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Data sheet

# ClipX®

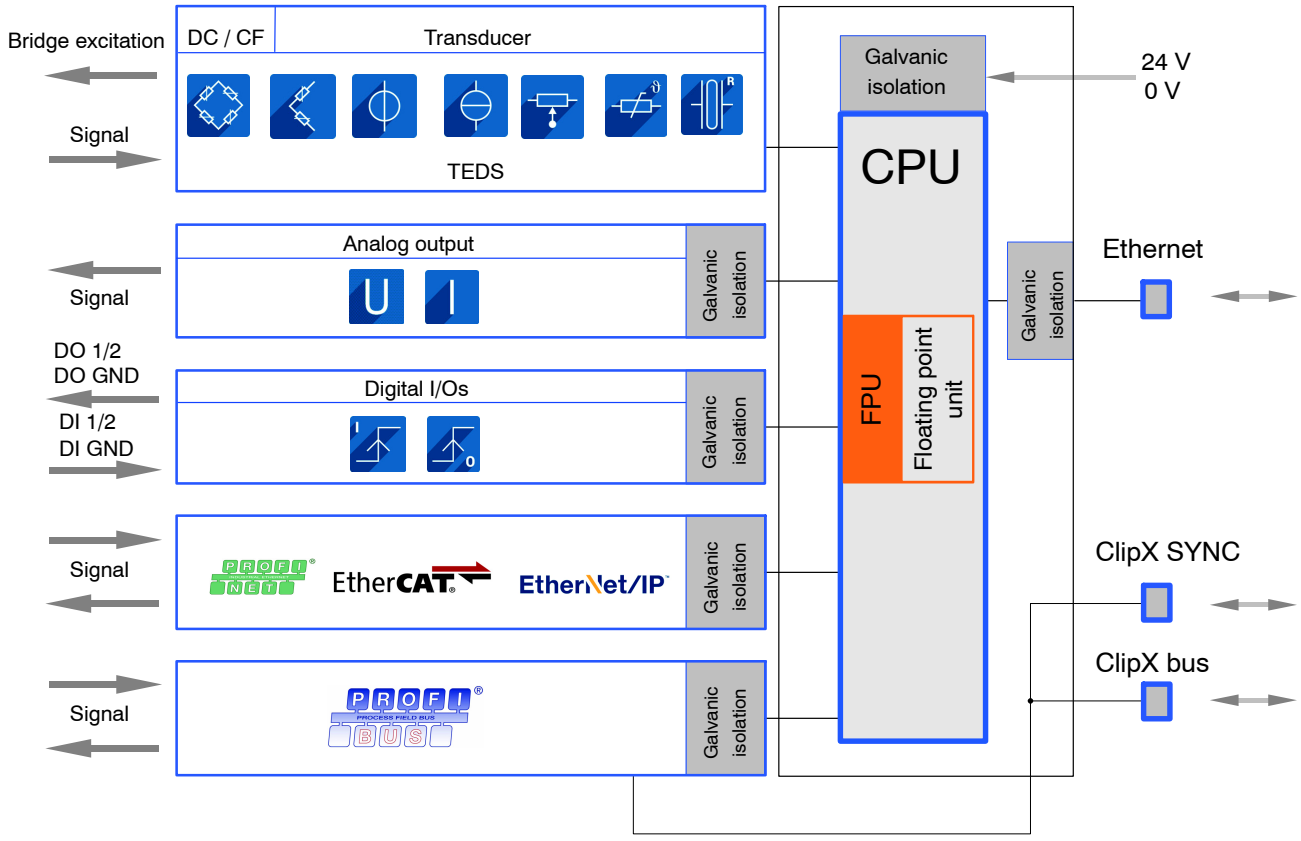
## BM40, BM40PB, BM40IE
## Industrial amplifier




### Special features

- **Freely configurable measurement channel with TEDS channel parameterization**
- **Connection of 7 transducer technologies with 19.2 kHz sample rate**
- **Accuracy class up to 0.01 with 32-bit A/D conversion**
- **4 digital I/Os and 1 analog output (voltage/current reversible)**
- **Modular connectivity for up to 6 modules by ClipX bus with transfer of measured values**
- **Internal calculation channels (Smart functions)**
- **OPC UA, PROFINET (IRT/RT), EtherCAT®, EtherNet/IP™, PROFIBUS (DPV1)**
- **Simple operation via integrated web server with 3 levels of user guidance**
- **Rugged and compact metal housing for attachment to DIN rail**

### Block diagram



## Specifications for ClipX

| General specifications | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Measurement input** | Number | 1, galvanically isolated to supply |
| **Transducer technologies** | | Full and half bridge strain gages, piezoresistive sensors (voltage-fed), potentiometric transducers, resistance thermometers (Pt100), electric voltage (±10V), electric current (±20mA) |
| **A/D conversion** | bit | 32, delta-sigma converter |
| **Sample rate** | S/s | 19,200 |
| **Signal bandwidth (-3dB)** | Hz | Direct voltage sensor excitation (DC): 3800 Hz when filter off<br>Carrier frequency sensor excitation (CF): 200 Hz |
| **Active low-pass filter** | Hz | Bessel or Butterworth 6th order, IIR<br>DC: 0.02 … 3000; filter OFF (3800)<br>CF: 0.02 … 200 |
| **Transducer identification** | | TEDS, IEEE 1451.4 |
| Supported variants | | Zero-wire TEDS and 1-Wire TEDS |
| TEDS module spacing, max. | m | 100 |
| **Supply voltage range** | $V_{DC}$ | 10 … 30 (nominal (rated) voltage 24 V) |
| **Supply voltage interruption**<br>(based on PLC standard DIN EN 61131-2) | | |
| 24 V (- 10 %) | ms | 10 |
| 12 V (- 10 %) | ms | 1 |
| **Power consumption** at 24 V supply voltage, max. | W | 5 |
| **Galvanic isolation** | V | 60<br>Between power supply, sensor input, ClipX bus, analog output, all digital inputs and outputs, as well as fieldbuses apart from PROFIBUS |
| **Fuses** | | None |
| Automatic current limiter | | For all input and output signals |
| Short-circuit resistance | | Input/output signals, synchronization and fieldbus are short-circuit proof and coding elements can be used to safeguard the connector plugs, so they are not transposed. |
| **Ethernet** (data link) | | 10Base-T / 100Base-TX |
| Protocol/addressing | | TCP/IP (direct IP address or DHCP) |
| Plug connection | | RJ45, 8-pin |
| Cable type | | Standard LAN, CAT5, SFTP |
| Max. cable length to device | m | 100 |
| **ClipX bus (data transfer)** | | |
| Number of devices, max. | | 6 |
| Data transfer | | 1 data value (measured value, calculated value, etc.) with status |
| Transmission speed | kHz | 1, with automatic synchronization |
| Protocol / addressing | | RS485, node 1 … 6 |
| Cabling | | Wires, twisted in pairs and shielded |
| Distance between 2 modules, max. | cm | 30 |
| **Real time calculation in device** | | |
| Calculated Channels | Number | 6 |
| Update rate | ms | 1 |
| Functions | | Matrix calculation (2x2 … 6x6), tolerance window, peak value with capture, trigger, automatic mean, mechanical work, algebra (+ - * /), counters, coordinates transformation (Cartesian ↔ polar), PID controller, logic functions (AND, OR, NAND, NOR, XOR, XNOR, NOT), signal generator, pulse-width measurement, time generator |

