

Mirror mount installation guide

The RLE fibre optic laser encoder uses interferometry to provide high resolution, high linearity position feedback. The RLE system comprises an RLU laser unit, one or two RLD10 detector heads and an additional optic - either a plane mirror or retroreflector, to complete the interferometer configuration.

Mirror selection and installation should be carried out carefully to avoid degrading the metrological advantages of the interferometer system. This document details a typical alignment procedure, which can be used with Renishaw mirrors and mounts to ensure errors are minimised.

The following instructions demonstrate one method for aligning two plane mirrors to an X-Y stage* using Renishaw mirror mounts. It is assumed that the person performing the procedure is familiar with the test equipment, all mechanical adjustments of the motion stages have been completed, the RLD10 detector heads are fully mounted and the axes are fully operational.

* If a vertical axis of motion is located under the mirrors a different method of pitch alignment may be necessary.

Equipment:

- 2 x stick mirrors of required length fitted with mount locations (3 ball pads)
- 2 x Renishaw mounting kits (RAM10-SX-XX) which include: 1 x adjustable mirror mount, 1 x fixed mirror mount, 2 x mirror clamps, 10 x M2.5 by 8 screws, 1 x Allen key (2.0 mm A/F), 1 x mount adjustment tool
- Alignment target

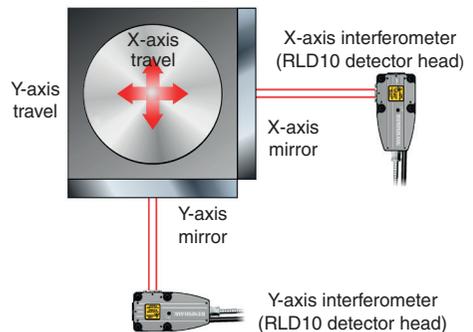


Figure 1: system terminology

1. Install Y-axis mirror into its mount

- The motion stage must provide fixing holes to accept the mirror mounts. These should be machined according to Figure 2 overleaf.
- Attach the adjustable mirror mount (see Figure 6) to the stage using 3 of the M2.5 screws provided. The screws should be torqued to 0.7 Nm.
- Repeat for the fixed mirror mount.

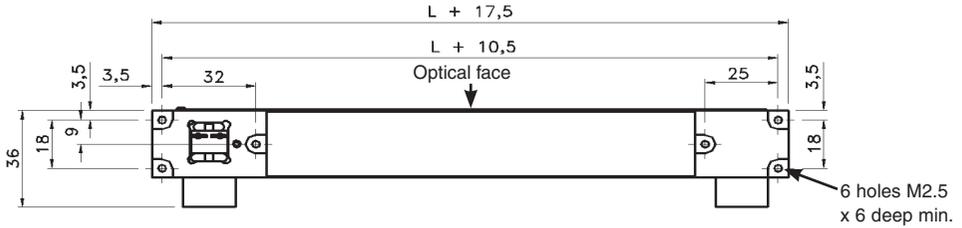


Figure 2: fixing holes for mirror of total length L ($L < 350$ mm): all dimensions in mm
View from underside of mirror mounts: Note: $L = \text{optical aperture} + 20$ mm

- Locate the stick mirror on the two mounts so that the ball pads on the bottom of the mirror sit in the location features on the mounts (as in Figures 3 and 4). **Note:** two ball pads are located at the adjustable mount end and one at the fixed mount end.

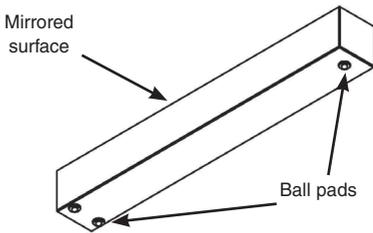


Figure 3: mirror with ball pads

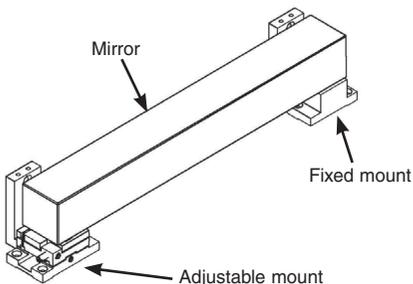


Figure 4: mirror located in mounts

2. Remove Y-axis interferometer (RLD10 detector head) cosine error

- Move the Y-axis (with the X-axis movement locked) to achieve the shortest separation between the Y-axis RLD10 and mirror.
- Attach a Renishaw target sticker on the mirror surface so that the laser beam is on the target.
- Move the axis to achieve the longest separation between the Y-axis RLD10 and mirror.
- Adjust the pitch and yaw of the beam from the RLD10 so the laser spot does not exhibit any translation from the target. **Note:** this can be an iterative process and may require multiple near and far field adjustments for the best alignment.

3. Align the Y-axis mirror perpendicular to the Y-axis travel

- Remove the sticker target from the front of the mirror.
- Move the mirror to the furthest separation and insert a metal Renishaw alignment target under the RLD10 (Figure 5).
- Visually align the mirror yaw, using the yaw adjustment screw located on the side of the mount (see Figure 6) so the return beam is in line with the centre of the alignment target aperture (mirror is perpendicular to the X-Y plane).

