# Q.bloxx XL A106

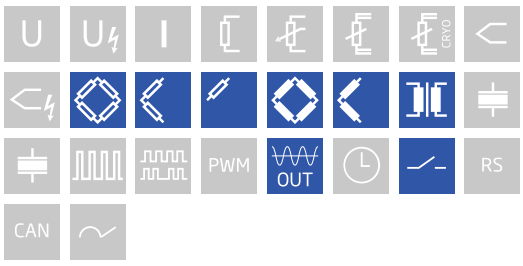
## Measurement Module for Strain Gage and LVDT/RVDT

Q.bloxx XL is a new addition to the Q.series product family - the ideal DAQ solution for widely distributed installations that require higher performance and custom sensor terminations. Q.bloxx XL products are packaged in modular, DIN Rail mountable enclosures that easily snap together for system expansion. Flexibility in distribution allows for highly synchronized data that is less prone to noise due to shorter sensor cable runs to the subject.

- RS485 fieldbus interface up to 48 Mbps: LocalBus, up to 115.2 kbps: Modbus-RTU, ASCII
- Connectable to Controller Q.station X
- Electromagnetic Compatibility according to EN61000-4 and EN55011
- Power supply 10 ... 30 VDC
- DIN rail mounting (EN60715)


## Key Features

- **2 galvanically isolated analog inputs channels**
  Strain gage and inductive half and full bridges, LVDT, RVDT
  quarter bridge with completion terminal
- **DC and carrier frequency (CF) principle**
  2.5 and 5 VDC excitation, 2.5 and 5 VDCeff excitation carrier frequency, 600 Hz or 4.8 kHz configurable per channel
- **2 Analog output channels**
  ± 10 VDC, 20 kHz update rate per channel
- **High-accuracy digitization**
  24-bit ADC, 20 kHz sample rate per channel
- **4 digital I/Os**
  Input: state, tare, memory reset, output: state, alarm, threshold
- **Signal conditioning**
  Linearization, filtering, average, scaling, min/max, RMS, arithmetic, alarm
- **3-Way galvanic isolation**
  Channel to channel, channel to power supply, and channel to bus

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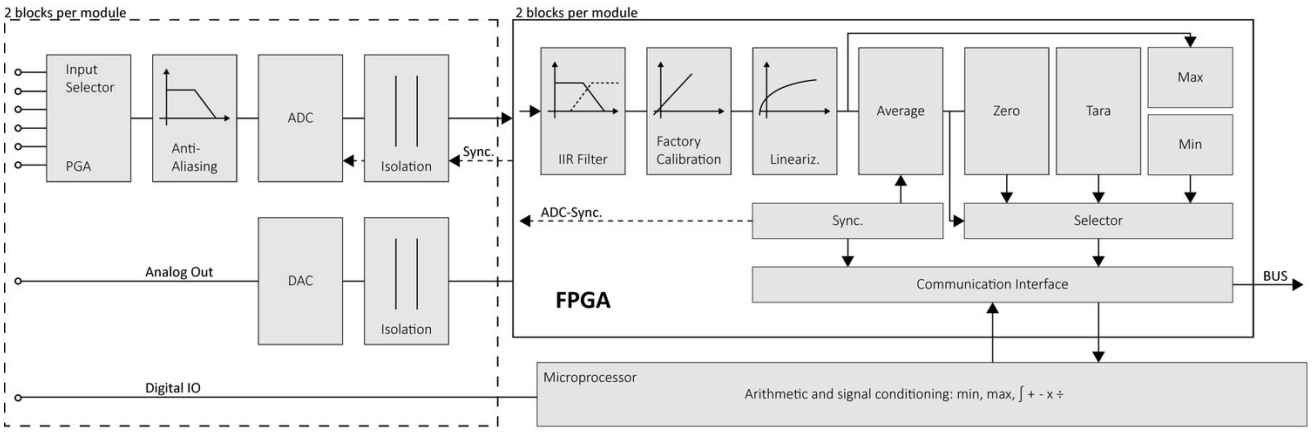
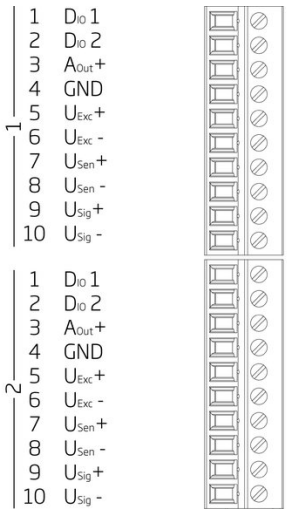
## Measurement Module for Strain Gage and LVDT/RVDT

