**Installation guide**
M-9553-9735-03-C

RENISHAW
apply innovation™

# RESOLUTE™ RESA30 and REXA30 absolute angle encoders

# Contents

# Product compliance

CE

Renishaw plc declares that RESOLUTE complies with the applicable standards and regulations. A copy of the EU declaration of conformity is available from our website at www.renishaw.com/productcompliance.

## FCC compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

**NOTE:** This unit was tested with shielded cables on the peripheral devices. Shielded cables must be used with the unit to ensure compliance.

## Patents

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

| | | | | |
|---|---|---|---|---|
| CN1260551 | DE10296644 | GB2395005 | JP4008356 | US7499827 |
| CN102197282 | EP2350570 | JP5480284 | KR1630471 | US8505210 |
| CN102388295 | EP2417423 | JP5659220 | KR1701535 | US10132657 |
| CN102460077 | EP2438402 | JP5755223 | JP6074392 | KR1851015 |
| US20120072169 | EP01103791 | US6465773 | EP1094302 | JP5442174 |
| US6481115 | CN1293983 | DE10297440 | GB2397040 | JP4813018 |
| US7723639 | CN1314511 | EP1469969 | EP2390045 | JP5002559 |
| US8466943 | US8987633 | JP4423196 | US7367128 | |

## Further information

Further information relating to the RESOLUTE encoder range can be found in the RESOLUTE data sheets. These can be downloaded from our website www.renishaw.com/encoderdatasheets and are also available from your local Renishaw representative. This document may not be copied or reproduced in whole or in part, or transferred to any other media or language, by any means without the written prior permission of Renishaw. The publication of material within this document does not imply freedom from the patent rights of Renishaw plc.

## Disclaimer

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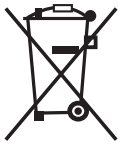
The packaging of our products contains the following materials and can be recycled.

| Packaging Component | Material | ISO 11469 | Recycling Guidance |
|---|---|---|---|
| **Outer box** | Cardboard | Not applicable | Recyclable |
| | Polypropylene | PP | Recyclable |
| **Inserts** | Low Density Polyethylene Foam | LDPE | Recyclable |
| | Cardboard | Not applicable | Recyclable |
| **Bags** | High Density Polyethylene Bag | HDPE | Recyclable |
| | Metalised Polyethylene | PE | Recyclable |

## REACH regulation

Information required by Article 33(1) of Regulation (EC) No. 1907/2006 ("REACH") relating to products containing substances of very high concern (SVHCs) is available at: www.renishaw.com/REACH



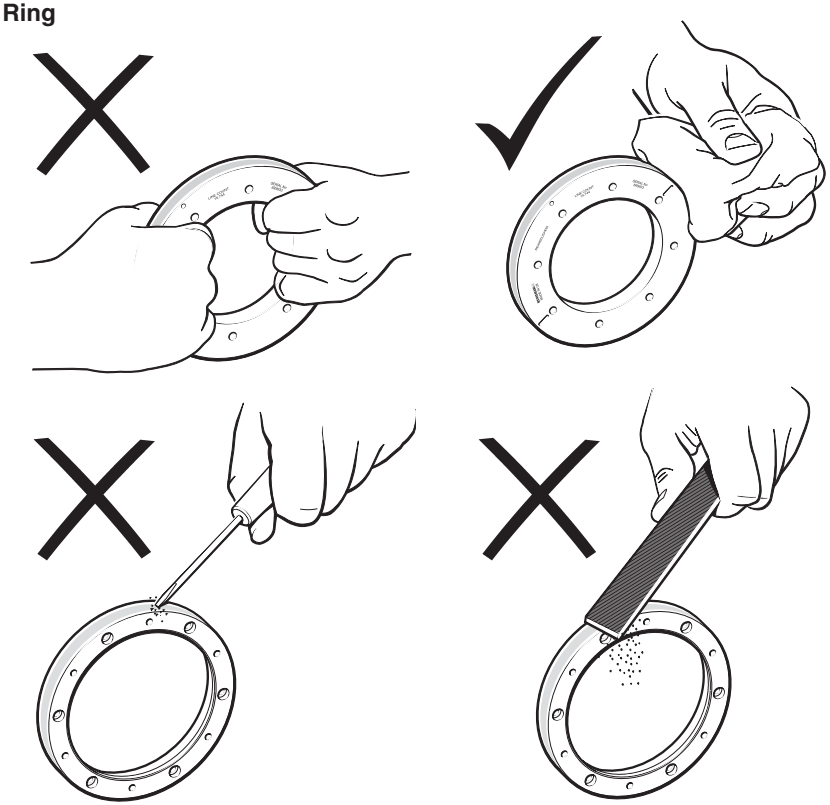
The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, please contact your local waste disposal service or Renishaw distributor.

## Storage and handling

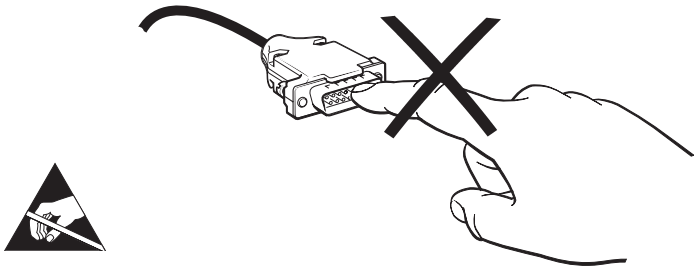
RESOLUTE RESA30 and REXA30 are non-contact optical encoders that provide good immunity against contaminants such as dust, fingerprints and light oils.

