

QUANTUMX

XXL performance in mini format

Reliable data acquisition opens up fascinating new opportunities

Benefit from universal connectors since QuantumX provides for all common transducer technologies

Safely monitor fast press-fit processes

... with PACEline, the new piezo technology from HBM



QUANTUMX

An award for XXL performance in mini format:



QuantumX – the new amplifier system from HBM – technically superior functions bundled together in minimal space to fit every test bench. The modules can be stacked and mounted one below the other.

HBM's QuantumX won the MESSTEC MASTERS AWARD 2007 for the most innovative product.

QuantumX provides extra added value for your projects – with high quality, accuracy, reliability, and robust performance.

- Extensive manufacturer measurement technology know-how: perfectly coordinated transducers, DAQ systems and software from a single source
- Recognized worldwide by national calibration institutes
- Excellent support and service network in more than 60 countries
- Working standard calibration included for that extra plus for safety

more...

www.hbm.com/quantumX



Editorial



Zoltan Teleki,
Marketing Manager

Dear Reader,

Today I would specifically like to thank you, our customers, for your loyalty and solidarity over the years, for you have been instrumental in helping HBM become the global market and technology leader for the measurement of mechanical quantities. This would not have been possible without your feedback and your practical ideas.

We listened to your requests and are reciprocating this year – and are reciprocating this year with three technological innovations, specifically tailored to your expanding requirements.

In particular our new universal QuantumX amplifier ensures a new look to data acquisition technology: XXL performance in mini format! Everything that you require from a modern data acquisition system was included in the development of QuantumX: small, fast, universal and easy to operate. The highlight of QuantumX is that it supports all common transducer technologies with consistently high HBM quality, despite being very compact.

But please note our other innovations: the optical measurement chain for strain measurements and the PACeline force transducers using piezo technology.

You'll find all the important facts about these products in this issue of HOTline. There is more news and information on our website, www.hbm.com, such as technical articles, data sheets and operating manuals.

Best Regards, Zoltan Teleki

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QUANTUMX

– the new, multi-functional amplifier system

XXL performance in mini format

QuantumX is a universal DAQ system that provides extra added value for your demanding test and inspection tasks. It is small, fast and universal and provides fascinating new opportunities for flexibility, efficiency and reliability.



The multi-talented performer for numerous transducers

A single MX840 amplifier module has 8 universal connectors that suit all common transducer technologies, whatever the combination. Connect the transducer – and measure – at 24-bit resolution!

- | | |
|--|--|
| | Strain gage full bridge |
| | Inductive transducers |
| | LVDT |
| | Voltage $\pm 100\text{mV}$, $\pm 10\text{V}$, $\pm 60\text{V}$ |
| | Current $\pm 30\text{mA}$ |
| | Resistance thermometers PT100, PT1000 |
| | Thermocouples of type K, J ... |
| | Potentiometer |
| | Frequency measurement, pulse counting |
| | CANbus |

Connect and measure immediately...

... with Advanced Plug & Measure (APM), for immediate measurement results

- QuantumX uses HBM's exclusive APM technology to detect your transducer
- 100% TEDS-compatibility:
APM uses TEDS, the Transducer Electronic Data Sheet. TEDS ensures that the transducer details are quickly, conveniently and safely transmitted to QuantumX, so that measurement can start immediately.

Setup and parameterization ...

... with the QuantumX Assistant

The QuantumX Assistant sets new standards for functionality and ease of operation. You benefit from the following features:

- QuantumX is fast and easy to setup and parameterize
- Automatic sensor detection via TEDS
- Comprehensive sensor database
- Measurement data visualized as graphs

HBM innovation



QuantumX for central and distributed data acquisition with universal connectors for all common transducer technologies

Professional data acquisition ...

... with catman®AP

Ideal for professionally acquiring and analyzing your QuantumX measurement data. Easy to use yet powerful: catman®AP bundles together highly efficient modules for a wide variety of different measurement tasks. Together they make up a flexible, powerful and networked high-performance package.

QuantumX can be integrated into other applications and programs via the API interface.

You can also conveniently and easily integrate QuantumX into LabVIEW®.

Applications –

Benefit from new potential for test bench engineering

Every test bench is different. But it does not matter whether there is abundant or limited space available for your amplifier, nor whether the tests you run change every day or are long-term load tests. QuantumX provides extra added value, even for a wide range of test bench requirements.

QuantumX is ideal for:

Functionality test rigs, power test stands, laboratory measurements, industrial conditions and road tests.

