DATA SHEET

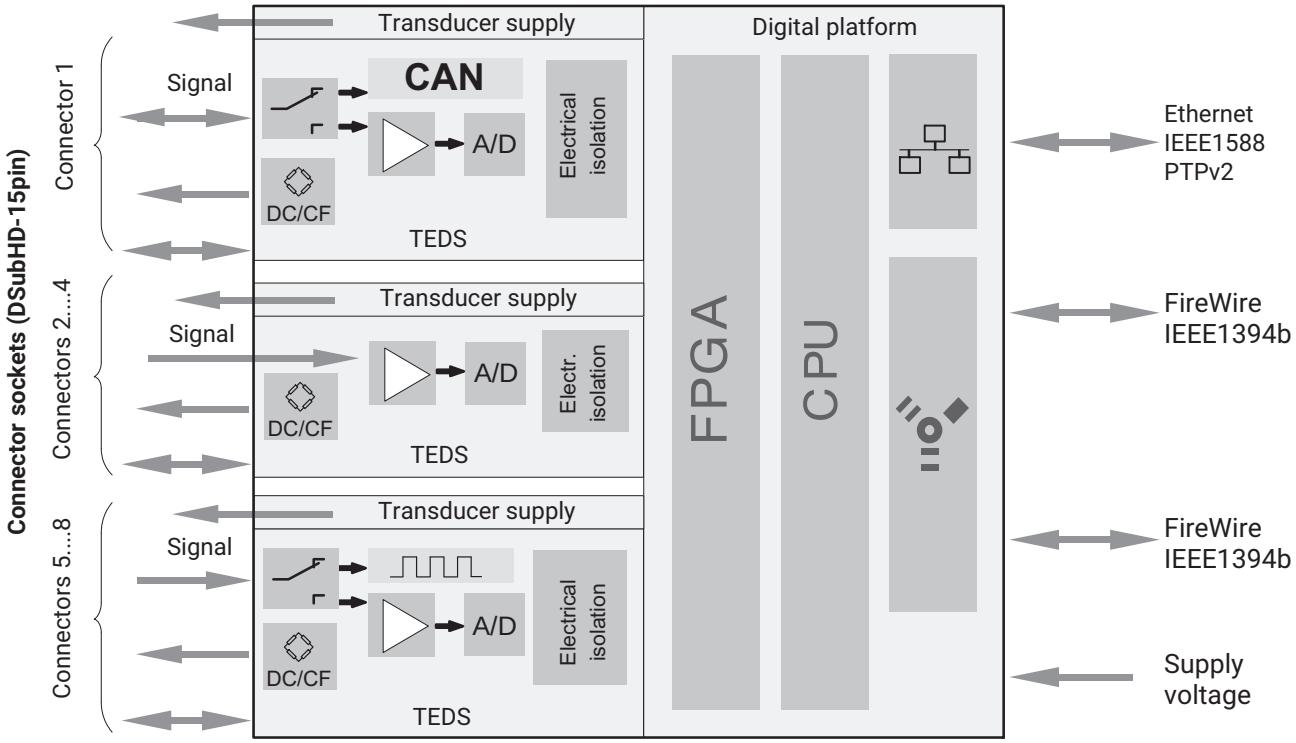
QuantumX MX840B
Universal amplifier

SPECIAL FEATURES

- 8 individually configurable measurement channels (electrically isolated)
- Connection of more than 16 transducer technologies per channel
- Individual sampling rates of 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
- CAN bus input or output (port 1)



BLOCK DIAGRAM



SPECIFICATIONS FOR MX840B

General specifications		
Inputs	Number	8, electrically isolated from one another and from the supply[1)]
Transducer technologies per connector		Strain gage full and half bridge, quarter bridge with 1-SCM-SG120/350/1000, inductive full and half bridge, piezoresistive full bridge, current-fed piezoelectric transducers (IEPE, ICP®), potentiometric transducers, electric voltage (100 mV, 10 V, 60 V and up to 300 V CAT II with 1-SCM-HV), electric current (0/4 … 20 mA), ohmic resistance (e.g. PTC, NTC, KTY), resistance thermometer (Pt100, Pt500, Pt1000), thermocouples (K, N, E, T, S, ...) with cold junction in the connector (1-SCM-TCK/J/E). **Additionally for connectors 5-8:** Rotary encoder, frequency measurement, rotational speed measurement (rpm), pulse counter, HBM torque, SSI protocol. **Additionally for channel 1:** CAN bus, receive signals or send measurement signals.
A/D conversion per channel		24-bit delta-sigma converter
Sampling rates (domain can be set via the software, factory setting is "HBM Classic")	S/s	Decimal: 0.1 … 40,000 HBM Classic: 0.1 … 38,400 [2)]
Signal bandwidth (-3 dB)	Hz	7,770 with linear phase filter 6,667 Hz
Active low-pass filter	Hz	Bessel, Butterworth, linear phase 0.01 ... 6,667 (-3 dB), filter OFF [3)]
Transducer identification max. TEDS module distance	 m	TEDS, IEEE 1451.4 100
Transducer connection		D-SUB-15HD
Supply voltage range (DC)	V	10 ... 30 (nominal (rated) voltage 24 V)
Supply voltage interruption, max. (at 20 mA)	ms	5[4)]
Power consumption without adjustable transducer excitation with adjustable transducer excitation	 W W	 < 9 < 12
Transducer excitation (active transducers) Adjustable supply voltage (DC) Maximum output power	 V W	 5 ... 24; adjustable channel by channel 0.7 per channel / 2 in total
Ethernet (data link) Protocol/addressing Plug connection Max. cable length to module	 - - m	10Base-T/100Base-TX TCP/IP (static IP/DHCP, IPv4/IP6v) 8P8C connector (RJ-45) with twisted-pair cable, streaming (CAT 5) 100
Synchronization options FireWire Ethernet EtherCAT®[5)] IRIG-B		 IEEE1394b (2 per device) IEEE1588 (PTPv2) or NTP via CX27C gateway IRIG-B (B000 to B007; B120 to B127) via MX440B / MX840B measurement channel
IEEE1394b FireWire (module synchronization, data link, optional voltage 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 an IEEE1394b FireWire system (incl. hubs[6)], backplane) Max. number of hops[7)]	 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)

1) When using variable transducer excitation voltage, clear the electrical isolation from the supply.
2) When using a bridge excitation voltage with carrier frequency (CF), the maximum sampling rate is 19.2 kS/s per channel.
3) Filter OFF is only recommended for real-time applications, e.g. for achieving low latency times.
4) Uninterruptible power supply (UPS) available as an accessory for longer interruptions
5) EtherCAT® is a registered brand and patented technology, licensed by Beckhoff Automation GmbH, Germany.
6) Hub: IEEE1394b FireWire node or distributor
7) Hop: Transition from module to module or signal conditioning/distribution via IEEE1394b FireWire (hub, backplane)
8) The DC voltage supply must meet the requirements of IEC 60950-1 for a SELV voltage supply.

