

# 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.

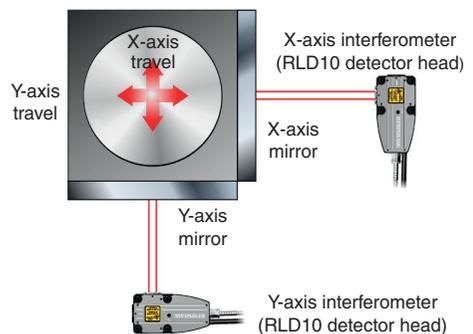
Mirror selection and installation should be carried out carefully to avoid degrading the metrological advantages of the interferometer system. This document details a typical alignment procedure, which can be used with Renishaw mirrors and mounts to ensure errors are minimised.

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:

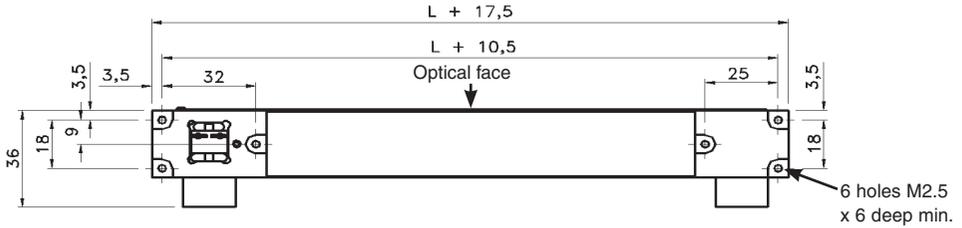
- 2 x stick mirrors of required length fitted with mount locations (3 ball pads)
- 2 x Renishaw mounting kits (RAM10-SX-XX) which include: 1 x adjustable mirror mount, 1 x fixed mirror mount, 2 x mirror clamps, 10 x M2.5 by 8 screws, 1 x Allen key (2.0 mm A/F), 1 x mount adjustment tool
- Alignment target



**Figure 1: system terminology**

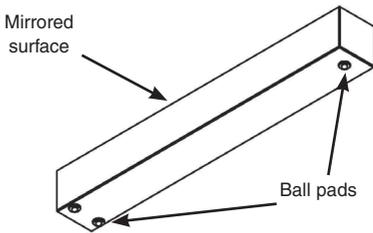
## 1. Install Y-axis mirror into its mount

- 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.

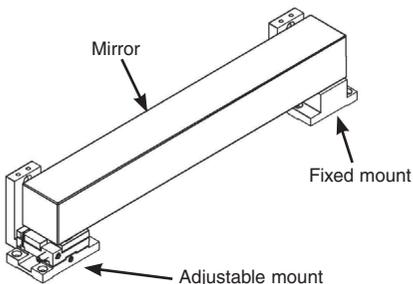


**Figure 2: fixing holes for mirror of total length  $L$  ( $L < 350$  mm): all dimensions in mm**  
View from underside of mirror mounts: Note:  $L = \text{optical aperture} + 20$  mm

- 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**

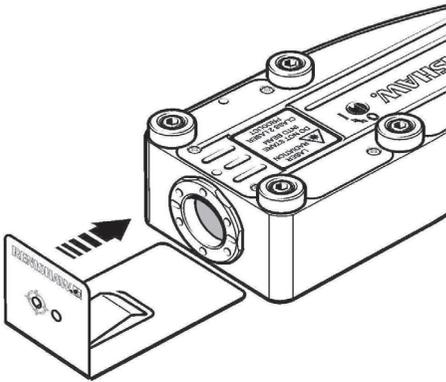
## 2. Remove Y-axis interferometer (RLD10 detector head) cosine error

- 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.

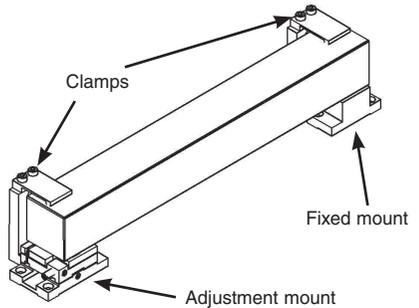


**Figure 5: Renishaw alignment target**

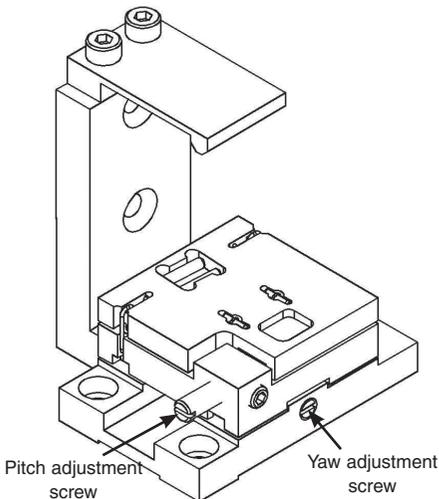
#### 4. Engage the locking mechanism on the Y-axis mirror

- 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  $0.2 \text{ Nm} \pm 0.05 \text{ Nm}$ .
- 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

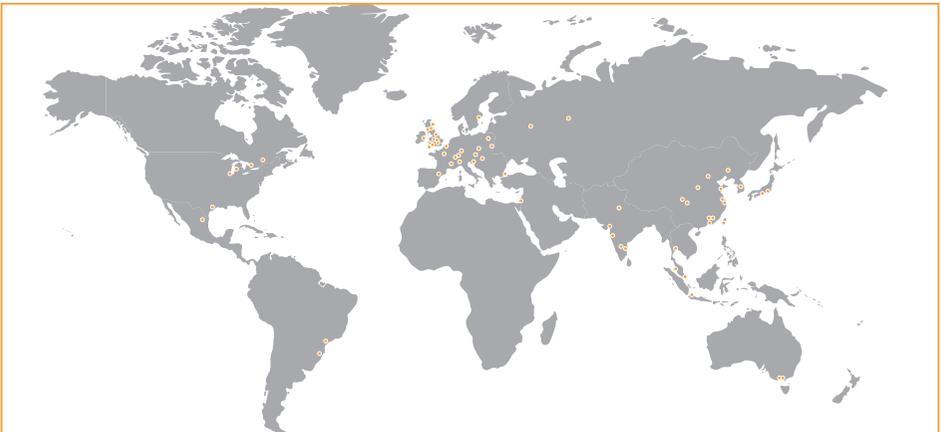
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