QUANTUMX

MX1615B

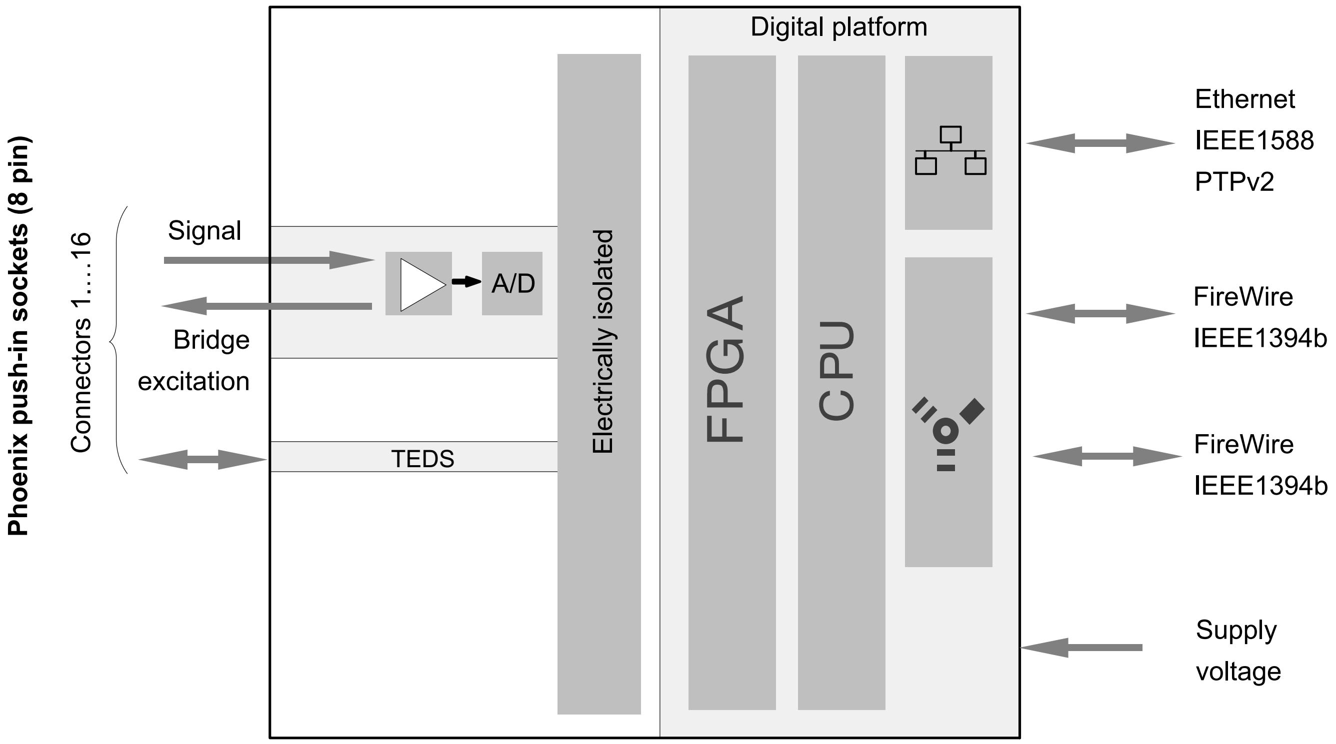
Strain gauge bridge amplifier

Special features

- 16 individually configurable inputs
- Connection of strain gauges in full-, half-, or quarter-bridge (120 or 350 Ohm)
- Bridge excitation : DC or carrier frequency
- Internal shunt resistor
- Connection of standard voltage, PT100, resistor, Potentiometer
- Individual data rates up to 20 kS/s per channel, active low pass filter
- 24-bit A/D converter per channel for synchronous, parallel measurements

Data sheet

Block diagram



Specifications MX1615B

General specifications		
Inputs	Number	16, electrically isolated from the supply
Transducer technologies, can be adjusted individually		Strain gauges in full- , half- or quarter-bridge configuration (120 or 350 Ohm). Selectable bridge excitation voltage : DC voltage or carrier frequency 1200 Hz
		SG-quarter bridges: Three wire and four wire SG-half bridges: five wire SG-full bridges: six wire
		Resistor, Resistance thermometer (PT100), connection in four-wire configuration
		Potentiometric transducers
		Voltage (± 10 V differential, 0 … 30 V unipolar)
A/D converter per channel		24 Bit Delta Sigma converter
Sample rates (Domain adjustable by software, Factory setting is HBM Classic)	S/s	Decimal: 0,1 …20,000 HBM Classic: 0,1 … 19,200
Bandwidth	Hz	3,900 (-3 dB) with Linear Phase filter, 400 using carrier frequency and bessel filter
Active low-pass filter		Bessel, Butterworth, Linear phase, Filter OFF
Transducer identification (TEDS, IEEE 1451.4) max. distance of the TEDS module	m	100
Transducer connection		Phoenix Contact FMC-1,5/8-ST-3,5-RF push-in terminal Plug included
Supply voltage range (DC)	V	10 ... 30 (24 V nominal (rated) voltage)
Supply voltage interruption		max. 5 ms at 24 V
Power consumption	W	< 12
Ethernet (data link)		10Base-T / 100Base-TX
Protocol(addressing)	-	TCP/IP (direct IP address or DHCP)
Connection	-	8P8C plug (RJ-45) with twisted pair cable (CAT-5)
Max. cable length to module	m	100
Synchronization options		IEEE1394b FireWire (only QuantumX)
EtherCAT®[1]		via CX27B
IRIG-B (B000 to B007; B120 to B127)		via MX440B - or MX840B input channel
IEEE1588 (PTPv2), NTP		Ethernet based Time Sync Protocol
IEEE1394b FireWire (module synchronization, data link, optional supply voltage)		IEEE 1394b (HBM modules only)
Baud rate	MBaud	400 (approx. 50 MByte/s)
Max. current from module to module	A	1.5
Max. cable length between the nodes	m	5 (oprical: 100)
Max. number of modules connected in series (daisy chain)	-	12 (=11 hops)
Max. number of modules in a IEEE1394b FireWire system (including hubs[2], backplane)	-	24
Max. number of hops[3]	-	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[5]
Degree of protection		IP20 per EN 60529
Mechanical tests[4]		
Vibration (30 min)	m/s^2	50
Shock (6 ms)	m/s^2	350
EMC requirements		per EN 61326-1
Max. input voltage at transducer socket to ground, transient free Pin 6 and 7 to Pin 1, 2, 3, 4 or 5	V	± 18
Dimensions, horizontal (W x H x D)	mm	52.5 x 200 x 122 (with case protection) 44 x 174 x 119 (without case protection)
Weight, approx.	g	980

1) EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany
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/s^2 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/s^2 for 6 ms, half sine pulse shape, with 3 shocks in each of the 6 possible directions.
5) The DC voltage supply must meet the requirements of IEC 60950-1 on a SELV voltage supply.

Specifications MX1615B (Continued)

Strain gauge full or half bridge, bridge excitation: carrier frequency		
Accuracy class		0.05 [1)]
Carrier frequency (square)	Hz	1,200 ± 2
Bridge excitation voltage (effective)	V	1; 2.5; 5 (± 5 %)
Transducers that can be connected		Strain gauge full and half bridges
Permissible cable length between module and transducer	m	< 100
Measuring ranges at 5 V excitation at 2.5 V excitation at 1 V excitation	 mV/V mV/V mV/V	 ± 4 ± 8 ± 20
Additional shunt resistor can be activated (control signal)	kΩ	100 ± 0,1% [2)] (typ. - 0.886 mV/V at 350 Ω)
Transducer impedance at 5 V excitation at 2.5 V excitation at 1 V excitation	 Ω Ω Ω	 300 ... 1,000 300 ... 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	 µV/V µV/V µV/V	 < 0.2 < 0.5 < 1.5
Linearity error	%	< 0.02 of full scale
Zero drift (Full bridge with 5 V excitation)	% / 10 K	< 0.01 [1)] of full scale
Full-scale drift (5 V excitation)	% / 10 K	< 0.05 of measurement value

1) 0.5 with half bridge (Linearity error < 0.02 %)

2) When using a half bridge, the shunt resistor may only be used when signals 1 (Pin 6) and 4 (Pin 7) are bridged (in this case, control signal: typ. + 0.873 mV/V at 350 Ω).

Strain gauge full or half bridge, bridge excitation: DC voltage		
Accuracy class		0.1 [1)]
Bridge excitation voltage (DC)	V	1; 2.5; 5; (± 5 %)
Transducers that can be connected		strain gauge half and full bridges
Permissible cable length between module and transducer	m	< 100
Measuring ranges at 5 V excitation at 2.5 V excitation at 1 V excitation	 mV/V mV/V mV/V	 ± 4 ± 8 ± 20
Additional shunt resistor can be activated (control signal)	kΩ	100 ± 0,1% [2)] (typ. - 0.886 mV/V at 350 Ω)
Transducer impedance at 5 V excitation at 2.5 V excitation at 1 V excitation	 Ω Ω Ω	 300 ... 1,000[3)] 300 ... 1,000[3)] 80 ... 1,000[3)]
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	 < 0.2 < 0.4 < 1 < 3
Linearity error	%	< 0.02 of full scale
Zero drift (Full bridge with 5 V excitation)	% / 10 K	< 0.1 [1)] of full scale
Full-scale drift (5 V excitation)	% / 10 K	< 0.05 of measurement value

1) 0.2 with Strain gage half bridge

2) When using a half bridge, the shunt resistot may only be used when signals 1 (Pin 6) and 4 (Pin 7) are bridged (in this case, control signal: typ. + 0.873 mV/V at 350 Ω).

3) A higher transducer impedance is possible (< 5 kΩ). This merely results in a higher zero error and thus an accuracy class of 0.3.

Specifications MX1615B (Continued)

Strain gauges quarter bridge, bridge excitation: carrier frequency[1]		
Accuracy class		0.1 [2]
Carrier frequency (square)	Hz	1,200 ± 2
Bridge excitation voltage (effective)	V	0.5; 1; 2.5; 5 (± 5 %)
Transducers that can be connected		SG quarter bridge in four wire circuit and three wire circuit
Permissible cable length between module and transducer	m	< 100
Measuring ranges at 5 V excitation (only at 350 Ohm strain gauge) at 2.5 V excitation at 1 V excitation at 0.5 V excitation	 mV/V mV/V mV/V mV/V	 ± 4 ± 8 ± 20 ± 40
Additional shunt resistor can be activated (control signal)	kΩ	100 ± 0,1% (typ. + 0.873 mV/V at 350 Ω)
Internal completion resistors	Ω	120 and 350
Noise at 25 °C and 5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel	 µV/V µV/V µV/V	 < 0.3 < 0.6 < 1.5
Linearity error[3]	%	< 0.05 of full scale
Zero drift[3] (5 V excitation)	% / 10 K	< 0.1 of full scale
Full-scale[3] drift (5 V excitation)	% / 10 K	< 0.1 of measurement value

1) 3-wire circuit with carrier frequency-based bridge excitation voltage is supported for modules as of February 2017.
2) Accuracy class focusses on linearity. Zero point deviation is 0.5% of range.
3) With 350 Ω resistor

