0.1"	≈ 0.041"	≈ 0.021"	≈ 0.010"	≈ 0.0041"	≈ 0.0020"
	255 mm† (40 000)	≈ 8.1"	≈ 1.62"	≈ 0.81"	≈ 0.32"	≈ 0.16"	≈ 0.081"	≈ 0.032"	≈ 0.016"	≈ 0.0081"	≈ 0.0032"	≈ 0.0016"
	300 mm (47 200)	≈ 6.9"	≈ 1.37"	≈ 0.69"	≈ 0.27"	≈ 0.14"	≈ 0.069"	≈ 0.027"	≈ 0.014"	≈ 0.0069"	≈ 0.0027"	≈ 0.0014"
	350 mm (55 040)	≈ 5.9"	≈ 1.18"	≈ 0.59"	≈ 0.24"	≈ 0.12"	≈ 0.059"	≈ 0.024"	≈ 0.012"	≈ 0.0059"	≈ 0.0024"	≈ 0.0012"
2 ⁿ line count	52 mm (8 192)	≈ 39.6"	≈ 7.9"	≈ 3.96"	≈ 1.58"	≈ 0.79"	≈ 0.4"	≈ 0.16"	≈ 0.079"	≈ 0.040"	≈ 0.016"	≈ 0.0079"
	104 mm (16 384)	≈ 19.8"	≈ 3.96"	≈ 1.98"	≈ 0.79"	≈ 0.4"	≈ 0.2"	≈ 0.08"	≈ 0.040"	≈ 0.020"	≈ 0.0080"	≈ 0.0040"
	209 mm (32 768)	≈ 9.89"	≈ 1.98"	≈ 0.99"	≈ 0.4"	≈ 0.2"	≈ 0.1"	≈ 0.04"	≈ 0.02"	≈ 0.0099"	≈ 0.0040"	≈ 0.0020"
	417 mm (65 536)	≈ 4.9"	≈ 0.99"	≈ 0.49"	≈ 0.2"	≈ 0.1"	≈ 0.05"	≈ 0.02"	≈ 0.0099"	≈ 0.0049"	≈ 0.0020"	≈ 0.00099"
Subdivisions of degrees	57 mm (9 000)	0.01°	0.002°	0.001°	0.0004°	0.0002°	0.0001°	0.00004°	0.00002°	0.00001°	0.000004°	0.000002°
	115 mm (18 000)	0.005°	0.001°	0.0005°	0.0002°	0.0001°	0.00005°	0.00002°	0.00001°	0.000005°	0.000002°	0.000001°
	229 mm (36 000)	0.0025°	0.0005°	0.00025°	0.0001°	0.00005°	0.000025°	0.00001°	0.000005°	0.0000025°	0.000001°	0.0000005°
Subdivisions of arc second	103 mm (16 200)	20"	4"	2"	0.8"	0.4"	0.2"	0.08"	0.040"	0.020"	0.0080"	0.0040"
	206 mm (32 400)	10"	2"	1"	0.4"	0.2"	0.1"	0.04"	0.020"	0.010"	0.0040"	0.0020"

