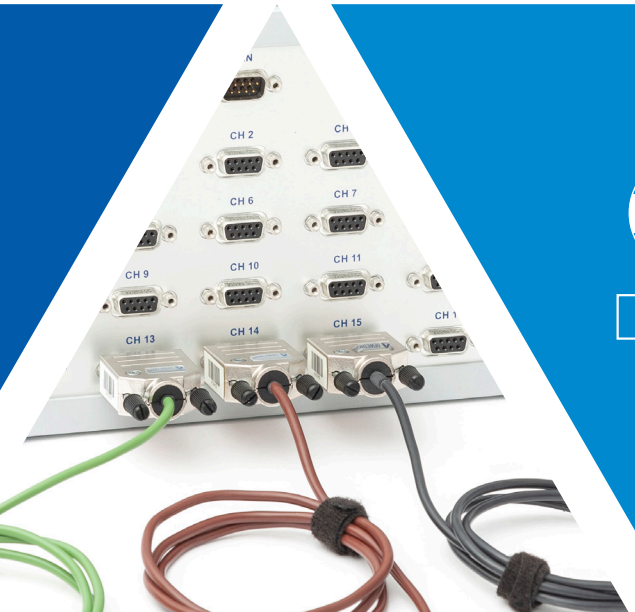
DEWETRON

MSI series with TRION-x-dLV-CB16-D9

TECHNICAL REFERENCE



EN ISO 14001

ISO 9001

Preface

Thank you!

Thank you very much for your investment in DEWETRON's unique data acquisition systems. These are top-quality instruments which are designed to provide you years of reliable service. This guide has been prepared to help you get the most from your investment, starting from the day you take it out of the box, and extending for years into the future.

This guide includes important startup notes, as well as safety notes and information about keeping your DEWETRON system in good working condition over time. However, this manual cannot and is not intended to replace adequate training.

This documentation contains operating as well as safety and care instructions that must be observed by the user. Faultless operation can only be guaranteed by observing these instructions.

Intended use

The TRION-x-dLV-CB16-D9 is a feature expansion box for TRION-1802-dLV-32 and -1600-dLV-32 modules. The box supports up to 16x D-SUB-9 sockets for analog inputs or the use of MSIs (Modular Smart Interfaces) as well as precision ±5 V excitation voltage with remote sense per channel. The TRION-x-dLV-CB16-D9 also features a CAN and digital I/O interface as well as auxiliary sensor supply.

System overview

- 16 channel sensor connection box
- Precision ±5 V excitation voltage with remote sense per channel
- MSI support (Modular Smart Interface)
- Auxiliary sensor supply

Table of contents

Safety

Safety instructions

The following safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. DEWETRON GmbH assumes no liability for the customer's failure to comply with these requirements.

General safety instructions

- Use this system under the terms of the specifications only to avoid any possible danger. If the unit is used in a manner not specified by the manufacturer the protection can be impaired.
- Maintenance is to be executed by qualified staff only.
- DO NOT use the system if equipment covers or shields are removed. If you assume the system is damaged, have it examined by authorized personnel only.
- Any other use than described above may damage your system and is attended with dangers like shortcut, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened (except for changing TRION modules).
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore, if
  - the system is damaged obviously or causes strange noises.
  - the system does not work anymore.
  - the system has been exposed to long storage in adverse environmental.
  - the system has been exposed to heavy shipment strain.
- The warranty is void if damages caused by disregarding this manual. For consequential damages NO liability will be assumed.
- The warranty is void if damages to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE). Exception: changing TRION modules.
- Prevent using metal bare wires as there is a risk of short-circuit and fire hazard.
- Make sure that your hands, shoes, clothes and as well as the floor, the system or measuring leads, integrated circuits etc. are dry.
- Use measurement leads or measurement accessories aligned to the specification of the system only. Fire hazard in case of overload.
- Do not disassemble the system. There is a high risk of getting a perilous electric shock. Capacitors still might charged, even the system has been removed from the power supply.
- The measuring systems are not designed for use at humans and animals.
- Contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Handle the product with care. Shocks, hits and dropping it even from an already lower level may damage your system.

  For exact values refer to the enclosed specifications.
- Also consider the detailed technical reference manual as well as the security advices of the connected systems.
- If you assume the system is damaged, get it examined by authorized personnel only.

Electrical safety instructions

- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- The system is grounded via a protective conductor in the power supply cord. To avoid electric shocks, the protective conductor has to be connected with the ground of the power network. Before connecting the input or output connectors of the system, make sure that there is a proper grounding to guarantee potential free usage. For countries, in which there is no proper grounding, refer to your local legally safety regulations for safety use.
- DC systems: Every DC system has a grounding connected to the chassis (yellow/green safety banana plug).
- Note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, carefully read and understand the corresponding specifications in the product manual.
- The inputs are not, unless otherwise noted (CATx identification), for connecting to the main circuits of category II, III and IV. The measurement category can be adjusted depending on module configuration.
- The power cord or the main power switch separates the system from the power supply. Do not block the power cord or main switch, since it has to be accessible for the users.
- Any direct voltage output is protected with a fuse against short cut and reverse-polarity, but is NOT galvanically isolated (except it is explicit marked on the system).
- Supply overvoltage category is II.
- The system must be connected and operated to an earthed wall socket at the AC mains power supply only (except for DC systems).
- DO NOT touch any exposed connectors or components if they are live wired. The use of metal bare wires is not allowed. There is a risk of short cut and fire hazard.
- The assembly of the system is equivalent to protection class I. For power supply, only the correct power socket of the public power supply must be used, except the system is DC powered.
- Be careful with voltages >25 VAC or >35 VDC. These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- Maximum input voltage for measuring cards are 70 VDC and 46.7 V_{PEAK}
- The electrical installations and equipments in industrial facilities must be observed by the security regulations and insurance institutions.
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.

Ambient safety notices

- This product is intended for use in industrial locations. As a result, this product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interferences to the reception of radio and television broadcasts.
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy overvoltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details refer to the specifications.
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Any use in wet rooms, outdoors or in adverse environmental condition is not allowed. Adverse environmental conditions are:
  - Moisture or high humidity
  - Dust, flammable gases, fumes or dissolver
  - Thunderstorm or thunderstorm conditions (except assembly PNA)
  - Electrostatic fields etc.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Direct exposure of any DEWETRON product to strong sunlight or other heat radiation shall be prevented, as this could excessively heat up the product and lead to permanent damage of the product.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.

Safety notices during operation

- During the use of the system, it might be possible to access another parts of a more comprehensive system. Read and follow the safety instructions provided in the manuals of all other components regarding warning and security advices for using the system.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not covered. Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.

Standards and norms

This product has left the factory in safety-related flawless and proper condition.

In order to maintain this condition and guarantee safety use, the user has to consider the security advices and warnings in this manual.

EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally welltried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for protection of buildings, are excluded from the scope of IEC 61326-3-1.

Typographic conventions

Safety and warning notices

WARNING

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

Notices

NOTICE

This text indicates situations or operation errors which could result in property damage or data loss.

INFORMATION

This text indicates important information or operating instructions. Not observing these instructions could inhibit or impede you from successfully completing the tasks described in this documentation.

Symbols

Denotes a warning that alerts you to take precautions to avoid injury. When this symbol is shown on the product, refer to the technical reference manual (ISO 7000-4034; 2004-01).

Indicates hazardous voltages.

Observe precautions for handling electrostatic sensitive devices.

Indicates the chassis terminal (IEC 60417-5020; 2002-10).

Direct current (IEC 60417-5031; 2002-10)

Alternate current (IEC 60417-5032; 2002-10)

Both direct and alternating current (IEC 60417-5033; 2002-10)

Three-phase alternating current (IEC 60417-5032-1; 2002-10)

Protective conductor terminal (IEC 60417-5019; 2006-08)

Equipment protected throughout by double insulation or reinforced insulation (IEC 60417-5172; 2003-02)

On (power) (IEC 60417-5007; 2002-10)

Off (power) (IEC 60417-5008; 2002-10)

General information

Environmental considerations

The following information refers to the environmental impact of the product and the product end-of-life handling. Observe the following guidelines when recycling a DEWETRON system:

- System and components recycling

The production of these components has required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life. Please recycle this product in an appropriate way to avoid an unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE). Further information about recycling can be found on the DEWETRON website (www.dewetron.com).