SPECIFICATIONS MX840B (CONTINUED)

Protection class		III[8)]
Equipment protection level		IP20 as per EN60529 (IP67 version available)
Mechanical tests[9)] 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 PIN 14 (voltage) to pin 9	 V V	 5.5 (without transients) ± 60 (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	980
Strain gage full bridge, 5 or 10 mV/V measurement range, bridge excitation AC/carrier frequency		
Accuracy class		0.05
Carrier frequency (sine)	Hz	4,800±1.5
Bridge excitation voltage (effective)	V	1 and 2.5 (±10 %)
Transducers that can be connected		Full bridge strain gages
Permissible cable length between MX840B and transducer	m	< 100
Measurement ranges at 2.5 V excitation at 1 V excitation	 mV/V mV/V	 ±5 ±10
Signal bandwidth (-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 bridge excitation (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 0.1 < 0.2 < 0.6 < 3
Non-linearity	%	< 0.02 of full scale value
Zero drift (2.5 V excitation)	%/10 K	< 0.02 of full scale value
Full scale drift (2.5 V excitation)	%/10 K	< 0.05 of measured value
Strain gage half bridge, 5 or 10 mV/V measurement 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 (±10 %)
Transducers that can be connected		Strain gage half bridges
Permissible cable length between MX840B and transducer	m	100
Measurement ranges at 2.5 V excitation at 1 V excitation	 mV/V mV/V	 ±5 ±10
Signal bandwidth (-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 bridge excitation (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 0.1 < 0.2 < 0.6 < 3
Non-linearity	%	< 0.02 of full scale value
Zero drift (2.5 V excitation)	%/10 K	< 0.1 of full scale value
Full scale drift (2.5 V excitation)	%/10 K	< 0.1 of measured value

9) 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 acceleration of 350 m/s^2 for a duration of 6 ms, half sine and with shocks in each of the six possible directions.

SPECIFICATIONS MX840B (CONTINUED)

Strain gage full bridge, 5 or 10 mV/V measurement range, bridge excitation DC/direct voltage		
Accuracy class		0.1
Bridge excitation voltage (DC)	V	1 and 2.5 (±10 %)
Transducers that can be connected		Full bridge strain gages
Permissible cable length between MX840B and transducer	m	100
Measurement ranges at 2.5 V excitation at 1 V excitation	 mV/V mV/V	 ±5 ±10
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 bridge excitation (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 1 < 1.2 < 1.5 < 2
Non-linearity	%	< 0.02 of full scale value
Zero drift (2.5 V excitation)	%/10 K	< 0.1 of full scale value
Full scale drift (2.5 V excitation)	%/10 K	< 0.05 of measured value
Strain gage half bridge, 5 or 10 mV/V measurement range, bridge excitation DC/direct voltage		
Accuracy class		0.1
Bridge excitation voltage (DC)	V	1 and 2.5 (±10 %)
Transducers that can be connected		Strain gage half bridges
Permissible cable length between MX840B and transducer	m	100
Measurement ranges at 2.5 V excitation at 1 V excitation	 mV/V mV/V	 ±5 ±10
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 bridge excitation (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 1 < 1.2 < 1.5 < 2
Non-linearity	%	< 0.02 of full scale value
Zero drift (2.5 V excitation)	%/10 K	< 0.1 of full scale value
Full scale drift (2.5 V excitation)	%/10 K	< 0.1 of measured value
Resistive full bridge, 100mV/V measurement range, bridge excitation DC/direct voltage e.g. for piezoresistive transducers		
Accuracy class		0.05
Bridge excitation voltage (DC)	V	2.5 (±10 %)
Transducers that can be connected		Piezoresistive strain gage full bridges
Permissible cable length between MX840B and transducer	m	100
Measurement range	mV/V	±100
Transducer impedance	Ω	300 ... 1,000
Noise at 25 °C (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 3 < 4 < 5 < 10
Non-linearity	%	< 0.02 of full scale value
Zero drift	%/10 K	< 0.02 of full scale value
Full-scale drift	%/10 K	< 0.05 of measured value

SPECIFICATIONS MX840B (CONTINUED)

Resistive full bridge, 1000 mV/V measurement range, bridge excitation DC/direct voltage e.g. for piezoresistive transducers				
Accuracy class		0.05		
Bridge excitation voltage (DC)	V	2.5 (±10 %)		
Transducers that can be connected		Piezoresistive strain gage full bridges		
Permissible cable length between MX840B and transducer	m	< 100		
Measurement range	mV/V	±1,000		
Transducer impedance	Ω	300 ... 1,000		
Noise at 25 °C (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 10 < 20 < 40 < 100		
Non-linearity	%	< 0.02 of full scale value		
Zero drift	%/10 K	< 0.02 of full scale value		
Full-scale drift	%/10 K	< 0.05 of measured value		
Inductive full bridge, 100mV/V measuring range, bridge excitation voltage AC				
Accuracy class		0.05		
Carrier frequency (sine)	Hz	4,800 ±1.5		
Bridge excitation voltage (effective)	V	1 and 2.5 (±10 %)		
Transducers that can be connected		Inductive full bridges		
Permissible cable length between MX840B and transducer	m	< 100		
Measurement ranges at 2.5 V excitation at 1 V excitation	 mV/V mV/V	 ±100 ±300		
Signal bandwidth (-3 dB)	kHz	0 ... 1.6		
Transducer impedance	Ω mH	80 3	300 10	1,000 35
Noise at 25 °C and 2.5 V bridge excitation (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 1 < 2 < 5 < 15		
Non-linearity	%	< 0.02 of full scale value		
Zero drift (2.5 V excitation)	%/10 K	< 0.02 of full scale value		
Full scale drift (2.5 V excitation)	%/10 K	< 0.05 of measured value		
Inductive full bridge, 1000 mV/V measuring range, bridge excitation voltage AC				
Accuracy class		0.1		
Carrier frequency (sine)	Hz	4,800 ±1.5		
Bridge excitation voltage (effective)	V	1 (±10 %)		
Transducers that can be connected		Inductive full bridges		
Permissible cable length between MX840B and transducer	m	< 100		
Measurement range	mV/V	±1,000		
Signal bandwidth (-3 dB)	kHz	0 ... 1.6		
Transducer impedance	Ω mH	80 3	300 10	1,000 35
Noise at 25 °C (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 10 < 30 < 100 < 300		
Non-linearity	%	< 0.02 of full scale value		
Zero drift	%/10 K	< 0.02 of full scale value		
Full-scale drift	%/10 K	< 0.1 of measured value		

SPECIFICATIONS MX840B (CONTINUED)

