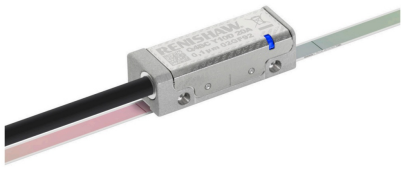
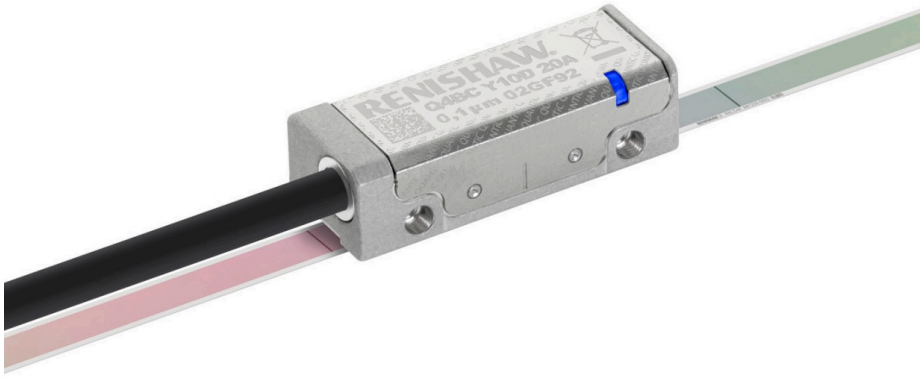


# RENISHAW QUANTiC RKLC40-S Incremental Linear Encoder System Installation Guide



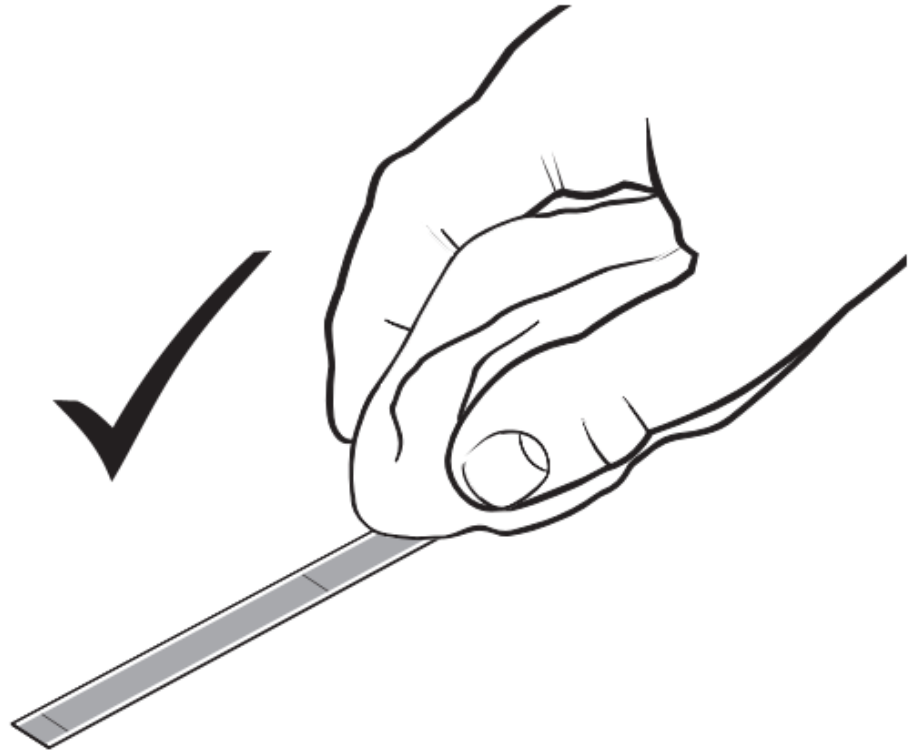
**RENISHAW QUANTiC RKLC40-S Incremental Linear Encoder System Installation Guide**

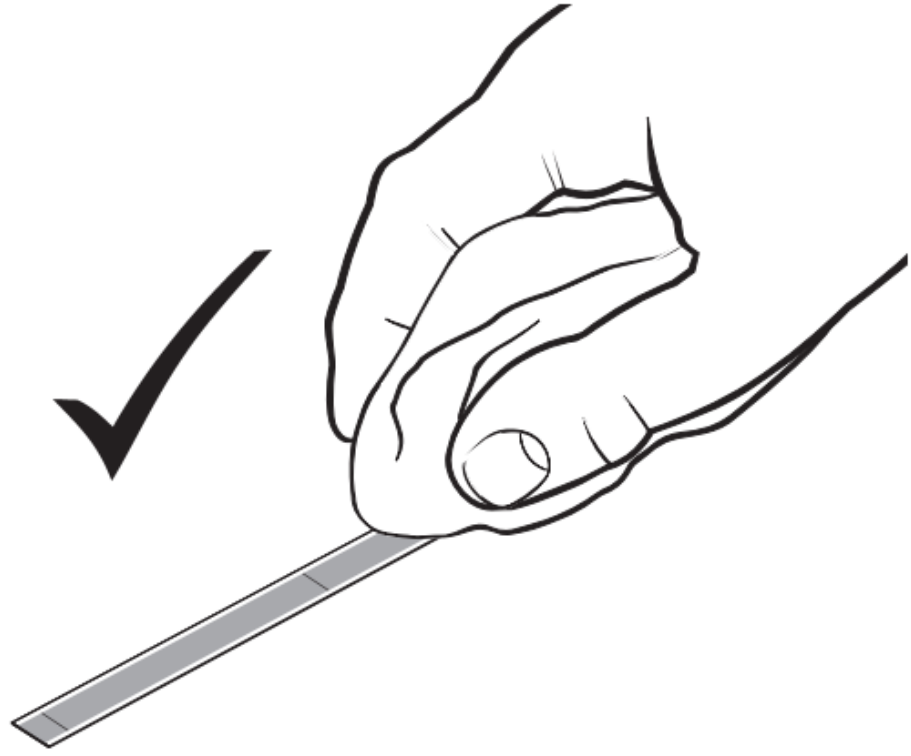


Contents

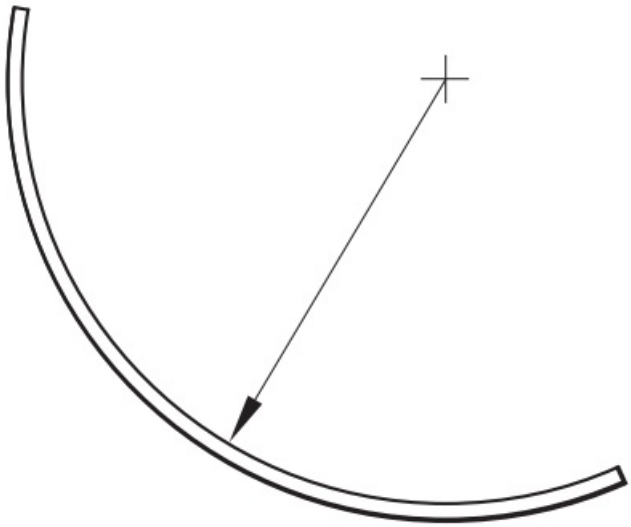


## Storage and handling



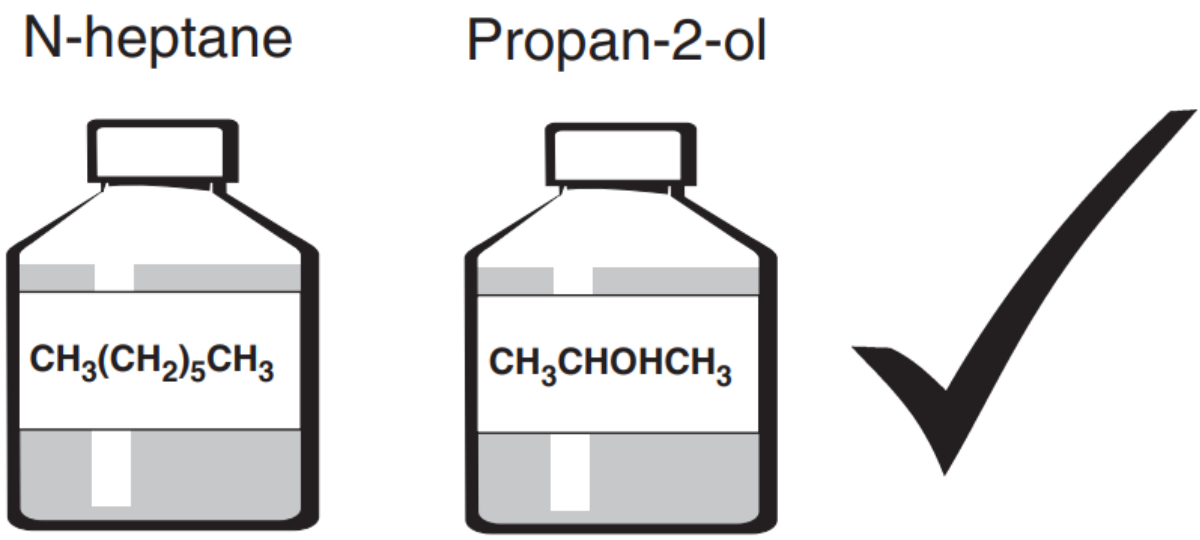


Minimum bend radius
**RKLC40-S – 50 mm**

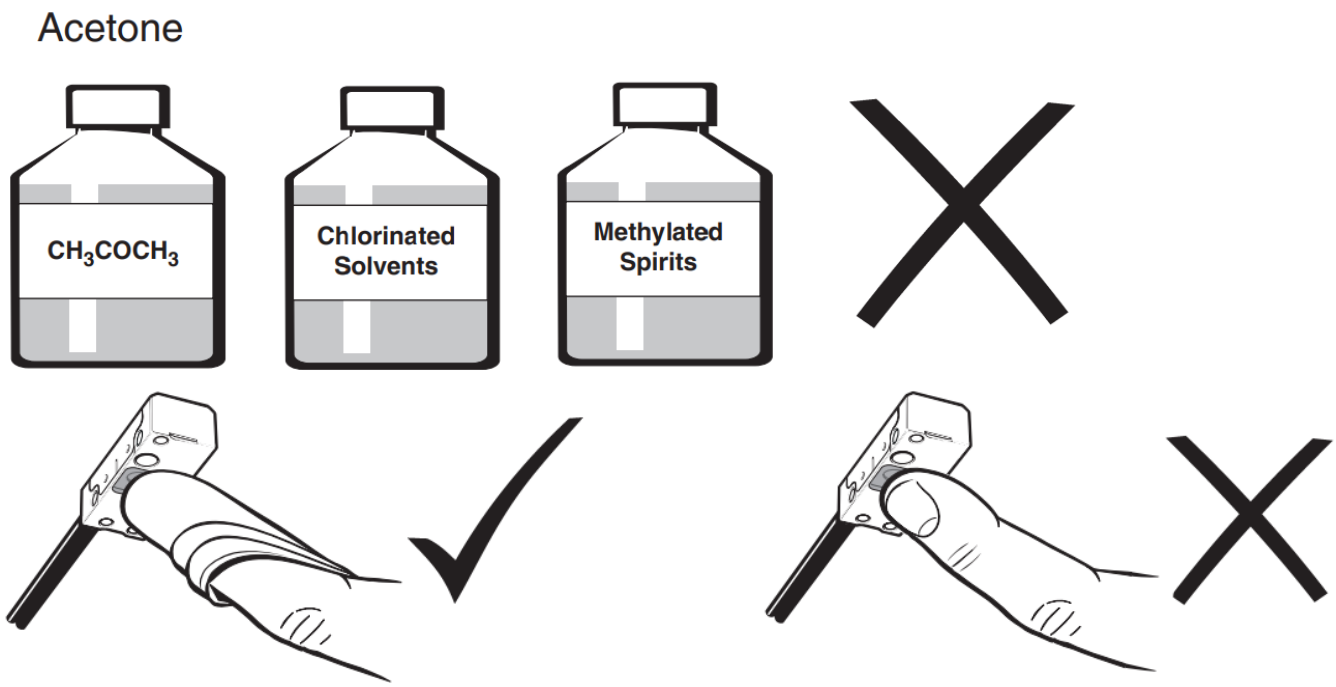


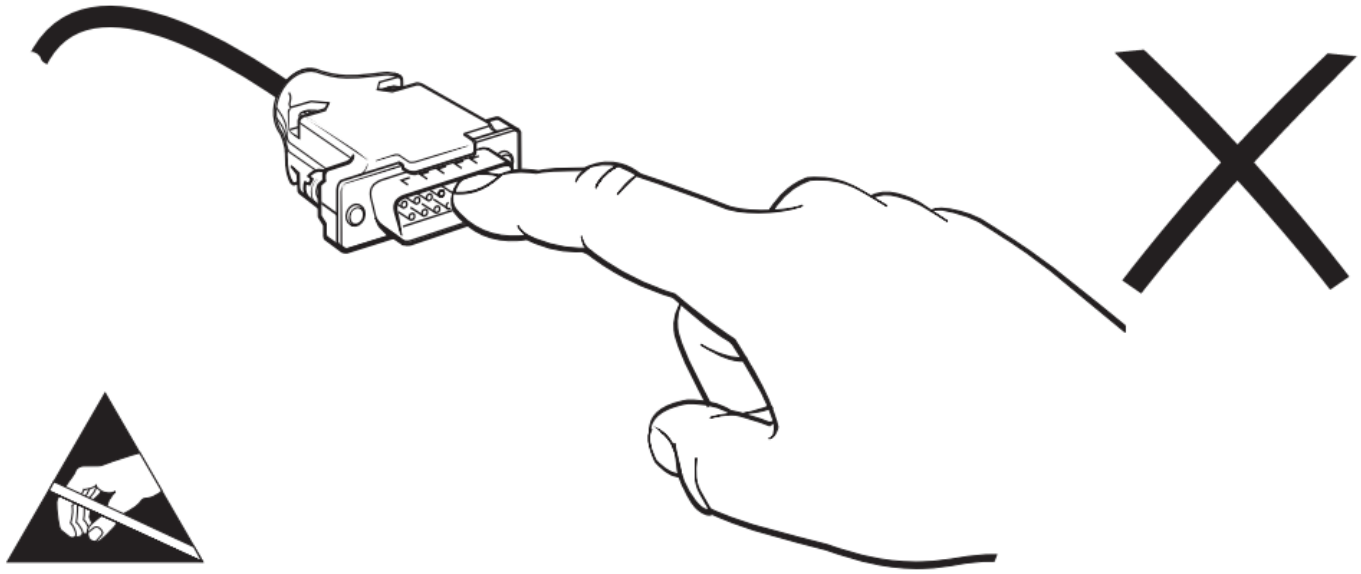
**NOTE:** During storage, ensure self-adhesive tape is on the outside of the bend.

