Measurement: The Bridge between Reality and Theories

Editorial

Goodbye 2014

2014 is reaching its end! Only a few more weeks to go and we will be starting a brand new year. We can all look back on a year full of changes. Our magazine changed, old columns stopped, new columnists were born. And we will continue this trend in 2015!

This last issue of 2014 goes back to the basics of measurements. Why? Because to measure is to know! The only way to prove that theories are right is to show measurements. Measurements can reveal a lot of secrets, but only if they are done in a correct and accurate way. And this is mandatory in all application fields.

In this issue of our *IEEE Instrumentation and Measurement Magazine,* you will discover different measurement issues in different application fields. But they all have one thing in common: quality measurement is indispensable!

I wish you all a happy New Year and we will see each other back in 2015!

Groetjes,

Wendy

P.S. December can be very dark and cold in northern countries, such as Sweden. To bring some brightness during these long nights a lot of lights and hence energy is used. I thought it would be a great starting point for our February 2015 issue…

Article Summaries

Measurement Science: Constructing Bridges between

Reality and Knowledge

(Summary)

Luca Mari and Dario Petri

Currently, measurement is not only a key discipline for scientific investigation but is in all domains of human activities and endeavors to promote social evolution and prosperity. In this paper, the authors propose an explanation of the crucial role of measurement in our society by describing measurement as a bridge between the empirical world and the information world. They describe measurement science as built upon this feature and discuss its basic motivation and scope accordingly.

This summary includes text from introduction to the article.

The Mathematical Theory of Evidence and Measurement Uncertainty
Comparison of Measurement Results Expressed in Terms of Random-Fuzzy Variables

(Summary)

Simona Salicone

In two previous articles, the author showed how the Random-Fuzzy variables (RFVs) can be effectively employed to represent a measurement result. The effects of the systematic and random contributions to uncertainty can be well identified in the RFV, and all confidence intervals at all confidence levels are provided, so that complete information about the measurement result is given. Moreover, this distinction also allows one to model the propagation of the systematic and the random contributions in two different ways, according to their different nature and different behavior when they combine. In most practical applications, the final aim of a measurement procedure is to take a decision on the basis of the comparison of the obtained measurement result with a given threshold. Moreover, the threshold could be either a fixed value or a measurement results itself, thus affected by measurement uncertainty. The aim of this paper is to show that also this final step can be done in terms of RFVs.

This summary includes text from the introduction of the article.

Introducing a Course in Test and Measurement at Texas A&M University – Kingsville

(Summary)

Claudio M. Montiel

Dr. Claudio Montiel was awarded the first IMS Faculty Course Award to develop the course that he describes in this column. The Faculty Course Award is a key part of the IMS's strategic plan, which includes a goal to "disseminate and support instrumentation and measurement culture within institutional educational channels." The article describes a graduate level electrical engineering course offered at Texas A&M University – Kingsville, *Mixed-Signal IC Test and Measurement,* a special topics course designed to introduce electrical engineering students to the technical issues involved in integrated circuit high-volume, high-throughput, production testing.

This summary includes text from the article.

Using Neural Network Techniques in Environmental Sensing and Measurement Systems to Compensate for the Effects of Influence Quantities

(Summary)

Miguel Dias Pereira, Octavian Postolache, and Pedro Silva Girão

Multiple influence quantities affect environmental sensing and measurement (ESM) systems. Accounting for their variations over time promotes metrological comparability and traceability of measurement results. Using suitable data processing techniques allows identification of the main influence quantities that affect the measurement result of a given quantity and allows evaluation of the associated compensation coefficients. This paper presents several concerns related to implementation of ESM systems, paying particular attention to the impact of the multiple of measuring and influence quantities on system performance. A review of different data processing techniques to compensate for the effects of influence quantities is presented. A case study based on water conductivity measurements is to illustrate the capability of artificial neural network based techniques and to cope with errors due to a low number of measurement values and due to collinear effects between influence quantities.

This summary includes text from the introduction of the article.