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

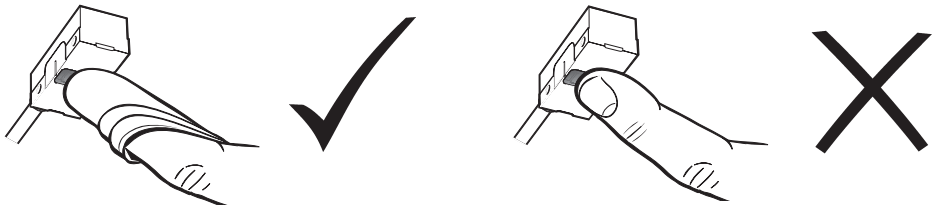
### Ring



### Readhead and DRIVE-CLiQ interface

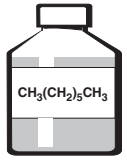


### Readhead



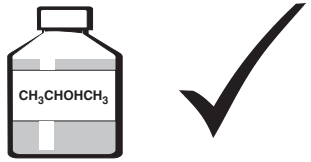
### System

N-heptane



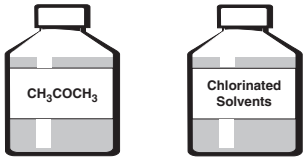

**NOTE:** Do not use N-heptane on External Temperature Range (ETR) readheads

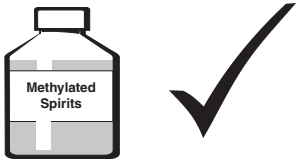
Propan-2-ol




### Ring only

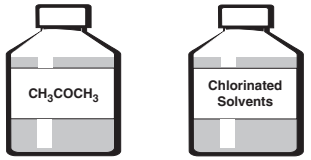
Acetone



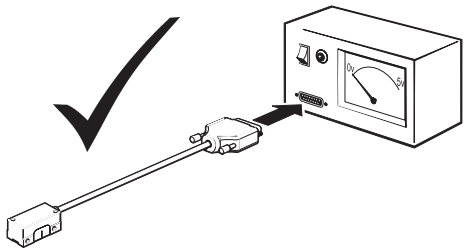



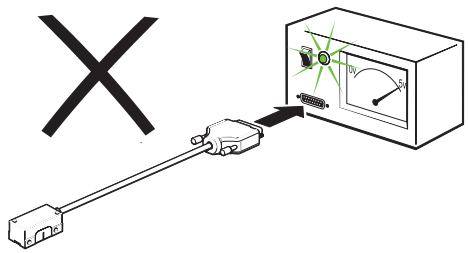

### Readhead only

Acetone



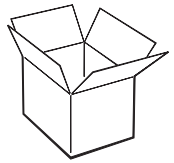






### Storage

Standard
+80 °C
–20 °C



ETR
+80 °C
–40 °C

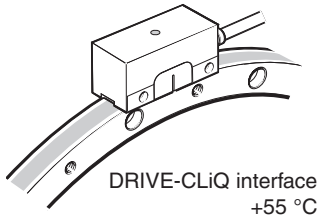
UHV
+80 °C
0 °C
Bakeout +120 °C

### Operating

Standard
+80 °C
0 °C

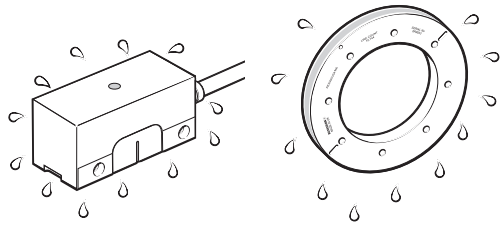
ETR
+80 °C
–40 °C

UHV
+75 °C
0 °C



DRIVE-CLiQ interface
+55 °C
0 °C

### Humidity

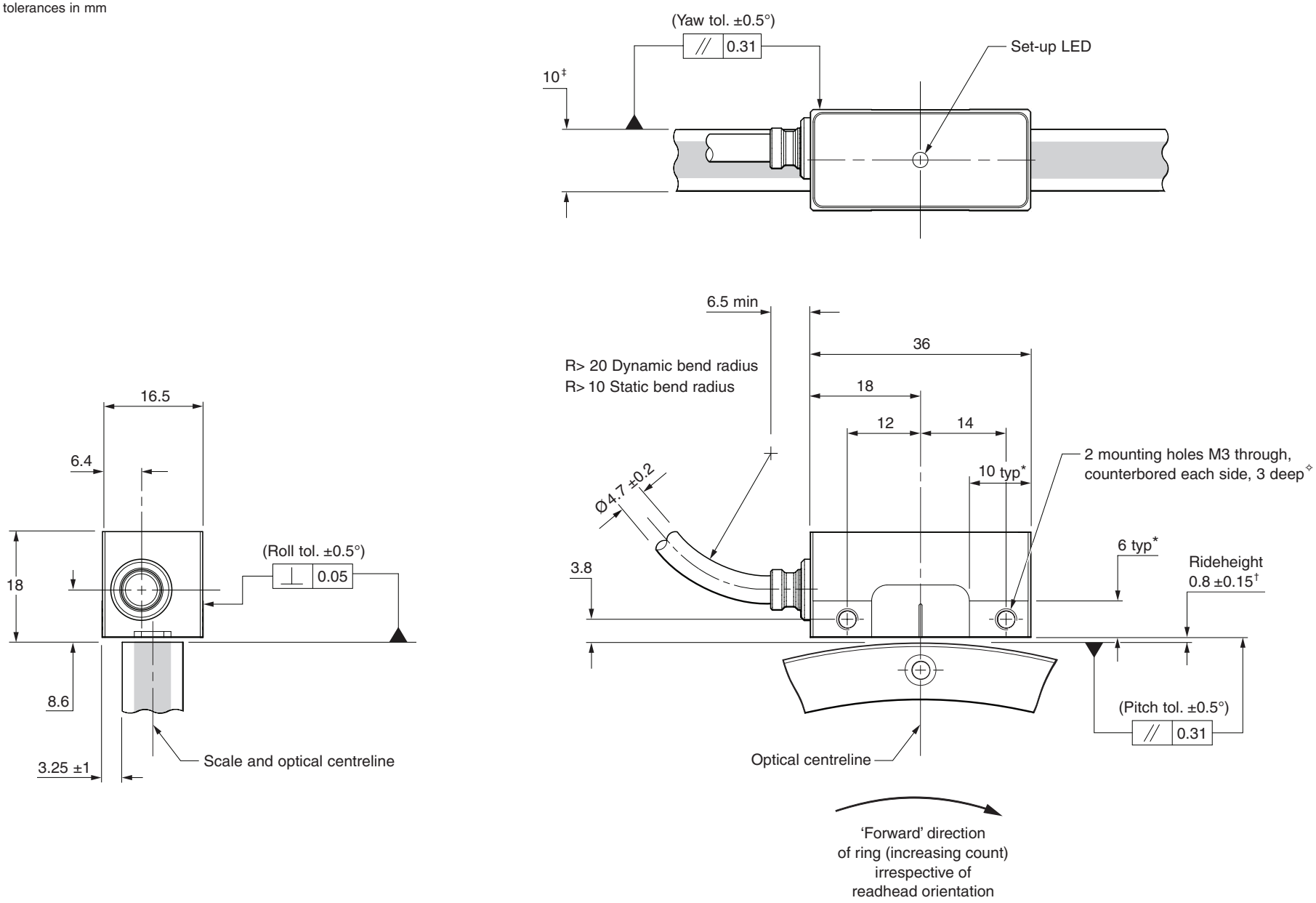


Standard and UHV: 95% relative humidity (non-condensing) to IEC 60068-2-78

ETR: 0 °C to 60 °C, 95% relative humidity decreasing linearly to 40% at 80 °C

## Installation drawing: RESOLUTE readhead - standard cable outlet (shown on RESA30 ring)

Dimensions and tolerances in mm




* Extent of mounting faces.

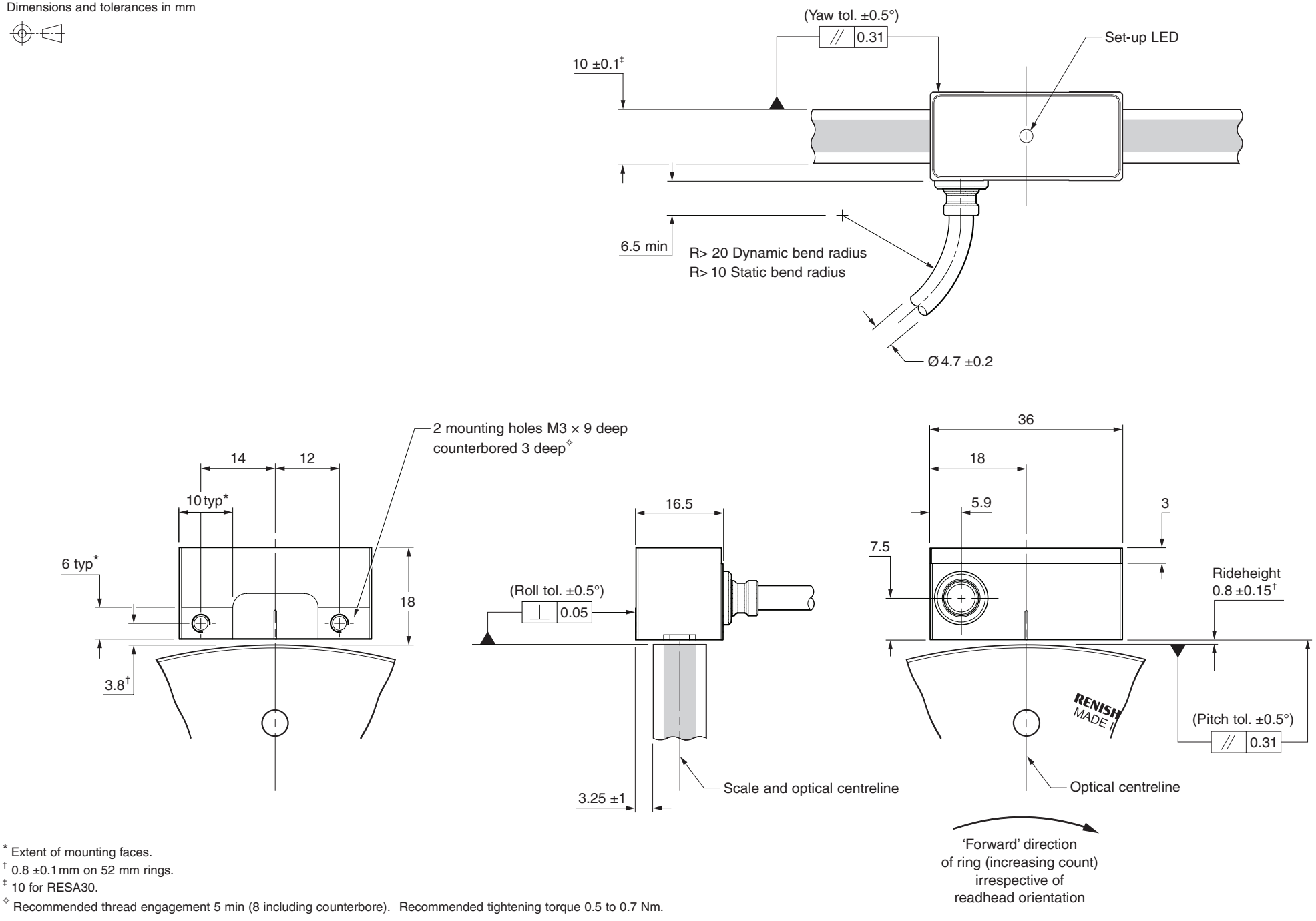
† 0.8 ±0.1 mm on 52 mm rings.

‡ 10 ±0.1 mm for REXA30.

✧ Recommended thread engagement 5 min (8 including counterbore). Recommended tightening torque 0.5 to 0.7 Nm.

## Installation drawing: RESOLUTE readhead - side cable outlet (shown on REXA30 ring)

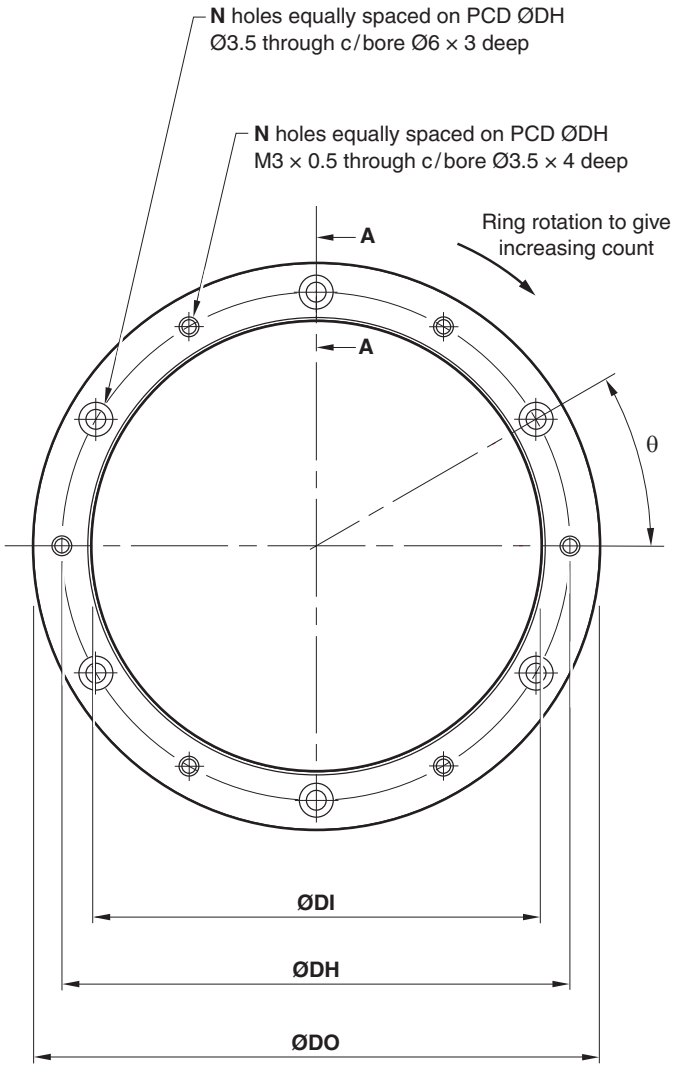
Dimensions and tolerances in mm




* Extent of mounting faces.
† 0.8 ±0.1 mm on 52 mm rings.
‡ 10 for RESA30.
✧ Recommended thread engagement 5 min (8 including counterbore). Recommended tightening torque 0.5 to 0.7 Nm.

