

# QUANTUM<sup>X</sup> MX840A

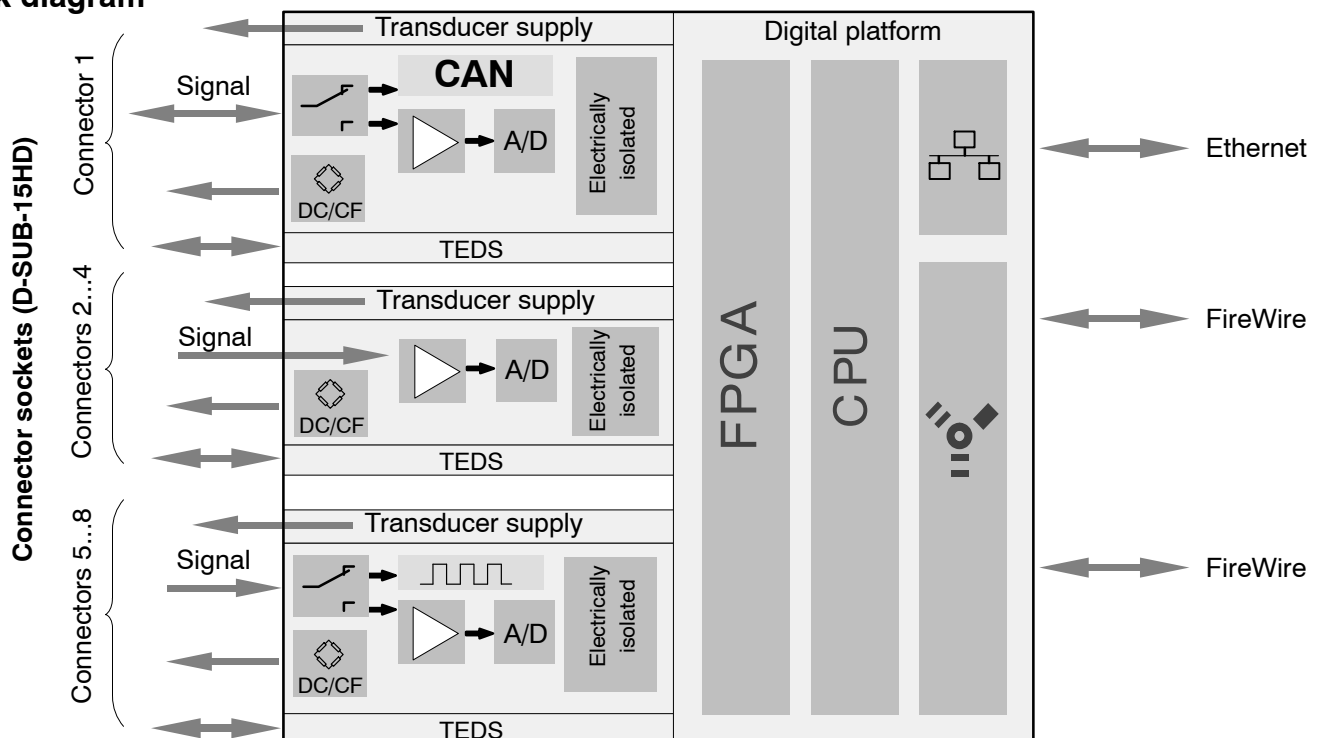
Universal amplifier



## Special features

- 8 individually configurable inputs (electrically isolated)
- Connection of more than 15 transducers technologies
- Data rate: up to 19,200 Hz
- 24-bit A/D converter per channel for synchronous, parallel measurements
- Active low pass filter
- TEDS support
- CANbus Input/Output
- Supply voltage for active transducers (DC): 5 V ... 24 V
- External synchronization IRIG-B
- Ultra-rugged version available

