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Non-contact encoder products guide

Position encoders

Renishaw offers a wide range of precision position feedback systems for a diverse range of linear and rotary motion applications.

From our range of robust magnetic encoders for incremental and absolute requirements, through to high speed optical linear encoders and precision optical angle encoders, we can meet your motion system requirements, including ultra-high vacuum (UHV) applications. Renishaw also presents RESOLUTE™, a true absolute, fine pitch optical encoder system that has excellent dirt immunity and an impressive specification that breaks new ground in position feedback. All systems have an established reputation for ease of set-up and installation, plus minimal cost of ownership.

If you require the ultimate accuracy in linear position feedback then take a look at our range of interferometer-based laser encoders.

Applications include:

- Semiconductor
- Metrology
- Motion control
- Flat panel displays
- Print
- Machine tools
- Electronics
- Scientific & medical
- Military / Aerospace
- Laser / Water-jet cutting
- Motor control
- Security & surveillance
- Renewable energy & solar farms
- Industrial automation
- Agriculture
- Food processing
- Off road vehicles

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RESOLUTE™ absolute optical encoder system

RESOLUTE is a revolutionary new true absolute, fine pitch optical encoder system, with excellent dirt immunity, offering an impressive specification that breaks new ground in position feedback.

- True absolute non-contact optical encoder system: no batteries required
- Wide set-up tolerances for quick and easy installation
- High immunity to dirt, scratches and light oils
- Resolutions to 1 nm or 32 bit rotary
- 100 m/s maximum speed for all resolutions (to 36 000 rev/min)
- Unique single-track technology eliminates yaw de-phasing
- ±40 nm sub-divisional error for smooth velocity control
- Less than 10 nm RMS jitter for improved positional stability
- Built-in separate position checking algorithm provides inherent safety
- IP64 sealed readhead for high reliability in harsh environments
- Integral set-up LED enables easy installation and provides diagnostics at a glance
- Readhead and linear/rotary scales are bolt-hole compatible with SiGNUM™ encoders
- Available with linear encoder scales with accuracy to ±1 µm and angle encoder scales with accuracy to ±1 arc second
- Operates up to +80 °C with integral over-temperature alarm
- Variety of serial protocols available to suit industry-standard controllers

TONiC™ encoder system

The TONiC series represents a new generation of super-compact encoders, designed for highly-dynamic precision motion systems, bringing higher accuracy, speed and greater reliability to a wide variety of demanding industry sectors.

- Compact readhead (35 x 13.5 x 10 mm)
- Compatible with RGSZ20 gold tape scale, *FASTRACK*™/RTLC scale system, RSLM, RELM, RESM, RESD and REXM with customer-selectable *IN-TRAC*™ auto-phase optical reference mark (datum)
- Linear encoder scale accuracy to ±1 µm, angle encoder scale accuracy to ±1 arc second
- Third-generation filtering optics optimised for even lower noise (jitter)
- Dynamic signal processing inside the readhead, provides ultra-low cyclic error of ±30 nm
- Auto Gain Control ensures consistent signal strength for long-term reliability
- Increased ride height tolerance and integral set-up LED for ease of installation
- Maximum speed to 10 m/s (3.24 m/s at 0.1 µm resolution)
- Detachable analogue or digital 'active' connector with integral interpolation to 1 nm resolution (0.00075 arc seconds)
- Integral dual limits (linear only)
- Operating temperature to 70 °C

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SiGNUM™ encoder system

The SR readhead and Si interface are part of the SiGNUM range of optical encoders offering high speed, reliable operation and open, non-contact performance with excellent immunity to dirt and electrical noise.