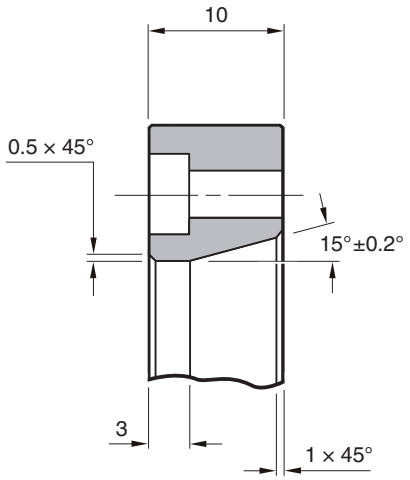
# Installation drawing: RESA30 ring (‘A’ section)

Dimensions and tolerances in mm




**NOTE:** The scale zero position is radially aligned with the centre of the mounting hole to the left of the Renishaw logo.

**NOTE:** θ is the angle between one tapped hole and the adjacent clearance hole.
The angle between two clearance holes is 2θ.




**Section A-A**

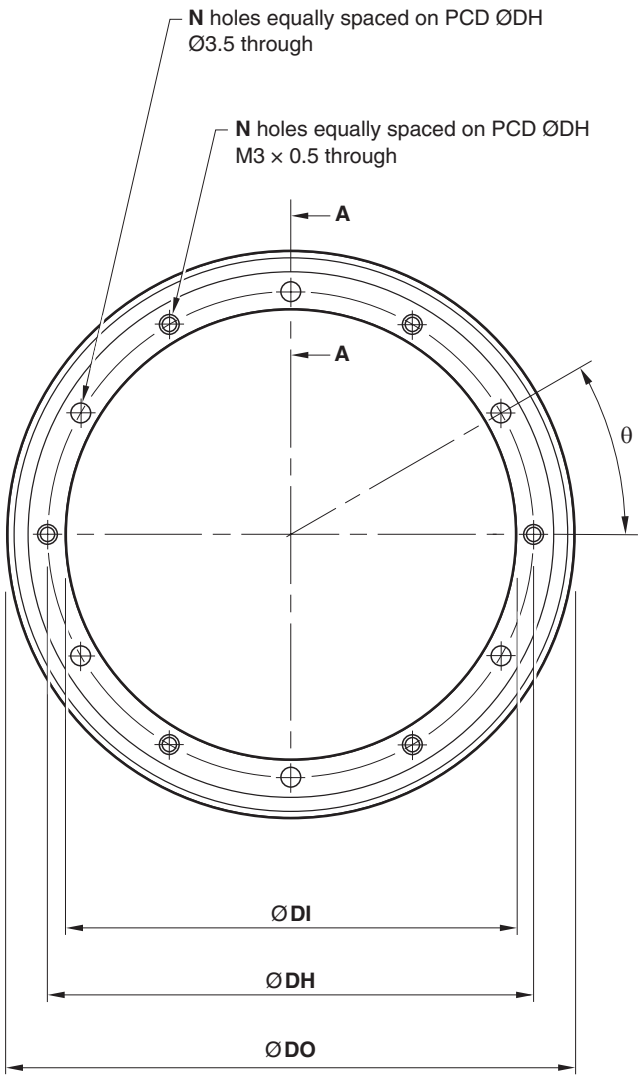
| Nominal external diameter (mm) | DO (mm) | DI (mm) | Mounting holes | | |
|---|---|---|---|---|---|
| | | | DH (mm) | N | θ |
| **52** | 52.20<br>52.10 | 30.04<br>30.00 | 40 | 6 | 30° |
| **57** | 57.35<br>57.25 | 37.04<br>37.00 | 47 | 6 | 30° |
| **75** | 75.40<br>75.30 | 55.04<br>55.00 | 65 | 6 | 30° |
| **100** | 100.30<br>100.20 | 80.04<br>80.00 | 90 | 6 | 30° |
| **103** | 103.20<br>103.00 | 80.04<br>80.00 | 90 | 6 | 30° |
| **104** | 104.40<br>104.20 | 80.04<br>80.00 | 90 | 6 | 30° |
| **115** | 114.70<br>114.50 | 95.04<br>95.00 | 105 | 6 | 30° |
| **150** | 150.40<br>150.20 | 130.04<br>130.00 | 140 | 9 | 20° |
| **200** | 200.40<br>200.20 | 180.04<br>180.00 | 190 | 12 | 15° |
| **206** | 206.50<br>206.10 | 186.05<br>186.00 | 196 | 12 | 15° |
| **209** | 208.80<br>208.40 | 186.05<br>186.00 | 196 | 12 | 15° |
| **229** | 229.40<br>229.00 | 209.05<br>209.00 | 219 | 12 | 15° |
| **255** | 254.80<br>254.40 | 235.06<br>235.00 | 245 | 12 | 15° |
| **300** | 300.40<br>300.20 | 280.06<br>280.00 | 290 | 16 | 11.25° |
| **350** | 350.40<br>350.20 | 330.06<br>330.00 | 340 | 16 | 11.25° |
| **413** | 412.70<br>412.30 | 392.08<br>392.00 | 402 | 18 | 10° |
| **417** | 417.40<br>417.00 | 380.10<br>380.00 | 390 | 18 | 10° |
| **489** | 489.12<br>488.72 | 451.10<br>450.90 | 462 | 20 | 18°* |
| **550** | 550.20<br>549.80 | 510.10<br>510.00 | 520 | 20 | 9° |

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

**IMPORTANT:** RESOLUTE readheads must be used with the correct size RESA30 ring. Ensure matching part numbers when ordering.

# Installation drawing: RESA30 ring (‘B’ section)

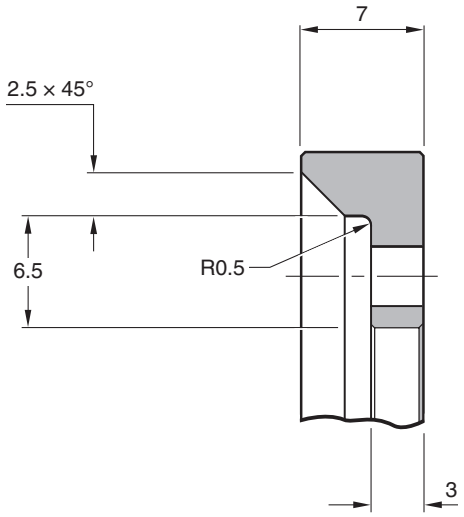
Dimensions and tolerances in mm




**NOTE:** The scale zero position is radially aligned with the centre of the mounting hole to the left of the Renishaw logo.

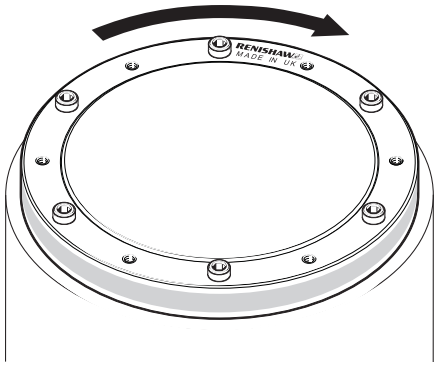
**NOTE:** θ is the angle between one tapped hole and the adjacent clearance hole.
The angle between two clearance holes is 2θ.

| Nominal external diameter (mm) | DO (mm) | DI (mm) | Mounting holes | | |
|---|---|---|---|---|---|
| | | | DH (mm) | N | θ |
| 52 | 52.20<br>52.10 | 32.04<br>32.00 | 38 | 6 | 30° |
| 75 | 75.40<br>75.30 | 55.04<br>55.00 | 61 | 6 | 30° |
| 100 | 100.30<br>100.20 | 80.04<br>80.00 | 86 | 6 | 30° |
| 115 | 114.70<br>114.50 | 95.04<br>95.00 | 101 | 6 | 30° |
| 150 | 150.40<br>150.20 | 130.04<br>130.00 | 136 | 9 | 20° |
| 200 | 200.40<br>200.20 | 180.04<br>180.00 | 186 | 12 | 15° |

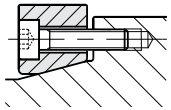
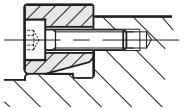
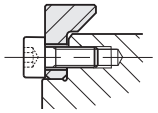



**Section A-A**

Ring rotation to give increasing count



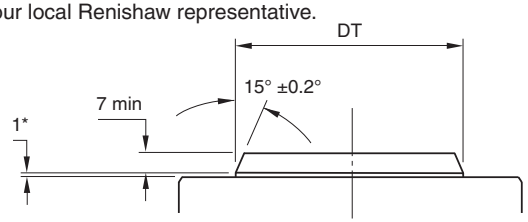
# RESA30 – Select a mounting option

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

## Taper mount method Step 1

**Mounting shaft specifications**

When using a RESOLUTE External Temperature Range variant (ETR) the hub should be made of a material with a CTE of between 14 and 18 µm/m/°C. For more information on mounting the ring when using ETR, contact your local Renishaw representative.




