

DATA SHEET

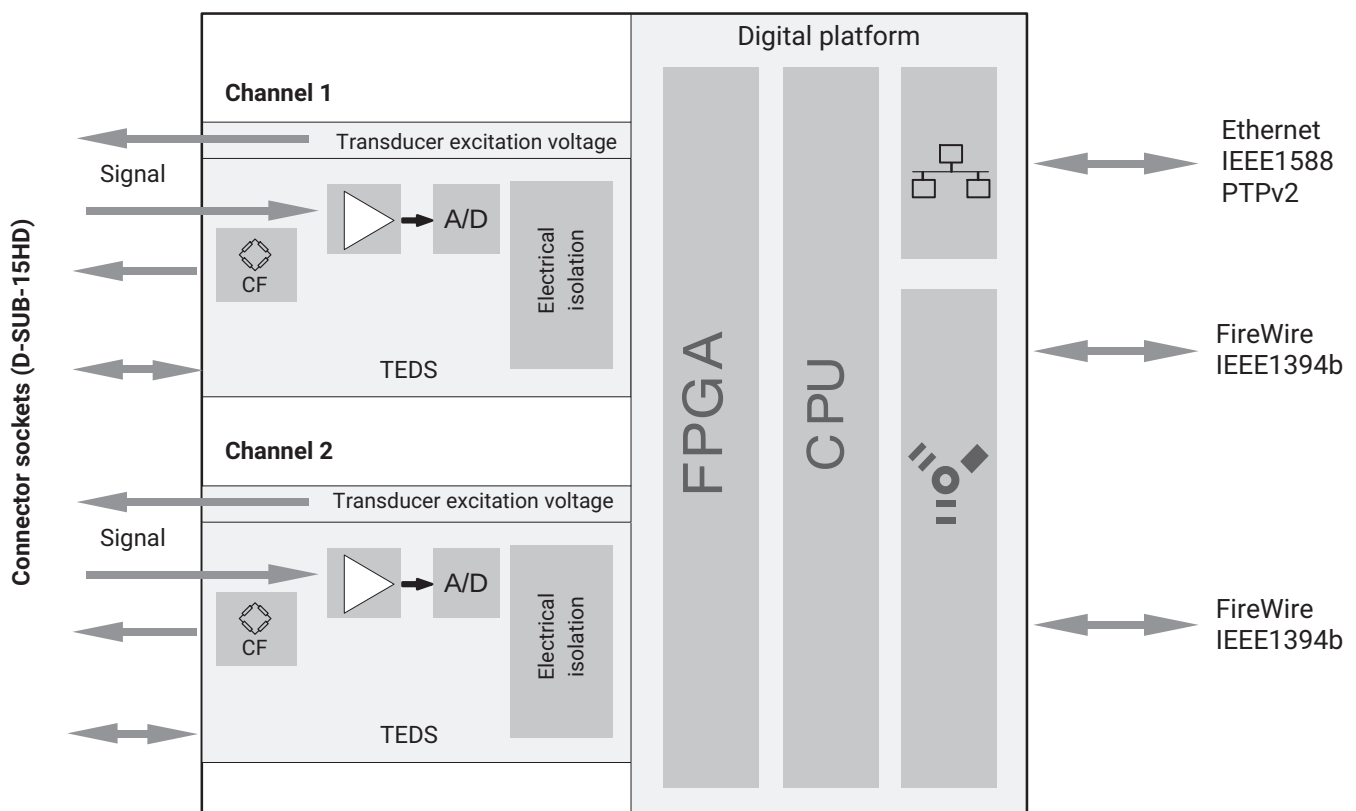
QuantumX MX238B Highest-precision measuring instrument

SPECIAL FEATURES

- Accuracy class 0.0025
- Two Highest-precision strain gage full bridge measurement channels
- 24-bit A/D converter per channel
- Carrier frequency 225 Hz
- Patented background calibration



