

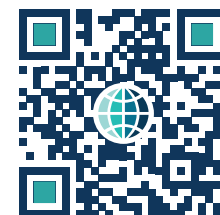


ONE DATA ACQUISITION SYSTEM. UNLIMITED SOLUTIONS.

QuantumX

The QuantumX data acquisition system (DAQ) is the perfect tool for all your test and measurement needs. For reliable data acquisition of different physical quantities and sensor technologies, QuantumX is the preferred choice. It has the unique capability to acquire any signal and sensor information.

Reliable data acquisition for many tasks



MOBILE VEHICLE TESTING AND DATA ACQUISITION



Typical applications

Durability/Road Load Data Acquisition (RLDA), Ride & Handling, vehicle dynamics, brake testing, advanced driver assistance systems (ADAS), monitoring, endurance, summer/winter testing, and more.

QuantumX/SomatXR benefits

- **Input fusion:** Sensors, transducers, digital vehicle bus data (CAN FD, xCP, FlexRay, Automotive Ethernet), position (GNSS) and kinematics (IMU, RTK), wheel force transducers, video
- **Efficient:** Powerful recorder – no PC needed for unattended testing, distributable and short sensor lines, same devices and software for mobile and bench testing, TEDS/sensor database/spreadsheet setup, automated routines (scripting), etc.
- **Robust:** Shock and vibration, extended temperature range (–20 to 65°C), with SomatXR MIL-graded shock and vibration, IP65/IP67 rated, dew-point resistive, –40 to 80°C.
- **Networked:** Ethernet technology, web server for remote monitoring



LAB AND BENCH TESTING



Typical applications

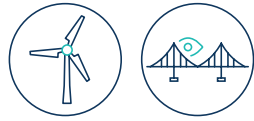
Durability testing (chassis, BiW, axle, steering, powertrain), multi-physics propulsion/powertrain testing (dyno, 2- or 4-wheel drive, rollers), battery pack performance testing, thermal integrity, aerodynamics (wind tunnel, rolling road), and component testing (function, load, thermal, etc.).

QuantumX benefits

- **Plug & Play:** Efficient setups with universal inputs + TEDS, for daily-changing jobs and tasks
- **Freely scalable:** High channel count, high dynamic rate (120 dB), high data throughput
- **Reliable and repeatable results:** Noise suppressing (optical link, strain gauge technology, isolation)
- **Easy to integrate:** Rack, real-time (EtherCAT™, PROFINET, xCP, CAN FD), any PC software (LabVIEW, CANape, MLab, DIAdem, DASYLab, INOVA, Visual Studio, etc.)



STRUCTURAL HEALTH MONITORING (SHM)



Typical applications

Preventive or predictive maintenance of infrastructure: railway (tracks, crossing vehicles, in-vehicle, catenary lines/overhead lines), bridges, tunnels, streets, skyscrapers, energy powerplants (foundations, towers, blades, tidal, dams, turbines, fuel rods), seismic monitoring, and more.

QuantumX benefits

- **Versatile:** All sensor types supported (classic, optical fibre), in addition to weather stations, video
- **Cost efficient:** Distributed modules and short sensor lines or long optical fibres
- **Multi-recorder:** 24/7 long-term measurement, up to three triggered recorders in parallel
- **Scalable:** Unlimited number of sensors, smart edge data recorder
- **Networked:** Server/cloud integration (OPC UA, MQTT, SFTP, notifications – warnings/alarms on signal levels and status), server-based data analytics



SERVICE (INSPECTION, CALIBRATION, MAINTENANCE)



Typical applications

Machine or sensor calibration, fault investigation, inspection, diagnostics, benchmarking.

QuantumX benefits

- **Portable:** Small and lightweight modules optimised for travelling
- **Quick and efficient on-site service:** Universal inputs and TEDS (plug & measure), API and personal support integrating into your individual software in any language
- **Results you can trust:** Highly accurate inputs
- **Traceable quality:** Onboard calibration certificate



Seamless. Reliable. Traceable.

Sensor/Signals

TEDS

ROBUST AND PRECISE

Acquire true multi-physics test specimen information based on measuring strain, force, acceleration, torque, pressure, displacement, temperature, voltage, electric current, rotating speed, position and many more. Use fibre Bragg grating based sensors in high voltage environments such as pantographs or for monitoring with large channel counts.

