

QUANTUM^X MX840B

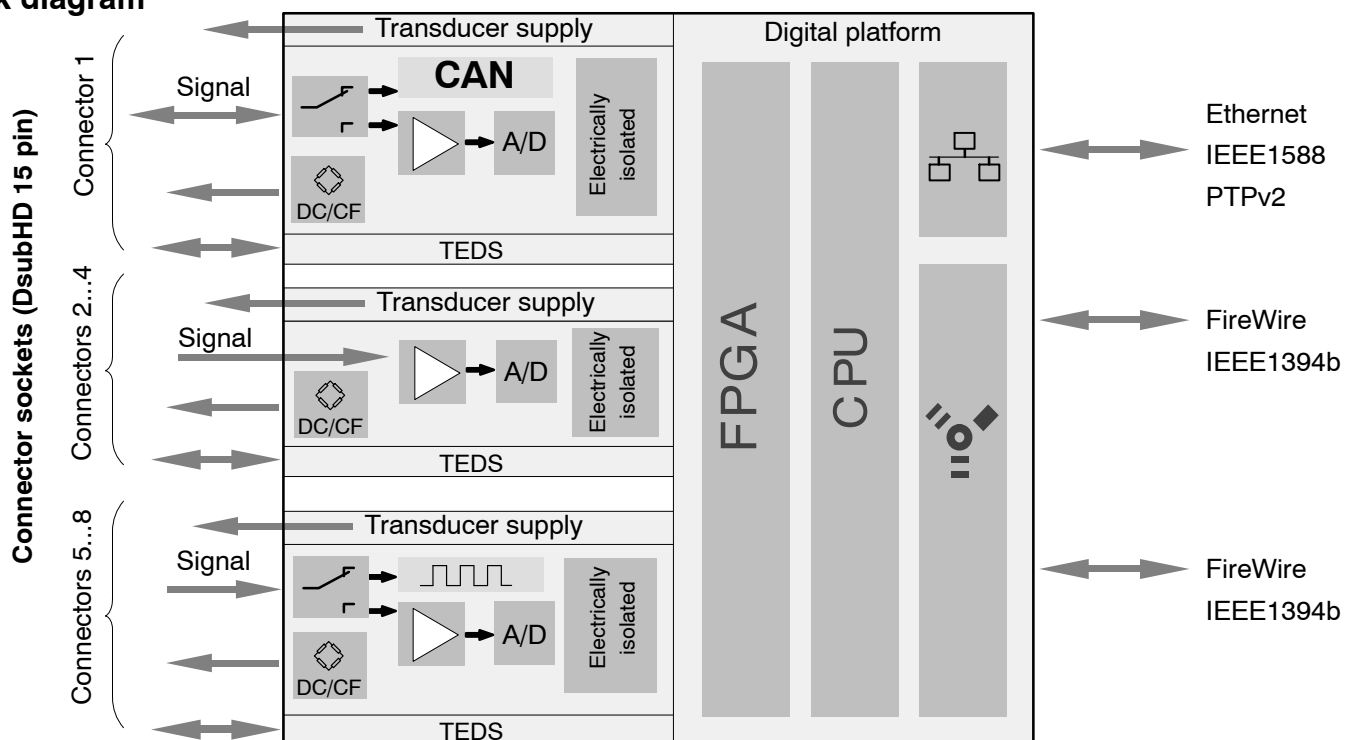
Universal amplifier



Special features

- 8 individually configurable measurement channels (electrically isolated)
- Connection of more than 16 transducer technologies per channel
- Individual sample rates up to 40 kS/s per channel, active low pass filter
- 24-bit A/D converter per channel
- Automatic channel parameterization (TEDS)
- Supply voltage for active transducers (DC): 5 V ... 24 V
- CANbus Input/Output

Block diagram



Specifications MX840B

General specifications		
Inputs	Number	8, electrically isolated from each other and from the supply voltage ¹⁾
Transducer technologies		Strain gauge full and half bridge, quarter-bridge with 1-SCM-SG120/350, inductive full and half bridge, piezoresistive full bridge, current-fed piezoelectric transducer (IEPE, ICP [®]), potentiometric transducers, electrical voltage (100 mV, 10 V, 60 V direct, up to 300 V CAT II with 1-SCM-HV), electrical current (20 mA); resistance (e. g. PTC, NTC, KTY); resistance thermometer (PT100, PT1000); thermocouples (K, N, E, T, S, ...) with cold junction in the plug (1-THERMO-MXBOARD) Additional support on channel 5-8: frequency, incremental rotary encoder, speed sensor (rpm), pulse counter, HBM torque, SSI protocol Additional for channel 1: CAN bus, receive any signal or send measurement signals
A/D converter		24 Bit Delta Sigma converter
Sample rates (Domaine adjustable by software, Factory setting is „HBM Classic)	S/s	Dezimal: 0,1 ... 40.000 HBM Classic: 0,1 ... 38.400 ⁶⁾
Signal bandwidth	kHz	7.2
Aktive low-pass filter	Hz	Bessel, Butterworth, linear phase 0.01 ... 5000 (-3 dB), Filter OFF
Transducer identification max. distance of the TEDS module	m	TEDS, IEEE 1451.4 100
Transducer connection		D-SUB-15HD
Supply voltage range (DC)	V	10 ... 30 (24 V nominal (rated) voltage)
Supply voltage interruption		max. 5 ms at 24 V
Power consumption without adjustable transducer excitation with adjustable transducer excitation	W	< 9 < 12
Transducer Excitation (active transducers) Adjustable supply voltage (DC) Maximum output power	V W	5 ... 24; adjustable for each channel 0.7 each channel / a total of 2
Ethernet (data link) Protocol/addressing 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
Synchronization Firewire Ethernet EtherCAT ^{®5)} IRIG-B		IEEE1394b (2 ports per device) IEEE1588 (PTPv2) or NTP via CX27 EtherCAT Gateway module IRIG-B (B000 up to B007; B120 up to B127) via MX440B / MX 840B input channel
IEEE1394b FireWire (module synchronization, data link, optional supply voltage) Baud rate Max. current from module to module Max. cable length between the nodes Max. number of modules connected in series (daisy chain) Max. number of modules in a IEEE1394b FireWire system (including hubs ²⁾ , backplane) Max. number of hops ³⁾	MBaud A m - - -	IEEE 1394b (HBM modules only) 400 (approx. 50 MByte/s) 1.5 5 12 (=11 Hops) 24 14
Nominal (rated) temperature range	°C [°F]	-20 ... +65 [-4 ... +149]
Storage temperature range	°C [°F]	-40 ... +75 [-40 ... +167]
Rel. humidity	%	5 ... 95 (non condensing)
Protection class		III
Degree of protection		IP20 per EN 60529 (IP67-version available)
Mechanical tests⁴⁾ Vibration (30 min) Shock (6 ms)	m/s ² m/s ²	50 350

¹⁾ When the variable transducer supply is used, there is no electrical isolation from the supply voltage.

