QUANTUMX
Data Acquisition System – Universal and Distributable
Engineering of High-Quality Products

Mobile data acquisition

Typical applications:
Acquiring load on mechanical components on bad road surfaces or track; testing vehicle dynamics (ride and handling); brake or acceptance tests

QuantumX benefits:
- **High performance**: Correlate sensors, vehicle bus, position (GPS, GNS) and video
- **Reproducible and efficient**: Script automatic routines
- **Robust and reliable**: Shock, vibration, temperature
- **Easy integration**: Cloud, remote access

Structural health monitoring

Typical applications:
Preventive or predictive maintenance of bridges, tunnels, railway tracks, etc.

QuantumX benefits:
- **Universal**: All sensor types, noise, weather and video
- **Reduced installation cost**: Distributable, short sensor lines
- **Individual jobs at the same time**: Long-term, triggered
- **Quick results**: Full data process (local recorder, server based analytics)
- **Always up to date**: Notification services (push-message, log book)
Lab and bench testing

**Typical applications:**
Structural durability and powertrain testing in dynos; system and component testing and verification

**QuantumX benefits:**
- **Plug & Play:** Universal inputs + TEDS
- **Freely scalable:** High channel count, data throughput
- **Reliable results:** Highly accurate inputs
- **Easy to integrate:** Rack, real-time, any PC software

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Service/Maintenance

**Typical applications:**
Calibration of machinery components

**QuantumX benefits:**
- **Portable:** Small and light-weight
- **Results you can trust:** Highly accurate inputs
- **Traceable quality:** On-board calibration protocol
- **Quick on-site service:** Individual user interface in any language

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More than 20,000 modules in use worldwide
A Reliable Measuring Chain ...

Dependable results require optimal matching of transducers, data acquisition system and software. HBM provides you with the complete measuring chain: connect — visualize and save — analyze.

Rugged and precise
Acquire strain, force, torque, pressure or displacement using precise sensors and transducers from HBM.
Integrate sensors or systems from other manufacturers.
Acquire any signal quantity such as voltage, current or resistance.

Universal and fast
QuantumX provides universal inputs and supports TEDS*, the standardized electronic data sheet in the sensor for automatic channel configuration.

*Transducer Electronic Datasheet (IEEE standard 1451): Device identifies transducer and automatically configures the channel as soon as connected.
A comprehensive solution – the complete measuring chain from HBM

Software

Distributable

Install your QuantumX modules at the measuring points and connect the modules in a distributable synchronized network.

Integrate the measurement signals in real-time and analyze them in parallel using PC software.

Intuitive and fast

Store data locally in the data recorder or PC.

catman® allows easy computation, visualization, storage and analysis of measured values and signals.

QuantumX also can be integrated into your own programs

→ LabVIEW → .NET → CANape

From 2 to 2,000 channels: QuantumX makes it happen
Professional and Project-Oriented: Data Handling Using catman®
A single tool allows full parameterization of all channels, visualization and control of test and measurement tasks, as well as fundamental data analysis: catman®. Work in a project-oriented way and describe your measuring equipment and task.

**catman®**

**Professional software for data acquisition and processing**

- Easy integration of measuring devices
- Fast and reusable channel configuration (sensor database, TEDS, CAN dbc)
- Easy creation of computed channels using formula editor
- Plug-ins for signal analysis of rotating mechanical shafts, combustion engines, electric propulsion systems, mechanical stress and fatigue life analysis
- Smart triggers based on signal analysis
- Individual visualization and control on multiple pages, screens or full-screen (chart recorder, digital display, table, analog meter, function key, text, video, image, test track, etc.)
- Signal visualization in time, frequency or angular domain
- Event monitoring (limit value switches, push notification / email, logbook, etc.)
- Multiple formats for storage and export (catman BIN, Microsoft® Excel, ASCII, MDF 3/4, National Instruments DIAdem, MathWorks MATLAB, RPC III, UFF58, ...)
- Automatic file transfer to server / cloud
- Powerful data analysis (statistics, editing, matching, etc.)
- Automation of sequences using predefined functions, VBA script or AutoSequence
- Reporting (direct or using Microsoft® Word, Excel)

*Every day more than 10,000 users rely on catman*
Flexible Concept, Consistent Quality

Small or large numbers of channels? Connected to a PC or stand-alone with a data recorder? Integrated in real-time? Stationary or mobile? Centralized or distributed? QuantumX provides a solution in all cases.

