

DATA SHEET

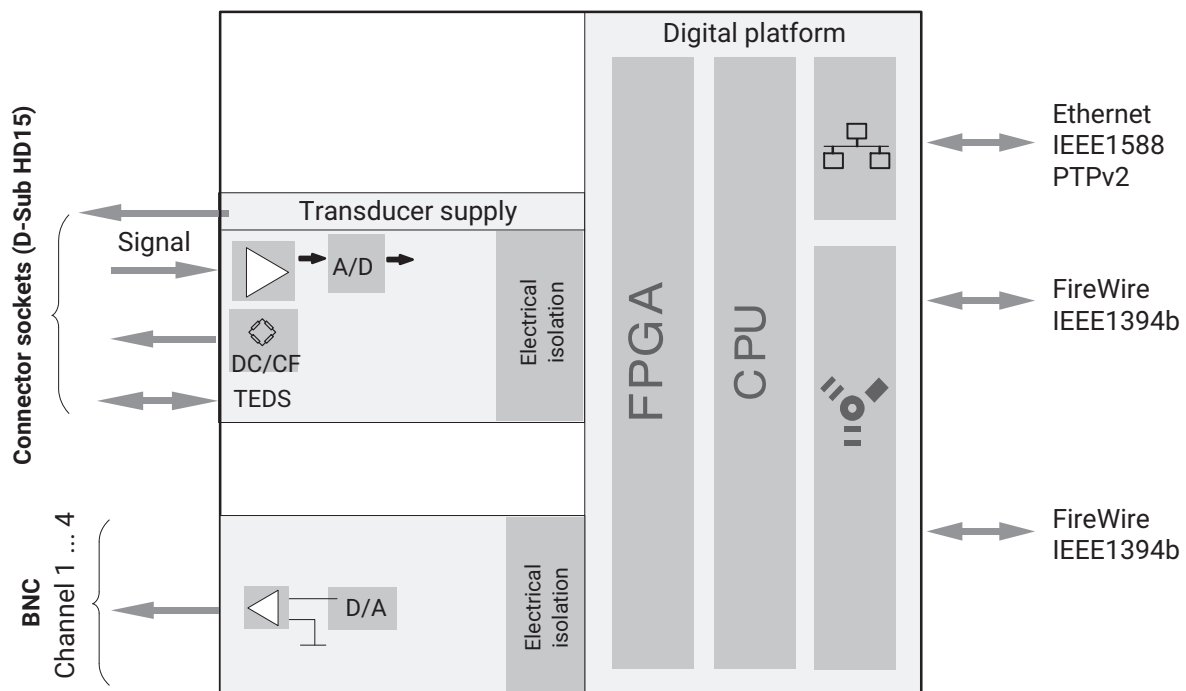
QUANTUM^X MX430B Full Bridge Circuit Industrial Amplifier

SPECIAL FEATURES

- Four precision full bridge strain gage measurement channels (accuracy class of 0.01)
- Variable bridge excitation voltage: DC or carrier frequency (600 Hz sine)
- 6-wire circuit and AutoCal
- 24-bit A/D transducer per channel
- Electrically isolated channels
- Automatic TEDS channel parameterization
- Fast sensor check (shunt)
- Real time matrix compensation calculation to connect multi-component sensors
- Four analog outputs with minimal latency