²⁾ Hub: IEEE1394b FireWire node or distributor

³⁾ Hop: Transition from module to module or signal conditioning / distribution via IEEE1394b FireWire (hub, backplane)

⁴⁾ Mechanical stress is tested according to European Standard EN60068-2-6 for vibrations and EN60068-2-27 for shock. The equipment is subjected to an acceleration of 50 m/s² in a frequency range of 5...65 Hz in all 3 axes. Duration of this vibration test: 30min per axis. The shock test is performed with a nominal acceleration of 350 m/s² for 6 ms, half sine pulse shape, with 3 shocks in each of the 6 possible directions.

⁵⁾ EtherCAT[®] is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

⁶⁾ When bridge excitation with carrier frequency (CF) is used, the maximum sample rate is 19.2 kS/s per channel.

Specifications MX840B (Continued)

EMC requirements		per EN 61326
Max. input voltage at transducer socket to ground PIN 1, 2, 3, 4, 5, 7, 8, 10, 13, 15 to Pin 6 PIN 14 (voltage) to Pin 9	V V	+ 5.5 (no transients) ± 60 (no transients)/
Dimensions, horizontal (W x H x D)	mm	52.5 x 200 x 121 (with case protection) 44 x 174 x 116,5 (without case protection)
Weight, approx.	g	980

Strain gauge full bridge, 5 or 10 mV/V measuring range, bridge excitation AC / carrier frequency		
Accuracy class		0.05
Carrier frequency (sine)	Hz	4800 ± 1.5
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		strain gauge full bridges
Permissible cable length between MX840B and transducer	m	100
Measuring ranges at 2.5 V excitation at 1 V excitation	mV/V mV/V	± 5 ± 10
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance at 2.5 V excitation at 1 V excitation	Ω Ω	300 ... 1,000 80 ... 1,000
Noise at 25 °C and 2.5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 0.1 < 0.2 < 0.6 < 3
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	0.02 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.05 of measurement value
Strain gauge half bridge, 5 or 10 mV/V measuring range, bridge excitation AC / carrier frequency		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4,800 ± 1.5
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		strain gauge half bridges
Permissible cable length between MX840B and transducer	m	100
Measuring ranges at 2.5 V excitation at 1 V excitation	mV/V mV/V	± 5 ± 10
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance at 2.5 V excitation at 1 V excitation	Ω Ω	300 ... 1,000 80 ... 1,000
Noise at 25 °C and 2.5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 0.1 < 0.2 < 0.6 < 3
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	0.1 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.1 of measurement value

Specifications MX840B (Continued)

Strain gauge full bridge, 5 or 10 mV/V measuring range, bridge excitation DC voltage		
Accuracy class		0.1
Bridge excitation voltage (effective)	V	1 and 2.5 ($\pm 5\%$)
Transducers that can be connected		strain gauge full bridges
Permissible cable length between MX840B and transducer	m	100
Measuring ranges at 2.5 V excitation at 1 V excitation	mV/V mV/V	± 5 ± 10
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Transducer impedance at 2.5 V excitation at 1 V excitation	Ω Ω	300 ... 1,000 80 ... 1,000
Noise at 25 °C and 2.5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	$\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$	< 1 < 1.2 < 1.5 < 2
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	0.1 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.05 of measurement value
Strain gauge half bridge, 5 or 10 mV/V measuring range, bridge excitation DC voltage		
Accuracy class		0.1
Bridge excitation voltage (effective)	V	1 and 2.5 ($\pm 5\%$)
Transducers that can be connected		strain gauge half bridges
Permissible cable length between MX840B and transducer	m	100
Measuring ranges at 2.5 V excitation at 1 V excitation	mV/V mV/V	± 5 ± 10
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Transducer impedance at 2.5 V excitation at 1 V excitation	Ω Ω	300 ... 1,000 80 ... 1,000
Noise at 25 °C and 2.5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	$\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$	< 1 < 1.2 < 1.5 < 2
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	0.1 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.1 of measurement value
Resistive (strain gauge) full bridge, 100 mV/V measuring range, bridge excitation DC voltage e.g. for piezoresistive transducers		
Accuracy class		0.05
Excitation voltage (DC)	V	2.5 $\pm 5\%$
Transducers that can be connected		piezoresistive strain gauge full bridges
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV/V	± 100
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Transducer impedance	Ω	300 ... 1,000
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	$\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$	< 3 < 4 < 5 < 10
Linearity error	%	< 0.02 of full scale
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

Specifications MX840B (Continued)

Resistive (strain gauge) full bridge, 1000 mV/V measuring range, bridge excitation DC voltage e.g. for piezoresistive transducers		
Accuracy class		0.05
Bridge excitation voltage (DC)	V	2.5 ± 5%
Transducers that can be connected		piezoresistive strain gauge full bridges
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV/V	± 1,000
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Transducer impedance	Ω	300 ... 1,000
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 10
with filter 10 Hz Bessel	μV/V	< 20
with filter 100 Hz Bessel	μV/V	< 40
with filter 1 kHz Bessel	μV/V	< 100
Linearity error	%	< 0.02 of full scale
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value
Inductive full bridge, 100 mV/V measuring range, bridge excitation AC		
Accuracy class		0.05
Carrier frequency (sine)	Hz	4,800 ± 1.5
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		inductive full bridges
Permissible cable length between MX840B and transducer	m	100
Measuring ranges		
at 2.5 V excitation	mV/V	± 100
at 1 V excitation	mV/V	± 300
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance		
at 2.5 V excitation	Ω	300 ... 1,000
at 1 V excitation	Ω	80 ... 1,000
Noise at 25 °C and 2.5 V excitation (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 1
with filter 10 Hz Bessel	μV/V	< 2
with filter 100 Hz Bessel	μV/V	< 5
with filter 1 kHz Bessel	μV/V	< 15
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	< 0.02 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.05 of measurement value
Inductive full bridge, 1000 mV/V measuring range, bridge excitation AC		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4800 ± 1.5
Bridge excitation voltage (effective)	V	1 (± 5 %)
Transducers that can be connected		inductive full bridges
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV/V	± 1,000
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance	Ω	80 ... 1000
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 10
with filter 10 Hz Bessel	μV/V	< 30
with filter 100 Hz Bessel	μV/V	< 100
with filter 1 kHz Bessel	μV/V	< 300
Linearity error	%	< 0.02 of full scale
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