Impact Factor and Research Quality

(Summary)

Paolo Carbone

The need to provide decision makers with information on the amount of work done by scientists has favored a large increase in the usage of citation indicators, such as the Impact Factor. This ratio is defined as the relationship between the number of citations in a given year to articles published in a scientific journal in the two preceding years, and the total number of published articles in that journal over the same time period. Thus, it estimates the average number of citations per paper published in the considered journal, evaluated on a two-year interval. Much was written on the information conveyed by this indicator and on the consequences that potentially can result from its misuses. The author shares some of the issues associated with the usage of the Impact Factor in the research community.

This summary includes text from the introduction of the article.

Electrical Distribution System State Estimation:
Measurement Issues and Challenges

(Summary)

Davide Della Giustina, Marco Pau, Paolo Attilio Pegoraro,
Ferdinanda Ponci, and Sara Sulis

Because electrical distribution networks have measurement devices available mainly in the high to medium voltage substations, it is commonly accepted that such configuration is insufficient to achieve the minimum accuracy requirements needed for an efficient management and control of a future distribution network. A snapshot of network conditions in an electrical distribution system can be obtained by using a State Estimation algorithm, which exploits measurements and other information that is available about the network. This article presents an overview of potential applications deployed in the new Distribution Management System for distribution grid control centers and based on SE output, including descriptions of measurement devices and their optimal placement.

This summary was written by K. Virostek and includes text from the article.

Grinding Dynamometer for Vertical Glass Edge Grinding Machine with V-Grinding Wheel

(Summary)

Honghai Xu, Xiaoyang Li , Xiping Zhao, and Yanjun Zeng

Grinding force is an important parameter during the grinding process. A grinding dynamometer based on resistance strain gauge technology was developed for the special installation and work conditions of a glass edge grinding machine with a V-grinding wheel. The sensing components are strain gauges mounted on an elastic sleeve held in place by a thrust ball bearing on the end of the grinding wheel shaft. Grinding force signals are transmitted by multipoint contact slip rings. Calibration and validity checks indicate the transfer of tangential and radial grinding forces by the dynamometer are as high as 97 and 70 percent with excellent linearity. These transfer values are only 75 and 52 percent in the absence of a thrust ball bearing. The article provides a basis for measurement and research of grinding forces in similar grinding machines.

This summary includes text from the introduction of the article.

Columns

Basic Metrology

(Summary)

Bryan Kibble

What are Metrologists Made Of?

In this column, the author questions, "What *are* metrologists made of?" Certainly not "snaps and snails and puppy-dogs tails," nor even "sugar and spice and all things nice," but rather persistence to the point of obstinacy, obsession with the problem in hand, determination to spend as long as it takes to overcome it, and the need to get the best possible correct measurement in the end, which might be years away.

This summary includes text from the article.

Life after Education

Max Cortner

Life after Graduation

This columnist answers a key question, "What can you expect of life after graduation?" You can expect it to be interesting, challenging, and constantly changing. You can expect to work yourself out of a job, only to get a better one. Look forward to it. Instrumentation and Measurement is always improving, and your next job may be in a technology that wasn't covered during your education. Invest in your career by continuing to learn. Most of all, do what you enjoy and enjoy what you do!

This summary includes text from the article.

Chapter Report

The IEEE Ukraine Section

Anatoly Sachenko, Chapter Chairman

The Instrumentation & Measurement / Computational Intelligence (I&M/CI) Society Chapter of IEEE Section Ukraine was established on June 7, 2005 and consists of the fifteen active members from Lviv, Ternopil, Khmelnytskyy, Kyiv, Odessa, Chernivtsi, Ivano-Frankivsk and Zaporozhye. Although the chapter is not large, it is a team of highly qualified researchers with good expertise and capability of solving complex problems. Their high-level competence and research activities are proven by running numerous international projects within INTAS, Framework 7, CRDF, STCU, NSF, and NATO Programs. The majority of those projects are conducted by the Research Institute for Intelligent Computer systems, Ternopil National Economic University (TNEU) and V.M. Glushkov Institute of Cybernetics, National Academy of Science, Ukraine (www.ics.tneu.edu.ua).