## Specifications for ClipX (continued)

| | | |
|---|---|---|
| **Peak-value memory** | | |
| Number | | 3 |
| | | Min., max. or peak-to-peak |
| Reference level | | All measurement signals, all calculation channels, data from ClipX bus, fieldbus and Ethernet, analog output |
| Response time, typical | µs | 52 |
| **Limit switches** | | |
| Number | | 4 |
| Reference level | | All measurement signals, all calculation channels, data from ClipX bus, fieldbus and Ethernet, analog output |
| Function | | Exceeding or falling below a level<br>Inside / outside a tolerance band |
| Response time, typical | µs | 300 |
| **Digital inputs** | | |
| Number | | 2 |
| Function | | Zero, tare, reset limit value, digital output, parameter set selection (bit-coded), flags for calculation channels |
| Response time, typical | ms | 1 |
| **Digital outputs** | | |
| Number | | 2 |
| | | Designed as high-side switches |
| Function | | Limit value, digital input, measured value/system status, fieldbus flag, current parameter set number (bit-coded), calculation channel flags and Ethernet flags |
| Response time, typical | ms | 1 |
| **Parameter Sets** | | |
| Number | | 10<br>Sensor settings, measurement acquisition incl. computation channels, limit values, digital input/output settings, analog output settings. |
| Device “cloning” | | All the device settings can be saved in full to a PC as a backup and reloaded, either with or without Ethernet and fieldbus settings. |
| Switching time | | <100 ms plus settling time of low-pass filter;<br>The measured value status is set to 'invalid' for 2.5 seconds so as to suppress transient responses. |
| **Nominal (rated) temperature range** | °C | 0 … 50 |
| **Operating temperature range** (no condensation allowed/module not immune to water condensation) | °C | -20 … + 60 |
| **Storage temperature range** | °C | -25 … +75 |
| **Relative humidity** | % | 5 … 95 (non-condensing) |
| **Class** (height up to 2,000 m, degree of contamination 2) | | III (according to EN 61140) |
| **Equipment protection level** | | IP20 (according to EN 60529) |
| **Mechanical tests** (device off, according to PLC hardware standard EN61131-2) | | |
| Oscillation (90 min. in each direction) | g | 2 (20 m/s$^2$); 8.4 … 200 Hz (constant acceleration);<br>5 … 8.4 Hz (constant amplitude 14 mm) |
| Impact (3 times in each direction) | g | 35 (350 m/s$^2$); sinusoidal; impact duration 6 ms |

## Specifications for ClipX (continued)

| | | |
|---|---|---|
| **EMC requirements** | | According to EN 55011 (Emissions) group 1, class B is fulfilled.<br>According to EN 61326-1) (Immunity) for ESD and surge criterion B is fulfilled. |
| **Proof of quality** | | Manufacturer's certificate 2.1 according to EN 10204 and the HBM factory calibration certificate are stored in the device and can be downloaded from https://www.hbm.com/ClipX. |
| **Long-term stability** | | All devices are pre-aged in an oven run to improve long-term stability. |
| **Dimensions, (H x W x D),** including DIN rail mounting material | mm | 100 x 25 x 118 |
| **Weight** , approx. | g | 360 |

| **Strain gage full bridge** | | **BM40, BM40PB, BM40IE** |
|---|---|---|
| **Accuracy class** | | 0.01 |
| **Transducers that can be connected** | | Full bridge strain gages |
| **Transducer impedance** | Ω | 80 … 5000 |
| **Measurement ranges (at 5 V bridge excitation)** | mV/V | 2.5 or 5, reversible |
| **Bridge excitation voltage** | V | 5 (± 10 %), direct voltage (DC) or carrier frequency (CF) 1200 Hz reversible |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800<br>CF: 0 … 200 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; optionally 1-wire technology with separate TEDS module or HBM zero-wire technology with TEDS module in the sense leads of the sensor |
| **Noise (peak-to-peak) at 25 °C, excitation 5 V (DC), 350 Ohm-Full bridge** | | |
| with 1 Hz Bessel filter | µV/V | 0.04 |
| with 10 Hz Bessel filter | µV/V | 0.12 |
| with 100 Hz Bessel filter | µV/V | 0.4 |
| with 1 kHz Bessel filter | µV/V | 1.2 |
| **Noise (peak-to-peak) at 25 °C, excitation 5 V (CF), 350 Ohm-Full bridge** | | |
| with 1 Hz Bessel filter | µV/V | 0.05 |
| with 10 Hz Bessel filter | µV/V | 0.16 |
| with 100 Hz Bessel filter | µV/V | 0.5 |
| with 200 Hz Bessel filter | µV/V | 0.8 |
| **Non-linearity** | % | 0.005 of full scale value |
| **Zero drift (bridge excitation 5 V)** | % / 10 K | 0.01 of full scale value |
| **Full-scale drift (bridge excitation 5 V)** | % / 10 K | 0.01 of measured value |
| **Full bridge strain gage with Zener barriers** | | |
| **Accuracy class** | | |
| at 80 Ω transducer impedance, 6-wire configuration, max. 100 m cable length and DC or CF | | 0.2 |
| at 350 Ω transducer impedance, 6-wire configuration, max. 100 m cable length and DC or CF | | < 0.05 |
| at 350 Ω … 5 kΩ transducer impedance, 6-wire configuration, max. 100 m cable length and DC | | 0.05 |

## Specifications for ClipX (continued)

| Strain gage half bridge | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Accuracy class** | | 0.1 |
| **Transducers that can be connected** | | Strain gage half bridges |
| **Transducer impedance** | Ω | 80 … 5000 |
| **Measurement ranges (at 5 V bridge excitation)** | mV/V | 2.5 or 5; reversible |
| **Bridge excitation voltage** | V | 5 (± 10 %), direct voltage (DC) or carrier frequency (CF) 1200 Hz reversible |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800<br>CF: 0 … 200 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; optionally 1-wire technology with separate TEDS module or HBM zero-wire technology with TEDS module in the sense leads of the sensor |
| **Noise (peak-to-peak) at 25 °C, excitation 5 V (DC), 350 Ohm-Half bridge** | | |
| with 1 Hz Bessel filter | µV/V | 0.08 |
| with 10 Hz Bessel filter | µV/V | 0.24 |
| with 100 Hz Bessel filter | µV/V | 0.8 |
| with 1 kHz Bessel filter | µV/V | 2.4 |
| **Noise (peak-to-peak) at 25 °C, excitation 5 V (CF), 350 Ohm-Half bridge** | | |
| with 1 Hz Bessel filter | µV/V | 0.1 |
| with 10 Hz Bessel filter | µV/V | 0.32 |
| with 100 Hz Bessel filter | µV/V | 1 |
| With 200 Hz Bessel filter | µV/V | 1.6 |
| **Non-linearity** | % | 0.05 of full scale value |
| **Zero drift (bridge excitation 5 V)** | % / 10 K | 0.1 of full scale value |
| **Full-scale drift (bridge excitation 5 V)** | % / 10 K | 0.1 of measured value |