■ Jens Boersch, HBM

MX840 – the key data

- 8 individually adjustable and electrically isolated connectors
- Accuracy class: up to 0.01, depending on the measurement principle
- 4.8 kHz carrier frequency technology
- Sampling rate of up to 19.2 kHz/channel
- 24-bit A/D converter per channel for synchronous, parallel measurement
- Filters: Bessel, Butterworth 0.01 Hz up to 1 kHz, adjustable channel by channel
- Supply voltage: 10...30 V DC
(Power pack included in the scope of supply)
- Transducer supply: 5...24 V DC, each connector adjusted individually
- Transducer connector: D-Sub-15HD plug
- Computer link: Ethernet TCP/IP, Firewire (available soon)
- Dimensions: 44 x 174 x 119 mm (W x H x D)
- Maximum permissible cable length to transducer: 100 m
- Nominal (rated) temperature range: -20 °C...+60 °C

www.hbm.com/quantumX

HBM innovation

PACeline – piezoelectric force measurement chains

High-tech for reliable measurement results:

HBM, the global leader in strain gage technology, is breaking new ground. Putting the focus on industrial process control made it necessary to open up to other technologies, to provide a more extensive portfolio of solutions for measuring mechanical quantities.

PACeline makes the difference

HBM's PACeline product family provides piezoelectric force measurement technology for quality control in industrial production. Typical applications include fitting and assembly processes, such as press-fitting, riveting or clinching. Extreme rigidity with modest mounting dimensions and high natural frequencies are convincing arguments for piezoelectric force measurement technology.

The first member of the PACeline product family, the CMC complete, calibrated measuring chain, is now available. It comprises a piezoelectric force transducer, a transducer connection cable and a charge amplifier.

CMC covers the nominal (rated) forces that are interesting for assembly processes in ranges up to 5kN, 20kN, 50kN, 70kN and 120kN. The calibrated output signal of the charge amplifier is an analog DC voltage of a nominal 10V at maximum capacity.

The supply voltage, measuring range selection and reset input of the charge amplifier are electrically isolated and thus de-coupled from ground looping and immune from interference.

Both measuring ranges of 100% and 20% of the nominal (rated) force can be individually calibrated for each measuring chain. The Zoom function focuses on process critical sections, so that they can be even more precisely monitored.

Integrated TEDS allows detection and automatic configuration of the individual characteristics of both measuring ranges by evaluating downstream electronics with TEDS functionality. In conjunction with the MP85A FASTpress process controller, HBM provides a complete solution for applications that require small mounting dimensions, high rigidity and convenient process monitoring.

■ Johannes Müter, HBM

more... www.hbm.com/PACeline



Fig. 1: CMC piezoelectric measurement chain from the PACeline product family



Fig. 2: MP85 FASTpress



GaPo4 - Crystal: Gallium phosphate forms the unique base material of piezo technology

Test and inspection

F-35 Lightning II test plane

Fast and reliable testing with HBM:

The British company BAE Systems works with HBM data acquisition equipment to bring greater reliability to the test flight technology used for the F-35 Lightning II under the Joint Strike Fighter Program (JSF program). It is usually tricky to check a data acquisition system in a modern military aircraft, a situation requiring the use of the aircraft's own test flight technology.

The functionality of the individual components of the aircraft is assured

In the JSF program, the actual data acquisition system is only installed in Texas, USA, when the aircraft and its components are delivered. This means that BAE Systems has to activate all the installed transducers and the associated aircraft wiring during the construction phase and check that they are working properly. This is how BAE ensures that the entire system functions as intended when the individual components of the aircraft (tail section, tail fin, tail plane) are delivered.

"With the MGCplus system and catman® Professional software from HBM to acquire and analyze the measurement data, we are able to perform all the tests really easily, yet with utmost precision."

Mike Revuke, chief test flight technology engineer,
BAE Systems, UK

The MGCplus amplifier system and the associated equipment are located in a handcart, which the team from BAE Systems uses to quickly move on to the next aircraft, and vastly reduce the time taken for setup and testing.



48 channels are designed for strain gages, 16 channels for acceleration transducers (voltage inputs) and 8 channels for PT100 thermocouples. On-site training and support are included in the scope of supply.

"We decided to use the MGCplus system because it met our requirements exactly. It is fully configurable and can be re-programmed at short notice."

Mike Revuke

The modular construction F-35 Lightning II fighter aircraft is built from fully-equipped aircraft components, which are later assembled at the factory in Texas. All the systems are already mounted and tested before final assembly. 23 aircraft will run through the program in the first series by the end of 2009.

