

Telemetric measurement technology as an integrated solution

Tech article

Modern measurement technology for testing vehicles, installations and components must be geared towards increasingly complex electro-mechanical systems. Various components and their interaction must be examined and a wide range of parameters acquired. Some of the physical or electrical quantities can sometimes only be measured under difficult conditions – especially when forces and torques have to be measured on rotating components, such as drive shafts, as well as on mobile test objects, or when sensors are used in high-voltage environments or in inaccessible places. There is a solution for all these challenges: telemetry measurement technology. It overcomes the limitations of classically wired sensors.

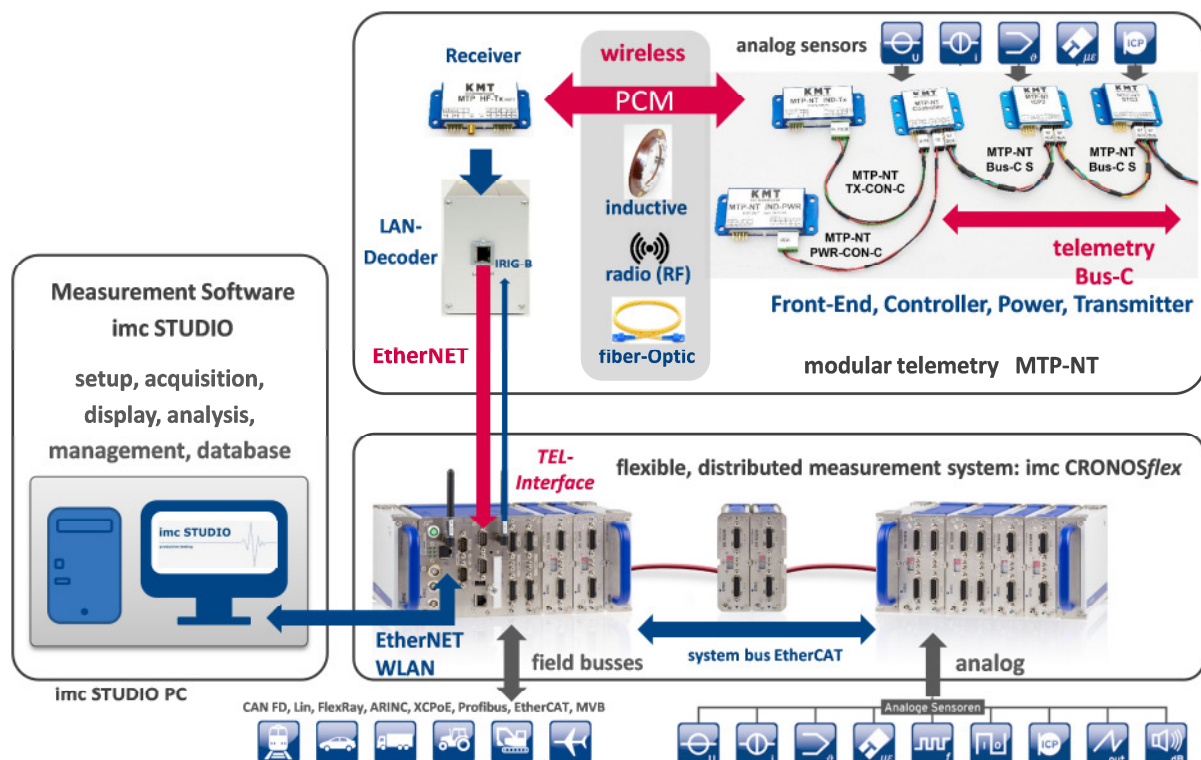


Figure 1: Flexible measurement system with directly integrated modular telemetry

Challenges for modern telemetry solutions

The special challenge for modern and future-oriented telemetry concepts lies in its flexible and seamless integration into the rest of the measurement equipment. Product and component tests have long since ceased to be a one-dimensional job. They are characterized by holistic considerations and “multi-domain” data acquisition. In addition to traditional physical parameters such as force, strain, temperature, angle, speed, etc., digital process signals must also be included. Moreover, field and vehicle buses have to be acquired on which the involved electronic control units (ECUs) exchange their measurement and status variables. Such distributed intelligence and digital networking is becoming increasingly important in highly complex mechatronic systems. It is thus essential to be able to capture all relevant parameters of the various “domains” in a uniform and completely synchronous manner. This concerns also the seamless integration of the telemetry subsystems.

On the software side, too, all these components need to be consistently combined: both for configuring test scenarios and for recording, displaying, analyzing and managing the generated measurement data. This ensures a comprehensive overview and control. Only then can the test and product specialists involved fully concentrate on their very core tasks – namely interpreting the content of the results and better understanding and optimizing the actual product under test.

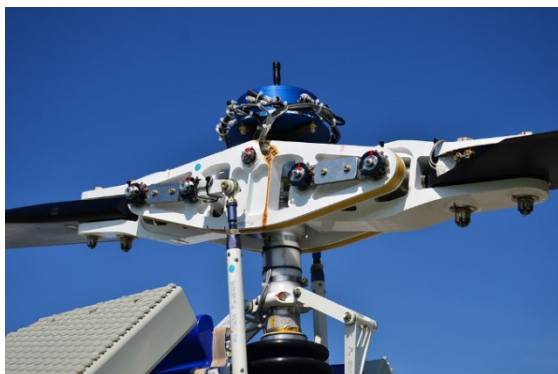


Figure 2: Application on ultralight helicopter

Requirements for modern and flexible telemetry

Modular concepts are also in demand for telemetry systems. They have to allow the number and characteristics of the measurement inputs to be precisely matched. The “MTP-NT” telemetry system offered by imc, for example, is a completely modular kit. It consists of freely selectable sensor front end modules, controller and power supply modules, as well as a transmitter unit. The digitized measurement data of all modules are transmitted wirelessly via the common transmitter module using a PCM-coded data stream.