Specifications MX840B (Continued)

Inductive half bridge, 100 mV/V measuring range, bridge excitation AC		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4,800 ± 1.5
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		inductive half bridges
Permissible cable length between MX840B and transducer	m	100
Measuring ranges at 2.5 V excitation at 1 V excitation	mV/V mV/V	± 100 ± 300
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance at 2.5 V excitation at 1 V excitation	Ω Ω	300 ... 1,000 80 ... 1,000
Noise at 25 °C and 2.5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 1 < 2 < 5 < 15
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	< 0.1 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.1 of measurement value
LVDT, displacement transducer, Linear Variable Differential Transformer, bridge excitation AC		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4800 ± 1.5
Bridge excitation voltage (effective)	V	1 (± 5 %)
Transducers that can be connected		LVDT
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV/V	± 3,000
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance	mH	4 ... 33
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 10 < 30 < 100 < 300
Linearity error	%	< 0.02 of full scale
Zero drift	% / 10 K	< 0.1 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value
Potentiometric transducers / potentiometer		
Accuracy class		0.1
Excitation voltage (DC)	V	2.5 (± 5 %)
Transducers that can be connected		potentiometric transducers
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV/V	± 500
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Transducer impedance	Ω	300 ... 5,000
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 10 < 20 < 40 < 100
Linearity error	%	< 0.02 of full scale
Zero drift (1 V excitation)	% / 10 K	< 0.1 of full scale
Full-scale drift (1 V excitation)	% / 10 K	< 0.1 of measurement value

Specifications MX840B (Continued)

Current-fed piezoelectric transducers (IEPE – Integrated Electronics Piezo Electric, ICP®)			
Accuracy class		0.1	
Transducer technology		IEPE (BNC adapter available: 1–SUBHD15–BNC)	
Permissible cable length between MX840B and transducer	m	< 30	
Transducer identification (TEDS, IEEE 1451.4)		only version 1.0	
Transducer excitation	mA	4,0 ± 15%	
Measuring ranges	V	± 8	
Internal resistance of the connected voltage source, typ.	kΩ	< 2,5	
Measurement frequency range (-3 dB)	Hz	0.34 ... 7.200	
Noise at 25 °C and measuring range ± 10 V (peak to peak)	at 1 Hz Bessel filter	μV	< 200
	at 10 Hz Bessel filter	μV	< 300
	at 100 Hz Bessel filter	μV	< 500
	at 1 kHz Bessel filter	μV	< 1.500
Linearity error	%	< 0.1 of full scale value	
Common-mode rejection	at DC common-mode	dB	> 100
	at 50 Hz common-mode, typically	dB	75
Max. common-mode voltage (to housing and supply ground)	V	± 60	
Zero drift	% / 10 K	< 0.1 of full scale value	
Full-scale drift	% / 10 K	< 0.05 of measurement value	

± 10 V standardized electrical voltage			
Accuracy class		0.05	
Transducers that can be connected		voltage generator up to ± 10 V	
Permissible cable length between MX840B and transducer	m	BNC adapter available: 1–SUBHD15–BNC 100	
Measuring range	V	± 10	
Measurement frequency range (-3 dB)	kHz	0 ... 7.2	
Internal resistance of the voltage source	Ω	< 500	
Internal impedance, typ.	MΩ	1	
Noise at 25 °C (peak to peak)	with filter 1 Hz Bessel	μV	< 200
	with filter 10 Hz Bessel	μV	< 300
	with filter 100 Hz Bessel	μV	< 500
	with filter 1 kHz Bessel	μV	< 1.500
Linearity error	%	< 0.02 of full scale	
Common-mode rejection	with DC common mode	dB	> 100
	with 50 Hz common mode, typ.	dB	75
Maximum common-mode voltage (to housing and supply ground)	V	± 60	
Zero drift	% / 10 K	< 0.02 of full scale	
Full-scale drift	% / 10 K	< 0.05 of measurement value	

Specifications MX840B (Continued)

± 60 V DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator up to ± 60 V
Permissible cable length between MX840B and transducer	m	100
Measuring range	V	± 60
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Internal resistance of the voltage source	Ω	< 500
Input impedance, typ.	MΩ	1
Noise at 25 °C (peak to peak) with filter 1Hz Bessel with filter 10Hz Bessel with filter 100Hz Bessel with filter 1kHz Bessel	μV μV μV μV	< 300 < 400 < 1,000 < 3,000
Linearity error	%	< 0.02 of full scale
Common-mode rejection with DC common mode with 50 Hz common mode, typ.	dB dB	> 100 75
Maximum common-mode voltage (to housing and supply ground)	V	± 60
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

± 100 mV voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV	± 300
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Input impedance	MΩ	> 20
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV μV μV μV	< 5 < 10 < 30 < 100
Linearity error	%	< 0.02 of full scale
Common-mode rejection with DC common mode with 50 Hz common mode, typ.	dB dB	> 90 75
Maximum common-mode voltage (to housing and supply ground)	V	± 30
Zero drift	% / 10 K	< 0.05 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

Specifications MX840B (Continued)

0 / 4...20 mA (2, 3, 4-wire) standardized electrical signal current		
Accuracy class		0.05
Transducers that can be connected		transducers with current output (0 ... 20 mA or 4 ... 20 mA)
Permissible cable length between MX840B and transducer	m	100
Measuring range	mA	± 20
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Measurement resistance value, typ.	Ω	10
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μA	< 1
with filter 10 Hz Bessel	μA	< 1.5
with filter 100 Hz Bessel	μA	< 15
with filter 1 kHz Bessel	μA	< 40
Linearity error	%	< 0.02 of full scale
Common-mode rejection		
with DC common mode	dB	> 100
with 50 Hz common mode, typ.	dB	75
Maximum common-mode voltage (to housing and supply ground)	V	± 30
Zero drift	% / 10 K	< 0.05 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