Strain gauges quarter bridge, bridge excitation: DC voltage		
Accuracy class		0.1 [2]
Bridge excitation voltage (DC)	V	0.5; 1; 2.5; 5 (± 5 %)
Transducers that can be connected		SG quarter bridges in four wire circuit and three wire circuit
Permissible cable length between module and transducer	m	< 100
Measuring ranges at 5 V excitation (only at 350 Ohm strain gauge) at 2.5 V excitation at 1 V excitation at 0.5 V excitation	 mV/V mV/V mV/V mV/V	 ± 4 ± 8 ± 20 ± 40
Additional shunt resistor can be connected (control signal)	kΩ	100 ± 0,1% (typ. + 0.873 mV/V at 350 Ω)
Internal completion resistors	Ω	120 and 350
Noise[1] at 25 °C and 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	 < 0.4 < 0.6 < 1.5 < 3
Linearity error[1]	%	< 0.05 of full scale
Zero drift[1] (5 V excitation)	% / 10 K	<0.1 of full scale
Full-scale[1] drift (5 V excitation)	% / 10 K	< 0.05 of measurement value

1) With 350 Ω resistor and connection using a four-wire circuit.
2) Accuracy class focusses on linearity. Zero point deviation is 0.5% of range.

Specifications MX1615B (Continued)

Potentiometric transducer		
Accuracy class		0.1
Excitation voltage (DC)	V	1 (± 5 %)
Transducers that can be connected		Potentiometric transducers (5-wire circuit)
Permissible cable length between module and transducer	m	< 100
Measuring range	mV/V	± 500
Transducer impedance	Ω	100 ... 50,000
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	 < 2 < 4 < 10 < 30
Linearity error	%	< 0.05 of full scale
Zero drift	% / 10 K	< 0.1 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

Voltage ± 10 V (DC)		
Accuracy class		0.05
Transducers that can be connected		Voltage transmitter ± 10 V
Permissible cable length between module and transducer	m	< 100
Measuring range	V	± 15 differential
Internal resistance of the connected voltage source	Ω	< 500
Input impedance (symmetrical)	MΩ	> 1.5
Noise at 25 °C (peak to peak) at 1 Hz Bessel filter at 10 Hz Bessel filter at 100 Hz Bessel filter at 1 kHz Bessel filter	 µV µV µV µV	 150 300 600 2,000
Linearity error	%	< 0.02 of full scale
Common-mode rejection at DC common-mode at 50 Hz common-mode, typically	 dB dB	 > 100 75
Max. common-mode voltage Channel against housing and supply ground Channel against channel	 V V	 ± 60 ± 5
Zero drift	% / 10 K	< 0.03 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

Specifications MX1615B (Continued)

Resistance		
Accuracy class		0.1
Transducers that can be connected		PTC, NTC, KTY, TT-3, resistances generally (connection with four wire configuration)
Permissible cable length between module and transducer	m	< 100
Measuring range	Ω	0 ... 1,000[1)]
Excitation current	mA	0.37 ... 1.43
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	 Ω Ω Ω Ω	 < 0.1 < 0.2 < 0.5 < 1.5
Linearity error	%	< 0.05 of full scale
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

1) Measuring range can be modulated up to 5 kΩ, in this case: accuracy class 2

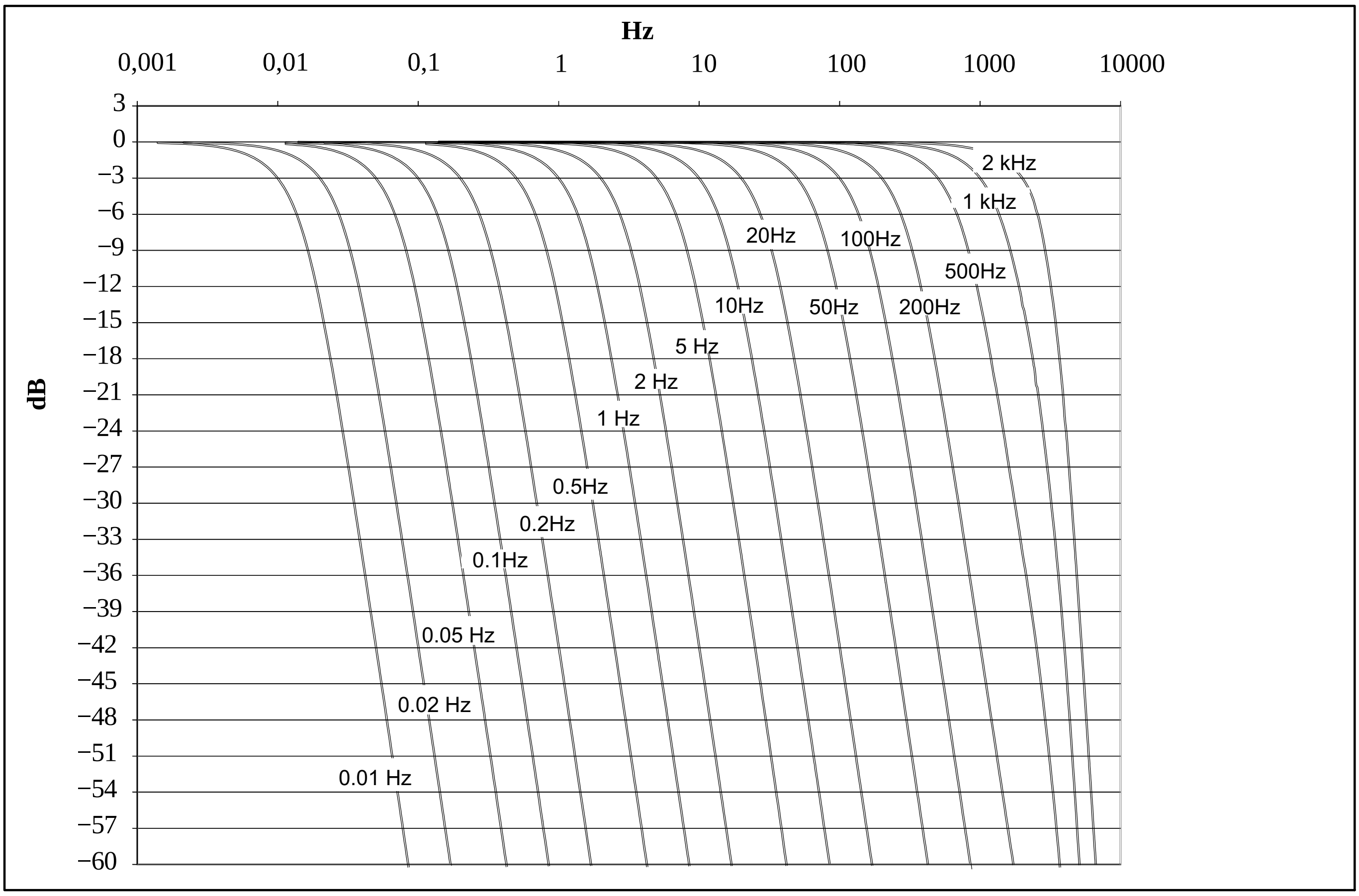
Resistance thermometer (PT100)		
Accuracy class		0.1
Transducers that can be connected		PT100 (connection with four wire configuration)
Permissible cable length between module and transducer	m	< 100
Linearization range	°C [°F]	-200 ... +848 [-328 ... +1,558.4]
Excitation current	mA	0.67 ... 1.36
Noise 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	 K K K K	 < 0.02 < 0.04 < 0.1 < 0.3
Linearity error	K	< ± 0.3
Zero drift	K / 10 K	< 0.2
Full-scale drift	K / 10 K	< 0.5

