

Welcome to the Webinar

Easily add any Sensor Data to your CAL tool when fine-tuning In-vehicle Software

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/ 3pm Europe Summer Time**

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The Presenters

Christof Salcher

- Engineer Electrical & Information Technology, Technical University Munich (1999)
- Now heading Product Management Test & Measurement at HBK since 2007
- Previously – different roles in automotive software engineering



David Norris

- BS in Mathematics from University of Illinois at Urbana-Champaign (2003)
- Embedded Software Engineer with HBK since 2015
- Previously – Senior Software Engineer in flight simulation and real-time avionics integration at Frasca International, US



Agenda

- Challenges in Automotive Industry and Software Development
- Need to fine-tune Software in Lab or Mobile Testing
- QuantumX and xCP-on-Ethernet Integration
- Quick Summary and Benefits

- Live demo

Influencing Factors to the Automotive Market



Influencing Factors to the Automotive Market



Geo politics / economical
import taxes – protectionism!



Urbanization / urban transport
Density, safety, traffic jams,
parking, public transport, ...



Sustainability & Laws
Zero Emission, overall emission
reduction of fleet , energy mix,
noise, safety



Innovative Technologies
Digital Transformation as Mega Trend –
software, smart / IoT, blockchain, 3D
printing, autonomous driving, SaaS,
simulation,