## Block diagram



## Specifications MX840A

General specifications		
<b>Inputs</b>	Number	8, electrically isolated from each other and from the supply voltage <sup>1)</sup>
<b>Transducer technologies</b>		Strain gauge full and half bridge, inductive full and half bridge, piezoresistive full bridge, potentiometric transducers, three voltage ranges, current; 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). Frequency, pulse counting, SSI, incremental rotary encoder (connectors 5-8 only) Receive CAN signals or send measurement signals on CAN CAN (ISO 11898; connector 1 only)
<b>A/D converter</b>		24 Bit Delta Sigma converter
<b>Data rate</b>	Hz	0.1 ... 19,200, adjustable for each channel
<b>Active low-pass filter</b> (Bessel/Butterw., can be switched off)	Hz	0.01 ... 3,200 (-3 dB)
<b>Transducer identification (TEDS, IEEE 1451.4)</b> max. distance of the TEDS module	m	100
<b>Transducer connection</b>		D-SUB-15HD
<b>Supply voltage range (DC)</b>	V	10 ... 30 (24 V nominal (rated) voltage)
<b>Supply voltage interruption</b>		max. 5 ms at 24 V
<b>Power consumption</b> without adjustable transducer excitation with adjustable transducer excitation	W W	< 9 < 12
<b>Transducer Excitation</b> (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
<b>Ethernet</b> (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 (CAT-5) 100
<b>FireWire</b> (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 FireWire system (including hubs <sup>2)</sup> , backplane) Max. number of hops <sup>3)</sup>	MBaud A m - - -	IEEE 1394b (HBM modules only) 400 (approx. 50 MByte/s) 1.5 5 12 (=11 Hops) 24 14
<b>Synchronization options</b> EtherCAT <sup>®5)</sup> NTP IRIG-B (B000 to B007; B120 to B127)		FireWire (only QuantumX, automatically, recommended) via CX27 via Ethernet via MX440A- or MX840A input channel
<b>Nominal (rated) temperature range</b>	°C [°F]	-20... +60 [-4 ... +140]
<b>Operating temperature range</b>	°C [°F]	-20 ... +65 [-4 ... +149]
<b>Storage temperature range</b>	°C [°F]	-40 ... +75 [-40 ... +167]
<b>Rel. humidity</b>	%	5 ... 95 (non condensing)
<b>Protection class</b>		III
<b>Degree of protection</b>		IP20 per EN 60529 (IP67-version available)
<b>Mechanical tests<sup>4)</sup></b> Vibration (30 min) Shock (6 ms)	m/s <sup>2</sup> m/s <sup>2</sup>	50 350
<b>EMC requirements</b>		per EN 61326
<b>Max. input voltage at transducer socket to ground (Pin 6)</b> PIN 1, 2, 3, 4, 5, 7, 8, 10, 13, 15 PIN 14 (voltage)	V V	5.5 (no transients) 60 (no transients)/typ. 500
<b>Dimensions, horizontal (W x H x D)</b>	mm	52.5 x 200 x 124 (with case protection) 44 x 174 x 124 (without case protection)
<b>Weight, approx.</b>	g	980

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

<sup>2)</sup> Hub: FireWire node or distributor

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

<sup>4)</sup> 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<sup>2</sup> 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<sup>2</sup> for 6 ms, half sine pulse shape, with 3 shocks in each of the 6 possible directions.

<sup>5)</sup> EtherCAT<sup>®</sup> is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

## Specifications MX840A (Continued)

5 mV/V strain gauge full bridge with 1 V or 2.5 V excitation (carrier frequency/AC, effective)		
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 MX840A 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	< 0.2 < 0.5 < 1 < 4
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

5 mV/V CF strain gauge half bridge with 1 V or 2.5 V excitation (AC, effective)		
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 MX840A 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	< 0.5 < 0.7 < 1 < 4
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 MX840A (Continued)

100 mV/V DC resistive strain gauge full bridge with 2.5 V (DC) excitation, e.g. for piezoresistive transducers		
Accuracy class		0.05
Excitation voltage (DC)	V	2.5 ± 5%
Transducers that can be connected		piezoresistive strain gauge full bridges
Permissible cable length between MX840A and transducer	m	100
Measuring range	mV/V	± 100
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
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	μV/V μV/V μV/V μV/V	< 4 < 6 < 15 < 80
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

1000 mV/V DC piezoresistive strain gauge full bridge with 2.5 V (DC) excitation		
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 MX840A and transducer	m	100
Measuring range	mV/V	± 1,000
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
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	μV/V μV/V μV/V μV/V	< 40 < 100 < 200 < 700
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 MX840A (Continued)