* 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**)

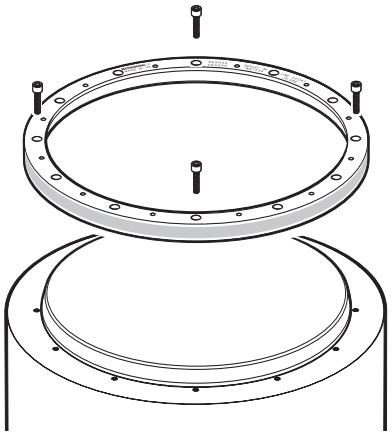
| DO (mm) | DT (mm) |
|---|---|
| 52 | 33.85<br>33.65 |
| 57 | 40.85<br>40.65 |
| 75 | 58.85<br>58.65 |
| 100 | 83.85<br>83.65 |
| 103 | 83.85<br>83.65 |
| 104 | 83.85<br>83.65 |
| 115 | 98.85<br>98.65 |

| DO (mm) | DT (mm) |
|---|---|
| 150 | 133.85<br>133.65 |
| 200 | 183.85<br>183.65 |
| 206 | 189.85<br>189.65 |
| 209 | 189.85<br>189.65 |
| 229 | 212.85<br>212.65 |
| 255 | 238.85<br>238.65 |
| 300 | 283.85<br>283.65 |

| DO (mm) | DT (mm) |
|---|---|
| 350 | 333.85<br>333.65 |
| 413 | 395.85<br>395.65 |
| 417 | 383.85<br>383.65 |
| 489 | 454.85<br>454.65 |
| 550 | 513.85<br>513.65 |

**DO** = Nominal external diameter

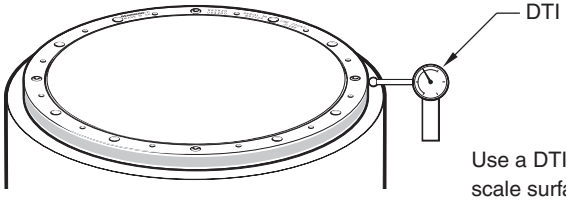
## Taper mount method Step 2

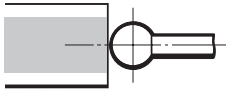


- Clean shaft taper and internal taper of RESA30 as recommended in the storage and handling section.
- Insert the first screws:
  For RESA30 rings with 6, 9 or 18 mounting holes, use 3 equally-spaced M3 screws.
  For RESA30 rings with 12, 16 or 20 mounting holes, use 4 equally-spaced M3 screws.

  **NOTES:**
  - Do not lubricate screws.
  - Recommended screw type M3 × 0.5: ISO 4762/DIN 912 grade 10.9 minimum/ANSI B18.3.1M.
- Insert the screws so that the RESA30 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.

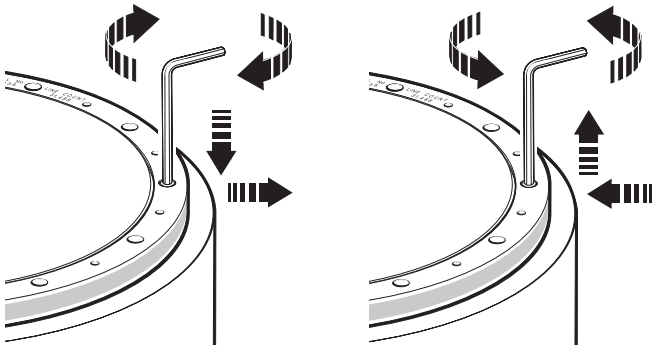


Use a DTI with low exertion force to avoid scratching the scale surface. A DTI with a ruby ball stylus is recommended as a further precaution against scratches.

- 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.

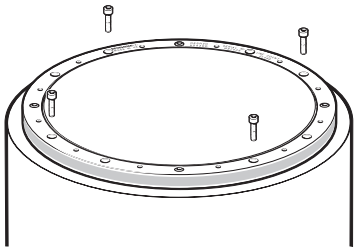
  **NOTE:** It may be necessary to loosen screws whilst tightening other screws.



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

# RESA30 – Select a mounting option (continued)

## Taper mount method Step 3



- Insert the next screws:
  For RESA30 rings with 6, 9 or 12 mounting holes, insert all the remaining M3 screws.

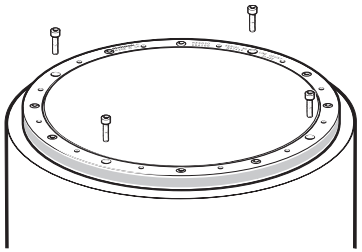
  For RESA30 rings with 16 mounting holes, insert 4 equally-spaced M3 screws.

  For RESA30 rings with 18 mounting holes, insert 6 equally-spaced M3 screws.

  For RESA30 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 already inserted, so that the radial displacement at each screw location is within ±5 µm.
- Lightly tighten the screws (less than 0.5 Nm).

  **NOTE:** The torque required to achieve the radial displacement tolerance will be slightly higher during step 3 than during step 2.

## Taper mount method Step 4



- Insert screws into the remaining mounting holes.

## Taper mount method Step 5

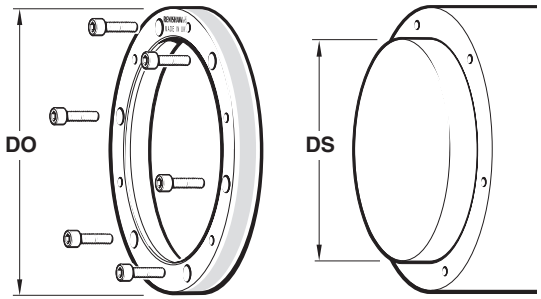
| Diameter (mm) | Recommended torque range (Nm) |
|---|---|
| ≤ 115 | 1.5 – 2.1 |
| 150 to 255 | 0.8 – 1.1 |
| 300 to 413 | 0.5 – 0.7 |
| ≥ 417 | 1.2 – 1.7 |

- Rotate the RESA30 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.
- Rotate the RESA30 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 ±3 µm and that all screw torques are within the specified range.
- Excessive tightening of screws can have a small effect on accuracy. Contact your local Renishaw representative for more details.

## Interference fit method

**Mounting shaft specifications.**

When using a RESOLUTE ETR, the hub should be made of a material with a CTE of between 14 and 18 µm/m/°C.
Contact your local Renishaw representative for more information.
Applies to A and B section rings.




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

**DO** = Nominal external diameter

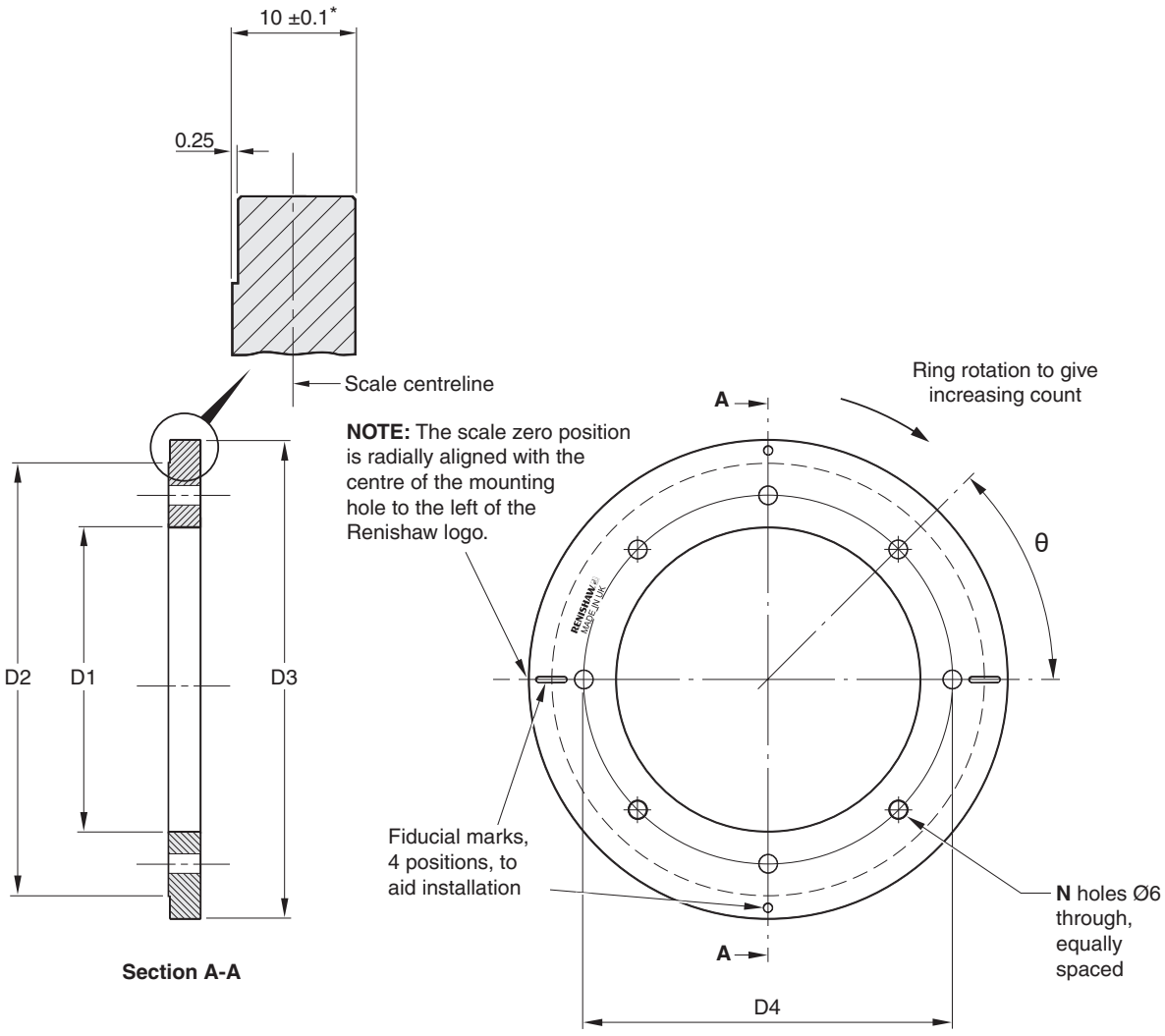
**DS** = Recommended shaft diameter to enable interference fit