Inductive half bridge, 100 mV/V measurement 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 (±10 %)
Transducers that can be connected		Inductive half bridges
Permissible cable length between MX840B and transducer	m	< 100
Measurement ranges at 2.5 V excitation at 1 V excitation	 mV/V mV/V	 ±100 ±300
Signal bandwidth (-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 bridge excitation (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 1 < 2 < 5 < 15
Non-linearity	%	< 0.02 of full scale value
Zero drift (2.5 V excitation)	%/10 K	< 0.1 of full scale value
Full scale drift (2.5 V excitation)	%/10 K	< 0.1 of measured value
LVDT (linear variable differential transformer) displacement transducer, bridge excitation voltage AC		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4,800 ±1.5
Bridge excitation voltage (effective)	V	1 (±10 %)
Transducers that can be connected		LVDT
Permissible cable length between MX840B and transducer	m	< 100
Measurement range	mV/V	±3,000
Signal bandwidth (-3 dB)	kHz	0 ... 1.6
Transducer impedance	mH	4 ... 33
Noise at 25 °C (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 10 < 30 < 100 < 300
Non-linearity	%	< 0.02 of full scale value
Zero drift	%/10 K	< 0.1 of full scale value
Full-scale drift	%/10 K	< 0.1 of measured value
Potentiometric transducers / potentiometers		
Accuracy class		0.1
Excitation voltage (DC)	V	2.5 (±10 %)
Transducers that can be connected		Potentiometric transducers
Permissible cable length between MX840B and transducer	m	< 100
Measurement range	mV/V	±500
Transducer impedance	Ω	300 ... 5,000
Noise at 25 °C (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µV/V µV/V µV/V µV/V	 < 10 < 20 < 40 < 100
Non-linearity	%	< 0.02 of full scale value
Zero drift (1 V excitation)	%/10 K	< 0.1 of full scale value
Full scale drift (1 V excitation)	%/10 K	< 0.1 of measured value

SPECIFICATIONS MX840B (CONTINUED)

Current-fed piezoelectric transducers (IEPE - Integrated Electronics Piezo Electric, CCLD, ICP®)		
Accuracy class		0.1
Transducer technology		IEPE (BNC adapter available: 1-SUBHD15-BNC)
Permissible cable length between MX840B and transducer, lay only inside closed buildings	m	< 30
Transducer identification (TEDS chip, IEEE 1451.4)		Version 1.0 only
Transducer excitation	mA	4.0 ±15%
Measuring range (AC)	V	±10
IEPE compliance voltage, typically	V	21
Signal bandwidth (-3 dB)	Hz	0.34 … 7770
Noise at 25 °C and ±10 V measurement range (peak-to-peak)		
With 1 Hz Bessel filter	µV	< 200
With 10 Hz Bessel filter	µV	< 300
With 100 Hz Bessel filter	µV	< 500
With 1 kHz Bessel filter	µV	< 1,000
Non-linearity	%	< 0.1 of full scale value
Common-mode rejection		
for DC common mode	DB	> 100
for 50 Hz common mode, typically	dB	75
Max. common-mode voltage (to housing and supply ground)	V	±60
Zero drift	%/10K	< 0.1 of full scale value
Full-scale drift	%/10 K	< 0.05 of measured value
Electric voltage ±10 V		
Accuracy class		0.05
Transducers that can be connected		Voltage sources up to ±10 V
Permissible cable length between MX840B and transducer	m	< 100 (BNC adapter available: 1-SUBHD15-BNC)
Measurement range	V	±10
Internal resistance of voltage source	Ω	< 500
Typical input impedance	MΩ	1
Noise at 25 °C (peak-to-peak)		
With 1 Hz Bessel filter	µV	< 200
With 10 Hz Bessel filter	µV	< 300
With 100 Hz Bessel filter	µV	< 500
With 1 kHz Bessel filter	µV	< 1,000
Non-linearity	%	< 0.02 of full scale value
Common-mode rejection		
for DC common mode	dB	> 100
for 50 Hz common mode, typically	dB	75
Max. common-mode voltage (to housing and supply ground)	V	±60
Zero drift	%/10 K	< 0.02 of full scale value
Full-scale drift	%/10 K	< 0.05 of measured value

SPECIFICATIONS MX840B (CONTINUED)

Voltage ±60 V		
Accuracy class		0.05
Transducers that can be connected		Voltage sources up to ±60 V
Permissible cable length between MX840B and transducer	m	< 100
Measurement range	V	±60
Internal resistance of voltage source	Ω	< 500
Typical input impedance	MΩ	1
Noise at 25 °C (peak-to-peak) With 1Hz Bessel filter With 10Hz Bessel filter With 100Hz Bessel filter With 1kHz Bessel filter	 µV µV µV µV	 < 300 < 400 < 1,000 < 3,000
Non-linearity	%	< 0.02 of full scale value
Common-mode rejection for DC common mode for 50 Hz common mode, typically	 DB dB	 > 100 75
Max. common-mode voltage (to housing and supply ground)	V	±60
Zero drift	%/10 K	< 0.02 of full scale value
Full-scale drift	%/10 K	< 0.05 of measured value
Voltage ±100 mV		
Accuracy class		0.05
Transducers that can be connected		Voltage sources
Permissible cable length between MX840B and transducer	m	< 100
Measurement range	mV	±100
Input impedance	MΩ	> 20
Noise at 25 °C (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	 < 5 < 10 < 30 < 100
Non-linearity	%	< 0.02 of full scale value
Common-mode rejection for DC common mode for 50 Hz common mode, typically	 dB dB	 > 90 75
Max. common-mode voltage (to housing and supply ground)	V	±30
Zero drift	%/10 K	< 0.05 of full scale value
Full-scale drift	%/10 K	< 0.05 of measured value
Signal current 0 / 4 ... 20 mA (2, 3, 4-wire)		
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
Measurement range	mA	±20
Measuring resistance value, typically	Ω	10
Noise at 25 °C (peak-to-peak) With 1 Hz Bessel filter With 10 Hz Bessel filter With 100 Hz Bessel filter With 1 kHz Bessel filter	 µA µA µA µA	 < 1 < 1.5 < 15 < 40
Non-linearity	%	< 0.02 of full scale value
Common-mode rejection for DC common mode for 50 Hz common mode, typically	 dB dB	 > 100 75
Max. common-mode voltage (to housing and supply ground)	V	±30
Zero drift	%/10 K	< 0.05 of full scale value
Full-scale drift	%/10 K	< 0.05 of measured value

SPECIFICATIONS MX840B (CONTINUED)

Ohmic resistor		
Accuracy class		0.1
Transducers that can be connected		PTC, NTC, KTY, TT-3, resistors in general (connected in a 4-wire configuration)
Permissible cable length between MX840B and transducer	m	< 100
Measurement ranges	Ω	0 ... 5,000
Feed current	mA	0.4 ... 0.8
Noise at 25 °C and 5 kΩ unbalance (peak-to-peak)		
With 1 Hz Bessel filter	Ω	< 0.1
With 10 Hz Bessel filter	Ω	< 0.2
With 100 Hz Bessel filter	Ω	< 0.5
With 1 kHz Bessel filter	Ω	< 1.5
Non-linearity	%	< ±0.02 of full scale value
Zero drift	%/10 K	< 0.02 of full scale value
Full-scale drift	%/10 K	< 0.1 of measured value
Resistance thermometer (Pt100, Pt500, Pt1000)		
Accuracy class		0.1
Transducers that can be connected		Pt100, Pt500, Pt1000 (connected in a 4-wire configuration)
Permissible cable length between MX840B and transducer	m	< 100
Linearization range	°C	-200 ... +848
Noise at 25 °C (peak-to-peak)		
With 1 Hz Bessel filter	K	< 0.1
With 10 Hz Bessel filter	K	< 0.2
With 100 Hz Bessel filter	K	< 0.5
With 1 kHz Bessel filter	K	< 1.5
Non-linearity	K	< ±0.3
Zero drift		
for Pt100, Pt500	K/10 K	< 0.2
with Pt1000	K/10 K	< 0.1
Full-scale drift		
with Pt100	K/10 K	< 0.5
with Pt500	K/10 K	< 0.8
with Pt1000	K/10 K	< 1