100 mV/V CF inductive full bridge with 1 V or 2.5 V excitation (AC, effective)		
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 MX840A 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	< 3 < 5 < 15 < 50
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

1000 mV/V CF inductive full bridge with 1 V excitation (AC, effective)		
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 MX840A 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 with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 40 < 100 < 500 < 1,200
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 MX840A (Continued)

100 mV/V CF inductive half bridge with 1 V or 2.5 V excitation (AC, effective)		
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 MX840A 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	< 3 < 5 < 15 < 50
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		
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 MX840A 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	< 40 < 100 < 500 < 1,200
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

## Specifications MX840A (Continued)

Potentiometric transducer		
Accuracy class		0.1
Excitation voltage (DC)	V	2.5 (± 5 %)
Transducers that can be connected		potentiometric transducers
Permissible cable length between MX840A and transducer	m	100
Measuring range	mV/V	± 500
Measurement frequency range (–3 dB)	kHz	0 ... 3.2
Transducer impedance	Ω	300 ... 5,000
<b>Noise at 25 °C (peak to peak)</b> 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	< 40 < 100 < 200 < 700
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

10 V DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator up to ± 10 V
Permissible cable length between MX840A and transducer	m	100
Measuring range	V	± 10
Measurement frequency range (–3 dB)	kHz	0 ... 3.2
Internal resistance of the voltage source	Ω	< 500
Internal impedance, typ.	MΩ	1
<b>Noise at 25 °C (peak to peak)</b> with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV μV μV μV	< 150 < 300 < 600 < 3,000
Linearity error	%	< 0.02 of full scale
<b>Common-mode rejection</b> with DC common mode with 50 Hz common mode, typ.	dB dB	> 100 75
<b>Maximum common-mode voltage</b> (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 MX840A (Continued)

60 V DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator up to $\pm 60$ V
Permissible cable length between MX840A and transducer	m	100
Measuring range	V	$\pm 60$
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Internal resistance of the voltage source	$\Omega$	< 500
Input impedance, typ.	M $\Omega$	1
Noise at 25 °C (peak to peak) with filter 1Hz Bessel with filter 10Hz Bessel with filter 100Hz Bessel with filter 1kHz Bessel	$\mu$ V $\mu$ V $\mu$ V $\mu$ V	< 150 < 300 < 600 < 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	$\pm 60$
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

100 mV DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator
Permissible cable length between MX840A and transducer	m	100
Measuring range	mV	$\pm 300$
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Input impedance	M $\Omega$	> 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	$\mu$ V $\mu$ V $\mu$ V $\mu$ V	< 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	$\pm 30$
Zero drift	% / 10 K	< 0.05 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value



## Specifications MX840A (Continued)

20 mA DC 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 MX840A and transducer	m	100
Measuring range	mA	± 30
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Measurement resistance value, typ.	Ω	10
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	μA μA μA μA	< 1 < 1.5 < 15 < 40
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	± 30
Zero drift	% / 10 K	< 0.05 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

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 MX840A and transducer	m	100
Measuring ranges	Ω	0 ... 5,000
Speisestrom	mA	0.4 ... 0.8
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
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	< 0.5 < 1 < 2 < 6
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 MX840A and transducer	m	100
Linearization range	°C [°F]	-200 ... +848 [-328 ... +1558.4]
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
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	< 0.1 < 0.2 < 0.5 < 1.5
Linearity error	K	< ± 0.3
Zero drift with PT100 with PT1000	K / 10 K K / 10 K	< 0.2 < 0.1
Full-scale drift with PT100 with PT1000	K / 10 K K / 10 K	< 0.5 < 1