BLOCK DIAGRAM



SPECIFICATIONS

General specifications		
Inputs	Number	2, electrically isolated from each other and from the supply
Transducer technologies		Strain gage full bridge
A/D conversion per channel		24-bit delta-sigma converter
Signal bandwidth	Hz	50
Active low-pass filter	Hz	Bessel, Butterworth, 0.01 ... 50
Sample rates (data output rate, activated via software, default setting HBM Classic)	S/s	Decimal: 0.1 ... 40000 HBM Classic: 0.1 ... 9600
Transducer identification (TEDS chip, IEEE 1451.4) max. TEDS module distance	m	100
Transducer connection		D-SUB-15HD
Supply voltage range (DC)	V	10 ... 30 (nominal (rated) voltage 24 V)
Supply voltage interruption		max. for 5 ms at 24 V
Power consumption without adjustable transducer excitation with adjustable transducer excitation	W W	< 7 < 10
Ethernet (data link) Protocol/addressing Plug connection Max. cable length to module	- - - m	10Base-T/100Base-TX TCP/IP (static IP/DHCP, IPv4 / IPv6) 8P8C plug (RJ-45) with twisted-pair cable streaming (CAT-5) 100
Synchronizing several modules FireWire Ethernet EtherCAT®4) IRIG-B (B000 to B007; B120 to B127)		IEEE1394b IEEE1588 (PTPv2) or NTP via CX27B EtherCAT gateway IRIG-B (B000 to B007; B120 to B127) via MX440B or MX840B measurement channel
IEEE1394b FireWire (module synchronization, data link, optional power supply) Baud rate Max. current from module to module Max. cable length between nodes Max. number of modules connected in series (daisy chain) Max. number of modules in one IEEE1394b FireWire system (including hubs ¹⁾ , backplane) Max. number of hops ²⁾	MBaud A m - - -	IEEE 1394b (HBM modules only) 400 (approx. 50 MBytes/s) 1.5 5 12 (= 11 hops) 24 14
Nominal (rated) temperature range	°C	-20 ... +65
Storage temperature range	°C	-40 ... +75
Relative humidity	%	5 ... 95 (non-condensing)
Protection class		III
Equipment protection level		IP20 per EN60529
Mechanical tests³⁾ Vibration (30 min) Shock (6 ms)	m/s ² m/s ²	50 350
EMC requirements		per EN 61326
Maximum input voltage at transducer socket to ground PIN 1, 2, 3, 4, 5, 7, 8, 10, 13, 15 to pin 6	V	+ 5.5 (without transients)
Dimensions, horizontal (H x W x D)	mm	52.5 x 200 x 121 (with case protection) 44 x 174 x 116.5 (without case protection)

Weight, approx.	g	850
SG full bridge bridge excitation voltage AC / Carrier frequency		
Accuracy class		0.0025 ⁵⁾
Carrier frequency (sine)	Hz	225±0.5
Bridge excitation voltage (effective)	V	2.5 and 5 (±5 %)
Transducers that can be connected		Strain gage full bridges (6-wire configuration)
Permissible cable length between MX238B and transducer	m	100
Measuring range at 5 V excitation at 2.5 V excitation	mV/V mV/V	± 2.5, ± 5 ± 2.5, ± 5
Selectable shunt resistor (control signal)	kΩ	100 ± 0.1 % (typ. -0.886 mV/V at 350 Ω)
Measurement frequency range	Hz	0 ... 50
Transducer impedance at 5 V excitation at 2.5 V excitation	Ω Ω	150 ... 5000 75 ... 5000
Input resistance (DC)	MΩ	> 100
Noise at 25 °C, 350 Ω Impedance for 2 Sigma (95%), (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter	μV μV	0.06 0.20
Non-linearity	%	< 0.002 of full scale value
Common-mode rejection	dB	> 120
Effect of ambient temperature on the zero point	%/10 K	< 0.0005 ⁵⁾ of full scale value
Effect of ambient temperature on the sensitivity	%/10 K	< 0.001 ⁵⁾ of measured value
Short-term drift	%/24h	< 0.001 ⁵⁾
Long-term drift	%/a	< 0.0015 ⁵⁾

1) Hub: IEEE1394b FireWire node or distributor

2) Hop: Transition from module to module/signal conditioning

3) 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/s² 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 acceleration of 350 m/s² for a duration of 6 ms, half sine and with shocks in each of the six possible directions.

