

RESR angle encoder system



Patents

Features of Renishaw's RESR angle encoder systems and similar products are the subjects of the following patents and patent applications:

EP 1094302	JP 3,202,316	US 6,051,971	JP 248,895/1993	EP 0543513
EP 0748436	EP 826138	JP 506,211/1999	US 5,861,953	US 5,241,173
EP 0514081	US 5,302,820			

Further information

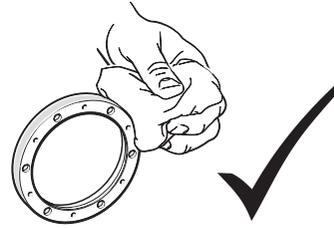
For further information relating to the installation of RESR angle encoder system, see also the RESR Data sheet (Part number L-9517-9128) and the Data sheet and the Installation guide for the readhead that you are using. These can be downloaded from our website www.renishaw.com and are also available from your local representative.

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Storage and handling

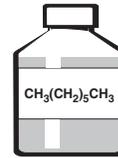


The RESR is a non-contact optical encoder that provides good immunity against contaminants such as dust, fingerprints and light oils.

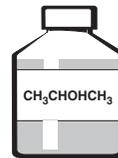
However, in harsh environments such as machine tool applications, protection should be provided to prevent ingress of coolant or oil.

Ring and readhead

N-heptane

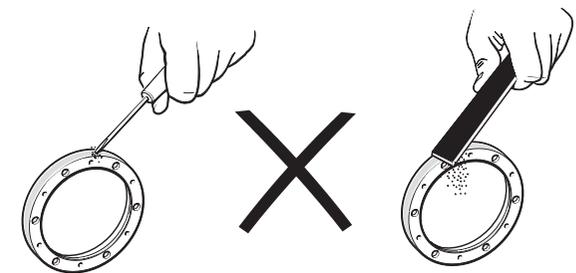
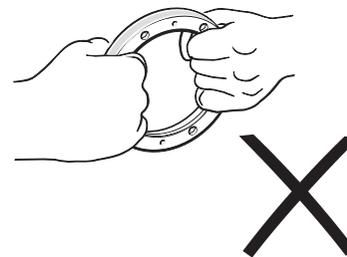
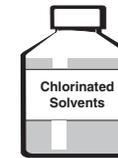
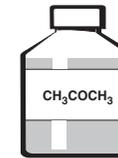


Propan-2-ol

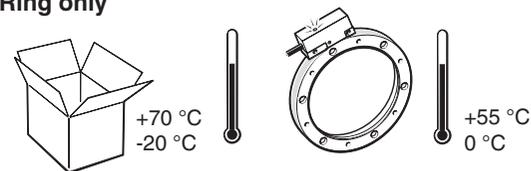


Ring only (avoid contact with readhead)

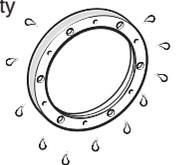
Acetone



Ring only



95% relative humidity (non-condensing) to EN 60068-2-78



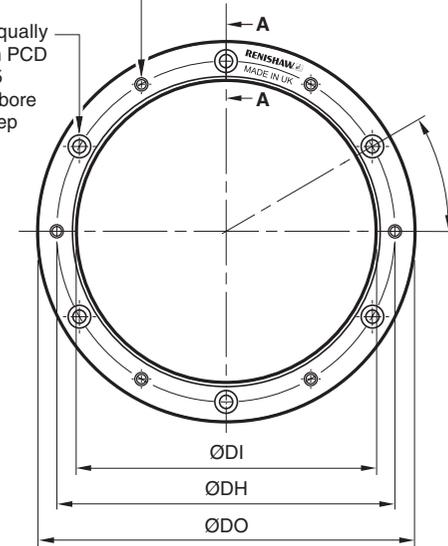
Installation drawing ('A' section)

