

The IEEE Instrumentation & Measurement Magazine

February 2015 Issue

Smart Energy Measurements

Editorial

Welcome 2015!

Wendy Van Moer

A new year has come! I would like to take the opportunity to wish you all a very happy and fruitful scientific 2015! And that all your dreams may come true. Together with this New Year, a new column is born! From now on, we will give our readers a voice. You will be able to send us your questions and remarks and we will publish them in the magazine. Our AEIC will take care of this column. Thank you, Shervin!

Energy... We all need it! Can you imagine a life without light and heat? No, so let's use it carefully. In Belgium, they have set up this year what they call the 'OFF/ON' plan. Since they are afraid that there will be not enough energy available this winter, they have a plan to shut off the energy to some parts of the country during some peak hours. No more energy, so no heating, no cooking ... for some hours. It makes you think about how valuable energy is. This February issue is all about smart energy measurements. Enjoy it!

Groetjes,

Wendy

President's Message

Quality-Awareness-Diligence

Reza Zoughi

Dear I&M Society members and colleagues,

A new year is upon us, and it gives me great pleasure to share with you the state of our Society along with some of our accomplishments. Our Society is endowed with many terrific people who continue to give selflessly and diligently of their time and energy. In the most dedicated and professional manner, they work to ensure that the numerous business aspects of

our Society proceed at the highest level of quality while fully-tuned on who we are and what our focus is as a Society.

You may recall that our Vision is to “Be the premier international professional Society in the Instrumentation and Measurement (I&M) fields.” Our Mission is to:

- Provide the most comprehensive and high-quality services to our members and related professionals.
- Serve as the professional incubator for the growth of all (particularly younger) members.
- Be in the forefront of future I&M technological advances.

I would like for us to look back at some of our accomplishments in 2014, which set the framework for our future directions. Let’s look at:

- *IEEE Transactions on Instrumentation and Measurement* – Every indicator of quality, with respect to the technical content as well as timeliness, is at an all-time high, and we have seen sustained progress. The Transactions EIC (Professor Alessandro Ferrero) has laid down a path primarily based on achieving quality through diligence and total awareness of the main focus of the Transactions. Consequently, we have been able to achieve all other goals and metrics. His team of dedicated associate editors, reviewers, and Transactions administrators has made all of this possible.
- *IEEE I&M Magazine* – The magazine serves as one of the most effective conduits between the Society and its members. Last year was an interesting, eventful, and fruitful year for the Magazine. Under the leadership of Professor Wendy Van Moer (the Magazine EIC), significant changes were implemented in the overall process of how the Magazine was run, and an effective and knowledgeable Editorial Board was put in place. All of the published issues have received significant praise in terms of breadth and quality of articles published, as well as other aspects related to the presentation in the Magazine. IEEE has made requests to re-publish several articles from the Magazine in other publications venues. This has been a significant shot-in-the-arm for the Magazine and has reflected very positively on the Society.
- *Conferences* - The Conference Committee instituted a methodical plan to change the submission and accept process, from submitting an extended abstract to one requiring submission of a full proceedings paper. You have most likely seen this change as you submitted your papers for the upcoming I2MTC meeting in Pisa. We believe that in the long-term, this critical change will add more value and quality to our conferences and will attract more high-quality papers.

- *Education* - The Education Committee is consistently receiving more applications for our awards that directly impact our students such as the Graduate Fellowship Award. Serving our members, particularly our students, is one of our main goals. We have had and continue to have a very successful Distinguished Lecturer (DL) program. This program has been consistently more and more visible to our members, and our DLs have done a magnificent job in promoting our core technical fields as well as the Society. I2MTC Tutorials continue to be well attended and successful, receiving high praises from the attendees.
- *Publications* - Our Society officers have been proactively involved with the IEEE with respect to the issue of Open Access. This remains a significant publications-related issue with ramifications way beyond publications. It is comforting to know that as we tread these unknown waters, our Society has a significant voice in how things may be formed in the future.
- *Membership* - Regions 9 and 10 have been particularly the focus of attention in the past several years. To this end, we held our first-ever I2MTC meeting in beautiful Montevideo, Uruguay in May 2014. Subsequent to this successful meeting, the I2MTC board is looking to other future venues in South America. AdCom appointed a Region 10 Liaison, Professor Ruqiang Yan, with whom we hope to proactively work to engage more of our current and future members from this vast region. You may know that I2MTC 2016 will be held in beautiful Taipei, Taiwan.

We are currently gathering critical data by which to better connect to, engage and serve our industrial members. A dedicated Industry Liaison (Mr. Lee Barford) is in charge of this initiative, and we anticipate many good things to result from this effort. Our Chapter Chair Liaison (Professor Sergio Rapuano) has been very active as a critical and effective link to our Chapters. We anticipate increased mutual engagement between our Chapters and Sections and the Society.

