The IEEE Instrumentation & Measurement Magazine
February 2017 Issue

I&M in CSI

Editorial

Welcome 2017

Wendy Van Moer

A new year has come! Together with a new year, 2017 brings us a lot of new I&M Magazine gifts! New topics, new articles, new discussions, and not to forget: new columnists!

Our column "Future trends"' appeared for the first time in our October 2014 issue. I felt so honored when Simona Salicone agreed to start up this column. She put her heart into it and made this column a huge success. After more than two years of excellent work, Simona passes the torch to Irina Florea in this issue. She will take care of the "Future trends" column for the next two years. I am a very proud and honored EIC, as Irina gladly accepted my invitation for this challenging work. Thank you so much, Simona, for the great work and welcome on board, Irina.

If we look back to 2016, it was a great year with happiness and success, but also some sadness. We lost our dear friend and columnist Bryan Kibble. He started our successful column "Basic Metrology," which was appreciated by all our readers. In the beginning of 2016, Bryan was already thinking about Richard Davis as a good successor. I could not agree more with Bryan, as Richard is the perfect person to continue Bryan's excellent work. Welcome on board, Richard and let us remember Bryan for all his great work.

This February issue is all about Instrumentation and Measurement in CSI! We did not have to look very long for the perfect guest editor for this special issue… She is sitting in our own editorial board: Veronica Scotti. I would like to thank Veronica for her excellent work! Last, but not least, we have plenty of other exciting articles covering different topics! Go and discover it yourself on the next pages of this issue!

Let us make 2017 even better than 2016! Enjoy!
Groetjes, Wendy

Guest Editorial

Profiling: A Promising Field for Metrologists

Veronica Scotti

This issue of the *Magazine* is dedicated to profiling, which is an interesting subject not yet completely explored by metrologists who could really contribute to improve it through their skills and competencies. That is why I have asked some experts in this field to contribute to this issue to share their vision on some specific aspects of profiling.

More and more frequently, judicial cases are decided on a technical basis related to scientific evidence or supposed scientific evidence. Especially when profiling is concerned, legal proceedings often come to debatable conclusions because measurement uncertainty is not carefully considered: its evaluation would lead to solutions, which could differ from the verdict returned by the trier of facts.

If the United States and European legal systems are compared from a metrological perspective, by considering the measurement activities performed by technical experts, it is undeniable that the United States approach has been changing since the famous Daubert sentence in 1993 [JUSTICA U.S. Supreme Court. https://supreme.justia.com/cases/federal/us/509/579/ case.html]. In the sentence, Judge J. Blackmun of the Supreme Court affirmed the principle related to uncertainty in scientific matters when he wrote:

> *[I]t would be unreasonable to conclude that the subject of scientific testimony must be 'known' to a certainty; arguably there are no certainties in science.*

The increasing awareness of these aspects led the U.S. courts to consider that, if the experimental sciences cannot provide certain answers, not only uncertain opinions could be allowed, but also it should be forbidden for the expert witnesses to provide absolutely certain opinions. On the European Courts side, they rely on scientific evidence and consider their value extremely relevant or crucial in solving the case without taking into account that all scientific knowledge is limited when it concerns well-assessed methods, experiments, and laboratory tests. Unfortunately, the decisions are often taken (made) only on a single piece of evidence, obtained by a technical or scientific activity, without considering the existence (or not) of other elements. This is clearly evident in criminal proceedings that involve or require DNA analysis or other tests which allow identification (maybe!) of the perpetrator(s) of a crime.

Do you think that a DNA analysis or a fingerprint analysis is enough to identify somebody unknown? Are you sure that those tests are so infallible and incontrovertible? Let me suggest that you read the articles in this issue before answering those questions.

I think you will appreciate the overview reported by Ted Vosk and Henry Swofford on the state of the art in fingerprint recognition activity where they wrote:

> *This is likely always to be an issue where humans, who are by their very nature non-standardized from a strict metrological standpoint, play the role of the measuring instrument.*

In this area, an effort is required by the scientific community to identify a standardized method to compare samples and to establish a unified system of evaluation, as objective as possible, regardless of a personal human contribution.

