QUANTUM X
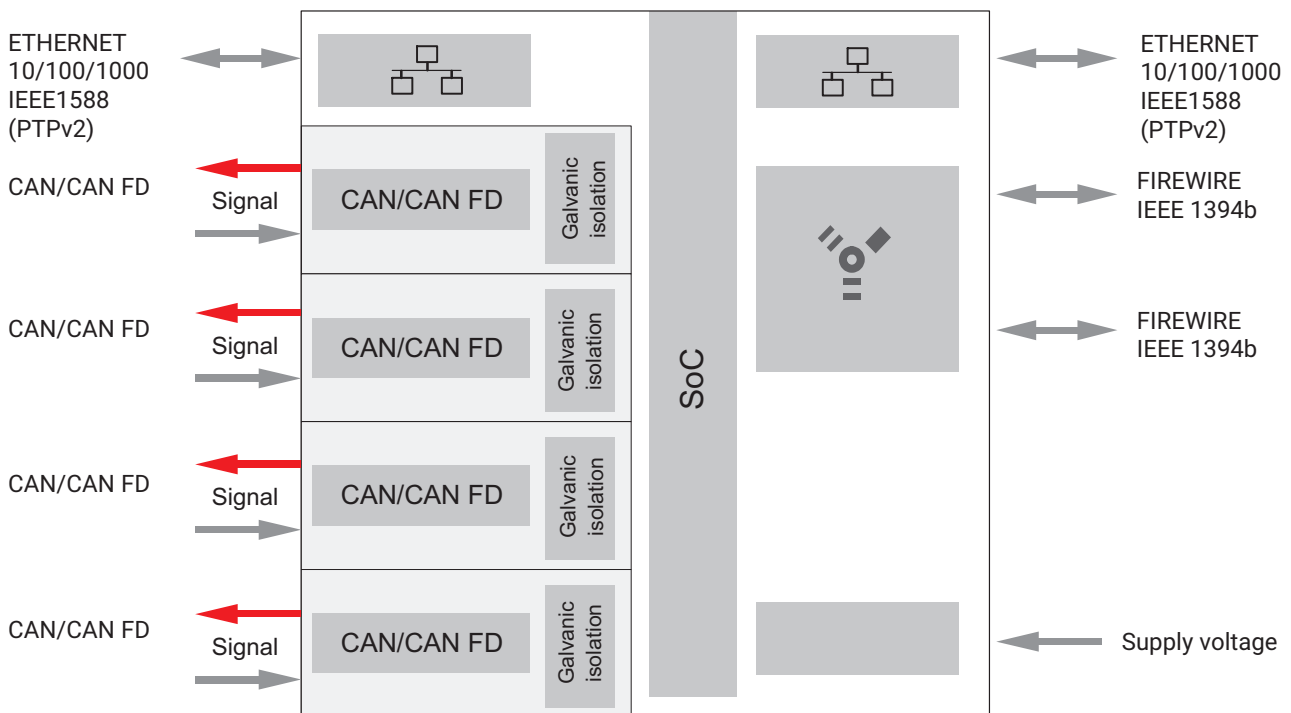
MX471C
CAN FD module

SPECIAL FEATURES

- Four individually configurable channels (galvanically isolated)
- Supports CAN FD (ISO 11898-1:2015), CAN 2.0A/B
- Other protocols: SAE J1939, xCP-on-CAN/CAN-FD
- Transmit: Sensor signals of other MX modules, CAN input signals
- Ethernet gateway for connected measurement modules

BLOCK DIAGRAM

ETHERNET 10/100/1000 IEEE1588 (PTPv2)

CAN/CAN FD — Signal — CAN/CAN FD — Galvanic isolation

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SoC

ETHERNET 10/100/1000 IEEE1588 (PTPv2)

FIREWIRE IEEE 1394b

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Supply voltage

SPECIFICATIONS FOR MX471C

General specifications		
Number of CAN *FD* ports		4, galvanically isolated
Supported protocols		CAN 2.0A (11-bit identifier) CAN 2.0B (29-bit identifier, extended format) ISO CAN FD 11898-1:2015
Bus link		two-wire, as per ISO11898-2
Transducer connection		D-SUB-9
Supply voltage range (DC)	V	10 ... 30 (nominal (rated) voltage 24 V)
Supply voltage interruption max. (at 24 V)	ms	5[1]
Power consumption	W	< 6
Ethernet (module synchronization, data link)	Mbit/s	1000Base-TX/100Base-TX/10Base-T
Protocol (addressing)	-	TCP/IP (static IP/DHCP, IPv4/IPv6)
Plug connection	-	8P8C plug (RJ-45) with twisted-pair cable (CAT-5)
Max. cable length to module	m	100
Synchronization options		
FireWire IEEE1394b		FireWire-based synchronization
Ethernet PTPv2 IEEE1588		Ethernet-based Precision Time Protocol
Ethernet NTP		Ethernet-based Network Time Protocol
PROFINET		
FireWire (module synchronization, data link, optional power supply)		IEEE 1394b (HBM modules only)
Baud rate	MBaud	400 (approx. 50 MBytes/s)
Max. current from module to module	A	1.5
Max. cable length between nodes	m	5 (optical: 100)
Max. number of modules connected in series (daisy chain)	-	12 (= 11 hops[2])
Max. number of modules in a FireWire system (including hubs[3], backplane)	-	24
Max. number of hops	-	14
Nominal (rated) temperature range	°C	-20 ... +60
Operating temperature range	°C	-20 ... +65
Storage temperature range	°C	-40 ... +75
Relative humidity	%	5 ... 95 (non-condensing)
Protection class		III[4]
Equipment protection level		IP20 as per EN 60529
Mechanical tests[5]		
Vibration (30 min)	m/s^2	50
Impact (6 ms)	m/s^2	350
EMC requirements		per EN 61326
Dimensions, horizontal (H x W x D)	mm	52.5 x 200 x 122 (with case protection) 44 x 174 x 119 (without case protection)
Weight about (with case protection)	g	850[6]