BLOCK DIAGRAM



SPECIFICATIONS FOR MX430B

General specifications		
Inputs	Number	Four electrically isolated from each other and from the supply
Transducer technologies per connector		Full bridge strain gage (6-wire circuit and 4-wire circuit), quarter bridge (3-wire circuit) with 1-SCM-SG120/350/1000
A/D conversion per channel		24-bit delta-sigma converter
Signal bandwidth (-3 dB)	Hz	6000 (with Butterworth 6000 Hz filter) in DC operation, 200 in carrier frequency operation
Active low-pass filter	Hz	Bessel, Butterworth, 0.01 ... 6000, OFF filter
Sample rates (activated via software, standard classic HBM setting)	S/s	Decimal: 0.1 ... 40,000 HBM Classic: 0.1 ... 19,200
Transducer identification Max. TEDS module distance	m	TEDS, IEEE 1451.4 100
Transducer connection		D-Sub HD15
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 voltage with adjustable transducer excitation voltage	W W	< 11 < 14
Ethernet (data link) Protocol/addressing Plug connection Max. cable length to module	- - m	10Base-T / 100Base-TX TCP/IP (direct IP address or DHCP) 8P8C plug (RJ-45) with twisted-pair cable streaming (CAT-5) 100
Synchronizing several modules FireWire Ethernet EtherCAT®1) 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 / 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 (incl. hubs ²⁾ , backplane) Max. number of hops ³⁾	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 tests⁴⁾ Vibration (30 min) Shock (6 ms)	m/s ² m/s ²	50 350
EMC requirements		to EN61326
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
Full bridge strain gage, bridge excitation voltage in carrier frequency (600 Hz sine)		
Accuracy class		0.01 ⁵⁾

Carrier frequency (sine)	Hz	600±1.5
Bridge excitation voltage (effective)	V	2.5; 5.0 (±5%)
Transducers that can be connected		Full bridge strain gages
Permissible cable length between module and transducer	m	100
Measuring range At 5 V excitation At 2.5 V excitation	mV/V mV/V	±2.5; ±5.0 ±2.5; ±5.0
Switchable shunt resistance (transducer test)	kΩ	100±0.1% (typ. - 0.886 mV/V at 350Ω)
Measurement frequency range	Hz	0 ... 200
Transducer impedance At 5 V excitation At 2.5 V excitation	Ω Ω	150 ... 5000 75 ... 5000
Input resistance (DC)	M	> 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 With 100 Hz Bessel filter	μV μV μV	< 0.07 < 0.22 < 0.7
Non-linearity	%	< 0.0025 of full scale value
Common-mode rejection	dB	> 120
Effect of ambient temperature on the zero point	%/10 K	< 0.0025 ⁵⁾ of full scale value
Effect of ambient temperature on the sensitivity	%/10 K	< 0.005 ⁵⁾ of measured value
Short-term drift	%/24h	< 0.002 ⁵⁾
Long-term drift	%/a	< 0.005 ⁵⁾
Full bridge strain gage, bridge excitation voltage DC (direct voltage)		
Accuracy class		0.01 ⁵⁾
Bridge excitation voltage (DC)	V	2.5; 5.0; 10.0 (±5%)
Transducers that can be connected		Full bridge strain gages
Permissible cable length between module and transducer	m	100
Measuring range At 10 V excitation At 5 V excitation At 2.5 V excitation	mV/V mV/V mV/V	±2.5; ±5.0 ±2.5; ±5.0 ±2.5; ±5.0
Switchable shunt resistance (control signal)	kΩ	100±0.1% (typ. - 0.886 mV/V at 350Ω)
Measurement frequency range	Hz	0 ... 6000
Transducer impedance At 10 V excitation At 5 V excitation At 2.5 V excitation	Ω Ω Ω	300 ... 5000 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 With 100 Hz Bessel filter With 1 kHz Bessel filter	μV μV μV μV	< 0.12 < 0.38 < 1.20 < 3.79
Non-linearity	%	< 0.0025 of full scale value
Common-mode rejection	dB	> 120
Effect of ambient temperature on the zero point	%/10 K	< 0.01 ⁵⁾ of full scale value
Effect of ambient temperature on the sensitivity	%/10 K	< 0.01 ⁵⁾ of measured value
Short-term drift	%/24h	< 0.005 ⁵⁾