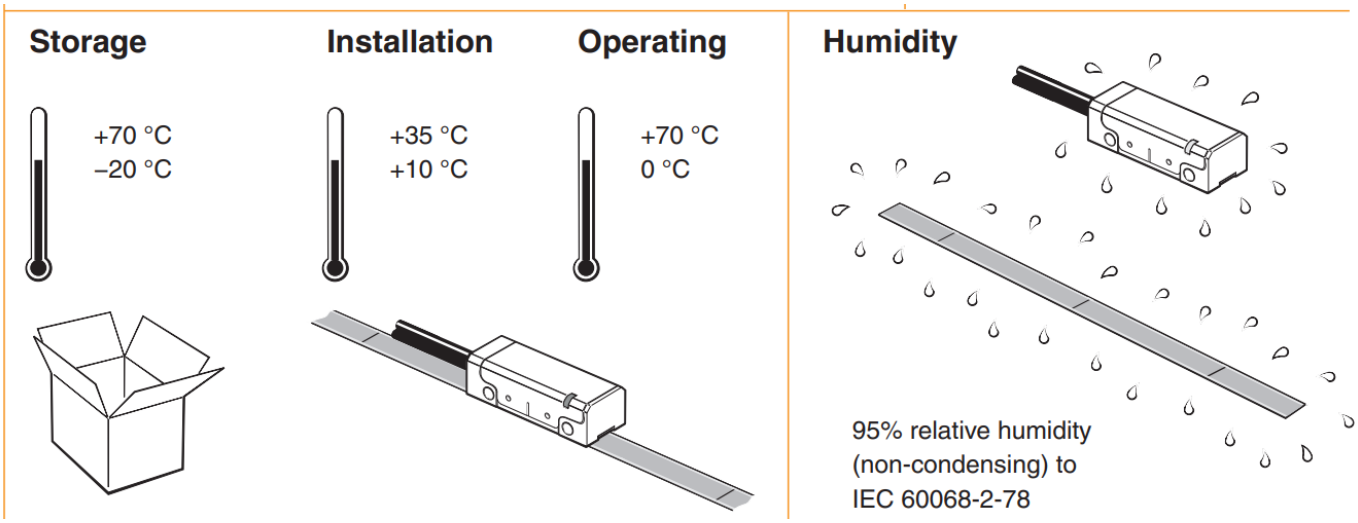
**Scale and readhead**



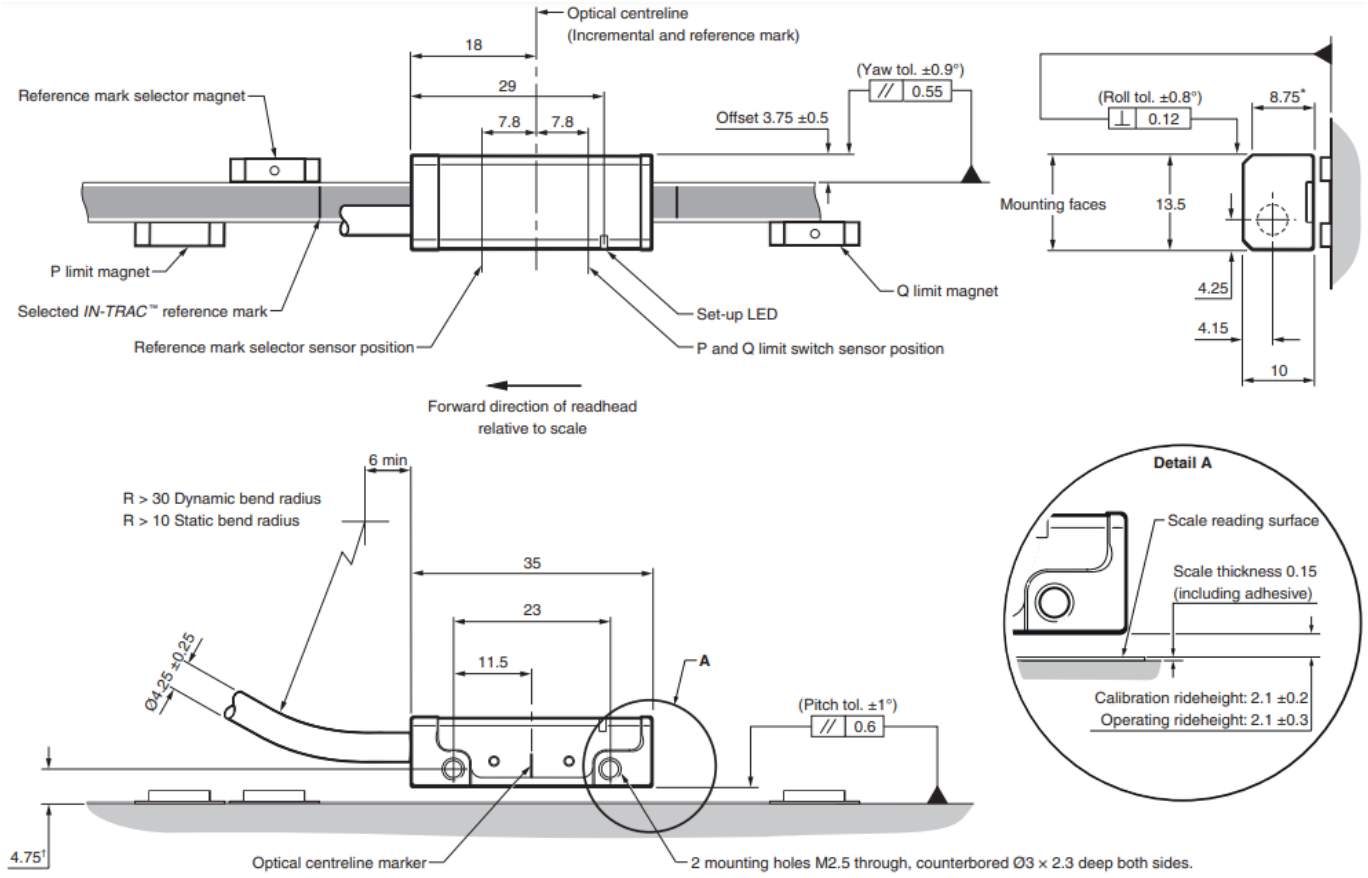

**Readhead only**








**QUANTiC redhead installation drawing**

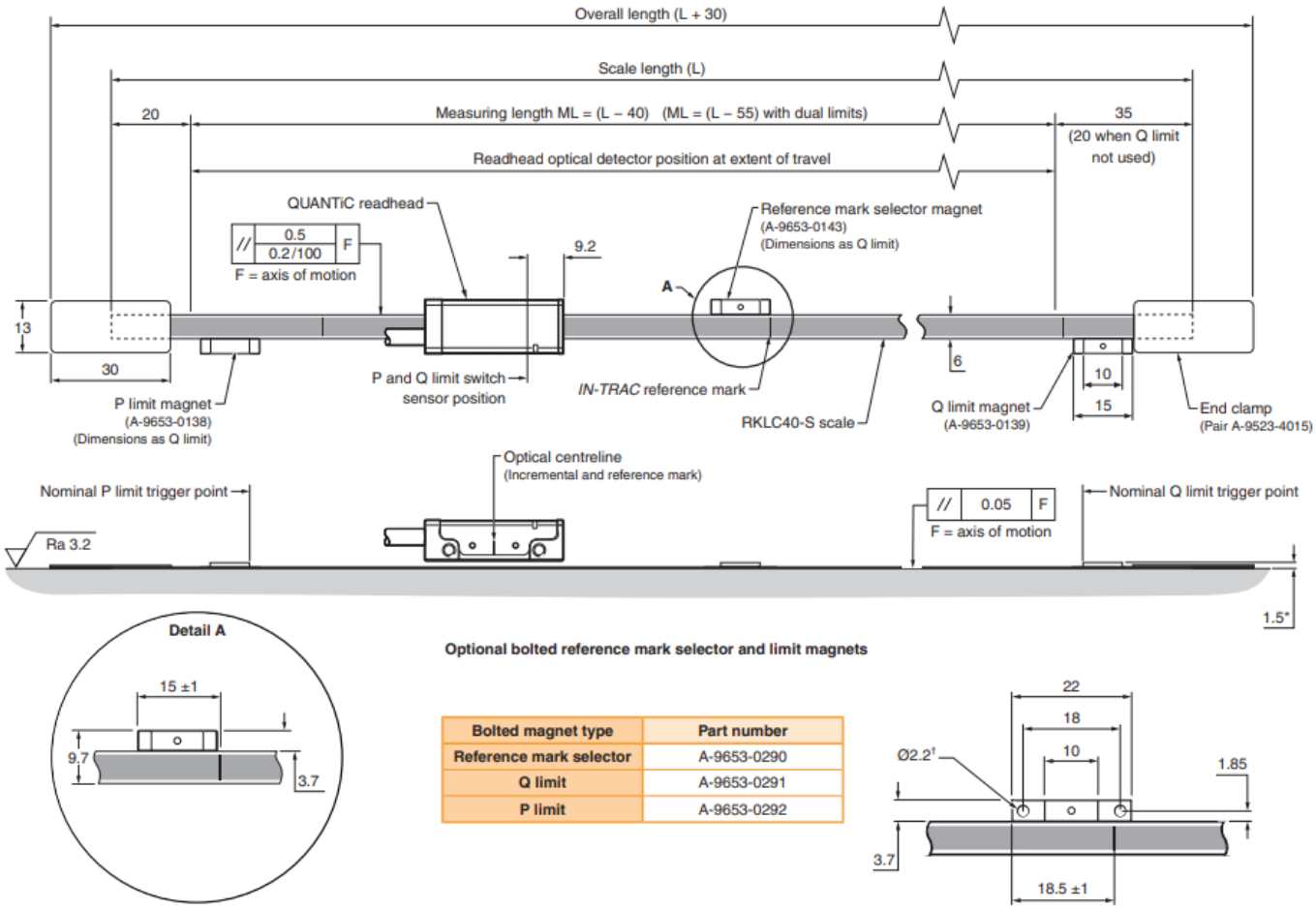



Extent of mounting faces. † Dimension from substrate

QUANTIC RKLC40-S linear installation guide

**NOTE:** The recommended thread engagement is 5 min (7.5 including counterbore) and the recommended tightening torque is between 0.25 and 0.4 Nm.

## RKLC40-S scale installation drawing




| Bolted magnet type | Part number |
|---|---|
| Reference mark selector | A-9653-0290 |
| Q limit | A-9653-0291 |
| P limit | A-9653-0292 |

**Dimension from substrate †** Supplied with 2 × M2 × 4 screws.
**NOTES:** The reference mark selector and limit actuator locations are correct for the readhead orientation shown. External magnetic fields greater than 6 mT, in the vicinity of the readhead, may cause false activation of the limit and reference sensors.

## RKLC40-S scale application

**Suitable for:**

- RKLC tape scale (any length)

**Required parts:**

- Appropriate length of RKLC40-S scale **(‘RKLC40-S scale installation drawing’, page 4)**
- Scale applicator (A-6547-1912)
- End clamp kit (A-9523-4015)
- RGG-2 two part epoxy adhesive (A-9531-0342)
- Appropriate cleaning solvents **(‘Storage and handling’, page 2)**
- 2 × M2.5 screws

**Optional parts:**

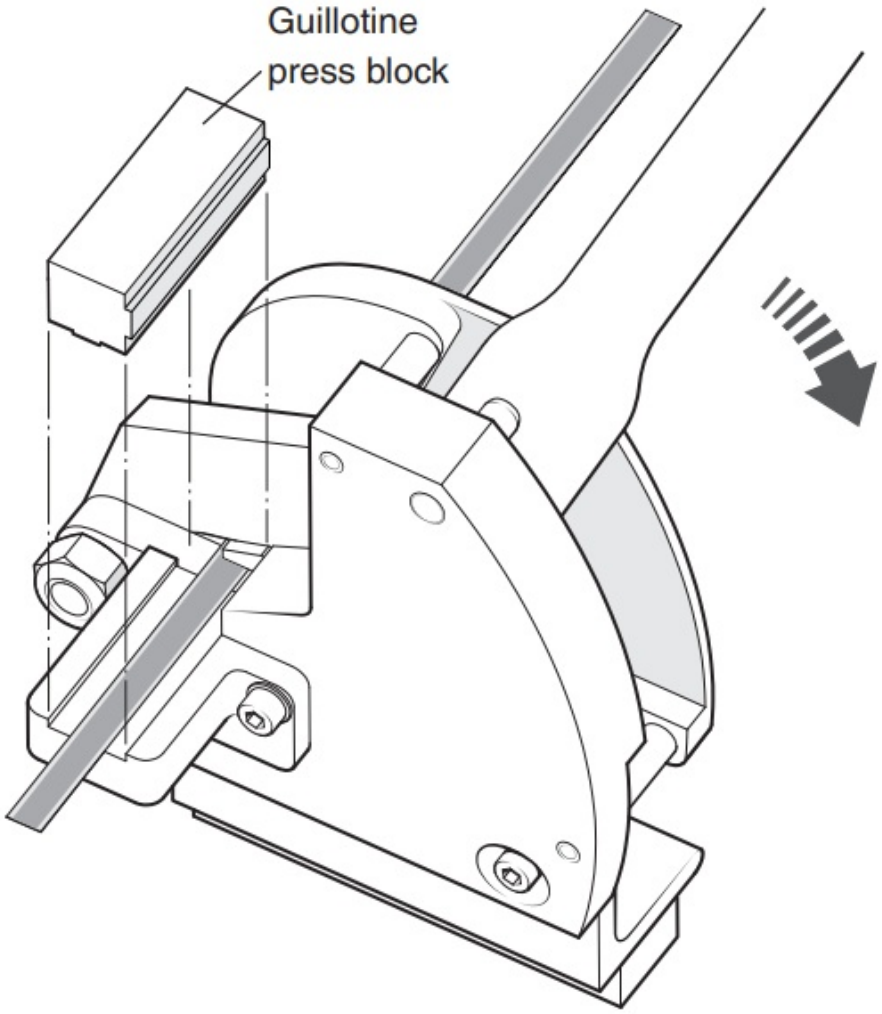
- Renishaw scale wipes (A-9523-4040)
- Lint-free cloth

- Magnet applicator tool (A-9653-0201)
- Limit magnets (P limit – A-9653-0138, Q limit – A-9653-0139)
- Reference mark selector magnet* (A-9653-0143)
- Guillotine (A-9589-0071) or shears (A-9589-0133) for cutting RKLC40-S to length required.