Service / Sharing
Position-based digital journey



Old and New Players
Classic OEM / Tier 1 / Start-ups
Sharing services

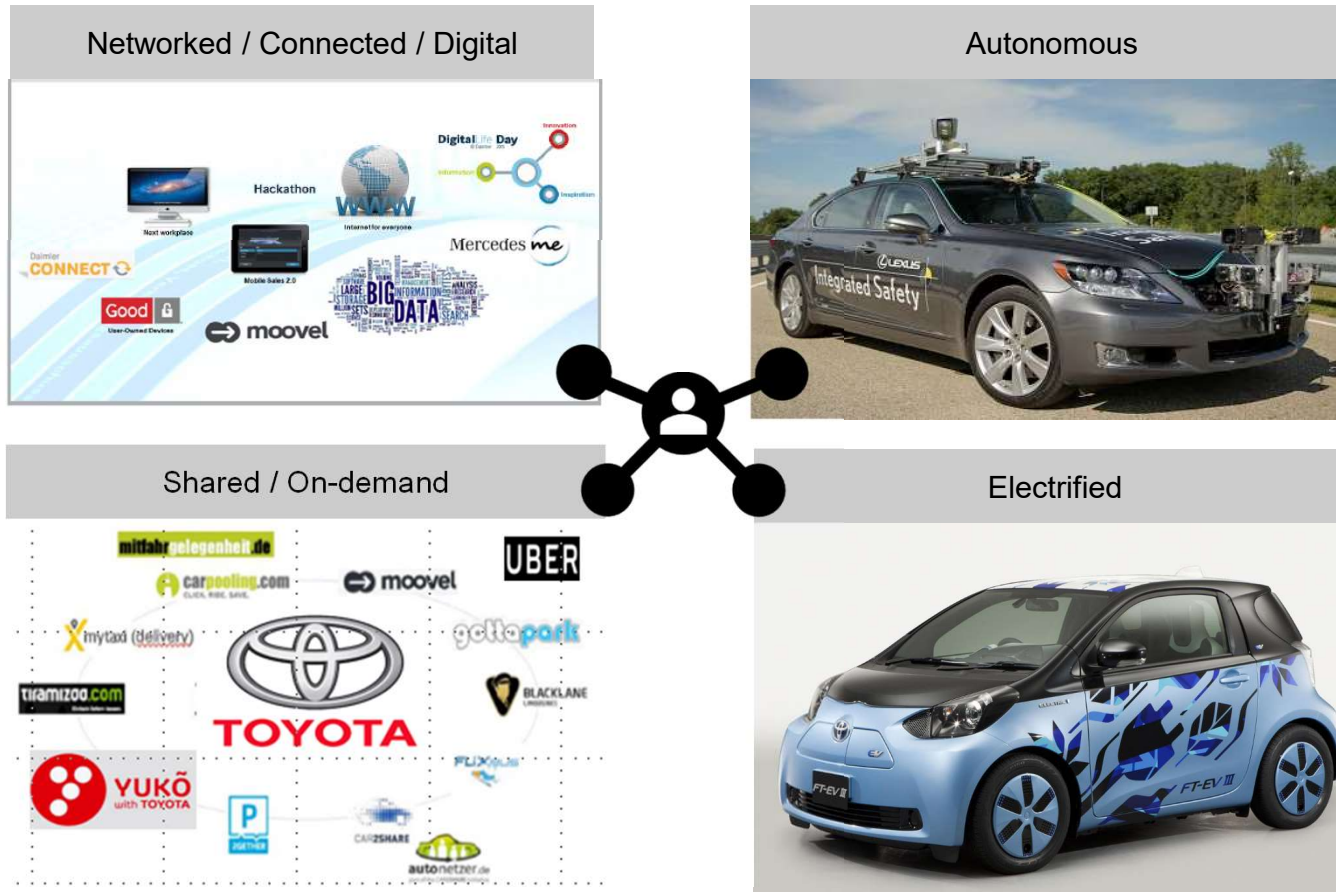


Society & consumer trends
(voice, touch, gesture, always on,
streaming, crypto digital currency,
online ordering, monthly services,
...)



Employees & Work environment
(work / life, digital, interactive)

The Automotive Mega Trends



The Challenge from a Product point of View

The Mega Trends – Sustainable – Electrified – Autonomous – Networked and Shared

The amount of software grows exponentially driven by multiple forces

- Innovation through an improved user experience in whatever geographical market
- Increasing **efficiency / performance**
- Increasing **comfort and safety** by further assistance (ADAS) or autonomous driving

The Challenge from a Product point of View

In vehicle electronics are established in all domains of a vehicle since decades. It started with radio and entertainment, electronic control or management units (ECU) attached to engine, gearbox, brakes, for safety – very local, dedicated sensors and actuators, typically CAN networked. The amount of ECUs was growing and growing and thus the overall networked complexity.

The Challenge - the amount of software in vehicles grows exponentially driven by multiple forces

- Innovation through an improved user experience in whatever geographical market
- Increasing **efficiency / performance** by electrification, hybrids or alternative fuels
 - Means electric drive, fuel cell, battery, charging, recuperating, overall thermal management, ...
- Increasing **comfort and safety** by further assistance (ADAS) or autonomous driving
 - Networked vehicles: V2V, V2I, to OEM including Over-the Air update (OTA) from the user

The Challenge for EE development and testing point of view

- Need towards **less**, but more **powerful electronics** and an open **software framework**
- **Object-oriented programming languages** and **enhanced operating systems**
- **Scalable** and **reusable function blocks** cross domains and across different cars
- **Safe operation** is must, fulfilling safety standards (SOTIF, ISO 26262 / ASIL)
- **Quicker** from idea to roll-out into vehicles is a market advantage
- **Easy to maintain** when in use (OTA – Over-the-Air services)

