SOMAT XR

Data acquisition in harsh environments

HBM

Data Acquisition and Testing in Harsh Environments

Rugged mobile data acquisition

As the next generation of rugged mobile data acquisition systems, the powerful HBM SomatXR amplifier system was specially developed for applications in harsh environments. The rugged modules acquire a wide range of physical measurands from strain, vibration, and displacement to voltage, current, and temperature. All modules are protected against moisture, dust, shock, and vibrations and feature an impressively wide temperature range. It is ideal for use in mobile vehicle tests or stationary measurements under extreme conditions.

The CX22B-R data recorder is the main module with pre-installed catman measurement software from HBM for unattended and interactive testing. The data acquisition modules can also be connected directly to a PC with data acquisition software (catman), or integrated into a test bench via EtherCAT®, PROFINET IRT, or CAN.

Rugged features:

- Designed to the degree of protection IP65/IP67 (dust, water)
- Extended temperature range from -40 to +80 °C (dew-point proof)
- Vibration resistant up to 10 g (MIL-STD202G, Method 204D, Test condition C)
- Shock resistant up to 75 g (MIL-STD202G, Method 213B, Test condition B)

Wide-Ranging Applications

SomatXR is designed for a wide range of applications and environments such as when laptops or other amplifiers reach their limit. Due to its rugged design and flexible system configuration, it is suited for mobile vehicle tests, structural monitoring, stationary measurements, and much more.

Mobile vehicle testing

Railway testing

Lab/Bench testing

Benefits at a glance:

- Backed by 40 years of experience in data acquisition in harsh environments
- Highly variable data recorder for both interactive testing due to its convenient data analysis options and unattended testing as an autonomous black-box logger
- Proven signal conditioning from HBM's QuantumX product family including a high noise immunity (carrier frequency, AutoCal, galvanic isolation)

- Modular system with universal inputs to adapt to different measurement tasks
- Precision Time Protocol (IEEE1588 - PTPv2) for a highly accurate synchronization between the different modules, which can be distributed via Ethernet over 100 m
- Quick channel and signal setup by Transducer Electronic Data Sheet (TEDS), sensor data base, and DBC sensor database for CAN signals

CX22B-R: Fast Measurement Results in the Field

The rugged SomatXR CX22B-R data recorder is intended for use in harsh environments and reliably stores the data measured in applications such as mobile vehicle tests.

The recorder acquires data from other SomatXR modules using a FireWire or Ethernet connection. At the same time, the CX22B-R allows for use as as a gateway for direct data transmission via Ethernet to the PC. Both centralized and distributed measurement systems can thus be implemented.

Measured data is acquired using the pre-installed catman Easy measurement software, either in unattended (autonomous black-box recorder) or interactive operation. Conversion to other formats is easy. The convenient catman software solution can be tailored to suit your needs and provides extensive functions for analysis in the field to enable measured data to be visualized, analyzed, and stored.

Data Analysis Made Easy – With the catman Measurement Software

Parameterize

- Fast configuration of the modules and the complete system
- Fast and reusable channel configuration (sensor database, TEDS, CAN dbc)
- Easy creation of computed channels using the formula editor
- Channel configuration without connected devices is possible in off-line mode or using Microsoft Excel

Visualize and control

- Individually visualize and control on multiple pages, screens, or in full-screen format (strip chart, numeric display, table, meter, video, map, image, etc.)
- Visualize signals in the time, frequency, or angular range
- Connect positioning sensors (GPS, GNSS) or wheel force transducers
- Send push messages for defined events