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

Typ	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay*) (ms)	Rise time (ms)	Overshoot (%)	Rate (Hz)
Bessel	1,203	2,000	3,830	0.113	0.189	2.10	20,000
	596	1,000	2,494	0.256	0.355	1.0	20,000
	298	502	1,278	0.581	0.701	0.9	20,000
	119	200	509	1.56	1.76	0.9	20,000
	59	100	254	3.21	3.51	0.9	20,000
	29.6	49.9	127.1	6.50	7.01	0.9	20,000
	11.8	20.0	50.8	16.4	17.6	0.9	20,000
	5.9	10.0	25.4	32.9	35.1	0.9	20,000
	2.96	4.99	12.70	69.0	70.1	0.9	10,000
	1.18	2.00	5.08	168	176	0.9	10,000
	0.59	1.00	2.54	333	351	0.9	5,000
	0.295	0.498	1.271	663	701	0.9	1,000
	0.118	0.200	0.508	1,660	1,760	0.9	1,000
	0.059	0.100	0.254	3,300	3,510	0.9	500
	0.0295	0.0498	0.1271	6,620	7,010	0.9	100
	0.0118	0.0200	0.0508	16,500	17,600	0.9	100
	0.0059	0.0100	0.0254	33,000	35,100	0.9	50

*) The analog-to-digital converter's delay time is 128 µs for all data rates and has not been accounted for in the “Phase delay” column!
The anti-aliasing filter's delay time (160 µs) is not accounted for as well. Hence 288 µs need to be added to the “Phase delay”.