- *Technical and Standards Committee* - As I stated in my message last year, we continue the effort to revise, revamp, stimulate, and engage our Technical Committees (TCs) and ensure that they serve the purpose for which they were established, remain active and continually engage their members. We look at TCs as a critical resource for technical expertise, member recognition (e.g., qualified Fellow, Keithley and other Society Award nominations), organizing conference special sessions, etc. This has been a major undertaking, and we have several dedicated individuals who have been expertly navigating this ship of change.

We have come a long way, and still have a way to go. You can positively impact all of these activities for the better and we look to you for help in achieving all of this and more. I close by repeating part of my previous message: “the AdCom is here to help you and facilitate processes that bring tangible, useful and high-quality services to our members. Please keep in touch; you are the Society and we need to hear from you as to how we are doing and what more we can do, and better. I look forward to working with the AdCom, all of our members and the IEEE to continue bringing quality to all aspects of our Society.”

Cheers,

Reza

Letters to the Editor

Call for Letters to the Editor

Shervin Shirmohammadi

Dear Readers,

The IEEE *Instrumentation and Measurement Magazine* is YOUR magazine. As such, we would love to hear your comments and feedback about the magazine and its content. We encourage you to send us E-mails, titled Letters to the Editor as they are known, about anything related to the magazine, including your views on issues, trends, and opportunities affecting the instrumentation and measurement profession, comments or corrections about the articles and columns published, as well as other suggestions about the magazine. Is there anything you appreciate in particular or anything missing in your opinion? Is there a technical error in one of the articles that you wish the authors to clarify, or do you agree and emphasize the points made by authors of a particular article? Tell us what is on your mind.

Please send your letters to the Associate Editor-in-Chief, Shervin Shirmohammadi (shervin@ieee.org), with the subject “Letters to the Editor - *I&M Magazine*.” Please note that your letters may be printed in the magazine (with edits for clarity and brevity.)

Thanks,

Shervin

Article Summaries

Smart Grids *Part 1: Instrumentation Challenges*

(Summary)

José Antonio de la O Serna and Ernesto Vázquez Martínez

In general, a smart grid is a modernized electrical grid that uses digital technology for measurement, control, and protection functions to ensure a network security. It tries to solve the problem of weather-dependent fluctuations of renewable energy power supplies (e.g. wind turbines, or photo-voltaic systems) when they are connected to an actual power system. In two papers in this issue, the authors present some of the challenges raised by Smart Grids in instrumentation and measurement applications, putting emphasis on synchrophasor estimation. In this part 1 article, they describe the problem of identifying a normal condition from a fault condition and between a fault condition and an oscillation using phasor estimations in protective relays.

This summary includes text from introduction to the article.

Smart Grids
Part 2: Synchrophasor Measurement Challenges
(Summary)

José Antonio de la O Serna and
Ernesto Vázquez Martínez

In “Smart Grids Part 1: Instrumentation Challenges,” the authors present some of the challenges raised by Smart Grids in instrumentation and measurement applications. In this second, related article, they succinctly present the contributions of the Taylor-Fourier approach in both applications. The Taylor-Fourier approach is presented by successive extensions, starting from the Fourier filter and ending with the Taylor-Fourier transform. In this way, it is easier to understand how this mathematical framework provides the Taylor-Fourier coefficients of the fundamental component, or of multiple independent frequency components, not necessarily harmonically related, and with much lower frequencies than the fundamental one. Such extensions improve the parametric accuracy of synchrophasors, electromechanical oscillations, or dynamic harmonics.

This summary includes text from the introduction of the article.

Smart Electric Energy Measurements in

Power Distribution Grids

(Summary)

Carlo Muscas, Marco Pau,
Paolo Attilio Pegoraro, and Sara Sulis

Smart Grid is an expression that has diffused worldwide. However, the meaning of this expression is not commonly shared, since there is not yet a totally defined or accepted idea of *smartness*. This paper discusses some of the challenges and the opportunities related to the measurement of energy in modern distribution grids. In particular, the possibility to estimate energy flows in the network branches is explored, by focusing on the importance of a proper choice of the components of the distributed measurement system, mainly in terms of typology, metrological characteristics, and number and position of the measurement devices. Furthermore, some hints are provided about possibly using the same distributed measurement system to achieve a sufficiently clear picture of the power quality in the network.

This summary includes text from the article.