Dimensions and tolerances in mm

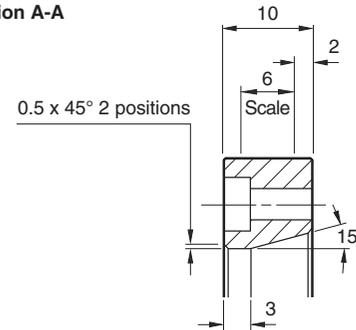
Nominal external diameter (mm)	Line count		DO (mm)	DI (mm)	Mounting holes		
	20 μ m pitch	40 μ m pitch			DH (mm)	N	θ
52	8 192	4 096	52.20 52.10	30.04 30.00	40	6	30°
57	9 000	4 500	57.35 57.25	37.04 37.00	47	6	30°
75	11 840	5 920	75.40 75.30	55.04 55.00	65	6	30°
100	15 744	7 872	100.30 100.20	80.04 80.00	90	6	30°
103	16 200	8 100	103.20 103.00	80.04 80.00	90	6	30°
104	16 384	8 192	104.40 104.20	80.04 80.00	90	6	30°
115	18 000	9 000	114.70 114.50	95.04 95.00	105	6	30°
150	23 600	11 800	150.40 150.20	130.04 130.00	140	9	20°
200	31 488	15 744	200.40 200.20	180.04 180.00	190	12	15°
206	32 400	16 200	206.50 206.10	186.05 186.00	196	12	15°
209	32 768	16 384	208.80 208.40	186.05 186.00	196	12	15°
229	36 000	18 000	229.40 229.00	209.05 209.00	219	12	15°
255	40 000	20 000	254.80 254.40	235.06 235.00	245	12	15°
300	47 200	23 600	300.40 300.20	280.06 280.00	290	16	11.25°
350	55 040	27 520	350.40 350.20	330.06 330.00	340	16	11.25°
413	64 800	32 400	412.70 412.30	392.08 392.00	402	18	10°
417	65 536	32 768	417.40 417.00	380.10 380.00	390	18	10°
550	86 400	43 200	550.20 549.80	510.10 510.00	520	20	9°

N holes equally spaced on PCD \varnothing DH M3 x 0.5 through c/bore \varnothing 3.5 x 4 deep

N holes equally spaced on PCD \varnothing DH \varnothing 3.5 through c/bore \varnothing 6 x 3 deep



Section A-A

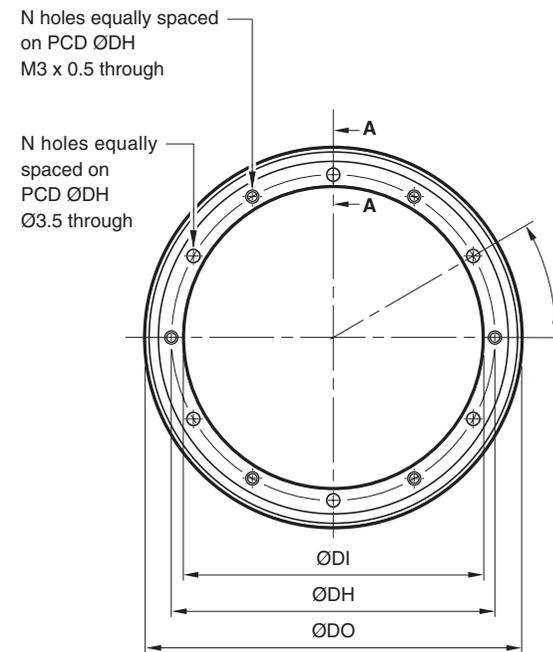


Note: θ is the angle between one tapped hole and the adjacent clearance hole. For example, the angle between two clearance holes is 2θ .

Installation drawing ('B' section)

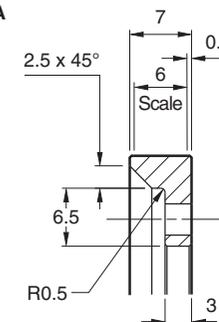
Dimensions and tolerances in mm

Nominal external diameter (mm)	Line count		DO (mm)	DI (mm)	Mounting holes		
	20 µm pitch	40 µm pitch			DH (mm)	N	θ
75	11 840	5 920	75.40 75.30	55.04 55.00	61	6	30°
100	15 744	7 872	100.30 100.20	80.04 80.00	86	6	30°
150	23 600	11 800	150.40 150.20	130.04 130.00	136	9	20°
200	31 488	15 744	200.40 200.20	180.04 180.00	186	12	15°



Note: θ is the angle between one tapped hole and the adjacent clearance hole. For example, the angle between two clearance holes is 2θ.