■ Simon Dudley, BAE Systems, UK

more ... www.hbm.com/aerospace

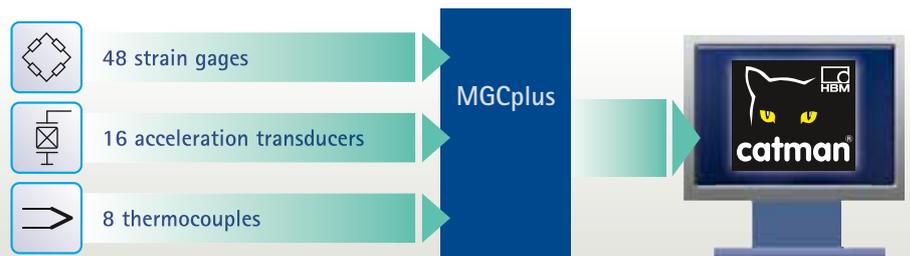


Fig. 1: With HBM measurement technology, BAE Systems can conclusively prove that all the test flight technology functions as intended. In case of need, all data are also traceable before delivery.

Experimental stress analysis

Characterization of optical strain gages for large-scale strains in the test laboratory

Initial findings indicate that optical strain gages can also be used for large-scale strains and show good linearity. They are also noted for their intrinsically zero-point related strain measurement.

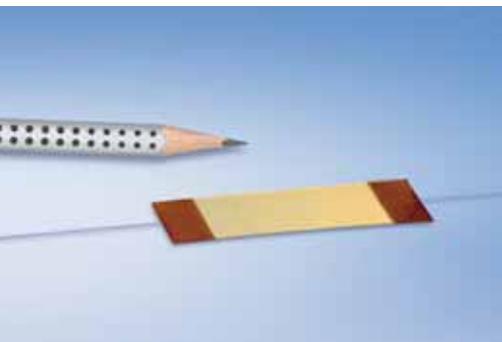


Fig. 1: Optical strain gage

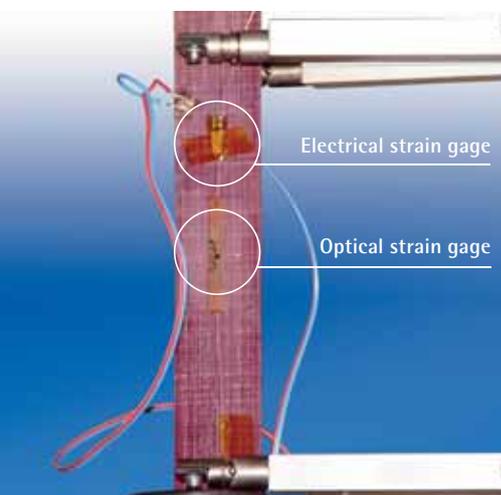


Fig. 2: Material sample made from GFRP (glass-fiber reinforced plastic) with installed optical and electrical strain gages. Parts of the glass scale based extensometer used as an additional reference strain measuring device can be seen at top and bottom.

An optical FBG (Fiber Bragg Grating) sensor basically comprises an optical glass fiber that contains a so-called Bragg grating giving a periodic variation of the optical refractive index of the glass material. The Bragg grating period describes a length scaling that is affected by the external strains, where the length of the scale can be queried via the wavelength of the light reflected in the optical fiber. The optical fiber thus acts both as a sensor element and as a transmission medium for the sensor signals.

To characterize the HBM optical strain gages in the large-scale strain range, behavior in the uniaxial stress state was examined in a materials tester (Fig. 2). HBM's catman® software was used for the data recording of all the sensor signals.

A cyclically recurrent strain of $7,500 \mu\text{m}/\text{m}$ was applied to the material sample. Fig. 3 shows the results of the test series after the various load cycles and there is always a linear correlation between the wavelength variation and the mechanical strain.

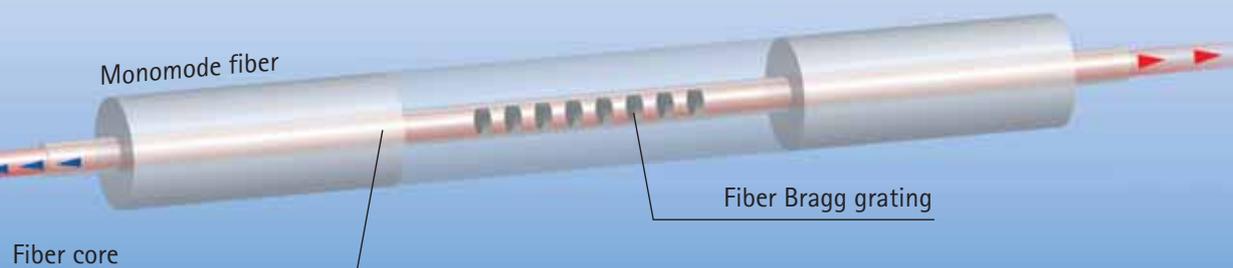
The k-value of the optical strain gage can be determined from the gradients of the straight lines. No variation in the k-value of the optical strain gage was observed by the time the sustained loading tests were discontinued at 10^5 cycles (Fig. 4). By contrast, it was possible to detect a certain change in the sample material, caused by the sustained loading (Fig. 5).