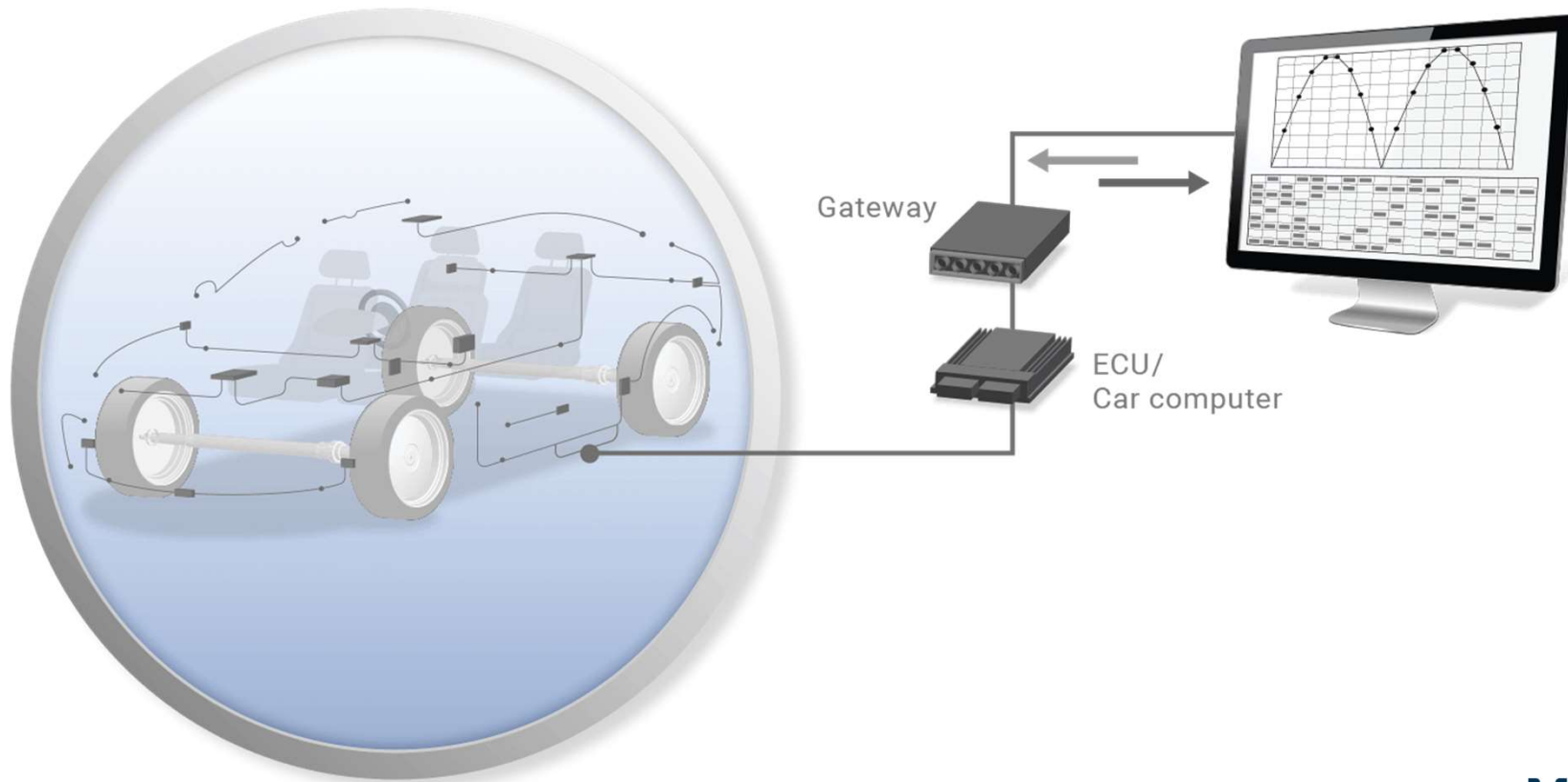
Flexible tools are required for system and software development and testing