Save

- Use signal analysis to define smart triggers
- Scale few up to 1,000 channels
- Multiple formats for storage and export available (catman BIN, Microsoft® Excel, ASCII, MDF 3/4, National Instruments DIAdem, MathWorks MATLAB, RPC III, UFF58, etc.)
- Uploading of measured date to an FTP server
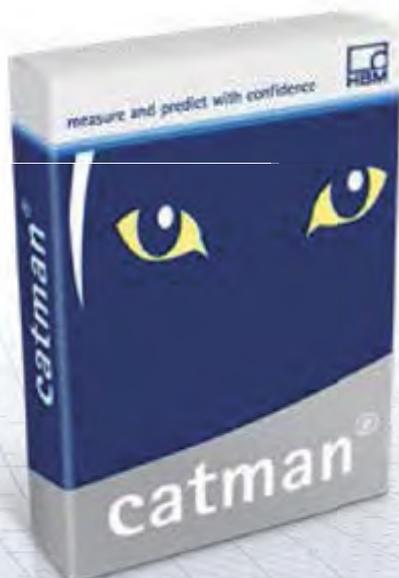
CX22B-R data recorder with pre-installed catman measurement software

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catman Easy or AP:
It's your choice

catman measurement software facilitates measured data acquisition, visualization, and analysis Data can be saved with up to 12 MS/s or 100 MB/s.
catman AP provides the following additional functions that are not available with catman Easy:

- Visualization of GNSS data in geographical maps
- Visualization and analysis of CAN raw data
- Video recording of up to four cameras
- Scripting capabilities

- Data cleansing and conditioning
- Streaming to the cloud
- Parallel recording
- Integration of Kistler wheel force transducers via Ethernet

More information:
www.hbm.com/catman

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SOMAT XR

Extremely rugged

- The complete measurement system, from the amplifier to the data recorder, is protected from humidity, dust, shock, and vibration.

Flexible and universal

- Acquires all common mechanical, electrical, and thermal quantities owing to the wide range of sensors that are supported

Precise and reliable

- High accuracy due to active noise suppression (24-bit ADC, galvanic isolation, 6-/5-/4-wire circuit with AutoCal and carrier frequency)

Time-synchronous data acquisition

- Using your preferred data rate for the analysis of data from different sources

Autonomous or interactive

- The SomatXR data recorder can be used as both a black-box recorder and a full-fledged measurement PC with a touch display.

100 % digital:

- Calibration data is stored in each module

Can be combined with QuantumX:

Select the right module depending on functionality and environmental conditions!

QUANTUM X

QUANTUM X

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Your Individual Data Acquisition System

The SomatXR system's modular design enables you to adapt your measurement system to your requirements. Different data sink options are provided, ranging from the data recorder with pre-installed data acquisition software for mobile vehicle tests through the universal use of the amplifiers directly at a computer to the Industrial Ethernet gateway for test bench integration.

Sensors and transducers ▸ **Data acquisition modules**

Analog inputs

Strain (strain gauge)
Force
Torque
Acceleration
Pressure
Displacement
Temperature
Voltage
Current
Resistance
…

Digital inputs

CAN/CAN-FD
GPS
Camera
Wheel force sensor
Frequency
Encoder
…

SOMAT XR
Data acquisition modules

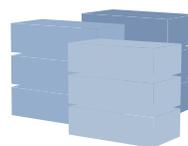**QUANTUM X**
Data acquisition modules

Synchronous

Ethernet PTPv2,
FireWire,
IRIG-B, EtherCAT®,
Ethernet NTP

Scalable

1 to 10,000 channels

1   10,000

Data recorders and gateways

Software and visualization

SOMAT XR
CX22B-R
Data recorder & gateway

Autonomous

Black-box recording or interactive testing
without a PC using catman DAQ software

Connected

PC with DAQ software:
- catman (HBM)
- LabVIEW*/DIAdem* (NI)
- CANape* (Vector)
- Others via .NET* API

SOMAT XR
CX27C-R
Industrial Ethernet gateway

ECU optimization

Integration of analog sensor signals into MCD
software tools via XCP-on-Ethernet (CX27C).

SOMAT XR
MX471C-R
CAN-FD gateway

Test stand

- Real-time integration via:
- EtherCAT/PROFINET IRT (CX27C)
- CAN/CAN-FD (MX471C)

* LabVIEW and DIAdem are registered trademarks of National Instruments Corporation.
* CANape is a registered trademark of Vector Informatik GmbH.
* .NET is a registered trademark of Microsoft Corporation.