## Specifications MX840A (Continued)

Thermocouples <sup>6)</sup>		
Transducers that can be connected		Thermocouples (type B, E, J, K, N, R, S, T)
Permissible cable length between MX840A and transducer	m	100
Measuring range	mV	± 100
<b>Linearization ranges</b> Type B (Pt-30 % Rh and Pt-6 % Rh) Type E (Ni-Cr and Cu-Ni) Type J (Fe and Cu-Ni) Type K (Ni-Cr and Ni-Al) Type N (Ni-14,2 % Cr and Ni-4,4 % Si-0,1 % Mg) Type R (Pt-13 % Rh and Pt) Type S (Pt-10 % Rh and Pt) Type T (Cu and Cu-Ni)	°C [°F] °C [°F] °C [°F] °C [°F] °C [°F] °C [°F] °C [°F] °C [°F]	+100 ... +1,820 [+212 ... +3,308] -200 ... +900 [-328 ... +1,652] -210 ... +1,200 [-346 ... +2,192] -270 ... +1,372 [-454 ... +2,501.6] -270 ... +1,300 [-454 ... +2,372] -50 ... +1,768 [-58 ... +3214.4] -50 ... +1,768 [-58 ... +3214.4] -270 ... +400 [-454 ... +752]
Transducer impedance	Ω	< 500
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
<b>Noise Type K (peak to peak)</b> with Filter 1 Hz Bessel with Filter 10 Hz Bessel with Filter 100 Hz Bessel with Filter 1 kHz Bessel	K K K K	0.05 0.1 0.5 1
<b>Total error limit at 22 °C ambient temperature</b> Type E, J, K, T Type R, S Type B	K K K	± 1 ± 4 ± 15
Temperature drift (type K)	K/10K	< ± 0.5
<b>Cold junction 1-THERMO-MXBOARD</b> Nominal (rated) temperature range Operating temperature range Storage temperature range	°C [°F] °C [°F] °C [°F]	-20 ... +60 [-4 ... +140] -20 ... +65 [-4 ... +149] -40 ... +75 [-40 ... +167]

<sup>6)</sup> The external cold junction is required for connecting thermocouples to the MX840A (Order no.: 1-THERMO-MXBOARD).

## Specifications MX840A (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 encoder, pulse counters, SSI transducers
Permissible cable length between MX840A and transducer	m	50
Signals F <sub>1</sub> (±) F <sub>2</sub> (±) Zero index (±)		Frequency or pulse signal Direction of rotation signal shifted by ±90° to F <sub>1</sub> 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 <sub>out</sub> = 5 mA	V V	5 > 4.5
Permissible load impedance	kΩ	> 1

CAN (connection 1/read only)		
Supported protocols		CAN 2.0A, CAN 2.0B
Number of CAN ports		only connection 1
Bus link		two wire, according to ISO11898
Baud rates and permissible cable lengths	kBit/s m	1000, 500, 250, 125, 100 25, 100, 250, 500, 600
Formats		Motorola, Intel
Receiving Sampling rate Number of CAN signals CAN signal types	signals/s	max. 10,000 ≤ 128 standard, mode-dependent, mode-Signal
Transmitting Data rate (max.) Number of CAN signals (module-internal only) Generate dbc file (Assistant)	Hz	100 per signal 8