The first load cycles showed a permanent rise in the wavelength which was a result of the permanent deformation of the sample material. It is possible to record this effect because Bragg gratings are digitally-coded measurement channels within the fiberglass medium. The intrinsically zero-point related character of fiber-optic measurement technology is clear here, particularly its potential in the context of new, lightweight materials.

■ Johannes Roths, Alexander Horoschenkoff, Competence Center Smart Composites and Optical Fiber Sensors, University of Applied Sciences, Munich

more ...

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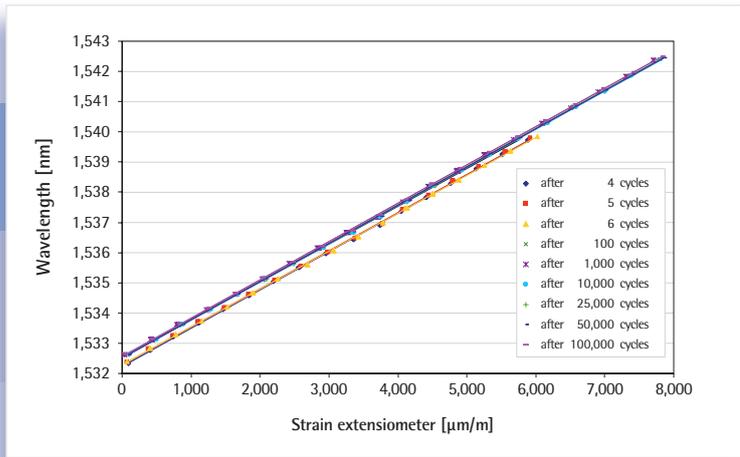


Fig. 3: The correlation between strain and wavelength, that is the strain signal of the optical strain gage, is also linear for large-scale strains. A glass scale-based extensometer was used as a reference strain measuring device.

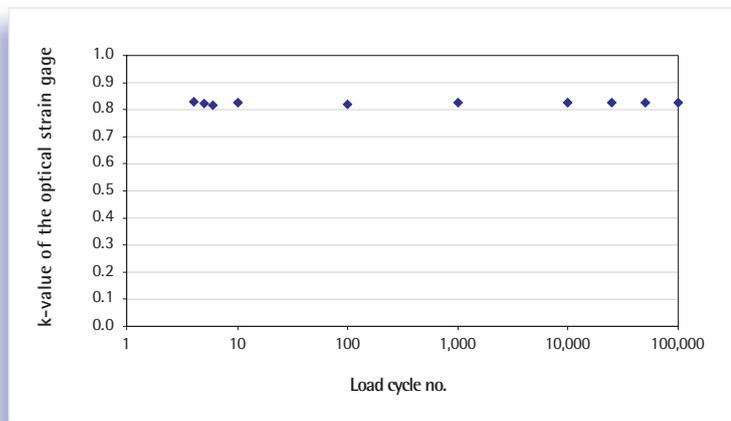


Fig. 4: Throughout continuous testing, with 10^5 load cycles, there was no significant variation in the k-value of the optical strain gage.