Then you will find a brief comment by Alessandro Ferrero on DNA analysis from the point of view of metrologists, especially considering the role of measurement uncertainty and related principles, and rules applied to this identification method. After that, an unusual system is presented to investigate individual identity through bite marks. It is useful when it is not possible to identify someone by other means (such as DNA); thanks to Aimé Conigliaro and Charles Georget, from the Criminal Research Institute of the French "Gendarmerie." Finally, see that this profiling method hides some unknowns, which could be better explored by applying basic rules of metrology.

This kind of overview allows us to understand the relevant role that metrology could and should play in forensic matters to reduce the risk of incorrect investigations and, consequently, incorrect or unfair decisions. There is an increasing need for an expert technical and scientific support in the legal field, which also requires cooperation and dialogue between metrologists and the law community to build solid ground on which a new way to consider circumstances can be established and be useful to evaluate responsibilities.

You may contact Veronica Scotti at veronica.scotti@gmail. com. Her bio is available at http://ieee-ims.org/contacts/ veronica-scotti.

Article Summaries

DNA Profiling: A Metrological and Signal Processing Perspective

(Summary)

Alessandro Ferrero

Metrology can give an important contribution, as shown in this article, to both the correct formulation of the problem and its solution. Most of the fundamental points raised in a recent government report are well-known concepts in metrology and may have a satisfactory solution if treated from a correct metrological perspective. Most importantly, the presence of doubt is a familiar concept in metrology, where the doubt about the validity of the results of measurements is considered and quantified in terms of measurement uncertainty. This same concept is extremely helpful in quantifying the doubt of a wrong decision when the decision is based on measurement results, such as DNA analysis. Therefore, the role of metrologists is extremely important in DNA profiling, too, and should be promoted by the I&M community.

This summary includes text from the conclusion of the article.

A Perspective on Bitemark Analysis: From Empiricism to Scientific Rationality

(Summary)

Charles Georget and Aimé Conigliaro

Among the numerous missions realized by the forensic odontologist, the morpho-analysis of a human bitemark, both on an alive or dead victim, plays a relevant role since the identification not only affects the victim but also concerns the perpetrator. For over a century, many experts have been working to make bitemark analysis more reliable and improve dental impression recording. Despite these efforts, the most used methods of bitemark analysis are not effectively compliant with any scientific rule. Currently, proofs obtained by bite mark analysis are obtained by experimental activity, but it is fundamental and necessary for these kinds of methods that such evidence has its roots in scientific data with sufficient technical knowledge to be validated by courts.

This summary includes text from the article.

Metrology Applied to Forensic Pattern Evidence Domains – A Call for More Forensic Science Metrology Principles

(Summary)

Henry Swofford and Ted Vosk

Over the last decade, the forensic science community has come under fire for the lack of research demonstrating the validity of conclusions within forensic pattern evidence domains such as fingerprints, firearms, handwriting, and other feature-based comparisons. Although the forensic science community has made a general call for research, there is little guidance for exactly *what* the issue is and *how* the metrology community may contribute. This article provides an introduction to *forensic science* and a general overview of the current examination methodology followed by many forensic pattern evidence domains. The authors highlight specific research gaps where the forensic sciences could benefit by the application of metrological principles as well as notable ways in which the metrology community may contribute.

This summary includes text from introduction of the article.

Analog-to-Information Converters in the Wideband RF Measurement for Aerospace Applications: Current Situation and Perspectives

(Summary)

Pasquale Daponte, Luca De Vito, Sergio Rapuano, and Ioan Tudosa

This paper aims at briefly summarizing the existing situation and the future trends in the field of wideband RF measurement by means of AICs in aerospace applications. First, several challenges in aerospace RF signal acquisition and measurement are briefly analyzed by looking at existing instrumentation characteristics. Then, a short overview regarding the current trends in modern design of wideband RF measurement instruments is presented. Finally, the authors present a comprehensive investigation of the advantages and disadvantages of the use of AIC as a potential candidate for wideband RF spectrum acquisition.

This summary includes text from introduction of the article.

