

Differential interferometer (DI) detector heads



Renishaw's versatile RDI-LP differential interferometer detector heads provide position or angular feedback for precision motion systems.

As part of Renishaw's RLE family of fibre optic laser encoder products, the RDI-LP detector heads are used with an RLU100, RLU200 or RLU300 laser unit. Their differential interferometer (DI) configuration enables measurement of displacement between two remotely mounted mirrors or changes in mirror angle, making them suitable for demanding motion-control applications. Accessories are available for mounting RDI-LP detector heads to a vacuum chamber to measure the relative position of the payload and host process equipment.

RDI-LP detector heads combine enhanced performance and usability with very low power consumption, minimising heat generation near sensitive instrumentation. Installation compatibility with existing RLD10-X3-DI applications also simplifies system upgrades.

A High Velocity detector head variant, the RDI-HV, is planned for future release and is intended for applications requiring measurement speeds greater than 1 m/s. Contact Renishaw for availability.

Benefits	Innovations
Cutting-edge performance Renishaw's differential interferometer detector heads combine low power dissipation with high bandwidth and high stability. The DI detector heads can be used at high motion velocities without compromising static position stability.	Enhanced beam pointing stability Renishaw's fibre optic laser encoder systems include an innovative collimator locking mechanism. When locked, the optical components are isolated from mechanical loads on the fibre optic interconnect.
Compactness The small mirror footprint requirement minimises additional payload mass.	Plug and play No manual set-up is required to use any combination of compatible detector heads and laser units (RLU100, RLU200 or RLU300). The DI detector head communicates with the laser unit to automatically set electronic gains and offsets to optimal values.
Expanded operating range The improved optical and electronic subsystems of the DI and compatible laser units ensure accuracy is maintained over greater distances, mirror angles and signal levels.	Robust beam steering mechanism The DI detector head's innovative optomechanical design includes independent beam alignment adjustments for the pitch and yaw of the reference and measurement beams.
Simple installation Individual optomechanical beam steerers are provided to align the DI detector head, ensuring that the RLE interferometer system can be quickly and easily installed onto the host machine. A single tool (2.5 mm hex key) is used for all head installation and beam alignment operations.	