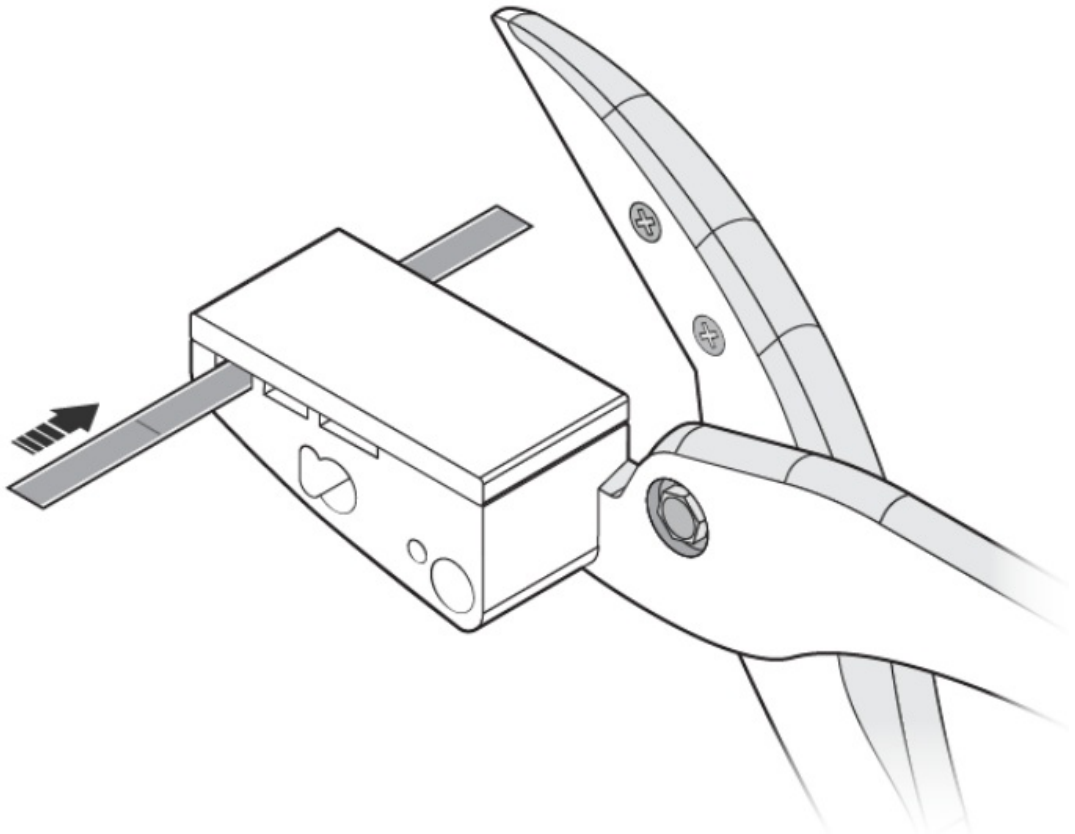
**Cutting scale**
If required cut scale to length using guillotine or shears.

**Using the guillotine**
The guillotine should be held securely in place, using a suitable vice or clamping method.
Once secured, feed the RKLC40-S scale through the guillotine as shown, and place guillotine press block down onto the scale. Ensure the block is in the correct orientation (as shown).
Whilst holding the block in place, in a smooth motion, pull down the lever to cut through the scale.

**Guillotine press block orientation when cutting RKLC40-S scale**

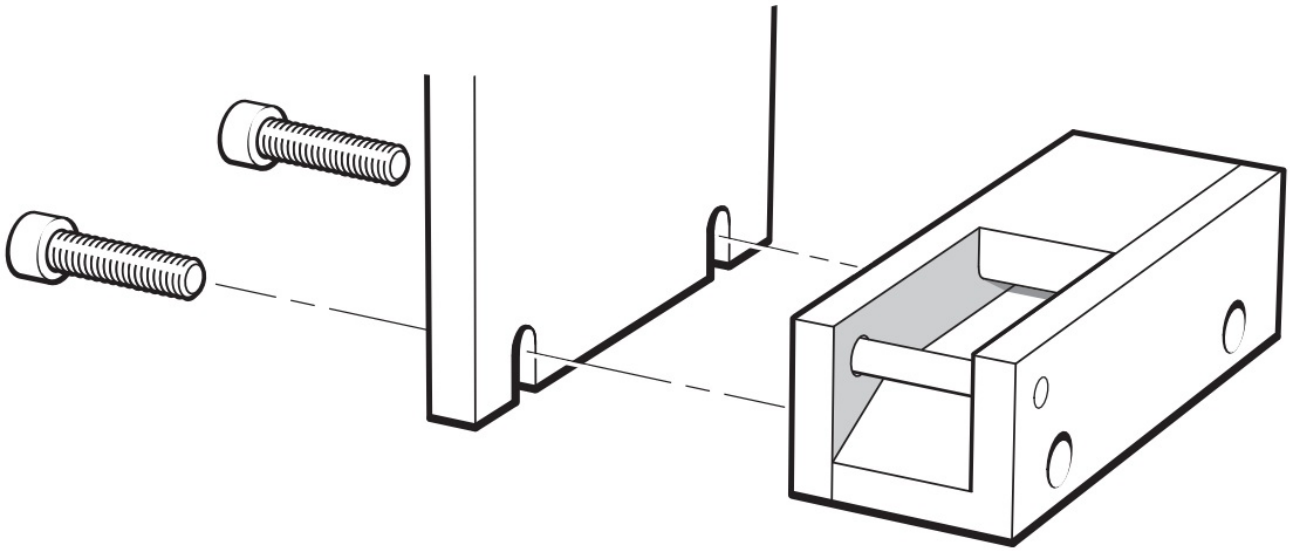



**Using the shears**
Feed the RKLC40-S scale through the first apperture on the shears (as shown).



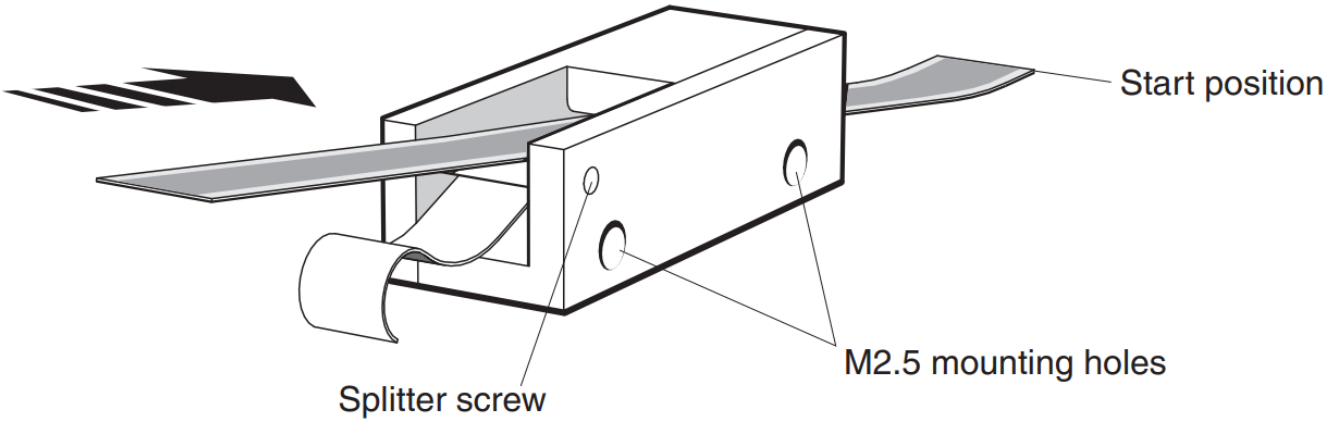
Hold the scale in place and close the shears in a smooth motion to cut through the scale.

1. Allow scale to acclimatise to installation environment prior to installation.
   **NOTE:** RKLC scale should be installed between +10 °C and +35 °C to ensure scale mastering.
2. Mark out the start position for the scale on the axis substrate – ensure that there is room for the end clamps (‘RKLC40-S scale installation drawing’, page 4).
3. Thoroughly clean and degrease the substrate using recommended solvents (‘Storage and handling’, page 2). Allow substrate to dry before applying scale.
4. Mount the scale applicator to the readhead mounting bracket. Place the shim supplied with the readhead between the applicator and substrate to set the nominal height.



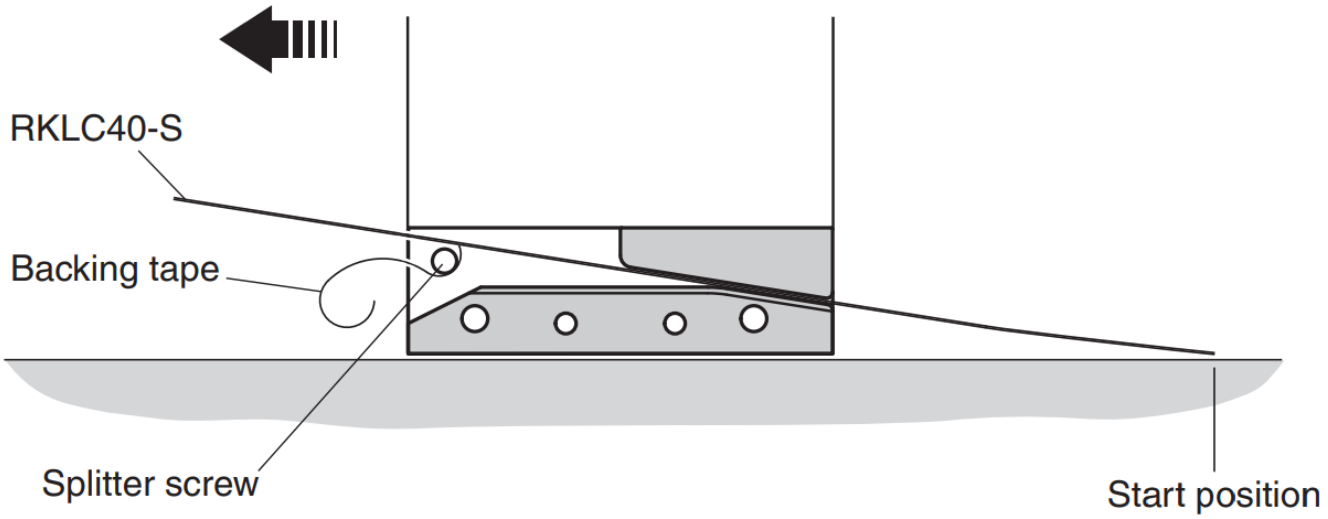
   **NOTE:** Scale applicator can be mounted either way round to enable easiest orientation for scale installation.
5. Move axis to scale start position, leaving enough room for the scale to be inserted through the applicator, as shown below.
6. Begin to remove the backing paper from the scale and insert scale into the applicator up to the start position

(as shown). Ensure backing paper is routed under the splitter screw.




7. Apply firm finger pressure via a clean, dry, lint-free cloth to ensure scale end adheres well to the substrate.
8. Slowly and smoothly move the applicator through the entire axis of travel, ensuring the backing paper is pulled manually from the scale and does not catch under the applicator.

**Direction of scale application**

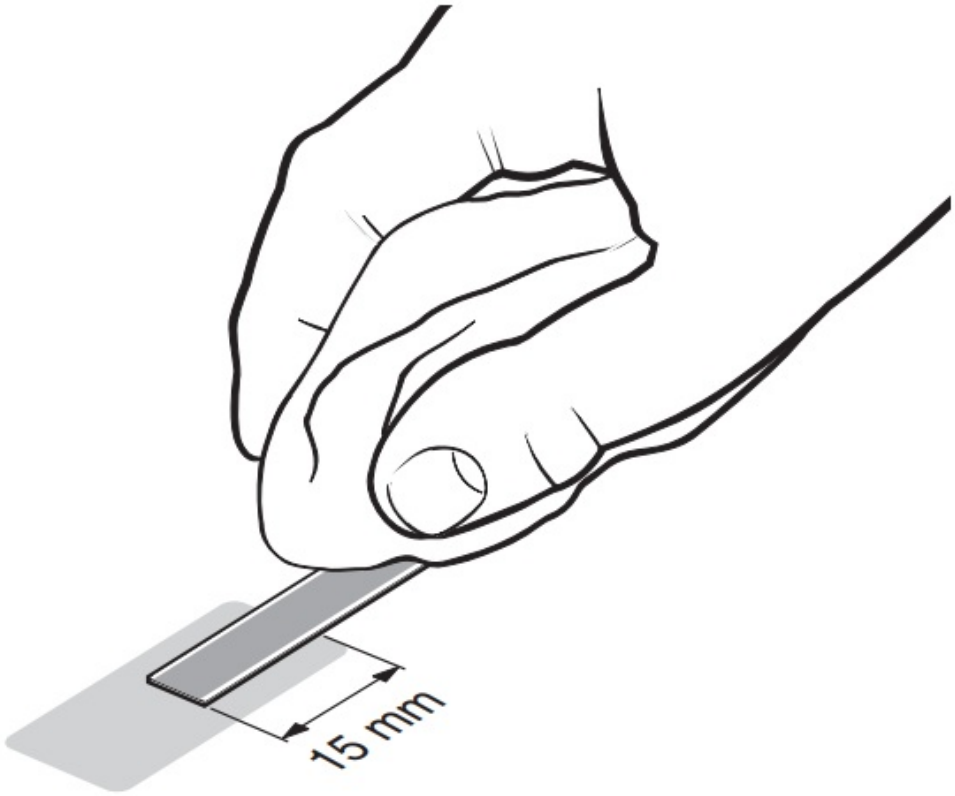



9. During installation ensure scale is adhered to substrate using light finger pressure.
10. Remove applicator carefully. Apply firm finger pressure via a clean lint-free cloth along the length of the scale after application to ensure complete adhesion.
11. Clean the scale using Renishaw scale wipes or a clean, dry, lint-free cloth.
12. Fit end clamps (‘End clamps’, page 8).

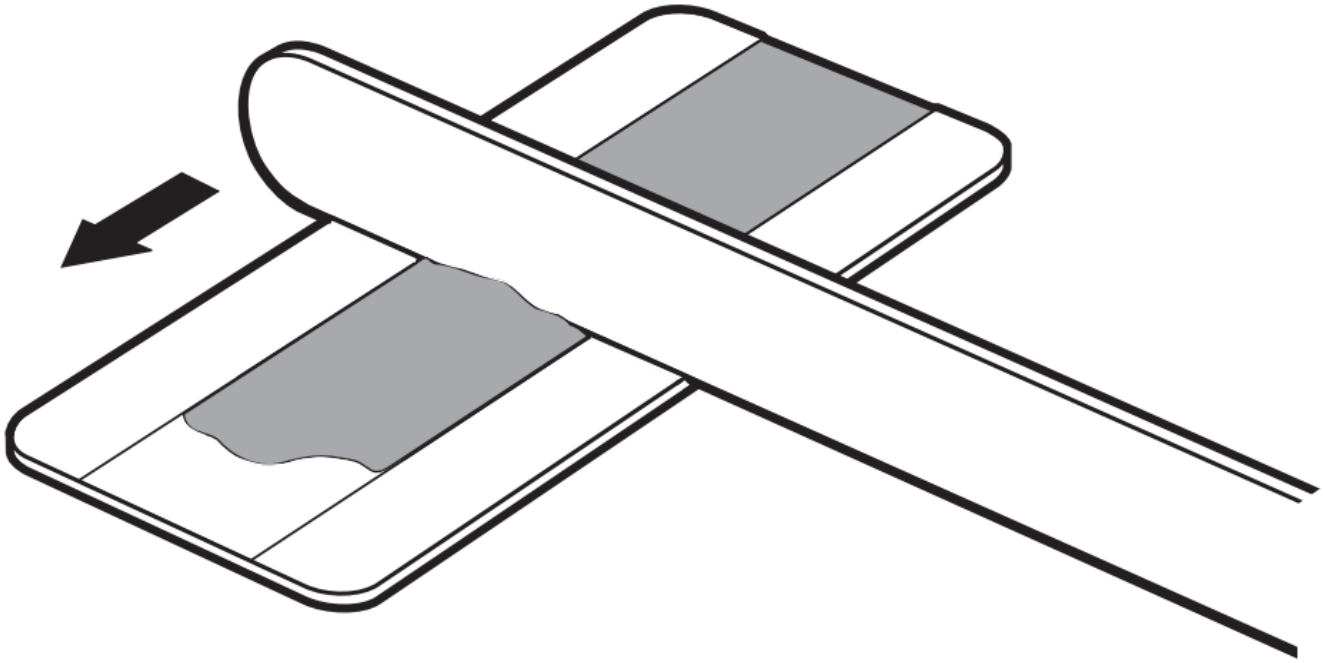
**End clamps**

The end clamp kit is designed to be used with Renishaw RKLC40-S scale. Alternative, narrow 6 mm wide end clamps (A-9523-4111), are also available.
**NOTE:** End clamps can be mounted before or after readhead installation.

