POSITAL

WHITE PAPER

POSITAL's NeXtGen Initiative: A new generation of position sensors for industrial motion control applications

POSITAL, a market leader in innovative sensors for motion control systems, is launching a major update to its product portfolio. With this initiative, termed NEXTGEN, the company is introducing new measurement and signal processing technologies for its IXARC rotary encoders, TILTIX inclinometers and LINARIX linear position sensors. These upgrades will benefit customers by improving performance, reducing energy consumption and harmonizing programming interfaces over POSITAL's full product range. Chips in these products are being upgraded, including an exciting new ASIC that will be incorporated into the Wiegand-powered event counter system for multiturn encoders.

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New magnetic sensor technology

IFor the new generation of IXARC rotary encoders, sensitive TMR (tunneling magnetoresistance) magnetic sensors replace the Hall-effect sensors used in earlier designs. These sensors, backed up by sophisticated signal processing software running on 32-bit microcontrollers, measure the rotary position of a permanent magnet attached to the device's shaft.

TMR sensors are new to rotary encoders, but they have a proven track record in disk drives and in automotive applications. In these devices, internal resistance varies with changes in the direction and strength of an external magnetic field. They are significantly more sensitive than Hall-effect sensors, opening the door to increased precision and accuracy. TMR sensors are also less temperature sensitive than Hall sensors, making the encoders more reliable in extreme operating environments.

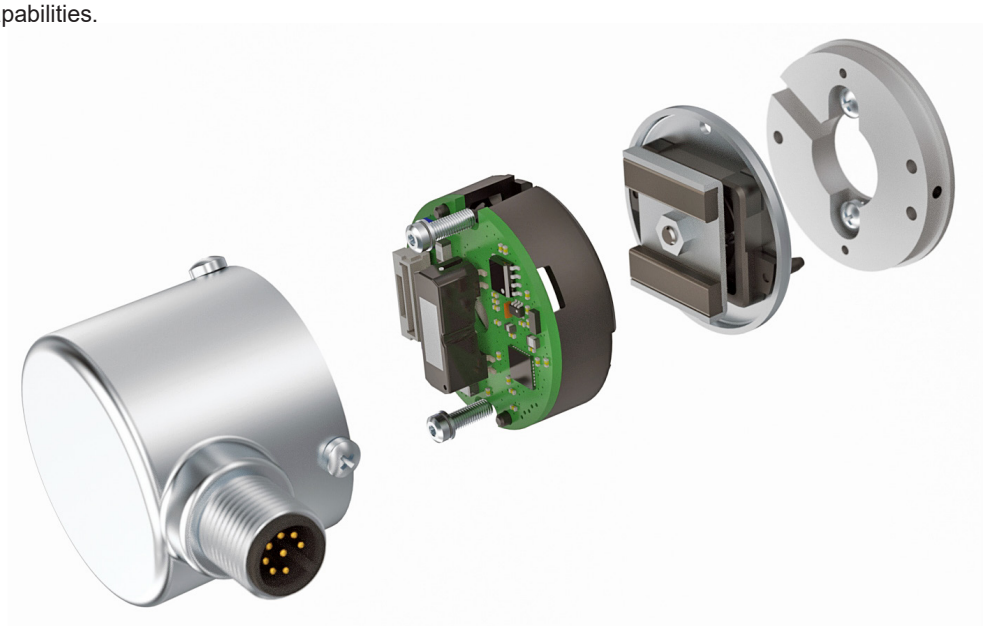
NEXTGEN encoders also make use more advanced microcontrollers for signal processing and communications interface management. The combination of TMR sensor and more efficient microcontroller ships has contributed to a 60% improvement in energy efficiency for incremental encoders. Moreover, as development continues, the new chips will support enhanced filtering and signal processing capabilities.

Wiegand technology for multiturn encoders

A feature that has defined POSITAL's magnetic multiturn encoders since 2005 has been a rotation counting system powered by Wiegand technology. With this system, Wiegand sensors inside the encoder collect both event signals (confirming a complete rotation of the device's shaft) and the electrical power needed to energize the counting circuitry. This ensures that each rotation of the encoder's shaft is reliably recorded, even if system power is unavailable. There is no need for backup batteries and the attendant cost of checking, replacing, and disposing of these components.

For its NEXTGEN multiturn encoders, POSITAL is introducing a newly developed ASIC to manage rotation counting and energy harvesting. This new component offers improved energy efficiency and more compact packaging than the general-purposed microprocessors used previously.

NEXTGEN encoders will also include an updated Wiegand sensor from POSITAL's sister company UBITO (the "Wiegand Company"). These sensors are manufactured in-house with a new production facility that features a fully automated process that will have positive impact on both cost and quality. The new facility



Kit Encoder Assembly

is the result of a multi-year R&D project and underlines the FRABA Group's ongoing commitment to Wiegand technology.FRABA's mastery of this technology (including IP) and its ability to produce Wiegand wire, Wiegand sensor assemblies and the new ASIC will simplify the supply chain, improving product availability and reducing delivery times.