| Resistive full bridge | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Accuracy class** | | 0.01 |
| **Transducers that can be connected** | | Resistive full bridge, voltage-fed |
| **Transducer impedance** | Ω | 80 … 5000 |
| **Measurement ranges (at 5 V bridge excitation)** | mV/V | 100 or 800, reversible |
| **Bridge excitation voltage** | V | 5 (± 10 %), direct voltage (DC) |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; optionally 1-wire technology with separate TEDS module or HBM zero-wire technology with TEDS module in the sense leads of the sensor |
| **Noise (peak-to-peak) at 25 °C, at 100 mV/V, excitation 5 V (DC), 350 Ohm-Full bridge** | | |
| with 1 Hz Bessel filter | µV/V | 0.2 |
| with 10 Hz Bessel filter | µV/V | 0.4 |
| with 100 Hz Bessel filter | µV/V | 1.5 |
| with 1 kHz Bessel filter | µV/V | 5 |
| **Noise (peak-to-peak) at 25 °C, at 800 mV/V, excitation 5 V (DC), 350 Ohm-Full bridge** | | |
| with 1 Hz Bessel filter | µV/V | 0.6 |
| with 10 Hz Bessel filter | µV/V | 1.2 |
| with 100 Hz Bessel filter | µV/V | 4.5 |
| with 1 kHz Bessel filter | µV/V | 15 |
| **Non-linearity** | % | 0.005 of full scale value |
| **Zero drift (bridge excitation 5 V)** | % / 10 K | 0.01 of full scale value |
| **Full-scale drift (bridge excitation 5 V)** | % / 10 K | 0.01 of measured value |

## Specifications for ClipX (continued)

| Potentiometric transducers/potentiometers | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Accuracy class** | | 0.1 |
| **Transducers that can be connected** | | Potentiometric transducers |
| **Transducer impedance** | Ω | 80 … 5000 |
| **Measurement ranges (at 5 V bridge excitation)** | mV/V | 500, corresponding to 0 … 100 % |
| **Bridge excitation voltage** | V | 5 (± 10 %), direct voltage (DC) |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; 1-wire technology with separate TEDS module |
| **Noise (peak-to-peak) at 25 °C, potentiometer, excitation 5 V (DC), 10 kΩ potentiometer, mid position** | | |
| with 1 Hz Bessel filter | % | 0.00008 |
| with 10 Hz Bessel filter | % | 0.00025 |
| with 100 Hz Bessel filter | % | 0.001 |
| with 1 kHz Bessel filter | % | 0.003 |
| **Non-linearity** | % | 0.05 of full scale value |
| **Zero drift (bridge excitation 5 V)** | % / 10 K | 0.1 of full scale value |
| **Full-scale drift (bridge excitation 5 V)** | % / 10 K | 0.1 of measured value |

| Resistance thermometers (Pt100) | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Accuracy** | °C | 0.5 |
| **Transducers that can be connected** | | Pt100 (connected in 3-wire configuration) |
| **Linearization range** | °C | -200 … +850 |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; 1-wire technology with separate TEDS module |
| **Noise (peak-to-peak) at 25 °C, Pt100 at 100 Ohm** | | |
| with 1 Hz Bessel filter | K | 0.008 |
| with 10 Hz Bessel filter | K | 0.012 |
| with 100 Hz Bessel filter | K | 0.06 |
| with 1 kHz Bessel filter | K | 0.2 |
| **Non-linearity** | % | < 0.5 |
| **Zero drift** | K / 10 K | < 0.2 |
| **Full-scale drift** | K / 10 K | < 1 |

| Voltage | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Accuracy class** | | 0.05 |
| **Transducers that can be connected** | | Voltage sources |
| **Transducer impedance** | MΩ | > 1 |
| **Measurement range** | V | ± 10 |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; 1-wire technology with separate TEDS module |

## Specifications for ClipX (continued)

| | | |
|---|---|---|
| **Noise at voltage input ±10 V** | | |
| with 1 Hz Bessel filter | mV | 0.05 |
| with 10 Hz Bessel filter | mV | 0,10 |
| with 100 Hz Bessel filter | mV | 0.25 |
| with 1 kHz Bessel filter | mV | 0.75 |
| **Common-mode rejection** | | |
| for DC common mode | dB | > 120 |
| for 50/60 Hz common mode, typical | dB | > 80 |
| **Common-mode voltage**, max. (to housing and supply ground) | V | ±30 |
| **Non-linearity** | K | 0.05 of full scale value |
| **Zero drift** | K / 10 K | 0.05 of full scale value |
| **Full-scale drift** | K / 10 K | 0.05 of measured value |

| **Signal current** | | **BM40, BM40PB, BM40IE** |
|---|---|---|
| **Accuracy class** | | 0.05 |
| **Transducers that can be connected** | | Transducers with current output |
| **Measuring resistance value, typical** | Ω | < 15 |
| **Measurement range** | mA | 4 … 20, ± 20 mA, reversible |
| **Signal bandwidth (-3 dB)** | Hz | DC: 0 … 3800 |
| **Permissible cable length between ClipX and transducer** | m | < 100 |
| **Transducer identification** | | TEDS, IEEE 1451.4; 1-wire technology with separate TEDS module |
| **Noise at current input ±20 mA** | | |
| with 1 Hz Bessel filter | µA | 0.05 |
| with 10 Hz Bessel filter | µA | 0.1 |
| with 100 Hz Bessel filter | µA | 0,5 |
| with 1 kHz Bessel filter | µA | 2 |
| **Common-mode rejection** | | |
| for DC common mode | dB | > 120 |
| for 50/60 Hz common mode, typical | dB | > 80 |
| **Common-mode voltage**, max. (to housing and supply ground) | V | ±30 |
| **Non-linearity** | % | 0.05 of full scale value |
| **Zero drift** | K / 10 K | 0.05 of full scale value |
| **Full-scale drift** | K / 10 K | 0.05 of measured value |