Note: In print version of the article, there is an error in the author bio for Ioan Tudosa. The correct email address for Ioan Tudosa is ioan.tudosa@gmail.com. We sincerely apologize for the error.

Photonics Enhanced Sensors for Food Monitoring: Part 2

(Summary)

Wendy Meulebroeck, Hugo Thienpont, and Heidi Ottevaere

This paper is the second part in a series of three in which the authors show how photonics based food sensors can contribute to the quality control and safety of solid and liquid food products. In the first part, the authors described the theoretical aspects of the various physical phenomena that can occur during food screening, together with their related measurement set-ups, data-processing steps and the concerned sensing platforms. This paper demonstrates the usefulness of optical screening methods to identify foreign bodies in solid food streams and defines four concrete applications together with the corresponding optical measures.

This summary includes text from introduction of the article.

Development and Selection of Balance Sensing Devices

(Summary)

Octavian A. Postolache and Gabriela B. Postolache

Balance is required for many functional activities of daily life. Qualitative or quantitative balance assessment is frequently used in the diagnosis of neuro-muscular diseases, in treatment or therapy monitoring, and for performance assessment in sports training programs. In the last years, various technologies were developed for balance or posture analysis with the main focus on sensors and reliability of the measurements. In this paper, the authors discuss the questions related with the development of a balance assessment system, which might facilitate the design or selection of components for balance sensing and training.

This summary includes text from introduction of the article.

Columns

Basic Metrology

(Summary)

Science and Precision Measurement

Richard Davis

Historically, increased measurement accuracy may lead to a more profound, perhaps even revolutionary, understanding of the underlying science. The history of this phenomenon was

encapsulated in a 1932 essay called “The Romance of the Next Decimal Place” by F.K. Richtmyer. Does science still progress this way? The serendipitous discovery in 1965 of the Cosmic Microwave Background provides an interesting case study.

This summary was written by the author.

Future Trends in I&M

(Summary)

Merging Theoretical Concepts with Practice

Irina Florea

In her inaugural column, the author introduces herself and her professional perspectives, reflecting back to her training as a master’s student: “I focused on uncertainties and power distribution measurements. I realized then how important it is to determine the uncertainty budget for any application. Years after, having worked in industry, I have combined the theoretical things that I learned as a student with real life problems. Measuring some parameters for engine testing is important, but analyzing and knowing how to use measurements is crucial. Not considering all uncertainties, sensors, and transducers’ specifications can lead to a wrong point of view.”

This summary includes text from the article.

Departments

New Products

Robert Goldberg

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Paperless Recorder

Future Design Controls has introduced the PR Series of Paperless Chart Recorders with intuitive color touch interface providing real-time process display and data logging of critical values. Available in 4.3 in 5.6 in and 12.1 in touchscreen displays, they are designed for industrial and

other applications supporting up to 48 analog inputs, 96 external devices via serial Modbus or Ethernet IP.

The easy to use PR Series provides a cost effective solution meeting the requirements for electronic data files for AMS2750E, CFR21 part 11, JCAHO as well as most HACCP programs.

Find more information at www.futuredesigncontrols.com.

Vector Signal Transceiver Supports 1 GHz Bandwidth

NI's second-generation PXI Vector Signal Transceiver (VST) offers 1 GHz of instantaneous RF bandwidth for signal generation and analysis. The PXIe-5840 VST combines a 6.5 GHz RF vector signal generator, 6.5 GHz vector signal analyzer, user-programmable Virtex-7 690T FPGA, and high-speed serial interface into a single 2-slot PXI module. Built on the LabVIEW reconfigurable I/O (RIO) architecture, it delivers programming flexibility and cutting-edge RF hardware to help users to meet challenging RF applications.

The latest VST is suited for a wide range of RF and wireless test applications such as 802.11ac/ax device testing, cellular device testing including future 5G standard, RFIC characterization, and radar prototyping.