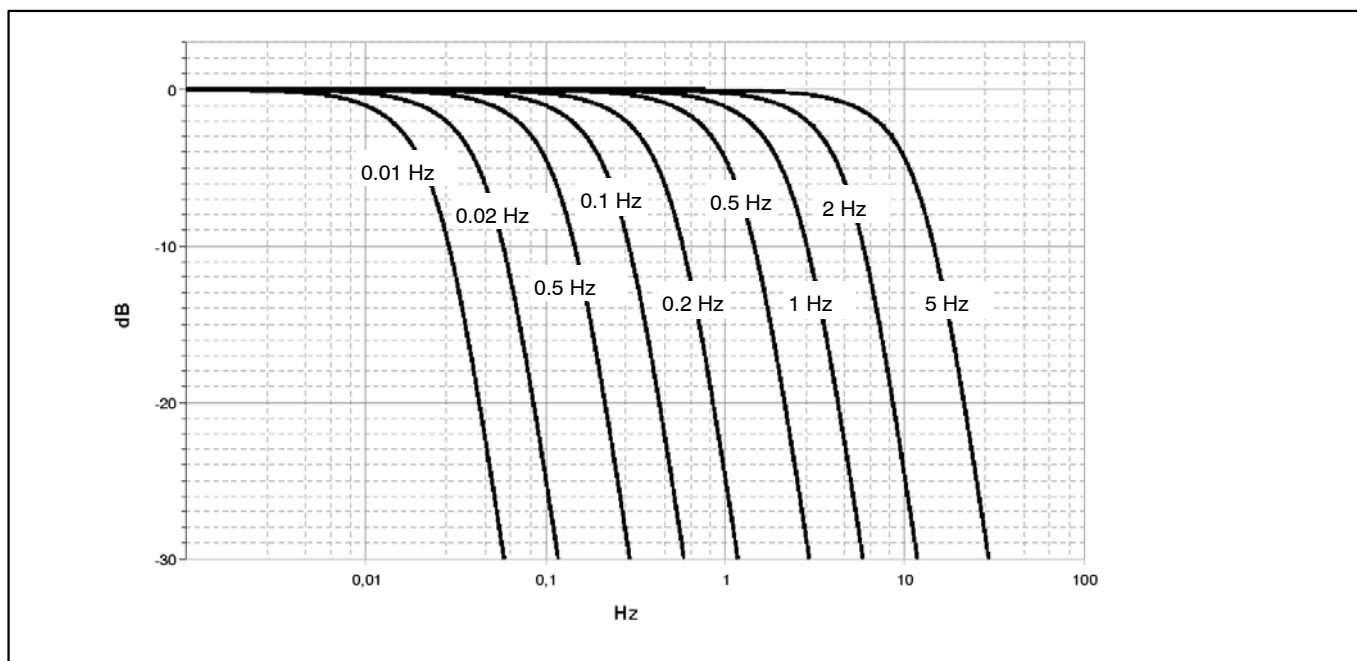
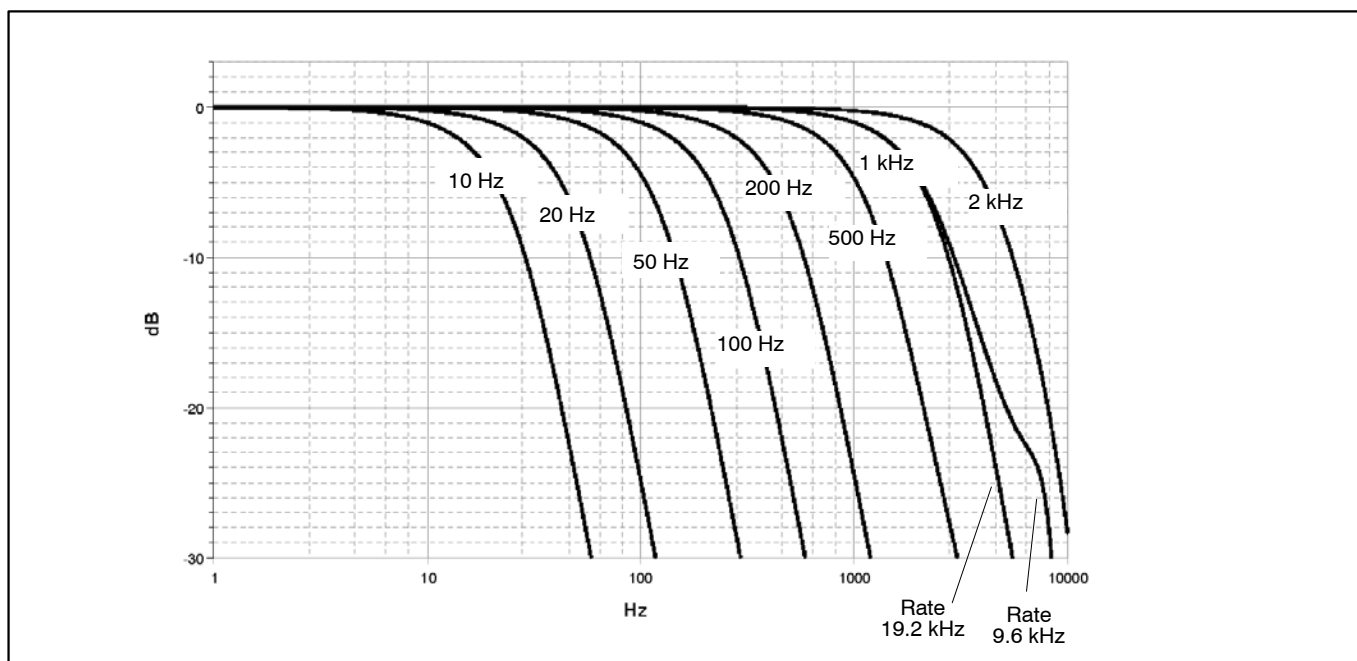
## Active low pass filter data MX840A