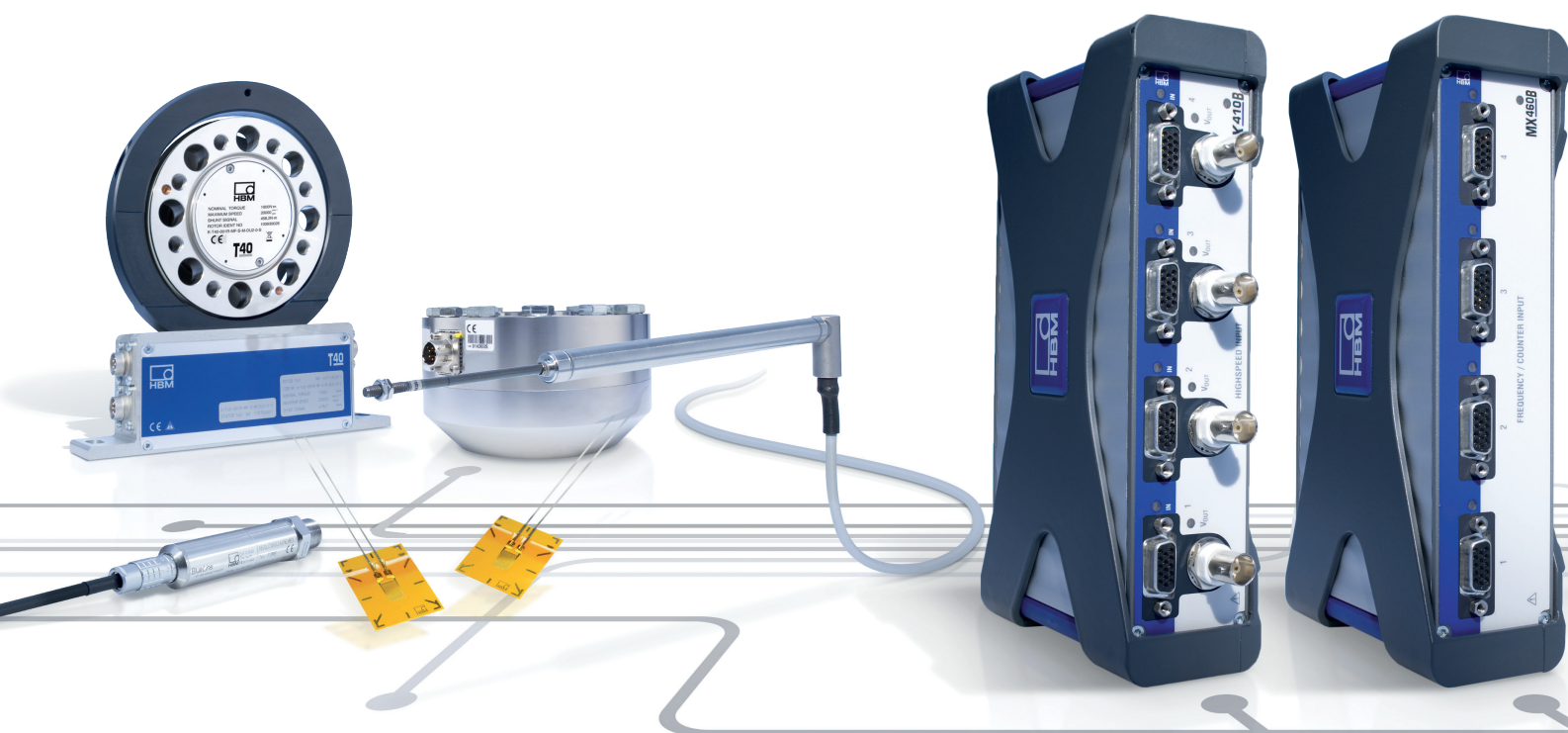
Set up the seamless measurement chain from HBM – from sensor to result.

Acquire digital vehicle bus signals from CAN FD, xCP, MVB, ARINC-429, or MIL-STD1553, as well as video camera, position and kinematics based on GNSS or inertial measurement units, weather stations, ZEISS ARAMIS or any other information you need in getting a complete picture of your test specimen.

QuantumX modules

UNIVERSAL AND FAST

QuantumX provides universal inputs and supports Transducer Electronic Data Sheets (TEDS), the standardised digital data sheet stored on a chip in the sensor or connector for automatic channel configuration (plug & measure).