Long-term drift	%/a	< 0.005 ⁵⁾
Analog output, electrical voltage ±10 V		
Accuracy class		0.05 ⁶⁾
Number of outputs	4	4 (one output per input)
Type of connection	-	BNC
Permissible cable length	m	< 30
Bandwidth	kHz	defined by the input signal filter
Max. output rate	kHz	40
Rated voltage	V	±10
Reference signal		Common ground for all outputs, electrically isolated from supply and measurement inputs
D/A converter resolution	Bit	16
Noise (peak-to-peak)	mV	< 10
Permissible input impedance	Ω	> 2000 / < 2 nF
Crosstalk attenuation	dB	> 65
Min. settling time	μs	10
Effect of ambient temperature on the zero point	%/10K	< 0.05 of full scale value
Effect of ambient temperature on the sensitivity	%/10K	< 0.05 of output value
Real-time calculation on the module to be issued on the analog output or system bus, e.g. EtherCAT (CX27B) or CANbus (MX471B)		
Mathematical unit		
Number of calculations		4
Maximum sample rate	kS/s	5
Maximum output rate	kS/s	5
Matrix calculation (e.g. for the compensation calculation when connecting multi-component transducers)		
Number of input signals		4
Number of output signals		4
Number of coefficients		16

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

2) Hub: IEEE1394b FireWire node or distributor

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

4) 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.

5) With calibration running in the background

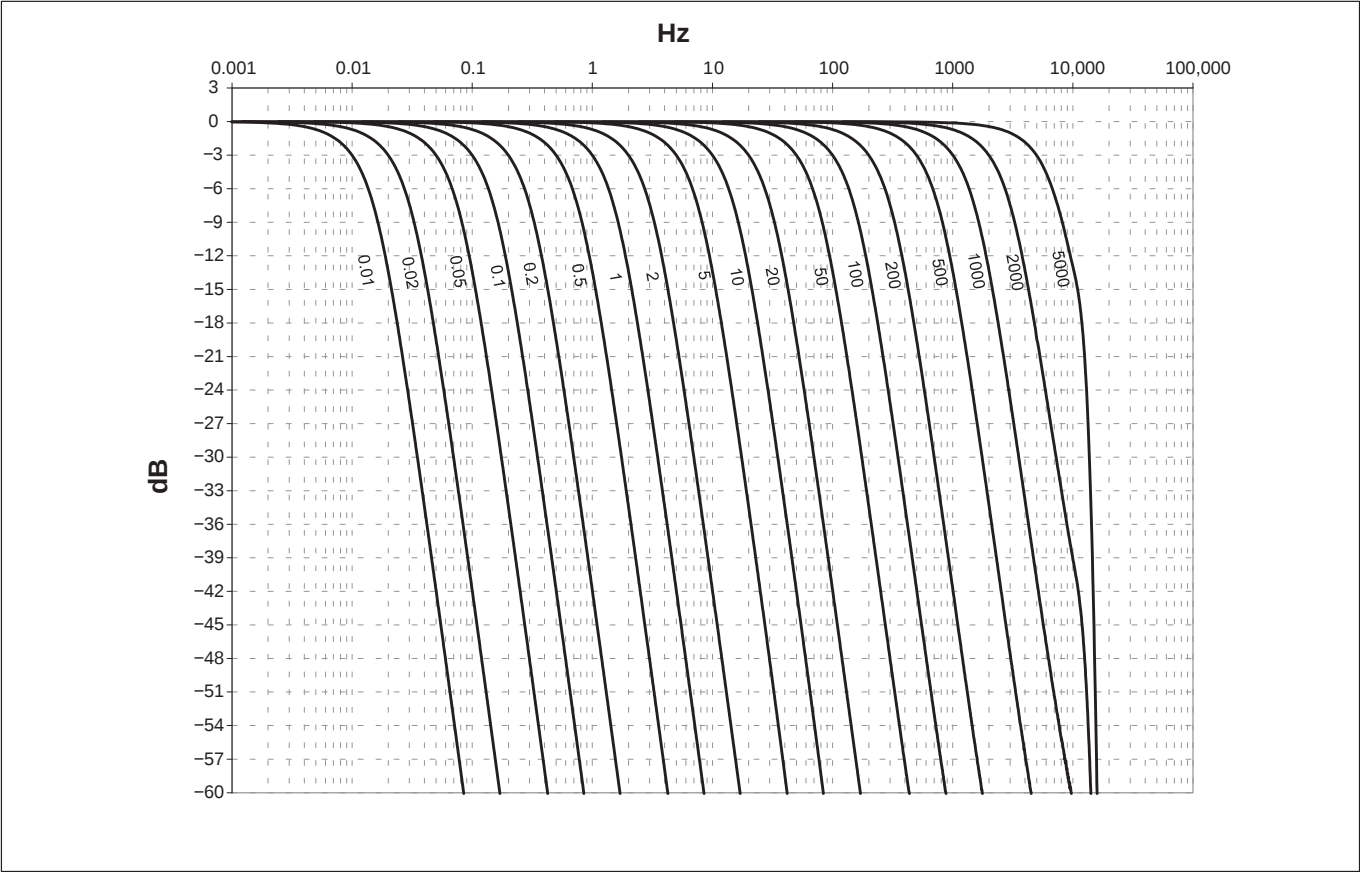
6) This value refers exclusively to the analog output. When looking at the entire signal flow (input and output), the specified maximum deviations must be added.