†Line count as a multiple of 1000

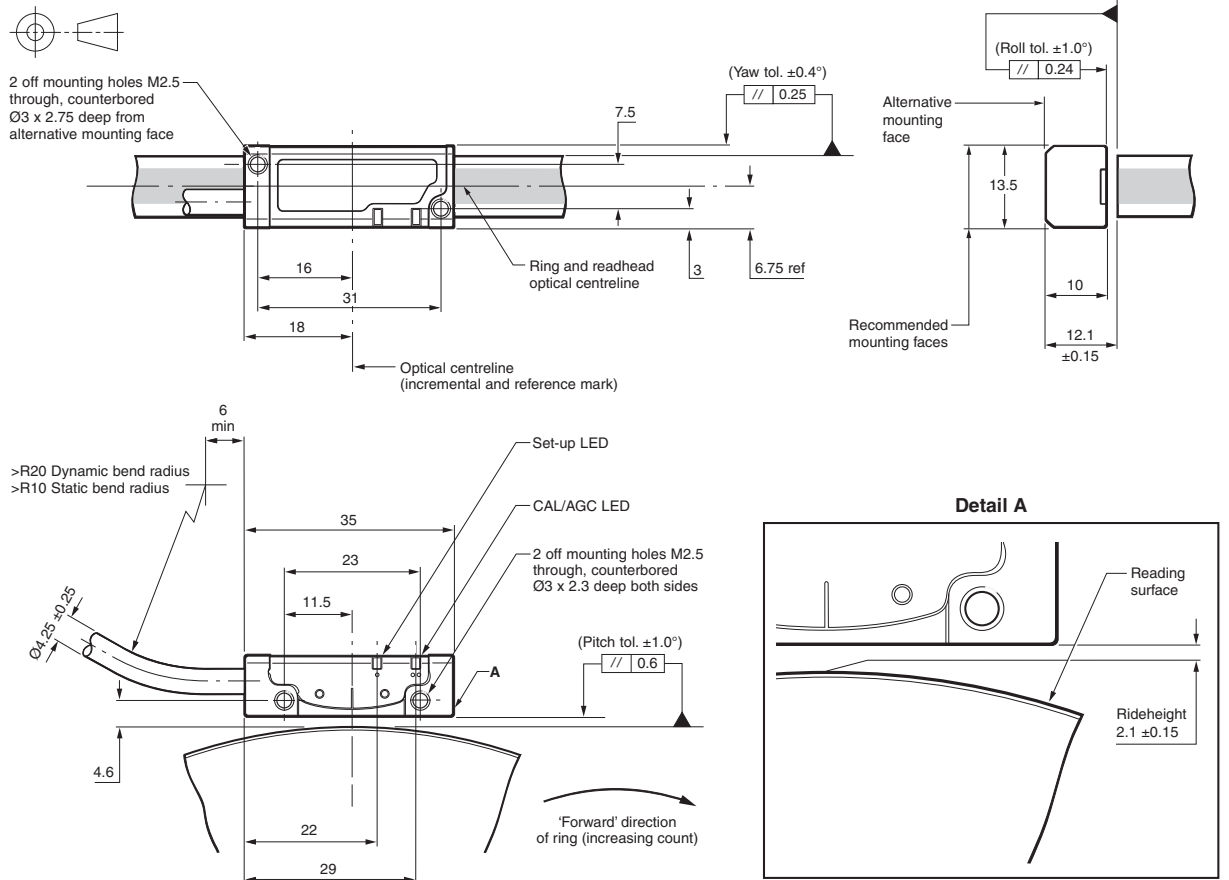
NOTE: The symbol " indicates units of arc seconds.

NOTE: Numbers preceded with a ≈ symbol show rounded resolution values.

To calculate the exact resolution in arc seconds, use the following equation:

$$\theta \text{ (arc seconds)} = \frac{1.296 \times 10^6}{[\text{Line count}] \times [\text{Interpolation factor}]}$$