Most of the chapter members help to organize or present at the International Intelligent Data Acquisition and Advanced Computing Systems Conference (IDAACS, www.idaacs.net), which provides a forum for high quality reports on Theory, Technology, and Applications of Intelligent Data Acquisition and Advanced Computer Systems. The Conference, which was called a workshop until 2009, is supported by IEEE IMS, and it has been held every two years. The following cities hosted IDAACS: Foros, Ukraine (2001), Lviv, Ukraine (2003), Sofia, Bulgaria (2005), Dortmund, Germany (2007), Rende (Cosenza), Italy, (2009), Prague, Czech Republic (2011), and Berlin, Germany (2013). Some of the chapter members were involved in a second

satellite IDAACS Symposium Wireless Systems within the IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems, held 11-12 September 2014 in Offenburg, Germany and the eighth IDAACS Conference held in Warsaw, Poland, September 24-26, 2015.

A Chapter is working closely with IEEE TNEU Student Branch. All Student Branch members and some of the Chapter members are from the Faculty of Computer Information Technologies, TNEU. Among the six Chapter Technical meetings in 2013, one was held during the IDAACS 2013 Berlin on 14 September 2013. There were two presenters: Anatoly Sachenko: "Results of the IEEE Conference IDAACS 2013" and Juergen Sieck: "Organization of IEEE Conference IDAACS Wireless 2014." There were 84 meeting participants, including 23 IEEE members and 61 guests.

The other five Technical meetings were held between January and May, 2014. The first meeting was on January 13, 2014 when Oleksandr Osolinskyy, a second year PhD student, gave a presentation entitled "Method for Measuring the Average power Consumption of Microprocessors." His goal was to present the tentative results of his PhD thesis and discuss the future work. As a result, Oleksandr was recommended to narrow down the field of his research and focus on more precise applications. There were 22 seminar participants, including ten IEEE members and twelve guests.

The second Technical meeting was held on February 25, 2014. Prof. Dan Cristea, a Head of the Department of Computer Science, Faculty of Computer Science, Alexandru Ioan Cuza University of Iasi, Romania made a presentation entitled "How to Combine the Teaching and Research." Secondly, Olexiy Roshchupkin, a third year PhD student, presented intermediate results of his PhD thesis entitled "Neural Network Method for Improving the Accuracy of the Ultraviolet Information-Measuring Systems" under supervising Prof. Anatoly Sachenko and Dr. Radoslav Smidt. There were fifteen in attendance, including ten IEEE members and five guests. The third Technical meeting was held on March 25, 2014.

A talk entitled "Philosophy of Computing" was presented by Fulbright Professor Robert Hiromoto, University of Idaho, USA. During the presentation, Prof. Hiromoto shared his vision about parallel computing and talked about its developments, potential challenges, and ways to overcome them. Overall, there were fifteen participants, including eleven IEEE members and four guests.

The fourth Technical meeting was held on April 14, 2014. Vladyslav Shults, a trainee researcher gave a presentation entitled "Spot Price Prediction for Cloud Computing Using Neural Networks" under supervising Dr. Volodymyr Turchenko. Alex Nykorak, a trainee researcher, made a presentation "Table-driven Algorithm for Line-tracking Autonomous Robots" under supervising Prof. Robert Hiromoto and Prof. Anatoly Sachenko. The purpose of both speakers was to present some experimental results and discuss the future work. In total, there were eighteen participants, including ten IEEE members and eight guests.

The fifth Technical meeting was held on May 15th, 2014. The speaker, Dr. Volodymyr Turchenko, gave a presentation entitled "Batch Pattern Parallelization Scheme of Neural Networks on Many-core Architectures," in which he summarized his research on neural networks and experience at Innovative Computing Laboratory, EECS, University of Tennessee, USA, where has worked for nine months under a Fulbright Fellowship. The total number of seminar participants was seventeen, including twelve IEEE members and five guests. Finally, I'd like to thank Kristen Donnell very much for her ongoing support.

The print article includes photos from one of the 2014 presentations and attendees at the 2013 IDAACS conference in Berlin.

People Behind the Scenes

VP of Finance and Treasurer Report

Dario Petri, VP of Finance and Frank Reyes, Treasurer

The IEEE I&M Society (IMS) is a vibrant and diverse community of about 4,200 multitalented experts that includes academics, industry and government professionals. IMS members play crucial roles in advancing science, technology and applications in the I&M and related fields, contributing to the advancement of scientific knowledge and providing long-term benefits to the whole humanity.