The VST combines the fast measurement speed and small form factor of a production test box with the flexibility and high performance of R&D-grade box instruments. This means you can use the VST to test a variety of cellular and wireless standards such as IEEE 802.11ax with an error vector magnitude of better than -45 dB (0.5 percent) at 5.8 GHz. In addition, you can easily expand the VST's small 2-slot 2U PXI Express form factor to support multiple input, multiple output (MIMO) configurations.

Built on the LabVIEW FPGA, the software for the VST features several starting points for your application including application IP, reference designs, examples, and LabVIEW sample projects. These open software starting points include default LabVIEW FPGA personalities and prebuilt FPGA bitfiles to help users to get started quickly and offer the ability to fully customize them.

To learn more about NI RF solutions and see how the new VST compares to traditional rack-and-stack instruments in performance, speed, and flexibility, visit http://www.NI.com.

Wideband Transceiver Supports Over-The-Air Testing of 802.11ad Devices

Keysight Technologies, Inc. announces their solution for testing 802.11ad devices. The flexible and compact E7760A wideband transceiver is an integrated test solution that supports the IEEE 802.11ad wireless standard.

The E7760A test solution includes:

- Embedded software that runs all required 802.11ad tests, allowing users to quickly create and analyze signals on a single screen
- A vector signal generator and vector signal analyzer to validate device IF performance
- Connectivity to remote M1650A mm Wave transceivers with an RF cable for over-the-air testing
- Fully calibrated test capability near the device without the need for external calibration equipment
- The ability to connect up to six M1650A's to one E7760A to validate beam forming capability or maximize throughput by testing multiple devices in a single setup

Keysight partnered with leading 802.11ad chipset designers to create chipset control software. These test automation tools shorten the design validation phase and increase early manufacturing throughput.

Keysight claims the flexibility of the E7760A and M1650A solution in making OTA RF and IF measurements in an integrated form factor makes it an excellent choice for designers and a key enabler of the 60 GHz wireless device ecosystem.

More information about the E7760A and M1650A is available at www.keysight.com/find/E7760A.

Low-Noise, Extreme Ultraviolet (EUV) Photodetector

Opto Diode Corporation announces the SXUV20C, a low-noise, extreme ultraviolet (EUV) photodetector that features a large 20 mm^2 circular active area. The new device has superior

responsivity in the 1nm to 200 nm wavelength region. It is specially designed to be stable over long periods of time when exposed to high intensity EUV energy.

The 20 mm² circular active area provides a substantial surface for easy alignment to the EUV laser. The SXUV20C offers superior hardness in extreme UV environments while providing lower noise than the previously released SXUV20HS1 device. The new photodetector joins Opto Diode's family of SXUV photodiodes with varying active area sizes to meet your most critical measurements, speed, and power monitoring performance objectives.

Additional features include high photon flux robustness, minimum shunt resistance of 50 MΩ, reverse breakdown voltage (typical) VR: 1R = 1μa 10 volts, and typical capacitance of C: VR = 0V 3nF. The low-noise EUV photodetector is housed in an industry-standard TO-8 package for easy integration into most UV laser systems. Operating and storage temperatures range from -20 °C to +80 °C and from -20 °C to +100 °C, respectively.

For more information on Opto Diode's SXUV20C photodiode, please visit www.optodiode.com.

Configurable Switched Filter Banks

Offering customer-defined passband frequencies from 20 MHz to 7500 MHz with ultimate rejection up to 20 GHz, API Technologies' standard line of switched filter banks can be used in a wide variety of applications where cost-efficiency and high performance is required. Their rugged construction makes them good solutions for military and high-end commercial applications needing superior signal integrity, including electronic warfare (EW) and electronic intelligence (ELINT). With lead times as fast as four weeks, the configurable solution significantly reduces development cycle time, resulting in cost savings and faster time to market.

These high performance, integrated devices use mechanically channelized PIN diode switch manifolds for lower insertion loss and high isolation, as well as lumped element filters for increased rejection, all in a space efficient footprint. They also feature integrated switch drivers with typical switching speeds of 200 nanoseconds.

The TTL-compatible filter banks optimize several characteristics, such as VSWR and passband flatness, in a compact form factor for increased performance as compared to individual components. By using common switch manifolds and machined housings populated with custom

filters, these devices are more cost-effective than fully custom solutions. Additional functionality, including gain compensation and leveling, can be added if required.