DISTRIBUTED OR CENTRALISED

Distribute your modules and install them close to the measurement points. Alternatively, build up a centralised rack-based data acquisition system (DAS) for bench testing or monitoring tasks without any backend cable, or combine both methods.

Build up a time-synchronised data acquisition network based on Ethernet PTPv2, NTP, IRIG-B and integrate all signals in real-time via EtherCAT, PROFINET, CAN FD, xCP-on-Ethernet in parallel to HBK's powerful PC software catman Easy/AP.

INTUITIVE AND OPEN

In mobile testing, store all data on the data recorder, work PC-tethered, or real-time integrated to server or cloud.

catman Easy/AP software is easy to use – from setup, visualisation, live calculation, storage, post-process, data analysis and reporting, test automation and individual workflows – mobile and in lab.

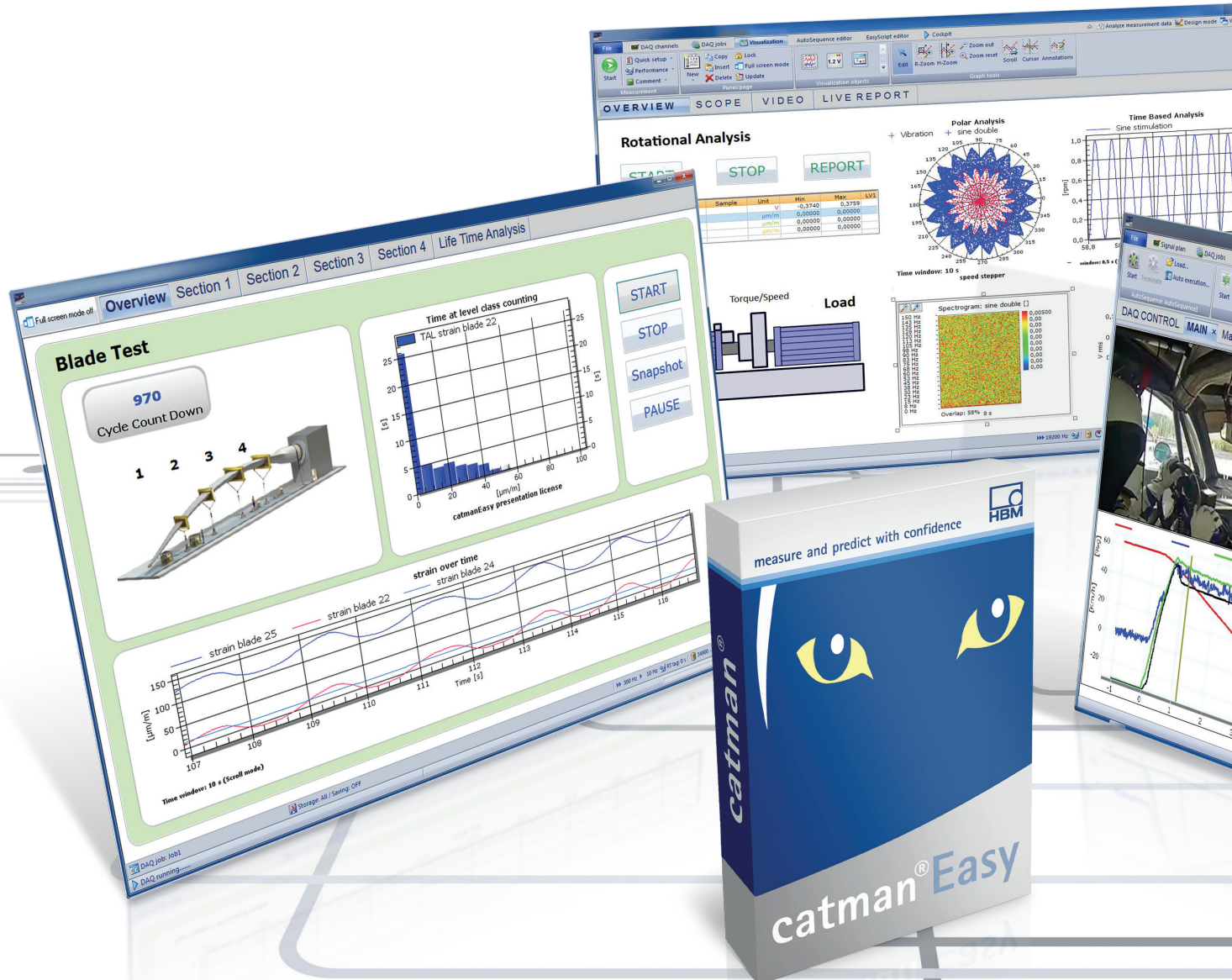
QuantumX can be integrated into any software such as:

- Commercial tools like LabVIEW, DIAdem, CANape, DASYLab, MLab, INOVA, IPEmotion, and more
- The common API allows you to integrate into your own software



Streamline your workflow with catman software for data acquisition and processing

Acquire – Control – Automate – Visualise – Analyse



A single tool for setup, visualisation, data analysis, reporting – getting your job done!

MORE
INFORMATION



CATMAN® EASY/AP: YOUR MEASUREMENT FRIEND

Professional software for data acquisition and processing: modern, multilingual, cloud-oriented

- **Fast channel setup:** TEDS, on channel, sensor database, spreadsheet, DBC, ARXML
- **Comprehensive online signal calculations:** Predefined GUI, formula editor, scripting, open interface
- **Intelligent recording:** Easy to complex triggering, multi-recorders, statistics journal, two storage formats same time, 24/7 endless, and many more options
- **Individual powerful visualisation:** Time/frequency/angular domains, y-t, y-x, polar, table, street and track map (GNSS, multi colour), video, buttons for touch operation, gauges, etc.
- **Event monitoring:** Warnings/alarms and reaction (email, sms, push, video/picture activation, logbook entry, etc.
- **Store in a standardised data format:** BIN, export to MATLAB, ASCII, Excel®, DIAdem, MDF, UFF, and many more
- **Cloud integration capability:** MQTT, OPC UA, Power BI
- **Powerful post-process data analysis:** data cleansing, data analysis, and reporting into Office files or PDF



Flexible concept. Highly efficient.

Small or high number of channels? Centralised or distributed? Stand-alone? PC-tethered? Mobile (attended/unattended)? Real-time integration?

Every measurement task in testing or monitoring has different requirements. What remains constant is the need for high data quality and getting the job done efficiently.

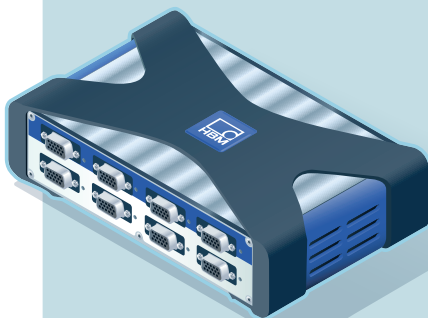
QuantumX/SomatXR provide a scalable, future-proof solution ready for your current and next job!

OPERATOR LEVEL

- Configuration/setup
- Visualisation and control
- Automation
- Recording
- Analysis
- Presentation (report, export)



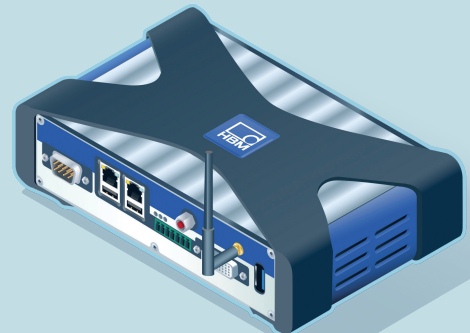
ETHERNET (PEER-TO-PEER, LAN)



Single device

DATA RECORDER

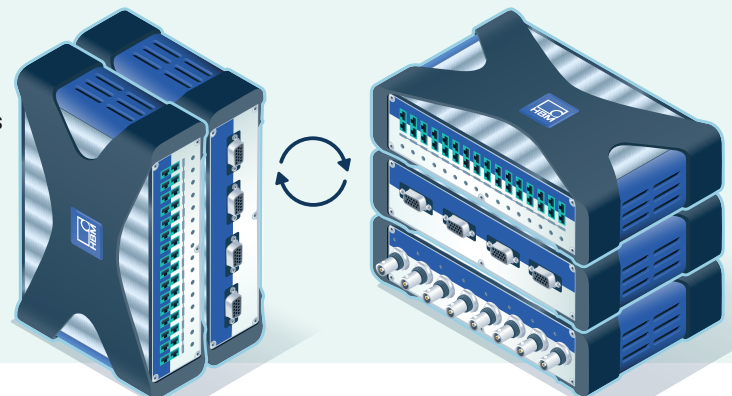
- Configuration
- Visualisation
- Recording
- Analysis