SPECIFICATIONS MX840B (CONTINUED)

Thermocouples[1)]		
Transducers that can be connected		Thermocouples (types B, C, E, J, K, N, R, S, T)
Permissible cable length between MX840B and transducer	m	< 100
Measurement range	mV	±100
Linearization ranges		
Type B (Pt-30 % Rh and Pt-6 % Rh)	°C	+100 ... +1,820
Type C (W and W-26 % Re)	°C	+0 ... +2,300
Type E (Ni-Cr and Cu-Ni)	°C	-200 ... +900
Type J (Fe and Cu-Ni)	°C	-210 ... +1,200
Type K (Ni-Cr and Ni-Al)	°C	-270 ... +1,372
Type N (Ni-14.2 % Cr and Ni-4,4 % Si-0.1 % Mg)	°C	-270 ... +1,300
Type R (Pt-13 % Rh and Pt)	°C	-50 ... +1,768
Type S (Pt-10 % Rh and Pt)	°C	-50 ... 1,768
Type T (Cu and Cu-Ni)	°C	-270 ... +400
Transducer impedance	Ω	< 500
Type K noise (peak-to-peak)		
With 1 Hz Bessel filter	K	0.05
With 10 Hz Bessel filter	K	0.1
With 100 Hz Bessel filter	K	0.5
With 1 kHz Bessel filter	K	1
Total error limit at 22ºC ambient temperature		
Types E, J, K, T, C	K	±1.5
Types R, S	K	±4
Type B	K	±15
Temperature drift (type K)	K/10 °C	<±0.5
1-THERMO-MXBOARD cold junction		
Nominal (rated) temperature range	°C	-20 ... +60
Operating temperature range	°C	-20 ... +65
Storage temperature range	°C	-40 ... +75

1) Prefabricated adapters for types K, E and J thermocouples from SubHD15 to Thermo-Mini are available for connecting thermocouples to the MX840B (ordering no.: 1-SCM-TCK /-TCE /-TCJ) or kit for self-assembly in the SubHD15 (ordering no.: 1-THERMO_MXBOARD)

SPECIFICATIONS MX840B (CONTINUED)

Frequency and pulse counting (connectors 5 ... 8)		
Accuracy class		0.01
Transducers that can be connected		All common timer-based digital signal sources (single-channel, two-channel, with/without index), pulse counters, incremental rotary encoders, HBM torque transducers (digital), SSI transducers (absolute position)
Permissible cable length between MX840B and transducer	m	< 50
Signals F_1 (±) F_2 (±) Zero index (±)		 Frequency or pulse signal Directional signal offset by ±90° to F_1 or static Zero position signal
Input signal range in differential mode Low level High level		 Differential inputs (RS-422): Signal (+) < signal (-) -200 mV Differential inputs (RS-422): Signal (+) > signal (-) +200 mV
Input signal range in single-pole mode Low level High level	 V V	 < 1.5 > 3.5
Maximum input voltage at transducer socket to ground (pin 6)	V	5.5 (without transients)
Measurement ranges Frequency Pulse counting	 Hz Pulses/s	 0.1 ... 1,000,000 0 ... 1,000,000
Typical input impedance	kΩ	10
Temperature drift	%/10 K	< 0.01 of measured value
SSI mode (differential) Clock shift Word length Coding Input level Low level High level Signals Data Clock shift	 kHz Bit 	 100, 200, 500, 1,000 12-31 binary or gray Differential inputs (RS-422): Signal (+) < signal (-) -200 mV Differential inputs (RS-422): Signal (+) > signal (-) +200 mV Data+, Data- (RS-422) Clk+, Clk- (RS-422)
Digital control output (e.g. for activating external shunts, resetting external charge amplifiers)		
Type of output		High side switch
Reference potential		Pin 6 (ground)
High level Output not under load, typically I_{out} = 5 mA	 V V	 5 > 4.5
Permissible input impedance	kΩ	> 1
CAN (connector 1)		
Supported protocols		CAN 2.0A, CAN 2.0B
Number of CAN ports		connector 1 only
Bus link		two-wire, as per ISO11898

Bit rates	kBit/s	1,000	800	666.6	500	400	250	125	100
Max. cable lengths	m	25	50	80	100	100	250	500	500

Bit sequence		Intel standard, Motorola MSB
Receiving[1], 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) Data rate (max.) Number of CAN signals (module-internal only) Generate dbc file	 Hz	 100 per channel 7 with MX Assistant

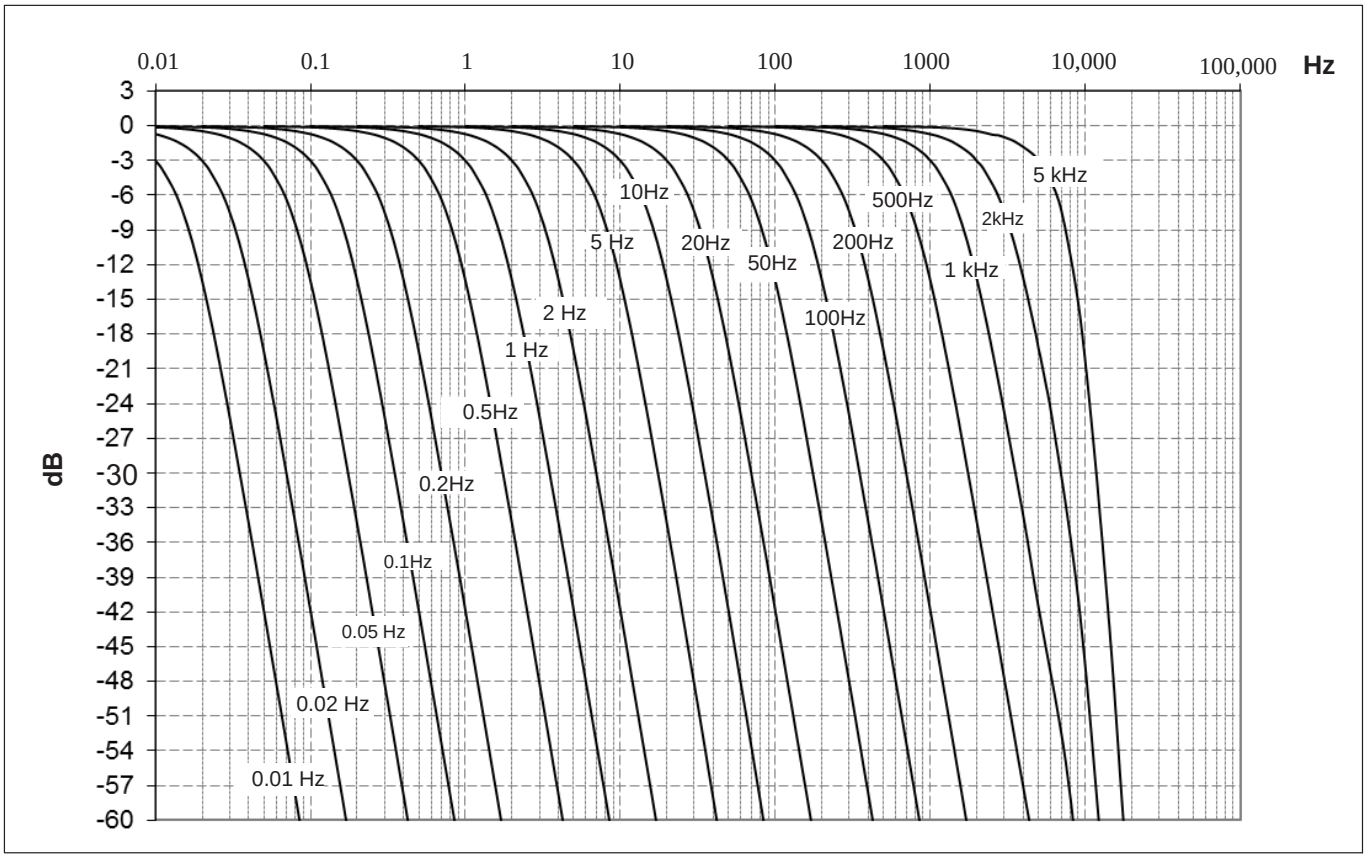
[1] Parameterization via CAN database (DBC) using catman® EASY or MX Assistant