API's switched filter banks have high isolation/rejection (> 60 dB typical) and operate from a single +5.0V supply.

For more information, visit http://micro.apitech.com/switched_filter_banks.aspx.

Users Can Supercharge Old DEC Systems Without Disrupting Operations

The Logical Company produces new low-cost replacements for aging DEC VAX and PDP systems. Many DEC users have found it difficult to migrate to newer technology without sacrificing decades of investment in hardware and software. The Logical Company announces NuVAX 1200 and NuPDP 1200, state-of-the-art single-board replacements for legacy VAX and PDP systems. Packaged with a new processor, memory and hard drives, Logical's embedded board design allows users to "drop a new engine" into existing Qbus chassis.

Migration to newer hardware has been particularly difficult in military, industrial, and scientific fields that depend upon specialized controllers. Thousands of VAX and PDP systems still use Qbus controllers to interface to expensive process control, test, and data acquisition equipment. Legacy software applications and specialized Qbus equipment will operate without disruption with the affordable new 1200 versions of NuVAX and NuPDP. These models:

- Support all Qbus devices
- Follow all Qbus rules and specifications
- Support all four Qbus interrupts
- Support both Qbus PIO and DMA data transfers
- PIO and DMA transfers occur at maximum speeds
- Throughput is limited only by the existing Qbus device(s)

Applications are transferred in their existing binary form onto the self-contained hard drive of the 1200 models. Neither recompilation nor recertification is required.

NuVAX 1200 and NuPDP 1200 will replace the aging devices below with a new CPU, memory and disks, thus increasing performance while simultaneously saving both power and space:

- DELQA Ethernet port

- TK50/TK70 virtual tape drives
- DLV11 serial console port
- DLV11 serial terminal/printer port
- VAX: RQDX2, RQDX3 and KDA50 virtual drives
- PDP: RLV11, RLV12, QDA50, RQDX3, RQZX1, RXV11, RX21 drives

NuVAX and NuPDP are manufactured by The Logical Company and sold by distributors.

For more information, visit www.logical-co.com.

Software Supports Process Manufacturing and Operations Data

Seeq Corporation announces the release of R15, the newest version of Seeq, an application for engineers and operations analysts in process manufacturing to rapidly achieve insights from asset and operations data. R15 accelerates all aspects of the user and organization experience with Seeq, enabling broader adoption of current deployments.

Seeq R15 delivers features and capabilities addressing the span of requirements for larger and broader deployments for existing users, as well as making Seeq easier to deploy for new users.

These features include:

- Easier for new users: As deployments expand, Seeq R15 delivers easier to use search, customized trending views, date manipulations, and asset comparisons.
- New Functions and Arithmetic Operators: Seeq R15 end-user improvements include data cleansing and regression functions for modeling multi-variate analysis, as well as improved variable and operator functionality for process calculations.
- Enterprise Data Support: Seeq R15 expands process historian support to include Honeywell PHD, Wonderware Historian, Yokogawa Exaquantum Historian, and GE Proficy Historian. This adds to existing support for the OSIsoft PI System, Emerson Automation Solutions DeltaV Continuous Historian, and Inductive Automation's Ignition SCADA system.
- Relational Database Integration: Seeq R15 simplifies integration with relational database offerings such as Microsoft SQL Server and its open-source alternative MySQL, as well as CSV file formats, to create batch and state context from manufacturing applications.

- Data Wrangling: Seeq replaces the hours of manual effort required to aggregate, cleanse, and contextualize data in spreadsheets.
- Enterprise Scalability: Seeq R15 now supports multi-node deployments for high availability deployments in distributed enterprise environments.

To accelerate awareness and familiarity of Seeq features and functionality, Seeq has also created a new playlist on its YouTube channel. Called “Seeq University,” this set of videos demonstrates the capabilities of Seeq features across all aspects of the product including search, trending, data-search, formulas, and more.

For the latest information, please visit the Seeq web site at www.seeq.com.