## Specifications for ClipX (continued)

## Input / Output

| Analog output | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Voltage output** | | |
| **Accuracy class** | | 0.05 |
| **Number** | | 1 |
| **Signal sources** | | All measurement signals, all calculation channels, data from ClipX bus, fieldbus and Ethernet |
| **Output signal** | V | ± 10; reversible, short-circuit proof |
| **D/A converter resolution** | bit | 16 |
| **Output rate, max.** | kHz | 19.2 |
| **Cutoff frequency (-3 dB)** | kHz | 2 |
| **Output resistance** | Ω | < 320 |
| **Permissible input impedance** | | 10 kΩ II 20 nF |
| **Permissible cable length,** max. | m | 100 |
| **Noise (peak-to-peak)** | mV | < 10 |
| **Non-linearity (INL)** Integral Non Linearity | LSB | < ±27 |
| **Zero drift** rel. to full scale | mV / 10 K | < 2 |
| **Full-scale drift** rel. to output value | mV / 10 K | < 2 |
| **Current output** | | |
| **Accuracy class** | | 0.05 |
| **Number** | | 1 |
| **Signal sources** | | All measurement signals, all calculation channels, data from ClipX bus, fieldbus and Ethernet |
| **Output signal** | mA | 4 … 20 mA, reversible, short-circuit proof |
| **D/A converter resolution** | bit | 16 |
| **Output rate, max.** | kHz | 19.2 |
| **Cutoff frequency (-3 dB)** | kHz | 2 |
| **Permitted burden** | Ω | < 400 |
| **Permissible cable length,** max. | m | 100 |
| **Noise (peak-to-peak)** | µA | < 60 |
| **Non-linearity (INL)** Integral Non Linearity | LSB | < ±27 |
| **Zero drift** rel. to full scale | µA / 10 K | < 5 |
| **Full-scale drift** rel. to output value | µA / 10 K | < 10 |
| **Digital inputs** | | **BM40, BM40PB, BM40IE** |
| **Number** | | 2 |
| **Functions** | | Zero, tare, reset limit value, digital output, parameter set selection (bit-coded), flags for calculation channels |
| **Switching time** | ms | < 1 |
| **Input signal range** | V | 0 … 30 |
| Maximum permitted input signal range | V | 30 |
| Low state input | V | 0 … 5 (or open) |
| High state input | V | 10 … 30 |
| **Input resistance (nominal)** | kΩ | 2.4 |
| **Cable length,** max. | m | 100 |
| **Cable type** (required in the event of interference) | | shielded |

## Specifications for ClipX (continued)

| Digital outputs | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Number** | | 2, short-circuit proof |
| **Functions** | | Limit value, digital input, measured value/system status, fieldbus flag, current parameter set number (bit-coded), calculation channel flags |
| **Switching time** | ms | < 1 |
| **Input voltage** | V | Operating voltage |
| **Output current per output, max.** | mA | 200 |
| **Output current (outputs total), max.** | mA | 400 |
| **Output impedance** | Ω | < 1 |
| **Start-up behavior** | | Low until the ClipX transmits the required level |

## Ethernet access

| Access method and parameters | | BM40, BM40PB, BM40IE |
|---|---|---|
| **Maximum number of connections (including in parallel)** | | 2 x web server, 1 x TCP/IP, 2 x OPC UA |
| **Direct access via Ethernet (TCP/IP)** | | Starting with firmware 1.2 |
| **Port** | | 55,000 |
| **Access method** | | SDO read and write commands, access to ClipX FIFO |
| **OPC UA Server** | | Starting with hardware 2.0 and firmware 1.4 or higher |
| **Profiles** | | Micro |
| **Transport** | | TCP/IP binary |
| **Security** | | Username and Password |
| **Methods** | | Supported |
| **Historical data access** | | Not supported |
| **Number of sessions** | | 2 |
| **Subscriptions per session** | | 1 |
| **Items per subscription** | | 6 |
| **Item queue size** | | 10 |
| **Minimum publishing interval** | ms | 100 |
| **Minimum sample interval** | ms | 20 |

## Fieldbuses

| PROFIBUS | | BM40PB |
|---|---|---|
| **Bit rate** | kBit/s | 9.6 … 12,000 auto-detect |
| **Node address** | | 3 - 126<br>adjustable via the web user interface<br>Factory setting: 126 |
| **Configuration data, max.** | bytes | 244 |
| **Logical slots** | | 30 |
| **Cyclic output data (master -> ClipX), max.** | bytes | 160 |
| **Cyclic input data (ClipX -> master), max.** | bytes | 160 |
| **Cycle time (slave interval), min.** | ms | 0.6 |
| **Acyclic data protocol** | | DP V1 Class 1 and Class 2<br>A list with the data objects can be downloaded via the web user interface |
| **Acyclic data, max.** | bytes | 240 |
| **Male connector** | | D-Sub 9-pin; galvanically isolated from supply and measurement ground |
| **PROFIBUS Ident No.** | | 0x1015 |

## Specifications for ClipX (continued)

| Industrial Ethernet IE | | BM40IE |
|---|---|---|
| **The operator can switch fieldbus type in the BM40IE via the ClipX web server** | | |
| **EtherCAT®[1)]** | | |
| **Type** | | EtherCAT complex slave |
| **Cable type** | | Standard CAT-5, shielded |
| **Cable length, max.** | m | 100 |
| **Connector socket** | | 2x RJ45 (IN / OUT) |
| **Hot-plug possible** | | Yes |
| **Input data, max.** | bytes | 166 |
| **Output data, max.** | bytes | 44 |
| **Online device description** | | CAN over EtherCAT Object Dictionary (ESI file not required) |
| **Offline device description** | | ESI file stored in the device |
| **Data transfer rate, max.** | kHz | 4 |
| **Distributed clocks**<br>Minimum cycle time | <br>µs | Supported, 32 bits<br>250 |
| **EtherNet/IP™[2)]** | | |
| **Type** | | Communication adapter |
| **Cable type** | | Standard CAT-5, shielded |
| **Cable length, max.** | m | 100 |
| **Connector socket** | | 2 x RJ45 |
| **Input data, max.** | bytes | 166 |
| **Output data, max.** | bytes | 44 |
| **IO connection types** | | Exclusive owner, Listen only, Input only |
| **IO connection trigger types** | | Cyclic, minimum 1 ms[3)],<br>Application triggered, minimum 1 ms[3)],<br>Change of state, minimum 1 ms[3)] |
| **Explicit messages connections** | | 10 |
| **Implicit messages connections** | | 5 |
| **Unconnected Message Manager (UCMM)** | | 10 |
| **Configuration control** | | STATIC, BOOTP, DHCP |
| **Bit rates** | Mbit/s | 10, 100 |
| **Duplex modes** | | Half, full, auto negotiation |
| **Data transport layer** | | Ethernet II, IEEE 802.3 |
| **Address collision detection** | | Supported |
| **Device level ring** | | Supported |
| **Integrated switch** | | Supported |
| **Reset services** | | Type 0, type 1 |
| **Quick connect** | | Not supported |
| **Tags** | | Not supported |
| **CIP sync** | | Not supported |

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

2) EtherNet/IP™ is a trademark of ODVA Inc. For more information regarding ODVA, visit www.odva.org.

3) Depends on the number of connections and the IO quantities.