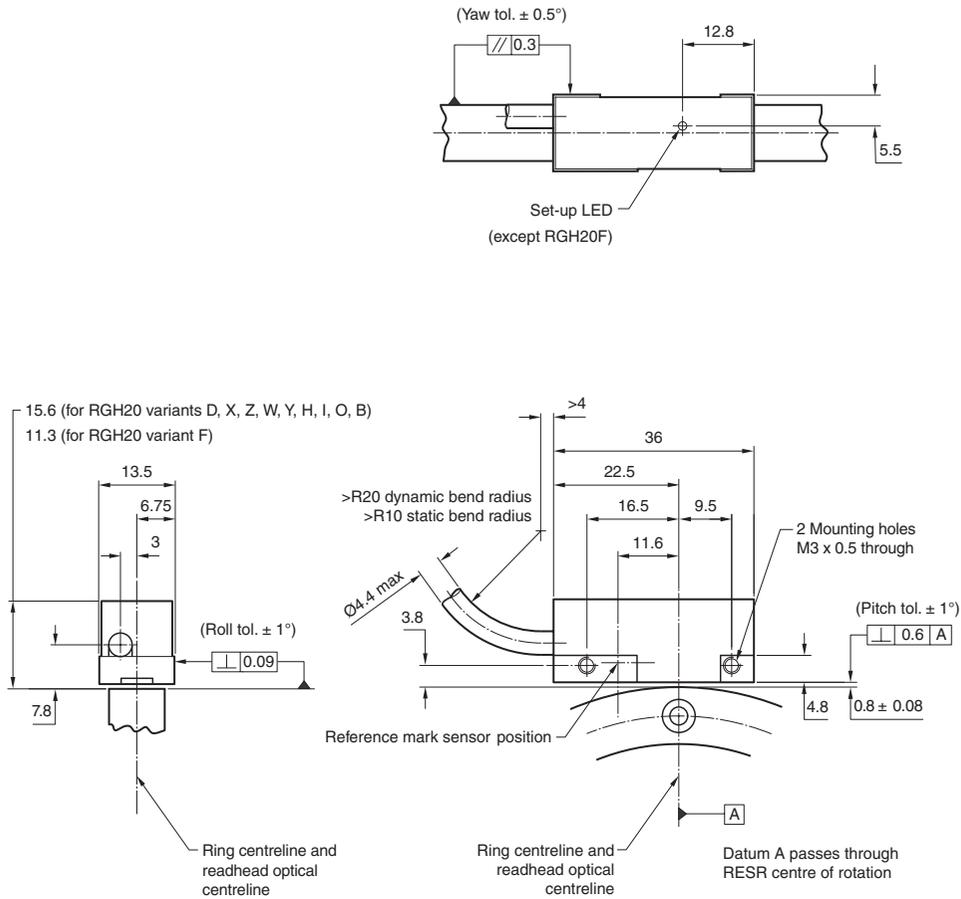
Section A-A



RGH20 mounted on 'A' section ring

Dimensions and tolerances in mm

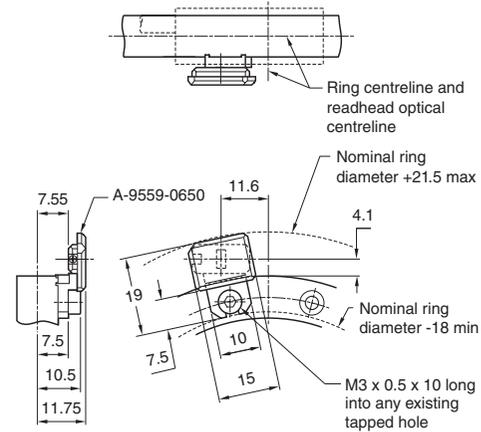
For RGH20 installation refer to Installation guide M-9561-0005.