4) EtherCAT® is a registered brand and patented technology, licensed by Beckhoff Automation GmbH, Germany.

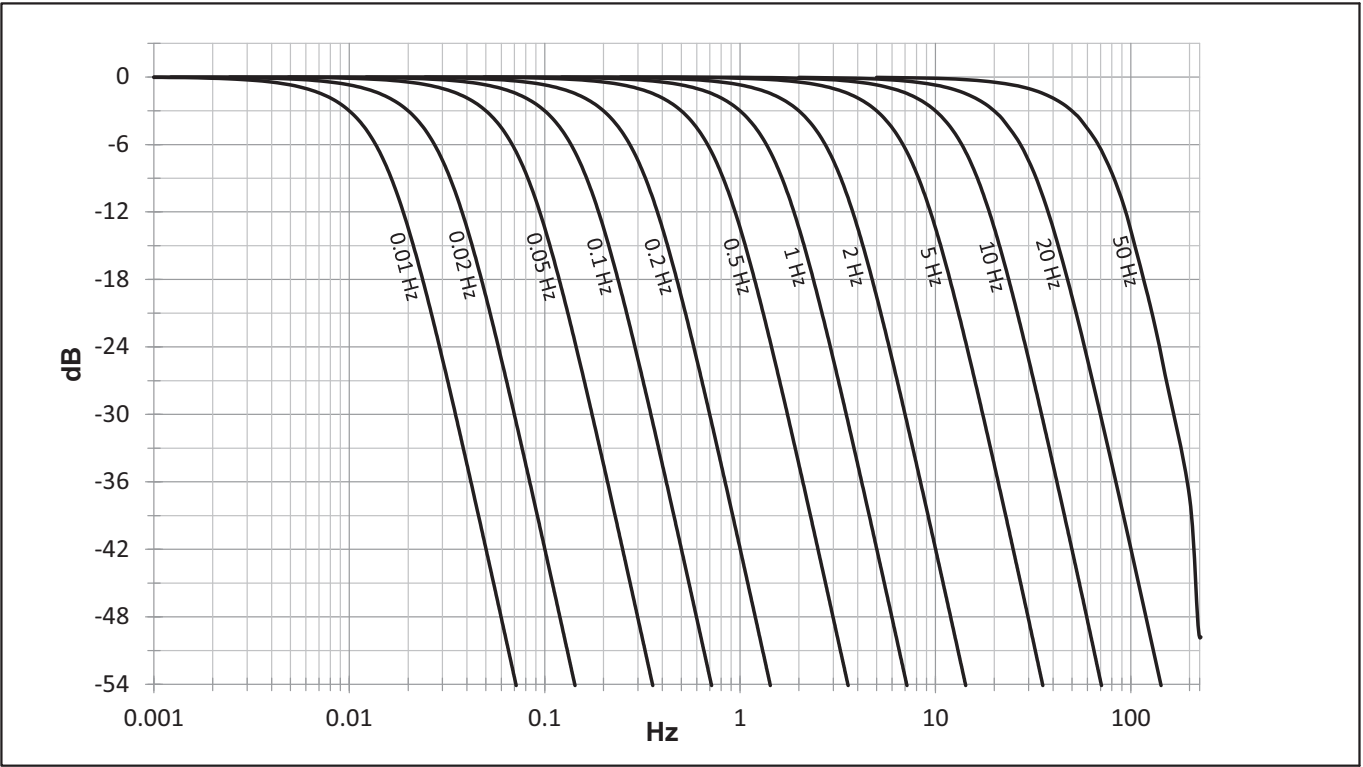
5) While auto or background calibration is running