- Visually align the mirror pitch, using the adjustment screw located on the side of the adjustable mirror mount (see Figure 6) so the return beam goes through the centre of the alignment target aperture (mirror surface is now perpendicular to the X-Y plane).
- Remove the target.
- Finely adjust the pitch and yaw of the Y mirror (using the adjustment screws located on the side of the mount) to maximise the signal strength.

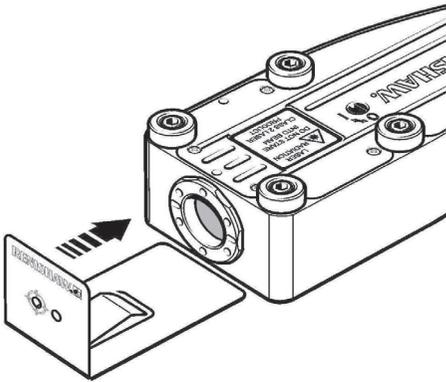


Figure 5: Renishaw alignment target

4. Engage the locking mechanism on the Y-axis mirror

- Place the clamps provided on top of the blocks and half tighten with the screws provided as shown in Figure 7. Torque screws on both sides to 0.2 Nm \pm 0.05 Nm.
- Check the clamping process has not altered the mirror alignment - some re-adjustment of mirrors may be required.

5. Align the X-axis mirror and interferometer perpendicular to the X-axis by repeating steps 1, 2, 3 and 4, substituting X for Y

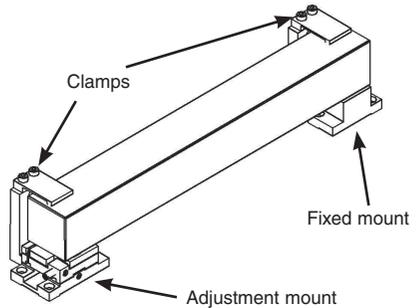


Figure 7: mirror clamped in mount

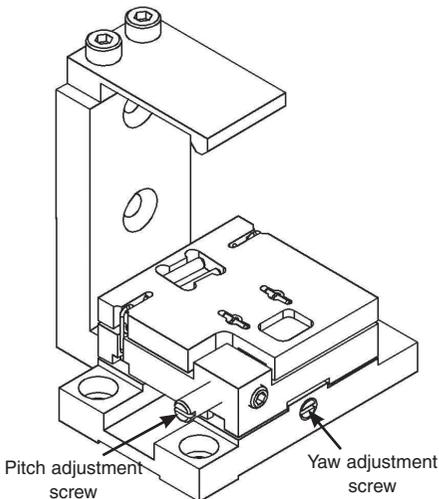


Figure 6: adjustable mirror mount

About Renishaw

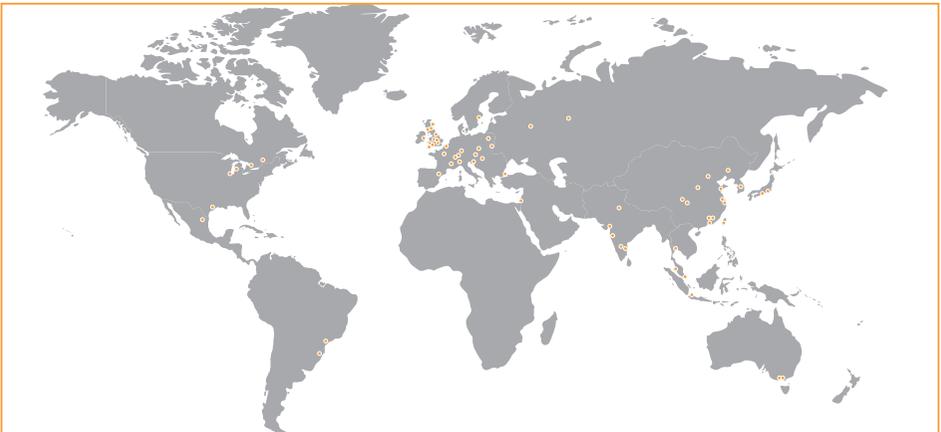
Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Products include:

- Additive manufacturing, vacuum casting, and injection moulding technologies for design, prototyping, and production applications
- Advanced material technologies with a variety of applications in multiple fields
- Dental CAD/CAM scanning and milling systems and supply of dental structures
- Encoder systems for high accuracy linear, angle and rotary position feedback
- Fixturing for CMMs (co-ordinate measuring machines) and gauging systems
- Gauging systems for comparative measurement of machined parts
- High speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs
- Styli for CMM and machine tool probe applications

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



RENISHAW HAS MADE CONSIDERABLE EFFORTS TO ENSURE THE CONTENT OF THIS DOCUMENT IS CORRECT AT THE DATE OF PUBLICATION BUT MAKES NO WARRANTIES OR REPRESENTATIONS REGARDING THE CONTENT. RENISHAW EXCLUDES LIABILITY, HOWSOEVER ARISING, FOR ANY INACCURACIES IN THIS DOCUMENT.

©2001-2014 Renishaw plc. All rights reserved.

Renishaw reserves the right to change specifications without notice

RENISHAW and the probe symbol used in the RENISHAW logo are registered trade marks of Renishaw plc in the United Kingdom and other countries. apply innovation and names and designations of other Renishaw products and technologies are trade marks of Renishaw plc or its subsidiaries. All other brand names and product names used in this document are trade names, trade marks or registered trade marks of their respective owners.



M - 9904 - 2179 - 04 - A

Issued: 1014 Part no. M-9904-2179-04-A