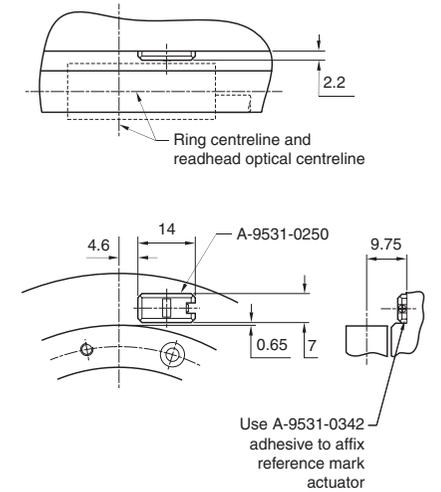
RGH20 reference mark options

Dimensions and tolerances in mm

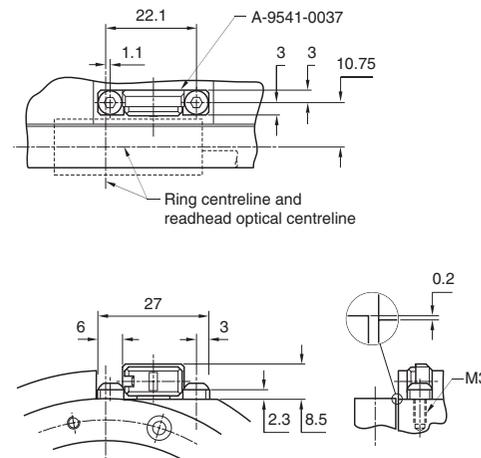
1. Using A-9559-0650



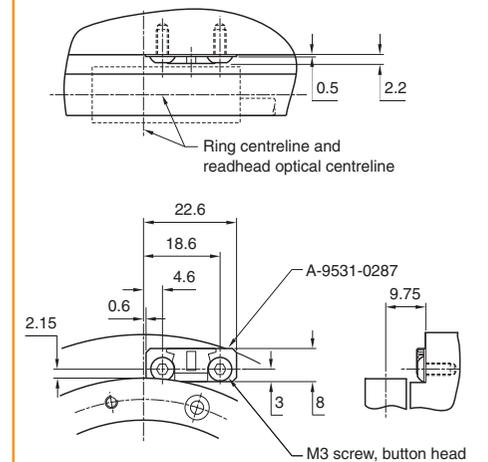
2. Using A-9531-0250



3. Using A-9541-0037



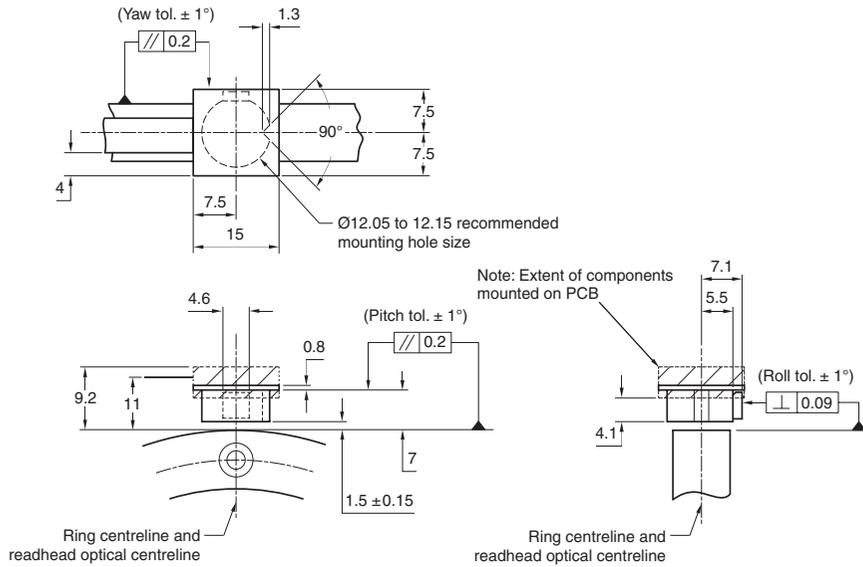
4. Using A-9531-0287



RGH34 mounted on 'A' section ring

Dimensions and tolerances in mm

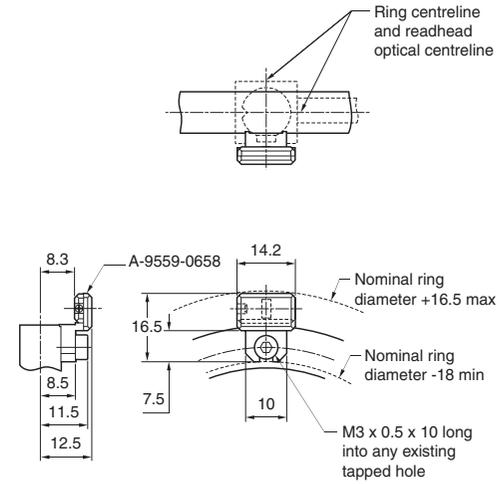
For RGH34 installation refer to Installation guide M-9537-0194.



