

RPI31 parallel interface



The Renishaw RPI31 parallel interface uses an improved communication protocol, which allows full resolution position data to be sampled at up to 25 MHz.

The RPI31 parallel interface accepts differential analogue 1 Vpp sine/cosine signals, interpolates by 4096 and provides up to 36 bits of position data in a parallel format. When used in combination with a double-pass plane mirror interferometer (PMI) system, RPI31 provides an LSB of 38.6 picometres at velocities up to 2 m/s. Active Lissajous correction can be enabled to compensate for residual DC offset and AC mismatch from the laser encoder, improving sub-divisional error (SDE) to ± 0.1 nm at low velocities.

The parallel interface uses 1.8 V LVCMOS for communication. Control and monitoring of the RPI31 is performed via an SPI interface in the parallel bus connector. Settings are stored on the RPI31 in EEPROM, and can be configured prior to installation if no SPI interface is available.

Optional connections for active feedthrough of the analogue quadrature (uncorrected) and RS-422 full duplex diagnostics interface are provided.

Information available over the diagnostics (RS-422) and control (SPI) interfaces includes:

- Device information including version and serial number
- ADC data at full resolution
- Full range magnitude (signal strength)
- Full resolution position independent of parallel interface settings
- Parallel interface settings
- Full error information, with the ability to reset errors independently of position
- Lissajous correction status, setup and control
- Internal datalogger which can capture position or ADC data up to the full 100 MHz internal sample rate.

Performance specification

Values stated define the contribution of the RPI31 on system performance, not of the laser encoder system.

Measurement performance

		Plane mirror - PMI	Retro Reflector - RRI
LSB resolution – user selectable		38.6, 77.2, 154.4 or 308.8 μ m	77.2, 154.4, 308.8 or 617.6 μ m
Maximum speed		2 m/s	4 m/s
Positional noise contribution (RMS) signal strength >25%		< 38.6 μ m	< 77.2 μ m
SDE contribution (excluding RLE and without correction enabled)	Velocity < 50 mm/s (PMI) Velocity < 100 mm/s (RRI) Signal strength > 25%	< ± 0.5 nm	< ± 1.0 nm
	Velocity > 50 mm/s and < 2 m/s (PMI) Velocity > 100 mm/s and < 4 m/s (RRI)	< ± 2.0 nm	< ± 4.0 nm
SDE (including RLE with correction enabled)	Velocity < 50 mm/s (PMI) Velocity < 100 mm/s (RRI) Signal strength > 50%	< ± 0.1 nm	< ± 0.2 nm
Position data format		36-bit (two's complement)	
Propagation delay (actual position is sampled) before latch enable signal		177 ns	
Propagation delay variation		± 5 ns	
Update rate		25 MHz	

RPI31 power requirements

Voltage	5 V ± 0.25 V
Operating current	500 mA
Noise and ripple	50 mVpp (DC to 10 MHz)

NOTE: The 5 V power supply should be single fault tolerant certified to EN (IEC) 60950-1.

Environmental specification

Pressure	Normal atmospheric pressure (650 mbar – 1150 mbar)
Humidity	0% to 95% RH (non-condensing)
Temperature	Storage –20 °C to +70 °C
	Operating +10 °C to +55 °C

Parallel bus and SPI interfaces

	Minimum (V)	Maximum (V)
Input low	-0.30	0.63
Input high	1.17	2.10
Output low		0.45
Output high	1.35	

NOTE: The digital interface on JAE connector is 1.8 V LVCMOS.