Impact of Improved Measurements on Performance of a Smart Thermal Energy System

(Summary)

Huibert Verra, Jacob Henderson,
John Dyer, and John N. Jiang

Decentralized electrical energy systems will play an essential role in the future smart grid. In this paper, we introduce a new industrial scale electric thermal energy system using a high-voltage electrode boiler, of which the level of electricity consumption can be adjusted as desired. It is also shown that, with appropriate instrumentation and measurement algorithms, the energy consumption can be adjusted quickly and accurately. This feature makes such a thermal energy system an ideal candidate to deal with the variability of renewable energy, to respond to the prices in the electric power markets and support the frequency stability of the power grid.

This summary includes text from the introduction of the article.

Columns

Basic Metrology

The Conference on Precision Electromagnetic Measurements 2014

(Summary)

Bryan Kibble

This column presents an overview of the Conference on Precision Electromagnetic Measurements (CPEM) convened every two years to bring together metrologists from all over the world to discuss improving measurement accuracy. CPEM not only addresses problems of international uniformity of electrical and magnetic SI units, standards and measurements but also allows discussions of physical constants measurements, which are the base of these units. These discussions now include non-electrical constants such as the Boltzmann constant for the entirely new thermodynamic temperature scale. Recently presented were measurements of ancillary quantities such as the local gravitational acceleration needed to link electrical SI units with the mechanical ones. Not unexpectedly, the hot topic of this 2014 conference was the continuing effort to supply the results necessary for the imminent redefinition of the kilogram by adopting a fixed value of Planck's constant h to replace the specified lump of platinum-iridium alloy locked away in a safe at the International Bureau of Weights and Measures.

This summary includes text from the article.

Trends in Future I&M

The Future of Instrumentation and Measurement

(Summary)

Sanna Gaspard

This issue's column shares the perspectives of Dr. Gaspard, the founder of Rubitection, a medical startup with the aim of developing a handheld diagnostic probe called the Rubitect Assessment System, which she co-invented. In the column, her aim is to inspire thoughts about the various ways that the I&M community can play a prominent and relevant role in shaping and improving societies around the world not just limited to healthcare. The improvements may result from applying conventional systems in new ways or by applying unconventional approaches to old problems.

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

History of Physical Standards

This is IEEE Energy: Energy Studies at NIST

(Summary)

James F. Schooley, Sr.

The author devotes this column to the more general topic of energy studies at the National Bureau of Standards (NBS)/ National Institute of Standards and Technology (NIST) and presents a brief history of the NBS/NIST as it has made contributions from its energy studies and applications. He discusses an early focus on heat and thermometry from the early 1900s, and then presents an overview of other decades when the focus transitioned to energy efficiency, the role of NBS in consumers' safe use of natural gas, chemical thermodynamics, and the energy involved in radioactive decay, radio waves, and X-rays. The author also presents the more recent role of the NBS in driving US policy development with its research in space and rocketry, oil and energy conservation and molecular physics.

This summary was written by K. Virostek

Life after Education

Staying Connected- in the Right Way

(Summary)

Max Cortner

The author uses this month's issue to describe how the IEEE Instrumentation and Measurement Society is a great example of a professional network. Although it does not function as a stand-alone internet application/database of the kind we have come to think of as a network, it is more effective in creating meaningful interaction opportunities. The society cuts across institutions, companies, and nations to create a broad network of professionals who are given numerous opportunities to interact at one of the many conferences and workshops organized by the society. Focused opportunities are available through the 39 Technical Committees based on special interest topics. The author presents the importance of the Instrumentation and Measurement Society being cross-connected to other IEEE Societies with whom members share mutual interests.

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

Instrumentation Notes

How Can Energy be Scavenged from Wideband Vibrations?

(Summary)

Bruno Ando

Portable devices, including wireless multi-sensor nodes and wearable electronics, are becoming widely used. Such systems require continuous power sources, and sometimes the use of batteries can be a limiting factor in the exploitation of the device functionality, especially when application contexts require a long operation time. In the framework of autonomous systems, power harvesting represents an interesting and powerful solution. This article presents a survey of recent research on the potential of harvesting energy from mechanical vibrations from the environment. In addition, how mechanical vibrations might provide a significant amount of energy that is usually unused. The author discusses several approaches to follow to develop harvesters from the millimeter scale to the micro-nano scale, including rapid prototyping of inkjet print technology and a nonlinear, bistable configuration provided by snap-through buckling mechanisms.

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

Departments

Society News

I&M Society Chapter Chair Summit 2014

Sergio Rapuano

The Second IEEE Instrumentation and Measurement Society (IMS) Chapter Chair Summit was held on May 12, 2014 at the Radisson Montevideo Victoria Plaza Hotel & Conference Center, Uruguay. It was in conjunction with the I2MTC 2014 meeting. As of October 2014, there are 49 chapters and 2 student branch chapters active in instrumentation and measurement technical fields. In 2014, the IMS chapters grew by adding the Kolkata, India Section IM09/CS23 Joint Chapter. There was a thorough revision of the Chapter Policies of the Society between 2013 and 2014.