Analysis Software

catman® PostProcess

Would you like to analyze your measured data and strengthen the reliability of your measurement results? The catman PostProcess software simplifies the acquisition, visualization, and analysis of your measured data. With its intuitive interface and adaptability, the catman software will help you streamline your measurement projects.

Features:

- Graphical data visualization in the time, frequency, or angle domain
- Individual visualizations and operator controls over several panels
- Data cleansing and preparation using curve operations
- Statistics: Min, Max, Mean, RMS
- Video-based data analysis

- Powerful math libraries: standard math and application specific functions (e.g. rosette and power calculations)
- Export data in various formats (Microsoft® Excel, ASCII, MDF3/4, National Instruments DIAdem, MathWorks MATLAB, RPCIII, UFF58, …)
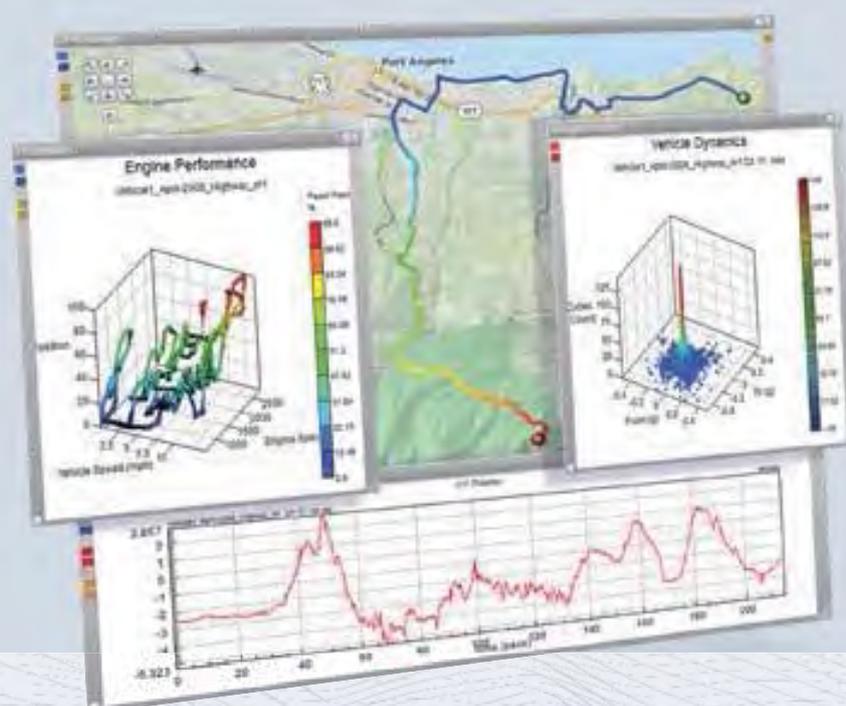- Report creation (direct or using Microsoft® Word)

nCode GlyphWorks® G

nCode GlyphWorks is a powerful data processing software used for analyzing engineering test data, with specialized capabilities in durability and fatigue analysis. Intrinsically multi-file, multi-channel, and multi-format, nCode GlyphWorks is optimized to handle massive and complex data efficiently while providing an intuitive graphical environment that enables users to go from raw data to results quickly and easily.