- *IN-TRAC* bi-directional reference mark and on-scale dual limit outputs
- Compatible with RESM, REXM (rotary) and RELM and RSLM (linear) scales
- Operating temperature up to 85 °C
- Speeds up to 12.5 m/s (4591 rev/min @ Ø52 mm)
- Dynamic signal control to give cyclic error of typically ±30 nm
- SiGNUM software for easy installation and system diagnostics
- Integral LEDs for optimum set-up and system diagnostics
- Industry standard analogue and digital outputs with resolutions from 5 µm to 5 nm (40 to 0.0038 arc seconds)
- Non-contact open optical system
- Filtering optics provide excellent dirt immunity
- Readhead sealed to IP64 for wipe-clean recovery
- High flex, UL approved cable
- Comprehensive software package for diagnostics and performance monitoring
- FANUC compatible versions also available

RG2 20 µm encoder system

RGH22 series encoder system

The RGH22 linear encoder system is a non-contact optical encoder designed for position feedback solutions. Suitable for use in a broad range of applications, the RGH22 offers high resolution and high speed with stability and reliability.

- Non-contact open optical system
- Integral interpolation
- Industry standard digital and analogue output options

- Resolutions from 5 µm to 50 nm
- Integral reference and limit sensors
- Dual limit sensor option
- Integral set-up LED for easy set-up and diagnostics
- Uses RGS20-S self-adhesive scale for cut-to-suit flexibility, simplifying stock
- High-flex double-shielded cable
- Excellent noise immunity for high EMI environments

RGH24 series readhead

RGH24 is an ideal feedback solution wherever precision controlled movement is required. The RGH24 readheads offer a wide selection of output configurations and their compact size and low mass makes the system ideal for small XY stages and actuators. Plus, an integral set-up LED enables quick and easy installation.

- Non-contact open optical system
- Compact size and low mass

- Integral interpolation
- Digital and analogue output options
- Resolutions from 5 µm to 10 nm
- Integral set-up LED
- Uses RGS20-S self-adhesive scale for cut-to-suit flexibility, simplifying stock
- Reference mark or limit switch capability
- RGH25 provides even lower profile readheads with dynamic signal conditioning in remote interface

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RG4 40 µm encoder system

RGH34 series encoder system

With the performance and reliability of the established RG4 linear encoder system, the RGH34 series offers the versatility of a miniaturised component system and allows integration flexibility for even the smallest motion systems.

- Non-contact open optical system
- Compact component style readhead
- Large installation tolerances
- High speed operation

- Industry standard digital and analogue output options
- Resolutions from 10 µm to 0.1 µm
- Optional reference or limit sensor
- Integral set-up LED
- Uses low profile RGS40-S self-adhesive scale, RGS40-G glass scale, RESR rings and other reflective scale types

RGH41 series readhead

The RGH41 40 µm series readheads offer all the benefits of the established 20 µm RG2 linear encoder system, such as reflective tape scale, unique filtering optics, set-up LED, good dirt immunity and high speed.

- Non-contact open optical system
- Large installation tolerances
- High speed operation up to 15 m/s
- Industry standard digital and analogue output options
- Resolutions from 10 µm to 50 nm
- Integral set-up LED

- Integral reference and dual limit sensors
- Uses RGS40-S self-adhesive scale (also available: tough polyester-coated scale option for high immunity against harsh solvents)
- Rugged, reliable and low cost-of-ownership. Ideal for OEM applications that require an upgrade to optical encoder performance

Linear and ring magnetic encoders

LM10, LM13 and LM15 magnetic encoders

Engineered for harsh environments and extreme service, the solid-state LM range of encoders operate from -20 °C to +85 °C, have water-proof sealing to IP68 and are highly resistant to shock, vibrations and pressure. The robust magnetic scale is also resistant to a range of chemicals commonly found in industry.