- Restriction of hazardous substances

  This product has been classified as Monitoring and Control equipment, and is outside the scope of the 2011/65/EU RoHS Directive. This product is known to contain lead.

Warranty information

A copy of the specific warranty terms applicable to your DEWETRON product and replacement parts can be obtained from your local sales and service office.

Legal information

Restricted rights legend

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Printing history

Refer to the page bottom for printing version.

System setup

TRION-x-dLV-CB16-D9 specifications

TRION-x-dLV-CB16-D9	
Sensor excitation	
– Voltage	±5V ±0.2%; balance around GND; remote sense support
– Maximum current	40 mA per channel
– Protection	Continuous short to ground; short circuit limit is 70 mA
Auxiliary sensor supply	Depending on external power supply; maximal 4 A
– Protection	– Self-resetting fuse; 4 A fuse for each of the 4 channels
Input connectors	
– Analog inputs	16x 9-pin female D-SUB
– CAN input	1x 9-pin male D-SUB
– Digital I/O	1x 15-pin male D-SUB
TEDS interface	Support TEDS chips; cable length up to 100 m

Tab. 1: Specifications TRION-x-dLV-CB16-D9

Connections and ports

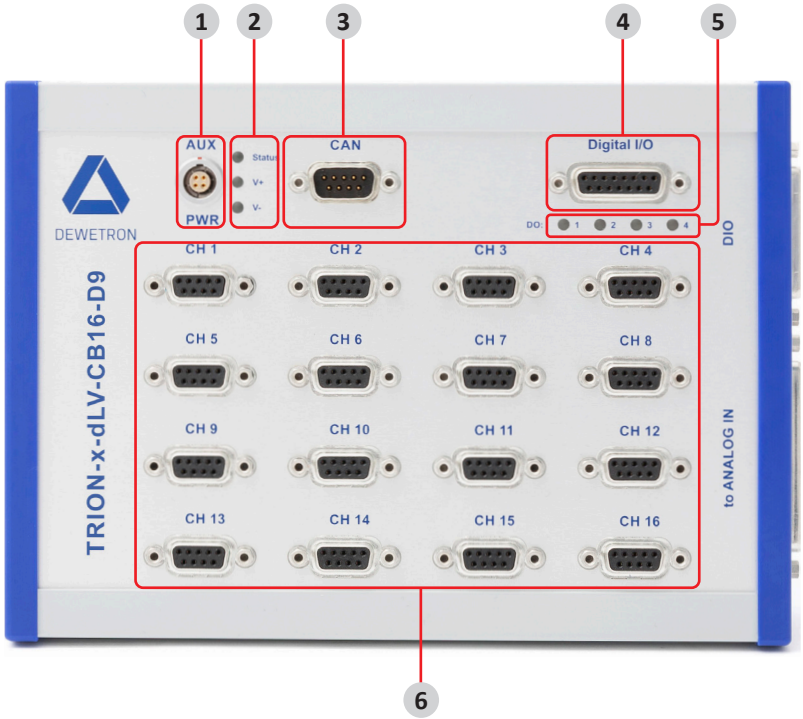
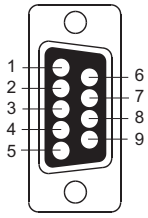
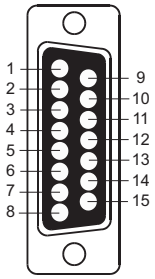
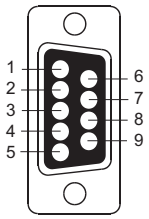


Fig. 1: TRION-x-dLV-CB16-D9 overview

No.	Element	Description	
1.	AUX power input connector 4-pin LEMO EGG.1B.304		Pin assignment: **1.** AUX 12 V **2.** GND **3.** AUX sensor supply (input) **4.** GND For details refer to *Simplified power schematic on page 13*.
		AUX 12V The TRION-1802 series board can drive a maximum of 16 MSI adapters or 600 mA in total on the CAN and Digital I/O terminal. If more power is required on the 12 V rail, connect an external 12 V supply to the AUX 12 V pin of the LEMO connector.	
		AUX sensor supply (input) The AUX sensor supply is directly wired to pin 5 of each analog input connector. By connecting this pin to an external power supply, all 16 channels can be supplied at once. There is a 4 A self-resetting fuse for every channel row: CH 1 to 4, CH5 to 8, CH9 to 12, CH 13 to 16. ***CAUTION*** For safety reasons DO NOT apply more than 48 VDC to AUX sensor supply.	
2.	LEDs	**Status indicator** – Green: Application software connected – OFF: Not connected	
		V+, V- – Green: ±5 V MSI supply OK – OFF: ±5 V MSI supply missing or overload	
3.	CAN interface connector 9-pin D-SUB connector (male)		Pin assignment **1.** +5 V out (max. 500 mA) **2.** CAN Low (isolated) **3.** GNDx CAN (isolated) **4.** Not connected **5.** Not connected **6.** GND Power **7.** CANx High (isolated) **8.** Not connected **9.** +12 V out (max. 600 mA)
4.	Digital I/O connector 15-pin D-SUB connector (female)		Pin assignment **1.** DI1 / CNT1 Input_A **2.** DI3 / CNT1 Input_Z **3.** DI5 / CNT2 Input_B **4.** DI7 **5.** DO1 **6.** DO3 **7.** GND **8.** +12 V (max. 600 mA) **9.** DI2 / CNT1 Input_B **10.** DI4 / CNT2 Input_A **11.** DI6 / CNT2 Input_Z **12.** DI8 **13.** DO2 **14.** DO4 **15.** NC
5.	LED for digital output	Green: output high OFF: output low	

Tab. 2: Connections and ports TRION-x-dLV-CB16-D9

No.	Element	Description	
6.	Sensor connection CH1 to CH16 9-pin D-SUB connector (female)		Pin assignment **1.** EXC+ (+5 V) **2.** IN+ **3.** Sense- **4.** GND **5.** AUX sensor supply Housing connected to chassis GND **6.** Sense+ **7.** IN- **8.** EXC (-5 V) **9.** TEDS

Tab. 2: Connections and ports TRION-x-dLV-CB16-D9

Input types

Input types		Input	Sensor excitation	Bandwidth[1)]	Accuracy	Sensor connection
Direct voltage input		tbd. V	tbd. V	tbd. kHz	tbd. %	D-SUB-9
MSI2-STG[2)]		Bridge-type sensors full-bridge, half-bridge, quarter bridge 120 Ω and 350 Ω	5 V and 10 V	60 kHz	±0.1 %	Miniature spring terminals
MSI2-LVDT[2)]		LVDT and RVDT sensors, 5- or 6-wire connection	3 V at 2.5, 5 or 18 kHz	1 kHz	±0.1 %	Soldering pads
MSI-BR-ACC[2)]		IEPE® sensors, typ. accelerometer, microphone	4 mA	1.4 Hz to 70 kHz	±0.2 %	BNC
MSI2-CH-x[2)]		Charge type sensors up to 100 000 pC	n/a	0.08 Hz to 70 kHz	±0.5 %	BNC
MSI2-TH-x[2)]		Thermocouple sensors Standard models for type K, J, T, others on request	n/a	DC to 30 kHz	±1 °C	Mini TC socket
MSI-BR-V-200[2)]		Voltage up to 70 V_{DC}, 46.7 V_{PEAK}	n/a	DC to 60 kHz	±0.1 %	BNC
MSI2-V-600[2)]		Voltage up to 600 V_{DC}	n/a	DC to 60 kHz	±0.1 %	Banana sockets
MSI-BR-RTD[2)]		RTD sensors Pt100, Pt200, Pt500, PT1000, Pt2000; 2, 3 and 4 wire connection	1.25 mA	DC to 10 kHz	±0.1 %	Binder 712 series 5-pin socket
MSI2-250R-20mA[2)]		4 to 20 mA sensors	n/a	DC to 70 kHz	±0.1 %	Miniature spring terminals

Tab. 3: Input types

1) ***INFORMATION*** Max. value; consider limit of the used TRION module.