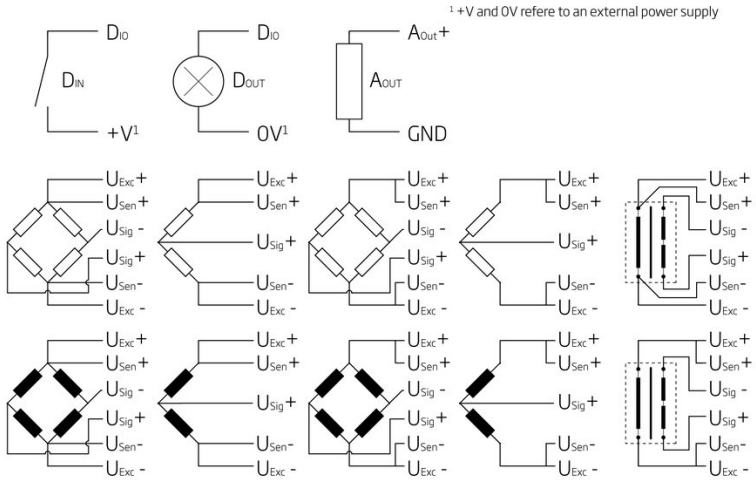
## Block diagram




## Technical Data

### Terminal assignment 10pole screw




### Analog Input

| | |
|---|---|
| Channels | 2 |
| Input impedance | > 10 MΩ |
| Isolation voltage | 500 VDC channel to channel, to power supply, channel to bus [1] |

[1] noise pulses up to 1000 VDC, continuous up to 250 VDC

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## Measurement Module for Strain Gage and LVDT/RVDT

### Strain Gage Measurement

| | | | | |
|---|---|---|---|---|
| Bridge configuration(s) | Resistive full-bridge (4/6-wire)<br>resistive half-bridge (3/5-wire)<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | |
| Allowable sensor cable length | < 30 m | | | |
| Shunt resistor | 100 kΩ internal resistor | | | |
| Bridge excitation | 2.5 - 5 VDC<br>2.5 - 5 Veff (Carrier Frequency) | | | |
| Bridge excitation stability | < 0.01 % / 24 hrs | | | |
| Bridge excitation drift | < 0.02 % / 10 K | | | |
| | **5 VDC** | **5 Veff (CF)** | **2.5 VDC** | **2.5 Veff (CF)** |
| Allowable sensor resistance | > 300 Ω | >300 Ω | >100 Ω | >100 Ω |
| Input range | ± 1.25 mV / V | ± 1.25 mV / V | ± 2.5 mV / V | ± 2.5 mV / V |
| | ± 2.5 mV / V | ± 2.5 mV / V | ± 5 mV / V | ± 5 mV / V |
| | ± 25 mV / V | ± 25 mV / V | ± 50 mV / V | ± 50 mV / V |
| | ± 50 mV / V | ± 50 mV / V | ± 100 mV / V | ± 100 mV / V |
| | ± 100 mV / V | ± 100 mV / V | ± 200 mV / V | ± 200 mV / V |
| | ± 200 mV / V | ± 200 mV / V | ± 400 mV / V | ± 400 mV / V |
| | ± 500 mV / V | ± 500 mV / V | ± 1000 mV / V | ± 1000 mV / V |
| Long-term stability | < 0.2 µV / V / 24 hrs (DC excitation)<br>< 0.1 µV / V / 24 hrs (CF excitation) | | < 2 µV / V / 8000 hrs (DC excitation)<br>< 1 µV / V / 8000 hrs (CF excitation) | |
| Temperature drift (range 2.5 mV/V) | < 0.2 µV / V / 10 K offset drift | | < 0.05 % / 10 K gain drift | |
| Noise (range 2.5 mV/V) | 0.3 µV / V at 0 up to 10 Hz | | 1 µV / V at 10 up to 1 kHz | |