Decimal sample rates : Amplitude response Bessel filter

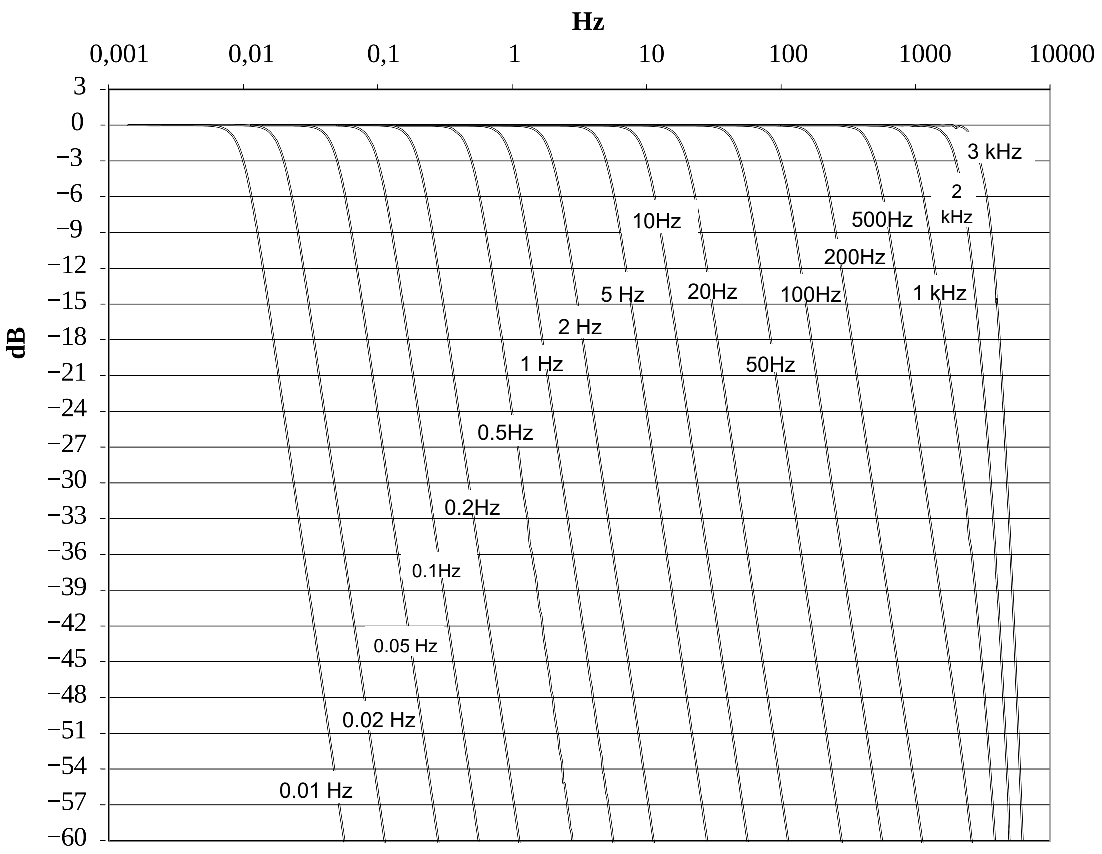


Decimal sample rates and digital low pass filter, type Butterworth 4th order

Typ	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay*) (ms)	Rise time (ms)	Overshoot (%)	Rate (Hz)
Butterworth	2,612	3,000	4,316	0.162	0.161	16.1	20,000
	1,703	2,000	3,600	0.234	0.211	12.7	20,000
	838	1,000	1,746	0.465	0.394	11.2	20,000
	430	500	890	0.914	0.778	11.0	20,000
	169	200	355	2.27	1.94	11.0	20,000
	84	100	178	4.51	3.88	11.0	20,000
	42.2	50.0	88.8	9.00	7.75	11.0	20,000
	16.9	20.0	35.5	22.5	19.4	11.0	20,000
	8.4	10.0	17.8	45	38.8	11.0	20,000
	4.22	5.00	8.88	90	77.5	11.0	20,000
	1.68	2.00	3.55	225	194	11.0	20,000
	0.84	1.00	1.78	449	387	11.0	20,000
	0.423	0.500	0.888	898	774	11.0	10,000
	0.169	0.200	0.356	2,250	1,940	11.0	10,000
	0.084	0.100	0.178	4,490	3,870	11.0.	5,000
	0.0422	0.0500	0.0888	8,980	7,740	11.0	1,000
	0.0168	0.0200	0.0356	22,500	19,400	11.0	1,000
	0.0085	0.0100	0.0178	44,900	38,700	11.0	500

*) The analog-to-digital converter's delay time is 128 µs for all data rates and has not been accounted for in the "Phase delay" column!
The anti-aliasing filter's delay time (160 µs) is not accounted for as well. Hence 288 µs need to be added to the "Phase delay".