2) MSIs are automatically detected

General MSI functionality

Each MSI is a signal conditioner designed for a dedicated sensor type.

By reading the TEDS chip, the measuring system gets any information necessary to adjust the amplifier accordingly. This means that the user is automatically shown the correct measuring ranges with the correct unit.

For traceability, important data, such as serial number or calibration date, are also read out and if necessary additionally stored with the measurement data file.

Simplified power schematic

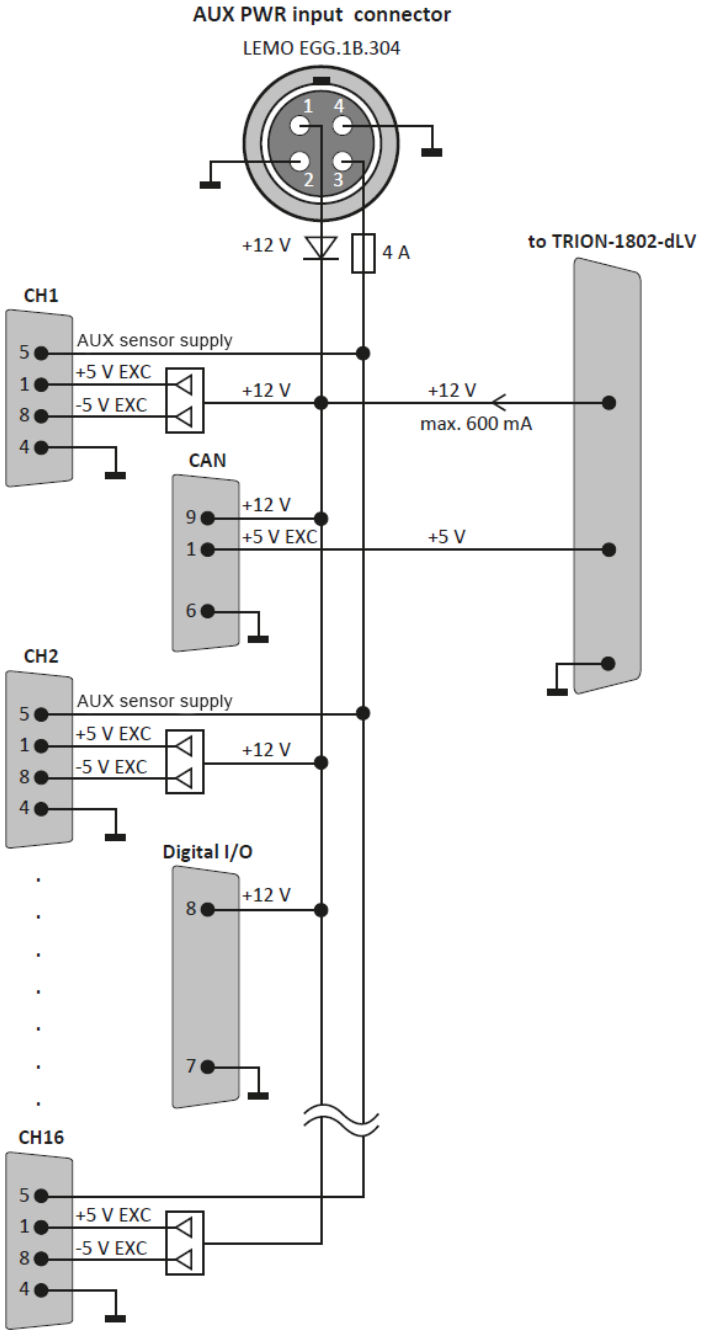


Fig. 2: Simplified power schematic

Dimensions*

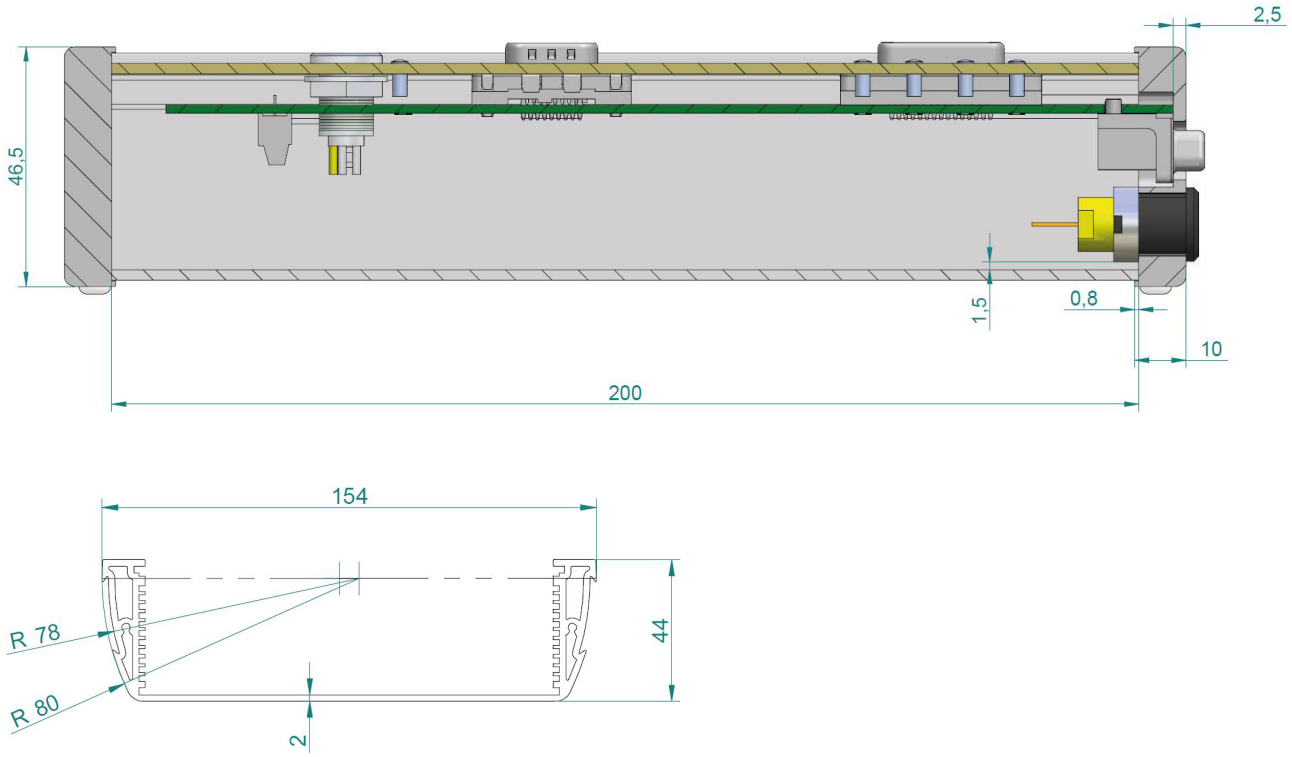


Fig. 3: Dimensions (in mm)

Optional accessory

Wall mounting assembly: CB16-D9-WALLMOUNT

Fig. 4: Wall mounting assembly

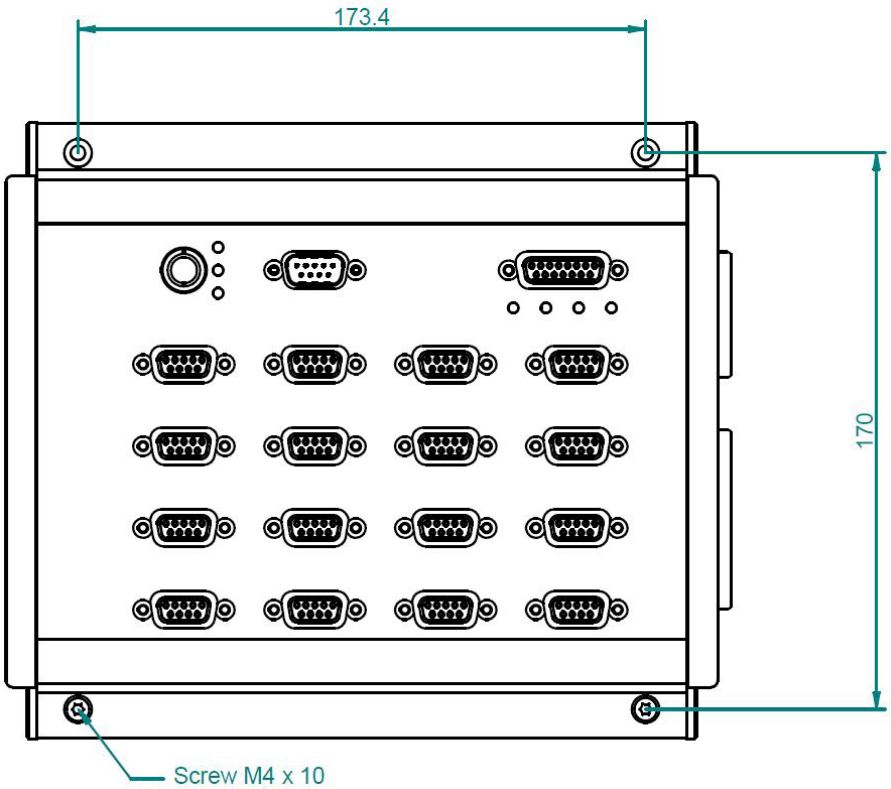


Fig. 5: Dimensions wall mounting (in mm)