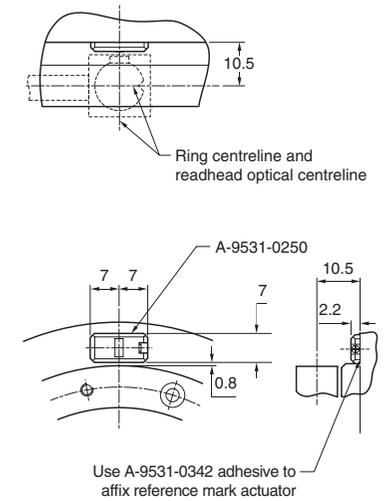
RGH34 reference mark options

Dimensions and tolerances in mm

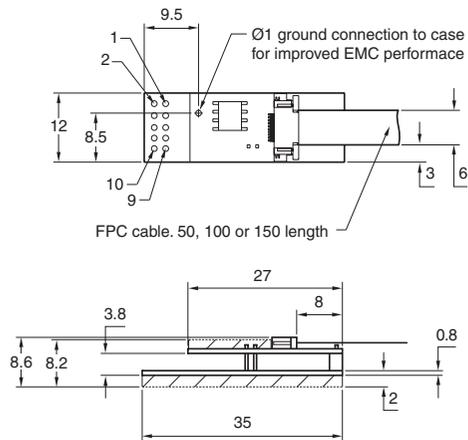
1. Using A-9559-0658



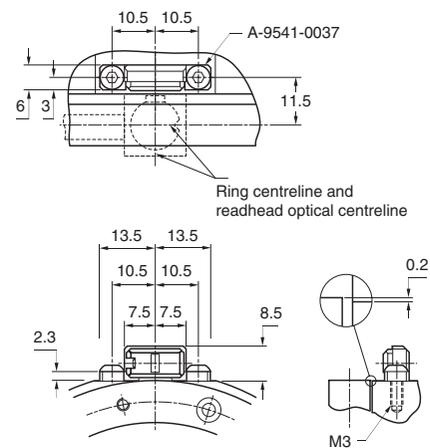
2. Using A-9531-0250



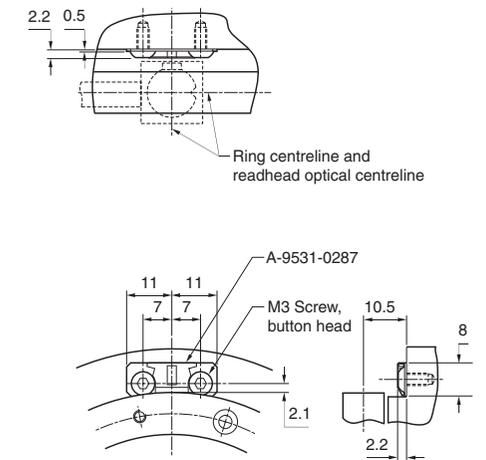
RG134 interface (for use with above)