### Strain Gage Measurement (Supply: 5 VDC)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bridge configuration(s) | Resistive full-bridge (4/6-wire), resistive half-bridge (3/5-wire)<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | | | | |
| Allowable sensor cable length | < 30 m | | | | | | |
| Shunt resistor | 100 kΩ internal resistor | | | | | | |
| Bridge power supply stability | < 0.01 % / 24 h | | | | | | |
| Bridge power supply drift | < 0.02 % / 10 K | | | | | | |
| Allowable sensor resistance | > 300 Ω | | | | | | |
| Measurement range | ± 500 mV / V | ± 200 mV / V | ± 100 mV / V | ± 50 mV / V | ± 25 mV / V | ± 2.5 mV / V | ± 1.25 mV / V |
| Margin of error | 200 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 10 µV / V | 1 µV / V | 0.5 µV / V |
| Long-term stability 24 h | 20 µV / V | 8 µV / V | 4 µV / V | 2 µV / V | 1 µV / V | 0.1 µV / V | 0.05 µV / V |
| 8000 h | 200 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 10 µV / V | 1 µV / V | 0.5 µV / V |
| Temperature drift offset drift | 20 µV / V / 10 K | 8 µV / V / 10 K | 4 µV / V / 10 K | 2 µV / V / 10 K | 1 µV / V / 10 K | 0.1 µV / V / 10 K | 0.05 µV / V / 10 K |
| Measuring range end value | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K |
| Noise no filter | 60 µV / Vpp | 24 µV / Vpp | 11 µV / Vpp | 8 µV / Vpp | 3.8 µV / Vpp | 4.5 µV / Vpp | 2.8 µV / Vpp |
| Noise 1kHz filter | 18 µV / Vpp | 9 µV / Vpp | 4 µV / Vpp | 3.5 µV / Vpp | 1.6 µV / Vpp | 2.2 µV / Vpp | 1.4 µV / Vpp |
| Noise 10 Hz filter | 1 µV / Vpp | 0.6 µV / Vpp | 0.3 µV / Vpp | 0.22 µV / Vpp | 0.2 µV / Vpp | 0.2 µV / Vpp | 0.1 µV / Vpp |

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## Measurement Module for Strain Gage and LVDT/RVDT

### Strain Gage Measurement (Supply: 5 Veff 600 Hz TF-excitation)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bridge configuration(s) | Resistive full-bridge (4/6-wire), resistive half-bridge (3/5-wire)<br>inductive full-bridge (4/6-wire), inductive half-bridge (3/5-wire), LVDT<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | | | | |
| Bridge power supply stability | < 0.01 % / 24 h | | | | | | |
| Bridge power supply drift | < 0.02 % / 10 K | | | | | | |
| Allowable sensor resistance | > 300 Ω | | | | | | |
| Measurement range | ± 500 mV / V | ± 200 mV / V | ± 100 mV / V | ± 50 mV / V | ± 25 mV / V | ± 2.5 mV / V | ± 1.25 mV / V |
| Margin of error | 200 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 10 µV / V | 1 µV / V | 0.5 µV / V |
| Long-term stability 24 h | 20 µV / V | 8 µV / V | 4 µV / V | 2 µV / V | 1 µV / V | 0.1 µV / V | 0.05 µV / V |
| 8000 h | 200 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 10 µV / V | 1 µV / V | 0.5 µV / V |
| Temperature drift offset drift | 20 µV / V / 10 K | 8 µV / V / 10 K | 4 µV / V / 10 K | 2 µV / V / 10 K | 1 µV / V / 10 K | 0.1 µV / V / 10 K | 0.05 µV / V / 10 K |
| Measuring range end value | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K |
| Noise 100 Hz filter | 27 µV / Vpp | 12 µV / Vpp | 6 µV / Vpp | 3.5 µV / Vpp | 1.5 µV / Vpp | 0.6 µV / Vpp | 1.35 µV / Vpp |
| Noise 10 Hz filter | 2.5 µV / Vpp | 1.2 µV / Vpp | 0.6 µV / Vpp | 0.4 µV / Vpp | 0.2 µV / Vpp | 0.16 µV / Vpp | 0.1 µV / Vpp |