*) Dimensions in mm (1 inch = 25.4 mm)

Signal connection

Direct signal connection

Voltage

NOTICE

Module is not isolated. Do not exceed ±12.5 V common mode range. See TRION-1802/1600-dLV-32 module specification.

Voltage measurement

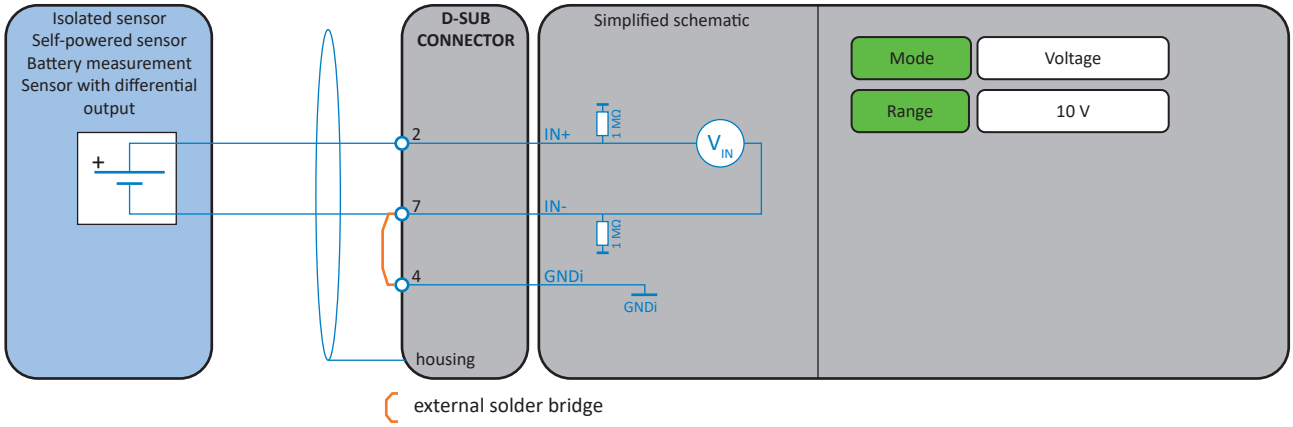


Fig. 6: Voltage measurement

Different output sensor powered by TRION module

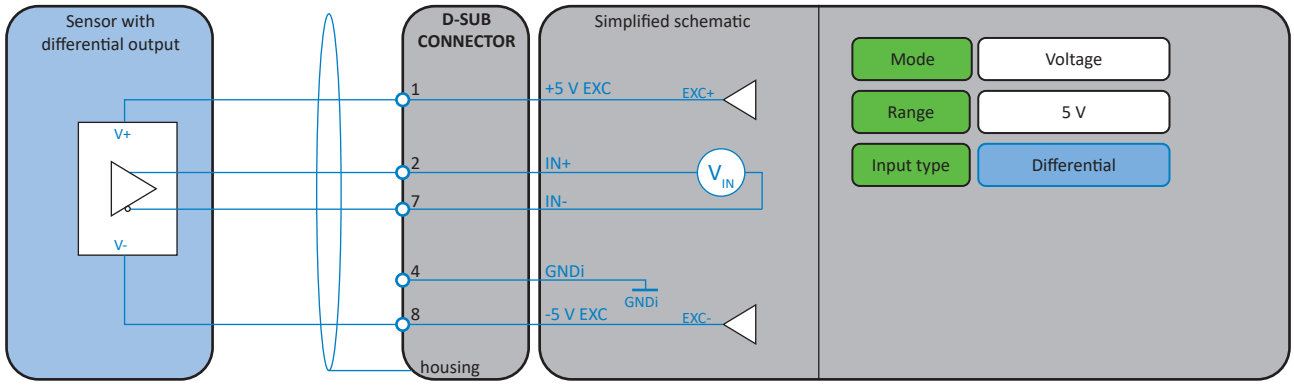


Fig. 7: Different output sensor powered by TRION module

Single-ended sensor powered by the TRION module

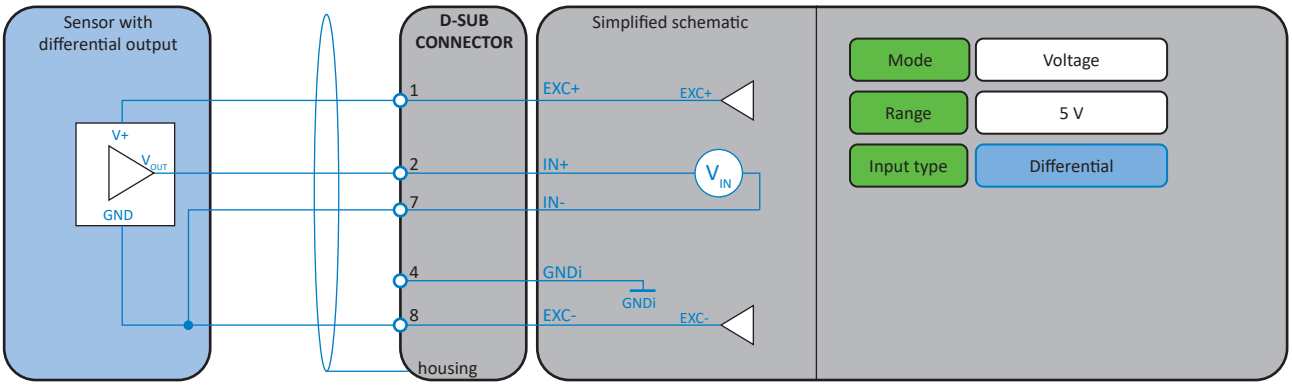


Fig. 8: Single-ended sensor powered by the TRION module

Potentiometric sensor

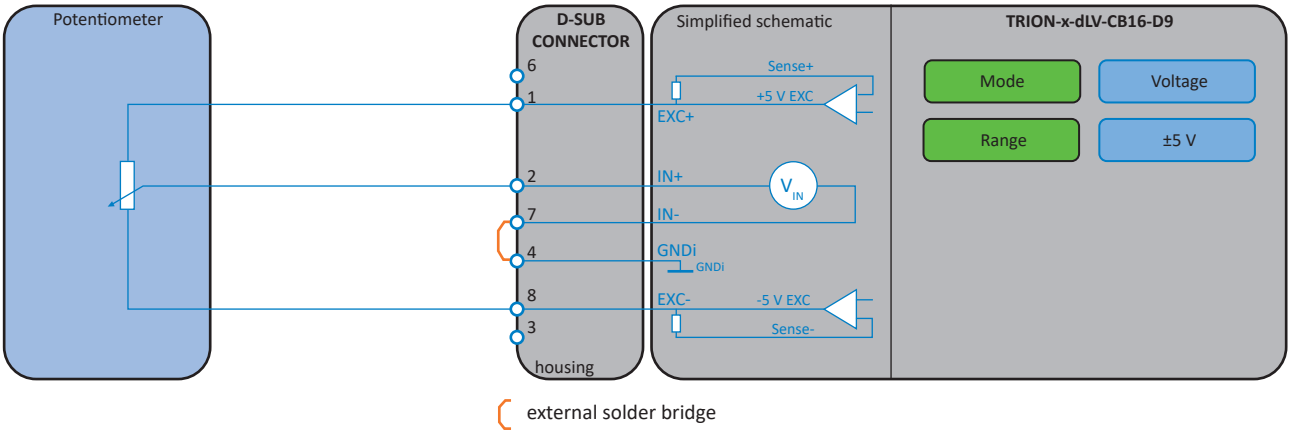


Fig. 9: Potentiometric sensor

Signal connection using MSI

MSI-BR-V-200

Voltage measurement (<50 V)