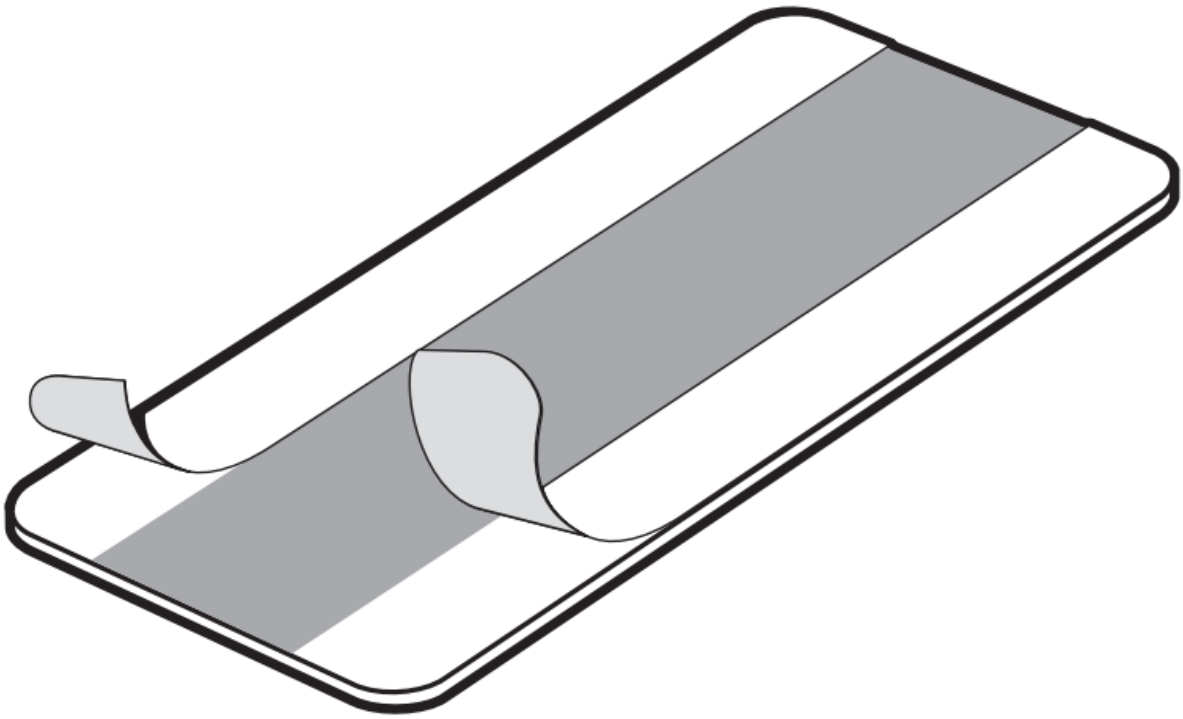
1. Clean ends of scale and the area where end clamps are to be fitted using Renishaw scale wipes or one of the recommended solvents (‘Storage and handling’, page 2).



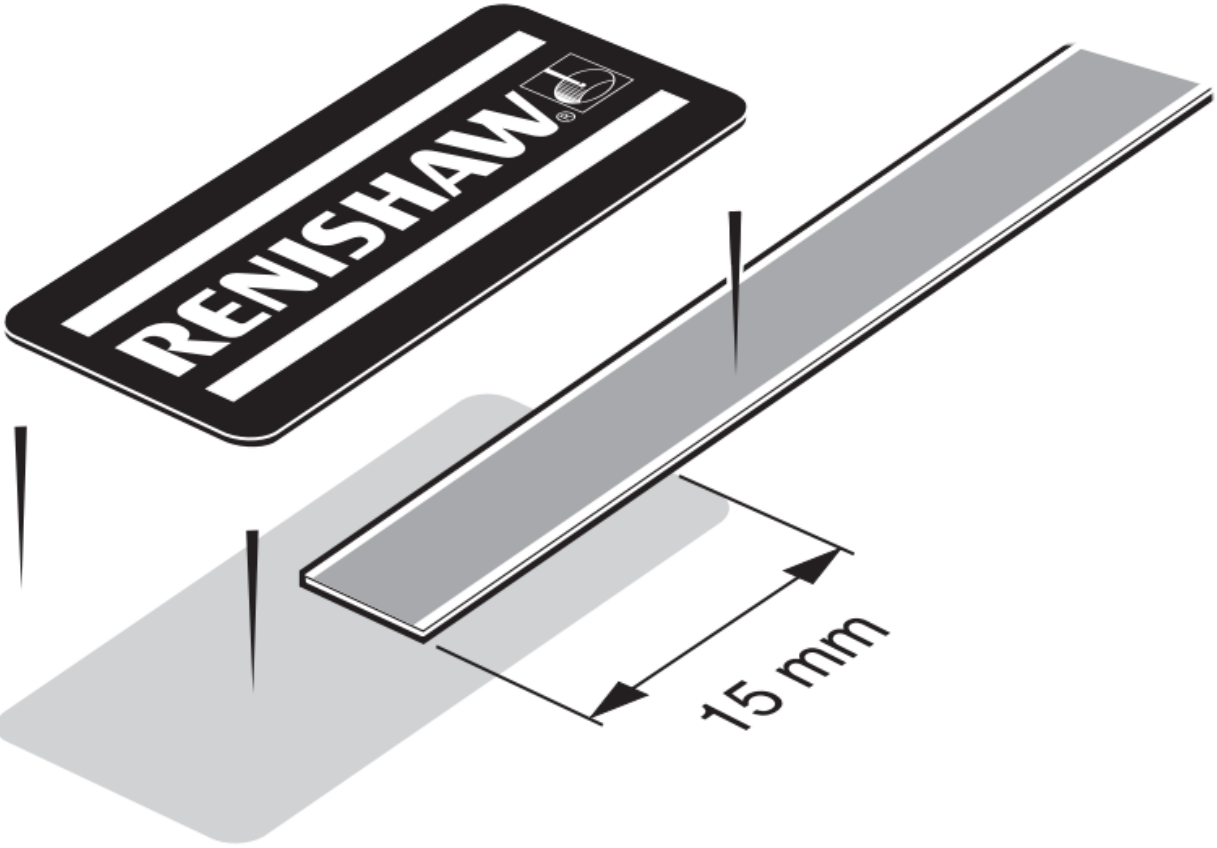

2. Thoroughly mix up a sachet of RGG-2 two part epoxy adheisve and apply a small amount to the underside of the end clamp.



3. The end clamp features two small regions of contact adhesive. These will temporarily hold the end clamp in position while the adhesive cures. Remove the backing tape from either side.



4. Immediately position end clamp over the end of the scale and push down to ensure complete adhesion. Allow 24 hours at 20 °C for full cure.



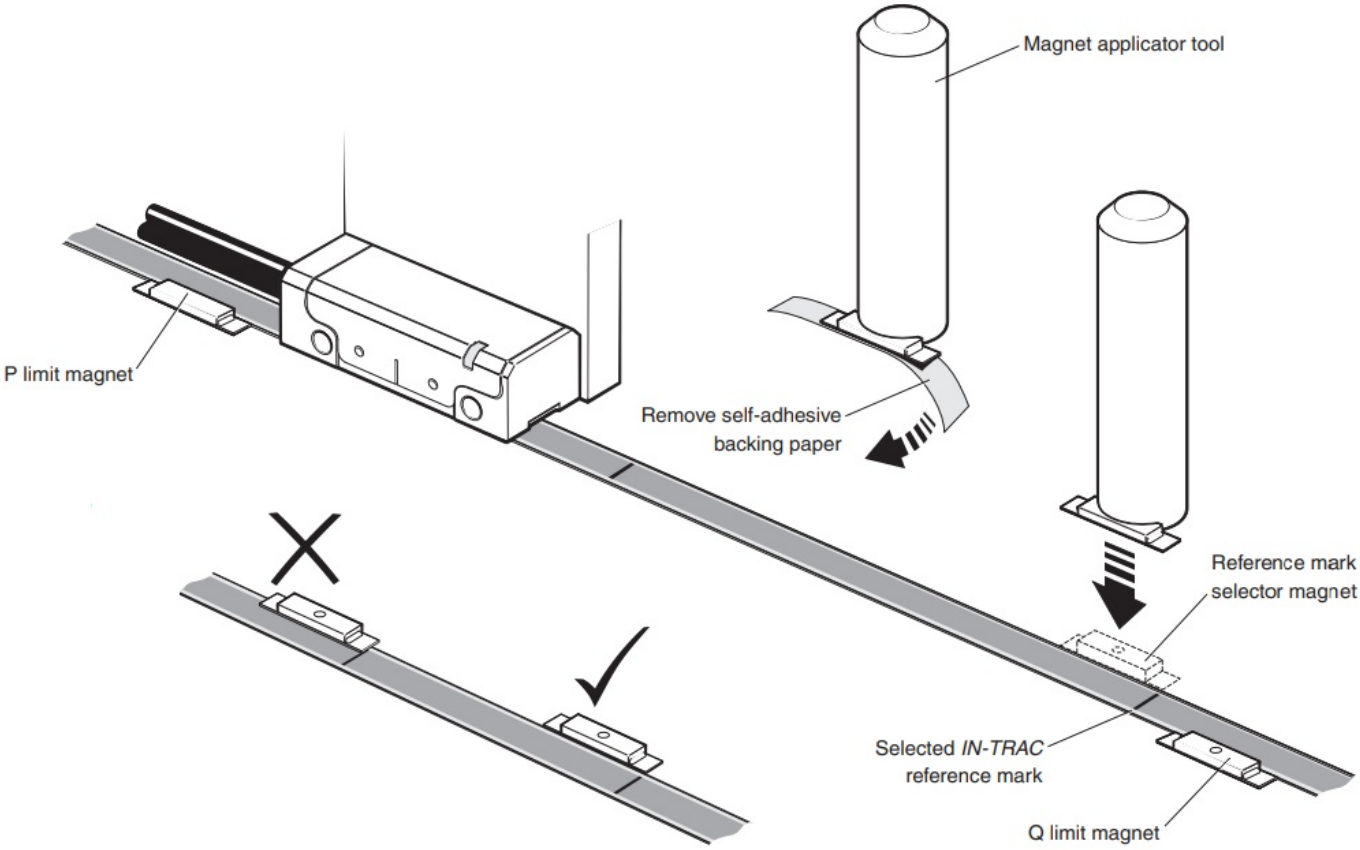

**CAUTION:** Ensure that excess adhesive is wiped away from scale as it may affect the readhead signal level.

To ensure scale end movement of typically < 1 µm, stabilise the system at least 5 °C higher than the maximum customer application temperature for a minimum of 8 hours.
**For example:** Customer application = 23 °C axis temperature. Stabilise the system at 28 °C for a minimum of 8 hours.

### Reference mark selector and limit magnet installation

**IMPORTANT:** Allow 24 hours after scale application before fitting magnets.
For accuracy and ease of positioning of reference mark selector and limit magnets, the applicator tool should be used. The magnet should be attached to the applicator tool as shown. Limit magnets can be positioned at any user defined location along the scale, but the reference mark selector magnet should be positioned adjacent to the selected IN-TRAC reference mark as shown.

As the QUANTiC readhead passes the reference mark selector magnet or limit switch magnet, a force of up to 0.2 N is generated between the magnet and the concentrators on the readhead. The design of the bracket should be sufficiently stiff so that it is able to tolerate such force without distorting.
Following the clamping instructions on the scale installation will prevent this magnetic force from disturbing the scale.




**Limit trigger point**
The limit output is nominally asserted when the readhead limit switch sensor passes the limit magnet leading edge, but can trigger up to 3 mm before that edge (‘RKLC40-S scale installation drawing’, page 4).

**NOTES:**

- Reference and limit magnets may creep when influenced by magnetic materials in close proximity. In such cases, they should be held in place using an additional fillet of epoxy glue or similar along the outer edge of the magnet assembly.
  Optional bolted reference and limit magnets are available (‘RKLC40-S scale installation drawing’, page 4).
- The reference mark selector and limit actuator locations are correct for the readhead orientation shown.
- The reference mark selector magnet is only required for ‘Customer selectable reference mark’ readheads. For more information refer to QUANTiC ™ series encoder system data sheet (Renishaw part no. L-9517-9778).
- External magnetic fields greater than 6 mT, in the vicinity of the readhead, may cause false activation of the limit and reference sensors.

## QUANTiC quick-start guide

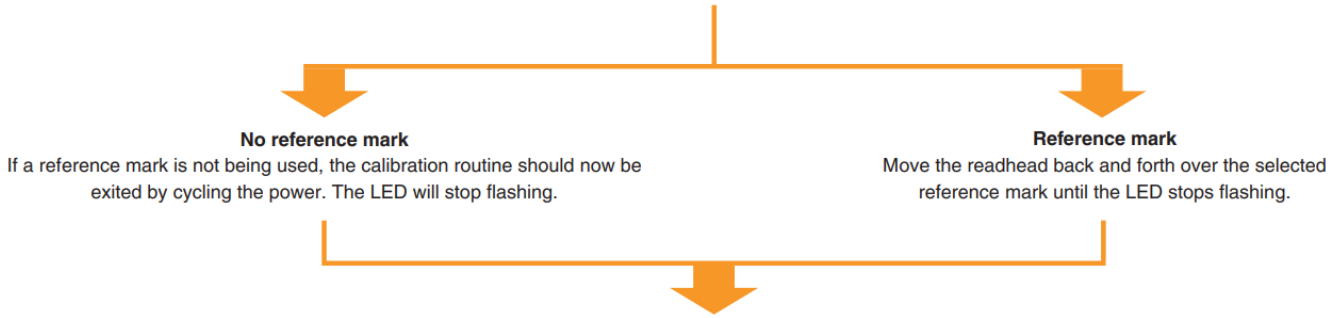
This section is a quick-start guide to installing a QUANTiC readhead. More detailed information on installing the readhead is contained on page 11 and page 12 of this installation guide.
The optional Advanced Diagnostic Tool ADTi-100* (A-6165-0100) and ADT View software† can be used to aid installation and calibration.

**INSTALLATION**

- Ensure scale, redhead optical window and mounting faces are clean and free from obstructions.
- If required, ensure reference mark selector magnet is correctly positioned (‘RKLC40-S scale installation drawing’, page 4).
- Connect the redhead to receiving electronics and power-up. The set-up LED on the readhead will flash.
- Install and align the redhead to maximize signal strength over the full axis of travel as indicated by a Green flashing LED.