Ohmic resistance		
Accuracy class		0.1
Transducers that can be connected		PTC, NTC, KTY, TT-3, resistances generally (connection with 4 wire configuration)
Permissible cable length between MX840B and transducer	m	100
Measuring ranges	Ω	0 ... 5,000
Excitation current	mA	0.4 ... 0.8
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	K	< 0.1
with filter 10 Hz Bessel	K	< 0.2
with filter 100 Hz Bessel	K	< 0.5
with filter 1 kHz Bessel	K	< 1.5
Linearity error	%	< ± 0.02 of full scale
Zero drift	%/10K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

Resistance thermometer (PT100, PT1000)		
Accuracy class		0.1
Transducers that can be connected		PT100, PT1000 (connection with 4 wire configuration)
Permissible cable length between MX840B and transducer	m	100
Linearization range	°C [°F]	-200 ... +848 [-328 ... +1558.4]
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	K	< 0.1
with filter 10 Hz Bessel	K	< 0.2
with filter 100 Hz Bessel	K	< 0.5
with filter 1 kHz Bessel	K	< 1.5
Linearity error	K	< ± 0.3
Zero drift		
with PT100	K / 10 K	< 0.2
with PT1000	K / 10 K	< 0.1
Full-scale drift		
with PT100	K / 10 K	< 0.5
with PT1000	K / 10 K	< 1

Specifications MX840B (Continued)

Thermocouples ⁷⁾		
Transducers that can be connected		Thermocouples (type B, E, J, K, N, R, S, T)
Permissible cable length between MX840B and transducer	m	100
Measuring range	mV	± 100
Linearization ranges		
Type B (Pt-30 % Rh and Pt-6 % Rh)	°C [°F]	+100 ... +1,820 [+212 ... +3,308]
Type E (Ni-Cr and Cu-Ni)	°C [°F]	-200 ... +900 [-328 ... +1,652]
Type J (Fe and Cu-Ni)	°C [°F]	-210 ... +1,200 [-346 ... +2,192]
Type K (Ni-Cr and Ni-Al)	°C [°F]	-270 ... +1,372 [-454 ... +2,501.6]
Type N (Ni-14,2 % Cr and Ni-4,4 % Si-0,1 % Mg)	°C [°F]	-270 ... +1,300 [-454 ... +2,372]
Type R (Pt-13 % Rh and Pt)	°C [°F]	-50 ... +1,768 [-58 ... +3214.4]
Type S (Pt-10 % Rh and Pt)	°C [°F]	-50 ... +1,768 [-58 ... +3214.4]
Type T (Cu and Cu-Ni)	°C [°F]	-270 ... +400 [-454 ... +752]
Transducer impedance	Ω	< 500
Measurement frequency range (-3 dB)	kHz	0 ... 7.2
Noise Type K (peak to peak)		
with Filter 1 Hz Bessel	K	0.05
with Filter 10 Hz Bessel	K	0.1
with Filter 100 Hz Bessel	K	0.5
with Filter 1 kHz Bessel	K	1
Total error limit at 22 °C ambient temperature		
Type E, J, K, T	K	± 1
Type R, S	K	± 4
Type B	K	± 15
Temperature drift (type K)	K/10K	< ± 0.5
Cold junction 1-THERMO-MXBOARD		
Nominal (rated) temperature range	°C [°F]	-20 ... +60 [-4 ... +140]
Operating temperature range	°C [°F]	-20 ... +65 [-4 ... +149]
Storage temperature range	°C [°F]	-40 ... +75 [-40 ... +167]

⁷⁾ The external cold junction is required for connecting thermocouples to the MX840B (Order no.: 1-THERMO-MXBOARD).

Specifications MX840B (Continued)

Frequency or pulse counting (connections 5 ... 8)		
Accuracy class		0.01
Transducers that can be connected		HBM-torque transducers, Frequency signal sources (square), incremental rotary encoder, pulse counters, SSI transducers
Permissible cable length between MX840B and transducer	m	50
Signals F ₁ (±) F ₂ (±) Zero index (±)		Frequency or pulse signal Direction of rotation signal shifted by ±90° to F ₁ or static Zero position signal
Input level with differential operation Low level High level		Differential inputs (RS422): Signal (+) < Signal (-) -200 mV Differential inputs (RS422): Signal (+) > Signal (-) +200 mV
Input level with unipolar operation Low level High level	V V	<1.5 > 3.5
Maximum input voltage at transducer socket to ground (pin 6)	V	5.5 (no transients)
Measuring ranges Frequency Pulse counting	Hz pulses/s	0.1 ... 1,000,000 0 ... 1,000,000
Input impedance, typ.	kΩ	10
Temperature drift	%/10K	< 0,01 of measurement value
SSI mode (differentially) Shift clock Word length Code Input level Low level High level Signals Data Shift clock	kHz Bit	100, 200, 500, 1,000 12-31 dual or gray Differential inputs (RS422): Signal (+) < Signal (-) -200 mV Differential inputs (RS422): Signal (+) > Signal (-) +200 mV Data+, Data- (RS-422) Clk+, Clk- (RS-422)

Digital control output (e.g. for triggering of external shunts, reset of external charge amplifiers)		
Output type		High side switch
Reference potential		Pin 6 (ground)
High level Output unloaded, typ. I _{out} = 5 mA	V V	5 > 4.5
Permissible load impedance	kΩ	> 1

CAN (connection 1)									
Supported protocols		CAN 2.0A, CAN 2.0B							
Number of CAN ports		only connection 1							
Bus link		two wire, according to ISO11898							
Bit rates	kBit/s	1000	800	666,6	500	400	250	125	100
Permissible cable lengths	m	25	50	80	100	100	250	500	500
Formats		Motorola, Intel							
Receiving¹⁾ , can be parameterized via CANdb (*.dbc) Sampling rate Number of CAN signals CAN signal types	signals/ s	max. 10,000 ≤ 128 standard, mode-dependent, mode-Signal							
Transmitting , MX Assistant generates CANdb (*.dbc) Sample rate (max.) Number of CAN signals (module-internal only) Generate dbc file (Assistant)	Hz	100 per signal 7							