The Challenge for EE development and testing point of view

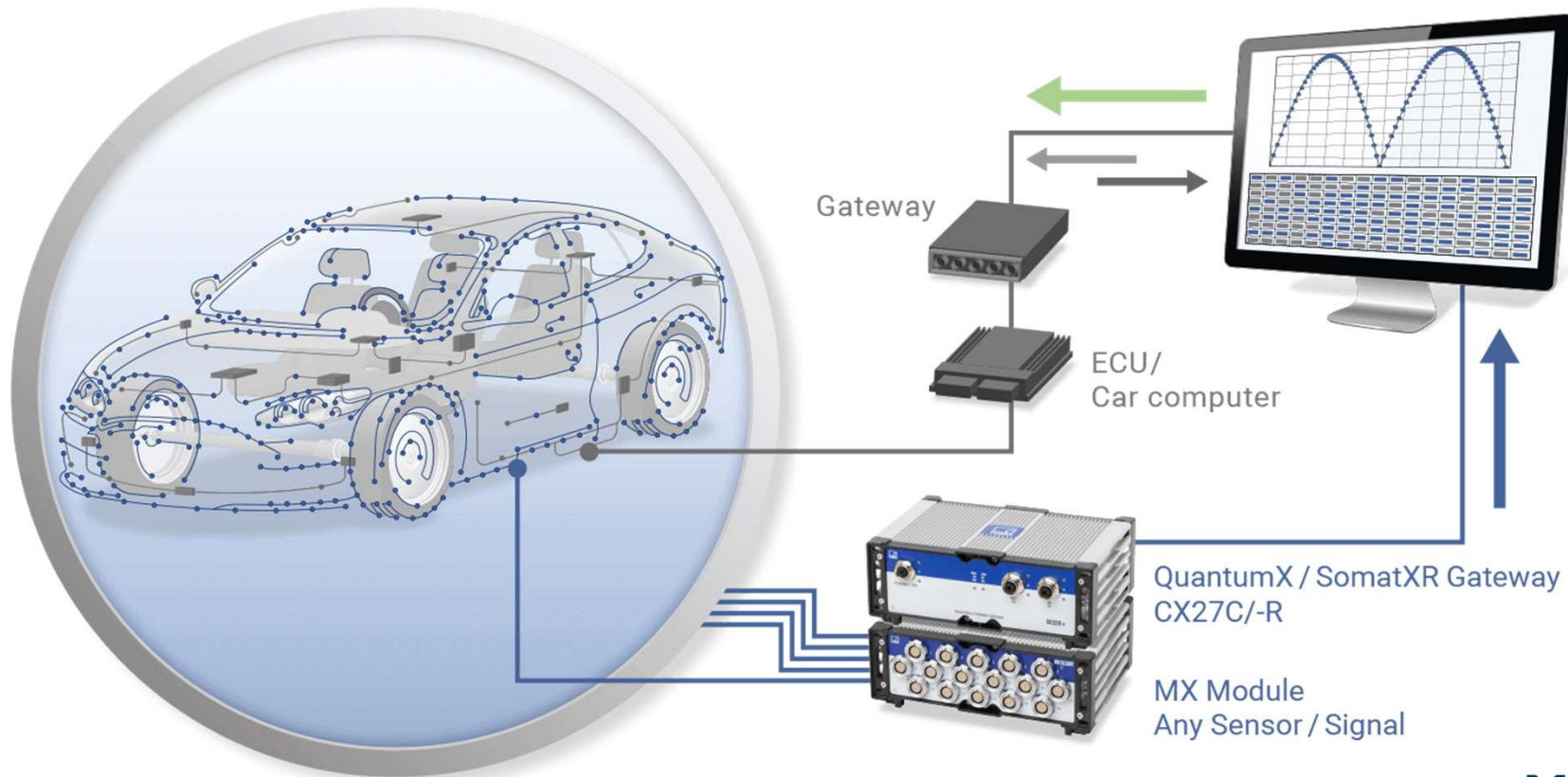
- Adding additional software into intelligent vehicles of the future is costly
- There is a need towards **less**, but more **powerful electronics** and an open **software framework**
- From code size optimization in C and assembler towards **object-oriented programming languages** and **enhanced operating systems** with the right links for maintenance and further improvements
- **Scalable** and **reusable function blocks** cross domains and across different cars (AUTOSAR) reduce cost
- **Safe operation** is must, fulfilling safety standards (SOTIF, ISO 26262 / ASIL), so high code quality
- **Quicker** from idea to roll-out into vehicles is a market advantage
- **Easy to maintain** when in use (OTA – Over-the-Air services)

Flexible tools are required for system and software development and testing

Fine-Tuning Software – Typical Setup



Fine-Tuning Software – Enhanced Setup



XCP – Calibration Protocol

Who offers this?

- XCP is an open calibration protocol, standardized by ASAM ensuring interoperability and can run on any “X” network transport layer (CAN, CAN *FD*, FlexRay or Ethernet)
- Successful because of its stability and backward-compatibility.

What does it offer?

- Time stamped **measurement** data, parameter **tuning** (calibration), **bypassing** functionality, **flashing** of ECUs and **debugging**
- **High data throughput** with XCP-on-Ethernet

What do you need?