* 52 mm 'B' section ring = $\frac{32.033}{32.017}$

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

# Installation drawing: REXA30 ring

Dimensions and tolerances in mm




| Nominal external diameter (mm) | Dimensions | | | Mounting Holes | | |
|---|---|---|---|---|---|---|
| | D1 | D2 | D3 | N | D4 | θ |
| **52**† | 26 | 50 | 52.1 – 52.2 | 4 | 38 | 90° |
| **57**† | 26 | 50 | 57.25 – 57.35 | 4 | 38 | 90° |
| **75** | 40.5 | 64.5 | 75.3 – 75.4 | 8 | 52.5 | 45° |
| **100** | 57.5 | 97.5 | 100.2 – 100.3 | 8 | 77.5 | 45° |
| **103** | 57.5 | 97.5 | 103.0 – 103.2 | 8 | 77.5 | 45° |
| **104** | 57.5 | 97.5 | 104.2 – 104.4 | 8 | 77.5 | 45° |
| **115** | 68 | 108 | 114.5 – 114.7 | 8 | 88 | 45° |
| **150** | 96 | 136 | 150.2 – 150.4 | 8 | 116 | 45° |
| **183** | 122.5 | 162.5 | 183.2 – 183.4 | 12 | 142.5 | 30° |
| **200** | 136 | 176 | 200.2 – 200.4 | 12 | 156 | 30° |
| **206** | 140.5 | 180.5 | 206.1 – 206.5 | 12 | 160.5 | 30° |
| **209** | 140.5 | 180.5 | 208.4 – 208.8 | 12 | 160.5 | 30° |
| **229** | 160.5 | 200.5 | 229.0 – 229.4 | 12 | 180.5 | 30° |
| **255** | 180.5 | 220.5 | 254.4 – 254.8 | 12 | 200.5 | 30° |
| **300** | 216 | 256 | 300.2 – 300.4 | 12 | 236 | 30° |
| **350** | 256 | 296 | 350.2 – 350.4 | 16 | 276 | 22.5° |
| **417** | 305 | 345 | 417.0 – 417.4 | 16 | 325 | 22.5° |

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

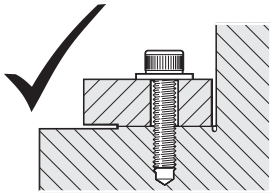
* Graduations are centered within this dimension

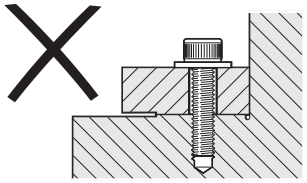
# REXA30 – Installation

REXA30 should be flange mounted onto a flat surface, this eliminates all installation errors except eccentricity, which can be compensated using twin readheads.

- Although taper mounting is best for thin cross-section rings, it is not suitable for thick cross-section REXA30 rings.
- The REXA30 ring should be flange mounted onto a flat surface to minimise 2-per-rev distortion.
- Some eccentricity of the ring is acceptable because it will be compensated by the use of twin readheads.
- To avoid distorting the scale, the REXA30 should not be interference fitted.

**NOTE:** If using REXA30 with RESOLUTE ETR, contact your local Renishaw representative.

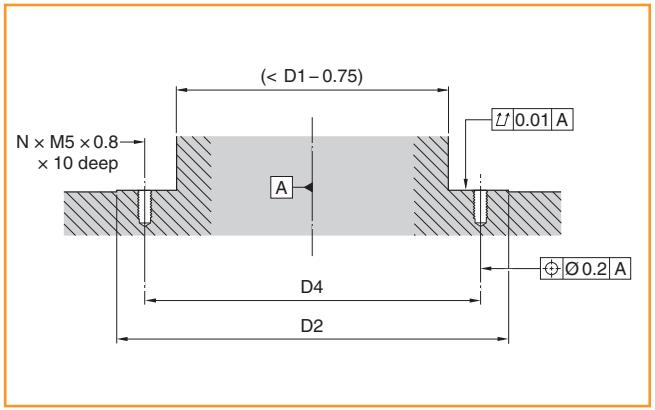


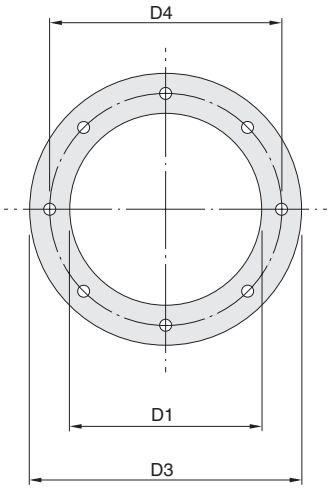


**CAUTION:** DO NOT interference fit.

## Shaft preparation Step 1

There is a mounting face on the lower side of the REXA30 ring. A flat surface must be prepared on the mounting shaft to match. The total axial run-out of the mounting surface must be better than 10 µm.

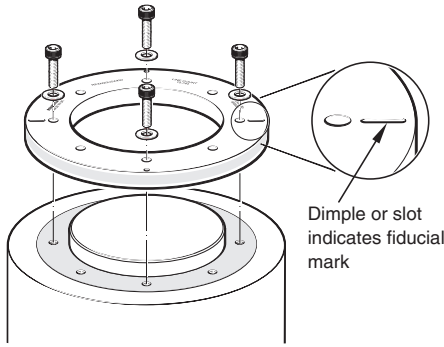


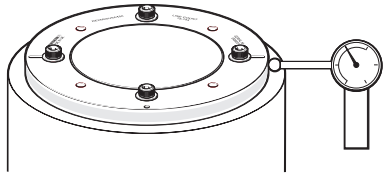



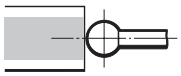

For dimensions D1, D2, D3, D4 and number of holes N, refer to page 9.

## Mounting Step 2

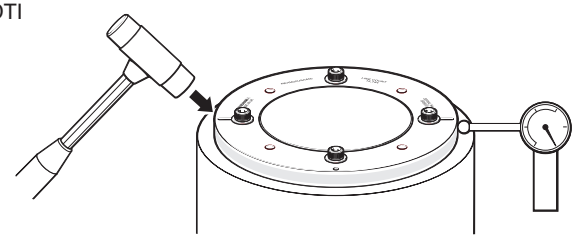
- Clean the mounting face on the lower side of the REXA30. Clean the mating surface on the mounting shaft.
- Place the REXA30 onto the mounting shaft, then insert four M5 screws with flat washers into the four screw holes by the fiducial marks.
  **NOTES:**
  - Do not lubricate screws.
  - Recommended screw type M5 × 0.8: ISO 4762/DIN 912 grade 10.9 minimum/ANSI B18.3.1M.
  - DO NOT tighten the screws at this stage – engage the threads ensuring that the heads do not touch the ring.
- Set up a Dial Test Indicator (DTI) to measure the run-out on the REXA30 ring.
  **NOTE:** At this stage the ring is not firmly fixed, so to avoid causing the ring to shift position, rotate the ring slowly and smoothly.
- Where the DTI shows the lowest radius reading, gently tap the opposite side of the ring on the edge using a rubber mallet, until the DTI reading is approximately at the 'mid point' of the run-out.
- Find the new lowest radius reading and gently tap the opposite side of the ring using a rubber mallet, until the DTI reading is approximately at the 'mid point' of the run-out.
- Continue this process until the run-out of the ring is approximately 30 µm (0.0012 inches).
  This is the initial adjustment.
  Adjust to 10 µm at the fiducial points (see overleaf).



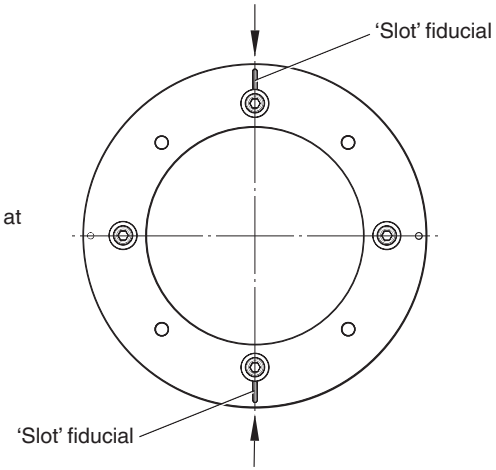


Use a DTI with low contact force to avoid scratching the scale surface. A DTI with a ruby ball stylus is recommended as a further precaution against scratches.



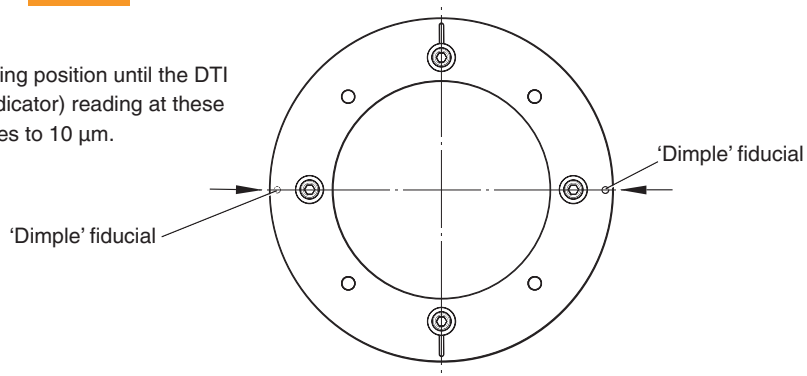
## Mounting Step 3

Adjust ring position until the DTI (dial test indicator) reading at these points agrees to 10 µm.