Decimal sample rates : Amplitude response Butterworth filter

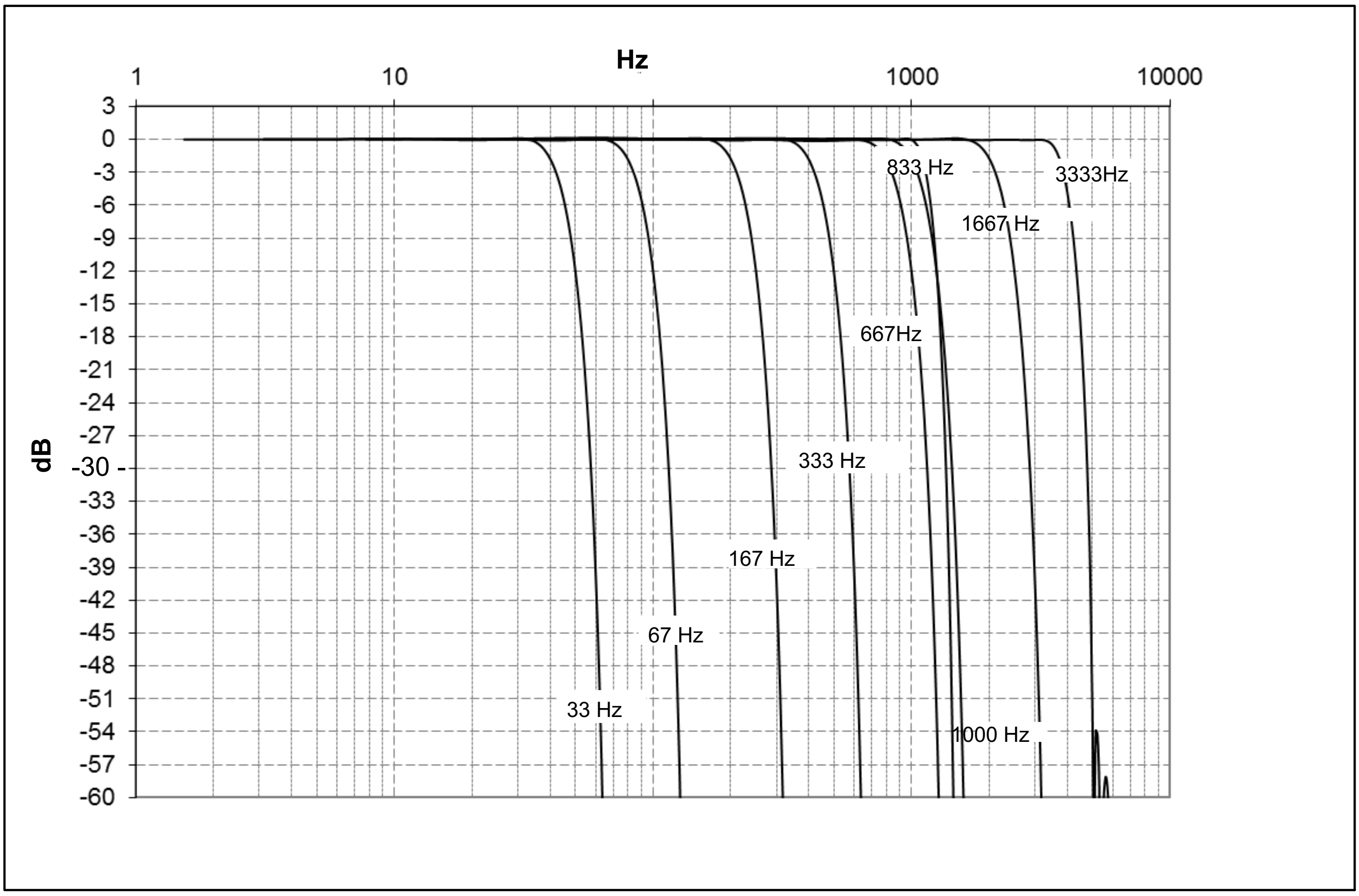


Decimal sample rates : active low pass filter MX1615B Linear Phase (FIR)

Type	Start of Roll-off (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay*) (ms)	Rise time (ms)	Overshoot (%)	Rate (Hz)
Linear Phase	3,333	3,900	4,580	0.802	0.117	8.6	20,000
	1,667	2,100	2,694	2.41	0.274	8.6	5,000
	1,000	1,130	1,308	6.21	0.544	8.6	2,500
	833	1.050	1,346	4.01	0.551	8.6	2,500
	667	838	1,078	4.80	0.694	8.6	1,000
	333	420	539	10.4	1.39	8.6	1,000
	167	210	269	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 analog-to-digital converter's delay time is 128 µs for all data rates and has not been accounted for in the "Phase delay" column! The anti-aliasing filter's delay time (160 µs) is not accounted for as well. Hence 288 µs need to be added to the "Phase delay".

Decimal sample rates : Amplitude response of MX1615B, Linear Phase (FIR)

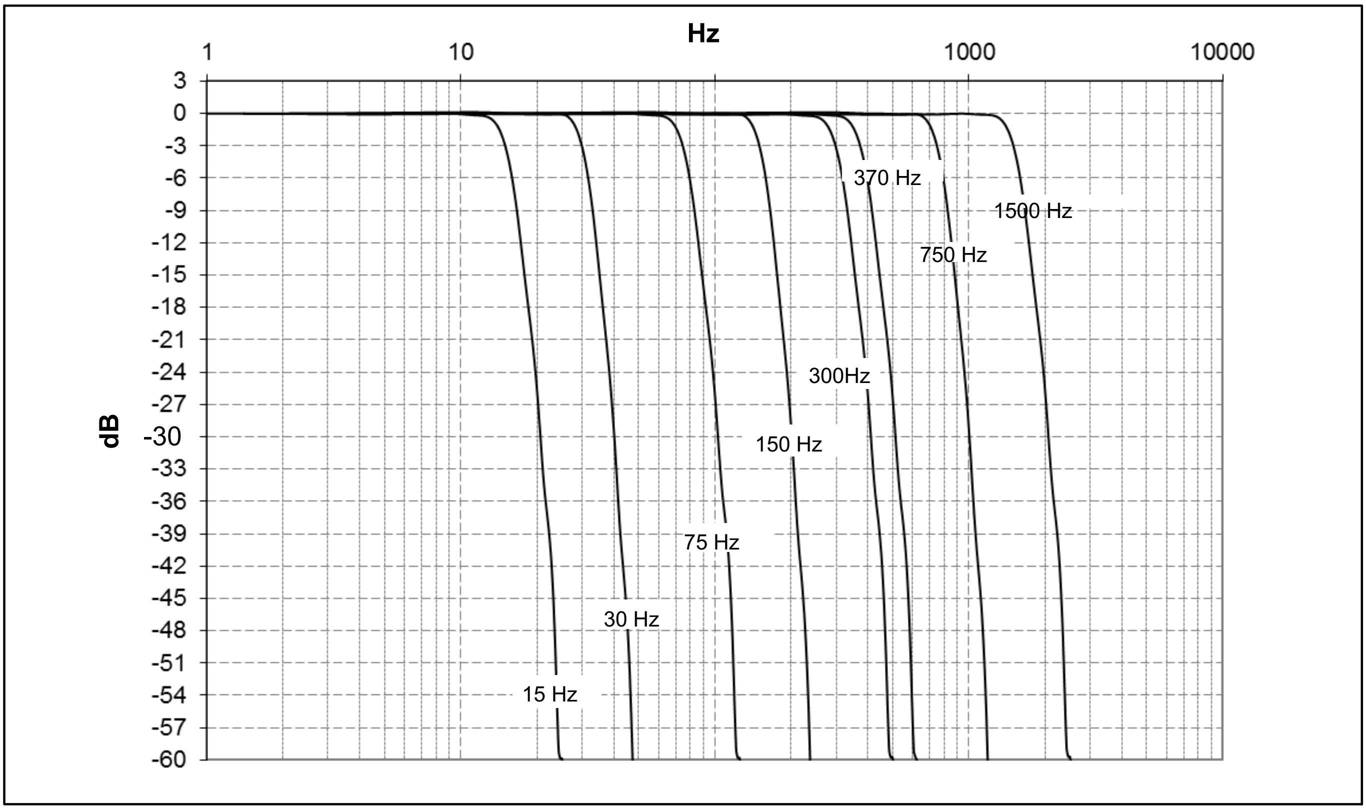


Decimal sample rates : active low pass filter MX1615B, Butterworth filter (FIR)

Type	-1 dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay*) (ms)	Rise time (ms)	Overshoot (%)	Rate (Hz)
Butterworth	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	2,000
	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 analog-to-digital converter's delay time is 128 µs for all data rates and has not been accounted for in the “Phase delay” column!
The anti-aliasing filter's delay time (160 µs) is not accounted for as well. Hence 288 µs need to be added to the “Phase delay”.