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

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) ¹⁾	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Bessel	3041	5000	9935	0.043	0.08	3.6	40,000
	1188	2000	5141	0.13	0.2	0.9	40,000
	594	1000	2561	0.29	0.3	0.85	40,000
	296	500	1273	0.62	0.7	0.8	40,000
	118	200	508	1.6	1.7	0.8	40,000
	59	100	254	3.2	3.5	0.8	40,000
	30	50	127	6.5	7	0.8	40,000
	12	20	51	16.4	17.5	0.8	40,000
	6	10	25	34.5	35	0.8	20,000
	3	5	13	69	70	0.8	10,000
	1.2	2	5.1	168	175	0.8	10,000
	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	16,495	17,508	0.8	100
	0.006	0.01	0.02	32,989	35,016	0.8	50

1) The delay time of the A/D converter and pre-filter for all sampling rates is 2.6 ms; this is not taken into account in the "Runtime" column.

DECIMAL SAMPLE RATES: BESSEL FILTER AMPLITUDE RESPONSE

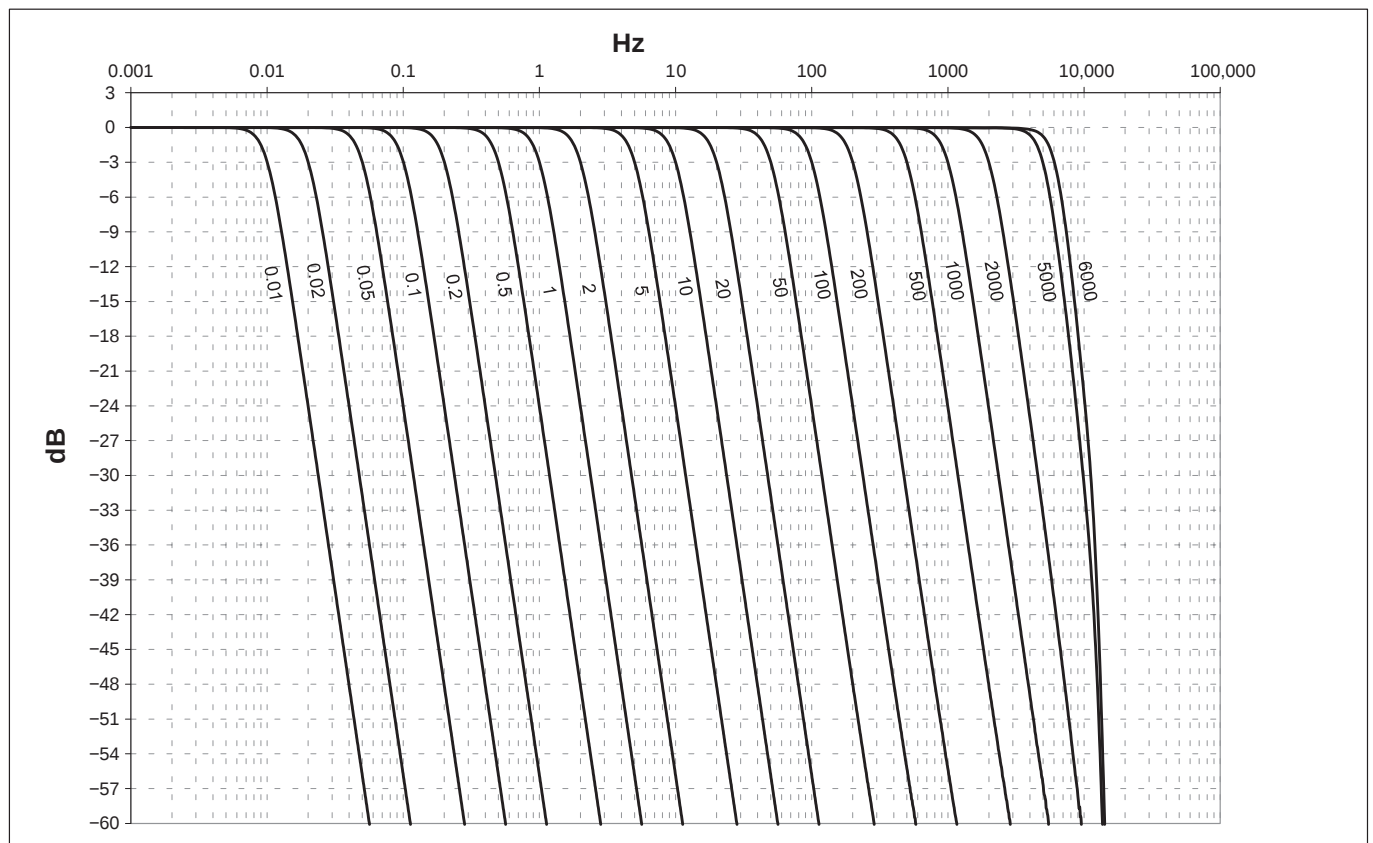


DECIMAL SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BUTTERWORTH

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) ¹⁾	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	5198	6000	8722	0.08	0.08	15.2	40,000
	4274	5000	7667	0.10	0.09	13.7	40,000
	1690	2000	3491	0.23	0.2	11	40,000
	844	1000	1768	0.46	0.4	10.9	40,000
	422	500	888	0.9	0.8	10.8	40,000
	169	200	355	2.2	1.9	10.8	40,000
	84	100	178	4.5	3.9	10.8	40,000
	42	50	89	9.2	7.7	10.8	20,000
	17	20	35.5	23	19.3	10.8	20,000
	8.4	10	17.8	45	39	10.8	20,000
	4	5	8.9	90	77	10.8	20,000
	1.7	2	3.5	225	193	10.9	20,000
	0.8	1	1.8	449	387	10.8	20,000
	0.4	0.5	0.9	898	774	10.8	10,000
	0.17	0.2	0.3	2241	1930	10.9	10,000
	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	22,405	19,303	10.9	1000
	0.008	0.01	0.02	44,810	38,606	10.9	500

¹⁾ The delay time of the A/D converter and pre-filter for all sampling rates is 2.6 ms; this is not taken into account in the "Runtime" column.