DECIMAL SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BESSEL

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Phase delay (ms)*)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Bessel	30	50	127	6.5	7	0.8	40000
	12	20	51	16.4	17.5	0.8	40000
	6	10	25	34.5	35	0.8	20000
	3	5	13	69	70	0.8	10000
	1.2	2	5.1	168	175	0.8	10000
	0.6	1	2.5	332	350	0.8	5000
	0.3	0.5	1.3	663	700	0.8	1000
	0.1	0.2	0.5	1652	1750	0.8	1000
	0.06	0.1	0.25	3299	3500	0.8	500
	0.03	0.05	0.13	6598	7003	0.8	100
	0.01	0.02	0.05	16495	17508	0.8	100
	0.006	0.01	0.02	32989	35016	0.8	50

*) The A/D converter and prefilter delay time for all sampling rates is 3.2 ms, and is not taken into account in the "Phase delay" column!

DECIMAL SAMPLE RATE: BESSEL FILTER AMPLITUDE RESPONSE



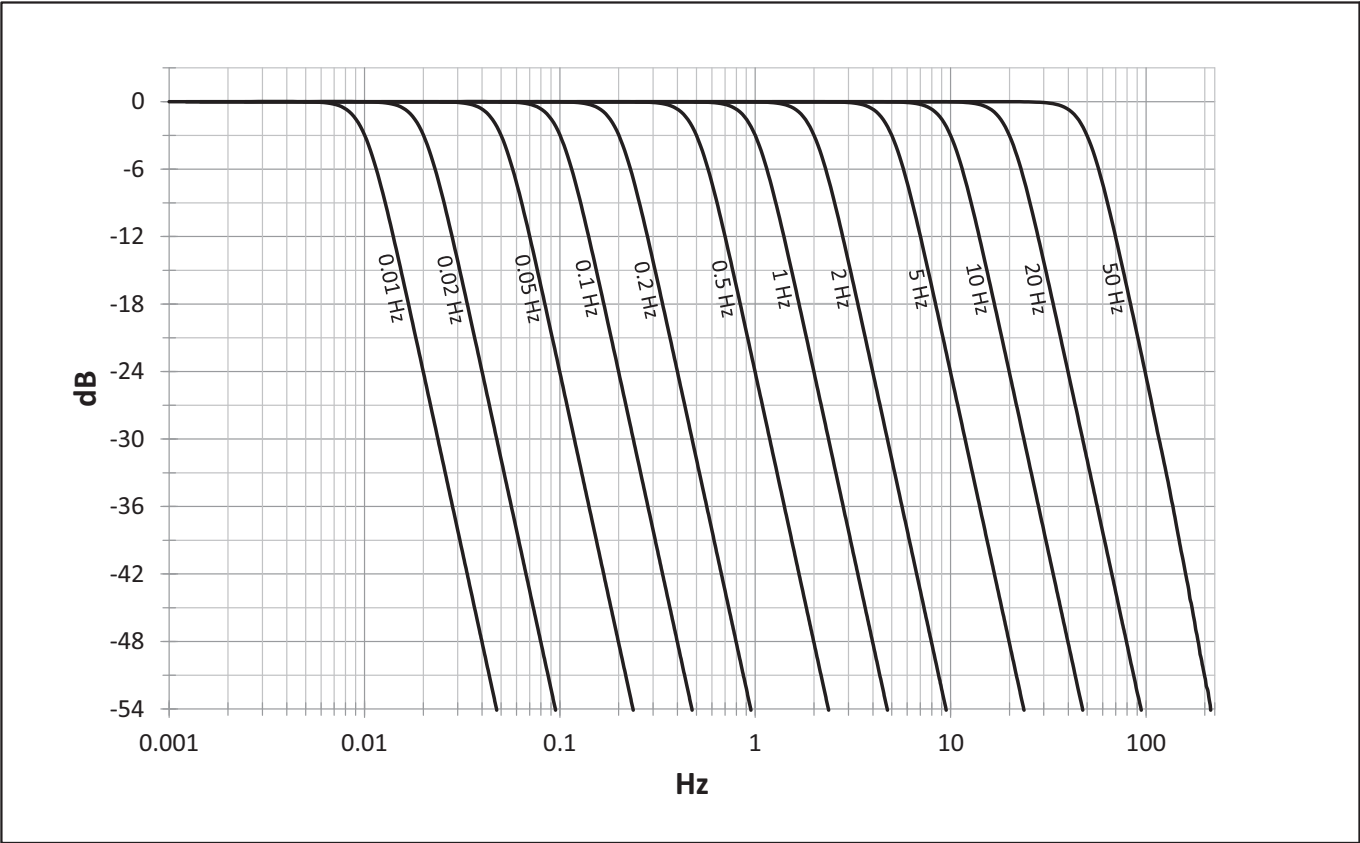
DECIMAL SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER

BUTTERWORTH

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Phase delay (ms)*	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	42	50	89	9.2	7.7	10.8	20000
	17	20	35.5	23	19.3	10.8	20000
	8.4	10	17.8	45	39	10.8	20000
	4	5	8.9	90	77	10.8	20000
	1.7	2	3.5	225	193	10.9	20000
	0.8	1	1.8	449	387	10.8	20000
	0.4	0.5	0.9	898	774	10.8	10000
	0.17	0.2	0.3	2241	1930	10.9	10000
	0.08	0.1	0.18	4481	3861	10.9	5000
	0.04	0.05	0.09	8962	7721	10.9	1000
	0.02	0.02	0.03	22405	19303	10.9	1000
	0.008	0.01	0.02	44810	38606	10.9	500

*) The A/D converter and prefilter delay time for all sampling rates is 3.2 ms, and is not taken into account in the "Phase delay" column!

DECIMAL SAMPLING RATES: BUTTERWORTH FILTER AMPLITUDE RESPONSE

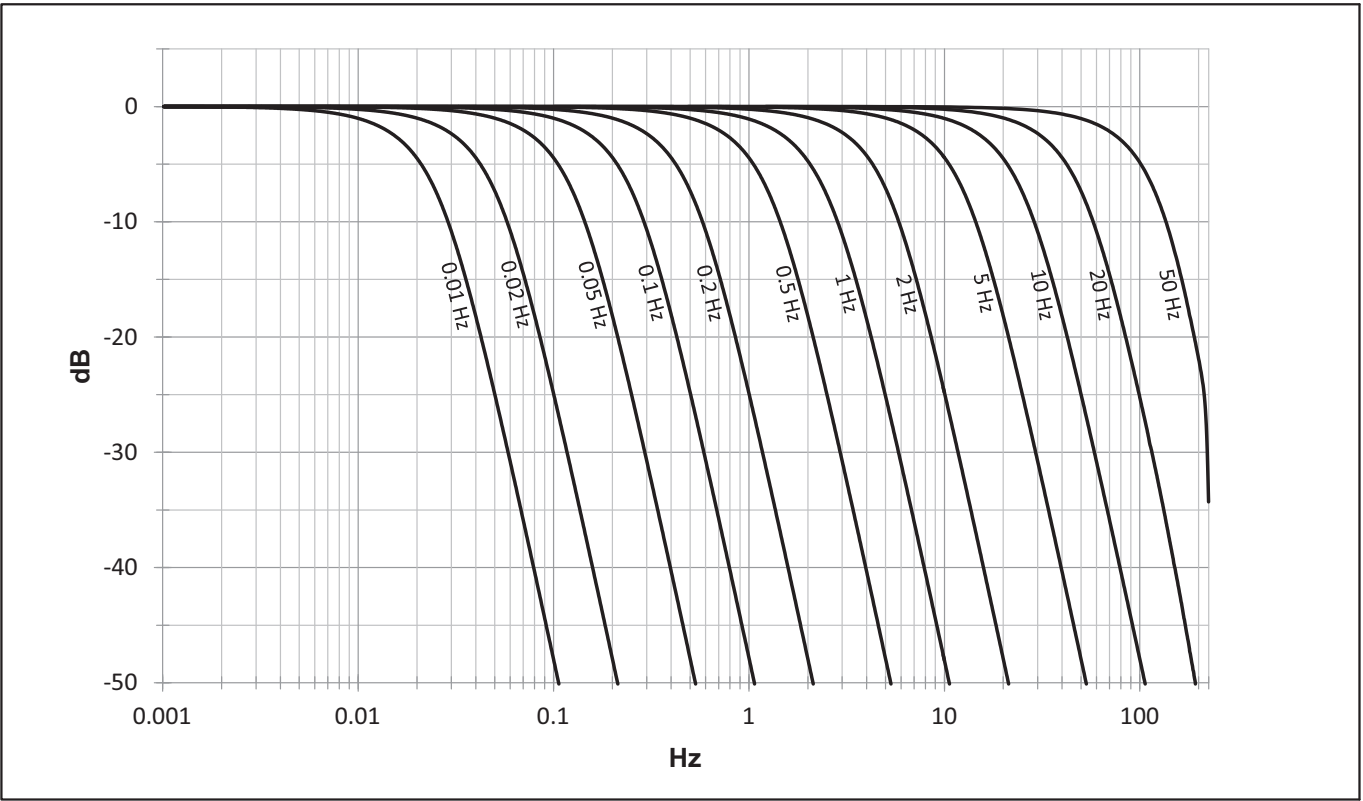


CLASSIC HBM SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BESSEL

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Phase delay (ms) ^{*)}	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Bessel	50	83	215	4	4.28	0.8	9600
	20	33.7	85	10	10.6	0.8	9600
	10	16.5	42	20	21.3	0.8	9600
	5	8.4	21	40	41.6	0.8	2400
	2	3.4	8.5	99	104	0.8	2400
	1	1.6	4.2	200	214	0.8	2400
	0.5	0.83	2.1	400	420	0.8	300
	0.2	0.34	0.85	1000	1060	0.8	300
	0.1	0.17	0.43	2000	2130	0.8	300
	0.05	0.084	0.21	3940	4200	0.8	20
	0.02	0.033	0.085	10000	10600	0.8	20
	0.01	0.017	0.042	20100	21300	0.8	20

*) The A/D converter and prefilter delay time for all sampling rates is 3.3 ms, and is not taken into account in the "Phase delay" column!