ETHERNET/INTERNAL BUS

System

Sync via an internal bus or Ethernet

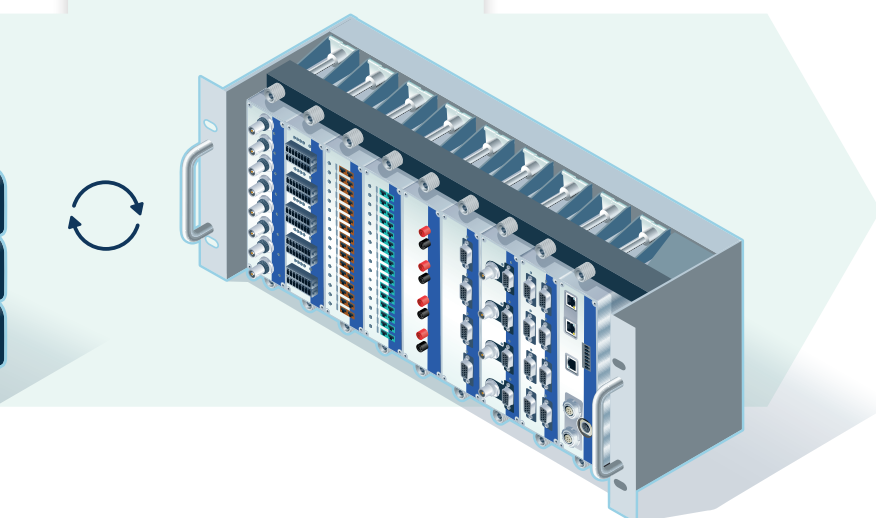




ETHERNET (LAN, WI-FI)



ETHERNET/INTERNAL BUS

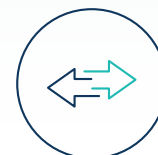


ALL STRENGTHS AT A GLANCE

- Acquires multi-physics sensor and signal data in the mechanical, electrical, and thermal fields
- Up to 100 kS/s per channel covering bandwidths up to 40 kHz
- High measurement quality and data accuracy due to active noise suppression (24-bit ADC, isolated, high-end bridge technology with carrier frequency excitation and AutoCal)
- Filters and scaling in real-time, optimal for real-time integration
- Fully time synchronised – distributed, centralised, open
- Scalable setups: PC tethered single module or multiple modules, with data recorder (including server or cloud integration), real-time test bench integration
- 100% digital: Calibration data and certificate stored on every MX module
- Robust: wide temperature range: -20°C to 65°C (-4°F to 150°F), shock and vibration for mobile and lab testing

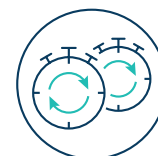
INTERFACES TO:

- GPS/GNSS and IMU/INS/RTK
- Video cameras
- Wheel force sensors (Kistler, MSC, A&D, MTS, Hexagon)



SYNCHRONOUS

Ethernet IEEE1588:2008 (PTPv2), internal bus, NTP, IRIG-B, EtherCAT



REAL-TIME INTEGRATED

- EtherCAT™ (write/read)/PROFINET/CAN FD
- Analogue voltage out/digital IO, onboard calculation



SCALABLE

1 to 10,000 channels

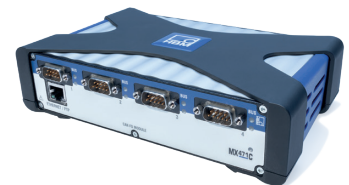
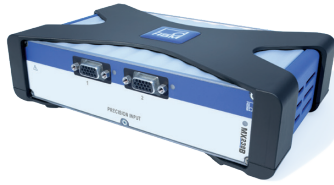


QuantumX: the facts

QuantumX is the freely scalable measuring system from HBM. Get a quick overview of the modules' flexibility.