## Mounting Step 4

Adjust the ring position until the DTI (dial test indicator) reading at these points agrees to 10 µm.




## Mounting Step 5

- Re-check the run-out at the two 'slot' fiducial points, to ensure the run-out at the two 'slot' points is still better than 10 µm. Adjust if necessary.
- Gradually tighten the 4 screws, a quarter-turn at a time so as to avoid moving the position of the ring.
- Finally, insert the remaining M5 screws and torque all the screws to 4 Nm.
- Re-check the run-out at the two 'slot' fiducial points, then at the two 'dimple' fiducial points. The run-out values at the 'slot' fiducial points do not have to match the run-out values at the 'dimple' fiducial points. If the ring has moved position outside the 10 µm limit, the screws must be loosened and the ring adjusted.

## Readhead mounting/installation

### Mounting brackets

The bracket must have a flat mounting surface, enable conformance to the installation tolerances, allow adjustment of the rideheight of the readhead, and be sufficiently stiff to prevent deflection of the readhead during operation.

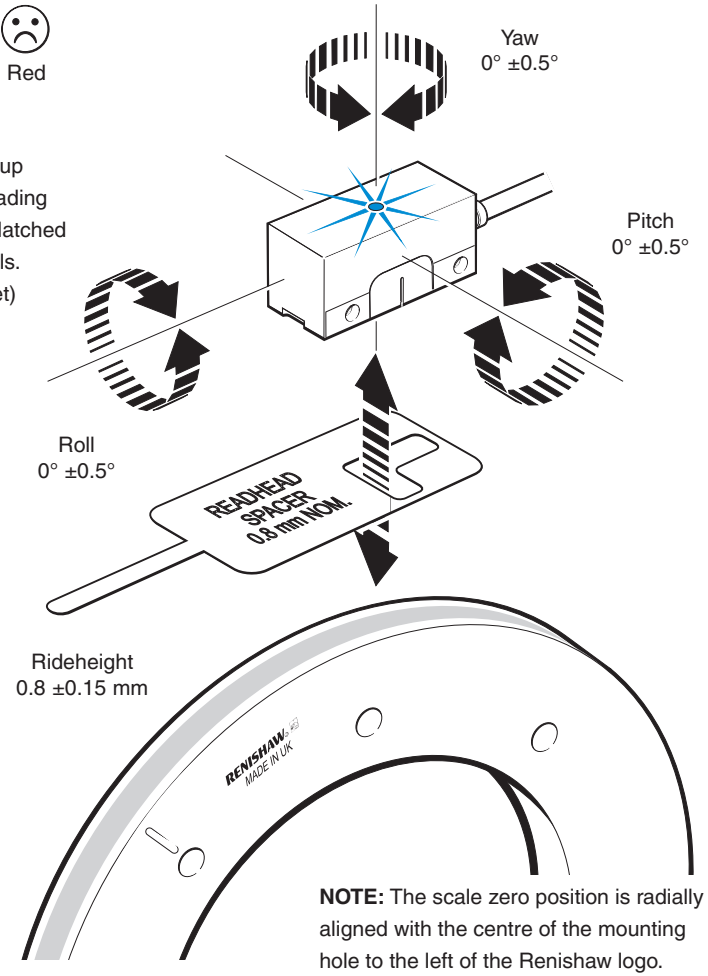
### Readhead set-up

Ensure that the scale, readhead optical window and mounting face are clean and free from obstructions. To set nominal rideheight, place the readhead spacer with the 'L' shaped aperture under the optical centre of the readhead to allow normal LED function during set-up procedure. Adjust the readhead to maximize the signal strength around the full axis rotation to achieve a green or blue LED.

### Readhead set-up LED and DRIVE-CLiQ interface set-up LED status

Blue Green Orange Red

**NOTE:** Flashing of set-up LED indicates scale reading error. Flashing state is latched for some serial protocols. (Remove power to reset)

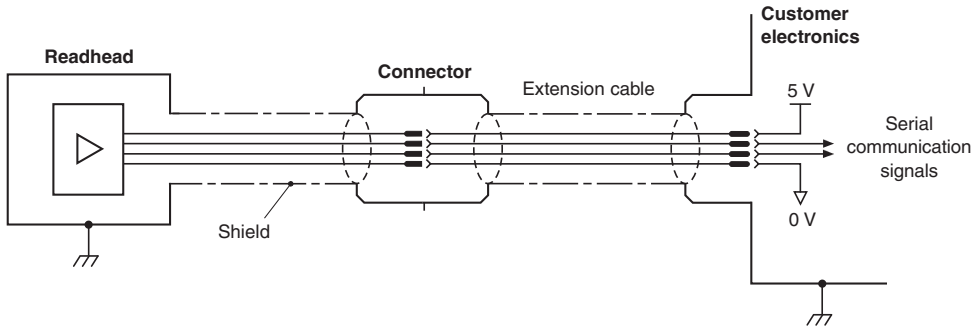



(REXA30 shown)

**NOTE:** The scale zero position is radially aligned with the centre of the mounting hole to the left of the Renishaw logo.

## Electrical connections

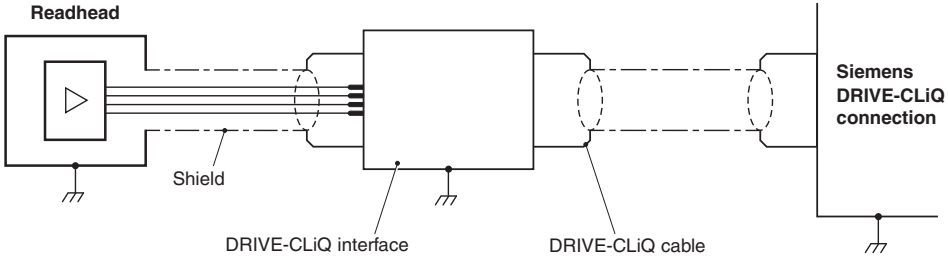
### RESOLUTE grounding and shielding




**IMPORTANT:** The shield should be connected to the machine earth (Field ground).

**IMPORTANT:** If the connector is modified or replaced, the customer must ensure both 0 V cores (White and Green) are connected to 0 V.

### RESOLUTE grounding and shielding - Siemens DRIVE-CLiQ protocol only



## General specifications

| | | |
|---|---|---|
| **Power supply** | 5 V ±10% | 1.25 W maximum (250 mA @ 5 V)<br>**NOTE:** Current consumption figures refer to terminated RESOLUTE systems. Renishaw encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1. |
| **Power supply** (DRIVE-CLiQ system) | 24 V | Single readhead system: 3.05 W maximum<br>(encoder: 1.25 W + interface: 1.8 W).<br>Dual readhead system: 4.3 W maximum<br>(2× encoders: 1.25 W each + interface: 1.8 W).<br>24 V power is provided by the DRIVE-CLiQ network.<br>**NOTE:** The Renishaw DRIVE-CLiQ interface must be powered from a 24 Vdc supply complying with the requirements for SELV of standard IEC 60950-1. |
| | Ripple | 200 mVpp maximum @ frequency up to 500 kHz |
| **Sealing** (readhead - standard) | | IP64 |
| (readhead - UHV) | | IP30 |
| (DRIVE-CLiQ interface) | | IP67 |
| **Acceleration** (readhead) | Operating | 500 m/s², 3 axes |
| **Shock** (readhead and interface) | Non-operating | 1000 m/s², 6 ms, ½ sine, 3 axes |
| **Maximum acceleration of scale with respect to readhead** | | 2000 m/s²<br>**NOTE:** This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative. |
| **Vibration** (readhead - standard) | Operating | 300 m/s², 55 Hz to 2000 Hz, 3 axes |
| (readhead - UHV) | Operating | 100 m/s², 55 Hz to 2000 Hz, 3 axes |
| (DRIVE-CLiQ interface) | Operating | 100 m/s², 55 Hz to 2000 Hz, 3 axes |
| **Mass** (readhead - standard) | | 18 g |
| (readhead - UHV) | | 19 g |
| (cable - standard) | | 32 g/m |
| (cable - UHV) | | 19 g/m |
| (DRIVE-CLiQ interface) | | 218 g |
| **Readhead cable** (standard) | | 7 core, tinned and annealed copper, 28 AWG<br>Single-shielded, outside diameter 4.7 ±0.2 mm<br>Flex life > 40 × $10^6$ cycles at 20 mm bend radius<br>UL recognised component |
| (UHV) | | Silver-coated copper braided single screen FEP core insulation over tin-plated copper wire. |
| **Maximum readhead cable length** | | 10 m (to controller or DRIVE-CLiQ interface)<br>(Refer to Siemens DRIVE-CLiQ specifications for maximum cable length from DRIVE-CLiQ interface to controller) |
| **M12 connector tightening torque** | | 4 Nm |

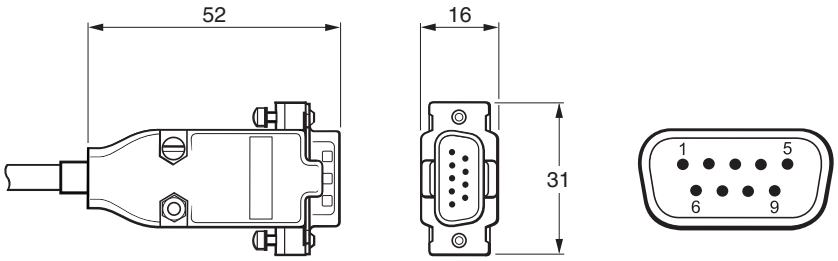
**The RESOLUTE encoder system has been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.**