The Summit meeting formula changed from the past year by adding current hot topics and the Chapter Best Practice presentations to the round table discussions. One of the new sessions was devoted to the outcome of the First Summit in Minneapolis, Minnesota USA. The second new session was an Education Activities Session, and the third one was a Publications Session.

During the Report Session, the Chapter Chair liaison:

- summarized the Chairs' comments, suggestions, and requests from the first Summit;

- explained the significant revisions authorized by the AdCom, including the previous Chapter Support Programs of the IMS as well as the aims and contents of the new forms available on the Society website;
- reported the contents of the R8 Chapter Coordinator Subcommittee Meeting held in Budapest in April 2014; and
- proposed some ideas for discussion which followed that was oriented to improve the chapter support and Society membership.

The round table of this year focused on several hot topics, like:

- the IMS support to Chapters during the start-up and the revitalization phase;
- the Chapter-Section relations;
- the IMS Chapter Award and the new Funding Program; and
- the Distinguished Lecturer program.

During the round table discussion, the Chapter Chairs presented several comments and suggestions, and they presented the Chapters activities that they thought could be interesting and useful for the other Chairs.

The IMS President, Reza Zoughi, the Membership VP, Kristen Donnell, the Education VP, Max Cortner, and the EIC of *IEEE Transactions on Instrumentation and Measurement* (TIM), Alessandro Ferrero, and the EIC of *IEEE Instrumentation & Measurement Magazine* (I&MM), Wendy Van Moer, attended the Summit at different times. The aims of the Education Session were to make the Chairs aware of the IMS Education Activities and Awards and to let the Chairs interact directly with the VP of Education to receive suggestions, comments, and requests. The aims of the Publication Session were to allow presentation of the policies of the TIM and I&MM to the Chairs and to let them interact directly with the EICs with comments and suggestions that could be useful to improve the quality of the publications and to provide better services to the members. The discussions were brief, due to time constraints, but the Chairs provided several useful interactions with the AdCom representatives.

The print article includes photos from the event.

TC Update

IMS TC-39 and Cross-Societies Initiatives: The IEEE SmartGrid

Mihaela Albu

As Instrumentation and Measurement Society (IMS) members, we are part of a larger community, sharing the IEEE values and endeavoring to shape the future of our profession. However, we live in a complex world where technological borders are hard to trace, keep, or even define. Recognizing this, IEEE strived in the last decade to encourage not only the active participation of its members to the societies' life but also a deeper collaboration across disciplines.

To this aim, a new IEEE organizational unit was established in 2012, the IEEE Future Directions Committee (FDC) (<http://www.ieee.org/about/technologies/index.html>), whose generous objectives are targeting emerging technologies and new applications of current technologies. Today (as of November 2014) there are eight working groups:

- Cloud Computing (<http://cloudcomputing.ieee.org>),
- Cyber Security (<http://cybersecurity.ieee.org>), launched by the IEEE Computer Society in 2014,
- Green ICT, Information and Communication Technology (ICT),
- Internet of Things (IoT) (<http://iot.ieee.org>),
- Rebooting Computing (<http://rebootingcomputing.ieee.org>),
- Smart Cities (<http://smartcities.ieee.org>),
- Software Defined Networks (<http://sdn.ieee.org>) and
- Transportation Electrification (<http://smartvehicle.ieee.org>),
- Life Sciences (<http://lifesciences.ieee.org>).

Life Sciences has now evolved to be operational in 2014. It transitioned from the Life Sciences Initiative (approved by the IEEE Board of Directors in 2010), and has the support of the six Founding Societies (Circuits and Systems; Communications; Computer; Consumer Electronics; Control Systems; and Engineering in Medicine and Biology). IMS has a large number of technical committees, reflecting the richness of our field. Therefore, the IMS members are invited to actively contribute to the wider goal of representing the instrumentation and measurement community within these emerging future IEEE communities.

The life cycle of such cross-societies initiatives spans three years. Success is measured by moving toward a well-established community, either as a new or existing IEEE society. That has been the case for the IEEE Smart Grid (SG), which was the first such initiative. It was established at the end of 2010 and has become very visible by its Web Portal (<http://smartgrid.ieee.org/>) that has had more than 1.5 million page views since Jan. 2010 from over 200 countries. It also has monthly Newsletters (with 10k subscriptions) that have been published since January 2011. Our Society is an active member of this community and has the benefit of posting relevant IMS activities on the Smart Grid portal for the wide audience.