Every measuring task has different system requirements. What remains constant is that high measurement quality is essential. The modules can be combined in an individual system that meets your requirements. This enables solutions for a wide range of applications to be implemented. Flexible, without any compromise. Versatile and dependable.

Operator level
- Configuration
- Visualization & Control
- Automation
- Recording
- Analysis
- Presentation

Data recorder
- Configuration
- Visualization
- Recording
- Analysis

System
Sync via FireWire or Ethernet
The benefits at a glance

- Acquires all common mechanical, electrical and thermal quantities
- Fully time synchronized while distributed
- High accuracy (24 bit AD, electrical isolation, AutoCal, 6/5/4-wire circuit, carrier frequency)
- Up to 100 kS/s per channel, individual filters and scaling
- Standalone with data recorder
- Store up to 12 MS/s with catman®
- Calibration certificate saved to every measurement module

Interfaces to
- GPS, Glonass, IMUs
- Video cameras
- Wheel force sensors (Kistler, A&D, MTS)

Synchronous
Ethernet PTPv2,
FireWire,
NTP, IRIG-B

Scalable
1 to 10,000 channels

Real-time
Real-time modules,
analog / digital outputs,
EtherCAT™ / CANbus
QuantumX: The Facts

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

<table>
<thead>
<tr>
<th>Universal</th>
<th>Precision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MX840B/ MX440B</strong></td>
<td><strong>MX410B</strong></td>
</tr>
<tr>
<td><strong>8-channel/4-channel universal amplifier</strong></td>
<td><strong>4-channel high-dynamic universal amplifier</strong></td>
</tr>
<tr>
<td><strong>Sampling rate per channel:</strong> 40 kS/s</td>
<td><strong>Sampling rate per channel:</strong> 100 kS/s (200kS/s, 2-chan.)</td>
</tr>
<tr>
<td><strong>Signal bandwidth:</strong> 7 kHz</td>
<td><strong>Signal bandwidth:</strong> 40 kHz (80 kHz, 2-channel)</td>
</tr>
<tr>
<td><strong>Transducer technologies</strong></td>
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</tr>
<tr>
<td>SG half or full bridge (DC or CF with 4.8 kHz)</td>
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<tr>
<td>Current-fed piezoelectric transducers (IEPE / ICP®)</td>
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<tr>
<td>Piezoresistive full bridge</td>
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</tr>
<tr>
<td>Resistance thermometers (PT100, PT1000)</td>
<td>Inductive half or full bridge</td>
</tr>
<tr>
<td>(Type K, N, R, S, T, B, E, J, C)</td>
<td>Voltage (±10 V)</td>
</tr>
<tr>
<td>Ohmic resistor</td>
<td>Current (0 / 4...20 mA)</td>
</tr>
<tr>
<td>Potentiometric transducers</td>
<td></td>
</tr>
<tr>
<td>Inductive half or full bridge, LVDT</td>
<td></td>
</tr>
<tr>
<td>Voltage (±100 mV, ±10 and ±60 V)</td>
<td></td>
</tr>
<tr>
<td>Current (0 / 4...20 mA)</td>
<td></td>
</tr>
<tr>
<td>Channel 5-8, in addition: Frequency, pulse counter, incremental rotary encoder (incremental with/without index), SSI</td>
<td></td>
</tr>
<tr>
<td>MX840B channel 1, in addition: High speed CAN (ISO 11898, read 128 signals, transmit 7 channels)</td>
<td></td>
</tr>
<tr>
<td>Sensor supply: 5...24 V, 0.7 W (module: 2 W)</td>
<td></td>
</tr>
</tbody>
</table>

**Connector**
- DSubHD 15 pole

**Accessories**
- Thermocouples: 1-THERMO-MXBOARD
- SG quarter bridge: 1-SCM-SG120/350/700/1000
- 10 or 300 V CAT II: 1-SCM-HV
- BNC adapter: 1-SUBHD15-BNC