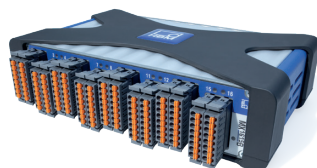


| Universal | | High precision |
|--|--|--|
| MX840B/MX440B | MX410B | MX430B |
| 8-channel/4-channel universal amplifier | 4-channel high-dynamic universal amplifier | 4-channel precision SG full bridge amplifier |
| Sampling rate per channel: 40 kS/s Signal bandwidth: 7 kHz | Sampling rate per channel: 100 kS/s (200 kS/s, 2-channel) Signal bandwidth: 40 kHz (80 kHz, 2-channel) | Sampling rate per channel: 40 kS/s Signal bandwidth: 6 kHz |
| Transducer technologies <ul style="list-style-type: none"> • SG half or full bridge (DC or CF with 4.8 kHz) • Current-fed piezoelectric transducers (IEPE/CCLD/ICP®) • Piezoresistive full bridge • Resistance thermometers (Pt100, Pt1000) • Thermocouples (types K, N, R, S, T, B, E, J, C) • Ohmic resistor • Potentiometric transducers • Inductive half or full bridge, LVDT • Voltage (± 100 mV, ± 10 and ± 60 V) • Current (0/4 – 20 mA) • Channel 5 – 8, in addition: Frequency, pulse counter, rotary encoder (incremental with/without index), SSI • MX840B channel 1, in addition: High speed CAN (ISO 11898, read 128 signals, transmit 7 channels) Sensor supply: 5 – 24 V, 0.7 W (module: 2 W) | Transducer technologies <ul style="list-style-type: none"> • SG half or full bridge (DC or CF with 4.8 kHz) • Current-fed piezoelectric transducers (IEPE/CCLD/ICP®) • Piezoresistive full bridge • Inductive half or full bridge • Voltage (± 10 V) • Current (0/4 – 20 mA) • Real-time: RMS, PEAK • Scalable voltage output: BNC socket, ± 10 V, 16 bit • Sensor supply: 5 – 24 V, 0.7 W (module: 2 W) | Accuracy class: 0.01 Transducer technologies <ul style="list-style-type: none"> • SG full bridge • DC or carrier frequency mode (600 Hz) • Bridge excitation: 2.5/5/10 V • Measuring ranges: 2.5 or 5 mV/V • Transducer impedance: up to 5000 ohms • Real-time: Matrix calculation, RMS • Scalable voltage output: BNC socket, ± 10 V, 16 bit |
| Connector D-Sub HD 15-pin Accessories IEPE or voltage to BNC: 1-SUBHD15-BNC Thermocouples: 1-SCM-TCK/TCJ Quarter bridge completion: 1-SCM-SG120/350 300 V CAT II or 500 V DC: 1-SCM-HV | Connector D-Sub HD 15-pin BNC (voltage output) Accessories IEPE or voltage to BNC: 1-SUBHD15-BNC Quarter bridge completion: 1-SCM-SG120/350 300 V CAT II or 500 V DC: 1-SCM-HV | Connector D-Sub HD 15-pin BNC (voltage output) Accessories 1-KAB416: SubD-2-DSubHD adapter 1-KAB144: MS-2-DSubHD adapter 1-SUBHD15-SAVE: Socket saver |



| High precision | Torque/Rotational speed | CAN FD |
|--|---|---|
| MX238B | MX460B | MX471C |
| 2-channel high-precision SG full bridge amplifier | 4-channel high-dynamic universal amplifier | CAN FD/Classic CAN |
| Sampling rate per channel: 40 kS/s Signal bandwidth: 50 Hz | Sampling rate per channel: 100 kS/s Signal bandwidth: 40 kHz | Receive: All (RAW), 128 decoded Transmit: 200 signals/messages |
| Accuracy class: 0.0025 Transducer technologies <ul style="list-style-type: none"> SG full bridge (6-wire circuit) Carrier frequency (225 Hz) Bridge excitation: 2.5 or 5 V Measuring ranges: 2.5 or 5 mV/V Transducer impedance: up to 5000 ohms | Transducer technologies <ul style="list-style-type: none"> Digital high-resolution timer inputs for frequency or torque measurement with HBM T10, T12, T40, and variants Rotary encoder/incremental encoder (digital, with/without index) for rotational speed measurement Pulse counter Inductive rotary encoders, crankshaft sensors (TDC sensor with gap detection) Pulse-width modulated signals (PWM) Real-time: Torsional vibration analysis Route channel 1 to 2 to determine crankshaft angle and rotational speed using a connected sensor Sensor supply: 5 – 24 V, 0.7 W (module: 2 W) | Interfaces Receive/Acquisition <ul style="list-style-type: none"> Acquisition of all CAN signals on the bus and decoding on the PC, or decoding of up to 128 signals in real time on the unit Databases: DBC, ARXML Others: J1939/22, ISOBUS, CANopen Support of Seed & Key (SKB) Selectable bus termination Send/Gateway <ul style="list-style-type: none"> Pack measurement signals and transmit to CAN/CAN FD to any data logger or the bench Port-2-Port gateway with galvanic isolation MX Assistant software generated DBC database Ethernet (PTPv2) gateway to PC for all the modules connected to the MX471C. |
| Connector D-Sub HD 15-pin Accessories 1-KAB416: SubD-2-DSubHD adapter 1-KAB144: MS-2-DSubHD adapter 1-SUBHD15-SAVE: Socket saver | Connector D-Sub HD 15-pin | Connector D-Sub 9-pin, male, CiA compliant pin out |