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

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms)*)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Bessel	3,041	5,000	9,935	0.043	0.08	3.6	40,000
	1,188	2,000	5,141	0.13	0.2	0.9	40,000
	594	1,000	2,561	0.29	0.3	0.85	40,000
	296	500	1,273	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	5,000
	0.3	0.5	1.3	663	700	0.8	1,000
	0.1	0.2	0.5	1,652	1,750	0.8	1,000
	0.06	0.1	0.25	3,299	3,500	0.8	500
	0.03	0.05	0.13	6,598	7,003	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 A/D converter delay time is 65 µs for a sampling rate of 38,400 Hz and 128 µs for all other sampling rates, and is not taken into account in the "runtime" column.

DECIMAL SAMPLING RATE : BESSEL FILTER AMPLITUDE RESPONSE

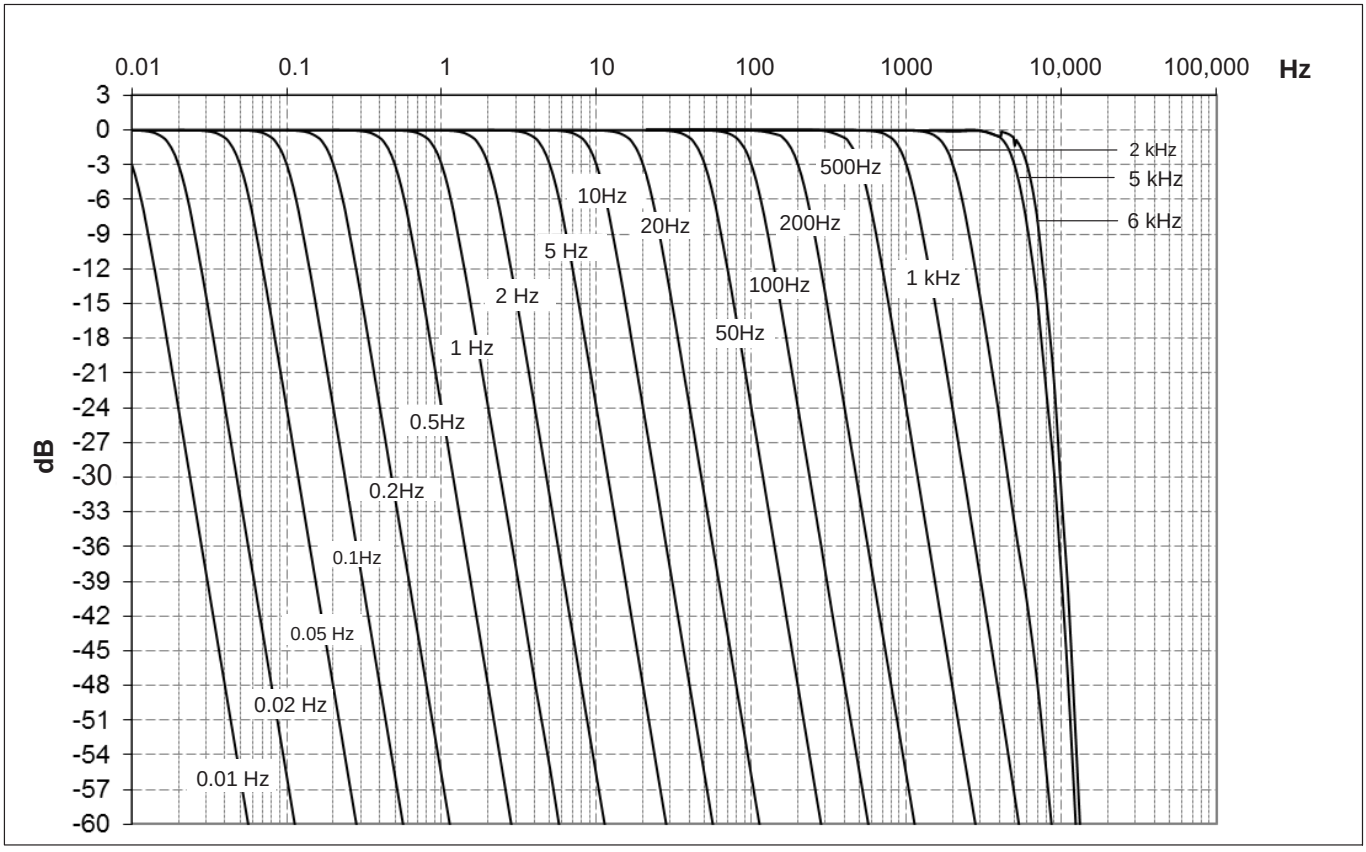


DECIMAL SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BUTTERWORTH

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms)*)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	5,198	6,000	8,722	0.08	0.08	15.2	40,000
	4,274	5,000	7,667	0.10	0.09	13.7	40,000
	1,690	2,000	3,491	0.23	0.2	11	40,000
	844	1,000	1,768	0.46	0.4	11	40,000
	422	500	888	0.9	0.8	11	40,000
	169	200	355	2.2	1.9	11	40,000
	84	100	178	4.5	3.9	11	40,000
	42	50	89	9.2	7.7	11	20,000
	17	20	35.5	23	19.3	11	20,000
	8.4	10	17.8	45	39	11	20,000
	4	5	8.9	90	77	11	20,000
	1.7	2	3.5	225	193	11	20,000
	0.8	1	1.8	449	387	11	20,000
	0.4	0.5	0.9	898	774	11	10,000
	0.17	0.2	0.3	2,241	1,930	11	10,000
	0.08	0.1	0.18	4,481	3,861	11	5,000
	0.04	0.05	0.09	8,962	7,721	11	1,000
	0.02	0.02	0.03	22,405	19,303	11	1,000
	0.008	0.01	0.02	44,810	38,606	11	500

*) The A/D converter delay time is 65 µs for a sampling rate of 38,400 Hz and 128 µs for all other sampling rates, and is not taken into account in the "runtime" column.