CLASSIC HBM SAMPLING RATES: BESSEL FILTER AMPLITUDE RESPONSE

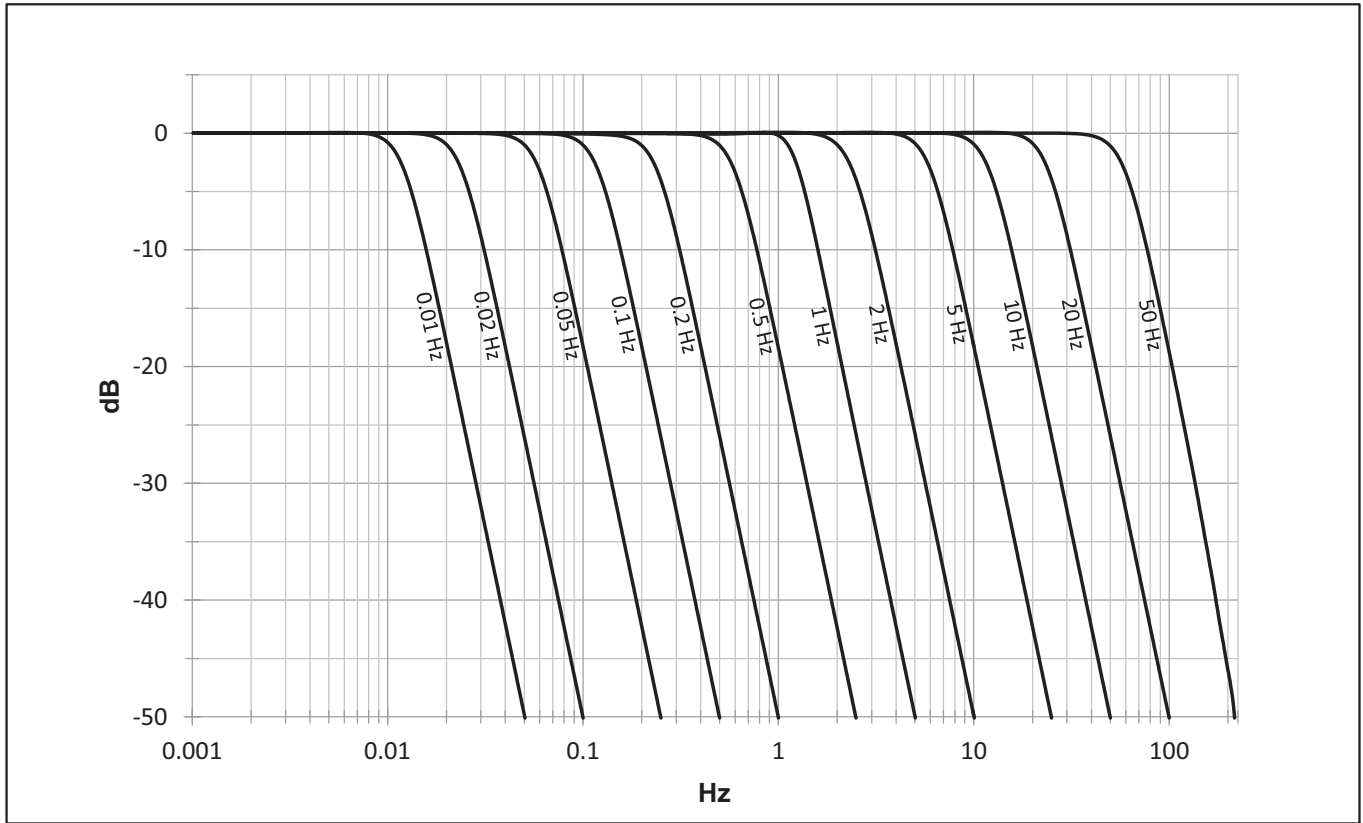


CLASSIC HBM SAMPLE RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BUTTERWORTH

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Phase delay (ms) ^{*)}	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	50	59	105	6.98	6.6	11	9600
	20	24	42	17.3	16	11	9600
	10	12	21	34.9	32	11	9600
	5	5.95	10.5	69	66	11	2400
	2	2.37	4.24	173	160	11	2400
	1	1.26	2.1	347	320	11	2400
	0.5	0.59	1.05	701	660	11	300
	0.2	0.236	0.421	1760	1600	11	300
	0.1	0.118	0.21	3510	3200	11	300
	0.05	0.059	0.105	6950	6600	11	20
	0.02	0.0235	0.042	17500	1600	11	20
	0.01	0.012	0.021	34600	3200	11	20

*) The A/D converter and prefilter delay time for all sampling rates is 3.3 ms, and is not taken into account in the "Phase delay" column!