### Strain Gage Measurement (Supply: 5 Veff 4.8 kHz TF-excitation)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bridge configuration(s) | Resistive full-bridge (4/6-wire), resistive half-bridge (3/5-wire)<br>inductive full-bridge (4/6-wire), inductive half-bridge (3/5-wire), LVDT<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | | | | |
| Bridge power supply stability | < 0.01 % / 24 h | | | | | | |
| Bridge power supply drift | < 0.02 % / 10 K | | | | | | |
| Allowable sensor resistance | > 300 Ω | | | | | | |
| Measurement range | ± 500 mV / V | ± 200 mV / V | ± 100 mV / V | ± 50 mV / V | ± 25 mV / V | ± 2.5 mV / V | ± 1.25 mV / V |
| Margin of error | 200 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 10 µV / V | 2.5 µV / V | 1.25 µV / V |
| Long-term stability 24 h | 20 µV / V | 8 µV / V | 4 µV / V | 2 µV / V | 1 µV / V | 0.25 µV / V | 0.15 µV / V |
| 8000 h | 200 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 10 µV / V | 2.5 µV / V | 1.25 µV / V |
| Temperature drift offset drift | 20 µV / V / 10 K | 8 µV / V / 10 K | 4 µV / V / 10 K | 2 µV / V / 10 K | 1 µV / V / 10 K | 0.2 µV / V / 10 K | 0.1 µV / V / 10 K |
| Measuring range end value | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K |
| Noise no filter | 70 µV / Vpp | 35 µV / Vpp | 15 µV / Vpp | 8 µV / Vpp | 3.8 µV / Vpp | 2.5 µV / Vpp | 1.4 µV / Vpp |
| Noise 1kHz filter | 9 µV / Vpp | 4 µV / Vpp | 2 µV / Vpp | 1.5 µV / Vpp | 0.7 µV / Vpp | 0.7 µV / Vpp | 0.5 µV / Vpp |
| Noise 10 Hz filter | 1.5 µV / Vpp | 0.7 µV / Vpp | 0.4 µV / Vpp | 0.25 µV / Vpp | 0.12 µV / Vpp | 0.2 µV / Vpp | 0.12 µV / Vpp |

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## Measurement Module for Strain Gage and LVDT/RVDT

### Strain Gage Measurement (Supply: 2.5 VDC)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bridge configuration(s) | resistive full-bridge (4/6-wire), resistive half-bridge (3/5-wire)<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | | | | |
| Allowable sensor cable length | < 30 m | | | | | | |
| Shunt resistor | 100 kΩ internal resistor | | | | | | |
| Bridge power supply stability | < 0.01 % / 24 h | | | | | | |
| Bridge power supply drift | < 0.02 % / 10 K | | | | | | |
| Allowable sensor resistance | > 100 Ω | | | | | | |
| Measurement range | ± 1000 mV / V | ± 400 m V / V | ± 200 mV / V | ± 100 mV / V | ± 50 mV / V | ± 5 mV / V | ± 2.5 mV / V |
| Margin of error | 400 µV / V | 160 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 2 µV / V | 0.1 µV / V |
| Long-term stability 24 h | 40 µV / V | 16 µV / V | 8 µV / V | 4 µV / V | 2 µV / V | 0.2 µV / V | 0.01 µV / V |
| 8000 h | 400 µV / V | 160 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 2 µV / V | 0.1 µV / V |
| Temperature drift offset drift | 40 µV / V / 10 K | 16 µV / V / 10 K | 8 µV / V / 10 K | 4 µV / V / 10 K | 2 µV / V / 10 K | 0.2 µV / V / 10 K | 0.01 µV / V / 10 K |
| Measuring range end value | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K |
| Noise no filter | 100 µV / Vpp | 50 µV / Vpp | 25 µV / Vpp | 15 µV / Vpp | 8 µV / Vpp | 8 µV / Vpp | 5 µV / Vpp |
| Noise 1kHz filter | 40 µV / Vpp | 16 µV / Vpp | 8 µV / Vpp | 6 µV / Vpp | 3 µV / Vpp | 4.5 µV / Vpp | 2.2 µV / Vpp |
| Noise 10 Hz filter | 2.5 µV / Vpp | 1 µV / Vpp | 0.5 µV / Vpp | 0.4 µV / Vpp | 0.2 µV / Vpp | 0.3 µV / Vpp | 0.2 µV / Vpp |