DECIMAL SAMPLING RATES: BUTTERWORTH FILTER AMPLITUDE RESPONSE

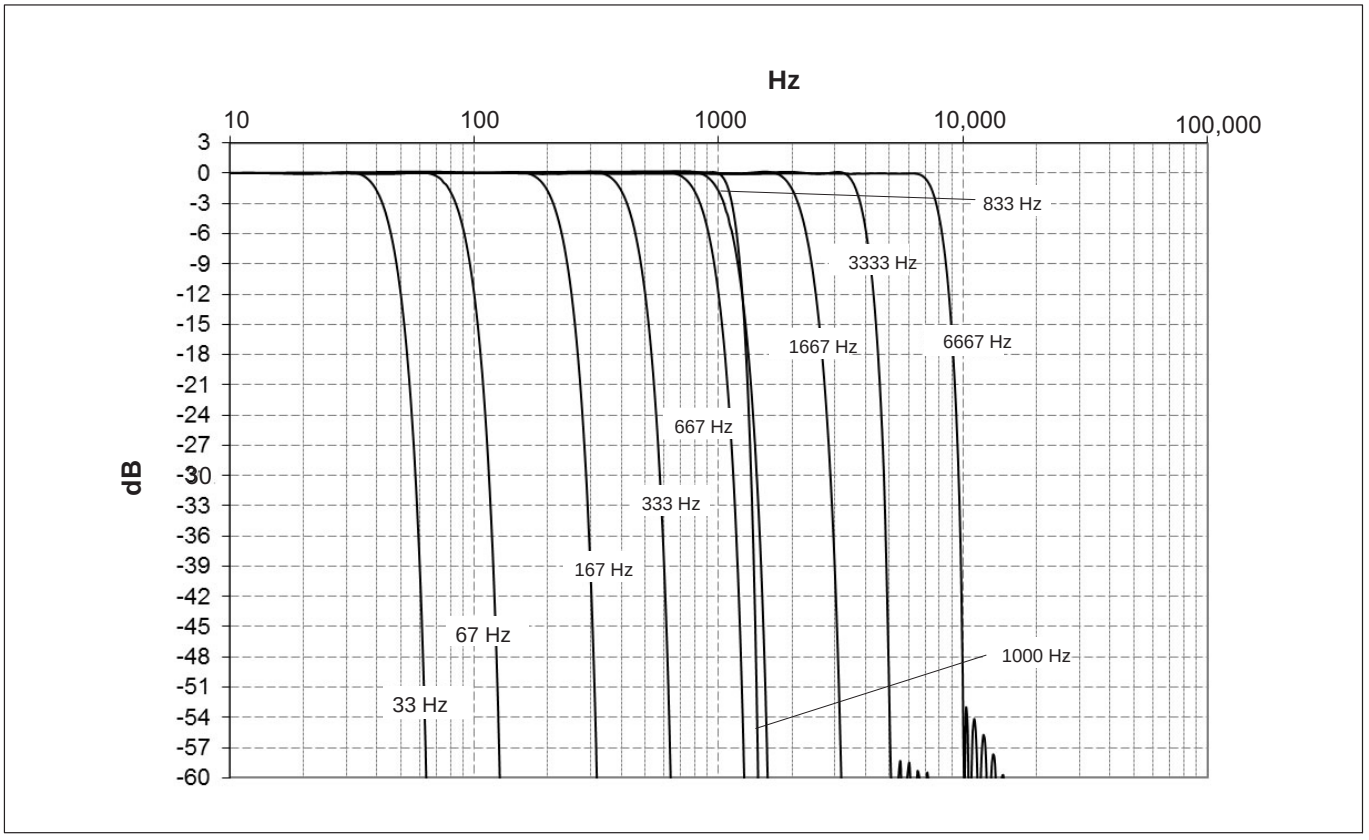


DECIMAL SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, LINEAR PHASE (FIR)

Type	Start of level drop (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime*) (ms)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Linear phase	6,667	7,770	9,220	0.41	0.06	8.6	40,000
	3,333	3,800	4,540	0.78	0.12	8.6	40,000
	1,667	2,120	2,700	2.41	0.28	8.6	5,000
	1,000	1,130	1,300	6.21	0.544	8.6	2,500
	833	1,050	1,345	4.01	0.551	8.6	2,500
	667	840	1,080	4.8	0.694	8.6	1,000
	333	420	540	10.4	1.39	8.6	1,000
	167	210	270	26.9	2.73	8.6	500
	67	84	108	50.2	6.88	8.6	200
	33	42	54	108	13.8	8.6	100

*) The A/D converter delay time is 65 µs for all sampling rates and is not taken into account in the “runtime” column.

DECIMAL SAMPLING RATES: AMPLITUDE RESPONSE, LINEAR PHASE (FIR)