The IMS mission is to effectively support members and related professionals in the achievement of this ambitious goal by:

- providing the most comprehensive and high-quality services;
- serving as professional incubator for the growth of all members; and

- being in the forefront of future I&M technological advances.

The IMS mission is implemented through a diverse set of technical activities performed by the volunteer members and business actions managed by volunteer leaders and employees. These actions include organizing meetings and conferences, publishing periodicals, editing technical standards, and offering opportunities for on-line communication.

The Finance Committee's mission is to provide the Society's Administrative Committee (AdCom) with fiscally sound annual budgets to enable it to make effective decisions that will optimize the quantity and quality of products and services provided to the members and broader community. Specifically, the Finance Committee:
- advises the President of the financial welfare of the Society;
- gathers IMS committee requests for new and continuing activities and high-quality services;
- provides fiscal updates to committee chairs to assist in managing budgets; and
- communicates with IEEE on fiscal issues.

Thus, for a non-profit technical organization like IMS, finance is not aimed at making profits but it is intended at achieving zero profit or breaking even. In fact, it is the fuel that ensures the good financial health of the Society, so that it can meet members' expectations and continue to promote the advancement of science, technology and applications in the I&M and related fields.

The revenue that the Society receives comes from three major sources: membership dues, publication subscriptions, and conference fees. Publication subscriptions include member, non-member and institutional subscriptions, article downloads and other fees that are associated with the Open Access Publication process.

IMS invests the revenue it receives in various services to its members, such as high-quality technical events and periodicals, membership and chapter activities, educational initiatives for student members, volunteer support, IMS infrastructure and IEEE Infrastructure. Many of these activities are not revenue-producing and thus must be subsidized by the revenue generated by dues, publications, and conferences.

In 2013, the total IMS budget was about US $2.5M, with a year-ending net revenue of US $27K, thus achieving the desired balance between revenue and expenses. Each year, theVP Finance, the

Treasurer and the Finance Committee carefully review projected revenue and planned expenses to create a budget that is both realistic and balanced. Throughout the year, this group closely monitors revenue and expenses and makes appropriate adjustments to help ensure that the yearend net revenue remains positive. The net revenues in a given year are put into a reserve account that can be used to absorb a deficit that might occur in a future year. There are occasionally factors outside the control of the Society, such as the global economic condition or travel restrictions placed on government employees that impact conference attendance, which can negatively impact the projected positive year-end balance, and in those years when a deficit may result, the reserves are used to ensure a zero net balance. Our current IMS reserves are about US $1.6M, so we have effectively managed our resources to ensure a healthy financial condition for our Society. Proper financial awareness and management is critical for enabling healthy operations aimed at offering the high-quality products and services IMS Members expect.

Departments

New Products

Robert Goldberg

User-Extensible Frequency Domain Analysis for Real-Time Oscilloscopes
Keysight Technologies, Inc. (formerly Agilent) announces the availability of a frequency domain analysis (FDA) option, a user-extensible spectrum FDA application for real-time oscilloscopes. The FDA option extends the capabilities of Keysight Infiniium and InfiniiVision Series oscilloscopes by enabling engineers to acquire live signals from the oscilloscope and visualize them in the frequency domain as well as make key frequency domain measurements.

Option N8832A-001 includes the application, the application source code for user extensibility, and MATLAB software. These tools allow engineers to extend the application's capabilities to meet their current and future testing needs. The FDA application provides capabilities to address many important frequency domain analysis challenges, including:

- Power spectral density (PSD) and spectrogram visualization, commonly found in spectrum analyzer and frequency domain analysis software.
- Frequency domain measurements in an application including relevant peaks in the PSD and measurements such as occupied bandwidth, SNR, THD (total harmonic distortion), SFDR (spurious free dynamic range) and frequency error.

- Oscilloscope configuration through the application to allow for repeatable instrument configuration and measurements; optionally includes additional SCPI commands for more advanced instrument setup.
- Insertion of additional custom signal processing commands prior to frequency domain visualization, as needed, for more advanced analysis insight.
- Live or post-acquisition analysis of time-domain data in MATLAB software.

For more information about N8832A-001 frequency domain analysis for real-time oscilloscopes, visit www.keysight.com/find/FDA.