(4<sup>th</sup> order Bessel/Butterworth)

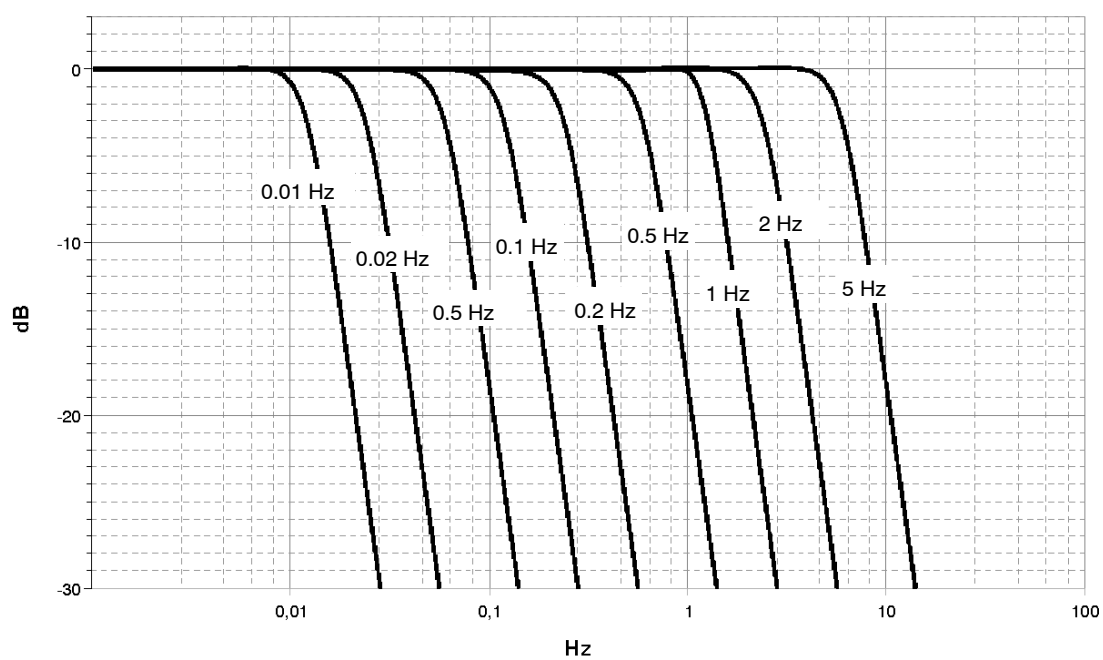
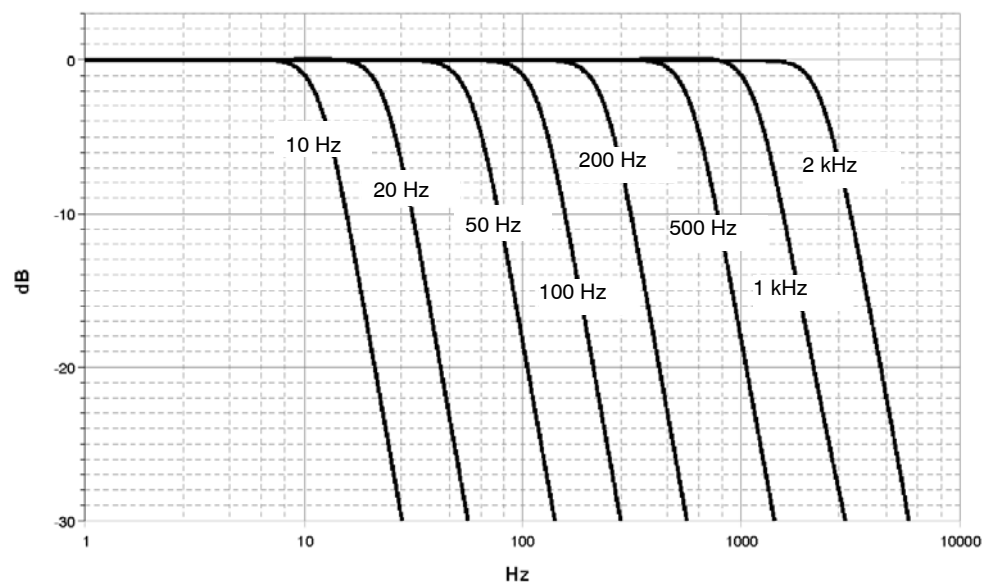
Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay (ms) <sup>*)</sup>	Rise time (ms)	Overshoot (%)	Data rate (Hz)
Bessel	2000	3210	8100	0.15	0.1	1.5	19200
	1000	1630	4050	0.24	0.2	1.4	19200
	1000	1640	5150	0.21	0.2	0.7	9600
	500	820	2120	0.4	0.43	1.4	9600
	200	335	860	1	1.04	1	9600
	100	167	430	2	2.1	0.8	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	10000	10600	0.8	20
	0.01	0.017	0.042	20100	21300	0.8	20
Butterworth	2000	2360	4331	0.2	0.15	11	19200
	1000	1178	2100	0.38	0.3	11	19200
	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	17500	16000	11	20
	0.01	0.012	0.021	34600	32000	11	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!