CLASSIC HBM SAMPLING RATES: BUTTERWORTH FILTER AMPLITUDE RESPONSE



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	V	24
I_A	A	1.25
Static output data		
U_A	V	$24 \pm 4\%$
I_A	A	0 ... 1.25
U_{Br} (output ripple voltage; peak-to-peak)	mV	≤ 120
Current limiter, typically from	A	1.6
Galvanic isolation primary - secondary		electrical, by optocoupler and transducer
SG creep and clearances	mm	≥ 8
High-voltage test	kV	≥ 4
Ambient temperature	$^{\circ}\text{C}$	0 ... +40
Storage temperature	$^{\circ}\text{C}$	-40 ... +70

MX238B ACCESSORIES, TO BE ORDERED SEPARATELY

Article	Description	Ordering number
Power supply		
AC-DC power supply / 24 V	Input: 100 ... 240 V AC ($\pm 10\%$), 1.5 m cable Output: 24 V DC, max. 1.25 A, 2 m cable with ODU male connector	1-NTX001
QuantumX supply cable	3 m cable to supply power to QuantumX modules; suitable male connector (ODU Medi-Snap S11M08-P04MJGO-5280) at one end and exposed wires at the other.	1-KAB271-3
Communication		
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
Ethernet cable	Ethernet cable for direct operation of devices on a PC or notebook, length 2 m, type CAT5+	1-KAB239-2
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 (large)	QuantumX backplane rack for a maximum of 9 modules of IP20 design; - 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 of IP20 design - 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 - External modules can be connected via FireWire - Power supply: 11 ... 30 V DC/ max. 5 A (90 W)	1-BPX003
Transducer-side		
Adapter D-Sub-HD 15-pin to D-Sub 15-pin	Two adapters D-Sub-HD 15-pin to D-Sub 15-pin for connecting strain gage full bridge transducers with pre-wired D-Sub plugs; length approx. 0.3 m Note: Pre-wired for full-bridge (6-wire).	1-KAB416
Adapter D-Sub-HD15 to MS socket	Two adapters for strain gage full bridge transducers in 6-wire configuration with MS plug to QuantumX. Construction: MS socket, 30 cm cable, 6-wire, D-Sub-HD15 plug.	1-KAB144
DSub-HD 15-pin plug kit with TEDS chip	DSub-HD 15-pin (male) plug kit with TEDS chip for storing a sensor data sheet; housing: metallized plastic with knurled screws. Note: The TEDS chip is blank.	1-SUBHD15-MALE
DSubHD 15-pole connector kit	DSubHD 15-pole connector kit (male); Housing: Metallized plastic with knurled screws	1-CON-P1025
Port saver Sub-HD 15-pin	4 x Sub-HD 15-pin port saver to increase the mating cycles by at least 500. Construction: Plug in socket with screw connection 4-40 UNC.	1-SUBHD15-SAVE
TEDS-Package 1 kb (5 pieces)	Package of TEDS chips, package consists of 5x 1-wire EEPROM DS28E07 (IEEE 1451.4 TEDS)	1-TEDS-PAK-B
TEDS-Package 4 kb (5 pieces)	Package of TEDS chips, package consisting of 5 units 1-wire EEPROM DS24B33 (IEEE 1451.4 TEDS)	1-TEDS-PAK
SG quarter bridge module 350 Ohm	Signal conditioning SG quarter bridge on QuantumX input with full bridge. Integrated 350 Ohm completion resistor, solder joints for transducer cable (3-wire); TEDS; DSubHD device connection.	1-SCM-SG350
SG quarter bridge module 120 Ohm	Signal conditioning SG quarter bridge on QuantumX input with full bridge. Integrated 120 Ohm completion resistor, solder joints for transducer cable (3-wire); TEDS; DSubHD device connection.	1-SCM-SG120
Software and product packages		
MX238B + catman [®] AP	Product package consisting of: - Measuring amplifier - Power supply (1-NTX001) - 2 transducer plugs (1-CON-P1025) - Ethernet cross-over cable (1-KAB239-2) - HBM catman[®]AP software (1-CATMAN-AP) - Including software maintenance for the first 12 months	1-MX238-PAKAP
DIAdem [®] driver	QuantumX device driver for the DIAdem [®] software from National Instruments. German user interface.	1-DIAD-EM-DRIVER

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