The maturity and success of this initiative brought the IEEE Smart Grid to become a unit of the IEEE Power Engineering Society, following a transition plan (effective January 1, 2014) agreed upon by the PES Board of Governors. In this process, all Organizational Units (OUs) and Societies have been invited and encouraged to participate. The organizational structure includes five PES Representatives and one representative from other OUs and it is based on participation. Our Society representative in IEEE Smart Grid is TC-39 (Measurements in Power Systems, <http://smartgrid.ieee.org>) Chair, Lorenzo Peretto. Lorenzo has made several contributions in the SG Newsletters 2011, 2012, and 2014. The July 2014 issue was almost entirely dedicated to the IEEE IMS connection to the modern measurements inclusion in the smart grid approaches, like the phasor measurement units applicability in distribution systems and low power instrument transformers. In addition, throughout the year we have the Applied Measurements for Power Systems (AMPS) series of workshops and the IMS I2MTC flagship Conference advertised on the IEEE SmartGrid Portal.

New Products

Robert Goldberg

Please send all "New Products" information to:

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Laser Creates Microfluidic Devices with Micron-Scale Resolution

LPKF, in cooperation with the Slovenian company, Aresis, and the University of Ljubljana, is developing new low-cost, fast processes for structuring of microcomponents. Maskless UV laser direct imaging (LDI) of photosensitive polymers (photoresists) offers numerous advantages over classic mask projection techniques. Research and development in the field of microfluidic devices and micromechanical systems benefit from fast prototyping processes such as the LPKF-LDI. Lab-on-a-chip devices help miniaturize processes and reduce liquid sample sizes as well as waste. This opens up tremendous possibilities for the LDI process in medicine, biology, chemistry, and physics.

The applications are diverse – blood and cell analysis, medical diagnosis and screening, sensors (chemical, biological, environmental, and weapons technology; automotive engineering), synthesis of chemicals, and physical experiments. Three processes are mainly used to manufacture microfluidic devices on the scale of tens of nanometers to more than a hundred micrometers. The currently prevailing method of photolithography is primarily recommended for large-scale production. For frequent layout changes or low production quantities, though, the process is too elaborate.

In the electron beam method, the structures are written directly onto a resist. The electron beam has resolutions of between 20 and 50 nm. However, special resists, conductive substrates, a high vacuum, and an extraordinarily large amount of time are required for this process. With Laser Direct Imaging (LDI), a scanner-guided laser beam writes structures directly, rapidly, and precisely onto the photoresist without using a mask. This results in extremely smooth side wall edges.

The LPKF ProtoLaser LDI can be used for production of microfluidic devices as well as MEMS, BioMEMS, integrated optics, and photonic experiments with microscale structures. Development costs are considerably lower than for electron beam lithography and for numerous mask alignment systems. For more information on this process, please visit <http://www.lpkfusa.com/>.

Digitizer Function Embedded In a LockIn Amplifier

Less than three years after the introduction of its high-end signal processing platform UHFLI Lock-in Amplifier, Zurich Instruments is proceeding with the next integration step and offering a new fully featured digitizer option for the UHFLI. Zurich claims that this latest extension is the first time that a lock-in amplifier has been equipped with the capability of storing a raw digitized signal along with demodulated samples.

The new product option is called the UHF-DIG Digitizer and offers competitive specifications when compared to high-resolution digitizers. As the UHF-DIG option is always paired with a high-performance lock-in amplifier, it cannot be purchased independently and therefore is not intended to compete against general purpose digitizers. Instead, Zurich Instruments addresses the niche applications that profit from the unique integration of time-domain (digitizer) and frequency domain (lock-in amplifier) instrumentation, always supported by its LabOne - All in One analysis software

Summary of UHFLI features:

- 600 MHz operation frequency
- 2 independent lock-in units

- 2 high-performance signal generators
- 4 independent harmonics per lock-in unit
- High-resolution 12-bit scope with 65k samples
- FRA frequency response analyzer
- FFT spectrum analyzer with 5 MHz span
- LabOne® support for Windows and Linux

For more information on this product, please visit <http://www.zhinst.com/products/uhfli/uhf-dig>.

Fiber Optic Test Links Qualify 40 and 100 Gigabit Ethernet Transceivers

Delaire USA's worst-case bandwidth test equipment, speeds and simplifies Ethernet component and system testing with the introduction of the Delaire USA 8800 Family of Fiber Optic Test Links. There is a test link for each of the 40 Gigabit Ethernet (40GE) and 100 Gigabit Ethernet (100GE) variants. From 40GBASESR4 to 100GBASE-SR10, there is now a fast and simple way to test transceivers against the IEEE 802.3 standard.