3. Using A-9541-0037



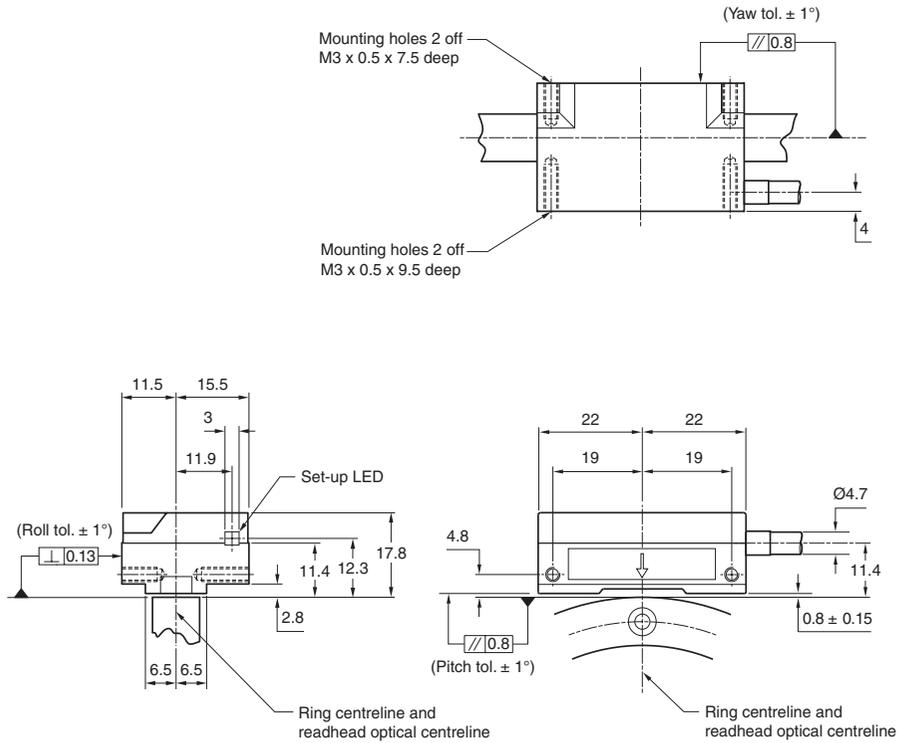
4. Using A-9531-0287



RGH40 mounted on 'A' section ring

Dimensions and tolerances in mm

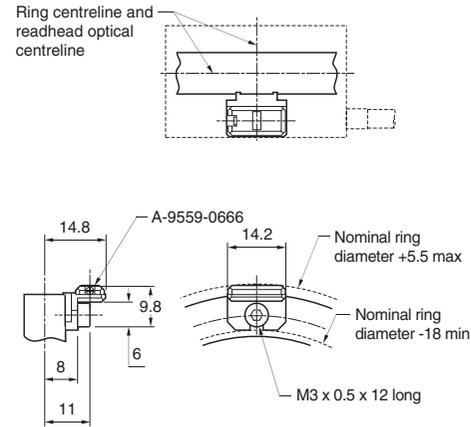
For RGH40 installation refer to Installation guide M-9550-0028.



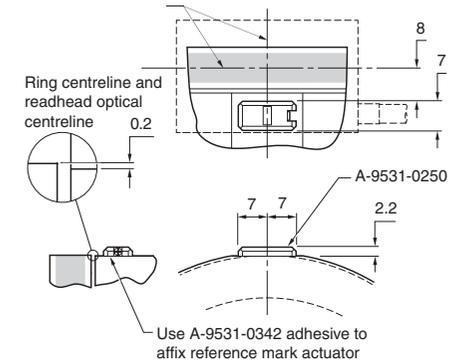
RGH40 reference mark options

Dimensions and tolerances in mm

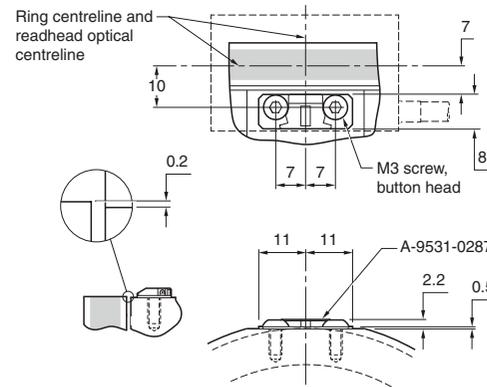
1. Using A-9559-0666



2. Using A-9531-0250

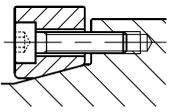
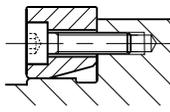
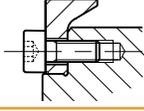


3. Using A-9531-0287



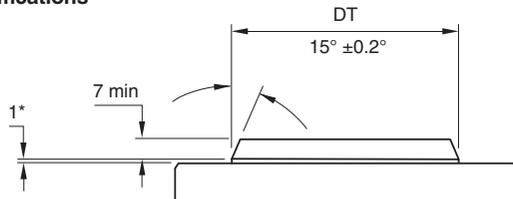
Please note that the A-9541-0037 and A-9546-0160 reference mark assemblies cannot be used with RGH40 readheads because this could potentially result in a collision.