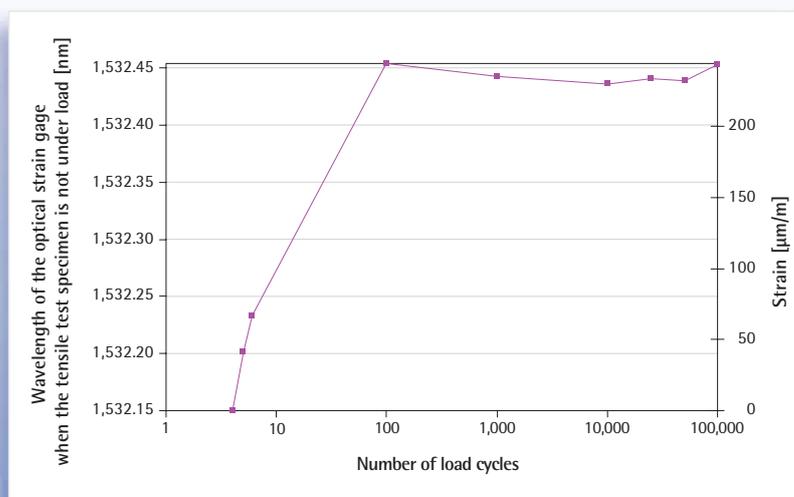


Fig. 5: A rise in the wavelength of the optical strain gage when the material sample is not under load, indicates permanent deformation of the tensile test specimen as a result of the preceding strain loading.

Reduce your need for interconnection with optical strain gages

Optical strain gages are based on Fiber Bragg gratings located in fiberglass. Within fiberglass, several optical strain gages can be connected in series – a clear advantage when it comes to the installation and connection of strain gages.

Conventional strain gage adhesives and aids are used for installation. No new installation procedures are needed.

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Calibration at HBM

Calibration technology

A distinct advantage with calibrated measurement technology

Calibration is not just a binding specification in a standard, such as ISO 9001, it also helps to obtain measured values that are demonstrably reliable. With calibration, these are continuously traced back to the national standard (traceability) and internationally comparable and globally recognized measured values are obtained.

In the aircraft industry, calibration is an absolute must, because the safety of people is paramount. In production, especially of products that are price-sensitive, regular calibration enables you to maintain the same level of quality. It also prevents expensive and possibly image-damaging callback campaigns. Taking preventive action to reduce errors also means avoiding unnecessary scrapping campaigns.

Customers regularly require calibration checks, which is why, in ISO/TS 16949, the automotive industry has defined very strict benchmarks, which must also be followed by component suppliers.

Calibration also provides information about the measurement tool being calibrated, its properties, its lifecycle and its metrological history. The effect of using, for example, incorrect loading can be documented and understood.

Every measurement engineer is responsible for measuring the "correct" value and should themselves check whether their measurement technology is traceably calibrated and is returning reliable measured values

■ Lioba Stenner, HBM

more...

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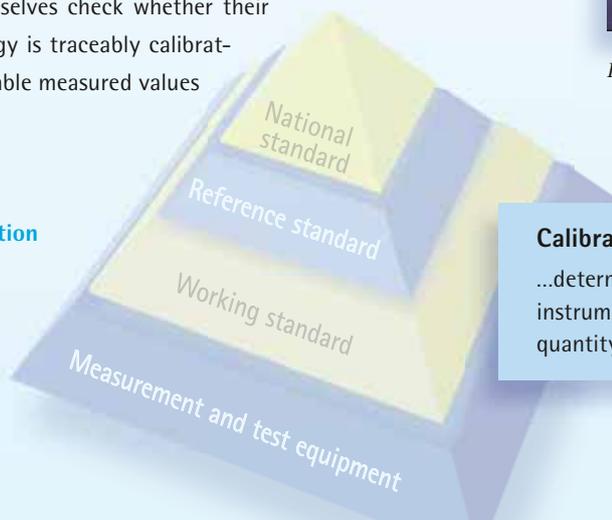


Fig. 1: Force calibration: transducer being calibrated (1), reference transducer (2)



Fig. 2: Force calibration machine in HBM's DKD calibration laboratory

Calibration is:...

...determining and documenting the deviation of a measuring instrument display from the correct value of the measured quantity.

Torque measuring technology

T22 torque transducer



Fig. 1:
T22 torque transducer
with couplings



Fig. 2: Automatic steering gear assembly

Economical, compact, easy to handle

HBM is famous as a global leader in the manufacturer of torque sensors for high-end test benches. Apart from these applications, there are still a large number of torque, measurement, regulatory and monitoring tasks that do not make such stringent demands on accuracy. These are the target for the new T22 torque transducer, with an accuracy class of 0.5 according to HBM's demanding definition.

A torque transducer with integrated electronics

The top priorities in the development of the T22 were: low costs, compact, robust design and ease of handling. Three sizes are available and HBM also provides suitable couplings.

T22	Nominal (rated) torque [N·m]	Nominal (rated) speed with couplings [rpm]
Size 1	5, 10, 20	16,000
Size 2	50, 100, 200	12,000
Size 3	500, 1000	9,000

Torque is acquired by means of strain gages and contactless transmission of energy and measurement signals. The integrated electronics simplify handling and lower the cost of the measuring chain. An 11.5V to 30V DC power supply and two analog outputs of $\pm 5V$ and 10 ± 8 mA are available in parallel.