DECIMAL SAMPLE RATES: BUTTERWORTH FILTER AMPLITUDE RESPONSE

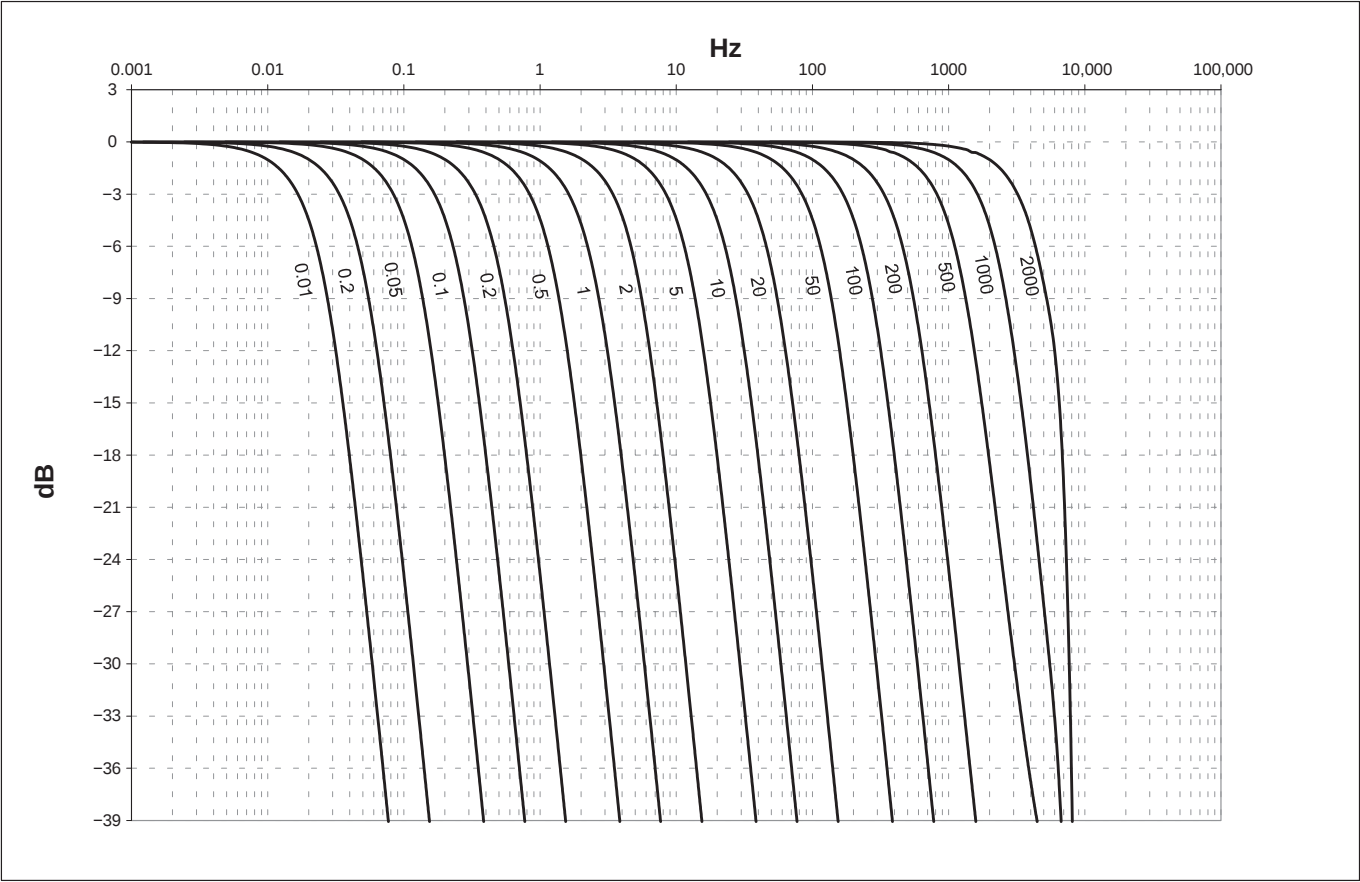


CLASSIC HBM SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BESSEL

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) ¹⁾	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Bessel	2000	3210	8100	0.15	0.1	1.5	19,200
	1000	1630	4050	0.24	0.2	1.4	19,200
	500	820	2120	0.4	0.43	1.4	9600
	200	335	860	1	1.04	1	9600
	100	167	430	2	2.1	0.8	9600
	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	10,000	10,600	0.8	20
	0.01	0.017	0.042	20,100	21,300	0.8	20

1) The delay time of the A/D converter and pre-filter for all sampling rates is 2.5 ms; this is not taken into account in the "Runtime" column.

