MEMS sensors

TDK expands the Tronics AXO®300 series with two types of high-performance digital MEMS accelerometer sensors

- AXO®301 High-Resolution Accelerometer and Inclinometer for Railway and Industrial Systems
- AXO®305 High-Performance Accelerometer for Land, Marine and Robotics applications

February 15, 2023

TDK Corporation (TSE: 6762) announces the extension of Tronics AXO®300 accelerometers platform with two new products. After the successful production launch in 2020 of the ±14 *g* AXO315 accelerometer for high-performance navigation and positioning of dynamic systems, Tronics extends the AXO300 accelerometer series with AXO301, a low-noise and high-resolution ±1 *g* accelerometer for high precision acceleration/deceleration measurements in railway applications and inclination control in industrial applications, and AXO305, a ±5 *g* accelerometer tailored for navigation, positioning, and motion control of land and marine manned and unmanned systems. Built with an innovative closed-loop architecture that delivers high linearity and stability even under strong vibrations, the accelerometers from the AXO300 platform feature an excellent one-year composite bias repeatability of 1 m*g* and composite scale factor repeatability of 600 ppm.

AXO301 High-Resolution Accelerometer and Inclinometer for Railway and Industrial Systems

AXO301 is a low-noise, high-resolution, closed-loop digital MEMS accelerometer with ±1 *g* input range that offers a performance-equivalent, low-SWaP (Size, Weight and Power) and cost-effective alternative to force balance inclinometers and servo-accelerometers. It demonstrates an ultra-low noise density of 8 µ*g*/√Hz with an excellent 50 µ*g* resolution to offer high-accuracy inclination angle measurements. AXO301 is tailored to odometry assistance for train positioning and localization systems, high-end industrial tilt and inclination measurements systems as well as motion control of construction machinery. The AXO301 is compliant with EN61373 railway standard for vibrations and shocks.

AXO305 High-Performance Accelerometer for Land, Marine and Robotics applications

With an input measurement range of ±5 *g* and vibration rectification error of 20 µ*g*/*g*², AXO305 is tailored to navigation, positioning and motion control functions of land, rail and marine transportation systems and vehicles. It demonstrates a Bias Instability of 4 µ*g* with a ±0.5 m*g* bias over its temperature range, thus enabling precise GNSS-aided navigation of manned and unmanned ground vehicles and trains when integrated into Inertial Navigation System (INS). AXO305 is a perfect candidate for Motion Reference Units (MRU) used for ship motion control and dynamic positioning, Inertial Measurement Units (IMU) for land navigation, subsea navigation of AUV (Autonomous Underwater Vehicles) and ROV (Remotely Operated Vehicles), platform and crane stabilization as well as precision robotics.

Miniature and robust accelerometers for systems operating under vibration conditions

The closed-loop architecture of Tronics AXO300 platform offers high resolution and strong vibration rejection. Accelerometers and inclinometers from the Tronics AXO300 series are housed in a miniature, hermetic, ceramic J-lead package that ensures long operational and storage life and guarantees a high compliancy with the stringent thermal cycling requirements of critical applications. They embed a fully hard-coded electronics with a 24-bit digital SPI interface for a swift integration into stand-alone sensor modules, INS, IMU as well as Attitude and Heading Reference Systems (AHRS). The built-in self-test ensures initial verification of the sensor's integrity and continuous in-operation functionality test.

Low-SWaP and cost-effective high performance accelerometers

Thanks to their common sensor's architecture, miniature package and low-power consumption, Tronics AXO315, AXO305 and AXO301 accelerometers offer a digital, cost-effective and low-SwaP alternative to bulky, expensive, and power-consuming analog solutions like tactical-grade quartz accelerometers. AXO300 accelerometers are ideally complemented by high performance Tronics GYPRO® digital rate gyros that share the same SMD J-lead ceramic package (12 x 12 x 5 mm) and same digital interface to enable low-cost integration, assembly, and reliability on PCB, even in fast-changing temperature conditions.

AXO315 volume production started in 2020. AXO301 and AXO305 are now available for sampling and customer evaluations, directly at Tronics or through specialized distribution channels like Texim. Swift evaluation of the sensors can also be made with an Arduino-based evaluation kit that provides built-in testing functionalities such as output reading and recording, recalibration, and digital self-tests.

AXO301 Main applications

- Train odometry and Automated Train Control
- Train performance testing
- Train tilt measurement
- Dynamic inclinometers
- Tilt sensors
- Motion control of construction machinery

AXO305 Main applications

- IMU/INS for GNSS-assisted ground vehicles navigation
- MRU for ship motion control and dynamic positioning
- Platform, antenna, and crane stabilization
- Motion control of underwater vehicles
- IMU and INS for navigation of AUV and ROV
- IMU for precision robotics

AXO301 Main features and benefits

- ±1 *g* range, single-axis in-plane accelerometer
- Resolution: 50 µ*g*
- 1 year composite bias repeatability: 1 m*g*
- 1 year composite scale factor repeatability: 600 ppm
- Bandwidth: 15 Hz (configurable upon request)
- Vibration Rectification Error : 20 µ*g*/*g*²
- Compliant with EN61373 railway standard for vibrations and shocks

AXO305 Main features and benefits

- ±5 *g* range, single-axis in-plane accelerometer
- 1 year composite bias repeatability: 1 m*g*
- Composite scale factor repeatability: 600 ppm
- Noise density: 8 µ*g*/√Hz
- Latency: 2 ms
- Vibration rejection: 20 µ*g*/*g*²

About TDK Corporation

TDK Corporation is a world leader in electronic solutions for the smart society based in Tokyo, Japan. Built on a foundation of material sciences mastery, TDK welcomes societal transformation by resolutely remaining at the forefront of technological evolution and deliberately "Attracting Tomorrow." It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK's comprehensive, innovation-driven portfolio features passive components such as ceramic, aluminum electrolytic and film capacitors, as well as magnetics, high-frequency, and piezo and protection devices. The product spectrum also includes sensors and sensor systems such as temperature and pressure, magnetic, and MEMS sensors. In addition, TDK provides power supplies and energy devices, magnetic heads and more. These products are marketed under the product brands TDK, EPCOS, InvenSense, Micronas, Tronics and TDK-Lambda. TDK focuses on demanding markets in automotive, industrial and consumer electronics, and information and communication technology. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2022, TDK posted total sales of USD 15.6 billion and employed about 117,000 people worldwide.

You can download this text and associated images from www.tdk-electronics.tdk.com/en/230215
Further information on the products can be found under
AXO®301: High Resolution MEMS Accelerometer (tdk.com)
AXO®305: High Performance MEMS Accelerometer (tdk.com)

Contact for media

		Phone	Mail
Vincent GAFF	Tronics Microsystems Crolles, FRANCE	+33 4 76 97 29 60	vincent.gaff@tdk.com