[1] Uninterruptible power supply (UPS) available as accessory for longer interruptions
[2] Hop: transition from module to module/signal conditioning
[3] Hub: FireWire node or distributor
[4] The DC voltage supply must meet the requirements of IEC 60950-1 on a SELV voltage supply.
[5] Mechanical stress is tested in accordance with European standards EN60068-2-6 for vibration and EN60068-2-27 for shock. The devices are exposed to an acceleration of 50 m/s^2 within the frequency range 5...65 Hz in all 3 axes. Duration of this vibration test: 30 minutes per axis. The shock test is implemented at a nominal (rated) acceleration of 350 m/s^2 for a duration of 6 ms, half sine and with shocks in each of the six possible directions.
[6] Without case protection: 660 g

CAN bus												
Bit rates[7] (CAN 2.0A, CAN 2.0B, CAN FD arbitration phase)	kBits/s	1000	800	666.6	500	400	250	125	100	50	20	10
Permissible cable lengths	m	25	50	80	100	100	250	500	600	1000	2500	5000
Additional bit rates[7] CAN FD data phase	Mbit/s	4	2.5	2	1.6	1.25	1	0.5				
Bit sequence formats		Motorola Forward MSB, Intel Standard										
Bus terminating impedance (internal; can be connected via software)	Ω	120 (common mode-stabilized, split termination)										
Identifier		11-bit or 29-bit										
Data types		REAL32 and REAL64, BOOL, INT32 and UINT32, INT64 and UINT64										

Receiving raw data stream	
Max. number of messages per port	Unlimited – complete BUS data
Parameterization	catman

Receiving decoded signals	
Max. number of input signals per port	128 or 250[8]
CAN signal types for input signal	Standard, mode-dependent, mode signal
Parameterization	Manually or from CAN database (*.dbc, *.arxml)

Receiving CCP and XCP on CAN/CAN FD	
Supported protocols	CCP Version 2.1 XCP on CAN Version 1.1 XCP on CAN FD Version 1.1
Parameterization	*.dbc plus optional *.skb Required step using CANape from Vector Informatik (read *.a2l, generate *.dbc)

Receiving SAE J1939 signals (no network management/PGN support)	
Parameterization	catman®Easy/AP, via DBC database (full CAN ID is needed, PGN is not sufficient), no network management, multi-packet messages are not supported

Transmitting CAN messages (dynamic)	
Signal sources	Sensor signals/measured values (MX inputs) CAN signal inputs (CAN gateway) Real-time signals (calculations)
Parameterization	MX Assistant, including determination of CAN ID and generating *.dbc
Max. number of messages (IDs) per port	128
Max. number of different signals per module	200
Numbers of signals per message	Several signals per message
Max. number of bytes per message	64
Message type	CAN or CAN FD
Transmission type	Timer-controlled (max. 1200/s) On a change of source value (defined delta), isochronous event (with divider) (max. 5000/s)

Transmitting predefined CAN messages (static)	
CAN messages	Can be used for wake-up, CANopen sensors, OBD-2
Max. number of messages (IDs) per port	32
Max. number of bytes per message	8 (CAN) 64 (CAN FD)
Transmission types	Timer-controlled (max. 1200/s), software control

[7] Recommended and tested bit rates
[8] If catman software is used, only the decoding of max. 128 signals per port is supported.

Performance			
Decoding performance			
Max. signal transmission rate (decoding) per module (without Ethernet gateway functionality)	1/s	250,000	
Max. signal transmission rate (decoding) per module (with Ethernet gateway functionality)	1/s	100,000	
Ethernet gateway performance			
Max. signal transmission rate (Ethernet gateway) per module without CAN functionality **Data rate, max.**	1/s	2,000,000	
Max. signal transmission rate (Ethernet gateway) per module with CAN functionality	1/s	1,000,000	