The Delaire USA 8800 Family of Fiber Optic Test Links approximates the standard's worst-case fiber lengths and worst-case bandwidths using real fiber. Inside each Delaire USA 8800 Family of Fiber Optic Test Links bench-top or rack-mounted unit, there are spools of fiber that produce the worst-case bandwidths required by the IEEE 802.3 standard. Lengths are spooled to within an accuracy of +/- 0.06%.

The 40GE uses four spools of engineered OM3 or OM4 fiber; 100GE uses ten spools. Connectors are mounted on the front panel. This allows data farm installers to conduct Layer 1 tests on routers and servers at their facilities before arriving at installation sites and avoids costly installation and commissioning delays. It allows system manufacturers to qualify transceivers for use in their systems and maintain quality and performance levels. The Delaire USA Family of Fiber Optic Test links also provides a practical way for transceiver manufacturers to qualify designs for the IEEE 802.3ba standard and to use in their production final acceptance test sets. More information is available at <http://www.DelaireUSA.com>.

Sapphire Optics Withstand UAV Hard Landings

Custom fabricated UAV sapphire optics that provide greater durability and scratch resistance from sand, dirt, and hard landings than germanium, have been introduced by Meller Optics, Inc. of Providence, Rhode Island and transmit from the visible through near IR.

Meller UAV Sapphire Optics feature Moh 9 hardness which is second only to diamond, are clear as glass, and transmit from 270 nm to 4.7 microns. Ideally suited for use as outboard

protective optics for imaging sensors, they can be custom fabricated as lenses, windows, and domes and incorporate mounting features to help assure their ability to withstand hard landings.

Available from 0.25 in. to 10 in. diameter (0.635 to 25.4 cm) with varying wall thicknesses, Meller UAV Sapphire Optics can incorporate stepped edges and elliptical edge shaping, holes, slots, and wedges for mounting. Flatness can be held to 1/10th wave in the visible and < 2 arc sec. in/in parallelism, with surface finishes from 60-40 to 40-20 scratch-dig. Meller UAV Sapphire Optics are priced according to configuration and quantity. Price quotations are available upon request.

For more information, please visit <http://www.melleroptics.com>.

New Multi-Function, Hand-Held Pressure Calibrator

GE Measurement & Control announces the new DPI 611 hand-held pressure calibrator from the GE Druck family of products. The DPI 611 business builds on the model DPI 610. A robust and easy-to-use device, it is twice as efficient at generating pressure, half the size of its predecessor, and has twice the pressure accuracy and three times better electrical accuracy. The DPI 611 is the latest addition to GE's integrated calibration and communication solutions platform and are designed for use throughout the process, oil is gas, power generation and general engineering sectors.

The new instrument is the first dedicated pressure calibrator to feature swipe screen touch technology. Its intuitive screen interface displays a comprehensive application dashboard, and a task menu allows simple, three-touch set-up for any pressure test or calibration. A "Favorites" facility also enables quick access to frequently used tasks and custom configurations, which are easily stored. Results are displayed on the large screen and can be documented in 8 GB of user memory.

The instrument can automate processes to significantly reduce calibration times by running pre-defined procedures, calculating errors and reporting PASS/FAIL errors. The DPI 611 integrates seamlessly with leading calibration and maintenance software, including 4Sight from GE, to help maintain compliance with industry standards and regulations and improve process and operational efficiency. The DPI 611 retains the comprehensive electrical measurement and sourcing capabilities of the DPI 610 and includes a 10 VDC regulated supply and 24 V loop power but is three times more accurate. Specifically, it is in pressure generation where it demonstrates truly significant improvements. Its mechanical pressure-generating system eliminates the pitfalls of electromechanical devices and has been totally redesigned to create 95% vacuum or generate maximum pressure of 20 bar/300 psi in just 30 seconds, while holding the instrument in one hand or on a table top.

For further information, visit <http://www.ge-mcs.com>.

New Boundary-Scan Tools for Test

JTAG Technologies announces support for new IEEE JTAG Standard (IEEE P1687) as an extension to basic IEEE 1149.1. IJTAG/ P1687 has been devised as an evolutionary extension to the basic IEEE 1149.1 and IEEE 1500 standards and describes how embedded (test) instruments within a device or S-O-C may be accessed using the conventional 4/5 wire JTAG port.

While the instruments themselves are not described as part of the standard, all of the mechanisms for interacting with the instruments are. JTAG Technologies has therefore developed tools to read in the new P1687 description format and make available the features of all compliant devices to their users.