Flexible telemetry solutions offer various wireless transmission technologies. For medium and long distances, radio transmission is typically applied, while inductive transmission is best suited for short distances. Inductive solutions also allow the transmitter and front end electronics to be wirelessly powered. Optical transmission of PCM signals via fiber-optics can also be an option, for example, in high-voltage environments such as a 15 kV pantograph on railway vehicles.

The integrated solution

Independently of the selected transmission technique, the serial coded PCM data stream is decoded on the receiver side and converted into a digital format. Such digital output is most flexible and efficient for integration into the overall measurement system. Here, interfacing via standard Ethernet network and protocol is most suitable. The receiving measurement system provides a dedicated interface with its own processor power. It collects the TCP/IP data stream and converts the packets into uniform data channels. This interface is directly integrated into the stand-alone measurement device, independent of the PC, which is often unnecessary for autonomous data acquisition. All imc measurement systems and data loggers can be expanded with such a telemetry interface. A particularly modular and flexible concept can be realized

by combining the imc CRONOS*flex* measurement system with MTP telemetry (see Figure 1), in which both telemetric and traditional measurement data acquisition apply modular design concepts.

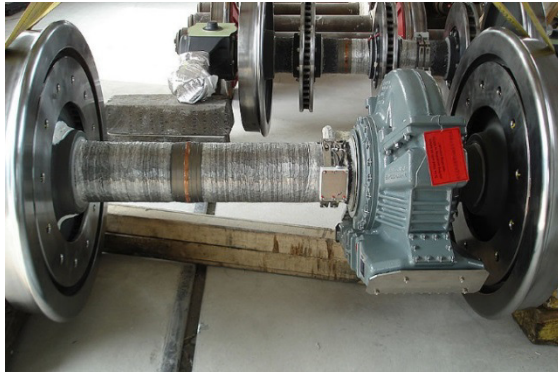


Figure 3: Temperature measurement on train brake disc

Precise synchronization of the telemetry is implemented with time stamps. These can already be assigned on the telemetry receiver, which is synchronized via IRIG-B. Any additional latencies and time jitter due to transfer on the reserved Ethernet network are thus compensated for. Such a solution even allows several telemetry receivers to be coupled via a network switch and served by one single interface unit.

At this point, the telemetry subsystem is fully integrated into the universal measurement

system. It can now be handled on a more abstract and uniform level by imc STUDIO the universal standard measurement software. Thus, all functionalities and workflows for testing tasks that are supported by the comprehensive imc STUDIO software are available for the synchronously integrated telemetry channels: from data acquisition with multi-trigger, real-time analysis, visualization and storage, up to complete test automation with database management.

To draw a conclusion, what is the real practical benefit for the user of such a solution? The most important advantage lies in the overall integrated measurement solution: this is a mandatory requirement to gain truly holistic views and insights of the test object on the basis of reliably synchronous measurement results. Modularity and flexibility also reduce equipment costs. For example, uniform sensor modules can be jointly procured, shared and also reused if an application has fulfilled its task or is to be modified. And thanks to a consistent software tool with a uniform operating philosophy, users' productivity is increased. Considering the proportion of personnel costs, one can estimate the large efficiency potentials to be exploited.

Additional information:

imc Meßsysteme GmbH

Voltastr. 5
13355 Berlin, Germany

Telephone: +49 (0)30-46 7090-0
Fax: +49 (0)30-46 31 576
E-Mail: hotline@imc-berlin.de
Internet: www.imc-berlin.com

For over 30 years, imc Meßsysteme GmbH has been developing, manufacturing and selling hardware and software solutions worldwide in the field of physical measurement technology. Whether in a vehicle, on a test bench or monitoring plants and machinery – data acquisition with imc systems is considered productive, user-friendly and profitable. So whether needed in research, development, testing or commissioning, imc offers complete turnkey solutions, as well as standardized measurement devices and software products.

imc measurement systems work in mechanical and mechatronic applications offering up to 100 kHz per channel with most popular sensors for measuring physical quantities, such as pressure, force, speed, vibration, noise, temperature, voltage or current. The spectrum of imc measurement products and services ranges from simple data recording via integrated real-time calculations, to the integration of models and complete automation of test benches. Founded in 1988 and headquartered in Berlin, imc Meßsysteme GmbH employs around 200 employees who are continuously working hard to further develop the product portfolio. Internationally, imc products are distributed and sold through our 25 partner companies.

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-berlin.com/our-partners/>



Terms of use:

This document is copyrighted. All rights are reserved. Without permission, the document may not be edited, modified or altered in any way. Publishing and reproducing this document is expressly permitted. If published, we ask that the name of the company and a link to the homepage www.imc-berlin.com are included.

Despite careful preparation of the content, this document may contain errors. Should you notice any incorrect information, we ask you to please inform us at marketing@imc-berlin.de. Liability for the accuracy of the information is excluded.