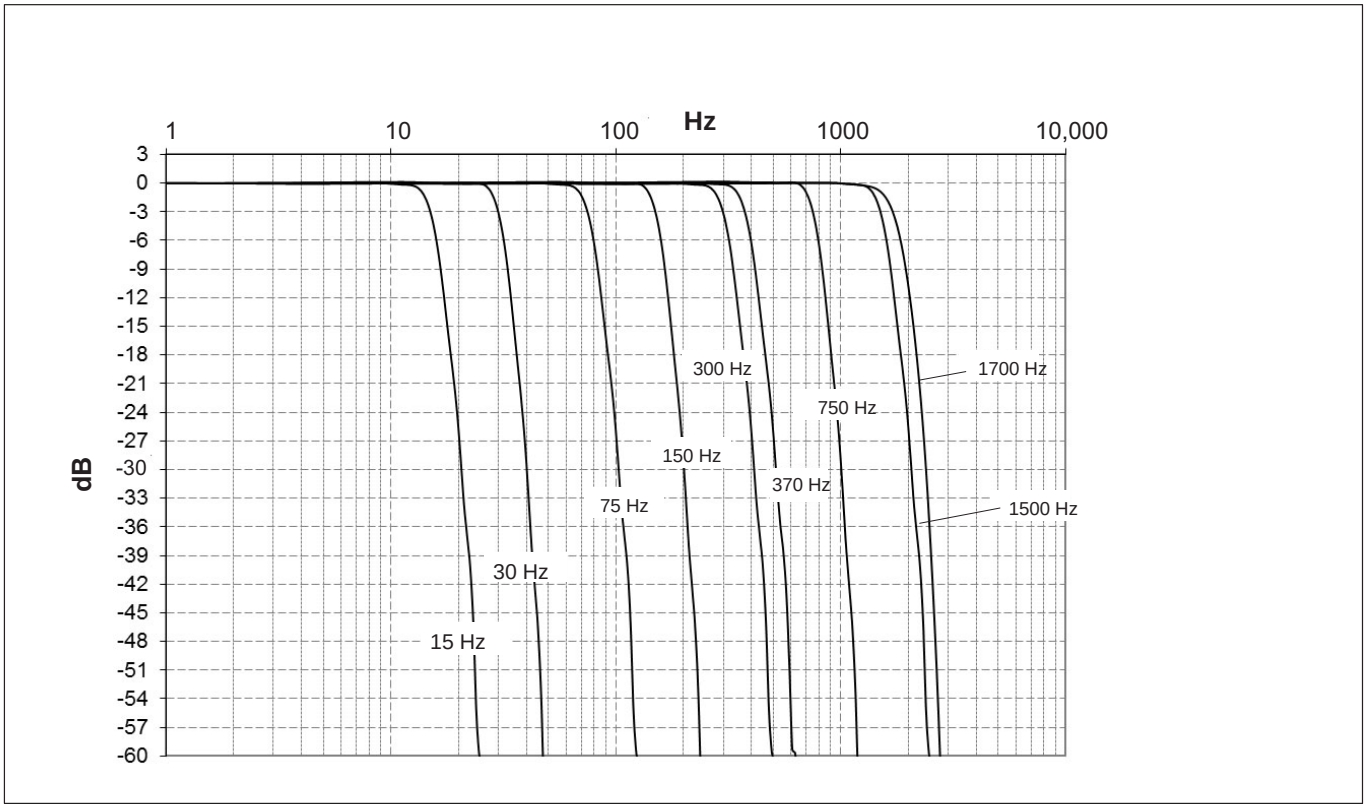


DECIMAL SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, BUTTERWORTH (FIR)

Type	Start of level drop (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime*) (ms)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	1,498	1,700	2,220	3.2	0.285	15.6	10,000
	1,384	1,500	1,887	3.48	0.346	18.7	10,000
	698	750	924	5.56	0.682	18.7	5,000
	344	370	471	14.1	1.40	18.7	2,500
	275	300	377	17.3	1.75	18.7	1,000
	140	150	185	27.6	3.41	18.7	1,000
	69	75	94	71.8	6.97	18.7	500
	28	30	37	139	17.0	18.7	200
	14	15	19	358	34.9	18.7	100

*) The A/D converter delay time is 65 µs for all sampling rates and is not taken into account in the “runtime” column.

DECIMAL SAMPLING RATES: BUTTERWORTH FILTER AMPLITUDE RESPONSE (FIR)

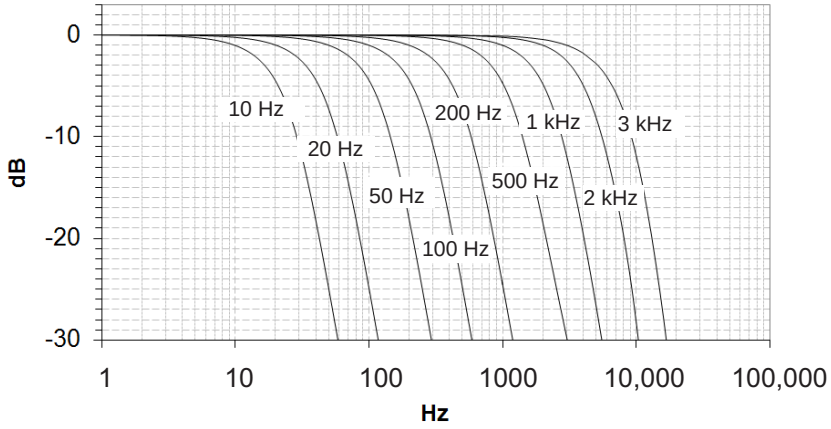


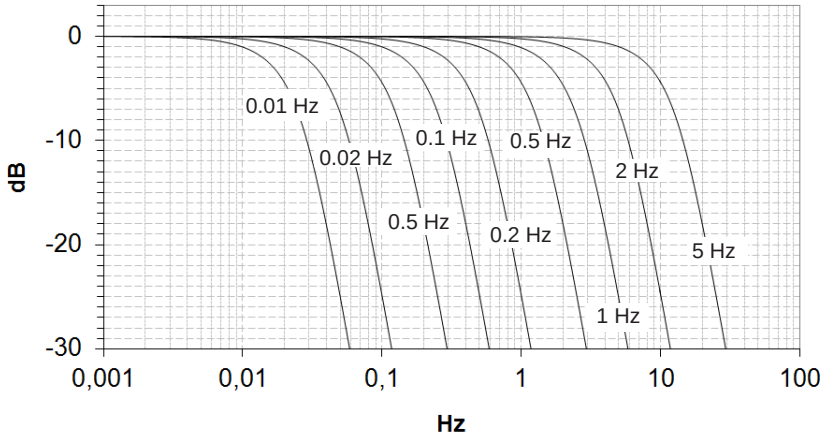
CLASSIC HBM SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BESSEL

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms)*)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Bessel	3,000	5,161	13086	0.012	0.07	0.157	38,400
	2,000	3,210	8,100	0.15	0.1	1.5	19,200
	1,000	1,630	4,050	0.24	0.2	1.4	19,200
	500	820	2,120	0.4	0.43	1.4	9,600
	200	335	860	1	1.04	1	9,600
	100	167	430	2	2.1	0.8	9,600
	50	83	215	4	4.28	0.8	9,600
	20	33.7	85	10	10.6	0.8	9,600
	10	16.5	42	20	21.3	0.8	9,600
	5	8.4	21	40	41.6	0.8	2,400
	2	3.4	8.5	99	104	0.8	2,400
	1	1.6	4.2	200	214	0.8	2,400
	0.5	0.83	2.1	400	420	0.8	300
	0.2	0.34	0.85	1,000	1,060	0.8	300
	0.1	0.17	0.43	2,000	2,130	0.8	300
	0.05	0.084	0.21	3,940	4,200	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 A/D converter delay time is 65 µs for a sampling rate of 38,400 Hz and 128 µs for all other sampling rates, and is not taken into account in the "runtime" column.