This makes the T22 torque transducer eminently suitable for direct connection to a PLC (programmable controller).

The principal applications are static and dynamic torque measurements on stationary or rotating components in the laboratory, the test shop and in trials, but it is also used in production and process monitoring and in teaching. ■ Rainer Schicker, HBM

more...

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Fig. 3: The three available sizes of the T22 torque transducer

Industrial process control



T20WN



EASYswitch - measuring switching points at the right moment

Despite careful quality controls during production, complex switching modules still need 100% operational checking. This can apply to push buttons and toggle switches, as well as rotary switches in single or multi-stage versions. As well as measuring the switching point, the actuation curve is also recorded and assessed.

The MP85A-S EASYswitch features just these characteristics and accurately assesses details such as switching point ON, switching point OFF or the responses of a switching operation.

Reliability starts with measurement acquisition

There are special requirements for testing rotary switches, as here torque sensors with an integrated angle of rotation measuring system have to be highly dynamic and record the characteristic curve of the switch synchronized to the switching event. The T20WN torque sensor in combination with MP85A-S EASYswitch is particularly suitable for this task.

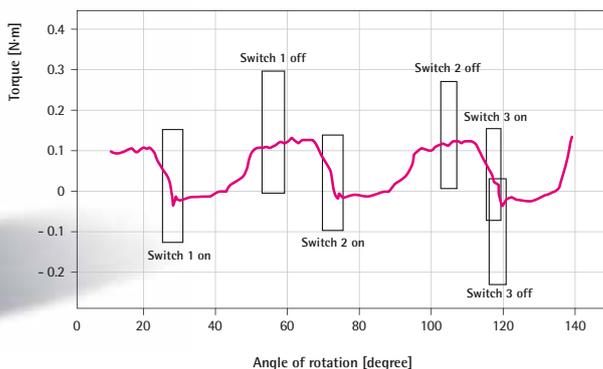
EASYswitch process monitoring records the analyses of all the collected data in a result file to comply with the switching system manufacturer's requirement for obligatory documentation.

■ Dirk Möller, HBM

more ...

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Fig.: Reliable switch checks with FASTpress and EASYswitch.



Industrial process control

digiCLIP DF30

Increased yield in solar cell production

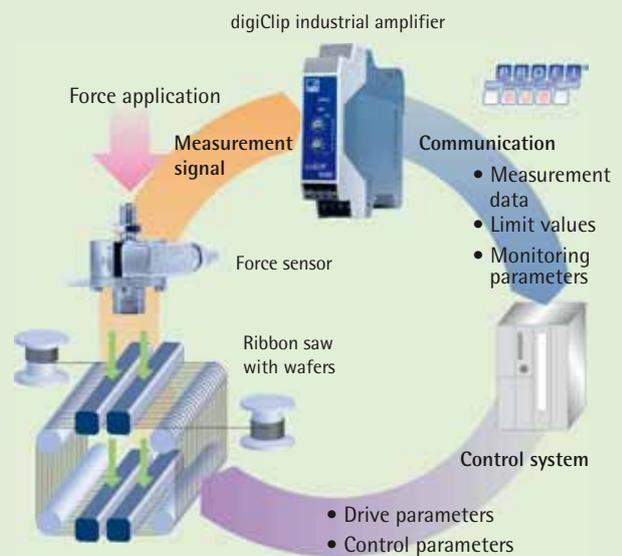


Silicon, the base material of a solar cell, is sawn into slices (wafers) 0.18...0.28 mm thick. The force and speed at which a serrated wire is driven through the silicon is crucial for determining quality. The tension of the wire is about 30N. The measuring device used comprises HBM force sensors and the digiCLIP DF30 industrial amplifier.

Constant production monitoring pays off:

- errors and malfunctions are quickly detected,
- material consumption is reduced,
- quality improves.