Select a mounting option

	Taper mount	Interference fit
'A' section		
'B' section	Not applicable	
Notes	<p>Recommended for all installations</p> <ul style="list-style-type: none"> 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. 	<p>Alternative installation</p> <ul style="list-style-type: none"> Will not correct eccentricity of the supporting shaft.

Taper mount method Step 1

Mounting shaft specifications



*Allow 2 mm for 417 mm, 489 mm and 550 mm rings only

Recommended taper roundness

Diameter (mm)	Roundness value (mm TIR)
≤ 115	0.025
150 to 255	0.050
≥ 300	0.075

Recommended surface finish
≤ Ra 1.2

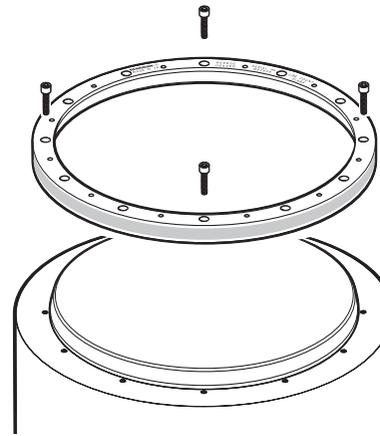
NOTE: It is recommended that the mounting surface is a turned, rather than ground finish.

Recommended taper diameter (DT)

DO (mm)	DT (mm)	DO (mm)	DT (mm)	DO (mm)	DT (mm)
52	33.85 33.65	150	133.85 133.65	350	333.85 333.65
57	40.85 40.65	200	183.85 183.65	413	395.85 395.65
75	58.85 58.65	206	189.85 189.65	417	383.85 383.65
100	83.85 83.65	209	189.85 189.65	489	454.85 454.65
103	83.85 83.65	229	212.85 212.65	550	513.85 513.65
104	83.85 83.65	255	238.85 238.65		
115	98.85 98.65	300	283.85 283.65		

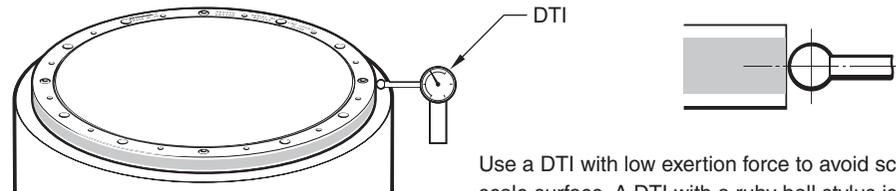
DO = Nominal external diameter

Taper mount method Step 2



- ▶ Clean shaft taper and internal taper of RESR as recommended in the storage and handling section.
- ▶ Insert the first screws:
For RESR rings with 6, 9 or 18 mounting holes, use 3 equally spaced M3 screws.
For RESR rings with 12, 16 or 20 mounting holes, use 4 equally spaced M3 screws.
NOTE: Do not lubricate screws.
Recommended screw type M3 x 0.5:
ISO 4762/DIN 912 grade 10.9 minimum/ANSI B18.3.1M.
- ▶ Insert the screws so that the RESR is loosely connected to the shaft, then roughly align the ring by eye and touch.
- ▶ Lightly tighten the screws. Use a Dial Test Indicator (DTI) to check the radial displacement at the screw locations.

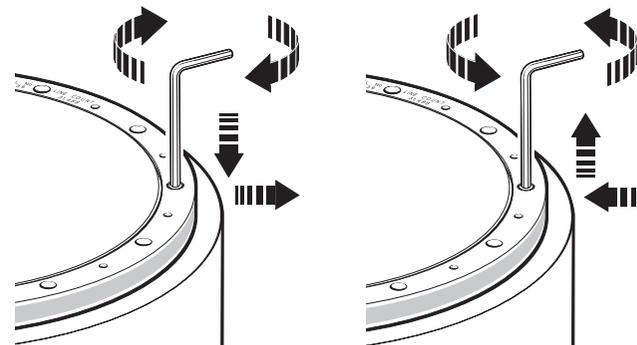
NOTE: Disregard the radial displacement between the screw locations.