New packaging concepts

POSITAL's kit encoders are designed to be attached directly to the housing of an electric motor, drive, or other mechanism to provide the device's controller with continuous feedback on the rotary position of its drive shaft. With this feedback loop in place, simple stepper or BLDC motors can fulfil many of the functions of more expensive servomotors. For kit encoders, a permanent magnet assembly is attached directly to host's drive shaft, eliminating the need for separate shaft, shaft bearings and seals. This makes these devices very cost efficient.

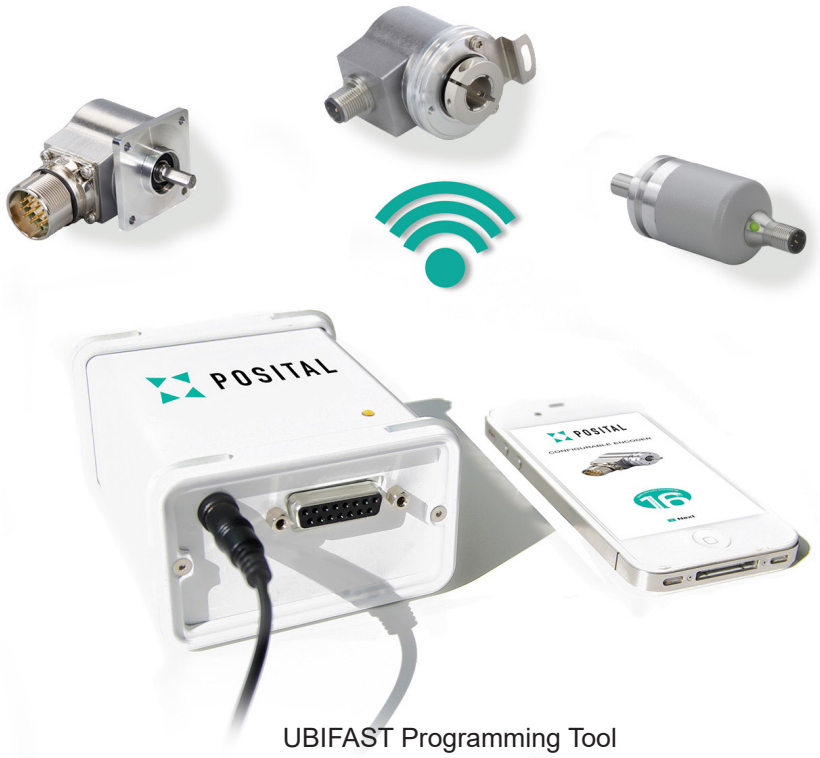
POSITAL's family of 36 mm diameter kit encoders have been redesigned to make them easier to install and to improve protection against environmental hazards like dust and moisture. The number of screws required to fasten the encoder package to the motor housing has been reduced from four to two, speeding installation. Mounting tabs used on earlier kit encoders to attach a shielding cover have been eliminated, with the shielding cover and measurement module integrated into a single unit. The shielding cover and cable clip are both sealed against dust.

Upgraded EMC and extended supply voltages.

The NEXTGEN initiative rollout will introduce sensors with enhanced EMC (Electromagnetic compatibility) for use in, for example, mobile construction machinery, agricultural and mining application. These devices will also be designed to operate with an extended range of supply voltages and to comply with the latest industrial standards in these areas.

H**armonized programming interface**

Many variants of POSITAL's incremental and absolute encoders are already programmable: that is, many operating parameters, such as the resolution of incremental encoders and the measurement limits of analogue encoders, can be modified through software



UBIFAST Programming Tool

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POSITAL LINARIX Linear Position Sensor

updates, with no need for changes to mechanical components. Absolute encoders with SSI, fieldbus and Ethernet interfaces also have programmable features.

For the NEXTGEN devices, the programming interface will be updated to be consistent across the full range of products, including both self-contained encoders and kit encoders. Firmware for the UBIFAST programming tools will also be updated for full compatibility.

NEXTGEN linear position sensors

LINARIX linear position sensors are made up of a heavy-duty draw-wire mechanism coupled to a rotary encoder. The performance improvements achieved with NEXTGEN IXARC encoders will be carried over to the LINARIX product family.

NEXTGEN inclinometers

In addition to changes in its rotary encoder lineup, POSITAL has made significant updates to its family of TILTIX inclinometers. New models feature three-axis MEMS accelerometers, enhanced firmware, and a new housing concept. The new accelerometers have reduced cross-talk sensitivity and allow POSITAL to offer better accuracy, improved signal-to-noise ratios, and new measurement capabilities, including the direct output of acceleration and roll-rate data. A new housing concept streamlines the manufacturing processes while retaining the high levels of environmental protection available with the earlier designs. The inclinometers can be easily used to replace older models, with identical mounting footprint and support for CANopen and analog communications interfaces.