MSI-BR-V-200				
Sensor connection	BNC			
Input attenuation	±50 ±0.5 %			
Input type	Differential			
Rated input voltage to earth according to IEC/EN 61010-2-30	33 V_{RMS}, 70 VDC, 46.7 V_{PEAK}			
Common mode voltage range	IN+ and IN-: -200 V to +180 V			
Input overvoltage protection	±250 V			
Input impedance IN+	1 MΩ			
Input impedance IN-	1 MΩ			
Gain drift	Typ. 25 ppm/K (max. 40 ppm/K)			
Input offset drift	200 µV/K			
Bandwidth (-3 dB)	60 kHz			
TEDS	For adapter identification and calibration data			
Ranges	±200 V, ±100 V, ±40 V, ±20 V			
DC accuracy:	±0.05 % of reading ±20 mV			
Signal-to-noise ratio; spurious-free SNR Effective number of bits; noise mV_{PP}	**SNR**	**SFDR**	**ENOB**	**Noise$_{PP}$**
Sample rate	[dB]	[dB]	[Bit]	[mV_{PP}]
5 kS/s	-105	130	17.7	6.2
10 kS/s	-102	125	17.3	8.2
20 kS/s	-99	125	16.7	12.5
50 kS/s	-95	120	16.1	21
100 kS/s	-92	120	15.6	29
200 kS/s	-89	115	15.1	47
Typical CMRR	100 dB @ 100 Hz 60 dB @ 10 kHz			

Tab. 4: Signal connection MSI-BR-V-200

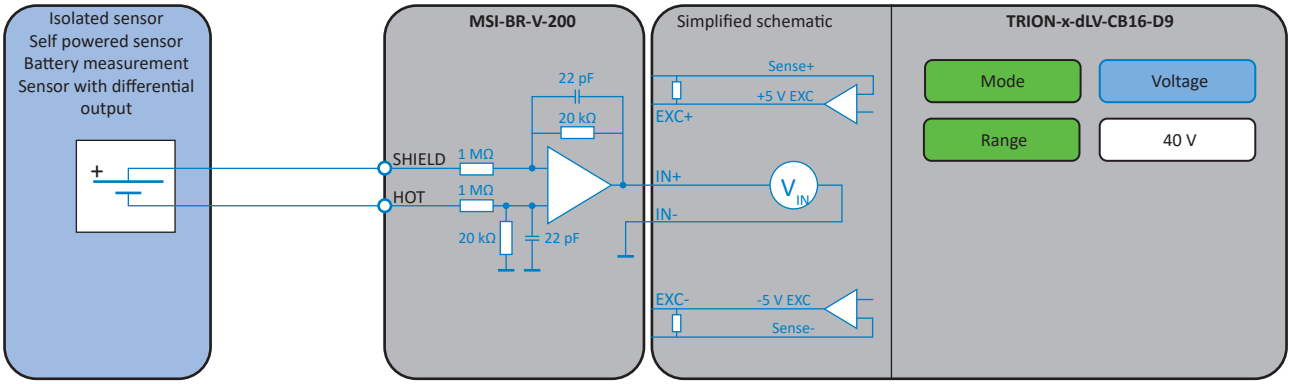


Fig. 10: Signal connection MSI-BR-V-200

WARNING

Risk of injury due to electric shock

Module is not isolated. Do not exceed ±12.5 V common mode range and do not apply voltage above rated input voltage of 33 V_{RMS}, 70 V_{DC}, 46.7 V_{PEAK} (see *Tab. 4 on page 18).*

See TRION-1802/1600-dLV-32 module specification for further information.

MSI2-V-600

High-voltage measurement

MSI2-V-600					
Sensor connection		4 mm safety banana sockets			
Input attenuation		250 ±0.5 %			
Input type		Differential			
Rated input voltage to earth according to IEC/EN 61010-2-30		300 V CAT III / 600 V CAT II			
Common mode voltage		±1000 V			
Overvoltage protection		1500 V_{PEAK} / 1000 V_{RMS} (1 min)			
Input impedance		5 MΩ differential / 2.5 MΩ to earth			
Gain drift		Typ. 25 ppm/K (max. 40 ppm/K)			
Input offset drift		200 µV/K			
Bandwidth (-3 dB)		60 kHz			
TEDS		For adapter identification and calibration data			
Ranges		±1000 V; ±500 V; ±200 V; ±100 V			
Accuracy	DC to 1 kHz	±0.1 % of reading ±100 mV			
	>1 kHz to 5 kHz	±0.5 % of reading ±100 mV			
	>5 kHz to 10 kHz	±1 % of reading ±100 mV			
Signal-to-noise ratio; spurious-free SNR Effective number of bits; noise mV_{PP}		**SNR**	**SFDR**	**ENOB**	**Noise$_{PP}$**
Sample rate		[dB]	[dB]	[Bit]	[mV_{PP}]
5 kS/s		102	130	16.7	37.4
10 kS/s		99	127	16.2	51.2
20 kS/s		96	122	15.7	77
50 kS/s		92	119	15.0	126
100 kS/s		89	117	14.6	177
200 kS/s		87	113	14.1	265
Typical CMRR		74 dB @ 100 Hz 50 dB @ 10 kHz			

Tab. 5: Signal connection MSI2-V-600

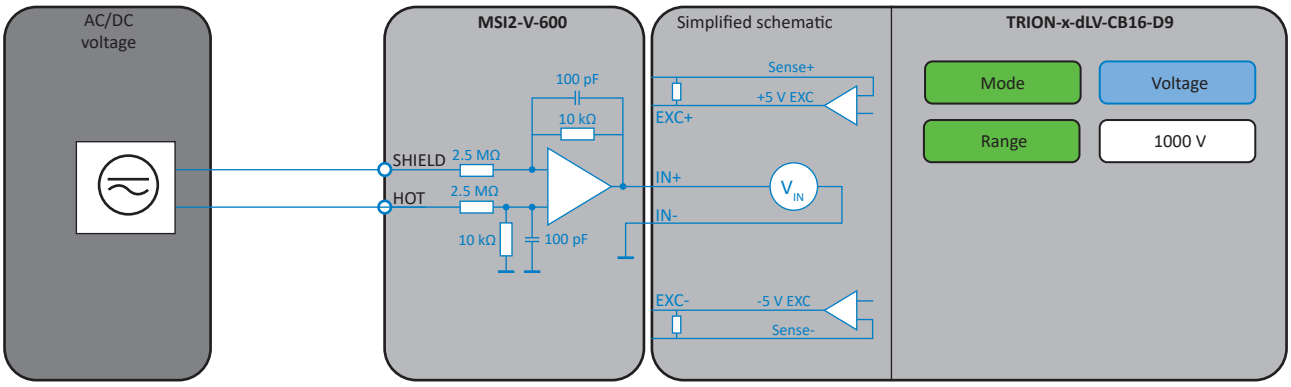


Fig. 11: Signal connection MSI2-V-600

CAUTION

Risk of injury

Voltage measurement up to 600 V_{RMS} must only be carried out with safety banana plug cords.