## Specifications for ClipX (continued)

| **PROFINET** | | |
|---|---|---|
| **Cable type** | | Standard CAT-5, shielded |
| **Cable length, max.** | m | 100 |
| **Connector socket** | | 2x RJ45 (port 1 / port 2) |
| **Realtime classes** | | 1 (“RT”) / 3 (“IRT”) |
| **Device access point “slow”** | | |
| Cycle time Class 1 | ms | 1 / 2 / 4 |
| Cycle time Class 3 | ms | 1 / 2 / 4 |
| Slots / max. number of modules | - | 30 |
| Input data, max. | bytes | 180 |
| Output data, max. | bytes | 100 |
| **Device access point “fast”** | | |
| Cycle time Class 1 | ms | 1 / 2 / 4 |
| Cycle time Class 3 | ms | 0.25 / 0.5 / 1 / 2 / 4 |
| Slots / max. number of modules | | 6 |
| Input data, max. | bytes | 60 |
| Output data, max. | bytes | 40 |
| **Supported protocols** | | RTC (Real Time Cyclic)<br>Class 1, unsynchronized<br>Class 3, synchronized |
| | | RTA - Real Time Acyclic |
| | | DCP - Discovery and Configuration |
| | | DCE/RPC - Distributed Computing Environment - Connectionless Remote Procedure Calls |
| | | LLDP - Link Layer Discovery Protocol |
| | | PTCP - Precision Transparent Clock Protocol |
| | | SNMP - Simple Network Management Protocol |
| **Media redundancy** | | MRP client |
| **Identification & maintenance** | | I&M0 … I&M3 read and write |

## Specifications for ClipX (continued)

## Signal delays (ms)

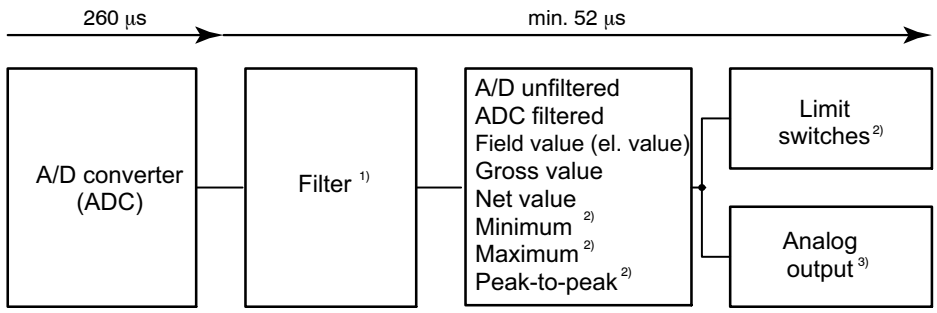
**The following table contains the phase delays of the A/D converter plus digital filter. Some filter frequencies are only possible with a DC amplifier. The bandwidth with DC and the digital filter switched off (Filter OFF) is 3800 Hz. The filter phase delay is then 0 ms, meaning the phase delay of the A/D converter with no filter is 260 µs.**

| Cut-off frequency in Hz (-3 dB) | Runtime with Bessel filter in ms | Runtime with Butterworth filter in ms |
|---|---|---|
| **3000 (DC only)** | 0.403 | 0.480 |
| **2500 (DC only)** | 0.432 | 0.524 |
| **2000 (DC only)** | 0.475 | 0.590 |
| **1500 (DC only)** | 0.547 | 0.700 |
| **1000 (DC only)** | 0.690 | 0.920 |
| **800 (DC only)** | 0.798 | 1.085 |
| **750 (DC only)** | 0.833 | 1.140 |
| **600 (DC only)** | 0.977 | 1.360 |
| **500 (DC only)** | 1.120 | 1.580 |
| **400 (DC only)** | 1.335 | 1.910 |
| **350 (DC only)** | 1.489 | 2.146 |
| **280 (DC only)** | 1.796 | 2.617 |
| **250 (DC only)** | 1.980 | 2.900 |
| **200** | 2.410 | 3.560 |
| **160** | 2.948 | 4.385 |
| **150** | 3.127 | 4.660 |
| **120** | 3.843 | 5.760 |
| **100** | 4.560 | 6.860 |
| **80** | 5.635 | 8.510 |
| **75** | 5.993 | 9.060 |
| **60** | 7.427 | 11.260 |
| **50** | 8.860 | 13.460 |
| **40** | 11.010 | 16.760 |
| **35** | 12.546 | 19.117 |
| **30** | 14.593 | 22.260 |
| **25** | 17.460 | 26.660 |
| **20** | 21.760 | 33.260 |
| **16** | 27.135 | 41.510 |
| **15** | 28.927 | 44.260 |
| **12** | 36.093 | 55.260 |
| **10** | 43.260 | 66.260 |
| **8** | 54.010 | 82.760 |
| **7.5** | 57.593 | 88.260 |
| **6** | 71.927 | 110.260 |
| **5** | 86.260 | 132.260 |
| **4** | 107.76 | 165.26 |

## Specifications for ClipX (continued)

| Cut-off frequency in Hz (-3 dB) | Runtime with Bessel filter in ms | Runtime with Butterworth filter in ms |
|---|---|---|
| **3.5** | 123.12 | 188.83 |
| **3** | 143.59 | 220.26 |
| **2.5** | 172.26 | 264.26 |
| **2** | 215.26 | 330.26 |
| **1.6** | 269.01 | 412.76 |
| **1.2** | 358.59 | 550.26 |
| **1** | 430.26 | 660.26 |
| **0.8** | 537.76 | 825.26 |
| **0.75** | 573.59 | 880.26 |
| **0.6** | 716.93 | 1100.26 |
| **0.5** | 860.26 | 1320.26 |
| **0.4** | 1075.26 | 1650.26 |
| **0.35** | 1228.83 | 1885.97 |
| **0.28** | 1535.97 | 2357.40 |
| **0.25** | 1720.26 | 2640.26 |
| **0.2** | 2150.26 | 3300.26 |
| **0.16** | 2687.76 | 4125.26 |
| **0.15** | 2866.93 | 4400.26 |
| **0.1** | 4300.26 | 6600.26 |
| **0.075** | 5733.59 | 8800.26 |
| **0.05** | 8600.26 | 13200.26 |
| **0.035** | 12286.0 | 18857.4 |
| **0.025** | 17200.3 | 26400.3 |
| **0.02** | 21500.3 | 33000.3 |

### Group 1: Measured values




1) Filter off: 0 s; Runtime filter plus A/D converter see table above; The result is the time for an output signal of 50% of the full scale value with a jump at the input.

2) These signals can also use other sources. The phase delays of the source signals must then be added.

3) If the analog output is to output a value from this group, you must add an additional 52 µs. If you are using a source from a different group, you must add the phase delay of the source signal to the 52 µs.

**Fig. 1: Minimum phase delays for group 1: 52 µs plus A/D converter conversion time**

Some signals might also have sources from other groups. For example, the analog output might deliver a signal from the ClipX bus. In these cases,you must add the phase delay of the source signal's group in order to get the total phase delay:

**Example 1**

Phase delay from input, e.g. 10 V, 20 mA or DC full/half bridge, to analog output (10 V) with a Bessel filter at 1 kHz:

A/D converter (ADC) plus filter: 690 µs
Analog output: 52 µs

Added to this is a jitter of up to 52 µs, as the A/D converter only starts a new conversion every 52 µs. So the total phase delay is 742 … 797 µs.

