A bridge to the acquisition of dynamic signals

Megahertz data acquisition

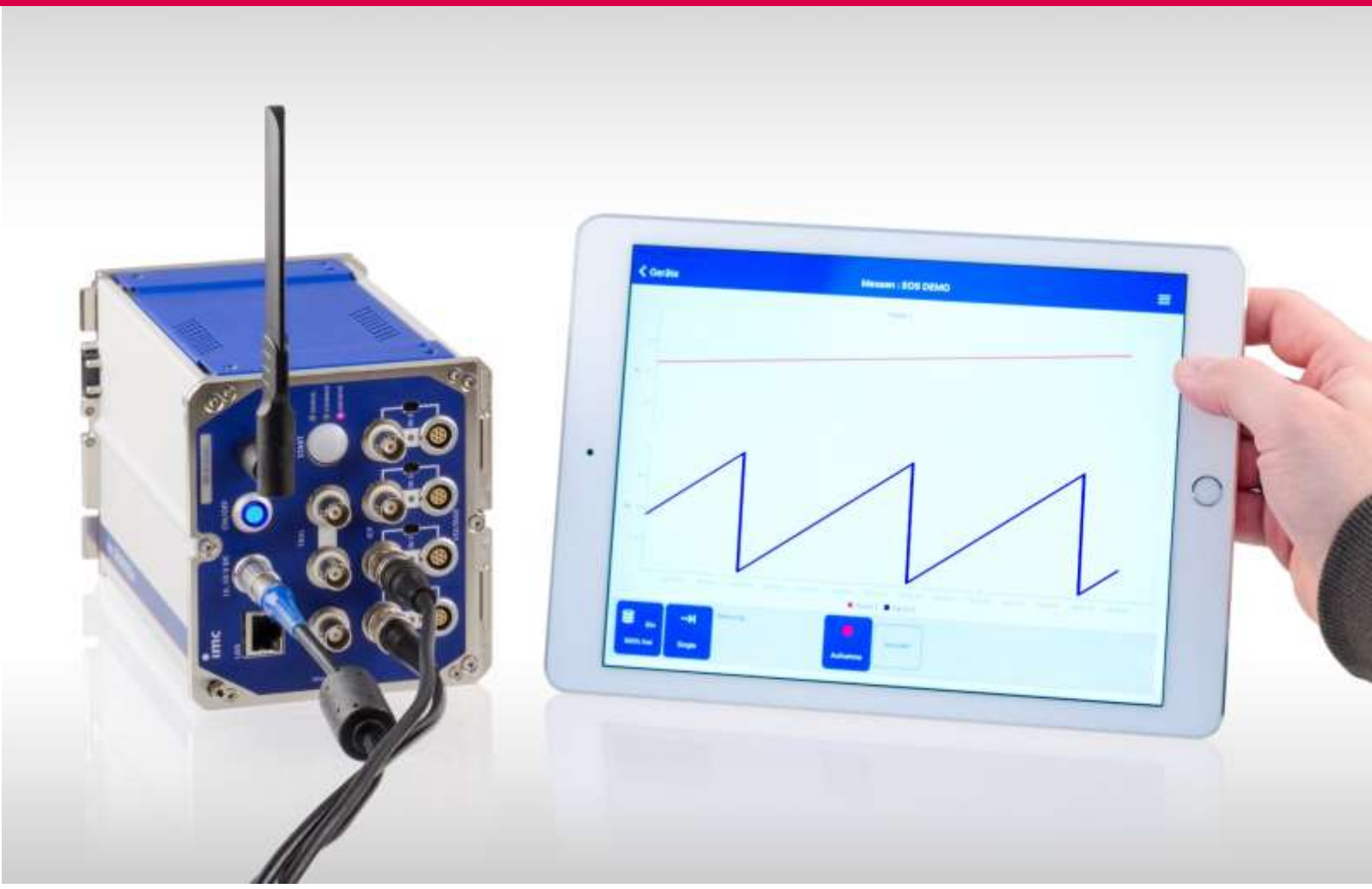

Fig. 1: imc EOS captures signals at 4 MHz

The demands placed on modern test environments are constantly increasing. In addition to the acquisition of purely physical quantities such as pressure, temperature, voltage and so forth, fast signals from electromechanical controls, for instance, must also be acquired in high resolution. This demands new measurement concepts that combine “slow” and “fast” data acquisition synchronously.

The demands are increasing

Many vehicle component tests focus on the influence of different physical quantities. Temperature, pressure and (structure-borne) noise as well as current and voltage are measured synchronously on several channels and correlated during the test itself or in later analysis. When only different physical quantities are measured on a test stand, measuring systems capable of acquiring signals of up to 100 KHz per channel are sufficient. This is because the mechanical inertia of the materials does not require a higher sampling rate. For one thing, measurement technology reaches its limits in especially harsh environments with the presence of moisture and extreme temperatures; secondly, in the number of channels; and/or thirdly, in the demand for real-time analysis of particularly extensive measurement data on the measuring device.

A test environment that is tailored to the acquisition of purely physical quantities must be suitable for measuring processes that are fast and dynamic, as these require high sampling rates. With the use of modern vehicle components, the boundaries between "slow" and "fast" signal acquisition are also disappearing in measurement technology. For example, to measure voltage signals from electronic controllers (Piezo actuators) of circuits, ignition or injection processes, measuring systems with sampling rates in the megahertz range are required. Oscilloscopes are traditionally used for this, but they do not capture other quantities and do not correlate the recorded signals with other signals. The new imc EOS measurement amplifier creates the necessary bridge for correlating parallel low and fast signals in dynamic processes.