MSI2-STG

Strain gauge measurement

- Full, half or quarter bridge
- 120 and 350 Ω quarter bridge
- 5 V or 10 V excitation with remote sense
- Simple connection without soldering

MSI2-STG				
Input range	20 mV/V at 5V excitation			
Sensor excitation voltage	5 V or 10 V (±5 V); remote sense support			
Maximum current	40 mA per channel			
Protection	Continuous short to ground; short circuit limit is 70 mA			
Supported bridge-types	Full bridge 4 or 6 wire Half bridge 3 or 5 wire Quarter bridge 3 wire; 120 Ω and 350 Ω bridge completion			
DC accuracy	±0.2 % of reading ±5 µV/V			
Bandwidth (-3 dB)	60 kHz			
Signal-to-noise ratio; spurious-free SNR	**20 mV/V range**			
Effective number of bits; noise mV_{PP}	**SNR**	**SFDR**	**ENOB**	**Noise$_{PP}$**
Sample rate	[dB]	[dB]	[Bit]	[mV_{PP}]
5 kS/s	101	124	17.1	0.88
10 kS/s	98	125	16.6	1.4
20 kS/s	83	123	14.1	1.9
50 kS/s	79	120	13.5	3.3
100 kS/s	76	115	13.0	4.5
200 kS/s	73	110	12.5	7
Drift	Offset: 0.4 uV/°C; gain: max. 50 ppm/°C			
Sensor connection	Push-in spring connection; 0.14 to 0.5 mm²; AWG 26 to 20			
TEDS	For adapter identification and calibration data			

Tab. 6: Signal connection MSI2-STG

The MSI2-STG is designed to connect nearly every strain gauge sensor to the TRION-x-dLV-CB16-D9.

Various bridge-types can be configured by jumper. That makes it very flexible and an ideal solution for strain gauge measurement on fixed installations.

It is also a perfect solution for harsh electronic environment. Because this tiny amplifier can be mounted directly next to the sensor with very short cables in between. The signal is immediately amplified by a factor of 50. This reduces the impact of electromagnetic disturbances by the same factor. The maximum cable length between MSI and the TRION-x-dLV-CB16-D9 is 50 meters.

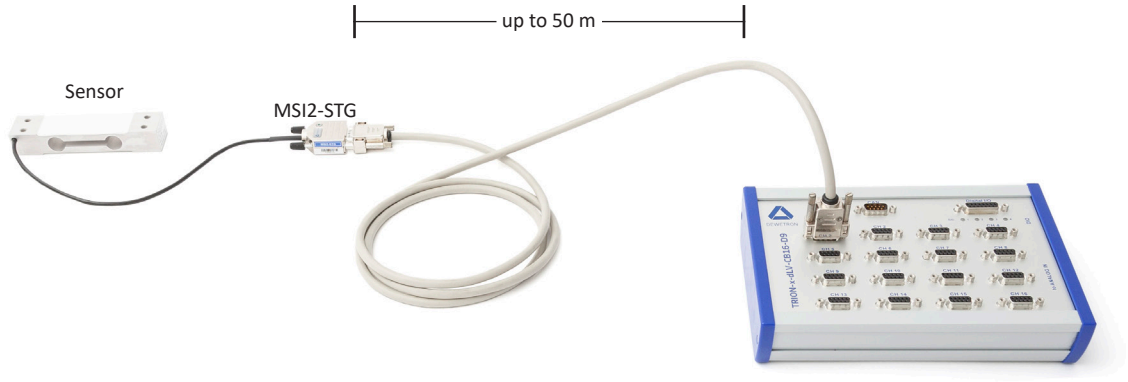


Fig. 12: MSI2-STG cable length

Jumper settings

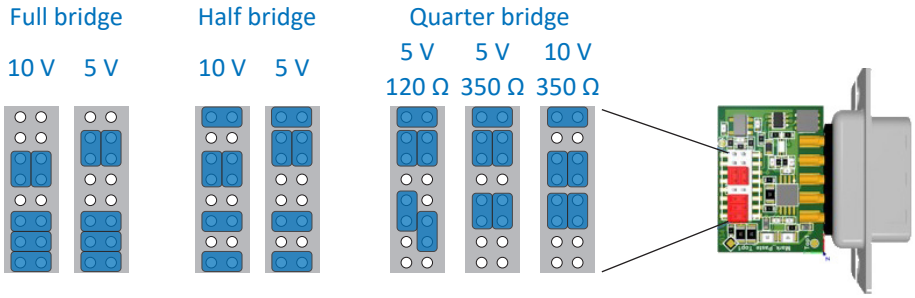


Fig. 13: Jumper settings

Connecting a sensor

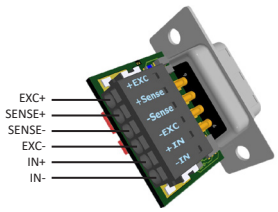
In order to connect a sensor proceed as follows:

1. Check the sensor datasheet and determine the correct connection.

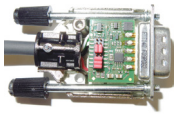
2. Prepare the sensor cable.

3. Connect the cable to the PCB.

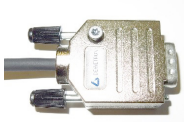
   The shield must be placed between housing and plastic.



4. Apply the jumper according to the sensor.

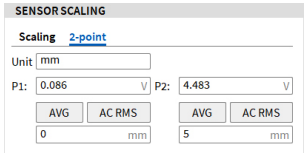


5. Close the housing.



6. Connect the sensor directly or via extension cable.

7. MSI2-STG is detected automatically. Sensor scaling can be applied.



INFORMATION For more information refer to chapter *MSI in OXYGEN on page 36.*

The sensor is now connected.