Decimal sample rates : Amplitude response of MX1615B, Butterworth filter (FIR)

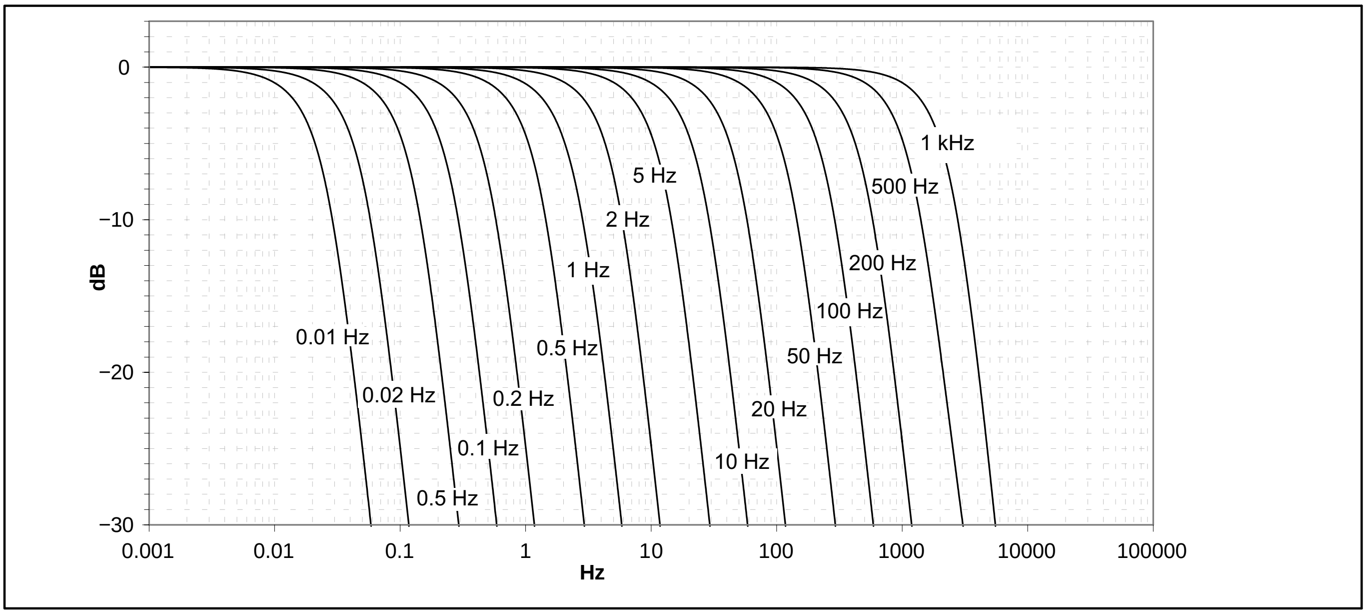


Classic HBM sample rates and digital low pass filter, type Bessel 4th order

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay (ms)*)	Rise time (ms)	Overshoot (%)	Rate (Hz)
Bessel	1,000	1,575	3,611	0.11	0.2	1.4	19,200
	500	812	2,079	0.3	0.38	1.3	9,600
	200	335	860	0.9	1.05	0.8	9,600
	100	168	427	1.8	2.11	0.8	9,600
	50	84	213	3.9	4.18	0.8	9,600
	20	33.7	85	9.5	10.4	0.8	9,600
	10	16.6	43	19.5	21.0	0.8	9,600
	5	8.4	21	39	41.4	0.8	2,400
	2	3.4	8.6	97	102	0.8	2,400
	1	1.6	4.2	197	215	0.8	2,400
	0.5	0.84	2.1	390	418	0.8	300
	0.2	0.34	0.85	980	1,033	0.8	300
	0.1	0.17	0.43	1,950	2,090	0.8	300
	0.05	0.085	0.21	3,860	4,170	0.8	20
	0.02	0.036	0.088	9,800	10,560	0.8	20
	0.01	0.017	0.044	19,500	21,200	0.8	20

*) The analog-to-digital converter's delay time is 128 µs for all data rates and has not been accounted for in the “Phase delay” column!
The anti-aliasing filter's delay time (160 µs) is not accounted for as well. Hence 288 µs need to be added to the “Phase delay”.