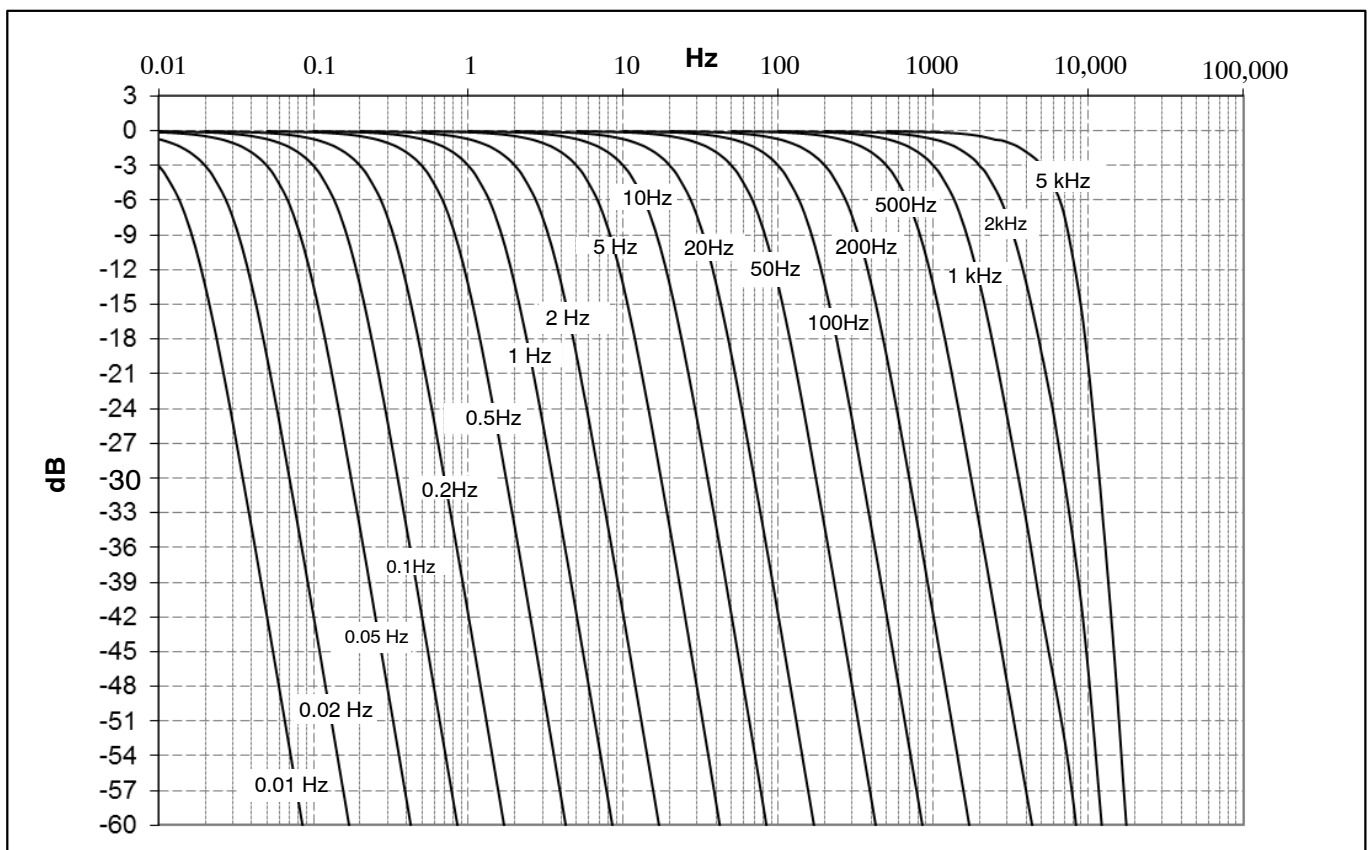
¹⁾ Parameterization from CANdb via catman[®]EASY or MX Assistant

Decimal sample rates and digital low pass filter, type Bessel 4th order

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay ^{*)} (ms)	Rise time (ms)	Overshoot (%)	Sample 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	

^{*)} The delay time of the ADC is 65 μ s for the sample rate 38,400 Hz and 128 μ s for the all other sample rates. This value has not been accounted in the "phase delay" column above.