A significant feature of the new TILTIX inclinometers is an enhanced programming function that enables users or distributors to set the measurement range of each device through simple configuration updates. These devices can be customized to function as a single axis (0-360°), two-axis (± 90°), or 2-axis pitch/roll (± 180°) sensor, depending on what's required for a specific application. Distributors and system integrators will appreciate this feature, since it allows them to stock fewer items and still provide customers with a full range of measurement range options. New filtering methods can also be selected through the configuration interface, making it possible to fine-tune these devices for improved signal quality and optimized dynamic response. These features make it possible to satisfy the requirements of very different applications, such as platform monitoring or cranes. The new TILTIX inclinometers incorporate 3-axis MEMS accelerometer sensors that reduce cross-axis sensitivity and improve measurement accuracy to ± 0.1 degrees over the full range of tilt angles.

TILTIX Inclinometers

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POSITAL's TILTIX inclinometers are used in motion control and safety assurance systems to measure a device's orientation with respect to the earth's gravitational field. Common applications include dynamic positioning of solar panels, rollover warning systems for mobile machinery, control systems for crane booms, and tilt control in service robots, AGV's and other materials-handling systems.

Staged Rollout

NEXTGEN incremental encoders and inclinometers are already available for order from POSITAL's online Product Finder. (www.posital.com) Absolute encoders will become available in stages from Q4-2023 to Q3-2024. The first models to be rolled out will feature SSI, BiSS-C, IO-Link, and analog Interfaces. Industrial Ethernet interfaces, CANopen, J1939, and Modbus RTU variants will follow later. Kit encoders with SSI and BiSS communications interfaces are scheduled for delivery in 2024.

The NEXTGEN rollout has been designed to guarantee customers a smooth transition. While Nextgen products contain exciting new technologies, they remain mechanically and electrically compatible with previous models.

NEXTGEN ENCODER

A history of innovation: the IXARC story

The new generation of POSITAL's IXARC rotary encoders marks a fourth major step in the evolution of these devices.

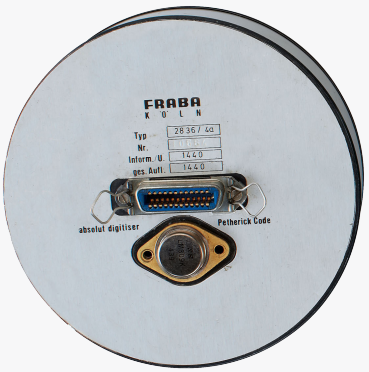
In the early 70s POSITAL played a pioneering role in the design and manufacture of optical multiturn encoders. Early models had a diameter of 100 mm, but this was reduced to 58 mm in the 1990s.

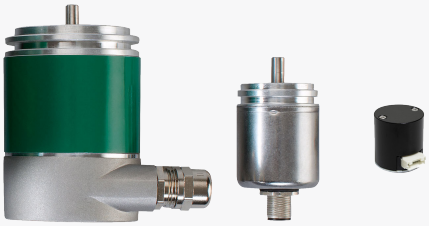
The first generation of magnetic encoders represented a radical departure from the optical encoder technology. The new magnetic encoders were smaller (36 mm) and more rugged than their optical counterparts, opening the door to more widespread deployment in construction equipment, mining machinery and other demanding applications. These first-generation magnetic encoders contained another revolutionary innovation: while their optical predecessors had used a series of miniature optical disks arranged in a gear train to record the number of complete shaft revolutions, the new magnetic devices incorporated a revolutionary rotation counting approach based on signals collected by a Wiegand sensor. In this case, the Wiegand sensors not only sensed each complete revolution of the device's shaft, but also captured the electrical energy needed to power the rotation counting circuitry. This ensures that the rotation counter will accurately record any shaft movements – even if power to the device is interrupted. The system is self-powered, successfully eliminated the need for a mechanically complex gear system or backup battery.

The second generation IXARC encoders retained the basic architecture of the earlier magnetic encoders but featured four Hall-effect sensors backed up by advanced signal processing software. This improved the accuracy and dynamic response of these devices. The new 'precision' IXARC encoders could deliver 12-bit resolution for incremental models and an accuracy of +/- 0.1 degrees for absolute variants. This series of 'precision' IXARC encoders was expanded to include 'kit' or modular encoders that were designed to be built into electric motors or drives as integrated rotation sensors for control system feedback.

In 2017, the third generation of encoders provided further performance improvements. This generation included both self-contained industrial encoders and kit encoders. In 2019, POSITAL introduced the world's smallest multiturn kit encoders. With a diameter of only 22 mm, these were designed to be integrated into small electric motors for use in robots, medical equipment, AGVs and other space-sensitive applications. Thanks to a miniaturized version of POSITAL's Wiegand-powered rotation counting technology, these tiny encoders are, like their larger counterparts, battery-free.

NeXtGen, the fourth generation, offers customers enhanced performance, reduced energy requirements and more efficient supply chains.





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