Use a DTI with low exertion force to avoid scratching the scale surface. A DTI with a ruby ball stylus is recommended as a further precaution against scratches.

- ▶ Adjust the screws to reduce the range of radial displacement. When adjusting, identify the screw location with the lowest radial displacement and tighten that screw, aiming for the average of the highest and lowest indicator readings.
- ▶ Repeat this process until the DTI readings are within ±5 μm at the screw locations.

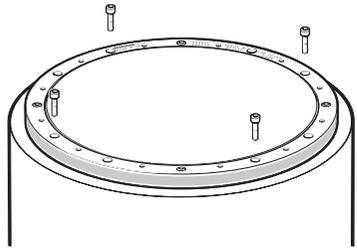
NOTE: It may be necessary to loosen screws whilst tightening other screws.



NOTE: At this stage, the screws should only be lightly tightened (less than 0.5 Nm) to allow further final adjustment.

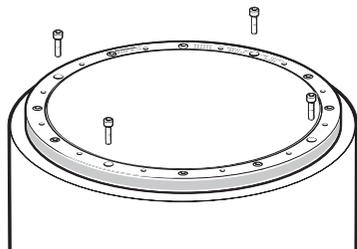
Select a mounting option (continued)

Taper mount method **Step 3**



- ▶ Insert the next screws:
For RESR rings with 6, 9 or 12 mounting holes, insert all the remaining M3 screws.
For RESR rings with 16 mounting holes, insert 3 equally spaced M3 screws.
For RESR rings with 18 mounting holes, insert 6 equally spaced M3 screws.
For RESR rings with 20 mounting holes, insert 8 equally spaced M3 screws (in four groups of two) between existing screws.
 - ▶ As described in Step 2, adjust all the screws inserted thus far, so that the radial displacement at each screw location is within $\pm 5 \mu\text{m}$.
 - ▶ Again, at this stage, the screws should only be lightly tightened (less than 0.5 Nm).
- NOTE: You may notice that the torque required to achieve the radial displacement tolerance will be slightly higher during step 3 than during step 2. This is normal.

Taper mount method **Step 4**



- ▶ Insert screws into the remaining mounting holes.

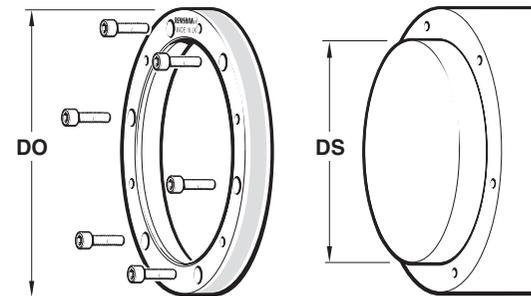
Taper mount method **Step 5**

Diameter (mm)	Recommended torque range (Nm)
≤ 115	1.5 - 2.1
150 to 255	0.8 - 1.1
300 to 413	0.5 - 0.7
≥ 417	1.2 - 1.7

- ▶ Rotate the RESR ring, measuring the radial displacement at all of the screw locations.
- ▶ Tighten the screw with the lowest radial displacement so that it matches the average radial displacement, whilst ensuring the maximum torque specified in the table is not exceeded.
- ▶ Again, rotate the RESR ring and re-check the radial displacement at all of the screw locations, tightening the screw with the lowest radial displacement so that it matches the average.
- ▶ Repeat this process until the radial displacement at all of the screw locations is within $\pm 3 \mu\text{m}$ and that all screw torques are within the specified range.
- ▶ Excessive tightening of screws can have a small effect on accuracy. Please contact your local representative for more details.

Interference fit method

Mounting shaft specifications.



NOTE: 417, 489 and 550 mm rings should be taper mounted only.

DO = Nominal external diameter
DS = Recommended shaft diameter to enable interference fit

DO (mm)	DS (mm)
52	30.033 30.017
57	37.033 37.017
75	55.039 55.020
100	80.045 80.023
103	80.045 80.023
104	80.045 80.023
115	95.045 95.023
150	130.052 130.027
200	180.052 180.027
206	186.060 186.031
209	186.060 186.031
229	209.060 209.031
255	235.060 235.031
300	280.066 280.034
350	330.073 330.037
413	392.073 392.037

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