**CALIBRATION**

- Cycle the power to the redhead to initiate the calibration routine. The LED will single flash Blue.
- Move the redhead along the scale at slow speed (< 100 mm/s), without passing a reference mark, until the LED starts double flashing Blue.




The system is now calibrated and ready for use. Calibration values, Automatic Gain Control (AGC) and Automatic Offset Control (AOC) status, are stored in readhead non-volatile memory at power down.
**NOTE:** If calibration fails (LED remains single flashing Blue), restore factory defaults by obscuring the readhead optical window on power-up (page 13). Repeat the installation and calibration routine.

For more details refer to the Advanced Diagnostic Tool ADTi-100 and ADT View software User guide (Renishaw part no. M-6195-9413) and Advanced Diagnostic Tool ADTi-100 and ADT View software Quick-start guide (Renishaw part no. M-6195-9321). †
The software can be downloaded for free from [www.renishaw.com/adt](www.renishaw.com/adt).

## Redhead mounting and alignment

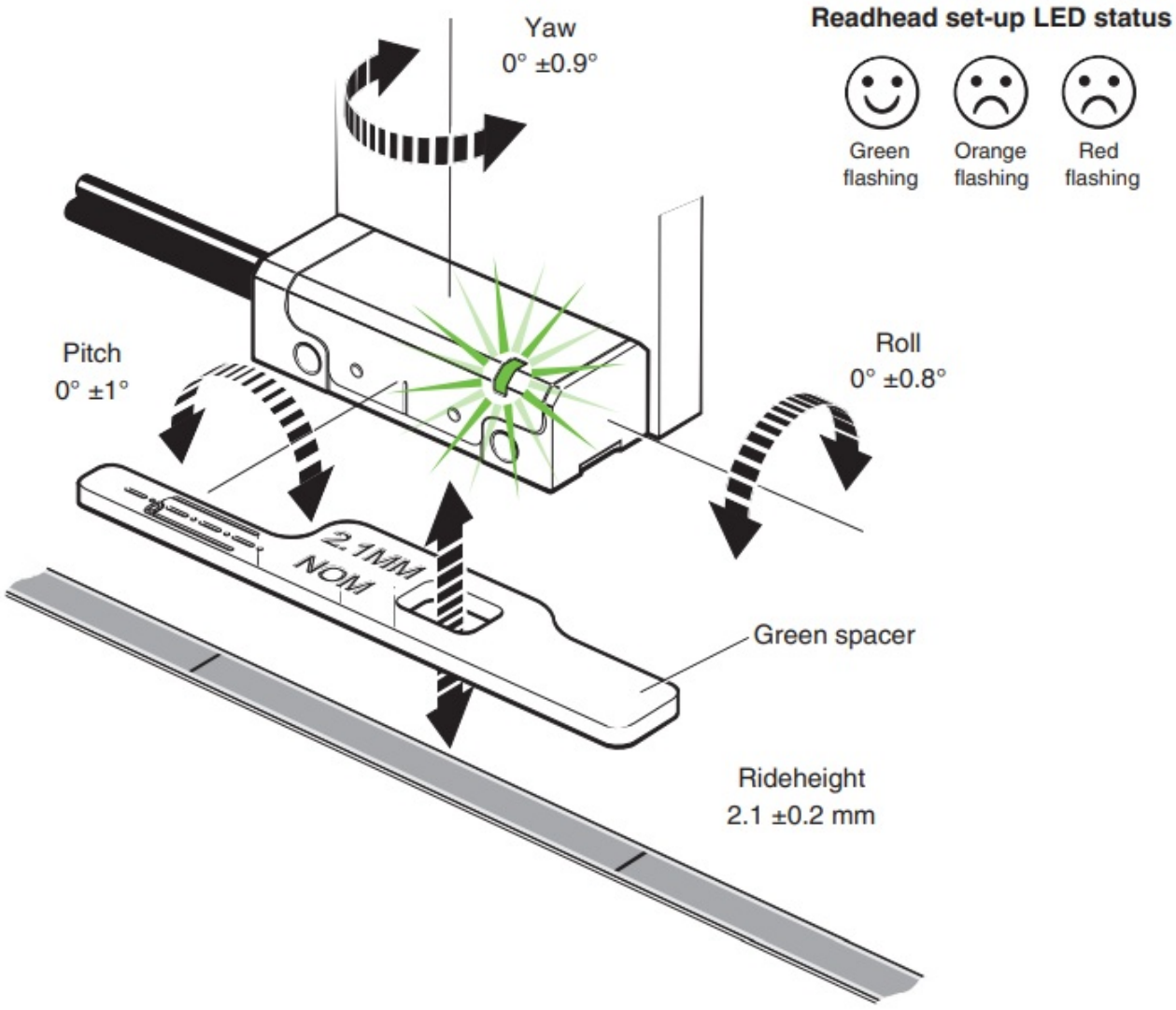
### Mounting brackets

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

### Readhead set-up

Ensure that the scale, readhead optical window and mounting face are clean and free from obstructions.
**NOTE:** When cleaning readhead and scale apply cleaning fluid sparingly, do not soak.
To set nominal rideheight, place the green spacer with the aperture under the optical centre of the readhead to allow normal LED function during set-up procedure. Adjust the readhead to achieve a flashing Green LED along the full axis of travel. The faster the flash rate, the closer it is to optimum set-up. The optional Advanced

Diagnostic Tool ADTi-100 (A-6195-0100) and ADT View software can be used to optimise signal strength in challenging installations. See **www.renishaw.com/adt** for more information.
**NOTE:** When re-installing the readhead factory defaults should be restored (page 13)




**Readhead LED diagnostics**

| Mode | LED | Status |
|---|---|---|
| **Installation mode** | Green flashing | Good set-up, maximise flash rate for optimum set-up |
| | Orange flashing | Poor set-up, adjust readhead to obtain Green flashing LED |
| | Red flashing | Poor set-up, adjust readhead to obtain Green flashing LED |
| **Calibration mode** | Blue single flashing | Calibrating incremental signals |
| | Blue double flashing | Calibrating reference mark |
| **Normal operation** | Blue | AGC on, optimum set-up |
| | Green | AGC off, optimum set-up |
| | Red | Poor set-up; signal may be too low for reliable operation |
| | Blank flash | Reference mark detected<br>(visible indication at speed < 100 mm/s only) |
| **Alarm** | Four red flashes | Low signal, over signal, or overspeed;<br>system in error |
| | Red and Purple flashing ( analogue variant only) | AGC out of normal operating range |

See ‘Troubleshooting’, page 14 for more information on diagnosing faults.

## System calibration

**NOTE:** The functions described below can also be carried out using the optional ADTi-100 and ADT View software. See **www.renishaw.com/adt** for more information.

**Before system calibration:**

- Clean the scale and readhead optical window.
- If reinstalling, restore factory defaults (‘Restoring factory defaults’, page 13).

- Maximise the signal strength along full length of travel (readhead set-up LED is flashing Green).

**NOTE:** Maximum calibration speed 100 mm/s or less than the readhead maximum, whichever is slowest.

**Step 1 – Incremental signal calibration**

- Cycle the power to the readhead or connect the ‘Remote CAL’ output pin to 0 V for < 3 seconds. The  eadhead will then single flash Blue to indicate it is in calibration mode as detailed in ‘Readhead mounting and alignment’, page 11. The readhead will only enter calibration mode if the LED is flashing Green.
- Move the readhead at slow speed along the axis ensuring it does not pass a reference mark, until the LED starts double-flashing indicating the incremental signals are now calibrated and the new settings are stored in the readhead memory.
- The system is now ready for reference mark phasing. For systems without a reference mark, cycle the power to the readhead or connect the ‘Remote CAL’ output pin to 0 V for < 3 seconds to exit calibration mode.
- If the system does not automatically enter the reference mark phasing stage (LED continues single flashing) the calibration of the incremental signals has failed. After ensuring failure is not due to overspeed (> 100 mm/s, or exceeding the readhead maximum speed), exit the calibration routine, restore factory defaults as detailed below, and check the readhead installation and system cleanliness before repeating the calibration routine.
  **NOTE:** For analogue variants of QUANTiC ensure correct termination of output signals (‘Recommended signal termination’, page 18).

**Step 2 – Reference mark phasing**

- Move the readhead back and forth over the selected reference mark until the LED stops flashing and remains solid Blue. The reference mark is now phased.
  **NOTE:** Only the chosen reference mark that has been used in the calibration routine is guaranteed to remain phased.
- The system automatically exits the calibration routine and is ready for operation.
- AGC and AOC are automatically switched on once calibration is complete. To switch off AGC refer to ‘Switching Automatic Gain Control (AGC) on or off’, page 13.
- If the LED continues double-flashing after repeatedly passing the chosen reference mark it is not being detected.
  - Ensure that the correct readhead configuration is being used. Readheads can either output all reference marks or only output a reference mark where a reference selector magnet is fitted depending on the options chosen when ordering.
  - Check reference mark selector magnet is fitted in the correct location relative to readhead orientation (‘RKLC40-S scale installation drawing’, page 4).

**Calibration routine manual exit**

- To exit the calibration routine at any stage cycle the power to the readhead or connect the ‘Remote CAL’ output pin to 0 V for < 3 seconds. The LED will then stop flashing.

| LED | Settings stored |
|---|---|
| **Blue single flashing** | None, restore factory defaults and recalibrate |
| **Blue double flashing** | Incremental only |
| **Blue (auto-complete)** | Incremental and reference mark |

## Restoring factory defaults

When realigning the readhead, reinstalling the system, or in the case of continued calibration failure, factory defaults should be restored.
**NOTE:** Restoring factory defaults can also be carried out using the optional ADTi-100 and ADT View software. See **www.renishaw.com/adt** for more information.

**To restore factory defaults:**

- Switch system off.
- Obscure the readhead optical window (using the spacer supplied with the readhead ensuring the cut-out is **NOTE** under the optical window) or connect the 'Remote CAL' output pin to 0 V.
- Power the readhead.
- Remove the spacer or, if using, the connection from the 'Remote CAL' output pin to 0 V.
- The LED will start continuously flashing indicating factory defaults have been restored and the readhead is in installation mode (flashing set-up LED).
- Repeat 'Readhead set-up' procedure on page 11.

#### Switching Automatic Gain Control (AGC) on or off

The AGC is automatically enabled once the system has been calibrated (indicated by a Blue LED). AGC can be manually switched off by connecting the 'Remote CAL' output pin to 0 V for > 3 seconds < 10 seconds.
The LED will then be solid Green.
**NOTE:** AGC can be switched on or off using the optional ADTi-100 and ADT View software. See **www.renishaw.com/adt** for more information.

## Troubleshooting

| Fault | Cause | Possible solutions |
|---|---|---|
| **LED on the readhead is Blank** | There is no power to the readhead | • Ensure 5 V supplied at the readhead<br>• For cable variants check correct wiring of connector<br>• If using the analogue variant of QUANTiC with the ADTi ensure appropriate adaptor cables are connected |

| | | |
|---|---|---|
| **LED on the readhead is Red flashing during installation mode** | The signal strength is < 50% | • Check the readhead optical window and scale are clean and free from contamination<br>• Restore factory defaults **(page 13)** and check alignment of the readhead. In particular:<br>  ◦ Rideheight<br>  ◦ Yaw<br>  ◦ Offset<br>• Ensure the correct scale and readhead combination |
| **Unable to get a Green LED over the complete axis length** | System run-out is not within specification | • Use a DTi gauge and check the run-out is within specifications<br>• Restore factory defaults<br>• Realign readhead to obtain a Green flashing LED at the mid-point of the run-out<br>• Recalibrate the system . |
| **Can’t initiate the calibration routine** | Signal size is < 70% | • Realign readhead to obtain a green flashing LED |
| **During calibration the LED on the readhead remains single flashing Blue even after moving it along the full axis length** | The system has failed to calibrate the incremental signals due to the signal strength being < 70% | • Exit CAL mode and restore factory defaults.<br>• Check readhead set-up and alignment. |
| | Incorrect termination ( analogue variant only) | • Check output signal termination<br>• When using with ADTi-100 in stand- alone mode ensure Termination tool is connected, Renishaw part number A-6195-2132<br>• Exit CAL mode and restore factory defaults.<br>• Check readhead set-up and alignment. |
| **During calibration the LED on the readhead is double flashing Blue even after moving it past the reference mark several times** | The readhead is not seeing a reference mark | • Ensure correct position of reference mark selector magnet<br>• Ensure you are moving the readhead past your chosen reference mark several times<br>• Check the readhead /selector magnet orientation<br>• Check the readhead optical window and scale are clean and free from contamination |

| Fault | Cause | Possible solutions |
|---|---|---|
| No reference mark output | | • Ensure you are not over-speeding the readhead during calibration mode (maximum speed < 100 mm/sec<br>• Calibrate the system<br>• If the system completes calibration mode then it has successfully seen and calibrated the reference mark. If you still don't see a reference mark then check the system wiring.<br>• If the system does not calibrate the reference mark (LED on the readhead remains double flashing Blue) see above for possible solutions |
| Reference mark is not repeatable | Only the chosen reference mark that has been used in the calibration sequence is repeatable, other reference marks may not be phased | • Ensure you are using the reference mark that has been calibrated for referencing your system<br>• The readhead bracket must be stable and not allow any mechanical movement of the readhead<br>• Clean the scale and readhead optical window and check for damage then recalibrate the system over the chosen reference mark |
| LED on the readhead is flashing Red over the reference mark | The reference mark is not phased | • Ensure you are using the reference mark that has been calibrated for referencing your system as only this reference mark will be guaranteed to remain phased<br>• Clean the scale and readhead optical window and check for scratches then recalibrate the system over the chosen reference mark **(page 12)** |
| Multiple reference marks are being output | The readhead reference mark option is either option B or F, 'All reference marks are output' | • Calibrate the system ensuring both Step 1 and Step 2 are completed.<br>• Ensure you calibrate the reference mark used for referencing your system as only this reference mark will be guaranteed to remain phased |

| | | |
|---|---|---|
| LED on the readhead is flashing Red and Purple (analogue variant only) | AGC out of normal operating range | • Check output signal termination<br>• When using with ADTi-100 in stand-alone mode ensure Termination tool is connected Renishaw part number A-6195-2132<br>• Check cable continuity<br>• Ensure the correct scale and readhead combination |
| LED on the readhead flashing Red four<br>times on switch on | Low signal, over signal, or overspeed; system in error | • Check readhead set-up and alignment (page 11) |
| | Incorrect termination ( analogue variant only) | • Check output signal termination<br>• When using with ADTi-100 in stand-alone mode ensure Termination tool is connected, Renishaw part number A-6195-2132<br>• Exit CAL mode and restore factory defaults<br>• Check readhead set-up and alignment |