**Group 2: Flags, digital I/O, calculated values, ClipX bus**

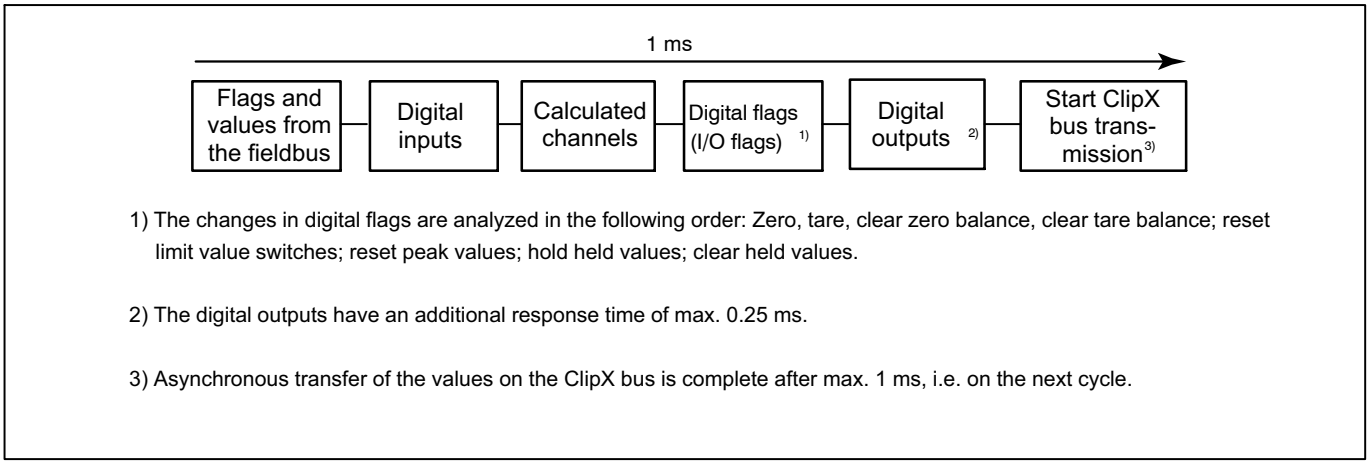



**Fig. 2: Maximum phase delay for group 2: 1 ms**

**Example 2**

Phase delay from input (see group 1) to a digital output with a Bessel filter at 1 kHz, limit value switch at half the step height.

A/D converter (ADC) plus filter: 690 µs
Group 2: 1 ms
Digital output: max. 250 µs response time

Added to this is a jitter of up to 52 µs, as the A/D converter is not synchronized with group 1. In the best case, a value is available at the start of the analysis in group 2 and can be outputted directly at the digital output for example. So the total phase delay is 940 … 1992 µs.

**Example 3**

Phase delay of a value from the ClipX bus via a limit value switch to a digital output.

ClipX bus: 1 ms
Limit value switch: 52 µs
Digital output: 1 ms plus max. 250 µs response time

This result in a total phase delay of 2.3 ms. However, you must add the phase delay in the device that places the value on the ClipX bus in order to get the time from the sensor until a response occurs.