QuantumX: the facts



| High channel count | | |
|--|--|---|
| MX1601B | MX1615B/MX1616B | MX1609KB/MX1609TB |
| 16-channel standard amplifier | 16-channel bridge amplifier | 16-channel thermocouple amplifier Type K/T |
| Sampling rate per channel: 20 kS/s Signal bandwidth: 3 kHz | Sampling rate per channel: 20 kS/s Signal bandwidth: 3 kHz | Sampling rate per channel: 300 S/s Signal bandwidth: 15 Hz |
| Transducer technologies <ul style="list-style-type: none"> • Current-fed piezoelectric transducers (IEPE/CCLD/ICP®) • Voltage (± 100 mV, ± 10 and ± 60 V) • Current (0/4 – 20 mA) | Transducer technologies <ul style="list-style-type: none"> • SG full bridge • SG half bridge • MX1615B: SG quarter bridge with integrated 120- and 350-ohm completion resistors • MX1616B: SG quarter bridge with integrated 350- and 1000-ohm completion resistors • Bridge excitation: DC or CF (1200 Hz) • Internal shunt resistor (100 kilohms) • Voltage (± 10 V) • Resistance thermometers (Pt100, Pt500, Pt1000) • Ohmic resistor • Potentiometric transducer | Transducer technologies <ul style="list-style-type: none"> • Thermocouple • Type K: MX1609KB • Type T: MX1609TB • Measuring point identification/ wireless TEDS (RFID) in the Thermo-Mini from HBK Innovative plug & measure functionality <ul style="list-style-type: none"> • Wireless TEDS (RFID) supports individual measurement spot name • No more cable stickers |
| Connector Phoenix Push-In (8-pin) Accessories 16 plugs: 1-CON-S1015 Wiring Setup Mate: 1-WIRING-MATE | Connector Phoenix Push-In (8-pin) Accessories 16 plugs: 1-CON-S1015 Wiring Setup Mate: 1-WIRING-MATE | Connector Thermo-Mini (green/brown) Accessories 10 plugs type K: 1-THERMO-MINI 10 plugs type T: 1-THERMO-MINI-T |



| Electrically isoated (CAT rated) | | Optical interrogator |
|---|--|--|
| MX809B | MX403B | MXFS8 |
| 8-channel amplifier for thermocouples and cell voltages (VDE-tested safety) | 4-channel module for voltage and current measurement (VDE-tested safety) | 8-connector module for Fiber Bragg Grating (FBG) based sensors |
| Sampling rate per channel: 600 S/s Signal bandwidth: 15 Hz | Sampling rate per channel: 100 kS/s Signal bandwidth: 40 kHz | Sampling rate per channel: Dynamic: 100S/s or 2kS/s Static: 1S/s or 10S/s Number of channels per connector: Dynamic: 16; Static: 64 |
| Transducers/input types <ul style="list-style-type: none"> • Thermocouples Type K, J, T, E, B, N, R, S • Voltage input (± 5 V) • Differential, electrically isolated inputs • Insulation: 1000 V RMS (2500 V Peak) • Measurement category: 600 V CAT II/300 V CAT III • Real-time RMS | Input types <ul style="list-style-type: none"> • Measurement ranges: 10, 100, and 1000 V • Differential, fully electric isolated inputs • Measurement category: 1000 V CAT II/600 V CAT III • Real-time RMS | Transducer technologies <ul style="list-style-type: none"> • FBG • Spectral range: 1500 – 1600 nm • Automatic channel definition • Sensor configuration at device level: absolute wavelength, relative wavelength, strain, temperature and acceleration • Ethernet gateway to the PC or recorder for all modules connected to the MXFS |
| Connector Standardised Thermo-Mini connector with an insulating cap from HBK Accessories Full thermocouple, type K: 1-ITC-K1000 4 insulating caps: 1-CON-A1018 4 Thermo-Mini type K: 1-CON-S1016 | Connector 4 mm safety laboratory connector Accessories Please request cables, burden resistors, current transducers (CT) | Connector FC/APC Alternatively: SC/APC Accessories newLight sensors |