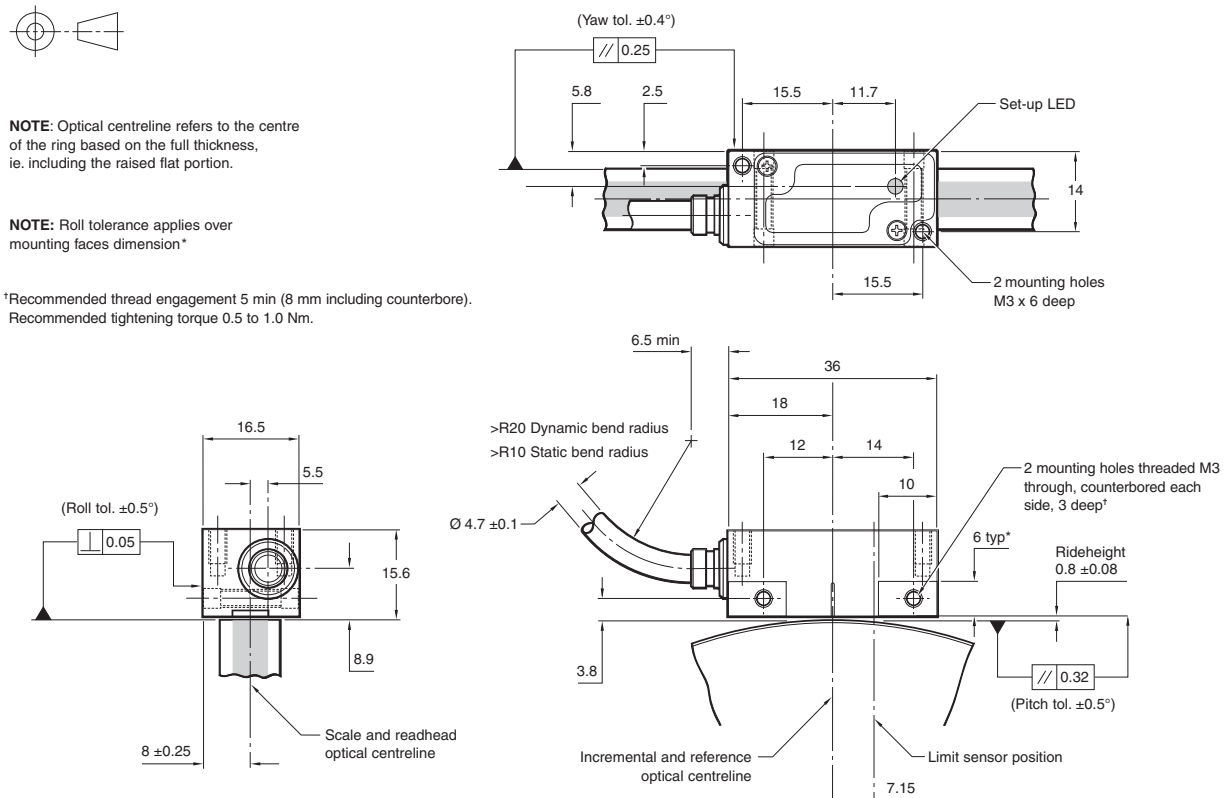
TONIC T2000 readhead mounted on REXM/REXT



For TONIC readhead installation details refer to TONIC REXM/REXT ultra-high accuracy angle encoder installation guide (M-9653-9248). This can be downloaded from www.renishawsupport.com/encoders or contact your local Renishaw representative.

SiGNUM readhead mounted on REXM/REXT

Dimensions and tolerances in mm



For SiGNUM readhead installation details refer to SiGNUM REXM/REXT ultra-high accuracy angle encoder installation guide (M-9671-0021). This can be downloaded from www.renishawsupport.com/encoders or contact your local Renishaw representative.

Maximum speed (rev/min) For 20 MHz clocked option.

For details of maximum speeds for other clocked options, please contact your local representative.

TONiC system

Nominal external diameter (mm)	Line count	Output resolution											Analogue*
		Ti0004 5 µm	Ti0020 1 µm	Ti0040 0.5 µm	Ti0100 0.2 µm	Ti0200 0.1 µm	Ti0400 50 nm	Ti1000 20 nm	Ti2000 10 nm	Ti4000 5 nm	Ti10KD 2 nm	Ti20KD 1 nm	
52	8 192	3 673	3 673	2 479	992	496	246	99	50	25	10	4.8	3 673
57	9 000	3 350	3 350	2 261	904	452	224	90	45	23	9.0	4.4	3 350
75	11 840	2 546	2 546	1 719	688	344	171	69	34	17	6.9	3.3	2 546
100	15 744	1 910	1 910	1 289	516	258	128	52	26	13	5.2	2.5	1 910
103	16 200	1 854	1 854	1 251	501	250	124	50	25	12	5.0	2.4	1 854
104	16 384	1 836	1 836	1 239	496	248	123	50	25	12	5.0	2.4	1 836
115	18 000	1 661	1 661	1 121	448	224	111	45	22	11	4.5	2.2	1 661
150	23 600	1 273	1 273	859	344	172	85	34	17	8.6	3.4	1.7	1 273
183	28 800	1 044	1 044	705	282	141	70	28	14	7.0	2.8	1.4	1 044
200	31 488	955	955	645	258	129	64	26	13	6.4	2.6	1.2	955
206	32 400	927	927	626	250	125	62	25	12	6.2	2.5	1.2	927
209	32 768	914	914	617	247	123	61	25	12	6.2	2.5	1.2	914
229	36 000	834	834	563	225	113	56	22	11	5.6	2.3	1.1	834
255	40 000	749	749	506	202	101	50	20	10	5.0	2.0	1.0	749
300	47 200	637	637	430	172	86	43	17	8.6	4.3	1.7	0.8	637
350	55 040	546	546	369	147	74	37	15	7.4	3.7	1.5	0.7	546
417	65 536	458	458	309	124	62	31	12	6.2	3.1	1.2	0.6	458