Decimal sample rates : Amplitude response Bessel filter

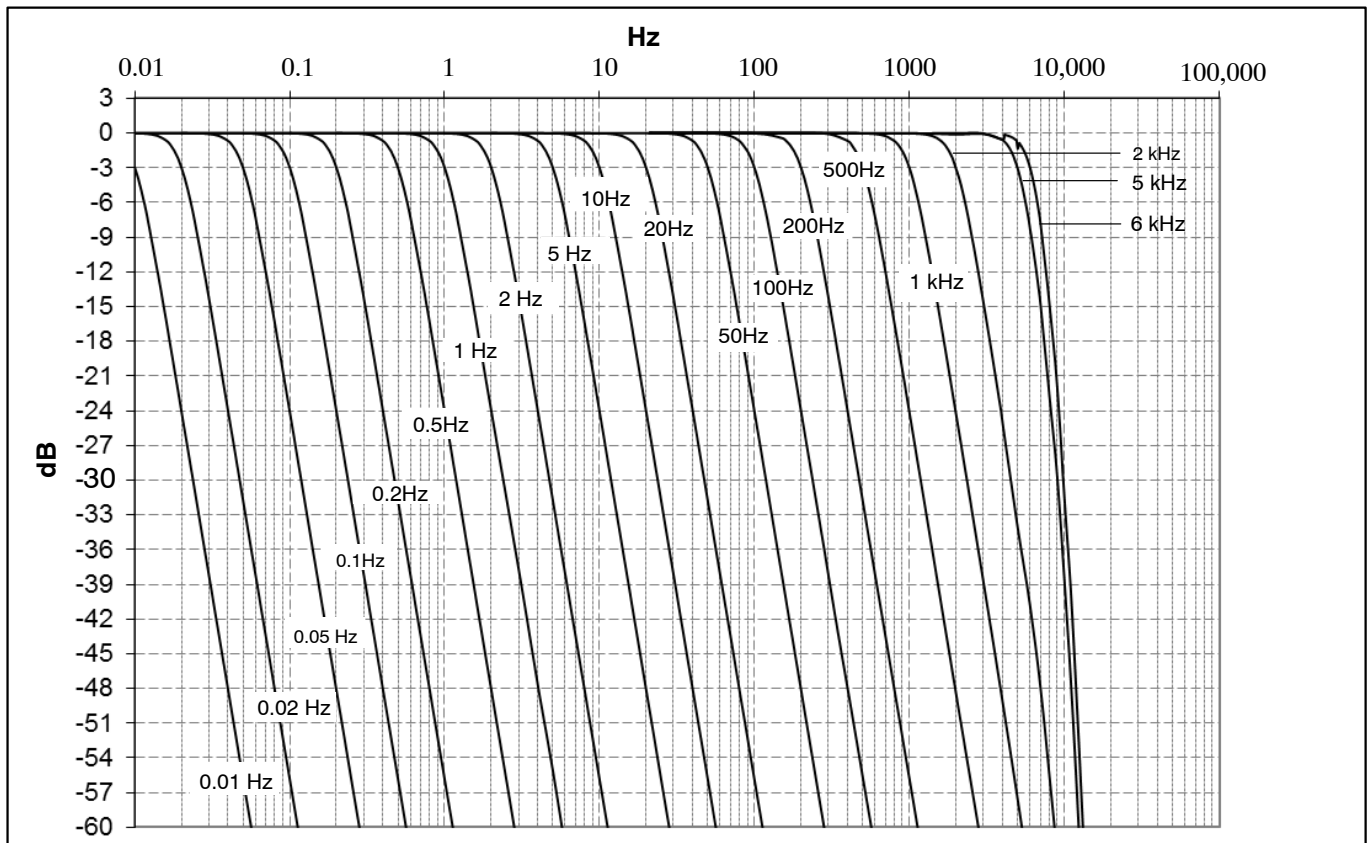


Decimal sample rates and digital low pass filter, type Butterworth 4th order

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay ^{*)} (ms)	Rise time (ms)	Overshoot (%)	Sample rate (Hz)
Butterworth	5198	6090	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	

^{*)} The delay time of the ADC is 65 μ s for the sample rate 38,400 Hz and 128 μ s for the all other sample rates. This value has not been accounted in the "phase delay" column above.

Decimal sample rates : Amplitude response Butterworth filter

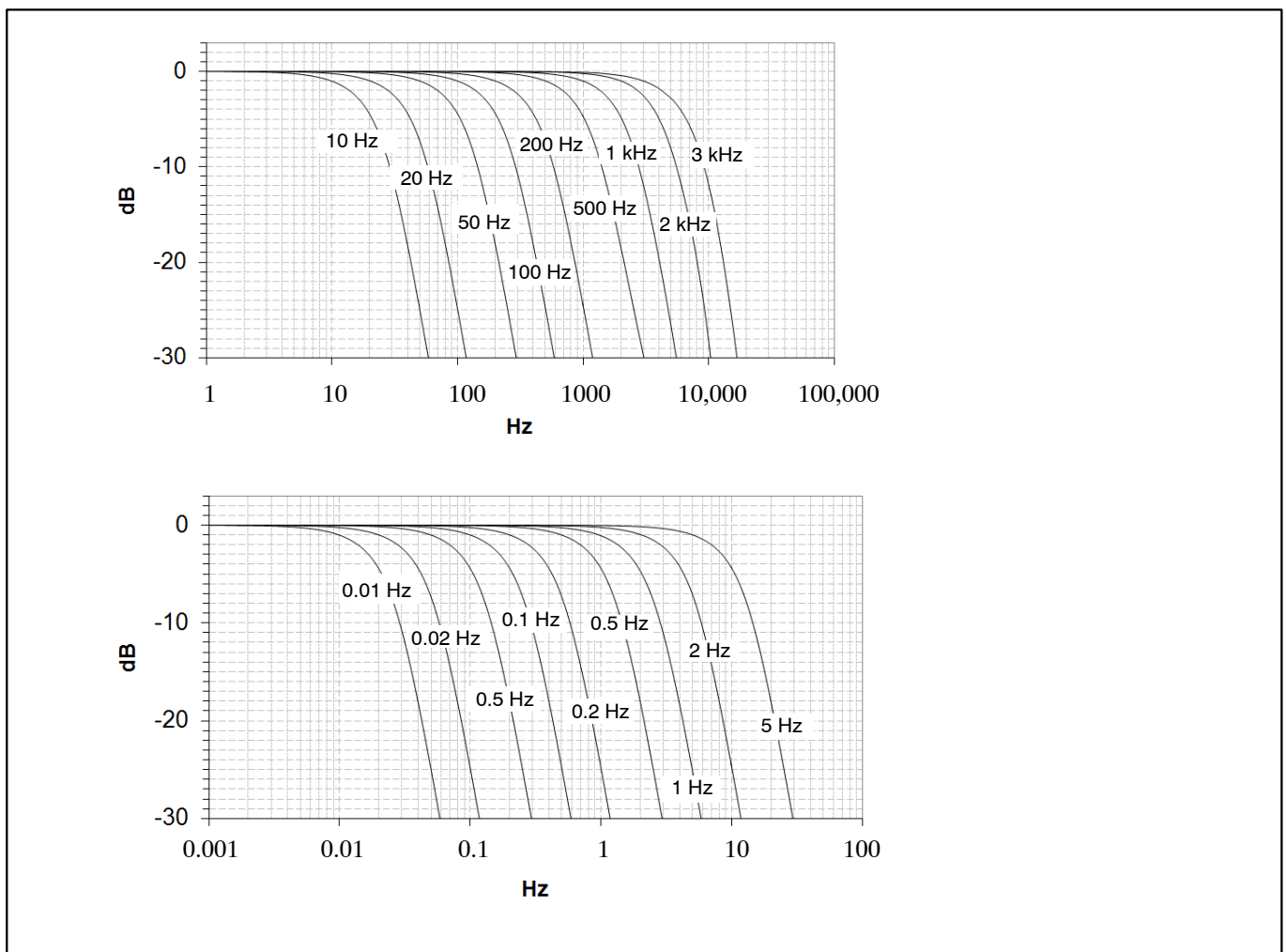


Classic HBM sample rates and digital low pass filter, type Bessel 4th order

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay (ms) ^{*)}	Rise time (ms)	Overshoot (%)	Sample rate (Hz)
Bessel	3000	5161	13,086	0.012	0.07	0.157	38,400
	2000	3210	8100	0.15	0.1	1.5	19,200
	1000	1630	4050	0.24	0.2	1.4	19,200
	1000	1640	5150	0.21	0.2	0.7	9600
	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	

*) The delay time of the ADC is 65 μ s for the sample rate 38,400 Hz and 128 μ s for the all other sample rates. This value has not been accounted in the "phase delay" column above.