- Parameter description files (A2L) and most likely a decrypting access key to electronics (SKB)



QuantumX or SomatXR CX27C-R Gateway



Functionality

EtherCAT[™] – EtherCAT[™] for test bench OR

PROFINET[®] – PROFINET IRT for test bench

- **Ethernet Gateway** (up to 2 MS/s) allowing to integrate all connected measurement modules to a PC
- **XCP-on-Ethernet** Gateway integrating any sensor to
 - INCA from ETAS
 - CANape from Vector
 - ControlDesk from dSPACE
 - Vision from ATI
 - DiagRA[®] X from RA Consulting
 - PUMA Open from AVL
 - Fleet recorders and many more



So this is all about openness and integration in **bench test automation** and **Cal tools in parallel**.

QuantumX – Versatile Distributable Data Acquisition System

Every module is a DAQ system...



... scale up and distribute modules...



... integrate in real-time ...



... stand alone recording!



QuantumX – Freely scale your System



Universal– “Swiss Army Knife of Measurement”
more than 16 transducers types
MX840B, MX440B

High Speed Mechanical
Force, Torque, Speed
MX410B, MX460B

High Accuracy Full Bridge
MX430B, MX238B

High Channel Count
Bridge, IEPE, +/-10V, 4..20 mA, thermocouple
MX1615B, MX1601B
MX1609KB, MX1609TB

Fully Isolated (CAT II / CAT III)
Voltage, current, universal thermocouple
MX403B, MX809B

Available a ruggedized version!

QuantumX – Freely scale your System

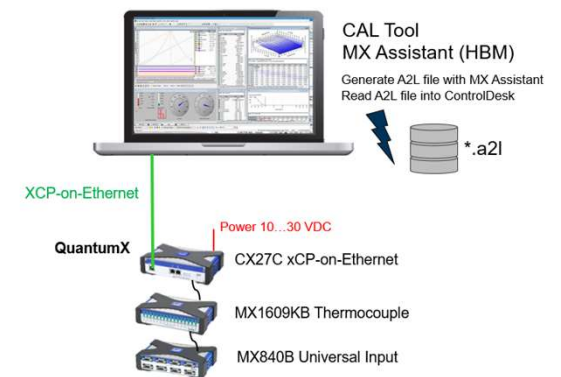


Optical Fiber Bragg Module
Strain, force, acceleration, temperature, inclination
MXFS8DI

Real-time Integration + Ethernet Gateway
EtherCAT, PROFINET, **xCP-on-Ethernet**
CX27C

Live Demo

1. Start MX Assistant software and setup all channels
2. Activate “xCP Client” on CX27C and generate A2L file
3. Read in A2L file into your CAL tool of choice and start your software optimization process



Further Information

Real-Time Integration with High-Speed Data Acquisition in Parallel

The CX27C gateway module enables up to 24 QuantumX modules to be integrated with the measurement chain, synchronously and in real-time.

QuantumX CX27C: Real-Time Bench Automation and Data Analysis – Perfectly Serves Both Worlds

- QuantumX CX27C gateway module is the key to many different measurement chain configurations – without compromise.
- Enables both time-synchronous metrological analysis of the test specimens and integration with test bench automation and thus real-time testing.
- Real-time information from up to 24 QuantumX or SomaXR modules can be acquired simultaneously and up to 198 signals can be integrated, in parallel, if available. The CX27C gateway module is particularly flexible due to the various possibilities of data integration.
- Integration via Ethernet TCP/IP into the custom data acquisition software or any other software.
- Real-time integration via EtherCAT or PROFINET IRT.
- Integration via XCP on-Ethernet into any OCU software.

Quickly and easily integrate QuantumX

A wide range of synchronization systems such as EtherCAT, PROFINET or Ethernet IEEE 1588 (IEEE 1588 PTPv2) and XCP are available to quickly and easily integrate the powerful data acquisition system QuantumX into a wide range of test environments.

The CX27C gateway makes the QuantumX ideal for the following applications:

TECH NOTE :: QuantumX/SomaXR Integration into Vision from ATI

Version: 2023-08-31
Status: public

This Tech Note describes how to integrate QuantumX / SomaXR into ATI Vision software set up as XCP master via standardized XCP-on-Ethernet.