*NOTE: Currently Renishaw do not offer an analogue Dual Head summing box, customer would have to do their own summing.

Accuracy

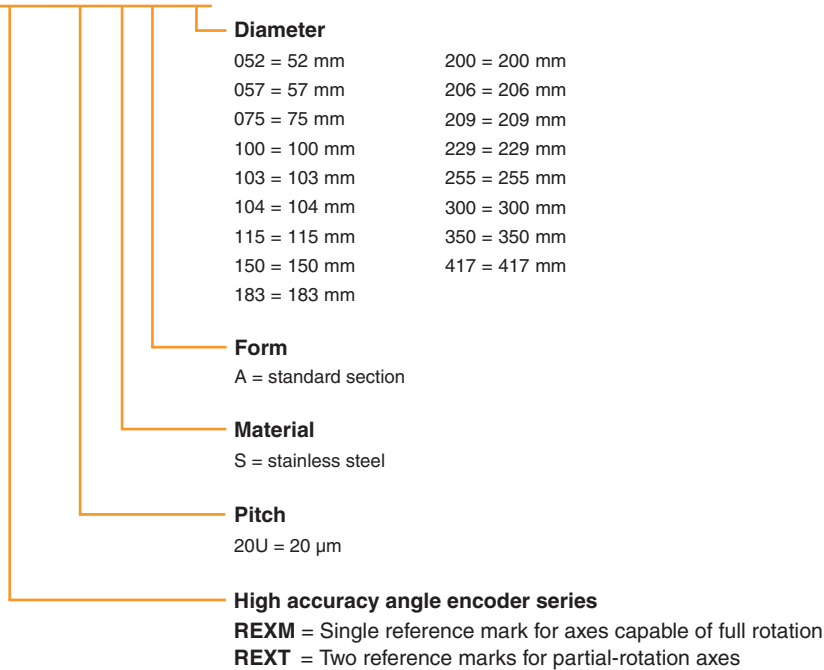
The total installed accuracy of the REXM/REXT rings when used with two SiGNUM or TONiC encoders, with the ring flange mounted onto a shaft surface prepared to the specifications detailed in the REXM/REXT installation guide, centred so that the radial run-out at the fiducial points agrees to within 10 µm TIR, will be as follows:

Nominal external diameter (mm)	Total installed accuracy (arc second)	Nominal external diameter (mm)	Total installed accuracy (arc second)
52	±2	200	±1
57	±2	206	±1
75	±1.5	209	±1
100	±1	229	±1
103	±1	255	±1
104	±1	300	±1
115	±1	350	±1
150	±1	417	±1
183	±1		

NOTE: The figures in this table refer to 'total installed accuracy', not to be confused with 'system accuracy'. Total installed accuracy includes graduation errors, readhead sub-divisional errors, installation errors and errors caused by bearing wander.

REXM/REXT ultra high accuracy angle encoder part numbers

REXM 20U S A 183



REXM/REXT compatible readheads

REXM/REXT



SIGNUM DSi

Installation guide M-9568-0200
 Data sheet L-9517-9231

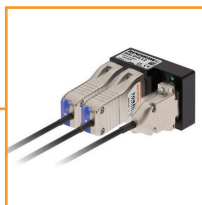


SIGNUM REXM/REXT

Installation guide M-9671-0021
 Data sheet L-9517-9155

TONiC DSi

Installation guide M-9653-9298
 Data sheet L-9517-9466



TONiC REXM/REXT

Installation guide M-9653-9248
 Data sheet L-9517-9337

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

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