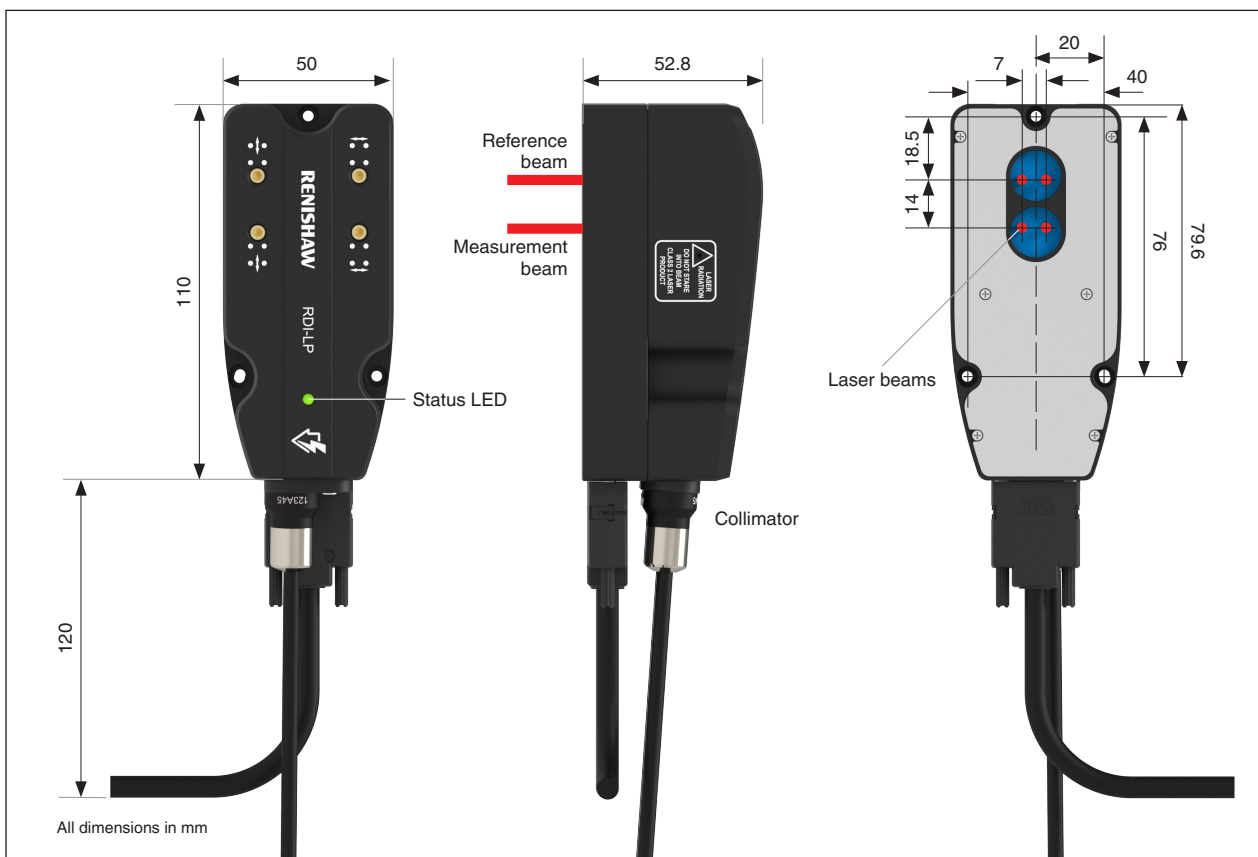


Figure 1 RDI-LP installation diagram (RDI-HV will have identical dimensions).

DI detector head specifications

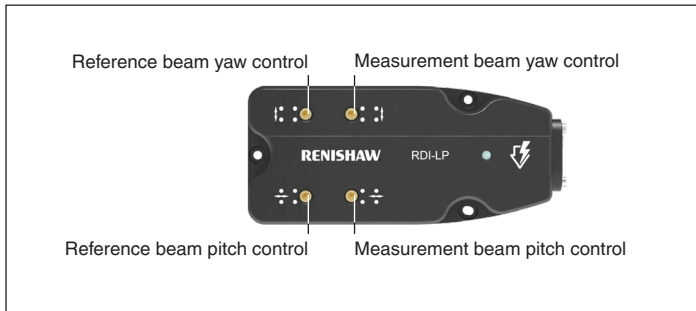
Measurement range	2 m	Reference and/or measurement paths, at optimal mirror alignment
	±400 µrad	Angular, at 1 m. Tolerance applies to both pitch and yaw during operation
Optical signal period	λ/4 (158 nm nominal)	
Maximum motion velocity	1.0 m/s	
Sub-divisional error (SDE) ¹	< ±1 nm	Velocities up to 200 mm/s, without automatic SDE correction. Further reduced by automatic SDE correction on the RLU200 and RLU300.
Electronic noise ²	< 10 pm	1 Hz - 50 kHz band
	< 200 pm	1 Hz - 25 MHz band
Zero-point drift	< 50 nm/°C	
Beam diameter	3 mm	Nominal
	Up to 3.5 mm	For mirror distances up to 1 m
	Up to 4.0 mm	For mirror distances up to 2 m
Beam separation	7 mm × 14 mm	Centre to centre
Beam alignment adjustment	±1° pitch / ±1° yaw	Integrated beam steering to simplify beam alignment
Power dissipation	0.14 W	
Component weight	450 g	
Operating environment	Pressure	650 mbar to 1150 mbar
	Humidity	0% to 95% RH
	Temperature	10 °C to 40 °C
Overall dimensions (mm)		52.8 (height) × 110 (length) × 50 (width) (including connectors)

¹ At optimal alignment (excludes interface).

² Electronic noise values assume that the system is in its factory configuration and achieves 100% signal strength.

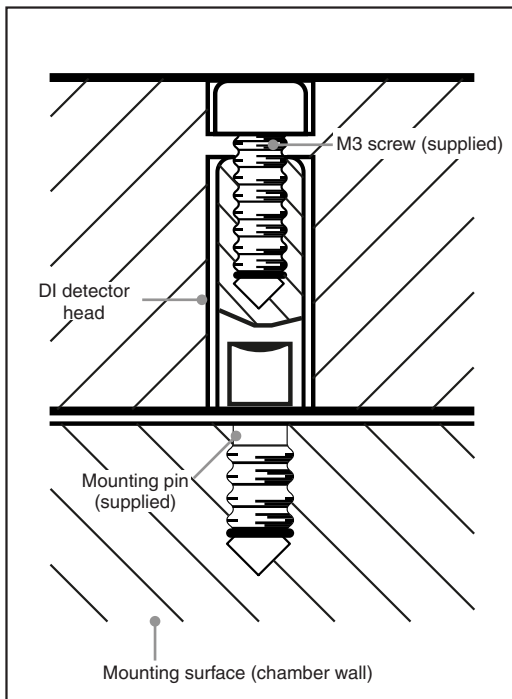
Laser beam alignment

The DI detector head contains four integrated beam steerers so that pitch and yaw adjustments can be made on the measurement and reference beams.



Mounting

The detector head mounts directly onto three pins (supplied), located on the mounting surface.



www.renishaw.com/contact



#renishaw

+44 (0) 1453 524524

uk@renishaw.com

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