Full bridge 6-wire

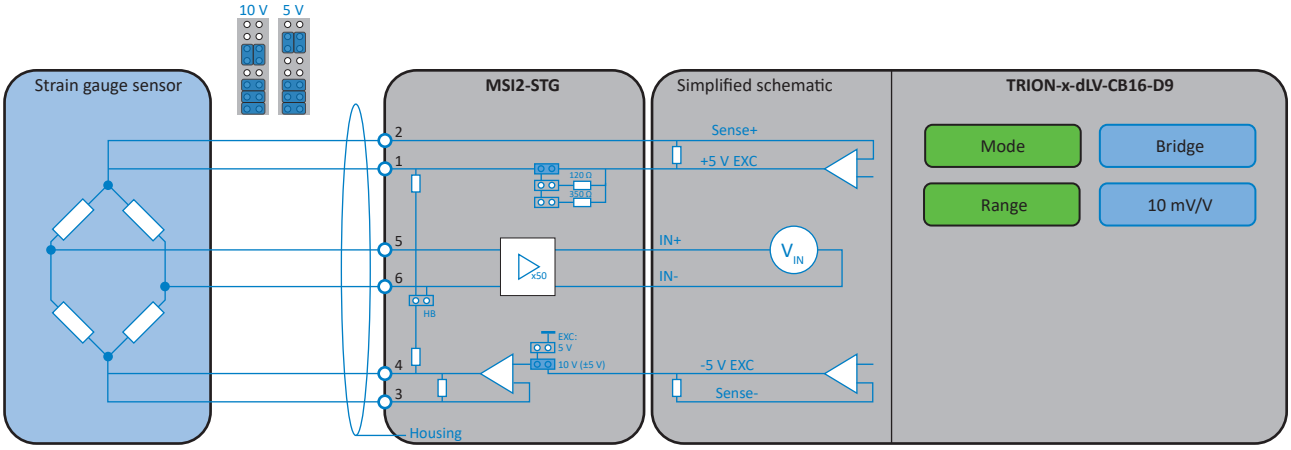


Fig. 14: Full bridge 6-wire

Full bridge 4-wire

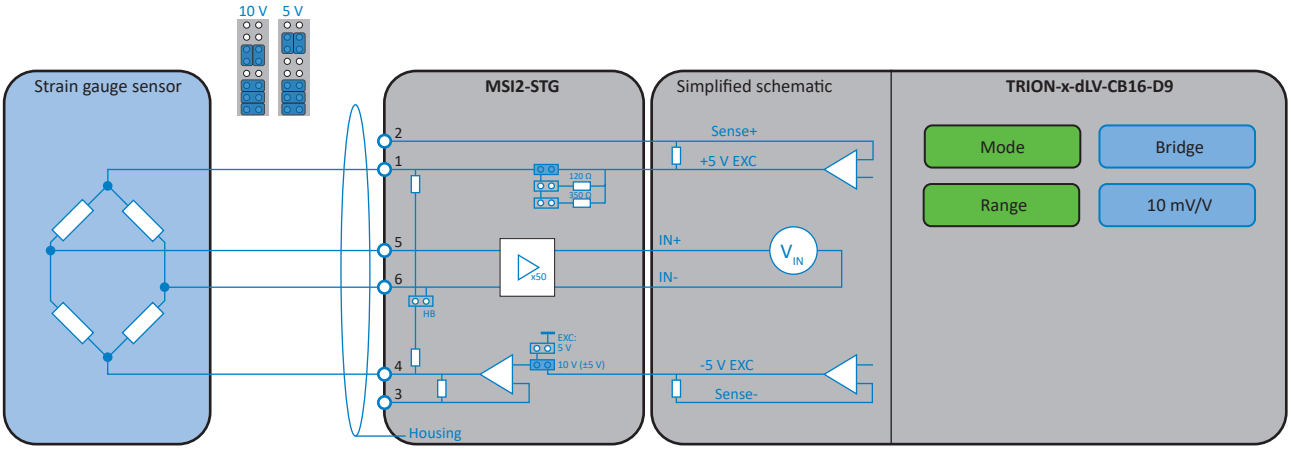


Fig. 15: Full bridge 4-wire

Half bridge 3-wire

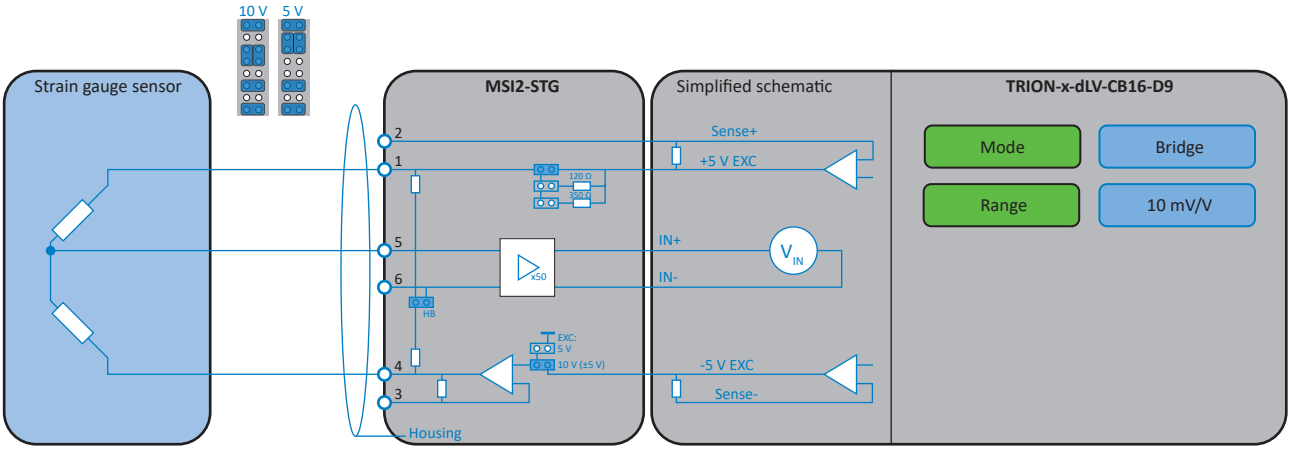


Fig. 16: Half bridge 3-wire

Quarter bridge 3-wire

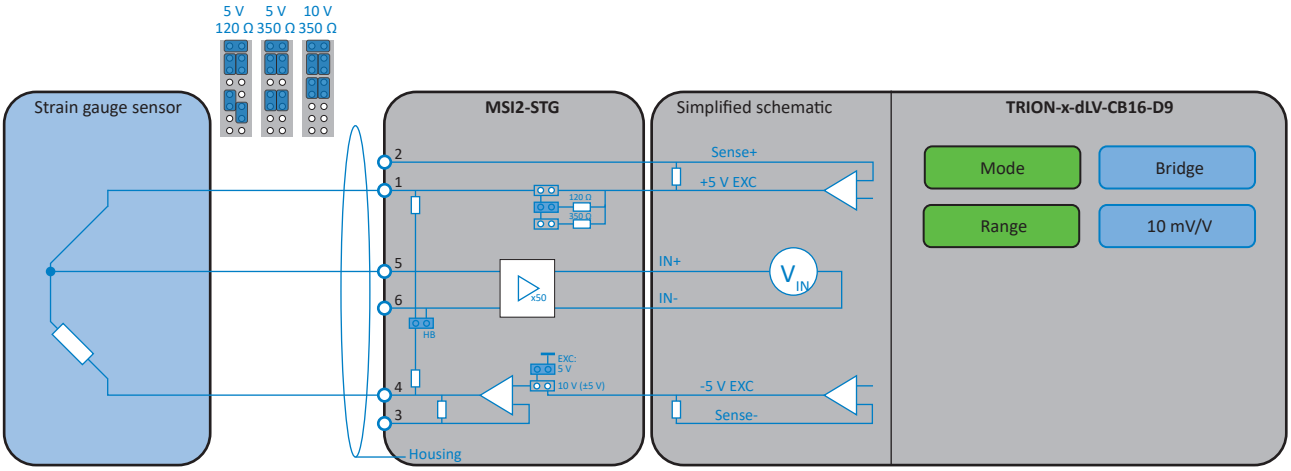


Fig. 17: Quarter bridge 3-wire

MSI-BR-ACC

IEPE®

MSI-BR-ACC				
Input range	±10 V			
Sensor excitation	4 mA ±10 %			
Compliance voltage	>23 V			
Accuracy	30 Hz to 30 kHz: 0.2 %			
Power consumption	Max. 380 mW			
Input coupling	AC 1.4 Hz			
Bandwidth	70 kHz limited by instrument			
Signal-to-noise ratio; spurious-free SNR Effective number of bits; noise mV_{PP}	**SNR**	**SFDR**	**ENOB**	**Noise$_{PP}$**
Sample rate	[dB]	[dB]	[Bit]	[mV_{PP}]
5 kS/s	101	124	17.1	0.88
10 kS/s	98	125	16.6	1.4
20 kS/s	83	123	14.1	1.9
50 kS/s	79	120	13.5	3.3
100 kS/s	76	115	13.0	4.5
200 kS/s	73	110	12.5	7
Sensor connection	BNC			
TEDS	For adapter identification			

Tab. 7: Signal connection MSI-BR-ACC

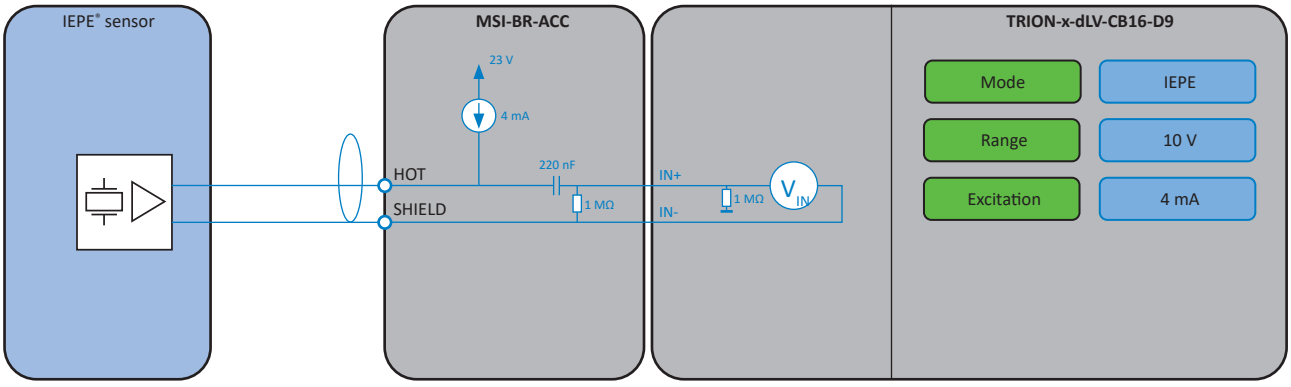


Fig. 18: Sensor connection MSI-BR-ACC

MSI2-CH-x

Charge

MSI2-CH-x				
Input range				
– MSI2-CH-5	±5000 pC			
– MSI2-CH-100	±100 000 pC			
Accuracy	3 Hz to 30 kHz: 0.5 %			
Gain drift	50 ppm/°C			
Input coupling	AC 0.14 Hz			
Bandwidth	70 kHz limited by instrument; >300 kHz with TRION(3)-18xx-MULTI series			
Signal-to-noise ratio; spurious-free SNR Effective number of bits; noise mV_{PP}	**SNR**	**SFDR**	**ENOB**	**Noise$_{PP}$**
Sample rate	[dB]	[dB]	[Bit]	[pC_{PP}]
10 kS/s	101	130	17.1	0.24
20 kS/s	99	130	16.7	0.35
50 kS/s	95	125	16.0	0.55
100 kS/s	92	120	15.5	0.8
200 kS/s	89	115	15.1	1.15
Sensor connection	BNC			
TEDS	For adapter identification and calibration data			