LM10 magnetic encoder

- Customer-selectable resolutions
- Distance coded reference mark option
- High speed operation – up to 25 m/s
- Excellent dirt immunity – sealed to IP68
- Integral set-up LED
- Axis lengths of up to 100 m
- High reliability from proven non-contact sensing technology
- Industry standard incremental digital and analogue output options
- Operation temperature from -20 °C to +85 °C
- Non-contact, frictionless design eliminates wear
- For use with MS magnetic scale
- ±40 µm accuracy specification
- Large ride height tolerance

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LM13 magnetic encoder

- Linear and ring encoders
- Resolutions from 1,280 to 327,680 counts per revolution
- High speed operation to 25,000 revolutions per minute
- Excellent dirt immunity - sealed to IP68
- Integral set-up LED
- High reliability from proven non-contact sensing technology
- Industry standard incremental digital outputs
- Operation temperature from -20 °C to +85 °C
- For use with magnetic rings (Ø100.5 mm OD) ±0.15 ° accuracy
- Large ride height tolerance

LM15 magnetic encoder

- Easy to install with wide installation tolerances
- Ride height from 0.1 mm to 4 mm
- Resolutions from 625 µm to 5 µm
- Bi-directional reference mark
- High speed operation
- Excellent dirt immunity
- Integral set-up LED
- Axis lengths of up to 100 m
- High reliability from proven non-contact sensing technology
- Industry standard incremental digital outputs

Rotary magnetic encoders

RM22, RE22, RM36, RE36, RM44 & RE58 encoders

A range of compact, high speed rotary magnetic encoders designed for use in harsh environments, such as marine, medical, print, converting, industrial automation, metal working, motor control and instrumentation.

The encoder comprises a magnetic actuator and separate encoder body. Rotation of the actuator is sensed by a custom encoder chip within the body and processed to the required output.

- Non-contact / frictionless and bearing versions available
- Resolutions to 13 bit (8192 positions per revolution)
- Excellent dirt immunity to IP68
- High speed operation to 30,000 rpm
- Industry standard absolute, analogue, incremental and linear outputs

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Rotary magnetic encoder ICs

The OnAxis™ encoder IC range provides absolute and incremental outputs including SSI, parallel, incremental, sin/cos, UVW, tacho and linear voltage. A range of both binary and decimal resolutions are available from 7 to 13 bit (128 to 8192 counts per revolution).

AM256

- 8 bit rotary magnetic encoder chip (5 V)
- Resolution: 7, 8 bit absolute, 128, 256 cpr incremental

AM512B

- 9 bit rotary magnetic encoder chip (5 V)
- Resolution: 9 bit absolute, 512 cpr incremental

AM4096

- 12 bit rotary magnetic encoder chip (3 V or 5 V) programmable zero position
- Resolution: Up to 12 bit absolute, 4096 cpr incremental

AM8192B

- 13 bit rotary magnetic encoder chip (5 V)
- Resolution: Up to 13 bit absolute, 8192 cpr incremental

Rotary magnetic encoder modules

For OEM integration we provide a range of low cost encoder modules.

The RMB range is ideal for high volume applications where the PCB can be protected by external housing.

RMB20

- 20 mm round PCB with a range of outputs from 9 to 13 bit resolution

RMB29

- 29 mm square PCB with an analogue sine/cosine output and connector, specially designed for motor applications

RMB 28

- 28 mm square PCB with a range of outputs from 7 to 13 bit resolution

RMB 30

- 30 mm round PCB with a range of outputs from 9 to 13 bit resolution

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About us...

Renishaw is a global metrology and healthcare company with core skills in measurement, motion control, spectroscopy and precision machining.

We develop innovative products that significantly advance our customers' operational performance - from improving manufacturing efficiencies and raising product quality, to maximising research capabilities and improving the efficacy of medical procedures.

We provide innovative solutions based on the following products:

- CNC machine tool products for automating job set-up, tool setting and inspection
- Encoder systems for high accuracy position feedback
- Sensors and software for post-process inspection on CMMs
- Spectroscopy systems for non-destructive material analysis
- Styli for inspection and tool setting probes
- Systems for performance measurement and calibration of precision machinery
- Automated multiplex diagnostic and clinical research systems
- Dental CAD/CAM systems for the production of high quality crowns and bridges
- Medical devices, surgical robots and planning software for neurosurgery

For worldwide contact details please visit:

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Part No. L-9517-9481-01-A