Investigation of dynamic processes

imc EOS, a four-channel, isolated measurement amplifier, measures fast and dynamic processes such as current and voltage, but also vibration, (structure-borne) noise, and explosion and ignition processes with sampling rates of up to 4 MHz. This measurement device has a BNC or LEMO interface to acquire these high-frequency signals. Precision current transformers are also supported. imc EOS can be used as a high-speed recorder and directly measure voltage signals up to ± 60 V. imc EOS also supports IEPE/ICP sensors such as accelerometers, microphones and force sensors for the acquisition of other high-frequency signals like sound or vibration. imc EOS offers high signal quality, because the analogue bandwidth extends up to 1.7 MHz and digitizes the acquired signals with 24 bits at up to 4 MHz per channel.

Fig. 2: imc EOS-U4 with integrated WLAN

If more than four channels are required for measurement data analysis, as is conceivable when investigating explosions, ignition processes or crashes, there is the option of com-

bining several EOS systems into one block. The user benefits from the fact that imc EOS has the same housing design as the tried and tested imc CRONOSflex series of measurement systems. Using a tried and tested click mechanism, several measurement amplifiers can be quickly connected to one another. When different signals must be recorded, all other imc CRONOSflex modules can also be mechanically clicked together with the imc EOS measurement amplifier to form one block. CRONOSflex series accessories such as power supply modules and handles, battery-buffered UPS solutions (“power handle”) or sensor supply modules for high-performance current converters and current probes are compatible with imc EOS measurement devices.

Furthermore, with imc NET-SWITCH – also with a click connection – a 5 port GBit network switch is available to the user, enabling the synchronous networking of systems. An especially comfortable feature: complete systems clicked together only need to be powered once. As a result, significantly reduced effort is required on the part of the user when wiring devices. imc EOS is also compatible with all other imc measurement data acquisition systems and can be operated synchronously with these during measurement. An existing measurement configuration with imc devices, such as a component test stand, can therefore be expanded to include measurement technology with high-speed channels. imc test stands for use in the laboratory or test field have a large measurement range and are suitable for a wide variety of tasks.

All mechanical, electrical and thermal properties, overload capacity and technical data such as efficiency and the power factor are investigated.

In standalone operation, an imc EOS measurement amplifier can save the data on an onboard flash memory of up to 1 TB for processing at a later time.

Fig. 3: imc EOS clicked together with sensor supply, mains switch and UPS handle from the flex series

If the device is networked via Ethernet, data can be transferred to a PC for real-time data processing with imc FAMOS or archived initially on network attached storage (NAS). Configuration and control of data acquisition is performed by imc STUDIO software, which can also be used to communicate with all other imc measurement systems in the setup – for example for control on a test stand.

Other application fields of imc EOS

Engineers face the problem of recording fast, dynamic signals often in combination with "slow" signal frequencies in other application fields as well. Forming processes such as crimping, bending, joining, punching or cutting can be investigated within the context of material tests. Changes to the material structure (“structural impact”) in crash tests, drop tests, cracking tests, dynamic stress and compression tests or in fatigue fractures can also be measured with imc EOS using ICP force sensors. This measurement amplifier is also suitable for recording dynamic loads – small strain variations and vibrations at a high base load, such as the reproduction of shock waves in materials and structures. In continuous monitoring, cyclical processes and loads can be recorded, such as in vibration and NVH analyses in the construction industry, or condition monitoring. Here, too, the ability to integrate imc EOS with other imc measurement systems and imc software for data analysis, control and process automation provides an unbeatable advantage. Within the framework of smart condition monitoring solutions from imc, the acquisition of dynamic sound and vibration signals from a machine, tool or workpiece can easily be placed in the overall context of other machine signals.

Furthermore, imc WAVE software provides the user with comprehensive analysis functions for in-depth sound and vibration analysis. imc EOS can also be used to record and investigate explosions or blasts. The robust architecture of the housing for this measurement amplifier – designed for an operating temperature from -10 ° C to + 55 ° C (without condensation) and with shock and vibration resistance according to the MIL 810F standard – makes it not only suitable for the test stand but also for data acquisition in the field, on building structures and in mines.

Authors:

Martin Riedel, imc Test & Measurement GmbH
Caroline Gabbert, imc Test & Measurement GmbH

Additional information:

imc Test & Measurement GmbH

Voltastr. 5
D-13355 Berlin

Telephone: +49 (0)30-46 7090-0
Fax: +49 (0)30-46 31 576
E-mail: hotline@imc-tm.de
Internet: http://www.imc-tm.com

imc Test & Measurement GmbH is a manufacturer and solution provider of productive test and measurement systems. imc implements metrological solutions for research, development, service and production.imc has particular expertise in the design and production of turnkey electric motor test benches.Precisely outfittedsensor and telemetry systems complementourcustomer applications.

Our customers from the fields of automotive engineering, mechanical engineering, railway, aerospace and energyuse imc measurement devices, software solutions and test stands to validate prototypes, optimize products, monitor processes and gain insights from measurement data. As a solution provider, imc offers their customers an attractive and comprehensive range of services.

These include project consulting, contracted measurements, data evaluation, specialist deployment, customer-specific software development and system integration.
imc consistently pursues its claim of providing services for “productive testing”.

If you would like to find out more specific information about imc products or services in your particular location, or if you are interested in becoming an imc distributor yourself, please go to our website where you will find both a world-wide distributor list and more details about becoming an imc distributor yourself:

http://www.imc-tm.com/our-partners