## Amplitude response of MX840A Bessel filter



## Amplitude response of MX840A Butterworth filter



## Specifications Power pack NTX001

NTX001		
Nominal input voltage (AC)	V	100 ... 240 ( $\pm 10\%$ )
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	$24 \pm 4\%$ $0 - 1.25$ $\leq 120$
Current limiting, typically from	A	1.6
Primary – secondary separation		galvanically, by optocoupler and converter
Creep distance and clearance	mm	$\geq 8$
High-voltage test	kV	$\geq 4$
Ambient temperature range	°C [°F]	0... +40 [+32 ... +104]
Storage temperature	°C [°F]	-40 ... +70 [-40 ... +158]

## Accessories, to be ordered separately

General accessories MX840A		
Article	Description	Order No.
AC-DC power supply / 24 V	Input : 100 ... 240 V AC ( $\pm 10\%$ ), 1.5 m cable Output: 24 V DC, max. 1.25 A, 2 m cable with ODU 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
Kommunikation		
FireWire cable (module-to-module)	FireWire connection cable for QuantumX modules; with matching plugs on both sides. Length 0.2 m/2 m/5 m Note: The cable enables QuantumX modules to be supplied with power (max. 1.5 A, from the source to the last drain).	1-KAB269-0.2 1-KAB269-2 1-KAB269-5
FireWire IEEE PC-Card	FireWire IEEE 1394b PC-Card (PCMCIA adapter) to connect QuantumX modules to a Notebook or a PC	1-IF001
IEEE1394b FireWire IEEE ExpressCard	FireWire IEEE 1394b ExpressCard (ExpressCard/34) zur Anbindung von QuantumX-Modulen an ein Notebook oder PC	1-IF002
FireWire cable PC-to-module	Firewire connection cable from the PC to the first module for data transfer from QuantumX modules to the PC; With matching plugs on both sides; Length: 3 m.	1-KAB270-3
3 m IEEE1394b FireWire-Kabel Hub zu Modul	FireWire-Verbindungskabel zwischen HUB und Modul (IP20). Zur Datenübertragung von QuantumX-Modulen zum HUB. Beidseitig mit passenden Steckern versehen. Länge: 3 m.	1-KAB275-3
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/6, max. 30 m). KAB270-3 connection is not possible!	1-SCM-FW
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