## Output signals

#### Digital outputs

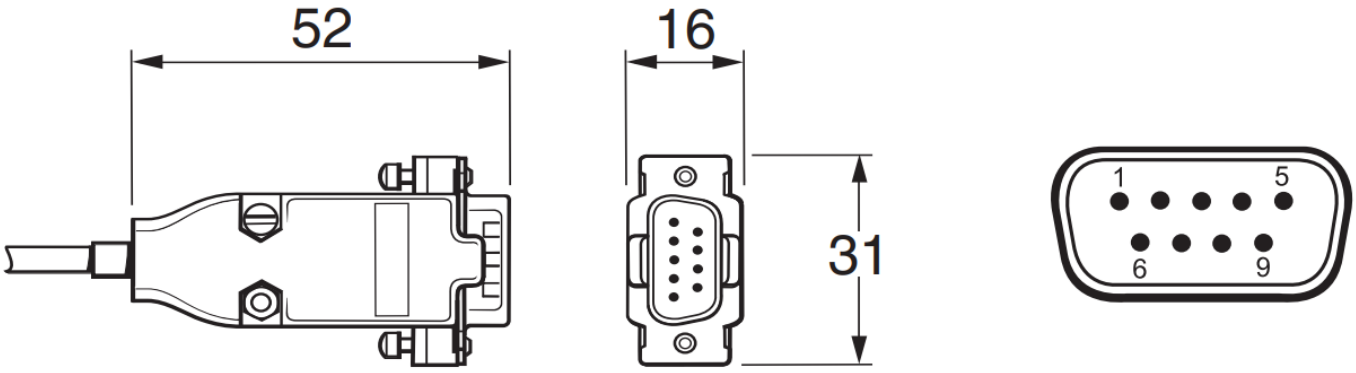
| Function | Signal | | Colour | 9-way D-type (A) | 15-way D-type (D) | 15-way D-type alternative pin-out (H) | 12-way circular connector† (X) | 14-way JST ‡ (J) |
|---|---|---|---|---|---|---|---|---|
| Power | 5 V | | Brown | 5 | 7, 8 | 4, 12 | G | 10 |
| | 0 V | | White | 1 | 2, 9 | 2, 10 | H | 1 |
| Incremental | A | + | Red | 2 | 14 | 1 | M | 7 |
| | | – | Blue | 6 | 6 | 9 | L | 2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | B | + | Yellow | 4 | 13 | 3 | J | 11 |
| | | – | Green | 8 | 5 | 11 | K | 9 |
| **Reference mark** | Z | + | Violet | 3 | 12 | 14 | D | 8 |
| | | – | Grey | 7 | 4 | 7 | E | 12 |
| **Limits** | P | | Pink | – | 11 | 8 | A | 14 |
| | Q | | Black | – | 10 | 6 | B | 13 |
| **Alarm** | E | – | Orange | – | 3 | 13 | F | 3 |
| **Remote CAL*** | CAL | | Clear | 9 | 1 | 5 | C | 4 |
| **Shield** | – | | Screen | Case | Case | Case | Case | Ferrule |

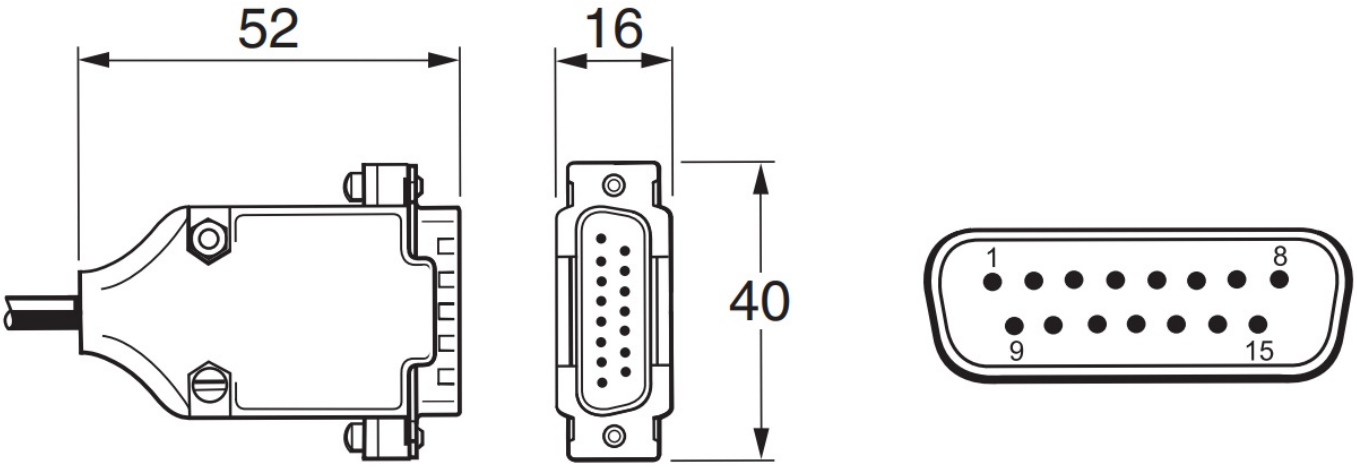
**Analogue outputs**

| Function | | Signal | | Colour | 15-way D-type (L) | 15-way D-type alternative pin-out(H) | 14-way JST ‡(J) |
|---|---|---|---|---|---|---|---|
| **Power** | | 5 V | | Brown | 4, 5 | 4, 12 | 10 |
| | | 0 V | | White | 12, 13 | 2, 10 | 1 |
| **Incremental** | **Cosine** | V1 | + | Red | 9 | 1 | 7 |
| | | | – | Blue | 1 | 9 | 2 |
| | **Sine** | V2 | + | Yellow | 10 | 3 | 11 |
| | | | – | Green | 2 | 11 | 9 |
| **Reference mark** | | V0 | + | Violet | 3 | 14 | 8 |
| | | | – | Grey | 11 | 7 | 12 |
| **Limits** | | Vp | | Pink | 7 | 8 | 14 |
| | | Vq | | Black | 8 | 6 | 13 |
| **Setup** | | Vx | | Clear | 6 | 13 | 6 |
| **Remote CAL*** | | CAL | | Orange | 14 | 5 | 4 |
| **Shield** | | – | | Screen | Case | Case | Ferrule |

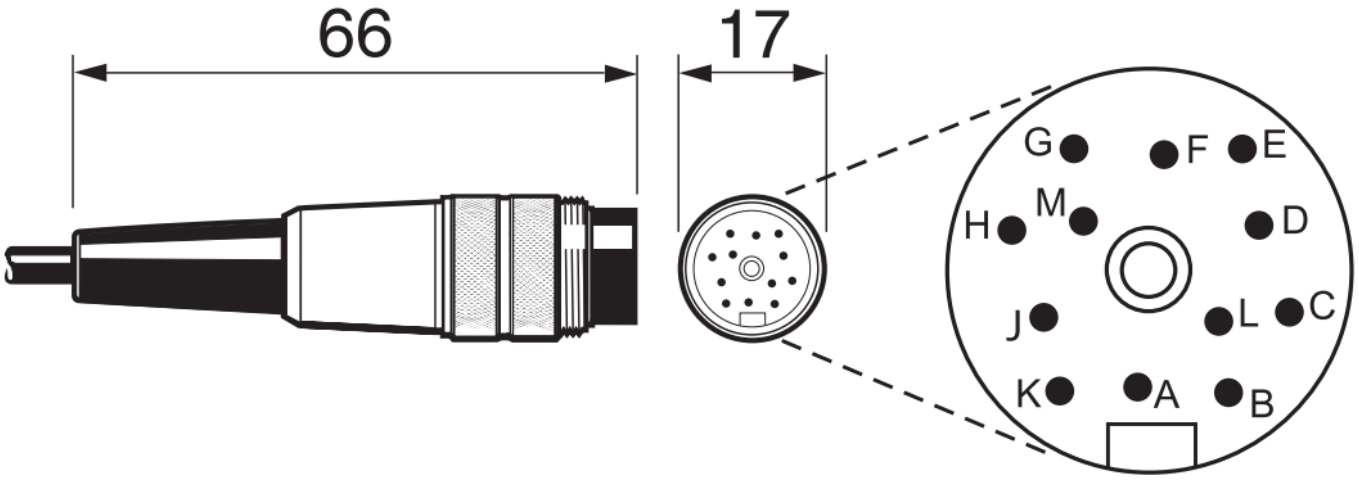
**9-way D-type connector (termination code A)**



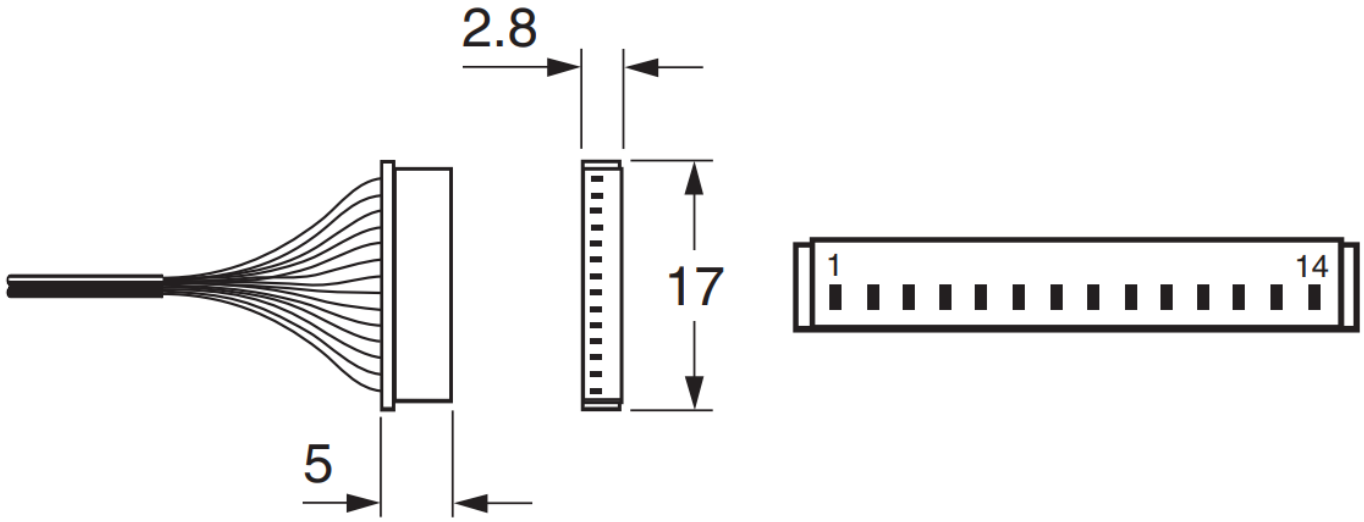

**15-way D-type connector (termination code D, L, H)**




**12-way in-line circular connector (termination code X)**




**14-way JST connector (termination code J)**




Remote CAL line must be connected for use with ADTi-100. †
12-way circular Binder mating socket – A-6195-0105. ‡
**Pack of 5 14-way JST SH mating sockets:**
A-9417-0025 – Bottom mount;
A-9417-0026 – Side mount.
Maximum of 20 insertion cycles for JST connector.

## Speed

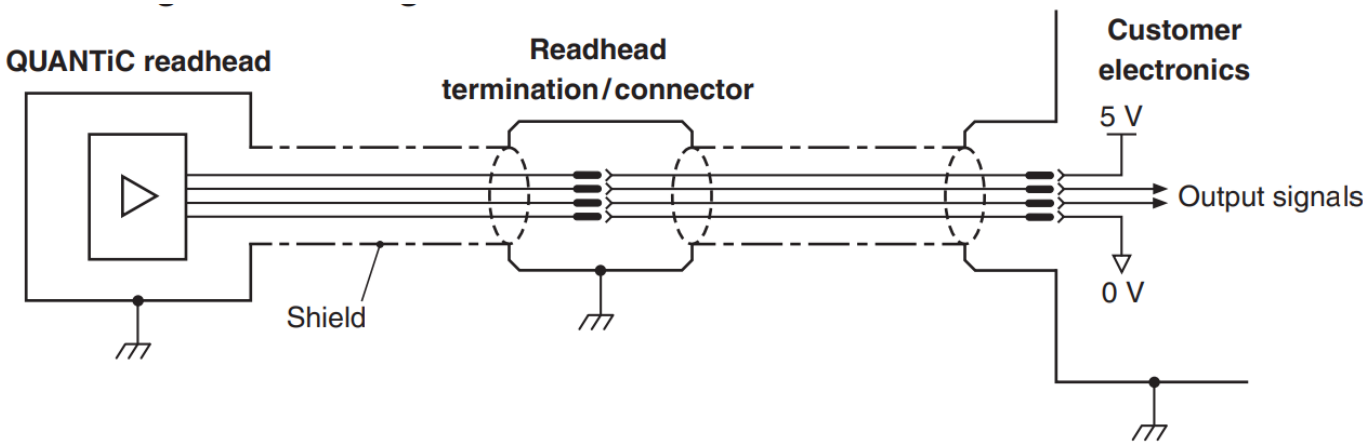
#### Digital redheads

| Clocked output option (MHz) | Maximum speed (m/s) | | | | | | | Minimum edge separation* (ns) |
|---|---|---|---|---|---|---|---|---|
| | T (10 µm) | D (5 µm) | X (1 µm) | Z (0.5 µm) | W (0.2 µm) | Y (0.1 µm) | H (50 nm) | |
| **50** | 24 | 24 | 24 | 18.13 | 7.25 | 3.626 | 1.813 | 25.1 |
| **40** | 24 | 24 | 24 | 14.50 | 5.80 | 2.900 | 1.450 | 31.6 |
| **25** | 24 | 24 | 18.13 | 9.06 | 3.63 | 1.813 | 0.906 | 51.0 |
| **20** | 24 | 24 | 16.11 | 8.06 | 3.22 | 1.611 | 0.806 | 57.5 |
| **12** | 24 | 24 | 10.36 | 5.18 | 2.07 | 1.036 | 0.518 | 90.0 |
| **10** | 24 | 24 | 8.53 | 4.27 | 1.71 | 0.853 | 0.427 | 109 |
| **08** | 24 | 24 | 6.91 | 3.45 | 1.38 | 0.691 | 0.345 | 135 |
| **06** | 24 | 24 | 5.37 | 2.69 | 1.07 | 0.537 | 0.269 | 174 |
| **04** | 24 | 18.13 | 3.63 | 1.81 | 0.73 | 0.363 | 0.181 | 259 |
| **01** | 9.06 | 4.53 | 0.91 | 0.45 | 0.18 | 0.091 | 0.045 | 1038 |