Deliver High Quality Video over Unmanaged Networks

VideoFlow is launching an important addition to its range of Digital Video Protection (DVP) solutions for delivering live, high quality video (SD, HD and above) over unmanaged, best efforts networks.

The new DVP100X handles up to 80 streams and 80 virtual private network (VPN) tunnels, simultaneously reaching 300 Mbps. This means that large multi-point networks can be created cost effectively using VideoFlow's technology which enables live content to be delivered over unmanaged networks like the Internet with no packets lost and nullifies the jitter caused by transiting the Internet. The DVP100X provides users a highly advanced, cost effective solution for broadcast quality and live video over standard Internet connections, thereby eliminating the need for expensive service level agreement (SLA). In addition, the DVP100X offers secured video connections with IPsec for maximum security level.

Live video is sent as a continuous bit stream, which the Internet was never designed to handle, resulting in artifacts caused by jitter and packet loss. More than a couple of seconds of latency is unacceptable by customers expecting to enjoy the excitement of real-time events as they happen. VideoFlow's patent pending technology opens the Internet for delivering streamed content by ensuring that no packet is lost and nullifying the jitter caused by transiting the Internet. By doing so, it affords the opportunity to use a highly advanced, low cost solution for live, high quality video streams in place of existing, expensive solutions.

The DVP comes as a "Plug and Play" pair - a Protector, which stores the packets until it is certain that they have been correctly received, and a Sentinel which monitors the health of the video stream by watching for packet loss and requests packets to be re-sent from the Protector's cache only if required.

VideoFlow's solution is highly flexible working with internet connections as slow as 200Kb/s or as fast as 800Mbps, yet delivering the desired high quality. Find more information at www.video-flow.com.

Small Machine Vision Smart Camera with Embedded Ethernet
Microscan announces the Vision MINI Xi industrial compact smart camera with embedded Ethernet. As part of Microscan's AutoVISION® machine vision product suite, this tiny camera is packed with features for close-range industrial auto ID, inspection, and other machine vision applications.

Microscan claims that the new industrial Vision MINI Xi is the world's smallest fully-integrated smart camera with embedded Ethernet, measuring in at 1 in. (25.4 mm) x 1.8 in. (45.7 mm) x 2.1 in. (53.3 mm) and weighing 3.2 oz. (91 g). The Vision MINI Xi features both Ethernet and serial connectivity, a 24-volt interface, and optically isolated I/O in one compact package.

Manufacturing engineers looking for robust inspection, color matching, symbol decoding, or CR can count on the Vision MINI Xi to fit into tight spaces in assembly line manufacturing and component tracking applications. The Vision MINI Xi can handle dot peen marks on power-train components, laser markings on medical devices or PCBs, as well as traditional printed barcodes on packaging and labels.

Together with the easy-to-use AutoVISION machine vision software, the Vision MINI Xi is an ideal solution for manufacturers who need to read barcodes but require the flexibility to add additional inspection capabilities to their processes using a single hardware device. All Microscan smart cameras run on the same vision software with easy job portability, or upgrade to Microscan's advanced Visionscape ® platform with 50+ machine vision tools without the need to switch cameras. For more information on Microscan's new Vision MINI Xi smart camera and AutoVISION® 3.0 software release, visit www.microscan.com.

Vision Sensor Series for Advanced Communication and Inspection Capabilities
Banner Engineering announces the release of the iVu Plus TG Gen2 and BCR Gen2 vision sensor series. Designed from the company's iVu Integrated Vision Sensor family, the Gen2 series offers faster response times and multiple inspection resolution choices.

Banner's iVu Plus Gen2 touch screen vision sensors advance inspection performance with Ethernet connectivity and multiple inspection capability. Ethernet connectivity enables sensors to share inspection data directly with PLCs, PCs or other factory devices, making communications and control even easier on the manufacturing floor.

For optimal detection of small parts and features, the iVu Plus TG Gen2 vision sensors offer the option for full 752 x 480 resolution. The iVu Plus Gen2 model can also be configured to operate using four different sensor types. These types include:

- Area, which verifies the presence of a feature or features of interest;
- Blemish, which identifies flaws on a part, such as scratches on a disc;
- Match, which verifies that a pattern, shape, or part in any orientation matches a reference pattern; and
- Sort, which recognizes and sorts as many as ten different patterns of parts, such as nuts, bolts, and washers.