## Accessories, to be ordered separately (continued)

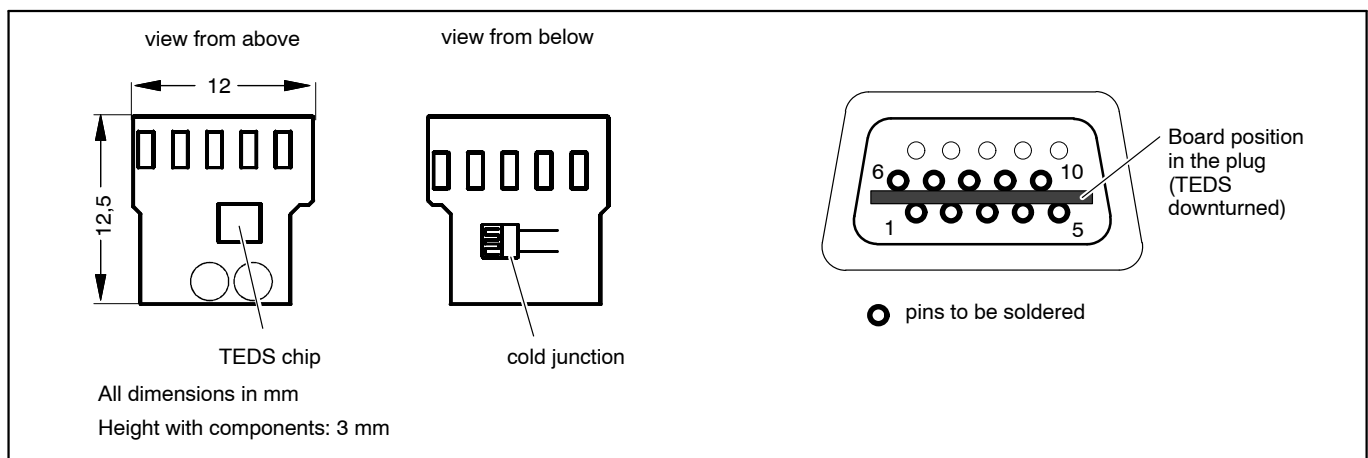
General accessories		
Article	Description	Order No.
<b>Mechanic</b>		
Connecting elements for QuantumX modules	Connecting elements (clips) for QuantumX modules; Set comprising 2 case clips including mounting material for fast connection of 2 modules.	1-CASECLIP
Connecting elements for QuantumX modules	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, IP 20 version; 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
<b>Transducer side</b>		
Cold junction for thermocouples on MX840, MX840A, MX440A	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
Adapter DSub HD 15-pin to BNC	Adapter for connecting current-fed piezoelectric sensors (IEPE) with BNC connection to MX410; DSub HD 15-pin plug to BNC-socket, (length approx. 5 cm)	1-IEPE-MX840A
DMS-Viertelbrücken-Modul 350 Ohm	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
DMS-Viertelbrücken-Modul 120 Ohm	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
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
Port saver, SubHD 15 pol.	4 x D-SUB HD 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
High-voltage signal conditioner	High-voltage signal conditioner for differential measurement of voltages up to 300 V CAT II with type MX840, MX840A, MX410 and MX440A QuantumX modules, with SubHD connector and fixed, 1-m-long measuring leads with 4-mm laboratory plugs.	1-SCM-HV



## Accessories, to be ordered separately (continued)

General accessories		
Article	Description	Order No.
<b>Software and product packages</b>		
MX840A + catman <sup>®</sup> EASY	Package including: - MX840A amplifier (1-MX840A) - Power supply (1-NTX001) - 4 transducer plugs with TEDS (1-SUBHD15-MALE) - Ethernet Cross-over cable (1-KAB239-2) - catman <sup>®</sup> Easy software from HBM (1-CATMAN-EASY) - Including software maintenance for the first 12 months	1-MX840A-PAKEASY
MX840A + catman <sup>®</sup> AP	Package including: - MX840A amplifier (1-MX840A) - Power supply (1-NTX001) - 4 transducer plugs with TEDS (1-SUBHD15-MALE) - Ethernet Cross-over cable (1-KAB239-2) - catman <sup>®</sup> AP software from HBM (1-CATMAN-AP) - Including software maintenance for the first 12 months	1-MX840A-PAKAP
DIAdem <sup>®</sup> driver	QuantumX driver for the software DIAdem <sup>®</sup> from National Instruments. German user interface only.	1-DIADEM-DRIVER
CANape <sup>®</sup> driver	QuantumX driver for the software CANape <sup>®</sup> from Vector Informatik. CANape versions from 10.0 are supported.	1-CANAPE-DRIVER
QuantumX-System-CD	QuantumX-Assistent, LabVIEW-Treiber, Programmierschnittstelle (.NETAPI), TEDS-Editor	Kostenlos
<b>Synchronization with ultra-rugged modules</b>		
FireWire cable (modul-to-modul, IP68)	FireWire connection cable for QuantumX modules; with matching plugs on both sides. Length 0.2 m/2 m/5 m Note: The cable enables QuantumX 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

## Cold junction 1-THERMO-MXBOARD



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