Classic HBM sample rates : Amplitude response Bessel filter

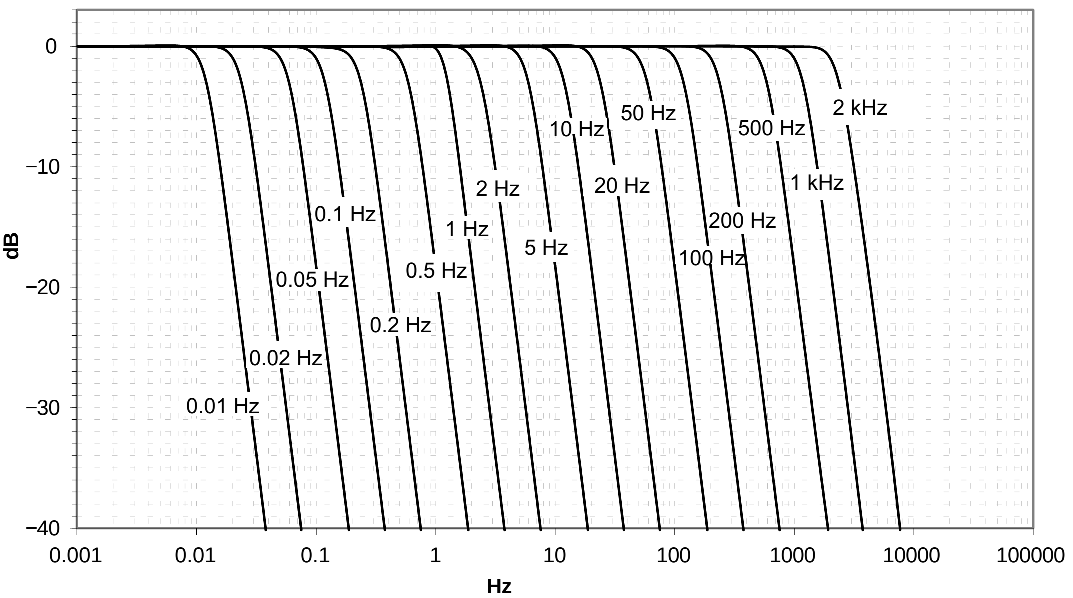


Classic HBM sample rates and digital low pass filter, type Butterworth 4th order

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay (ms)*)	Rise time (ms)	Overshoot (%)	Rate (Hz)
Butterworth	2,000	3,053	5,083	0	0.144	8.5	19,200
	1,000	1,170	2,077	0.27	0.344	11.0	19,200
	500	587	1,048	0.64	0.652	11.0	9,600
	200	237	420	1.76	1.64	11.0	9,600
	100	118	210	3.65	3.28	11.0	9,600
	50	59	105	7.49	6.29	11.0	9,600
	20	24	42	18.8	16.15	11.0	9,600
	10	12	21	37.7	32.29	11.0	9,600
	5	5.95	10.5	74.9	65.92	11.0	2,400
	2	2.37	4.24	188	163.6	11.0	2,400
	1	1.26	2.12	370	315	11.0	2,400
	0.5	0.59	1.05	756	656	11.0	300
	0.2	0.241	0.419	1,900	1,640	11.0	300
	0.1	0.122	0.210	3,770	3,280	11.0	300
	0.05	0.060	0.106	7,490	6,596	11.0	20
	0.02	0.0245	0.042	18,900	16,200	11.0	20
	0.01	0.012	0.021	37,700	32,383	11.0	20

*) The analog-to-digital converter's delay time is 128 µs for all data rates and has not been accounted for in the "Phase delay" column!
The anti-aliasing filter's delay time (160 µs) is not accounted for as well. Hence 288 µs need to be added to the "Phase delay".

Classic HBM sample rates : Amplitude response Butterworth filter



Specifications Power pack NTX001

NTX001		
Nominal input voltage (AC)	V	100 ... 240 (± 10%)
Stand-by power consumption at 230 V	W	0.5
Nominal load U_A I_A	 V A	 24 1.25
Static output characteristics U_A I_A U_{Br} (Output voltage ripple; peak to peak)	 V A mV	 24 ± 4% 0 - 1.25 ≤ 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	°C [°F]	0... +40 [+32 ... +104]
Storage temperature	°C [°F]	-40 ... +70 [-40 ... +158]

Accessories, to be ordered separately

MX1601B accessories		
Article	**Description**	**Ordering number**
Power supply		
AC-DC power supply / 24 V	Input: 100 ... 240 V AC (±10%), 1.5 m cable Output: 24 V DC, max. 1.25 A, 2 m cable with ODU plug	1-NTX001
3 m cable - QuantumX supply	3 m cable to supply power to QuantumX modules; suitable plug (ODU Medi-Snap S11M08-P04MJGO-5280) at one end and exposed wires at the other.	1-KAB271-3
Communication		
Ethernet cable	Ethernet patch cable for direct operation between a PC or Notebook and a module / device, 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) / 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-KAB272-2 1-KAB272-5
Mechanical		
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 (small)	QuantumX Backplane - for a maximum of 5 modules; - Connection of external modules by FireWire possible - Power supply: 24 V DC / max. 3.75 A (90 W)	1-BPX003
QuantumX Backplane (big)	QuantumX Backplane – for a maximum of 9 modules - 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		
Push-in connectors (8 pins), gold	10 push-in connectors, Phönix Contact, 8 pins, gold	1-CON-S1015
Mounting aid for Push-in connector	Mounting aid for MX1601/15/16 Push-in connector suitable for 1-CON-S1015	1-WIRING-MATE
1-wire EEPROM DS24B33	Package consisting of 10x 1-wire EEPROM DS24B33 (IEEE 1451.4 TEDS)	1-TEDS-PAK

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
MX1615B + catman®EASY	Package including: - MX1615B amplifier (1-MX1615B) - Power supply (1-NTX001) - 16 transducer plugs - Ethernet Cross-over cable (1-KAB239-2) - catman®Easy software from HBM (1-CATMAN-EASY) - Including software maintenance for the first 12 months	1-MX1615-PAKEASY
MX1615B + catman®AP	Package including: - MX1615B amplifier (1-MX1615B) - Power supply (1-NTX001) - 16 transducer plugs - Ethernet Cross-over cable (1-KAB239-2) - catman®AP software from HBM (1-CATMAN-AP) - Including software maintenance for the first 12 months	1-MX1615-PAKAP
LabVIEW™-driver[1)]	Universal driver from HBM for LabVIEW™.	1-LabVIEW-DRIVER
CANape® driver	QuantumX driver for CANape® software from Vector Informatik. CANape versions from 10.0 are supported.	1-CANAPE-DRIVER

Subject to modifications.
All product descriptions are for general information only. They are not to be understood as a guarantee of quality or durability.

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