Features:

- Standardized analysis processes for setting high and low pass filters, position and time-based resampling, and calculating derived channels

- Applies world-class durability and fatigue concepts for damage accumulation and test profile generation

- Integration with nCode DesignLife to improve data correlation between test and CAE

- Complete range of tools for analysis in the time and frequency domains as well as statistics

- Synchronized GPS and video displays

- Scripting capabilities to extend wireless using MATLAB® or Python programming language

- Fatigue materials database to calculate fatigue life from measured data to determine stress-life, strain life, crack growth, and creep analysis

- Optimized testing module to determine the most efficient mix of events required to match an overall target

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Recorder & Gateways

CX22B-R	CX27C-R	EX23-R
Data logging or gateway (FireWire-Ethernet)	**Industrial Ethernet gateway**	**10-port Ethernet switch**
Sum data rate (recorder): 5 MS/s Data through-put (gateway): 3 MS/s	Data throughput (Ethernet): 2 MS/s	
Interfaces	Interfaces	Interfaces
1x DIO (3 inputs, 3 outputs)	EtherCAT®	5 Gigabit Ethernet ports
2x Ethernet	PROFINET IRT	5 Gigabit Ethernet ports with "Power over Ethernet" (PoE)
2x FireWire	2x Ethernet	
2x USB	2x FireWire	
1x DVI-D		
Function	**Function**	**Function**
· Data logging or gateway (FireWire-Ethernet)	· Real-time connection of up to 199 signals from SomatXR measurement modules (EtherCAT® or PROFINET IRT)	· Gateway (Ethernet-Ethernet)
· Connection of SomatXR and QuantumX amplifiers and modules	· Parallel, Ethernet-based data recording using PC software	· Connection of SomatXR and QuantumX amplifiers and modules
· Channels computed online		
Special features	**Special features**	**Special features**
240 GB internal memory	PTPv2 support (Precision Time Protocol IEEE 1588)	PTPv2 support (Precision Time Protocol IEEE 1588)
catman Easy	FireWire-Ethernet routing (gateway)	Power supply for wireless access points or cameras via PoE
Integrated WiFi	XCP-on-Ethernet for integration int MCD software tools	
FireWire-Ethernet routing (gateway)		
	Connector	**Connector**
	M12 D-coded, 4 pole	M12 X-coded, 8 pole

Measurement Modules

MX1601B-R	MX1609B-R	MX1615B-R	MX840B-R
16-channel standard amplifier	**16-channel thermocouple amplifier**	**16-channel bridge amplifier**	**8-channel universal amplifier**
Sampling rate per channel: 20 kS/s Signal bandwidth: 3.8 kHz	Sampling rate per channel: 600 S/s Signal bandwidth: 20 Hz	Sampling rate per channel: 20 kS/s Signal bandwidth: 3.9 kHz	Sampling rate per channel: 40 kS/s Signal bandwidth: 7.7 kHz
Transducer technologies Voltage (±100 mV, ±10 V, ±60V) Current (0 to 20 mA) Current-fed, piezoelectric transducer (IEPE/ICP®)	Transducer technologies Thermocouples Type K: MX1609KB-R Type T: MX1609TB-R	Transducer technologies Strain gauge full bridge circuit Strain gauge half bridge circuit Strain gauge quarter bridge circuit with integrated 120- and 350-ohm completion resistors Voltage (±60 V) Ohmic resistor Potentiometer Pt100, Pt500, Pt1000 resistance thermometers (only one type per module)	Transducer technologies Strain gauge half or full bridge circuit Current-fed piezoelectric transducers (IEPE, ICP®) Piezoresistive full bridge Resistance thermometers (Pt100, Pt500, Pt1000) Thermocouples (types K, N, R, S, T, B, E, J, C) Ohmic resistor Potentiometer Inductive half or full bridge, LVDT Voltage (±100 mV, ±10 and ±60 V) Current (0 to 20 mA) Channel 5-8, in addition: Frequency, counter, rotary encoder (incremental with/without index), SSI Channel 1, in addition: High speed CAN (ISO 11898, read 128 signals, transmit 7 channels)
Special features Sensor supply ch 1-8: 5...24 V, 0.7 W (module: 2 W) Sensor supply ch 9-16: VIN-1V, 30 mA (module 75 mA)	**Special features** Measuring point detection (RFID)	**Special features** Bridge excitation: DC or CF (1,200 Hz) Internal shunt resistors: 100 kΩ	**Special features** Bridge excitation: DC or CF (4,800 Hz) Internal shunt resistors: 100 kΩ Sensor supply: 5...24 V, 0.7 W (module: 2W)
Connector ODU mini snap, 14 pole	**Connector** Thermo mini (green/brown)	**Connector** ODU mini snap, 14 pole	**Connector** ODU mini snap, 14 pole