Classic HBM sample rates : Amplitude response Bessel filter

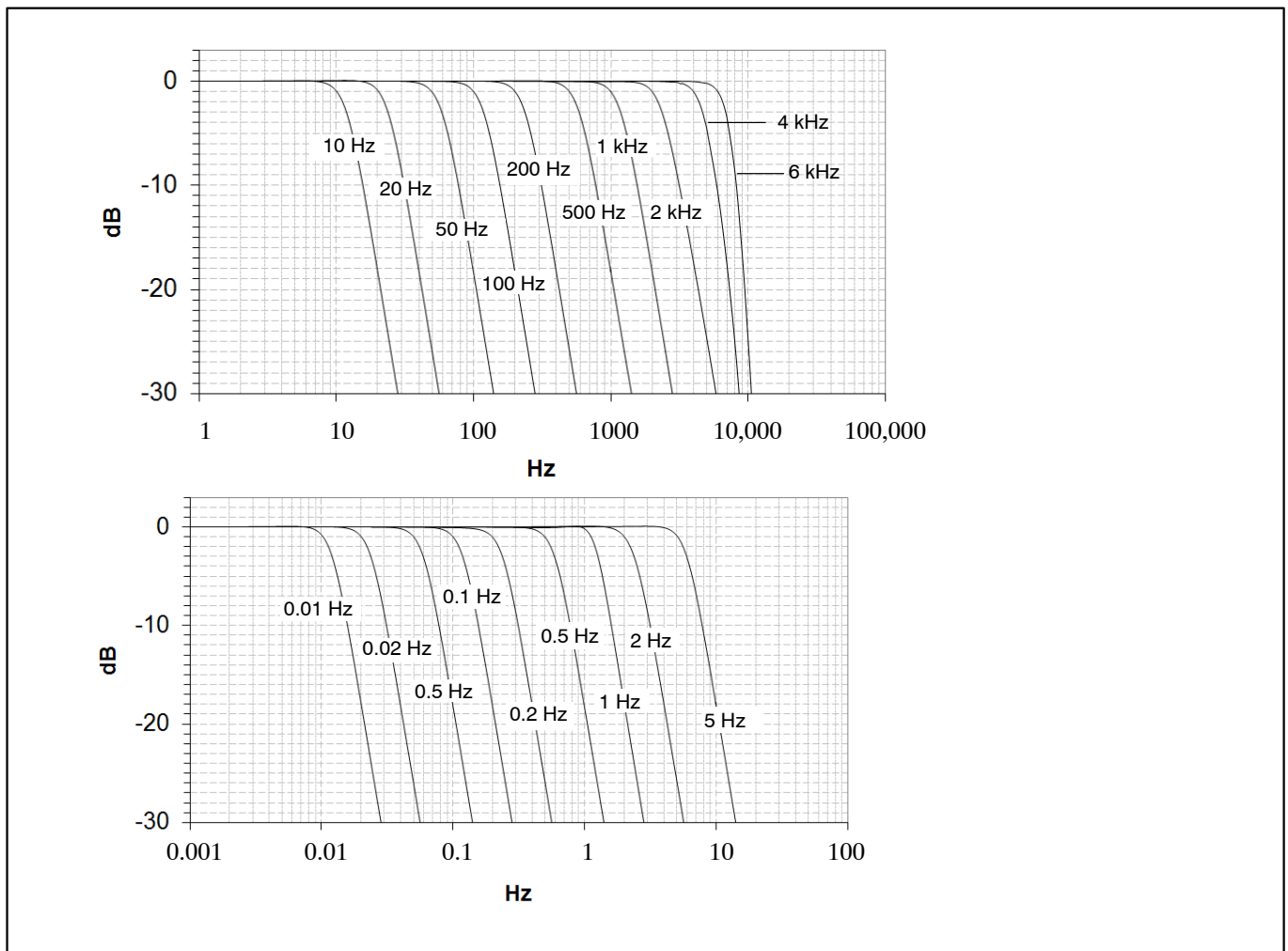


Classic HBM sample rates and digital low pass filter, type Butterworth 4th order

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay (ms) ^{*)}	Rise time (ms)	Overshoot (%)	Sample rate (Hz)
Butterworth	6000	6868	9433	0.07	0.07	15.90	38,400
	4000	4660	7324	0.10	0.09	13.52	38,400
	2000	2360	4331	0.2	0.15	8.5	19,200
	1000	1178	2100	0.38	0.3	11	19,200
	1000	1168	2140	0.32	0.32	11	9600
	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	16,000	11	20	
0.01	0.012	0.021	34,600	32,000	11	20	

*) The delay time of the ADC is 65 μ s for the sample rate 38,400 Hz and 128 μ s for the all other sample rates. This value has not been accounted in the "phase delay" column above.

Classic HBM sample rates : Amplitude response Butterworth filter



Specifications Power pack NTX001

30 W AC / DC power pack (1-NTX001)		
Nominal input voltage (AC)	V	100 ... 240 ($\pm 10\%$)
Stand-by power consumption at 230 V	W	0.5
Nominal load		
U_A	V	24
I_A	A	1.25
Static output characteristics		
U_A	V	$24 \pm 4\%$
I_A	A	0 - 1.25
U_{Br} (Output voltage ripple; peak to peak)	mV	≤ 120
Current limiting, typically from	A	1.6
Primary - secondary separation		galvanically, by optocoupler and converter
Creep distance and clearance	mm	≥ 8
High-voltage test	kV	≥ 4
Ambient temperature range	$^{\circ}\text{C}$ [$^{\circ}\text{F}$]	0... +40 [+32 ... +104]
Storage temperature	$^{\circ}\text{C}$ [$^{\circ}\text{F}$]	-40 ... +70 [-40 ... +158]