**Analogue readheads**
Maximum speed: 20 m/s (–3dB)†

## Electrical connections

#### Grounding and shielding



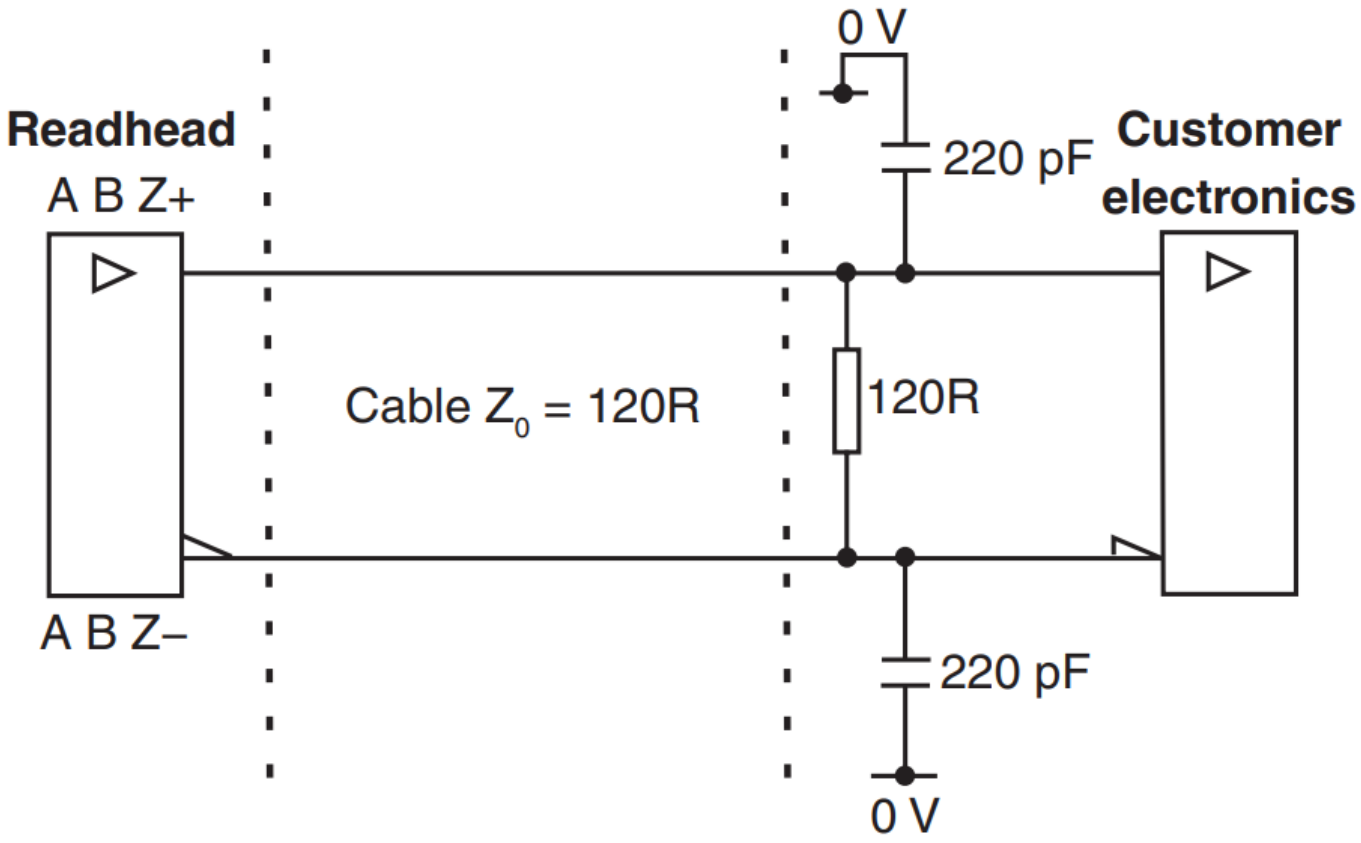

**IMPORTANT:** The shield should be connected to the machine earth (Field Ground).
For JST variants the ferrule should be connected to the machine earth.

### Maximum cable length

| | Analogue | Digital |
|---|---|---|
| **Readhead cable** | 5 m | 3 m |
| **Maximum extension cable length** | Dependent on cable type, readhead cable length and clocked output option. Contact your local Renishaw representative for more information. | |
| **Readhead to ADTi-100** | 5 m | 3 m |

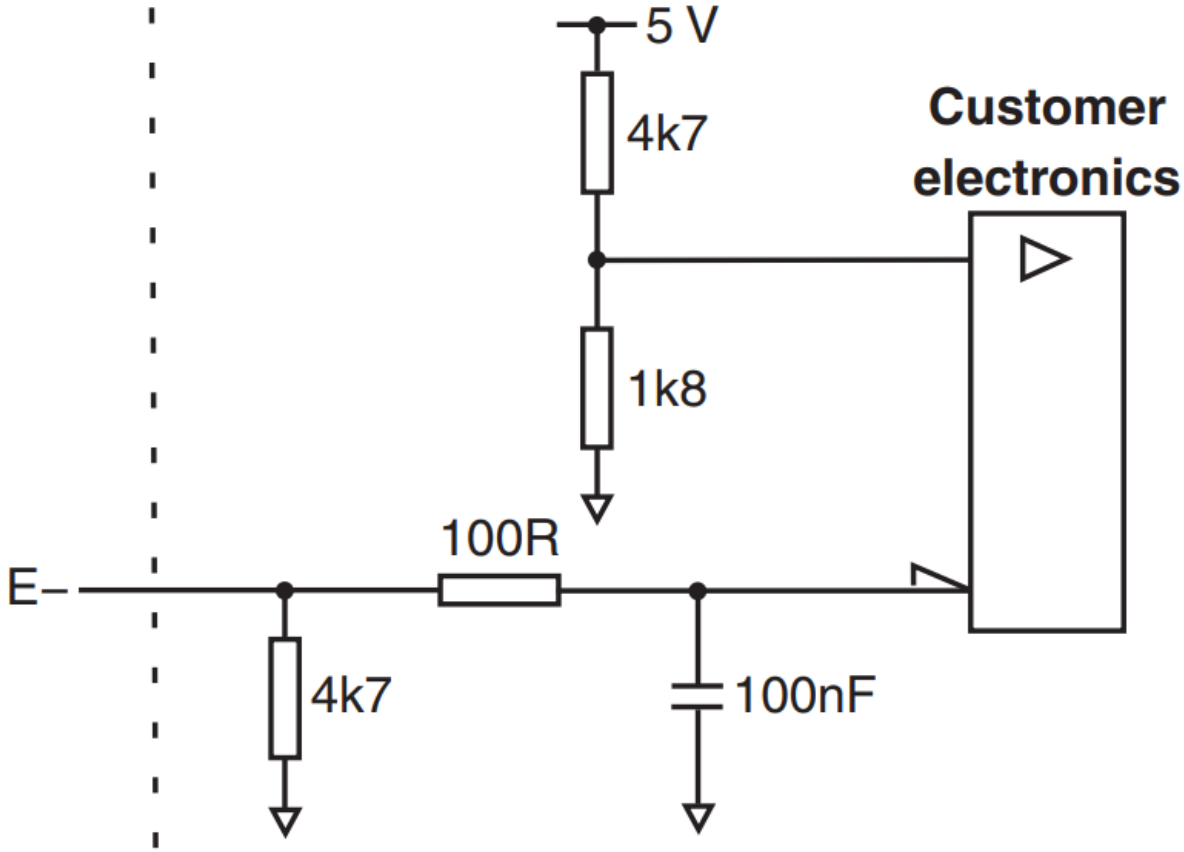
#### Recommended signal termination

### Digital outputs



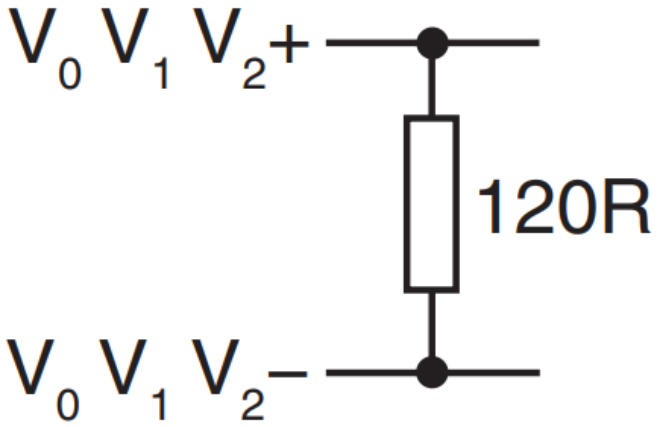

Standard RS422A line receiver circuitry.
Capacitors recommended for improved noise immunity.

**Single ended alarm signal termination**
(Not available with 'A' cable termination)



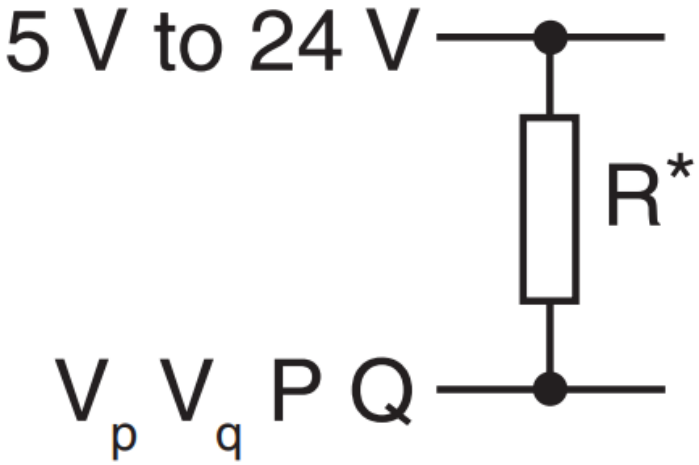

**Readhead**

**Analogue outputs**




**NOTE:** 120R termination on the analogue output signals is essential for correct AGC operation.

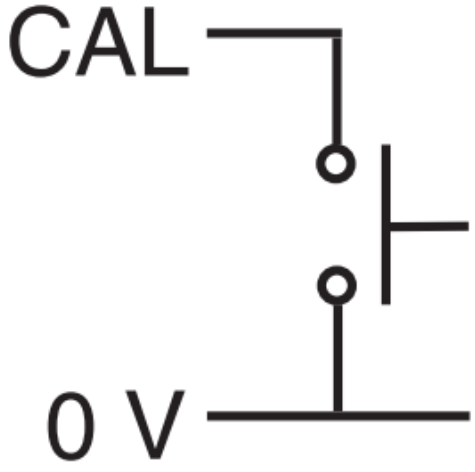
**Analogue and digital ouputs**




**Limit output**
(Not available with 'A' cable termination)

Select R so that maximum current does not exceed 20 mA.
Alternatively, use a suitable relay or optoisolator

**Remote CAL operation**

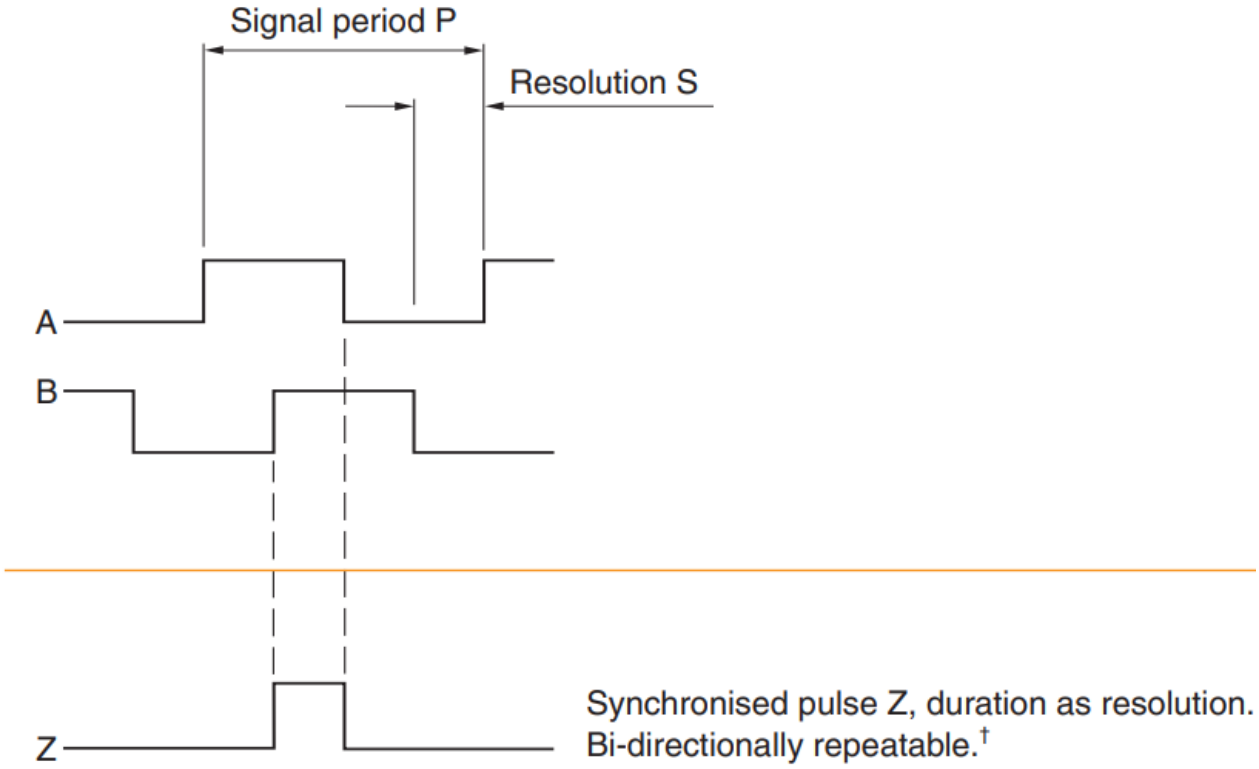



Remote operation of the CAL/AGC is possible via CAL signal.