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**Universal**

- **MX840B/ MX440B**
- **MX410B**
- **MX430B**

**Precision**

- **MX840B/ MX440B**
- **MX410B**
- **MX430B**

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- DSubHD 15 pole
- BNC (voltage output)

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### The modules at a glance

<table>
<thead>
<tr>
<th>High precision</th>
<th>Torque/Rotational speed</th>
<th>CAN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MX238B</strong></td>
<td><strong>MX460B</strong></td>
<td><strong>MX471B</strong></td>
</tr>
</tbody>
</table>

**2-channel high-precision SG full bridge amplifier**

- Sampling rate per channel: 40 kS/s
- Signal bandwidth: 50 Hz
- Accuracy class: 0.0025
- Transducer technologies:
  - 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

**4-channel high-dynamic universal amplifier**

- Sampling rate per channel: 100 kS/s
- Signal bandwidth: 40 kHz
- Transducer technologies:
  - Digital high-resolution timer inputs for frequency or torque measurement with HBM T10, T12, T40 and derivatives
  - 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)

**4-channel CAN module**

- Signal acquisition per channel: 128
- Signal transmission: 200
- Interfaces:
  - CAN 2.0 A/B (ISO 11898)
  - Acquisition of CAN signals or bit stream J1939 with catman
  - Individual combination and transmission of measurement signals (gateway)
  - Receive CCP or XCP-on-CAN
  - Software selectable internal termination resistor (120 ohms)
  - MX Assistant can generate DBC file

**Connector**

- DSubHD 15 pole

**Accessories**

- 1-KAB416: SubD-2-DSubHD adapter
- 1-KAB144: MS-2-DSubHD adapter
- 1-SUBHD15-SAVE: Socket saver

**Connector**

- DSubHD 15 pole

**Connector**

- DSub 9 pole, male, assignment per CiA
# QuantumX: The Facts

## High channel count

<table>
<thead>
<tr>
<th>MX1601B</th>
<th>MX1615B</th>
<th>MX1609KB / MX1609TB</th>
</tr>
</thead>
</table>

### 16-channel standard amplifier
- **Sampling rate per channel:** 20 kS/s
- **Signal bandwidth:** 3 kHz
- **Transducer technologies**
  - Current-fed piezoelectric transducers (IEPE / ICP®)
  - Voltage (±100 mV, ±10 and ±60 V)
  - Current (0 / 4...20 mA)

### 16-channel bridge amplifier
- **Sampling rate per channel:** 20 kS/s
- **Signal bandwidth:** 3 kHz
- **Transducer technologies**
  - SG full bridge
  - SG half bridge
  - SG quarter bridge with integrated 120 and 350 ohm completion resistors
  - Bridge excitation: DC or CF (1200 Hz)
  - Internal shunt resistor (100 kOhm)
  - Voltage (±10 V)
  - Resistance thermometers (PT100)
  - Ohmic resistor
  - Potentiometric transducer

### 16-channel thermocouple amplifier Type K/T
- **Sampling rate per channel:** 300 S/s
- **Signal bandwidth:** 15 Hz
- **Transducer technologies**
  - Thermocouple
  - Type K: MX1609KB
  - Type T: MX1609TB

### Connector
- Phoenix Push-In (8 pole)

### Accessories
- 10 plugs: 1-CON-S1015

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### The modules at a glance

<table>
<thead>
<tr>
<th>High voltage</th>
<th>Recorder/Gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MX809B</strong></td>
<td><strong>MX403B</strong></td>
</tr>
<tr>
<td><strong>CX22B-W</strong></td>
<td></td>
</tr>
</tbody>
</table>

#### 8-channel thermocouple and voltage amplifier (VDE-tested safety)

- **Sampling rate per channel:** 600 S/s
- **Signal bandwidth:** 15 Hz

#### 4-channel module for voltage (VDE-tested safety)

- **Sampling rate per channel:** 100 kS/s
- **Signal bandwidth:** 40 kHz

#### Transducer technologies

**Thermocouple**
- Type K, J, T, E, B, N, R, S

**Voltage:** ± 5 V
- Differential, electrically isolated inputs
- Isolation: 1000 V RMS (2500 V Peak)
- Measurement category: 600 V CAT II / 300 V CAT III
- Real-time: RMS