### Strain Gage Measurement (Supply: 2.5 Veff 600 Hz TF-Excitation)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bridge configuration(s) | Resistive full-bridge (4/6-wire), resistive half-bridge (3/5-wire)<br>inductive full-bridge (4/6-wire), inductive half-bridge (3/5-wire), LVDT<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | | | | |
| Bridge power supply stability | < 0.01 % / 24 h | | | | | | |
| Bridge power supply drift | < 0.02 % / 10 K | | | | | | |
| Allowable sensor resistance | > 100 Ω | | | | | | |
| Measurement range | ± 1000 mV / V | ± 400 mV / V | ± 200 mV / V | ± 100 mV / V | ± 50 mV / V | ± 5 mV / V | ± 2.5 mV / V |
| Margin of error | 400 µV / V | 160 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 2 µV / V | 0.1 µV / V |
| Long-term stability 24 h | 40 µV / V | 16 µV / V | 8 µV / V | 4 µV / V | 2 µV / V | 0.2 µV / V | 0.01 µV / V |
| 8000 h | 400 µV / V | 160 µV / V | 80 µV / V | 40 µV / V | 20 µV / V | 2 µV / V | 0.1 µV / V |
| Temperature drift offset drift | 40 µV / V / 10 K | 16 µV / V / 10 K | 8 µV / V / 10 K | 4 µV / V / 10 K | 2 µV / V / 10 K | 0.2 µV / V / 10 K | 0.01 µV / V / 10 K |
| Measuring range end value | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K |
| Noise 100 Hz filter | 60 µV / Vpp | 30 µV / Vpp | 10 µV / Vpp | 6 µV / Vpp | 3 µV / Vpp | 1 µV / Vpp | 0.5 µV / Vpp |
| Noise 10 Hz filter | 5 µV / Vpp | 2.5 µV / Vpp | 1.2 µV / Vpp | 0.8 µV / Vpp | 0.5 µV / Vpp | 0.4 µV / Vpp | 0.2 µV / Vpp |

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## Measurement Module for Strain Gage and LVDT/RVDT

### Strain Gage Measurement (Supply: 2.5 Veff 4.8 kHz TF-excitation)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bridge configuration(s) | Resistive full-bridge (4/6-wire), resistive half-bridge (3/5-wire)<br>inductive full-bridge (4/6-wire), inductive half-bridge (3/5-wire), LVDT<br>resistive quarter-bridge 120 Ω or 350 Ω (3-wire, with bridge completion terminal) | | | | | | |
| Bridge power supply stability | < 0.01 % / 24 h | | | | | | |
| Bridge power supply drift | < 0.02 % / 10 K | | | | | | |
| Allowable sensor resistance | > 100 Ω | | | | | | |
| Measurement range | ± 1000 mV/V | ± 400 mV/V | ± 200 mV/V | ± 100 mV/V | ± 50 mV/V | ± 5 mV/V | ± 2.5 mV/V |
| Margin of error | 400 µV/V | 160 µV/V | 80 µV/V | 40 µV/V | 20 µV/V | 5 µV/V | 0.25 µV/V |
| Long-term stability 24 h | 40 µV/V | 16 µV/V | 8 µV/V | 4 µV/V | 2 µV/V | 0.5 µV/V | 0.03 µV/V |
| 8000 h | 400 µV/V | 160 µV/V | 80 µV/V | 40 µV/V | 20 µV/V | 5 µV/V | 0.3 µV/V |
| Temperature drift offset drift | 40 µV/V / 10 K | 16 V/V / 10 K | 8 µV/V / 10 K | 4 µV/V / 10 K | 2 µV/V / 10 K | 0.5 µV/V / 10 K | 0.03 µV/V / 10 K |
| Measuring range end value | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K | 0.05 % / 10 K |
| Noise 1 kHz filter | 140 µV / Vpp | 70 µV / Vpp | 35 µV / Vpp | 16 µV / Vpp | 8 µV / Vpp | 5 µV / Vpp | 3 µV / Vpp |
| Noise 100 Hz filter | 16 µV / Vpp | 8 µV / Vpp | 4 µV / Vpp | 2 µV / Vpp | 1 µV / Vpp | 1 µV / Vpp | 0.8 µV / Vpp |
| Noise 10 Hz filter | 3 µV / Vpp | 1.5 µV / Vpp | 0.8 µV / Vpp | 0.5 µV / Vpp | 0.3 µV / Vpp | 0.3 µV / Vpp | 0.2 µV / Vpp |

### LVDT/RVDT Measurement

| | | |
|---|---|---|
| Sensor connection | 4- / 6-wire | |
| Sensor excitation (selectable) | **5 Veff** | **2.5 Veff** |
| Allowable sensor resistance | > 300 Ω | > 100 Ω |
| Input range | ± 1.25 mV / V | ± 2.5 mV / V |
| | ± 2.5 mV / V | ± 5 mV / V |
| | ± 25 mV / V | ± 50 mV / V |
| | ± 50 mV / V | ± 100 mV / V |
| | ± 100 mV / V | ± 200 mV / V |
| | ± 200 mV / V | ± 400 mV / V |
| | ± 500 mV / V | ± 1000 mV / V |
| Allowable sensor cable length | < 100 m[1] | |
| Long-term stability | < 0.1 µV / V / 24 hrs | < 1 µV / V / 8000 hrs |
| Temperature drift (range 2.5 mV/V) | <0.2 µV / V / 10 K offset drift | < 0.05 % / 10 K gain drift |
| Signal-to-noise ratio | < 0.3 µV / V at 10 Hz | < 1 µV / V at 100 Hz |