Intermodulation Analyzer for Mobile Network Testing

The network performance for LTE and LTE-Advanced technology is negatively affected by passive intermodulation (PIM). Communication Components Inc. (CCI) has developed the PiMPro Tower Series, providing mobile network operators and their service providers with a solution for PIM testing during the installation and maintenance of base stations. The PIM analyzer is now available exclusively from Rohde & Schwarz. The T&M expert offers single-source test solutions extending over the entire lifecycle of a mobile network.

In response to the continually increasing demand for higher data rates, network operators have to increase the spectral efficiency of their networks up to the theoretical limit. However, the high sensitivity of LTE and LTE-Advanced makes any interference even more noticeable. These passive intermodulation effects have therefore developed into a challenge for network operators wanting to ensure the quality of their networks. PIM effects can be caused by corroded connectors or poor antenna isolation, for example. Within buildings, distributed antenna systems (DAS) can be strongly affected by PIM due to the metal structures used to route cables.

Communication Components Inc. (CCI) has developed the PiMPro Tower Series PIM analyzer on the basis of its RAN (Radio Access Network) expertise. Rohde & Schwarz now has exclusive global sales rights for the PiMPro Tower Series. The analyzer ideally complements the extensive mobile network testing portfolio from Rohde & Schwarz, which includes T&M solutions for compliance, installation, optimization, operation and benchmarking of mobile networks.

The particularly lightweight instrument, which comes in a practical backpack, is ideal for use on transmitter masts. The user-friendly analyzer offers two 40 W output signals for PIM tests, making it the only instrument of its kind to address real-world challenges in the field. Even in battery mode, it can deliver this high output power for up to three hours. Users are able to perform PIM, return loss, distance-to-PIM and distance-to-fault measurements without requiring additional hardware, even in difficult-to-access areas. Its measurement sensitivity of -135 dBm and its ability to reduce two-tone transmit signals to 24 dBm (100 mW) make the PIM analyzer an ideal instrument for measurements on base stations and DAS.

For more information about the mobile network testing portfolio, go to www.rohde-schwarz.com/mobile-network-testing. For more information about the instrument, go to www.rohde-schwarz.com/ad/press/pimprotower.

High-Performance, High-Definition, Class-D Amplifier

The TPA3255 from TI is a high performance Class-D power amplifier that enables true premium sound quality with Class-D efficiency. It features an advanced integrated feedback design and proprietary high-speed gate driver error correction (PurePath™ Ultra-HD). This technology allows ultra-low distortion across the audio band and superior audio quality. The device is operated in AD-mode, and can drive up to 2 × 315 W into 4-Ω load at 10% THD and 2 × 150 W unclipped into 8-Ω load and features a 2 VRMS analog input interface that works seamlessly with high performance DACs such as TI's PCM5242. In addition to excellent audio performance, TPA3255 achieves both high power efficiency and very low power stage idle losses below 2.5W. This is achieved through the use of 85 mΩ MOSFETs and an optimized gate driver scheme that achieves significantly lower idle losses than typical discrete implementations.

Find more information at www.ti.com/product/tpa3255.

Flying Probe Test System

Seica announces their latest Flying Probe Test technology for electronic boards, the Pilot4D V8 HF. Seica claims it is the only flying probe tester able to perform frequency measurements up to 1.5 GHz.

The Pilot4D V8 HF is a result of Seica's more than 20 years of experience in designing flying probe systems and strong competencies in functional testing of RF products. It can be used for prototype testing and new product design certification, as well as a new instrument able to

characterize high volume productions, monitoring the process as well as the most sophisticated characteristics of an RF product.

The Pilot4D V8 HF combines its high frequency, flying probe measurement capabilities with all the powerful test capabilities of the Pilot4D V8 which include in-circuit, functional, optical, Laser and boundary scan in the same vertical, 12-probe, double-sided architecture.

Find more information at www.seica.com.

Miniature HV SMT Gas Discharge Tube

Littelfuse, Inc. introduces its first high voltage, surface-mount gas discharge tube (GDT) with two squared terminals that is capable of withstanding surge currents of 3kA@8/20µs in a small form factor.