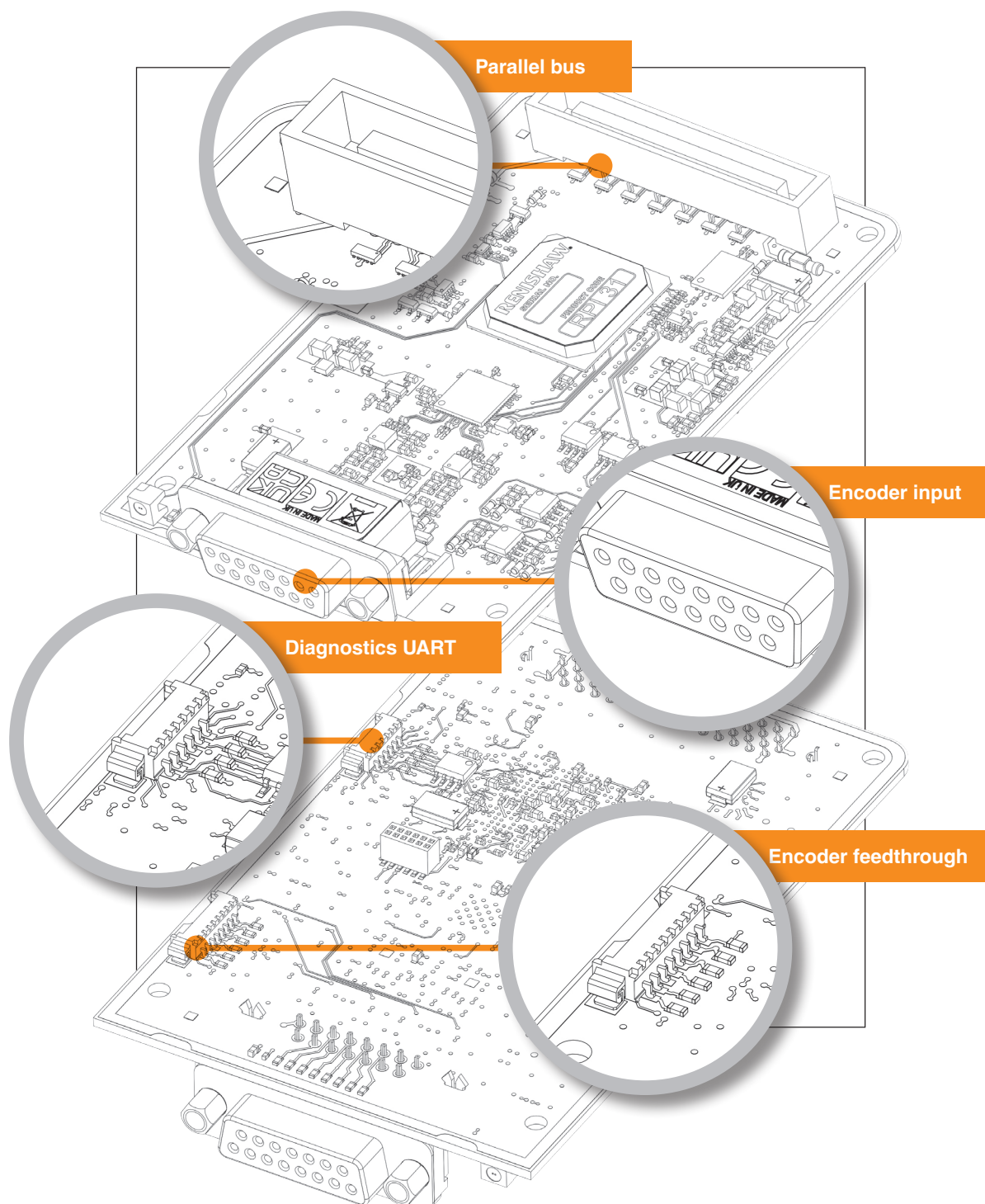
Encoder feedthrough

	Plane mirror - PMI	Retro Reflector - RRI
Analogue quadrature	Nominal 1 V pp into 120 Ω termination	Copy of encoder output, no SDE correction applied.
Error	RS-422 differential error	Encoder error only.
SDE contribution Velocity < 50 mm/s (PMI) Velocity < 100 mm/s (RRI) Signal strength > 25%	< ± 0.5 nm	< ± 1.0 nm
Max velocity	2 m/s	4 m/s

Diagnostics UART

Signal level	RS-422 full duplex
Baud rate	3 Mbaud
Format	1 start bit, 8 data bits 1 stop bit, no parity

RPI31 Connectors



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Part no.: L-9926-9224-01-A

Issued: 08.2026