Accessories, to be ordered separately

MX840B accessories		
Article	Description	Order No.
Power		
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 connector	1-NTX001
3m cable - QuantumX supply	3 m cable for voltage supply of QuantumX modules; Suitable plug (ODU Medi-Snap S11M08-P04MJGO-5280) on one side and open strands on the other end.	1-KAB271-3
Communication		
Ethernet cross over cable	Ethernet cross over cable for direct operation between a PC or Notebook and a module / device, 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/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-KAB272-0.2 1-KAB272-2 1-KAB272-5
IEEE1394b IEEE1394b FireWire IEEE ExpressCard	FireWire IEEE 1394b ExpressCard (ExpressCard/34) to connect QuantumX modules to a notebook or PC	1-IF002
IEEE1394b FireWire cable PC-to-module	Firewire connection cable between module and PC. With matching plugs on both sides; Length: 3 m. No voltage supply of the modules possible with KAB293.	1-KAB293-5
IEEE1394b FireWire cable from hub to module, IP68	FireWire connection cable between HUB and module. For data transfer from QuantumX modules to the HUB. Fitted with suitable plugs at both ends. Length: 3 m	1-KAB276-3
IEEE1394b FireWire Extender SCM-FW	Package including 2 in-line elements for extension of the FireWire connection up to 40 m; Required parts: 2 x 1-KAB269-x and Industrial Ethernet cable (M12, CAT5e. No voltage supply of the modules possible via KAB270.	1-SCM-FW

Accessories, to be ordered separately (continued)

Accessories MX840B		
Article	Description	Order No.
Mechanic		
Connecting elements for QuantumX modules	Connecting elements (clips) for QuantumX modules; Set comprising 2 case clips including mounting material for fast connection of 2 modules.	1-CASECLIP
Connecting elements for QuantumX modules	Fitting panel for mounting of QuantumX modules using case clips (1-CASECLIP), lashing strap or cable tie. Basic fastening by 4 screws.	1-CASEFIT
QuantumX Backplane (Standard)	QuantumX Backplane – Standard for a maximum of 9 modules; General: - Mounting on wall or control cabinet (19") - Connection of external modules by FireWire possible; - Power supply: 24 V DC / max. 5 A (150 W);	1-BPX001
QuantumX Backplane (Rack)	QuantumX Backplane – Rack for maximum 9 modules; - 19" rack mounting with handles left and right; - Connection of external modules via FireWire possible; - Power supply: 24 V DC / max. 5 A (150 W).	1-BPX002
Transducer side		
Cold junction for thermocouples on MX840, MX840B/MX440B	Electronics for temperature compensation for measurements with thermocouples including: - PT1000 cold junction - incl. TEDS chip for transducer identification Note: Installation in DSubHD 15-pole transducer plug.	1-THERMO-MXBOARD
DSubHD 15 pole-to-DSub 15 pole adapter	DSubHD 15 pole-to-DSub 15 pole adapter for connection of transducers with pre-wired DSub plug (length approx. 0.3 m); Note: Pre-wired for full bridge (6-wire).	1-KAB416
DSubHD15-to-DSub9 (CAN) adapter	Adapter for connection of CAN instruments. DSubHD 15-pole (plug) to DSub 9-pole (socket); Length: approx. 0.3 m.	1-KAB418
350 ohm strain gauge quarter bridge module	Signal conditioning of strain gauge quarter bridge at QuantumX full bridge input. Integrated 350-ohm completion resistor; soldering points for transducer cable (3 wire); TEDS; D-Sub-HD device connection.	1-SCM-SG350
120 ohm strain gauge quarter bridge module	Signal conditioning of strain gauge quarter bridge at QuantumX full bridge input. Integrated 120-ohm completion resistor; soldering points for transducer cable (3 wire); TEDS; D-Sub-HD device connection.	1-SCM-SG120
High-voltage signal conditioner	High-voltage signal conditioner for differential measurement of voltages up to 300 V CAT II with type MX840, MX840B, MX410 and MX440A QuantumX modules, with DSubHD connector and fixed, 1-m-long measuring leads with 4-mm laboratory plugs.	1-SCM-HV
DSubH 15-pol. to-BNC pole adapter	Adapter for QuantumX, BNC socket to DSubHD 15-pole (pin 14), for connecting 60 V, +/-10 V or IEPE / ICP [®]), provided that the amplifier supports this function	1-SUBHD15-BNC
DSubHD 15-pole connector kit with TEDS chip	DSubHD 15-pole connector kit (male) with TEDS chip for storage of a sensor data sheet; Housing: Metallized plastic with knurled screws. Note: The TEDS chip comes blank.	1-SUBHD15-MALE
TEDS-Package (10 piece)	Package of TEDS chips. Package of 10 1-wire-EEPROM DS24B33 (IEEE 1451.4 TEDS)	1-TEDS-PAK
Port saver, SubHD 15 pol.	4 x DSubHD 15 pin male to female port savers; protecting the wear and tear for frequent plugging and unplugging. Extends contact durability by min. 500. Adaptor attaches securely with screws 4-40 UNC.	1-SUBHD15-SAVE

Accessories, to be ordered separately (continued)

General accessories		
Article	Description	Order No.
Software and product packages		
catman® AP 	Complete package including catman® Easy functionality plus additional modules such as integration of video cameras (EasyVideoCam), complete post-process analysis (EasyMath), automation of recurring processes (EasyScript), offline preparation of measurement projects (EasyPlan) as well as additional functions such as calculating electrical power, special filters, frequency spectrum, etc. More details at www.hbm.com/catman	1-CATMAN-AP
catman® EASY 	The basic software package for measurement data acquisition comprises convenient 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, preparation and analysis of measurement data, including many mathematical functions, data export and reporting.	1-CATEASY-PROCESS
MX840B + catman® EASY	Package including: - amplifier - Power supply (1-NTX001) - 8 transducer plugs with TEDS (1-SUBHD15-MALE) - Ethernet Cross-over cable (1-KAB239-2) - catman® Easy software from HBM (1-CATMAN-EASY) - Including software maintenance for the first 12 months	1-MX840-PAKEASY
MX840B + catman® AP	Package including: - amplifier - Power supply (1-NTX001) - 8 transducer plugs with TEDS (1-SUBHD15-MALE) - Ethernet Cross-over cable (1-KAB239-2) - catman® AP software from HBM (1-CATMAN-AP) - Including software maintenance for the first 12 months	1-MX840-PAKAP
LabVIEW™-Treiber ¹⁾	Universal driver from HBM for LabVIEW™.	1-LabVIEW-DRIVER
CANape® driver	QuantumX driver for the software CANape® from Vector Informatik. CANape versions from 10.0 are supported.	1-CANAPE-DRIVER

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

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measure and predict with confidence