CLASSIC HBM SAMPLE RATES: BESSEL FILTER AMPLITUDE RESPONSE

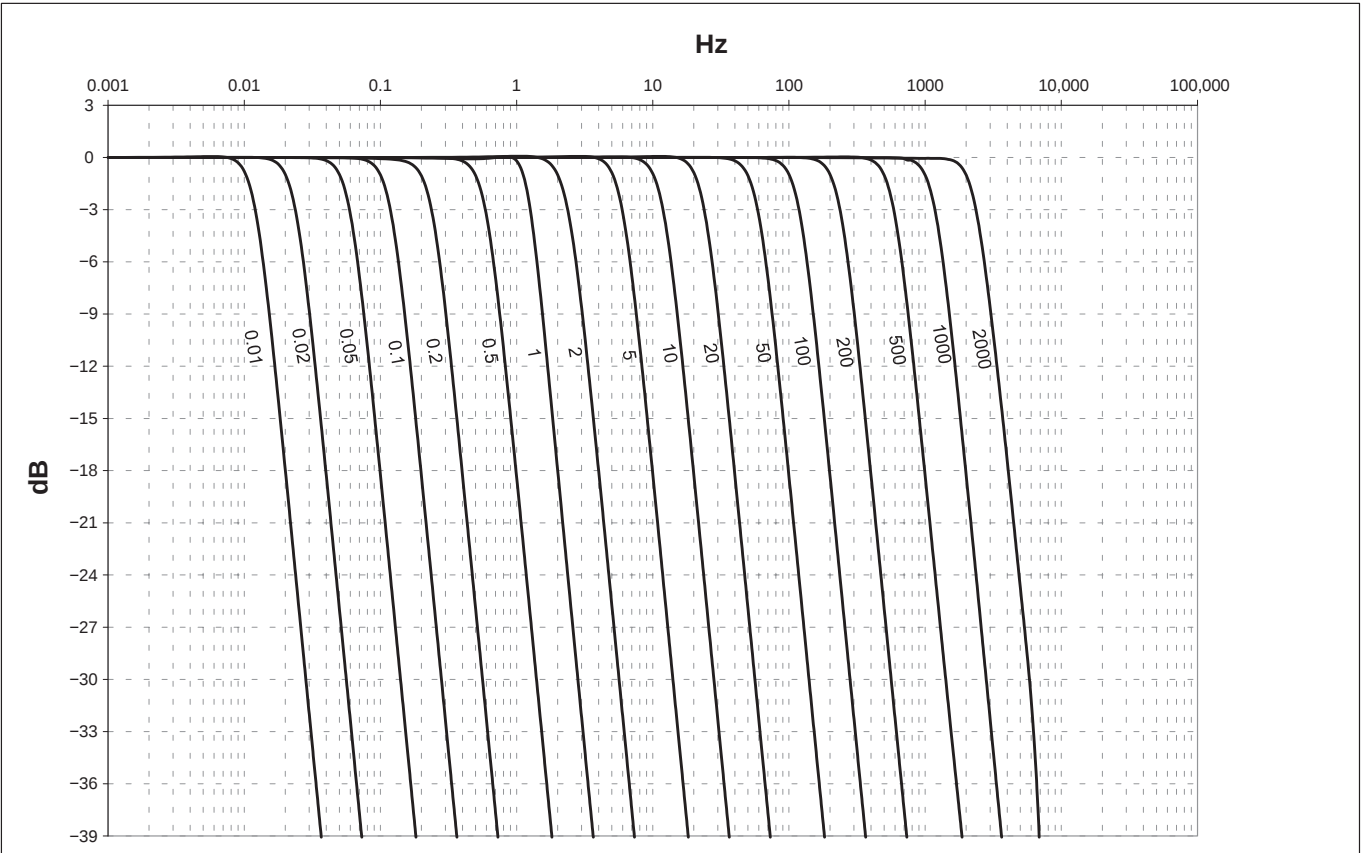


CLASSIC HBM SAMPLE RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BUTTERWORTH