CLASSIC HBM SAMPLING RATES : BESSEL FILTER AMPLITUDE RESPONSE



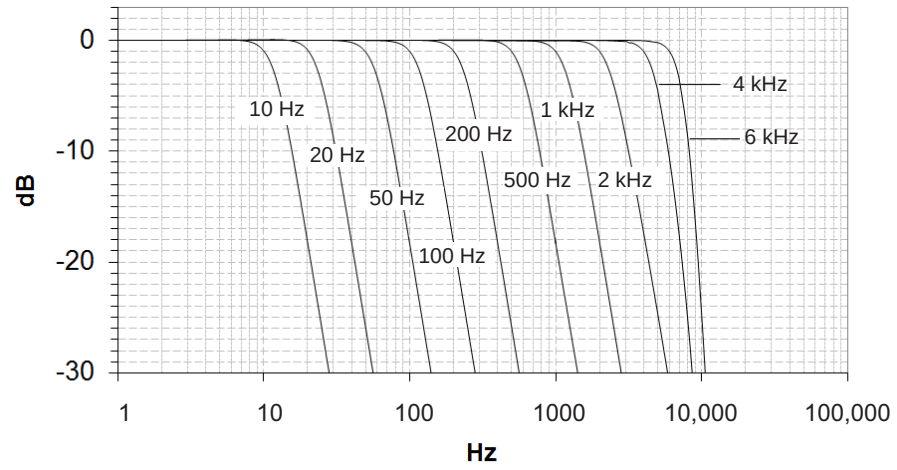


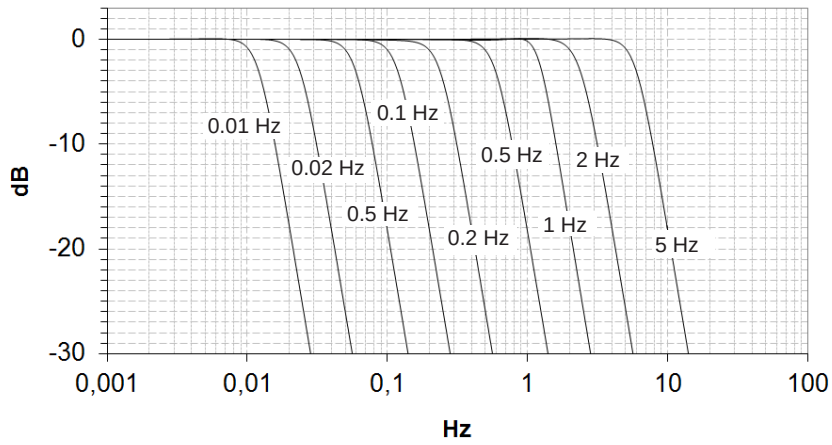
CLASSIC HBM SAMPLING RATES AND DIGITAL LOW-PASS FILTERS, 4TH ORDER BUTTERWORTH

Type	-1 dB (Hz)	-3 dB (Hz)	-20 dB (Hz)	Runtime (ms)*)	Rise time (ms)	Overshoot (%)	Sampling rate (Hz)
Butterworth	6,000	6,868	9,433	0.07	0.07	15.90	38,400
	4,000	4,660	7,324	0.10	0.09	13.52	38,400
	2,000	2,360	4,331	0.2	0.15	8.5	19,200
	1,000	1,178	2,100	0.38	0.3	11	19,200
	500	586	1,050	0.66	0.66	11	9,600
	200	235	420	1.7	1.6	11	9,600
	100	118	210	3.46	3.2	11	9,600
	50	59	105	6.98	6.6	11	9,600
	20	24	42	17.3	16	11	9,600
	10	12	21	34.9	32	11	9,600
	5	5.95	10.5	69	66	11	2,400
	2	2.37	4.24	173	160	11	2,400
	1	1.26	2.1	347	320	11	2,400
	0.5	0.59	1.05	701	660	11	300
	0.2	0.236	0.421	1,760	1,600	11	300
	0.1	0.118	0.21	3,510	3,200	11	300
	0.05	0.059	0.105	6,950	6,600	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 A/D converter delay time is 65 µs for a sampling rate of 38,400 Hz and 128 µs for all other sampling rates, and is not taken into account in the "runtime" column.

CLASSIC HBM SAMPLING RATES : BUTTERWORTH FILTER AMPLITUDE RESPONSE





SPECIFICATIONS POWER PACK NTX001

30 W AC/DC power pack (1-NTX001)		
Nominal (rated) input voltage (AC)	V	100 ... 240 (±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± 4% 0 / 1.25 ≤ 120
Current limiter, typically from	A	1.6
Electrical isolation primary - secondary		electrical, by optocoupler and transducer
SG creep and clearances	mm	≥ 8
High-voltage test	kV	≥ 4
Ambient temperature	°C	0 ... +40
Storage temperature	°C	-40 ... +70

MX840B ACCESSORIES, TO BE ORDERED SEPARATELY

Article	Description	Ordering number
Power supply		
AC/DC power pack / 30 W	Input: 100 ... 240 V AC (±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; matching plug (ODU Medi-Snap S11M08-P04MJGO-5280) at one end and exposed wires at the other.	1-KAB271-3
Communication		
Ethernet cable	Ethernet patch cable for direct operation of devices on a PC or notebook, length 2 m, type CAT6A	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 (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
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

Article	Description	Ordering number
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		
Type K thermocouple adapter	Type K Thermo-Mini connector to QuantumX input with thermocouple support, integrated cold junction (THERMO-MXBOARD), TEDS, DSubHD device connection	1-SCM-TCK
Type J thermocouple adapter	Type J Thermo-Mini connector to QuantumX input with thermocouple support, integrated cold junction (THERMO-MXBOARD), TEDS, DSubHD device connection	1-SCM-TCJ
Cold junction for thermocouples on MX840B/MX440B	Temperature compensation electronics for measurements with thermocouples comprising: - Pt1000 cold junction - Includes 1-wire TEDS chip for transducer identification Note: Installation in DSubHD 15-pin transducer plug	1-THERMO-MXBOARD
Strain gage quarter bridge module 120 ohms	Signal conditioning strain gage quarter bridge on QuantumX input with full bridge. Integrated 120-ohm completion resistor, solder joints for transducer lead (3-wire); TEDS; DSubHD device connection.	1-SCM-SG120
Strain gage quarter bridge module 350 ohms	Signal conditioning strain gage quarter bridge on QuantumX input with full bridge. Integrated 350-ohm completion resistor, solder joints for transducer lead (3-wire); TEDS; DSubHD device connection.	1-SCM-SG350
High-voltage signal conditioner	High-voltage signal conditioner for the differential measurement of voltages up to 300 V CAT II with QuantumX measurement modules type MX840, MX840B, MX410 and MX440A with DSubHD connector and fixed 1 m-long measuring leads with 4 mm lab connectors.	1-SCM-HV
DSubH15 to BNC adapter	Adapter for QuantumX from BNC socket to DSubHD15 15-pin (pin 14) for connecting 60 V, +/10 V or IEPE / ICP®, if the amplifier supports this function.	1-SUBHD15-BNC
DSubHD 15-pin plug kit with TEDS chip	DSubHD 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
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
Port saver, DSubHD 15-pin	4x DSubHD 15-pin port savers for increasing the plug/unplug cycles by at least 500. Construction: plug in socket with 4-40 UNC screw connection.	1-SUBHD15-SAVE
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, frequency spectrum, etc. 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
MX840B + catman®AP	Product package comprising: - Amplifier - Power pack (1-NTX001) - 8 transducer plugs (1-CON-P1025) - Ethernet crossover cable (1-KAB239-2) - HBM catman software®AP (1-CATMAN-AP) - Includes software maintenance for the first 12 months	1-MX840-PAKAP
MX840B + catman®EASY	Product package comprising: - Amplifier - Power pack (1-NTX001) - 8 transducer plugs (1-CON-P1025) - Ethernet crossover cable (1-KAB239-2) - HBM catman software®Easy (1-CATMAN-EASY) - Includes software maintenance for the first 12 months	1-MX840-PAKEASY
LabVIEW™ driver[1)]	Universal driver from HBM for LabVIEW™.	1-LABVIEW-DRIVER
CANape® driver	QuantumX device driver for CANape software® from Vector Informatik. CANape® version 10.0 and higher are supported.	1-CANAPE-DRIVER

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

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