## Ring technical specification

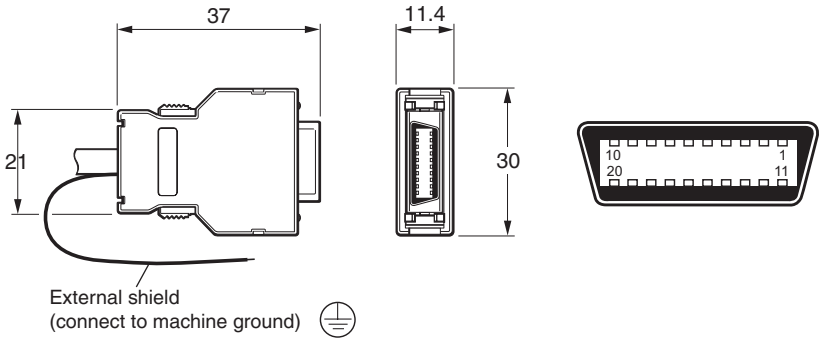
| | |
|---|---|
| **Material** | 303/304 stainless steel |
| **Coefficient of expansion** (at 20 °C) | 15.5 ±0.5 µm/m/°C |

# RESOLUTE termination options

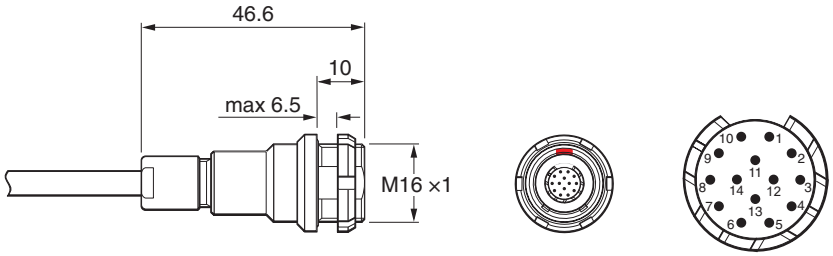
### 9-way D-type plug



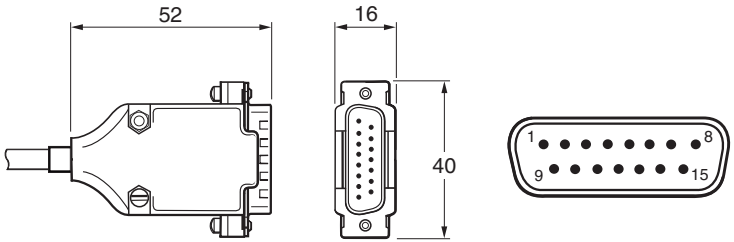

### 20-way FANUC connector



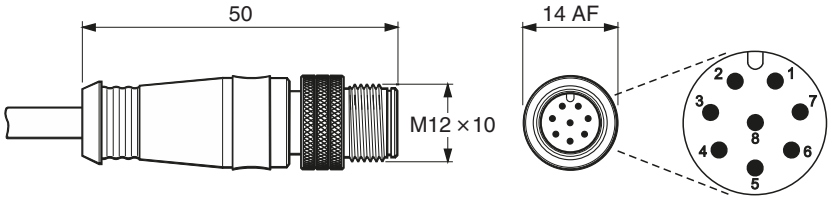

### LEMO in-line connector



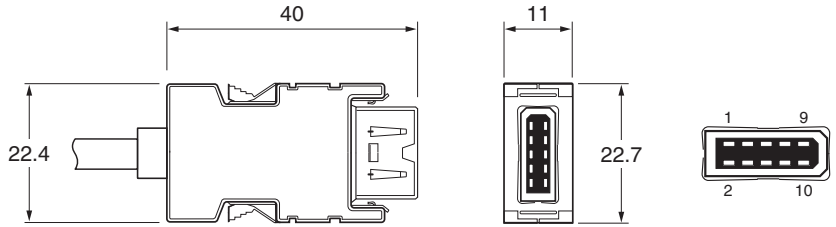

### 15-way D-type Mitsubishi connector




### M12 (sealed) connector




### 10-way Mitsubishi connector



## Output signals

### BiSS C serial comms

| Function | Signal[†] | Wire colour | Pin | | |
|---|---|---|---|---|---|
| | | | 9-way D-type | LEMO | M12 |
| **Power** | 5 V | Brown | 4, 5 | 11 | 2 |
| | 0 V | White | 8, 9 | 8, 12 | 5, 8 |
| | | Green | | | |
| **Serial communications** | MA+ | Violet | 2 | 2 | 3 |
| | MA– | Yellow | 3 | 1 | 4 |
| | SLO+ | Grey | 6 | 3 | 7 |
| | SLO– | Pink | 7 | 4 | 6 |
| **Shield** | Shield | Shield | Case | Case | Case |

[†] For details, refer to *BiSS C-mode (unidirectional) for RESOLUTE encoders* Data sheet (Renishaw part no. L-9709-9005).
**NOTE:** For UHV readhead only flying lead option available.

### FANUC serial comms

| Function | Signal | Wire colour | Pin | | |
|---|---|---|---|---|---|
| | | | 9-way D-type | LEMO | 20-way |
| **Power** | 5 V | Brown | 4, 5 | 11 | 9, 20 |
| | 0 V | White | 8, 9 | 8, 12 | 12, 14 |
| | | Green | | | |
| **Serial communications** | REQ | Violet | 2 | 2 | 5 |
| | *REQ | Yellow | 3 | 1 | 6 |
| | SD | Grey | 6 | 3 | 1 |
| | *SD | Pink | 7 | 4 | 2 |
| **Shield** | Shield | Shield | Case | Case | External, 16 |

### Mitsubishi serial comms

| Function | Signal | Wire colour | Pin | | | |
|---|---|---|---|---|---|---|
| | | | 9-way D-type | 10-way Mitsubishi | 15-way D-type | LEMO |
| **Power** | 5 V | Brown | 4, 5 | 1 | 7, 8 | 11 |
| | 0 V | White | 8, 9 | 2 | 2, 9 | 8, 12 |
| | | Green | | | | |
| **Serial communications** | MR | Violet | 2 | 3 | 10 | 2 |
| | MRR | Yellow | 3 | 4 | 1 | 1 |
| | MD[‡] | Grey | 6 | 7 | 11 | 3 |
| | MDR[‡] | Pink | 7 | 8 | 3 | 4 |
| **Shield** | Shield | Shield | Case | Case | Case | Case |

[‡] For 2 wire do not connect MD and MDR.

## Output signals (continued)

### Panasonic/Omron serial comms

| Function | Signal | Wire colour | Pin | | |
|---|---|---|---|---|---|
| | | | 9-way D-type | LEMO | M12 |
| **Power** | 5 V | Brown | 4, 5 | 11 | 2 |
| | 0 V | White | 8, 9 | 8, 12 | 5, 8 |
| | | Green | | | |
| **Serial communications** | PS | Violet | 2 | 2 | 3 |
| | $\overline{\text{PS}}$ | Yellow | 3 | 1 | 4 |
| **Shield** | Shield | Shield | Case | Case | Case |
| **Reserved** | **Do not connect** | Grey | 6 | 3 | 7 |
| | | Pink | 7 | 4 | 6 |

**NOTE:** For UHV readhead only flying lead option available.

### Yaskawa serial comms

| Function | Signal | Wire colour | Pin | | |
|---|---|---|---|---|---|
| | | | 9-way D-type | LEMO | M12 |
| **Power** | 5 V | Brown | 4, 5 | 11 | 2 |
| | 0 V | White | 8, 9 | 8, 12 | 5, 8 |
| | | Green | | | |
| **Serial communications** | S | Violet | 2 | 2 | 3 |
| | $\overline{\text{S}}$ | Yellow | 3 | 1 | 4 |
| **Shield** | Shield | Shield | Case | Case | Case |
| **Reserved** | **Do not connect** | Grey | 6 | 3 | 7 |
| | | Pink | 7 | 4 | 6 |

### Siemens DRIVE-CLiQ serial comms

#### Signals between readhead and interface

| Function | Signal | Wire colour | Pin |
|---|---|---|---|
| | | | M12 |
| **Power** | 5 V | Brown | 2 |
| | 0 V | White | 5, 8 |
| | | Green | |
| **Serial communications** | A+ | Violet | 3 |
| | A– | Yellow | 4 |
| **Shield** | Shield | Shield | Case |
| **Reserved** | **Do not connect** | Grey | 7 |
| | | Pink | 6 |

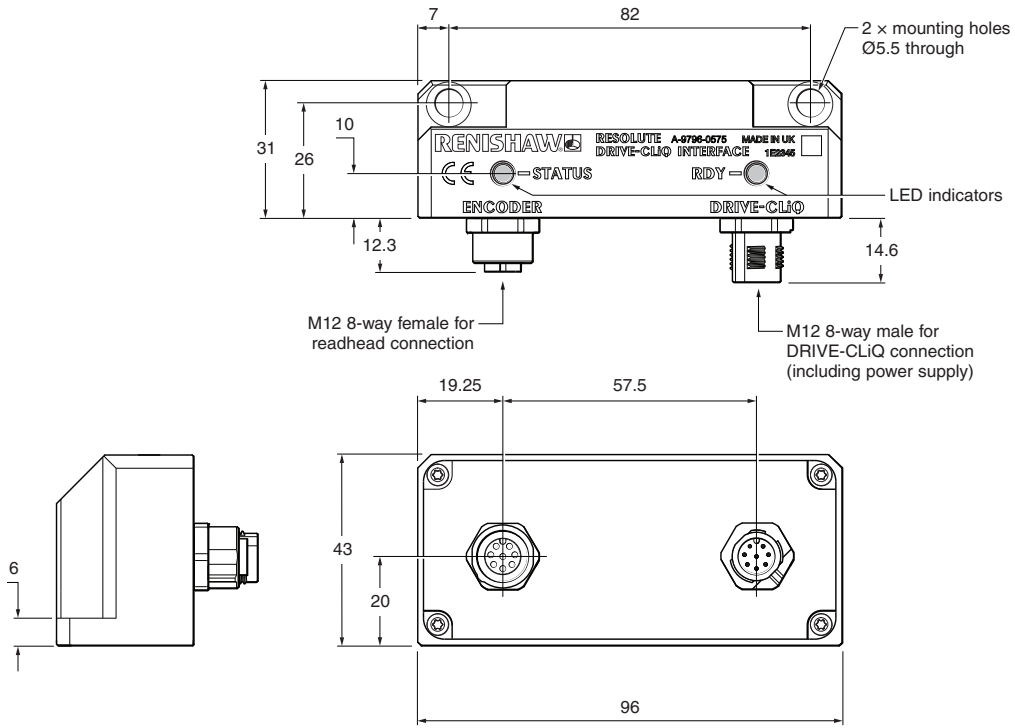
#### DRIVE-CLiQ interface output

| Function | Signal | Pin |
|---|---|---|
| | | M12 |
| **Power** | 24 V | 1 |
| | 0 V | 5 |
| **DRIVE-CLiQ communications** | RX+ | 3 |
| | RX– | 4 |
| | TX+ | 7 |
| | TX– | 6 |
| **Shield** | Shield | Case |