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms) ¹⁾	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	2000	2360	4331	0.2	0.15	8.5	19,200
	1000	1178	2100	0.38	0.3	11	19,200
	500	586	1050	0.66	0.66	11	9600
	200	235	420	1.7	1.6	11	9600
	100	118	210	3.46	3.2	11	9600
	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	17,500	1600	11	20
	0.01	0.012	0.021	34,600	3200	11	20

1) The delay time of the A/D converter and pre-filter for all sampling rates is 2.5 ms; this is not taken into account in the "Runtime" column.

CLASSIC HBM SAMPLE RATES: BUTTERWORTH FILTER AMPLITUDE RESPONSE



SPECIFICATIONS NTX001 POWER PACK

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

MX430B 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 So-matXR-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 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 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 - External modules can be connected via FireWire - Power supply: 11 ... 30 V DC/max. 5 A (90 W)	1-BPX003
Transducer-side		
D-Sub HD 15-pin to D-Sub 15-pin adapter	D-Sub-HD 15-pin to D-Sub 15-pin adapter for connecting transducers with pre-assembled D-Sub plug; length approx. 0.3 m Note: pre-wired for full bridge circuit (6-wire).	1-KAB416
D-Sub HD 15-pin to MS socket adapter	Two adapters for full bridge strain gage transducers in 6-wire circuit with MS plug. Construction: MS socket, 30 cm cable, 6-wire, D-Sub HD15 plug.	1-KAB144
SG quarter bridge module 120 Ohm	Signal conditioning SG quarter bridge on QuantumX input with full bridge circuit. Integrated 120 Ohm completion resistor, solder joints for transducer cable (3-wire); TEDS; D-Sub HD device connection.	1-SCM-SG120
SG quarter bridge module 350 Ohm	Signal conditioning SG quarter bridge on QuantumX input with full bridge circuit. Integrated 350 Ohm completion resistor, solder joints for transducer cable (3-wire); TEDS; D-Sub HD device connection.	1-SCM-SG350
D-Sub HD 15-pin plug set with TEDS chip	D-Sub HD 15-pin (male) plug set with TEDS chip for storing a sensor data sheet. Housing: metalized 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
Socket protector, D-Sub HD 15-pin	4 x D-SUB HD 15-pin socket protector to increase the plug cycles by at least 500. Construction: Plug in socket with 4-40 UNC screw connection.	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 consists of 5x 1-wire EEPROM DS24B33 (IEEE 1451.4 TEDS)	1-TEDS-PAK
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

Article	Description	Ordering number
catman®PostProcess 	Post Process edition for visualization, analysis and processing of measurement data with many mathematical functions, data export and reporting.	1-CATEASY-PROCESS
MX430B + catman®EASY	Product package consisting of: - Industrial amplifier - Power supply (1-NTX001) - 4 transducer plugs (1-CON-P1025) - Ethernet cross cable (1-KAB239-2) - HBM software catman®Easy (1-CATMAN-EASY) - Including software maintenance for the first 12 months	1-M430-PAKEASY
MX430B + catman®AP	Product package consisting of: - Industrial amplifier - Power supply (1-NTX001) - 4 transducer plugs (1-CON-P1025) - Ethernet cross cable (1-KAB239-2) - HBM software catman®AP (1-CATMAN-AP) - Including software maintenance for the first 12 months	1-MX430-PAKAP
LabVIEW™ driver ¹⁾	Universal driver from HBM for LabVIEW™.	1-LabVIEW-DRIVER
CANape® driver	QuantumX device driver for CANape® software from Vector Informatik. CANape® versions from 10.0 upwards are supported.	1-CANAPE-DRIVER

¹⁾ Further drivers and partners at www.hbm.com/de/quantumX/

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