Scalable Data Acquisition Systems in Automotive and Mechanical Engineering

The old saying "the product matures in the hands of the customer" should be regarded as outdated. In the age of total mobility, the tolerance for technical defects is rapidly diminishing. This applies to automobiles and in the manufacturing industry, where production losses as a consequence of defective machinery are no longer tolerable. "Today’s customers expect mature and reliable technology," says Thomas Maul, branch manager of GHM Messtechnik GmbH in Erolzheim. "That’s why the SIQUAD data acquisition system is the right partner. Its modular design makes it suitable for various tasks, such as detecting and correcting errors in the development process. "Soon we will launch a new SIQUAD CPU on the market, which is based on a modular concept of an external connection that factors in modified and future requirements.”

What is the difference between technically sophisticated products and aberrations?
The differences consist mostly of tiny details, minimal deviations and imprecise manufacturing, which can be determined by utilizing the most accurate measurement technology in the product development and verification phase, and can be adjusted for errors in the early testing phase.

The growing requirement for information
Generally speaking, dynamic measurements and test bench measurements analyze and record physical variables, such as strain, temperature, acceleration, pressure, speed, torque, way, forces, voltages and currents. The data allows an analytic comparison of seemingly minor yet crucial changes arising in the development process that result in an improved understanding of the final design.

According to the industrial engineer Thomas Maul, the amount of measured data with respect to data diversity and density continues to increase rapidly and customers can expect to see continuous improvements in technology as a result.

What should a measuring system contain?
When choosing the optimal device it is advisable to take future requirements of the measurement system into account,” remarks Maul. “These include expandability, scalability and flexibility in order to respond to changing or expanded measurement tasks.”

In general, highly accurate images of the signal curve require a high sampling rate and resolution. Therefore, a modern analog-to-digital converter and efficient processing hardware are recommended. Filters and an isolated signal processing assure that noise is eliminated and thus enable high quality data.

The correct measurement system - SIQUAD Technology
The SIQUAD data acquisition system of GHM Messtechnik is characterized by a rapid and
accurate detection of sensor data. Its modular design allows for rapid adjustment to differing measurement tasks.

The SIQUAD series extends from compact devices for a few measurement channels to linked multi-rack configurations for high channel numbers. Thus, the system is very flexible and can be used for specific applications and be built and expanded as necessary.

The universal amplifier is ideally suited for frequently changing measuring tasks with different types of sensors, as it detects a variety of sensor types. For recurring measuring tasks, sensor-specific measuring amplifiers are available for the most common types of sensors. Special inserts, such as a CAN interface for time-synchronous recording of CAN messages or a measuring amplifier for detecting the electric power, complete the system program.

Each measuring amplifier has its own signal processor (DSP) for processing and preparation of the data collected.

Data is transmitted via the Ethernet interface to a PC and further processing can take place via CAN or analog outputs.

The measuring system parameterization takes place with daSoft. The data collection takes place with software developed by GHMor with DAQSoft drivers for LabVIEW and DASYLab. A function library enables also the integration of the data into customer specific applications.

**New modular interface concept**

Over the course of time, the central unit of the SIQUAD family will be replaced by an enhanced version. "The new version will factor in modified requirements and focus on a modular concept of external links," says Maul. "Therefore, the system can be quickly adjusted to new interface requirements, thus making it future-proof."

As part of this development, the EtherCAT has been integrated as an interface for automation tasks in the system. The extremely fast data processing enables extremely short cycle times of up to 100 microseconds, which corresponds to a data rate of 10 kS / s per channel. An innovative multiprocessor approach allows parallel and independent data transmission to all connected interface modules.

Based on modularization, additional interfaces like Ethernet and CAN, as well as SD cards or WLAN are also made possible.
An overview of the SIQUAD family specifications

Technical specifications
Channels / 4 card
Resolution 24 bits
Sampling rate 20 kS / s
5 kHz bandwidth
Accuracy ≥ 0.03% to
Signal output Ethernet, CAN, in brief: EtherCAT
optional ± 10V
Signal Input DC voltage / current, strain gauge bridge, ICP / IEPE, potentiometer, Pt100, thermocouples, frequency (analog / digital), incremental encoder, torque transmitter, PWM, Digital inputs

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