With advanced barcode reading capabilities, the iVu Plus BCR Gen2 offers enhanced traceability with an integrated touch screen for easy setup and monitoring. Featuring a new coarse mode option, the iVu Plus BCR Gen2 sensors allow for faster barcode read rates, especially for 2D barcodes.

The Gen2 series is available in four models:
- iVu Plus TG Gen2 Integrated: An intuitive interface and functionality with enhanced remote communication, multiple inspections and complete sensor set.
- iVu Plus TG Gen2 Remote: A unique remote screen interface with an exceptionally wide viewing angle, highspeed processing and separate touch screen display for remote mounting.
- iVu Plus BCR2 Integrated: A barcode reader with accurate traceability in a compact, rugged package with integrated touch screen for easy setup and monitoring.
- iVu Plus BCR2 Remote: A barcode reader solution for applications where the vision sensor location makes it difficult to use an integrated display.

Each iVu Plus Gen2 model is housed in an IEC IP67-rated housing, making the sensors rugged and versatile to suit a broad range of application environments. For more information on the iVu Plus Gen2 vision sensors, visit www.bannerengineering.com.

Digital Radio Test Set for Automated Test and Alignment of EF Johnson Viking Series Radios

Aeroflex announces automated test and alignment capabilities for EF Johnson P25 radios on the Aeroflex 3920B Digital Radio Test Set. The new test capabilities focus on the Viking VP 600 Series. The Aeroflex Automated Test and Alignment procedure provides fully automated test and alignment of EF Johnson radios without the need for user interaction. This test system ensures consistent and reliable tests and alignment to manufacturer-recommended specifications and to industry standards, ensuring proper interoperability and a uniform standard of performance within the radio's network technology.

According to Aeroflex, the 3920B provides an advanced method for repeatable and highly accurate test and alignment for EF Johnson radios that requires minimal technical interface. Since the 3920B provides fully automated tests and alignment processes, EF Johnson dealers and end users can now utilize their technical resources to provide higher value services. For more information, visit www.aeroflex.com/, call Aeroflex Sales at +1 800 835 2352, or send email to info-test@ aeroflex.com.

Dynamic Vibration Sensor Easily Connects via USB

The Modal Shop, Inc. introduces its newest product, the USB ICPDigital™ Dynamic Accelerometer (model 333D01). The Modal Shop claims it is the first integrated and ruggedized high-resolution, broad-frequency piezoelectric vibration sensor with integrated data acquisition.

It is a truly plug-and-play device that works directly with smart phones, tablets, and PCs making accurate vibration measurement accessible to everyone. Making vibration measurements is now as easy as recording digital audio. This simplicity provides the utility of precision piezoelectric accelerometers while acting as a high-fidelity tool for both the test and industrial markets. Users can select from a growing number of third-party vibration analysis packages on all popular platforms or write their own applications in any programming environment that can access the audio input driver such as MathWorks, MATLAB,® or National Instruments LabVIEW®.

By pairing the 333D01 with a smart phone, a user no longer needs separate signal conditioners or dedicated digital data acquisition. A powerful vibration analysis system is now available in a small package. Utilizing a hermetically sealed precision ceramic piezoelectric single-axis sensing element expands both the measurement resolution (additional 66 dB over typical MEMS

accelerometers) and useable frequency range to 8 kHz (nearly eight times typical MEMS response). The 333D01 packages both the piezoelectric sensing element and internal electronics within a laser welded, ground isolated, stainless steel casing. This provides durability, portability and reliability for the entire measurement channel in both factory and laboratory environments.

The calibration of a USB ICPDigital Dynamic Accelerometer is NIST traceable, ensuring the precision of the integrated measurement channel. Calibration data is stored in the sensor, allowing optimized software to provide calibrated engineering units with no user involvement.

The USB ICPDigital Dynamic Accelerometer simplifies and improves the general accessibility to precision vibration measurements through the ease and simplicity of the consumer USB communication world. It expands beyond traditional piezoelectric accelerometer applications, opening the vibration world to laptop, tablet and smart phone vibration applications. Full specifications and a list of compatible and optimized third-party software are available at www.digiducer.com.