The specific P1687 module supports the key language elements of the proposed standard, namely: ICL- Instrument Connectivity Language that defines the hardware/logic interface to the instruments IP; and PDL - Procedural Description Language that defines the patterns or vectors that are applied and sensed via the logic interfaces in order to invoke the instruments' IP functions. The P1687 tool contains all the necessary parsers and interpreters required to create working applications for P1687 compatible devices that are now emerging in some key industry sectors. Also available is the JTAGLive CoreCommander, a simple, low-cost system that uses microprocessor core emulation modes to aid hardware validation and board (PCBA) testing. The easy user interface and low-cost JTAG interface hardware will enable users to construct read and write sequences from the processor core to embedded or external peripherals and peripheral controllers in minutes.

CoreCommander routines are ideal for diagnosing faults on 'dead-kernel' boards in either design debug or repair, since no on-board code is required to set memory reads and writes. Boundary-scan deficient parts can also be better utilized during production test, as CoreCommander-driven functions increase fault coverage. Since CoreCommander is Pythonbased, it complements perfectly the JTAGLive Script product, allowing access to mixed-signal parts such as ADCs and DACs and also synchronised testing to full boundary-scan devices.

For more information, please visit <http://www.jtaglive.com/>.

High-Speed 5 GS/s PCIe Digitizer Cards

Spectrum is offering a solution to engineers and scientists looking to capture and analyze fast electronic signals in the DC to 1 GHz frequency range. The company has greatly extended the performance of its PCIe based instruments by adding nine new models to its M4i series of

digitizers. These cards provide real-time sampling rates up to 5 GS/s and high bandwidth making it possible for them to measure signals, edges and pulses down into the sub nanosecond realm. Models are available with one, two or four channels, and come complete with large 4 GB on-board memories, advanced acquisition modes, and a host of software tools that allow easy integration into any system.

The new cards are useful for replacing conventional test instruments (such as digital oscilloscopes and spectrum analyzers) whenever measurement speed, flexibility, size or channel density becomes an issue. They can be used inside a PC, when the technology needs to be embedded or outside the PC (with an expansion box) if benchtop access is required.

The new digitizers are equipped with fully calibrated frontend signal conditioning circuits that offer input ranges from ± 200 mV up to ± 2.5 V full scale. Further signal conditioning can also be provided through the use of a wide range of optional amplifiers.

To allow the capture of complex and rare events, the cards also feature an array of flexible trigger modes. Triggering is possible on any channel or either of the two external trigger inputs. All of the trigger sources can be logically combined to enable conditional triggering on specific input patterns. For applications requiring more than four channels, it is possible to run up to eight M4i cards in one system. The cards can be connected together using Spectrum's Star-Hub option that distributes the clock and trigger signals between each card. By using Star-Hub it is possible to make systems that have from 8 to 32 fully synchronous channels.

Please visit <http://www.spectrum-instrumentation.com> for more information.

Micro-Ohmmeter Probes are Rugged and Comfortable

TEGAM, Inc. has introduced five new Kelvin probes. When used with TEGAM's R1L bond meters or the 1740 or 1750 microohmmeters, they enable engineers and technicians to more easily make four-wire bonding and other low-resistance measurements: The BKP-10 Kelvin probes are designed for heavy-duty applications where you must make four-wire surface resistance measurements on bonds and other metallic surfaces. Pin-to-pin spacing is 0.19 in (4.8 mm), and the probe can be ordered with three types of pins, including a spear point pin, a flat point pin for making surface resistance measurements, and a serrated pin when a coating must be pierced. The test leads are ten feet long (3.05 m) and terminated with dual banana plugs on 0.75 in spacing for use with the R1L bond meters.

The MKP-6 and MKP-1750/5 Kelvin probes are designed for making four-wire surface resistance measurements in tighter spaces. Pin-to-pin spacing is 0.11 in (2.8 mm), ensuring an operator error-free measurement. These probes can be ordered with five types of pins, including a spear point pin, a flat point pin, a serrated pin, a spherical point pin, and a rotating pin. This

probe uses a unique coaxial pin with a 0.63 in diameter that allows four-wire resistance measurements in very tight spaces. The test leads of the MCP-6 are ten feet long (3.05m) and terminated with dual banana plugs on 0.75 in spacing for use with the R1L bond meters. The test leads of the MCP-1750/5 are five feet long (1.54 m) and terminated with a connector compatible with the TEGAM 1740 and 1750 micro-ohmmeters.

To learn more about TEGAM's probe product offerings, visit <http://www.tegam.com/category.asp?categoryID=54>.