QuantumX: the facts



| Recorder/Gateway | | Multi-I/O |
|---|--|---|
| CX22B/CX22B-W | CX27 | MX878B/MX879B |
| Data recorder with catman^(R) Easy or AP | Gateway: Ethernet, EtherCAT[®], PROFINET, XCP-on-Ethernet | MX878B: 8-channel analogue output MX879B: +32-channel digital I/O |
| Sum data rate: 5 MS/s | Output data rate: Max. 4.8 kS/s | Output signals: Max. 4.8 kS/s Generate signals: Max. 96 kS/s |
| Interfaces <ul style="list-style-type: none"> • 3 × Ethernet TCP/IP (LAN and Wi-Fi) • 2 × FireWire • 3 × USB 2.0/3.1 (GNSS, keyboard, mouse, touch, etc.) • 1 × DVI-D • 6 × Dig IO with status LED • Backplane connector • 1 × RS-232 (GNSS, weather station, and more) Functions <ul style="list-style-type: none"> • Connect QuantumX or SomatXR modules • Configure setup via sensor database, TEDS or spreadsheet • Include online computations • Set trigger for start and stop • Record data on internal SSD, CFast or USB flash drive • Use as EDGE recorder • Set up for 'unattended test mode' | Interfaces <ul style="list-style-type: none"> • 2 × Ethernet Gigabit (PTPv2, XCPoE) • 2 × EtherCAT (in, out) • 2 × PROFINET (in, out) • 2 × FireWire • 1 × Backplane connector Functions <ul style="list-style-type: none"> • Support of QuantumX/SomatXR modules • Ethernet-based data transfer • Real-time data transfer of up to 199 signals • EtherCAT write and read (new) | Outputs <ul style="list-style-type: none"> • Voltage (± 10 V, 16 bit) • MX879B: +digital inputs or outputs Functions <ul style="list-style-type: none"> • Output of system or real-time signals • Real-time computation: Addition, multiplication, 6×6 matrix • PID controller, limit value switch • Frequency generator (constant, harmonic signals, arbitrary – replay of measured data) |
| Special characteristics <ul style="list-style-type: none"> • Internal memory (SSD, CFast) • Wi-Fi antenna included Accessories GNSS: 1-GPS-USB-18Hz Upgrade to catman AP: 1-CATEASY-To-AP | | Connector MX878B: BNC MX879B: Phoenix Push-In (8-pin) Accessories MX879B, 16 additional plugs: 1-CON-S1015 |

Your project is our challenge

Benefit from our worldwide network of experts, services and partners to get your tailored solution.

Our dedicated team will support you at every stage of your project. From sensor integration to data visualisation and acquisition, we ensure high-quality results through advanced data analytics. We bridge the gap between simulation and reality with precise data correlation, fostering team collaboration and accelerating decision-making based on actionable insights.

At HBK, we are committed to empowering your innovation. Our goal is to enhance your productivity, save you time, and reduce costs.



More than 5,000 customers worldwide trust QuantumX/ SomatXR and catman as a solution to get the job done!



Application and product consultancy



Managing customised products/projects/solutions



Measurement and data analysis service



Software development



Training (HBK Academy – at HBK or on-site)



Calibration service (at HBK, on-site or as product)

We provide exceptional validation tools that deliver actionable insights, enabling you to create solutions for a cleaner, healthier, and more productive world.



ACCELERATE YOUR PRODUCT INNOVATION

Hottinger Brüel & Kjær (HBK) provides integrated solutions and expertise across multiple domains and your product life cycle, bridging the gap between the digital world of simulation, modelling software and the physical world of sensors, testing and measurement and data analysis. We also address production end-of-line verification and in-operation data analysis.