Viscometers Comply with Revised ASTM D7279-14 Method
PAC announces that its ISL Houillon Viscomters, the VH1 and VH2, comply with the recently released revised version of ASTM D7279-14 Standard, "Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids by Automated Houillon Viscometer."

The new revision of the standard extends the scope from lubricating oils to include distillates (e.g., base oils, formulated oils, fuels, and biodiesel) and adds a new precision at 40 °C and 100 °C, established through an interlaboratory study.

Users can now run their distillate oil samples on the VH1 and VH2 while complying with ASTM D7279. Requiring less than 1-ml of sample, the Houillon approach is applicable to both transparent and opaque samples, while needing less manpower to run. Since the kinematic viscosity results are produced within 60 seconds, the ASTM D7279 method is ideal for rapid testing of in-service engine oil conditions.

In addition to small sample size and fast analysis, the ISL Houillon Viscometers are easy to operate, flexible due to the capability to accommodate one or two solvents for cleaning, and robust in construction. Finally, the single-bath design, including four Houillon tubes, combined together with advanced automatic features, enables the simultaneous run of up to sixteen tests.

For more information, visit www.paclp.com.

Motorized Miniature Screw-Actuator Provides 20 Nanometer Resolution

Physik Instrumente (PI) has introduced two new, vacuum compatible versions of its compact N-470 PiezoMike precision screwtype actuator family.

Applications include:

- Optics & Lasers
- Medical Engineering
- Physical Sciences
- Aerospace Engineering
- Biotechnology
- Photonics / Fiber Alignment
- Opto-Mechanics
-

Providing a positional resolution of 20 nanometers and travel ranges between 0.25 in and 1 in (6.35 mm to 25.4 mm), the actuators are now available for ambient applications and also in high vacuum (HV, 10-6 Torr) and ultra-high vacuum (UHV, 10-9 Torr) configurations.

N-470 actuators replace manual micrometer screws and can be computer-controlled to simplify the automated adjustment of optics, lasers, and micro-mechanical components. Both metric and English mounts are available for easy integration into conventional mirror mounts, optics holders or positioning stages.

When at rest, the drive is self-locking, requiring no electric power, and it generates no heat. The high holding force of >100N (22 lbs) and its self-clamping design make it vibration-proof and shock-resistant. Several OEM and bench top controllers for up to four channels are available. Versions with USB interface include host software and LabVIEW drivers. More information on the opto-mechanical precision piezo micrometer-actuator is available at www.physikinstrumente. com/en/news/fullnews.php?newsid=182.

Rugged Rack Mount Amplifier Delivers 100 W Power and 48 dB Gain over 700 –2700 MHz

Mini-Circuits new HPA-272+ high-power rack mount amplifier is capable of amplifying signals up to 100 W across its entire operating bandwidth of 700 – 2700 MHz. This new model delivers 48 dB typical gain with ±1.7 dB gain flatness across its entire operating frequency range. Its

wide bandwidth covers popular application bands including wireless communications, SATCOM, and radar in a single instrument, and its high gain performance and output power support a variety of high power test applications such as EMI, reliability testing, RF power stress testing, and more.

The amplifier operates on a standard 110/220 V ac line power supply, making setup quick and easy in lab environments. Extensive safety features to prevent amplifier damage include over-temperature protection with automatic shutoff above 85 °C and the ability to handle short/open loads. It comes housed in a rugged, 3U rack-mountable case with NType RF connectors, DB-9 connection on the front panel, and internal cooling fans, making it ideal for use in test equipment racks.

The HPA-272+ provides high reverse isolation (89 dB typical), thereby isolating load reflections. It achieves wide dynamic range with typical noise figure of 8.2 dB and IP3 performance of +55 dBm, and it is rated for operating temperatures from 0 °C to 50 °C. For more information, please visit http://www.mini-circuits.com.