Measurement Modules

MX411B-R	MX460B-R	MX471C-R	MX590B-R
4-channel high-dynamic universal amplifier	**4-channel high-dynamic digital module**	**4-channel CAN FD module**	**Amplifier with integrated pressure sensors**
Sampling rate per channel: 100 kS/s (2 channel: 200 kS/s) Signal bandwidth: 40 kHz (2ch: 80 kHz)	Sampling rate per channel: 100 kS/s Signal bandwidth: 40 kHz	Receive: raw or decoded (*.dbc) Transmit: sensor signals as gateway	Sampling rate per channel: 40 kS/s Signal bandwidth: 7.7 kHz
Transducer technologies	Transducer technologies	Transducer technologies	Individual transducers
Strain gauge full bridge circuit Strain gauge half bridge circuit Current-fed piezoelectric transducers (IEPE/ICP®) Piezoresistive full bridge Inductive half or full bridge, LVDT Voltage (±10 V) Current (0 to 20 mA)	Digital high-resolution timer inputs for frequency or torque measurement with HBM T10, T12, T40, and variants 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)	CAN 2.0 A/B (ISO 11898) CAN FD (ISO 11898-1:2015) XCP-on-CAN receive J1939 receive (no network management and not multi-ple-package messages)	Absolute pressure 0 to 4 bar Absolute pressure 0 to 6 bar Absolute pressure 0 to 10 bar Relative pressure ± 0.5 bar Relative pressure 0 to 1.6 bar Relative pressure -1 to 2.5 bar Relative pressure -1 to 4 bar Relative pressure -1 to 10 bar Relative pressure -1 to 16 bar Relative pressure 0 to 25 bar
Special features Bridge excitation: DC or CF (4,800 Hz) Internal shunt resistors: 100 kΩ Sensor supply: 5...24 V, 0.7 W (module: 2W) Real-time: RMS, Peak	**Special features** Sensor supply: 5...24 V, 0.7 W (module: 2 W) Route channel 1 to 2 to determine crankshaft angle and rotational speed using a sensor Real-time: Torsional vibration analysis	**Special features** Selectable internal bus termination Configurable bit rate MX Assistant can generate a DBC file FireWire-Ethernet routing (gateway)	**Special features** Measuring point detection (RFID)
Connector ODU mini snap, 14 pole	**Connector** ODU mini snap, 14 pole	**Connector** M12, 5 poles (CiA-compliant assignment)	**Connector** Walther LP-004

Accessories

UPX002	GPS-USB-18HZ	SCM-R-SG	SCM-R-TC	KAB430-0.3
Uninterruptible power supply	GPS receiver (USB)	Quarterbridge adapter	Thermocouple adapter	BNC adapter
Special features · Protects against cold-crank voltage drops, short-term power drop outs and over- voltage conditions · Provides a buffer of up to 80 s · Quick recharge	**Special features** · Simple GPS receiver · Update rate: up to 18 Hz · GPS and GLONASS · USB connection	**Special features** · Output for quarter bridges · Available in 120 Ω, 350 Ω and 1000 Ω · Features TEDS for automatic adapter config-uration	**Special features** · Output for thermocouples · Available types: K, T , E and J · Features TEDS for automatic adapter config-uration	**Special features** · BNC output for voltage or IEPE sensors
Compatible with all SomatXR modules	**Compatible with** CX22B-R	**Compatible with** MX840B-R MX411B-R	**Compatible with** MX840B-R	**Compatible with** MX840B-R MX1601B-R

Further accessories like cables, connectors, power adapters, and mounting aids are available.