Dynamic D/A Converter

Keysight Technologies announces the M9188A, a PXI-based, 16-channel, single-slot unipolar dynamic digital/analog converter (DAC). The M9188A is capable of supplying typical waveforms of up to +30 V. This eliminates the need for engineers to design and develop signal conditioning circuits for applications requiring up to +30 V and thus reduces test system application development and setup time. The M9188A provides a variable current source, such as DC, and pulse waveforms of up to +20 mA. This eliminates the need for an additional current transformer or source measure unit for application tests requiring current source signals. This helps users achieve a lower cost of test resulting in lower capital expenditure requirements.

The M9188A has an output disconnect switch at every channel. This helps prevent potential damage to the device under test (DUT) from external signal power sources and helps user achieve greater uptime. With 1 MB available memory per channel, the M9188A can behave like a basic arbitrary waveform generator (ARB) by simulating waveforms with a sampling period from 2 μ s to 512 μ s at up to 500 kSa/s update rate.

Information is available at <http://www.keysight.com>.

USB Pressure Sensor

The PX51-USBH pressure sensor is the latest in Omega's high speed USB output transducer family. Omega's 1 kHz, 24 bit, high precision USB core is combined with a heavy duty bonded film pressure sensor to extend its USB output capability to pressure ranges up to 30K PSI. An all stainless steel body, as well as a choice of Imperial or Metric pressure ports, transfer pressure data directly to your computer.

The transducer is temperature compensated from 60 to 160 °F, and can be operated between -50 and 185 °F. The PX51-USBH is available in pressure ranges from 750 to 30K PSI. Accuracy is +/-0.25% FS (linearity and hysteresis combined), and Span and Zero Thermal effects are 0.003 and 0.005% FSO/F respectively. It is CE approved to industrial specification EN16326-1:2006.

Omega's newly designed software, which allows graphing, logging, and displaying of data from multiple sensors, comes free of charge. Additionally, the digital pressure data can be accessed via ASCII commands, .NET APIs (included), and LabVIEW.

Please visit <http://www.omega.com> for more information.

Current Loop Transmitter Board Provides Channel-to-Channel Isolation

Sealevel Systems, Inc. adds a new 4-20 mA current loop board to the SeaRAQ™ family of I/O expansion designed for Relio industrial computers. The 4-20 mA signal standard remains a popular method for signal transmission in harsh environments, even over long distance. Current loop has a low sensitivity to electrical noise and is not affected by signal loss over cable runs or interconnections. Offering eight 4-20 mA transmitter channels, the 6520 board is ideal for controlling a wide variety of industrial process control and test equipment that use 4-20 mA signaling.

The 6520 provides 1500 VAC field-to-logic and channel-to-channel isolation to prevent ground loops in measurement systems and protect the host computer from harmful voltage spikes and surges. Field wiring connects to the boards using 20-position, removable, high-retention Phoenix terminal blocks compatible with 16-30 AWG wire. The board 4-20 mA transmitter is loop powered and compatible with 18-32 VDC.

Sealevel's SeaMAX software drivers and utilities make installation and operation easy using Microsoft Windows and Linux operating systems. Standard operating temperature range is 0 - +70 °C. Product features include:

- Eight 4-20 mA transmitter channels
- 18-32 VDC user loop voltage range
- 1500 VAC channel-to channel isolation
- Loop powered transmitter
- Reliable long-distance communication even in harsh environments
- Field wiring is simplified via removable 3.5mm terminal blocks compatible with 16-30 AWG wire
- Input power provided via backplane connector
- Included SeaMAX software supports Microsoft Windows and Linux operating systems.

Find more information at <http://www.sealevel.com>.

Tachometers for Engine Rotational Speed Measurements

Marsh Bellofram has introduced its WESTCON Model 758- 9905000, an industrial AC tachometer generator, designed for high-reliability 24/7 engine rotational speed measurements within voltage responsive systems. WESTCON 758 Series AC tachometers are designed to convert rotational shaft speed inputs into linear analog voltage outputs, even in the harshest of environments. Approximate starting torque is 2.0 in-oz., which is maintained at running speeds of up to 1000 RPM. Their rugged construction incorporates a multi-pole cylindrical magnet, which turns within a wound stator. The stator itself is constructed from high-quality transformer iron lamination material. Units are housed within a dustproof aluminum alloy housing and feature an SAE 1/8 in (3.18 mm) type steel mounting with 3/16 in (4.76 mm) solid drive dog. Single phase output current is expressed as a sine wave over the full speed range of the tachometer. Units feature 100 ohm stators as standard. Two binding posts are available for electrical connection.

Custom stator ranges are available upon request. For more information about the WESTCON Model 758- 9905000 or other industrial AC tachometers available from the WESTCON division of Marsh Bellofram Corporation, visit <http://www.marshbellofram.com>.