[1] low capacity sensor cable is strongly recommended

### Analog Output

| | | |
|---|---|---|
| Channels | 2 | |
| Accuracy | 0.02 % typical | |
| Voltage output | ± 10 VDC | |
| Allowable load resistance | > 2 kΩ | |
| Long-term drift | < 1 mV / 24 hrs | < 2.5 mV / 8000 hrs |
| Temperature drift | < 1 mV /10 K offset drift | < 0.05 % / 10 K gain drift |
| Noise voltage | <2 mV at 10 Hz | < 10 mV at 1 kHz |
| | includes a 3rd order Sallen-Key low-pass filter with a cutoff frequency of 10.4 kHz | |

# Q.bloxx XL A106

## Measurement Module for Strain Gage and LVDT/RVDT

### Digital Input & Output

| | |
|---|---|
| Channels | 4 Configurable I/Os |

| | |
|---|---|
| Input | status |
| Input voltage | 30 VDC max. |
| Logic voltage | < 2 VDC (Low) |
| | > 10 VDC (High) |
| Input type | PNP (current sinking) |

| | |
|---|---|
| Output voltage | 10 to 30 VDC (external supply required) |
| Contact | open drain p-channel MOSFET |
| Load capacity | 30 VDC / 100 mA (ohmic load) |

### Analog-to-Digital Conversion

| | |
|---|---|
| Resolution | 24-bit |
| Sample rate | 20 kHz per channel |
| Modulation method | Sigma-delta |
| Anti-aliasing filter | 2 kHz, 3th order (DC excitation)<br>1 kHz, 3th order (4.8 kHz CF excitation)<br>100 Hz, 3th order (600 Hz CF excitation) |
| Digital filters | Infinite impulse response (IIR), low-pass, high-pass, band-pass, band-stop, Butterworth or Bessel (2nd, 4th, 6th or 8th order), frequency range 0.1 Hz to 1 kHz in steps of 0.1 (adjustable via software) |
| Averaging | Configurable or automatic according to the user-defined data rate |

### Digital-to-Analog Conversion

| | |
|---|---|
| Resolution | 16-bit |
| Update rate | 20 kHz per channel |
| Settling time | 3 µs |

### Communication Interface Localbus

| | |
|---|---|
| Protocols | Proprietary LocalBus (115200 bps to 48 Mbps, latency <100 ns)<br>ASCII (19200 bps to 115200 bps)<br>Modbus RTU |
| Data format | 8E1 |
| Electrical standard | ANSI/TIA/EIA-485-A, 2-wire |

### Power Supply

| | |
|---|---|
| Input voltage | 10 to 30 VDC, overvoltage and overcurrent protection |
| Power consumption | approx. 2 W |
| Input voltage influence | < 0.001 %/V |
| Sensor excitation VS | 20 V up to 30 V |

# Q.bloxx XL A106

## Measurement Module for Strain Gage and LVDT/RVDT

## Environmental Specifications

| | |
|---|---|
| Electromagnetic compatibility (EMC) | according to IEC 61000-4 and EN 55011 |
| Operating temperature | -20 °C to +60 °C |
| Storage temperature | -40 °C to +85 °C |
| Relative humidity | 5 % to 95 % at 50 °C, non-condensing |

## Remarks

| |
|---|
| Are subject to a warm-up period of at least 45 minutes |
| In a controlled electromagnetic environment[1] |
| With configuration: Low-pass 10Hz[2] |
| Specifications subject to change without notice |

1 according to IEC 61326-1:2020

2 unless otherwise stated

## Mechanical information

| | |
|---|---|
| Material | Aluminium and ABS |
| Measurements (W x H x D) | 30 x 145 x 135mm |
| Weight | approx. 500 g |
| Protection class | IP20 |

Data Standard - supported

## Ordering Information

| | |
|---|---|
| Article number | 495329 |
| Accessories | Terminal B4/120-A106, article number 894387 |
| | Terminal B4/350-A106, article number 894488 |


Gantner Instruments

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