## Specifications for ClipX (continued)

### Group 3: Data from fieldbus master to ClipX

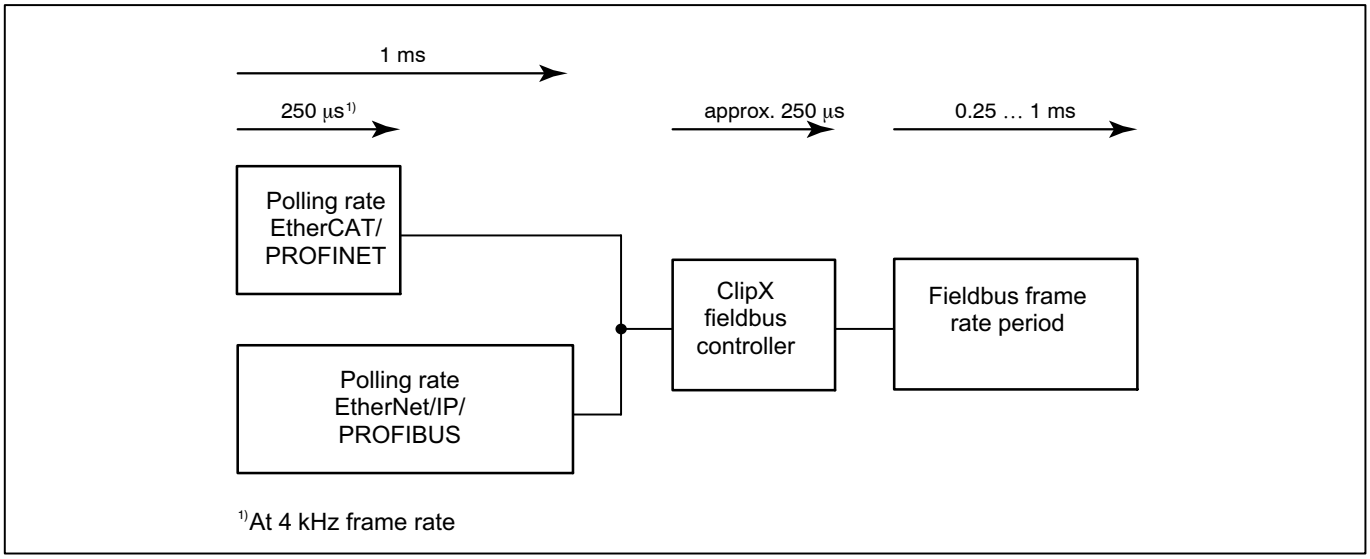



**Fig. 3: Phase delay for group 3**

### Group 4: Data from ClipX to fieldbus master

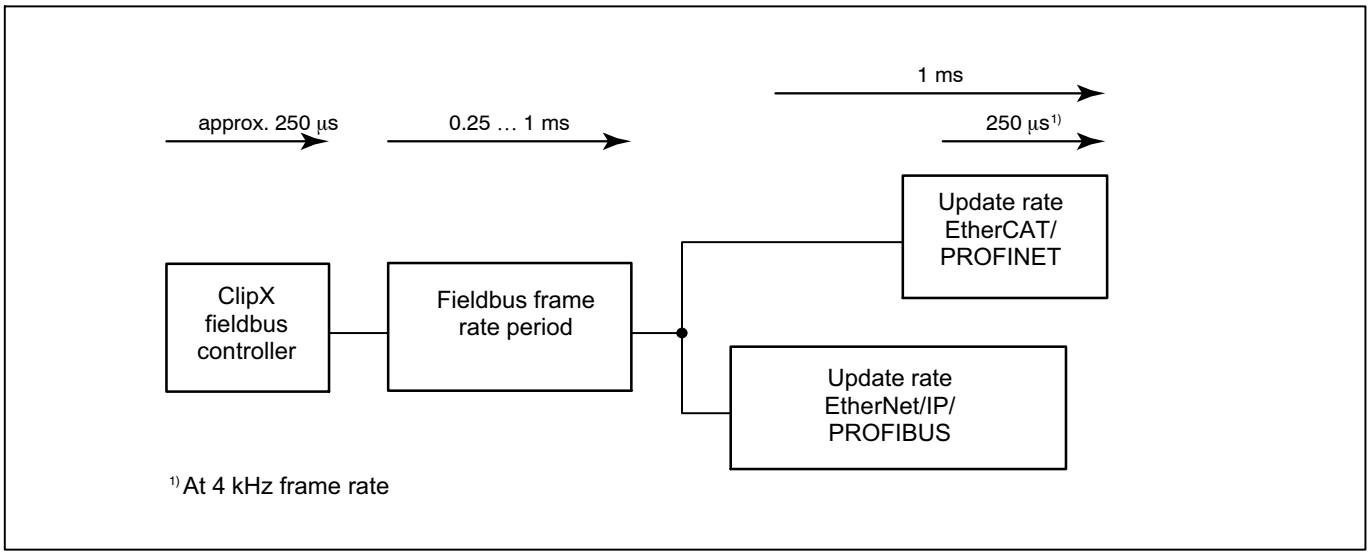
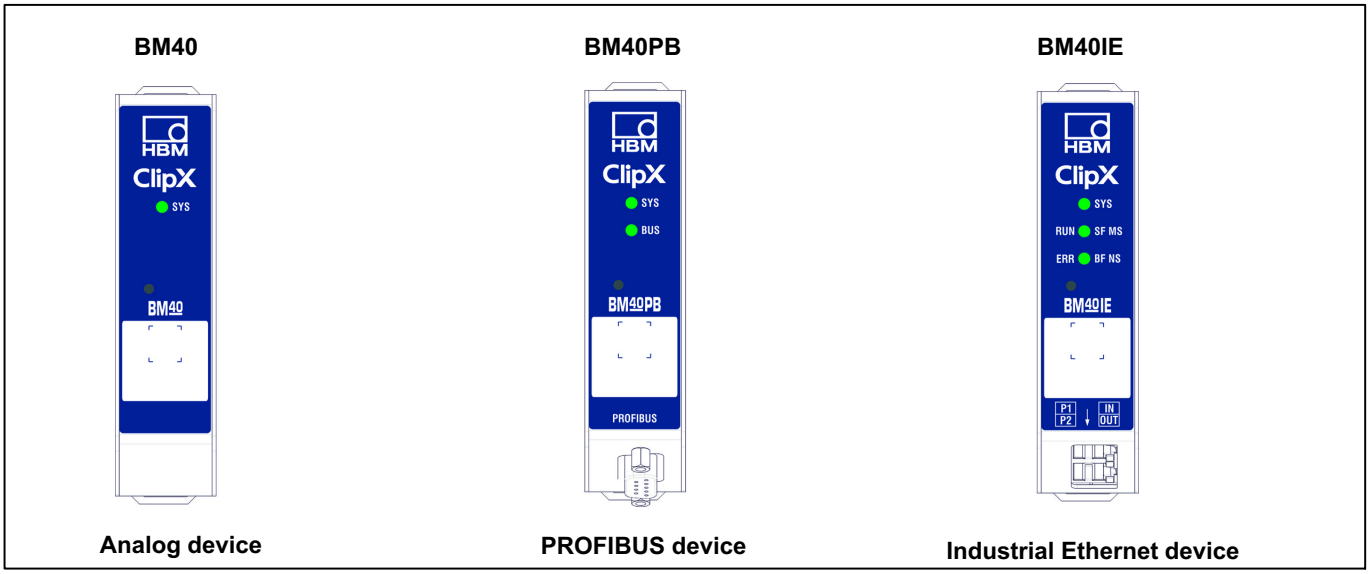


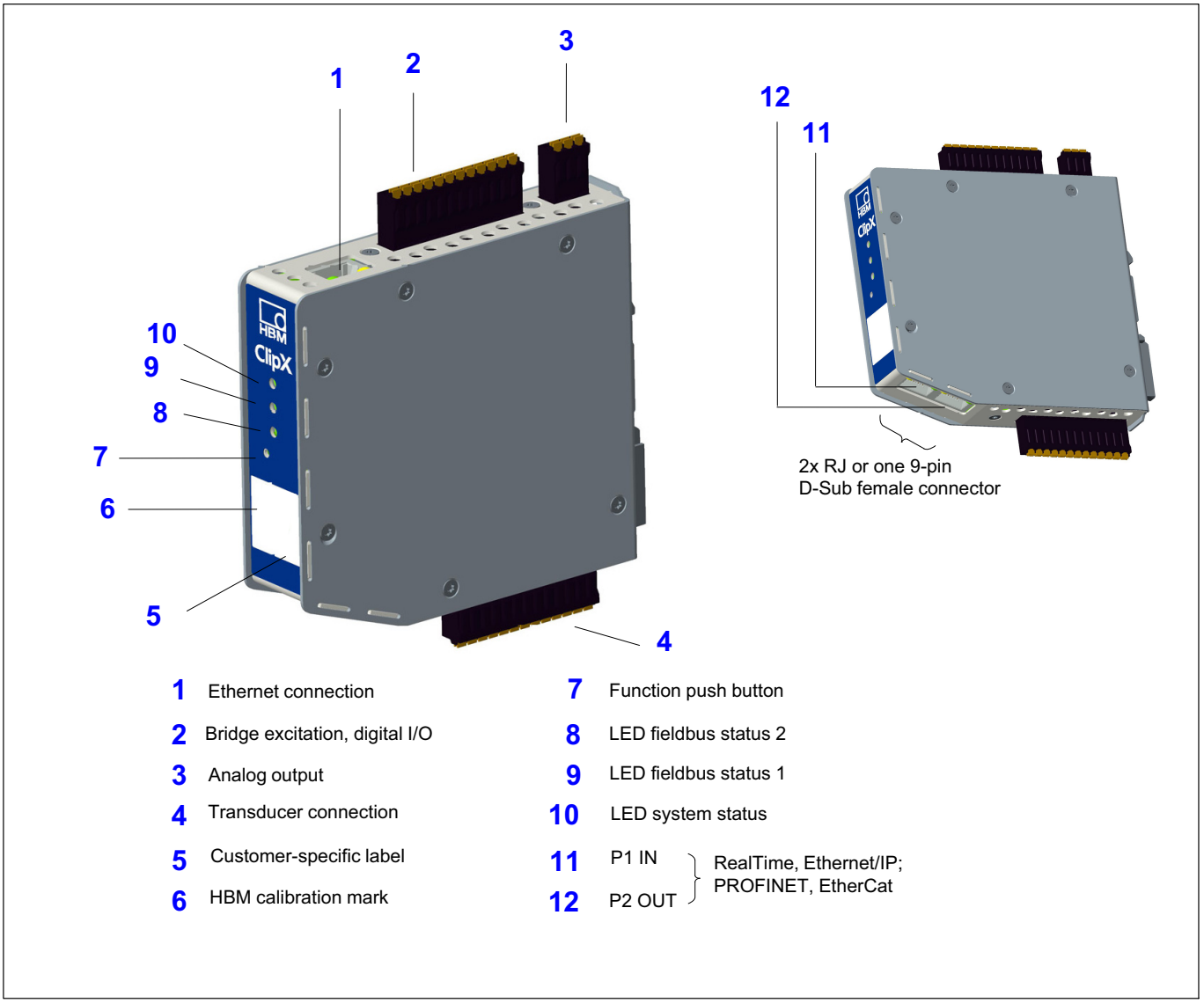

**Fig. 4: Phase delay for group 4**

## Specifications for ClipX (continued)

### ClipX variants




### Function overview




| | | | | |
|---|---|---|---|---|
| 1 | Ethernet connection | 7 | Function push button | |
| 2 | Bridge excitation, digital I/O | 8 | LED fieldbus status 2 | |
| 3 | Analog output | 9 | LED fieldbus status 1 | |
| 4 | Transducer connection | 10 | LED system status | |
| 5 | Customer-specific label | 11 | P1 IN | RealTime, Ethernet/IP; PROFINET, EtherCat |
| 6 | HBM calibration mark | 12 | P2 OUT | |

