

World's first 13-bit magnetic rotary encoder

Renishaw offers a wide range of magnetic and compact optical position feedback encoder systems to meet the diverse requirements of industrial automation. The latest additions to the range include the world's first 13-bit magnetic sensor, which is sealed for operation in harsh environments, including wash-down areas.

The range of reliable, low-cost, high-speed, miniature magnetic rotary encoders already provides class-leading performance along with ruggedness and durability. Now the addition of a 13-bit magnetic sensor, provides 8,192-count positioning resolution and operating speeds to over 30,000 rev/min, with availability in chip, chip-on-board, and ready-to-mount packaged versions. The enclosed versions, with sealing to IP68, are particularly suited for use in wash-down areas, whilst optional stainless steel housings meet food industry requirements.



The solid state, non-contact magnetic design, eliminates seals, bearings and moving parts for reliable rotary positioning, particularly for motor control and automation systems. As well as motor feedback and positioning control, the magnetic encoder products are used for torque sensing, flow control, scanning, and instrumentation, and can be selected for such price-competitive applications as industrial power tools, vending machines, CCTV, and valve positioners.

More recently they have found applications in the processing and packaging industry, including conveyor handling, robotic pick and place, wrapping systems, food processing machinery, checkweighers and labelling machinery.



Especially suited to difficult design and environmental requirements, the magnetic sensors provide -40°C to 125°C operational temperature range and superior shock and vibration resistance. Friction-less low-inertia operation enables consistent, wear-free 0.3° positioning accuracy at high acceleration/deceleration and rpm. The versatile sensors come in models providing digital absolute, incremental or analogue outputs, and even simultaneous SSI and incremental output. The simultaneous capability enables the 13-bit sensors, like all Renishaw's magnetic product line, to be used for both motor commutation, position and velocity control at the same time.

Renishaw's rotary magnetic family covers 8, 9, 10, 11, 12 and now 13-bit sensors, all available in chip, chip-on-board, and packaged/encapsulated versions are available. This gives designers everything from 256 to 8,192 counts per revolution to fit a wide range of applications.

Chip and chip-on-board models allow the sensors to be engineered and integrated into machinery and equipment designs. The ability to operate with a gap between the magnetic actuator and encoder chip meets design needs for isolation of moving elements. The component and modular units allow designers to optimise fit and space efficiency.

Packaged versions enclose the chip and electronics in robust metal cases for “fit and forget” reliability that should outlast the productive lifetime of the host machine. Enclosed units are widely used in rugged applications and environments, such as agricultural, automotive, elevators, converting, printing, metalworking, industrial automation, avionics, and military defence. Fully encapsulated versions are waterproof for wash-down processes and even immersible for use on pumps, marine equipment and sub-sea systems.

Two mounting versions are available, with shaft or with a hole for mounting on a shaft, and a mounting flange fits typical motor enclosures. With small sizes, starting at just 22 mm diameter bodies, ease of installation is ensured.

Technical notes

At the heart of every Renishaw magnetic rotary encoder are two core components - a small diametrically polarised magnet and a custom ASIC which contains an array of Hall effect sensors that generate a voltage when exposed to the magnetic flux field. The ASIC detects the change in magnetic flux density distribution at the surface of the silicon chip as the magnet rotates above it and delivers a voltage representation of magnetic field distribution. Through creative design, the ASIC is able to cancel magnetic interference, permitting it to operate in areas of high external magnetic fields.

Sine and cosine voltage outputs from the sensor array vary with magnet position. The sine and cosine signals are converted to absolute angle position within the ASIC. This basic sensing technology is then combined to produce a wide range of output formats. Resolutions up to 13 bit absolute (8,192 counts per revolution incremental) are achieved with internal interpolation.

Output signals are provided in industry standard absolute, incremental or linear formats.

Absolute (SSI) and incremental outputs are available on the same chip for motor commutation and feedback. Absolute position models are available in 8-bit (256 positions per revolution) to 13-bit (8192 positions per revolution) in SSI data format, while other output options include incremental, analogue, linear voltage and linear current.

For further information on Renishaw's encoder range, please visit:

www.renishaw.com/encoders