■ Michael Guckes, HBM



For a detailed description, go to ...
www.hbm.com/production

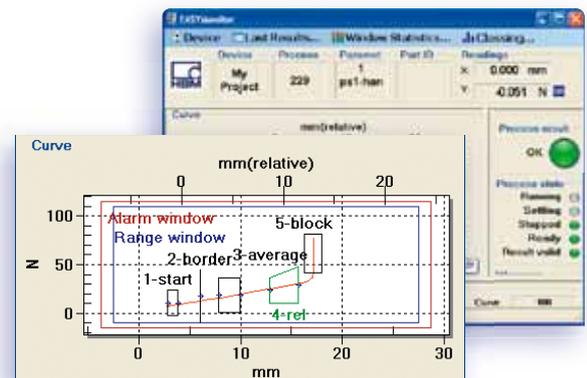
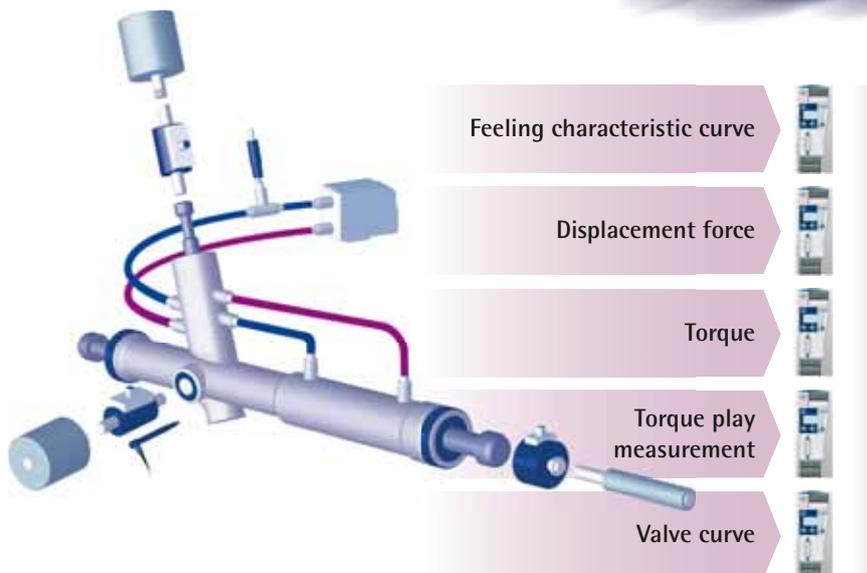
Safe sports driving thanks to steering tests

with MP85A-FASTpress

The handling and feel of modern vehicles with very complex functions can be greatly influenced by the steering system. Yet, despite new support systems, many vehicles continue to rely on hydraulic steering.



With modern sports cars, great importance is attached to the feel of the ride.



After assembly, the MP85A-FASTpress monitors the sports response of the steering system, by such means as the Feeling characteristic curve

That true sports car feeling

Whether electric or hydraulic, the demands made on the assembly and testing of these systems are strict. Many electrical and mechanical components have to be fitted, mounted and then tested.

With HBM's FASTpress system, not only are the assembly stages monitored, a final test is also performed on the entire steering system. The powerful hardware and software platform from the FASTpress product family ensures 100% documentation of the test results and their traceability.

The MP85A and FASTpress software suite ensure optimum compliance with the strict requirements governing monitoring, data storage and integration. It is then easy for the plant engineer to configure the entire system, including the control and monitoring elements, ready for the steering test. ■ Dirk Möller, HBM

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Customized sensors

Brunel Railmotive is accredited under EN 17025 for driving and braking tests, derailment safety tests, testing draw gear and buffing appliances and for strength tests. In this field of testing, Brunel Railmotive is also recognized by the Federal Railway Authority and by EisenbahnCERT, the notified certification and inspection body for rail car approval testing.

During strength tests, a crash test was staged to determine the impact force at 35 km/h between two 4-axle rail tankers (each 80 t), one with a baffle plate and one with a crash module.

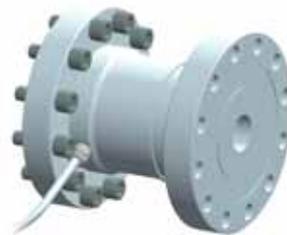
The crash module was to be bolted to the baffle plate of the buffing car via 6 force

Force transducers for crash tests

transducers. Because of the special geometric requirements, HBM developed a force transducer with a mounting flange and a through hole on both sides, to be bolted between the two plates. Because high dynamic forces were expected, the transducer was designed for a nominal (rated) force of 2 MN; with an accuracy of 0.2%. The crash was successfully performed at Brunel Railmotive's test facility in Görlitz (www.brunel.de/railmotive).

■ Sven-Patrick Schotte, HBM

more... www.hbm.com/customized

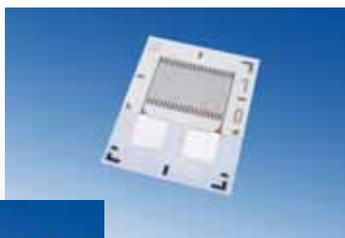


Six special force transducers were mounted on the rail tankers for the crash test.