## Pin assignment

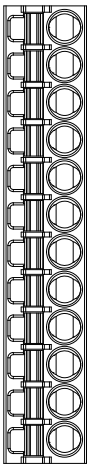
**1** **Ethernet (communication); RJ45**

Standard assignment



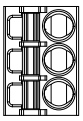

**Plug terminals :**

**2** **Supply, digital I/O, ClipX bus, 12-pin** (Phoenix MC1.5/12-G-3.5)



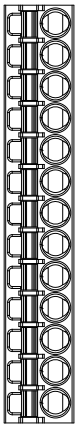
| | |
|---|---|
| 24 V | Power supply |
| 0 V | Power supply / Digital Out GND |
| DO1 | Digital Out 1 |
| DO2 | Digital Out 2 |
| DI1 | Digital In 1 |
| DI2 | Digital In 2 |
| ⊥ 0I | Digital In GND |
| Sync | |
| CxB | ClipX bus B (RS485-) |
| ⊥ X | ClipX bus GND |
| CxA | ClipX bus A (RS485+) |
| ⏚ | |

**3** **Analog output, 3-pin** (Phoenix MC1.5/12-G-3.5)



| | |
|---|---|
| ⏚ | |
| ⊥ AO | Analog Out Gnd |
| AO | Analog Out |

**4** **Transducer, 13-pin** (Phoenix MC1.5/13-G-3.5)



| | |
|---|---|
| Pt100 | |
| TEDS | |
| ⊥ S | |
| 4 | measurement signal - |
| 1 | measurement signal + |
| 2' | sense lead - |
| 2 | bridge excitation voltage - |
| 3' | sense lead + |
| 3 | bridge excitation voltage + |
| ⏚ | Outer shield |
| ⊥ AI | Cable shield |
| I IN | |
| U IN | |




Shield connection clamp for strain relief (included with delivery)



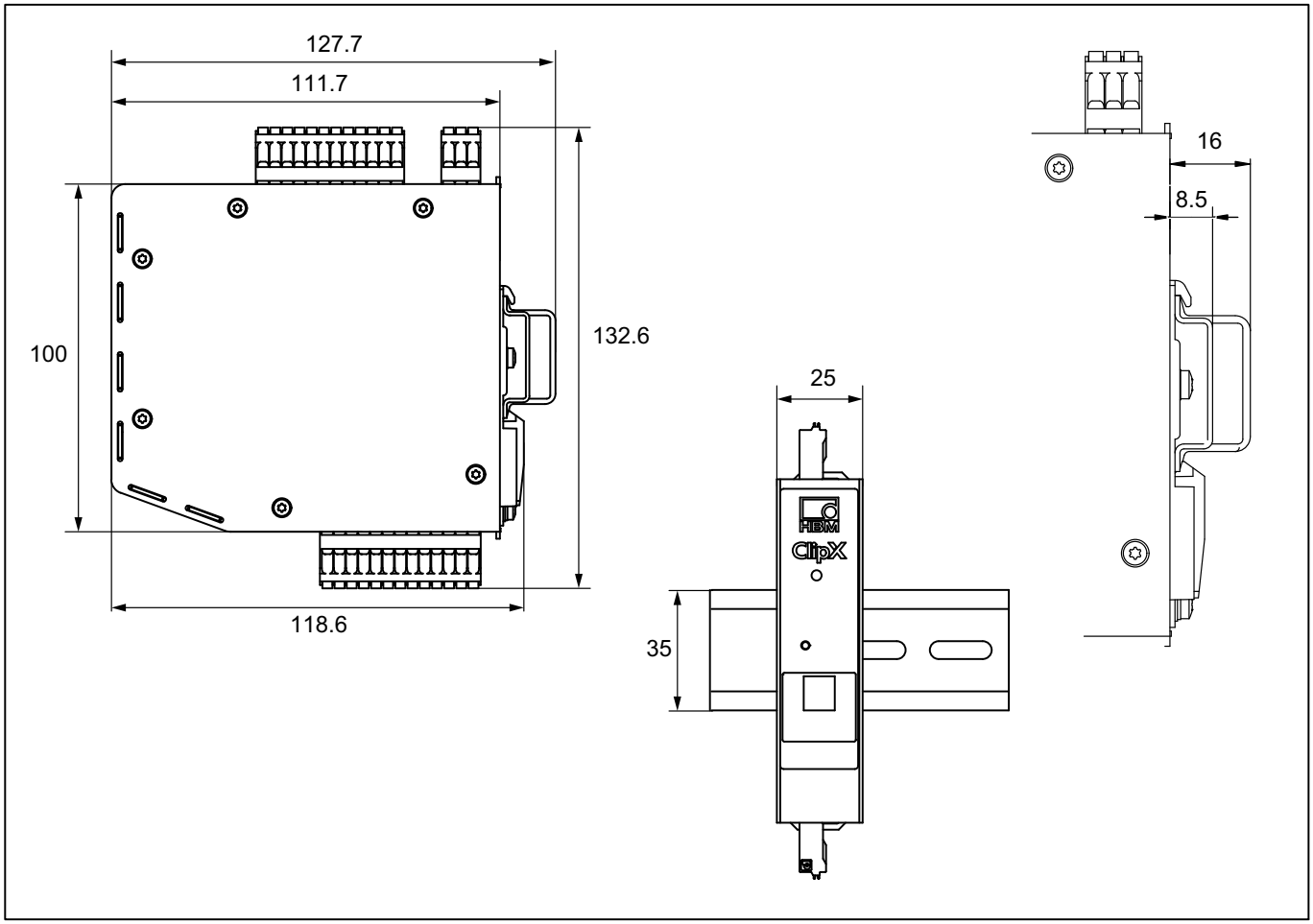
**Alternatively to plug terminals:**

Screw terminals, obtained directly from Phoenix



## Specifications for ClipX (continued)

### Dimensions




**Notice**: ClipX devices can be manually fitted to the DIN rail and removed without the need for tools. To help with construction, ready-prepared ePLAN macros (no license required) and 3D STEP files are available free of charge at https://www.hbm.com/ClipX.

### Replacement parts

| Accessories | Ordering number |
|---|---|
| **Ethernet cable**<br>For direct operation of devices on a PC or laptop, length 2 m, type CAT5+ | 1-KAB239-2 |
| **ClipX plug set (3x Push-in)**<br>Three-piece plug terminal set for sensor connection, power supply and analog output, including coding pins | 1-CON-S1019 |
| **Shield connection clamp ME-SAS MINI - 2200456 from PHOENIX**<br>Shield connection clamp for cable strain relief | 1-CON-A1023 |

**Notice**: A plug terminal set and a shield connection clamp are included with the delivery

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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