Typical performance[9] with catman[10], [11]			
Without simultaneous Ethernet gateway functionality		Signal transmission rate (decoding) per module	Signal transmission rate (encoding) per module
Decoding (4 x 128 signals)	1/s	200,000	-
Decoding (1 x 128 signals)	1/s	100,000	-
Decoding (4 x 128 signals) and raw (2 x)	1/s	180,000	-
Decoding (4 x 128 signals) and raw (4 x)	1/s	160,000	-
Decoding (2 x 128 signals) and encoding[12] (2 x 125 signals)	1/s	150,000	100,000
Encoding[12] (4 x 20012) signals)	1/s	-	200,000
With simultaneous Ethernet gateway functionality (1 MS/s)		Signal transmission rate (decoding) per module	Signal transmission rate (encoding) per module
Decoding (4 x 32 signals)	1/s	100,000	-
Decoding (1 x 128 signals)	1/s	100,000	-
Decoding (2 x 64 signals) and raw (2 x)	1/s	80,000	-
Decoding (1 x 100 + 1x 50 signals), raw (2x), and encoding[12] (1x 100 signals)	1/s	60,000	40,000
Encoding[12] (4 x 200 signals)	1/s	-	200,000

[9] Test setup: MX471C with 7 other MX modules
[10] catman settings for data transfer in DAQ job: max. number of measured values per data rate: 12,000; time between two data transfers in ms: 50; timeout for data transfer in ms: 10,000
[11] catman only supports decoding of max. 128 signals per port
[12] The MX Assistant must be used to parametrize encoding

SPECIFICATIONS NTX001 POWER SUPPLY

NTX001		
Nominal (rated) input voltage (AC)	V	100 ... 240 ($\pm$ 10 %)
No-load power consumption at 230 V	W	0.5
Nominal load U_A I_A	 V A	 24 1.25
Static output data U_A I_A U_{Br} (output ripple voltage; peak-to-peak)	 V A mV	 24 $\pm$ 4% 0 / 1.25 $\leq$ 120
Current limiter, typically from	A	1.6
Galvanic isolation		electrical, by optocoupler and transducer
SG creep and clearances	mm	$\geq$ 8
High-voltage test	kV	$\geq$ 4
Ambient temperature	°C	0 ... +40
Storage temperature	°C	-40 ... +70

MX471C ACCESSORIES:TO BE ORDERED SEPARATELY

Article	Description	Ordering number
Voltage supply		
AC-DC power supply, 30 W	Input: 100 ... 240 V AC ($\pm$10%), 1.5 m cable Output: 24 V DC, max. 1.25 A, 2 m cable with ODU plug	1-NTX001
QuantumX supply cable	3 m cable to supply power to QuantumX modules; suitable plug (ODU Medi-Snap S11M08-P04MJGO-5280) at one end and exposed wires at the other.	1-KAB271-3
Communication		
Ethernet cable	Ethernet cable for direct operation of devices on a PC or notebook, length 2 m, type CAT5+	1-KAB239-2
IEEE1394b FireWire cable (module to module)	FireWire connection cable for QuantumX or SomatXR modules; with matching plugs on both sides. Length 0.2 m (angled) / 0.2 m / 2 m / 5 m Note: The cable enables modules to be supplied with power (max. 1.5 A, from the source to the last drain).	1-KAB272-W-0.2 1-KAB272-0.2 1-KAB272-2 1-KAB272-5
Mechanical		
Connecting elements for QuantumX modules	Connecting elements (clips) for QuantumX modules; set comprising 2 connecting elements and including assembly material for fast connection of 2 modules.	1-CASECLIP
Connecting elements for QuantumX modules	Mounting plate for installing QuantumX modules using connecting elements (1-CASECLIP), lashing strap or cable ties. Basic fastening by 4 screws	1-CASEFIT
QuantumX backplane (big)	QuantumX backplane for a maximum of 9 modules - Wall or control cabinet installation (19") - External modules can be connected via FireWire - Power supply: 18 ... 30 V DC / max. 5 A (150 W)	1-BPX001

Article	Description	Ordering number
QuantumX backplane (rack)	QuantumX backplane rack for a maximum of 9 modules; - 19" control cabinet installation with left and right handles - External modules can be connected via FireWire - Power supply: 18 … 30 V DC / max. 5 A (150 W)	1-BPX002
QuantumX Backplane (small)	QuantumX Backplane for a maximum of 5 modules - Connection of external modules by FireWire possible - Power supply: 11 … 30 V DC/ max. 5 A (90 W)	1-BPX003
Software and product packages		
catman®AP	All-inclusive package, comprising catman®Easy Functionality plus add-on modules such as video camera integration (EasyVideoCam), full post-process analysis (EasyMath), recurrent activity automation (EasyScript), measurement project preparation offline (EasyPlan), and additional functions such as electrical power calculation, special filters, and frequency spectrum. Details at www.hbm.com\catman\	1-CATMAN-AP
catman®Easy	This basic software package for data acquisition includes simple channel parameterization using TEDS or the sensor database, measurement job parameterization, individual visualization, data storage and reporting.	1-CATMAN-EASY
catman®PostProcess	Post Process edition for visualization, analysis and processing of measurement data with many mathematical functions, data export and reporting.	1-CATEASY-PROCESS
LabVIEW™ driver[1]	Universal driver from HBM for LabVIEW™.	1-LabVIEW-DRIVER

[1] Other drivers and partners at www.hbm.com\quantumX\