## Output specifications

#### Digital output signals

Form – Square wave differential line driver to EIA RS422A (except limits P and Q)
**Incremental** 2 channels A and B in quadrature (90° phase shifted)

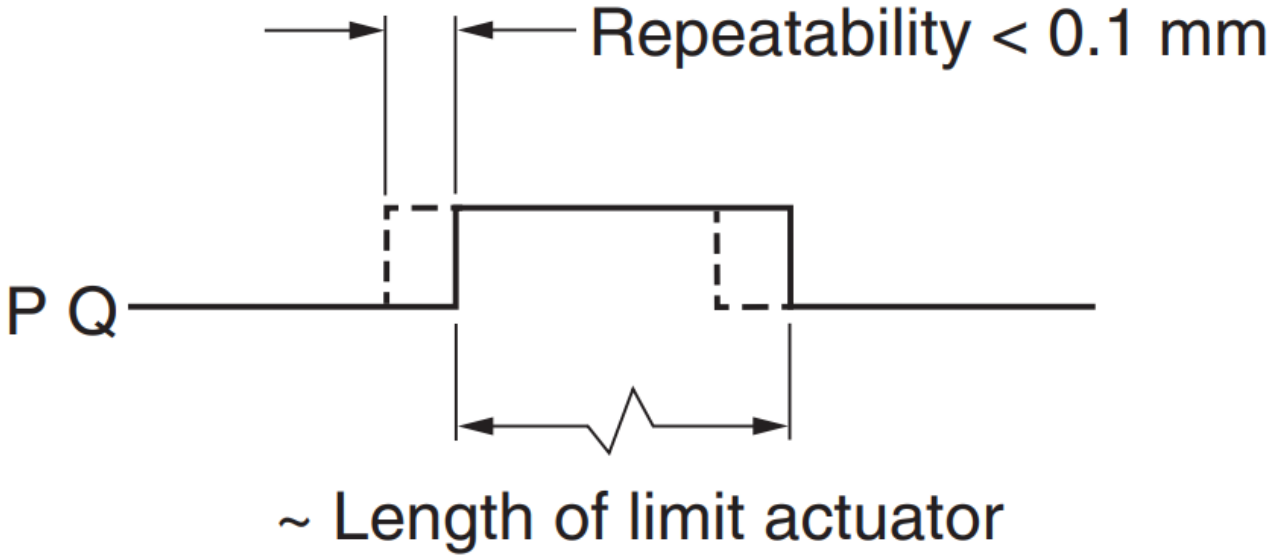



| Resolution option code | P (µm) | S (µm) |
|---|---|---|
| **T** | 40 | 10 |
| **D** | 20 | 5 |
| **X** | 4 | 1 |
| **Z** | 2 | 0.5 |
| **W** | 0.8 | 0.2 |
| **Y** | 0.4 | 0.1 |
| **H** | 0.2 | 0.05 |

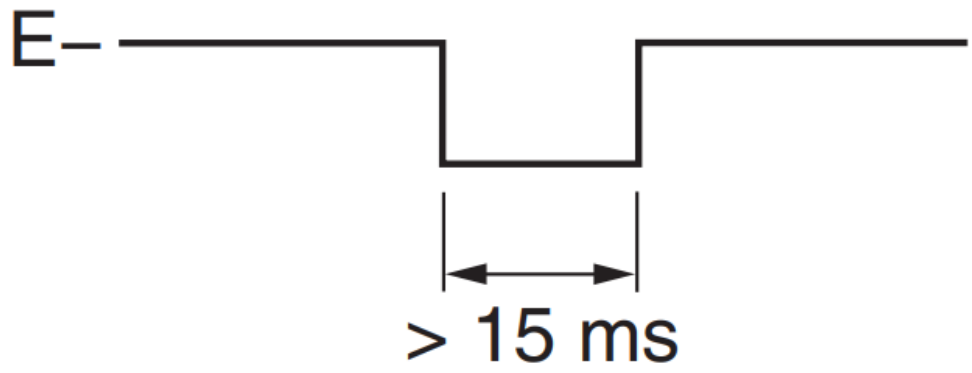
#### Reference

**NOTE:** A wide reference mark option, outputting a reference pulse for the duration of the signal period is available. Contact your local Renishaw representative for more information.

**Limits**
Open collector output, asynchronous pulse (Not available with ‘A’ cable termination)



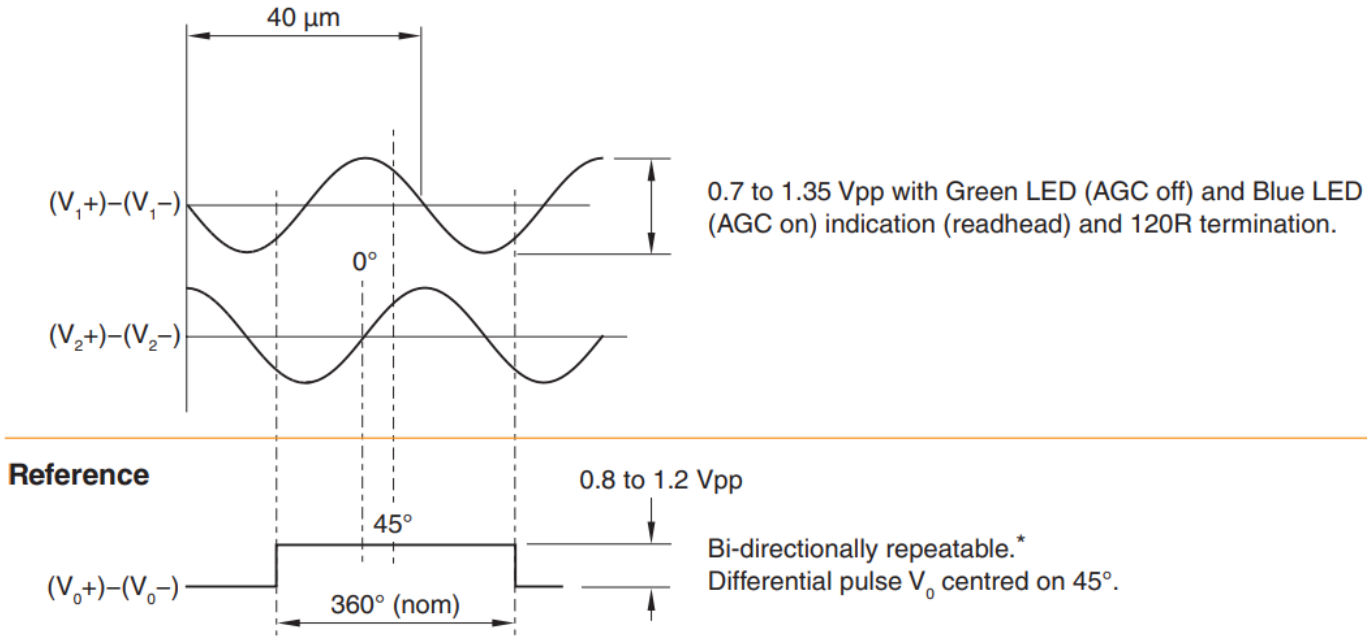

**Alarm**
Line driven (Asynchronous pulse) (Not available with ‘A’ cable termination)




**or 3-state alarm**
Differential transmitted signals forced open circuit for > 15 ms when alarm conditions valid.

**Analogue output signals**

**Incremental 2 channels V1 and V2** differential sinusoids in quadrature, centred on ~1.65 V (90° phase shifted)

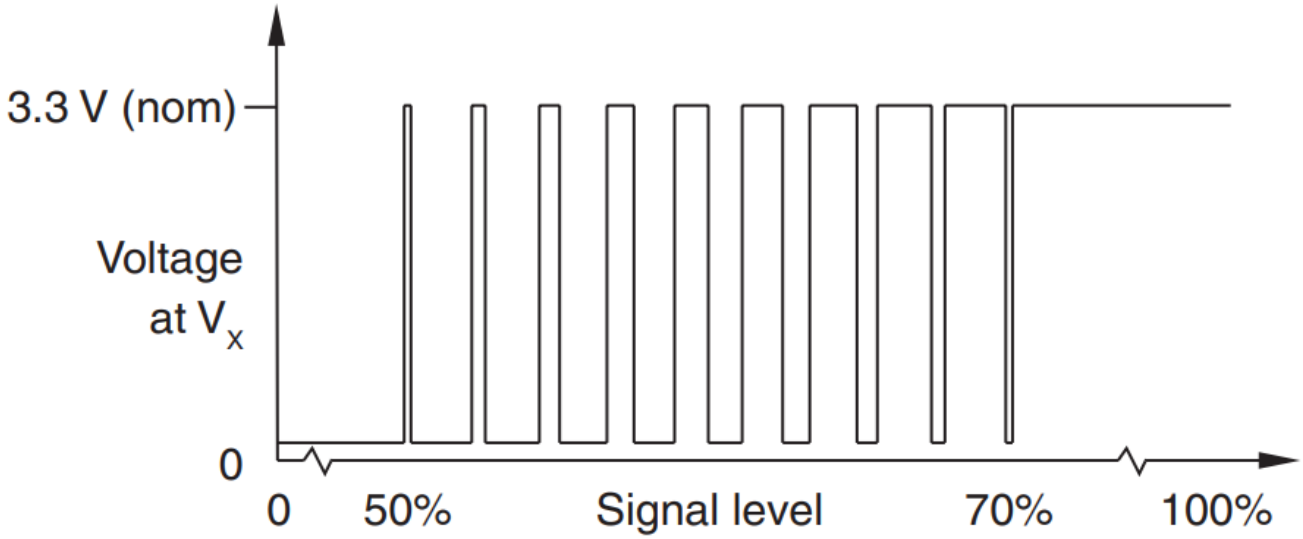



**Reference**

**Limits**
Open collector output, asynchronous pulse

**Set-up†**

Between 50% and 70% signal level, VX is a duty cycle.
Time spent at 3.3 V increases with incremental signal level.
At > 70% signal level VX is nominal 3.3 V.




Only calibrated reference mark is bi-directionally repeatable.
Set-up signal as shown is not present during calibration routine

## General specifications

| | | |
|---|---|---|
| **Power supply** | 5V –5%/ +10% | Typically 150 mA fully terminated (analogue output) |

| | | | |
|---|---|---|---|
| Typically 200 mA fully terminated (digital output) | | | |
| Power from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1 | | | |
| | Ripple | 200 mVpp maximum @ frequency up to 500 kHz | |
| **Temperature** (system) | Storage | –20 °C to +70 °C | |
| | Installation | +10 °C to +35 °C* | |
| | Operating | 0 °C to +70 °C | |
| **Humidity** (system) | | 95% relative humidity (non-condensing) to IEC 60068-2-78 | |
| **Sealing** | | IP40 | |
| **Acceleration** (system) | Operating | 400 m/s², 3 axes | |
| **Shock** (system) | Operating | 500 m/s², 11 ms, ½ sine, 3 axes | |
| **Vibration** (readhead) | Operating | 100 m/s² max @ 55 Hz to 2000 Hz, 3 axes | |
| (scale) | Operating | 300 m/s² max @ 55 Hz to 2000 Hz, 3 axes | |
| **Mass** | Readhead | 9 g | |
| | Cable | 26 g/m | |
| **EMC compliance** | | IEC 61326-1 | |

| | | | |
|---|---|---|---|
| **Readhead cable** | | Single-shielded, outside diameter 4.25 ±0.25 mm | |
| Flex life > 20 × $10^6$ cycles at 30 mm bend radius | | | |
| | | UL recognised component  | |
| | Maximum length | 5 m (analogue) | |
| | | 3 m (digital) | |
| **Connector options** | | **Code – connector type** | |
| A – 9-way D-type – Digital output only | | | |
| L – 15-way D-type (standard pin-out) – Analogue output only | | | |
| D – 15-way D-type (standard pin-out) – Digital output only | | | |
| H – 15-way D-type (alternative pin-out) | | | |
| X – 12-way circular connector – Digital output only | | | |
| | | J – 14-way JST connector | |
| **Typical sub-divisional error (SDE)** | | **Analogue output** | **Digital output** |
| | | < ±120 nm | < ±80 nm |

**CAUTION:** Renishaw encoder systems have been designed to the relevant EMC standards, but must be correc tly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

### RKLC40-S scale specifications

| | | |
|---|---|---|
| **Form** (H × W) | | 0.15 mm × 6 mm (including adhesive) |
| **Pitch** | | 40 µm |
| **Accuracy** (at 20 °C)<br>(includes slope and linearity) | RKLC40 -S | ±15 µm/m |
| | RKLC40 H-S | ±5 µm/m |
| **Linearity** | RKLC40 -S | ±3 µm/m achievable with 2 point error correction |
| | RKLC40 H-S | ±2.5 µm/m achievable with 2 point error correction |
| **Supplied length** | | 20 mm to 20 m (> 20 m available on request) |
| **Material** | | Hardened and tempered martensitic stainless steel fitted with a self-adhesive backing tape |
| **Mass** | | 4.6 g/m |
| **Coefficient of thermal expansion** (at 2 0 °C) | | Matches that of substrate material when scale ends fixed by epoxy mounted end clamps |
| **Installation temperature** | | +10 °C to +35 °C |

| | | |
|---|---|---|
| **End fixing** | | Epoxy mounted end clamps (A-9523-4015) Approved epo xy adhesive (A-9531-0342) Scale end movement typically < 1 µm* |
| **Reference mark** | | |
| **Type** | | Customer selected *IN-TRAC* reference mark, directly embedded into incremental track. Bi-directional position r epeatability |
| **Selection** | | Single reference mark selection by selector magnet (A-96 53-0143) customer positioned. |
| L ≤ 100 mm | | Single reference mark at scale centre |
| L > 100 mm | | Reference marks at 50 mm spacing (first reference mark 50 mm from scale end) |
| **Repeatability** | | Unit of resolution repeatability (bi-directional) across full s ystem rated speed and temperature ranges |
| **Limit switches** | | |
| **Type** | Magnetic actuators; with dimple triggers Q li mit, without dimple triggers P limit **(‘RKLC40-S scale installation drawing’, page 4)** | |
| **Trigger point** | The limit output is nominally asserted when t he readhead limit switch sensor passes the<br>limit magnet leading edge, but can trigger up to 3 mm before that edge | |
| **Mounting** | Customer placed at desired locations | |
| **Repeatability** | < 0.1 mm | |

The scale and end clamps must be installed following the installation process.

The scale and end clamps must be installed following the installation process.

## Legal notices



**Patents**

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

| | | | | |
|---|---|---|---|---|
| EP1173731 | US6775008 | JP4750998 | CN100543424 | EP1766334 |
| JP4932706 | US7659992 | CN100507454 | EP1766335 | IN281839 |
| JP5386081 | US7550710 | CN101300463 | EP1946048 | JP5017275 |
| US7624513 | CN101310165 | EP1957943 | US7839296 | CN108351229 |
| EP3347681 | JP2018530751 | KR20180052676 | US20180216972 | WO2017203210 |
| CN1314511 | EP1469969 | EP2390045 | JP5002559 | US8987633 |
| US8466943 | | | | |

## Disclaimer



## Terms and conditions and warranty

Renishaw warrants its equipment and software for a limited period (as set out in the Standard Terms and Conditions), provided that they are installed and used exactly as defined in associated Renishaw documentation. You should consult these Standard Terms and Conditions to find out the full details of your warranty.

Equipment and/or software purchased by you from a third-party supplier is subject to separate terms and conditions supplied with such equipment and/or software. You should contact your third-party supplier for details.

**Product compliance**
Renishaw plc declares that QUANTiC™ 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.**

## 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.

**Further information**
Further information relating to the QUANTiC encoder range can be found in the QUANTiC ™ series encoder system Data sheet (Renishaw part no. L-9517-9778), Advanced Diagnostic Tool ADTi-100 Data sheet (Renishaw part no. L-9517-9699), Advanced Diagnostic Tool ADTi-100 and ADT View software User guide (Renishaw part no. M-6195-9413) and Advanced Diagnostic Tool ADTi-100 and ADT View software Quick-start guide (Renishaw part no. M-6195-9321). These can be downloaded from our website at **www.renishaw.com/quanticdownloads** and are also available from your local representative.

**Packaging**

| 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.

## WEEE recycling guidelines

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.

## Support

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www.renishaw.com

**For worldwide contact details, visit www.renishaw.com/contact**

Renishaw plc. Registered in England and Wales. Company no: 1106260.
**Registered office:** New Mills, Wotton-under-Edge, Gloucestershire, GL12 8JR, UK.

## Documents / Resources

| | |
|---|---|
|  | RENISHAW QUANTiC RKLC40-S Incremental Linear Encoder System [pdf] Installation Guide<br>QUANTiC RKLC40-S Incremental Linear Encoder System, QUANTiC, RKLC40-S, Incremental Linear Encoder System, Encoder System, Linear Encoder System, Linear Encoder, M-9417-9238-03-D |

## References

- Renishaw: enhancing efficiency in manufacturing and healthcare
- Advanced Diagnostic Tools (ADTs)
- Contact us
- Product compliance
- QUANTiCâ„¢ incremental encoder downloads
- Product Environmental Compliance