Abstract

ATI Vision software can be used as Measurement, Calibration and Diagnosis (MCD) software optimizing embedded software.

In addition to this it is possible acquiring data from any sensor connected to QuantumX / SomaXR modules via XCP-on-Ethernet sensor timing under ATI Vision software.

System Setup Preparation

You will need:

- Latest version of the free HBM software [MX Assistant software](#)
- ATI Vision software with activated license (there are used Vision E.3)
- QuantumX CX27C gateway and any measurement module

Note: As we constantly improve our software, please keep QuantumX embedded and PC software always up to date.

ATI Vision (Accurate Technologies MX Assistant (HBM))

Connects A2, its with MX Assistant Head A2, the data Controller.

Connections:

- XCP-on-Ethernet
- QuantumX
- Power 10 - 30 VDC
- CX27C XCP-on-Ethernet
- MX1609G Thermocouple
- MO948S Universal Input

Connect all measurement modules to CX27C via cable type KAS27C or pass all devices into a backplane (BIB). Connect the Ethernet cable to front or rear side connector of the CX27C and to the device where the XCP master is running. Run MX Assistant and switch the module to for example "PROFINET" or "Ethernet" interface mode. Remove the module if necessary.

ECU Boosting: Software Optimization via XCP-on-Ethernet

Easy and Flexible Integration of QuantumX into your VCU Test Chain

Easy Software Parameter Tuning by Additional Sensor Data via XCP on-Ethernet

In the increase of size and complexity, functional software development plays a crucial role in any kind of vehicle. Algorithms running on modern electronic Control Units (ECUs) need to be finalized before the vehicles' release and maintained regularly. ECU fine-tuning and optimization start in a simulated environment at the PC, but is still dominantly validated in real conditions in a test bench or mobile test on a track.

Additional sensor data improves physical insights and is fundamental for a quick optimization and software release. Adding QuantumX measurement module and the right universal inputs, gathering all sensor types in a suitable way, allows overlapping of data sources – in-vehicle sensors and high grade data bus sensors.

Using all data into the same workflow with the standardized XCP protocol is easy and very flexible. All this ensures a friendly integration into your existing software tool and testing setups for Measurement, Calibration and Diagnosis (MCD), optimizing embedded software.

hbm.com
CX27C/-R

Tech Notes

- dSPACE: CALdesk
- CANape: CANape
- ATI: ATI Vision

Webinar / Video

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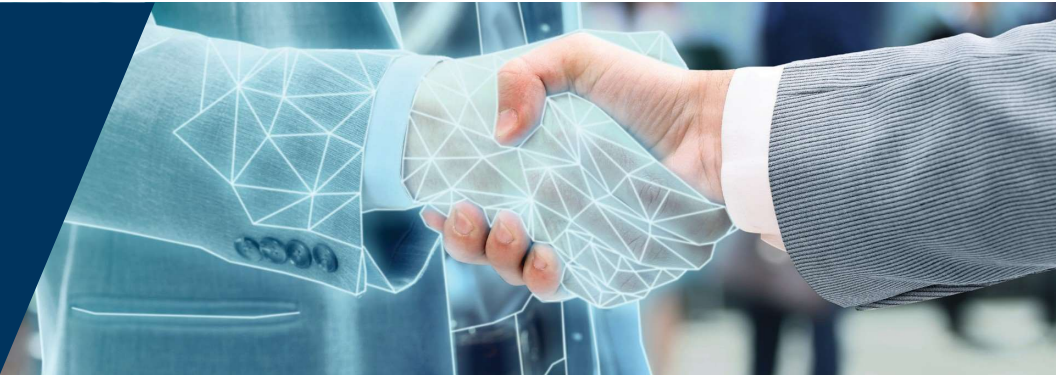
Summary and Benefits

- Integrate any sensor input - mechanical, electrical, thermal, flow, ... for a better physical view
- High-quality signal inputs
- Work mobile, in lab or in bench testing integrating in real-time to your test automation software
- Choose between standard or ultra-ruggedized modules or combine both
- Use the modules in many other testing applications – mobile, lab or bench - one system

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October 13th – 14th – 15th



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