CG4 Series Two-Terminal High Voltage Miniature Gas Discharge Tubes are high voltage (800V – 3000V) devices designed for over-voltage protection for high isolation applications. They help protect personnel, equipment and circuitry from abnormally high voltages caused by lightning or electrical transients.

Applications for the CG4 Series GDT include industrial systems like high voltage power supplies, variable frequency drivers, and high voltage test equipment; medical electronics, such as NMR medical devices and X-ray machines; and consumer electronics like set-top boxes.

CG4 Series Two-Terminal High Voltage Miniature Gas Discharge Tubes offer these key benefits:

- High (800V – 3000V) DC breakdown voltage provides high voltage isolation, suitable for applications where hi-pot testing is required.
- A miniature footprint in surface mount form factor, which aligns with the trend of using surface mount technology in compact, space-limited applications. Square terminals help improve manufacturing efficiency during the printed circuit board assembly process.
- Medium surge capability (3kA@8/20µs) allows greater design flexibility by offering a new gas discharge tube option for applications with surge protection requirements up to 3kA.

The CG4 Series is available in tape & reel packaging in minimum order quantities of 2,000 pieces. Sample requests can be placed through authorized Littelfuse distributors worldwide.

For more information, please visit www.Littelfuse.com. Additional information is available on the CG4 Series Gas Discharge Tube product page.

Laser Distance Sensor

Banner Engineering has added flush mount housings to its rugged series of Q4X laser distance measurement sensors. The new flush mount configuration offers a more compact housing to expand applications and increase mounting flexibility in constrained spaces.

The Banner Q4X offers superior performance, ambient light resistance and durability, with reliable detection of sub-millimeter changes in distances ranging from 35 to 310 mm. Utilizing a CMOS imager for reliable measurements, the Q4X offers dependable performance with highly reflective and multi-color surfaces, or light-absorbing materials and low contrasts, such as black foams or rubber combined with black plastics or metals. With dual teach mode, the Q4X uses a combination of intensity and distance, making it ideal for error-proofing applications and reliable detection of challenging targets, such as clear packaging and transparent object detection without a retroreflector.

Banner Q4X laser distance sensors are available with discrete, analog (0 to 10 V or 4 to 20 mA), and IO-Link output options.

The robust Q4X housing is rated to IP69K with FDA-grade stainless steel, and its rugged design resists mechanical impact, over tightening and extreme vibration. A highly visible, four-digit, angled display with sub-millimeter resolution is easily viewed from multiple vantage points.

For more information on Q4X laser distance measurement sensors, visit www.bannerengineering.com/.

PXI Millivolt Thermocouple Simulator Module

Pickering Interfaces introduces their first Millivolt Thermocouple Simulator Module. The PXI Thermocouple Simulator Modules (series 41-760) are ideal for simulating the operation of a thermocouple. They are available in a choice of 8, 16, 24 or 32 channels—each channel providing a low-voltage output across two connector pins capable of providing ±20 mV with 0.7

µV resolution, ±50 mV with 1.7 µV resolution and ±100mV with 3.3µV resolution, covering most thermocouple types.

These new thermocouple simulators use two wire outputs with a remote output reference sense to ensure the modules deliver accurate low-level voltages, even if the system has common mode voltages present. In addition, each simulation channel is also able to provide an open circuit setting to simulate faulty wiring connections to a sensor. For improved accuracy, each channel of the Low Voltage Source carries accurate calibration data stored on the module. The module also includes a calibration multiplexer for module test and verification purposes.

The 41-760 simulator modules can be connected straight into the thermocouple measurement system. To aid in this, Pickering offers a connector solution that has 8, 16, 24 or 32 copper twisted pairs terminated with mini copper thermocouple plugs. Pickering can also supply connector blocks that convert the module's 78-pin connector to terminal blocks to ease user wiring, or design alternative customized interconnections solutions.

The introduction of the PXI thermocouple simulator modules builds on Pickering Interfaces growing PXI simulation product line that includes standard and precision programmable resistors, including RTD and strain gauge simulation.

Find more information on their website at www.pickeringtest.com.