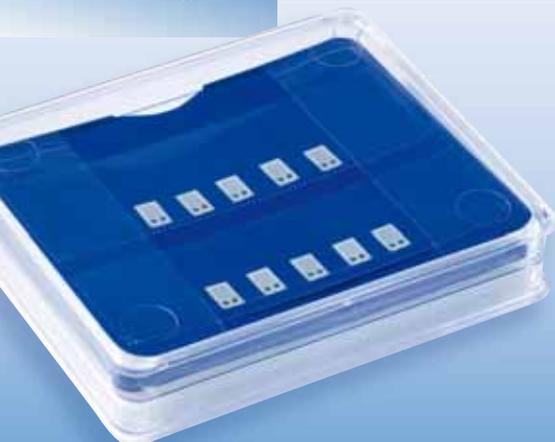


Strain gages

PEEKF, the new carrier material for strain gages for transducer construction



A vast choice of strain gage geometries is available.



The HBM product program has new strain gages, specifically designed for transducer construction. The wide variety of types available to the user are easy to handle and offer high quality at an attractive price.

Technically superior and user-friendly

One of the main advantages of the new PEEKF (Poly-EtherEtherKetone-Filled) carrier material compared other materials currently available is that it is highly resistant to the effects of humidity, which increases the stability of the transducer. The strain gages are also flexible and robust, making them easy to install.

PEEKF strain gages cover a wide choice of common strain gage geometries, with prompt delivery available for the preferred types. Standard options such as leads, adhesive coatings ("stick-on" option) and creep adjustment can be adapted.

Proven in practice

The PEEKF strain gage materials are an enhancement to the strain gages already used by HBM. They have been used for many years in transducer construction, both for transducers with maximum accuracy and for inexpensive types in full production.

Additional news and information, catalogs and samples can be obtained from our sales partners on site ...or simply e-mail us your question at:

makingtransducers@hbm.com.

■ Gerhard Kadijk, HBM Benelux

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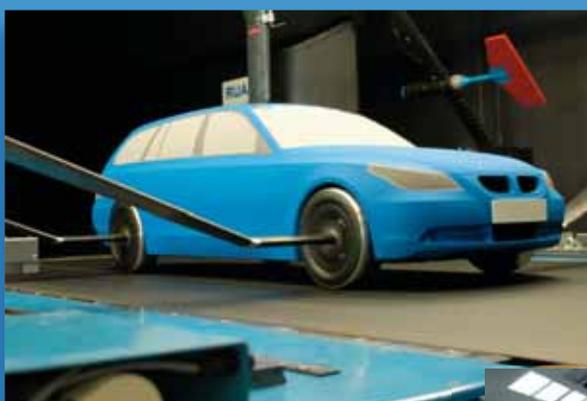
Test and inspection

RUAG: Quality assurance in the wind tunnel

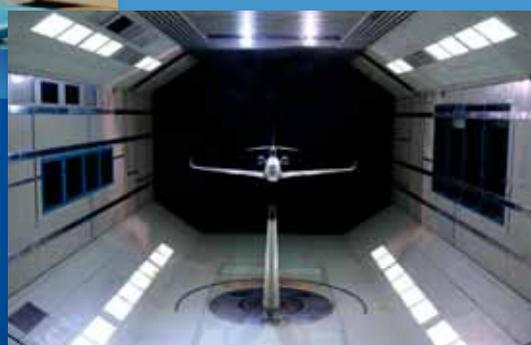
Experimental measurements in the wind tunnel provide structural engineers with the data they require to assess the aerodynamic properties of a test object (aircraft, vehicle, athlete, building, etc.). This is why the RUAG Aerospace, Aerodynamics Center in Emmen/Switzerland operates several wind tunnels, in which measurement data are acquired, conditioned and evaluated on an industrial scale.

At www.hbm.com/DAO, you will find two RUAG articles on "Quality assurance in the wind tunnel" and "Precision in the wind tunnel".

■ Claus Zimmermann, Werner Häberli, Raphael Christen,
RUAG Aerospace, Emmen /Switzerland



*Measurements in the wind tunnel
with different test objects*



Publication Details

Publisher

HBM GmbH
Im Tiefen See 45
D-64293 Darmstadt
Germany

Email: info@hbm.com
www.hbm.com

Editorial office

HBM Marketing Communication

Editor

Klaus Bathe

Design & Artwork

www.contrust-design.de

Printed by

Frotscher Druck GmbH,
Darmstadt, Germany

HOTline is issued twice annually
and distributed free of charge.

The Measurement Converter: a valuable asset for measurement engineers

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