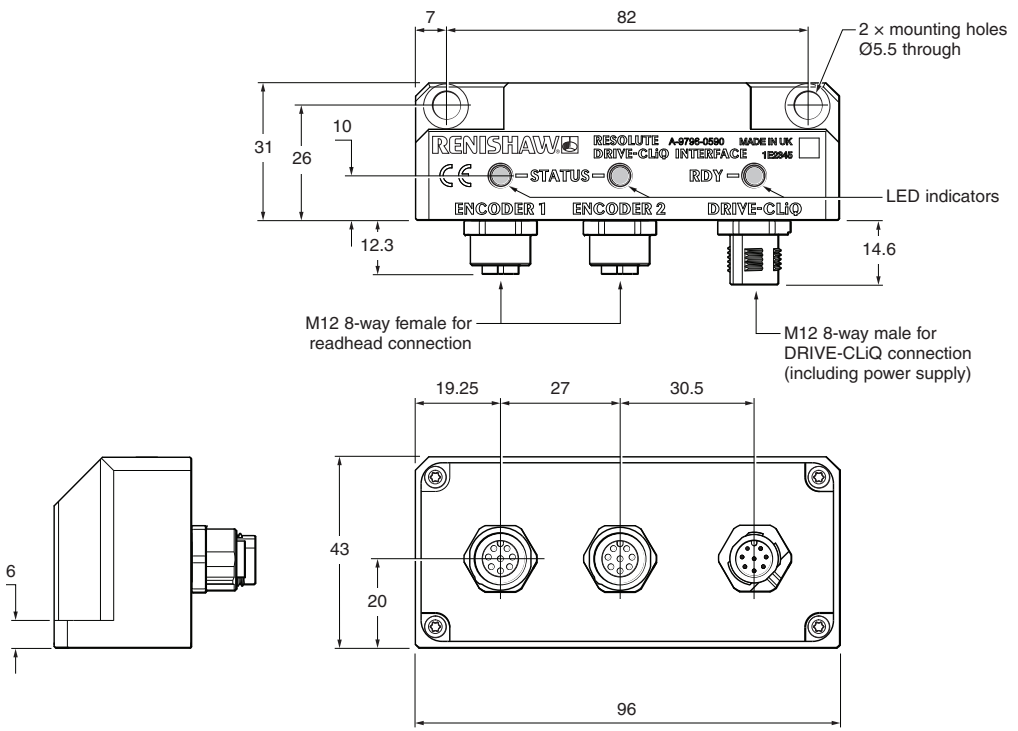
# Siemens DRIVE-CLiQ interface drawings

Dimensions and tolerances in mm

**Single readhead input** (A-9796-0575)




**Dual readhead inputs** (A-9796-0590)




## RDY LED functions

| Colour | Status | Description |
|---|---|---|
| – | Off | Power supply is missing or outside of permissible tolerance range |
| **Green** | Continuous light | The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place |
| **Orange** | Continuous light | DRIVE-CLiQ communication is being established |
| **Red** | Continuous light | At least one fault is present in this component.<br>**NOTE:** The LED is activated regardless of whether the corresponding messages have been reconfigured |
| **Green/Orange or Red/Orange** | Flashing light | Component recognition via LED is activated (p0144)<br>**NOTE:** Both options depend on the LED status when component recognition is activated via p0144=1 |

## STATUS LED(s) function

STATUS displays the readhead set-up status as shown on the readhead set-up LED(s)

Blue Green Orange Red

# Siemens DRIVE-CLiQ dual head installation

## Accuracy

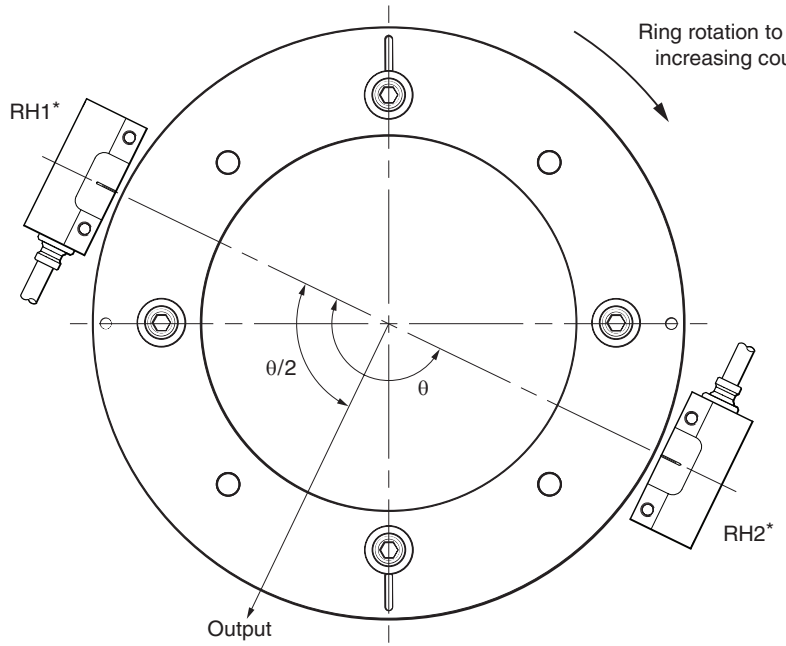
The dual head interface is designed for use with two RESOLUTE readheads and REXA30 ring only and compensates for the effect of bearing wander and eliminates all odd error harmonics including eccentricity. However, 'even' error harmonics such as ovality remain. This results in high angular accuracy to ±1 arc second, as shown in the accompanying table.

| REXA30 diameter | Total installed accuracy (with 2 readheads) |
|---|---|
| ≥ 100 mm | ±1 arc second |
| 75 mm | ±1.5 arc second |
| ≤ 57 mm | ±2 arc second |

For optimum accuracy performance, the readheads should be diametrically opposite each other so that the optical centre lines are 180° apart. However if this is not possible due to mounting constrictions, or for partial arc applications, the readheads should be mounted as close to this as possible; contact your local Renishaw representative to find out what accuracy you can expect if this is the case.

## Interface output

For readheads (RH1 and RH2) mounted such that the angle between them is θ.



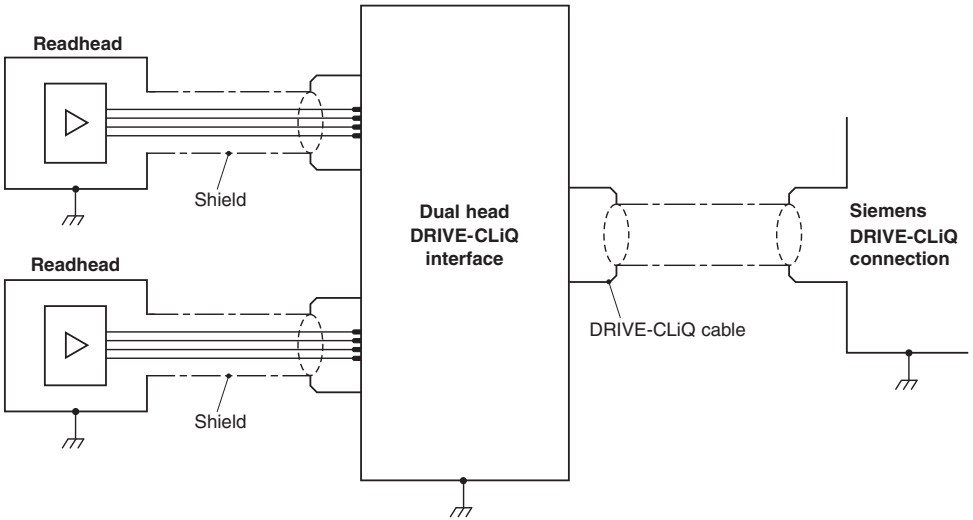

The dual head DRIVE-CLiQ interface takes simultaneous readings from both readheads and calculates the mean of them. The output is therefore at an angle of θ/2 and is in the position shown when the scale is orientated with increasing count as shown.

*Readhead can be mounted in any orientation

## Electrical connections

For high-speed applications, it is recommended to use similar cable lengths for each readhead to ensure the readings are simultaneous and achieve the highest accuracy.

The DRIVE-CLiQ cable is a proprietary part and is not supplied by Renishaw plc.




## Summary of procedure

Install both readheads on mounting surfaces.

Connect both readheads to dual head interface and connect interface to controller.

Supply power to the controller and interface, adjust each readhead such that both readheads have good signal levels around the ring (Green or Blue indication).

Acknowledge any errors on the controller that may have occured during installation.

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M-9553-9735-03

Part no.: M-9553-9735-03-C
Issued: 04.2020