**Voltage:** 10, 100 and 1000 V
- Differential, electrically isolated inputs
- Measurement category: 1000 V CAT II / 600 V CAT III
- Real-time: RMS

#### Interfaces

- 3 x Ethernet TCP/IP (LAN and WLAN)
- 2 x FireWire
- 3 x USB (keyboard, mouse, touch, GPS, etc.)
- 1 x DVI
- 3 x digital input
- 3 x digital output with status LED
- Backplane connection
- 1 x RS232 (GPS)

#### Function:

- Connection of QuantumX or SomatXR amplifiers and modules
- Configuration of measurement channels using sensor data base, TEDS or EXCEL™
- Online computation and analysis of channels
- Trigger for Start and Stop
- Data logging to internal eSSD, removable CFast or USB 2.0/3.0 flash drive
- Standalone test mode

#### Connector

- Standardized Thermo Mini connector with insulating cap from HBM
- 4 mm safety laboratory connector

#### Accessories

- Insulating cap: 1-CON-A2018
- 4 thermo mini type K: 1-CON-S1016
- 4 thermo mini for voltage: 1-CON-S1017

#### Special features

- Internal 32 GB ROM (eSSD), removable 8 GB CFast and antenna included in package

#### Connectors

- 4 mm safety laboratory connector

#### Accessories

- Virtual star: 1-G068-2
- Burden resistor (1, 2.5 and 10 Ω): 1-HBR/xΩhm
- BNC to laboratory connector: 1-G067-2
- Safety laboratory cables: 1-KAB282-1.5

#### Special features

- 1-CATEASY-Roadload
- 1-CATEASY-Videocam
- 1-GPS-USB-18Hz
## QuantumX: The Facts

<table>
<thead>
<tr>
<th>Gateway</th>
<th>Multi-I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CX27B</strong></td>
<td><strong>MX878B</strong></td>
</tr>
<tr>
<td><strong>EtherCAT®/Ethernet Gateway</strong></td>
<td><strong>8-channel analog output</strong></td>
</tr>
<tr>
<td><strong>Interfaces</strong></td>
<td><strong>Output signals:</strong> max. 4.8 kS/s</td>
</tr>
<tr>
<td>2 x EtherCAT®</td>
<td><strong>Generate signals:</strong> max. 96 kS/s</td>
</tr>
<tr>
<td>2 x Ethernet TCP/IP</td>
<td><strong>Output</strong></td>
</tr>
<tr>
<td>2 x FireWire</td>
<td>Voltage (± 10 V, 16 bit)</td>
</tr>
<tr>
<td>2 x digital input</td>
<td><strong>Functions</strong></td>
</tr>
<tr>
<td>2 x digital output with status LED</td>
<td>Real-time signal output</td>
</tr>
<tr>
<td><strong>Function:</strong></td>
<td><strong>Real-time computation:</strong> Addition, multiplication, 6 x 6 matrix, PID controller</td>
</tr>
<tr>
<td>· Connection of QuantumX amplifiers in real-time</td>
<td>Frequency generator (constant, harmonic signals, arbitrary – replay of measurement data)</td>
</tr>
</tbody>
</table>

| **MX879B** |
| Connector |
| BNC |
| **Accessories** |
| 10 plugs: 1-CON-S1015 |

| **MX878B** |
| Connector |
| Phoenix Push-In (8 pole) |
| **Accessories** |
| 10 plugs: 1-CON-S1015 |
QuantumX: Accessories

Choose the accessories that fit your test and measurement task from an extensive range of products.

**Mechanical integration**
- Mechanical connecting elements (CASECLIP)
- Fitting panel (CASEFIT)
- Backplane for rack mounting (BPX002)

**Extended functions (SubHD15)**
- Cold junction electronics for thermocouple connection to SubHD15
- Quarter bridge strain gauge (3-wire) to SubHD15 adapter
- BNC to SubHD15 adapter, e.g. for connecting IEPE sensors
- 300 V CAT II to SubHD15 adapter

**High-voltage series**
- Insulating cap for MX809B thermocouple or voltage connection
- Burden resistor for current measurement to be plugged on safety laboratory connector
- BNC to be plugged on safety laboratory connector
- Artificial star to be plugged on safety laboratory connector

Worldwide more than 1,300 customers trust QuantumX