Air Flow Meters with Full Suite of Global Agency Approvals
Sierra Instruments announces that its evolutionary QuadraTherm® 640i/780i air flow meters have received global standards of safe operation in potentially hazardous environments: cFMus (USA and Canada), ATEX (European Union), and IECEx (International). This signifies that the QuadraTherm is certified as flame-proof, protected from dust ignition sources, and meets all design criteria for electrically-powered flow meters used in areas where combustible gases may be present.

The IECEx and ATEX certification programs ensure explosion-proof and hazardous area compliance in the European Union and international destinations. The cFMus certification program ensures explosion-proof and hazardous area compliance in the United States and Canada. With approvals QuadraTherm is approved for applications in hazardous plant areas like facilities management, chemical processing, oil & gas, wastewater, and natural gas throughout the European Union and international communities.

The QuadraTherm provides: high accuracy of +/- 0.5% of reading above 50% of full scale for flow meter air measurement and other gases; built-in flow conditioning (inline version); multivariable outputs; flow ranges up to 60 000 SFPM (Surface Feet Per Minute) or (305

SMPS); qTherm®, Dial-A-Gas®, Dial-A-Pipe™; and Hazardous Area approvals. The QuadraTherm is available in two models: the 640i insertion and 780i inline.

The QuadraTherm family has a no-drift sensor with lifetime warranty; has multivariable output: mass flow, temperature, pressure (optional); measures all inert and all non-condensing clean gases and flammable gases (methane, propane, hydrogen, and digester gas); repeatability for mass flow rate is +/- 0.15% ; ValidCal™ Diagnostics to validate calibration in the field; and gas accuracy is +/- 1 °C (1.8 °F).Find more information at www.sierrainstruments.com.

Thermocouple Terminal Blocks

Omega's new patented DRTB-2 series of thermocouple terminal blocks are DIN rail mountable with a built-in miniature female thermocouple connector for auditing and troubleshooting. This series features a screw type terminal for secure maintenance free connections and type K, J, T, E, N, R/S, and U calibrations. The plastic housing is made from gray polyamide 6.6 thermoplastic resin with a UL 94 V0 rating for 85 °C. These thermocouple terminal blocks are UL recognized, ROHS compliant, fully enclosed and require no end plates. The label marking system is redesigned to accept industry standard labels. The screws are stainless steel and captive, and the wire clamps are made of tin plated brass.

Together they provide excellent vibration, maintenance free, and corrosion resistant connection. This product is designed for automation, controls and calibration/auditing. For more information, please visit http://www.omega.com.

Digital Gear Pump Drive for Performance Monitoring

With a larger, brighter interface, analog remote control, and simple programming, the new Cole-Parmer® Digital Gear Pump Drive for Micropump ® A-Mount Pump Head is easy to operate for automated process applications. Simply set time delay between cycles for hands-free dispensing. The batch count function counts down and displays batches completed while the cumulative volume or totalizer tracks amount dispensed across multiple cycles. View the four operating modes—continuous run, timed dispense, copy dispense, and volume dispense—on the graphical, multi-language LCD continually for performance monitoring.

When used with the Micropump A-mount pump head, the drive delivers pulse-free flow. Its turndown ratio is 100:1, while the flow range is from 0.612 to 4212 mL/min. The metering pump drive is IP33-rated to ensure splash and dust resistance. Smooth contours allow for easy cleaning.

Stack up to three drives to conserve benchtop space. For more information, please visit www.ColeParmer.com.

High Isolation RF Switches

Pasternack Enterprises announces an entirely new family of high isolation PIN diode switches consisting of three low insertion loss, high isolation, and high-speed modules covering a frequency range of 1 to 12 GHz.

Pasternack's new PIN diode switches feature very high port-to-port isolation of greater than 90 dB at 1-2 GHz, 80 dB at 2-4 GHz, and 75 dB at 6-12 GHz. Insertion loss of the high isolation switches varies between 1.0 dB and 2.5 dB depending upon the frequency and switching speed performance ranges from 35 and 75 nanoseconds. These new RF switches are designed with complementary-metal–oxide–semiconductor (CMOS) transistor–transistor logic (TTL) drivers, and are fully matched internally for 50 Ohm input and output, which eliminates the customer's need for any additional sensitive RF tuning components.

You can view information on the new RF switches by visiting ww.pasternack.com/pages/Featured_Products/high-isolation-pin-diode-switches.htm.