Tab. 8: Signal connection MSI2-CH-x

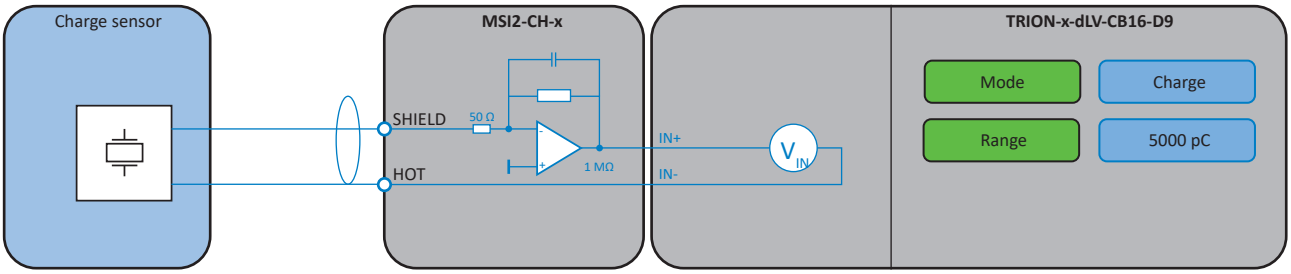
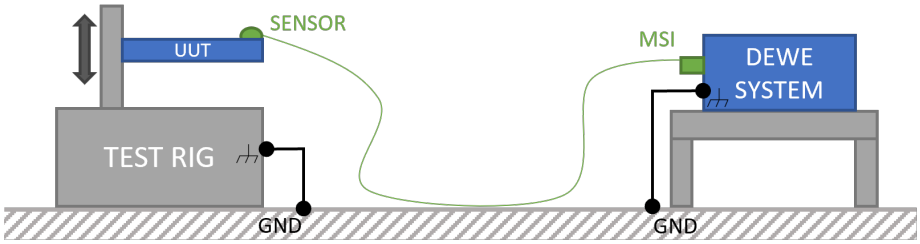
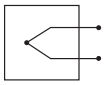


Fig. 19: Signal connection MSI2-CH-x

NOTICE

The MSI-CH-x input is very sensitive to electrostatic discharge and to floating voltages. To avoid damage, the unit under test and the housing of the DEWETRON measuring system must be grounded.





MSI2-TH-x

Thermocouple

MSI2-TH-x		
Thermocouple types	▸ Standard types: K, J, T ▸ Non-standard types[1]: C, E, R, S	
Sensor connection	1 m cable with standard miniature thermocouple connector according to TC type	
Preamplifier	Integrated; cable drive capability 50 m	
Open thermocouple detection	100 MΩ pullup; broken sensor shows positive full scale	
CJC	Accuracy: 0.5 °C	Drift: ±0.02 °C/°C
Input impedance	>10 MΩ	
Bias current	50 nA	
Linearization	Through software according to sensor type	
Bandwidth	30 kHz	
Isolation	Use with TRION-1802-dLV: not isolated	Use with TRION-MULTI series: isolated
Typical peak to peak noise for sensor type K	1 kHz bandwidth	0.50 °C
	100 Hz bandwidth	0.25 °C
	10 Hz bandwidth	0.04 °C
TEDS	For adapter identification and calibration data	

Tab. 9: Signal connection MSI2-TH-x

[1] Non-standard types are available on request

Accuracy incl. CJC error		
MSI2-TH-K – Type K (DIN-EN 60584-1)		
Input ranges	-200 to 1370 °C (-328 to 2498 °F)	
Accuracy incl. CJC error[2]	-200 to -100 °C	±1.2 °C
	-100 to 400 °C	±0.5 °C
	400 to 1370 °C	±0.6 °C
MSI2-TH-J – Type J (DIN-EN 60584-1)		
Input ranges	-210 to 1200 °C [-346 to 2192°F]	
Accuracy incl. CJC error[2]	-200 to -100 °C	±1.1 °C
	-100 to 1200 °C	±0.6 °C
MSI2-TH-T – Type T (DIN-EN 60584-1)		
Input ranges	-270 to 400 °C [-454 to 752°F]	
Accuracy incl. CJC error[2]	-250 to -100 °C	±3 °C
	-100 to 400 °C	±0.8 °C
MSI2-TH-C – Type C (ASTM E988-96) on request/not stocked		
Input ranges	0 to 2300 °C [32 to 4172 °F]	
Accuracy incl. CJC error[2]	0 to 1600 °C	±1 °C
	1600 to 2300 °C	±1.5 °C

Tab. 10: Accuracy incl. CJC error

[2] 1 year accuracy 23 °C ±5 °C

Accuracy incl. CJC error		
MSI2-TH-E – Type E (DIN EN 60584-1) on request/not stocked		
Input ranges	-200 to 1000 °C [-328 to 1832 °F]	
Accuracy incl. CJC error[2)]	-200 to -50 °C	±1 °C
	-50 to 1000 °C	±0.5 °C
MSI2-TH-S – Type S (DIN EN 60584-1) on request/not stocked		
Input ranges	-50 to 1760 °C [-58 to 3200 °F]	
Accuracy incl. CJC error[2)]	-50 to 200 °C	±1.8 °C
	200 to 1760 °C	±1.1 °C
MSI2-TH-R – Type R (DIN EN 60584-1) on request/not stocked		
Input ranges	-50 to 1760 °C [-58 to 3200 °F]	
Accuracy incl. CJC error[2)]	-50 to 200 °C	±1.8 °C
	200 to 1760 °C	±1.1 °C

Tab. 10: Accuracy incl. CJC error

[2)] 1 year accuracy 23 °C ±5 °C

Functional description

The MSI2-TH-x series is the improved version of the previous MSI series. The accuracy is approximately 3 times higher than at the previous version. A calibrated high precision cold junction compensation is included in the adapter. It comes with an integrated preamplifier that boosts the tiny thermocouple voltage up to a few volts. That is why the V2 series can be directly placed next to the sensor. Use extension cables up to 50 m between the MSI and the TRION system instead of having long thermocouple lines with small signal level. That can greatly improve your signal quality in a harsh electronic environment.

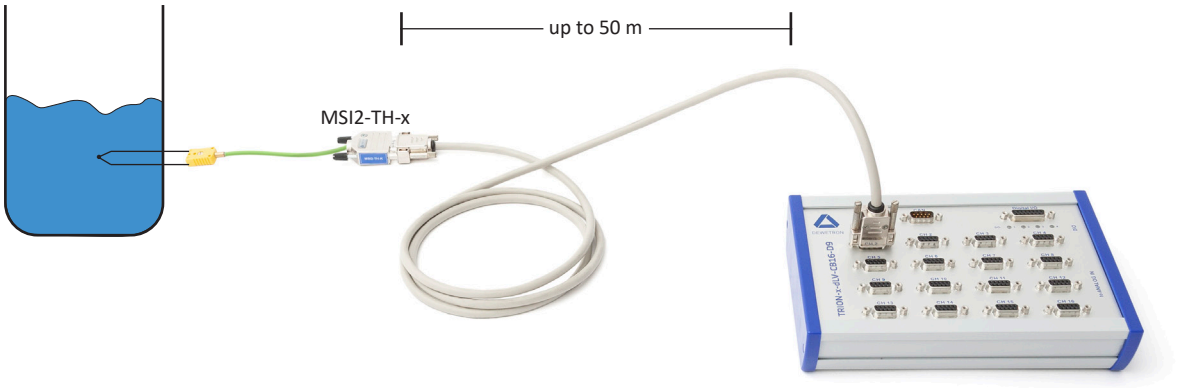


Fig. 20: Functional description MSI2-TH-x

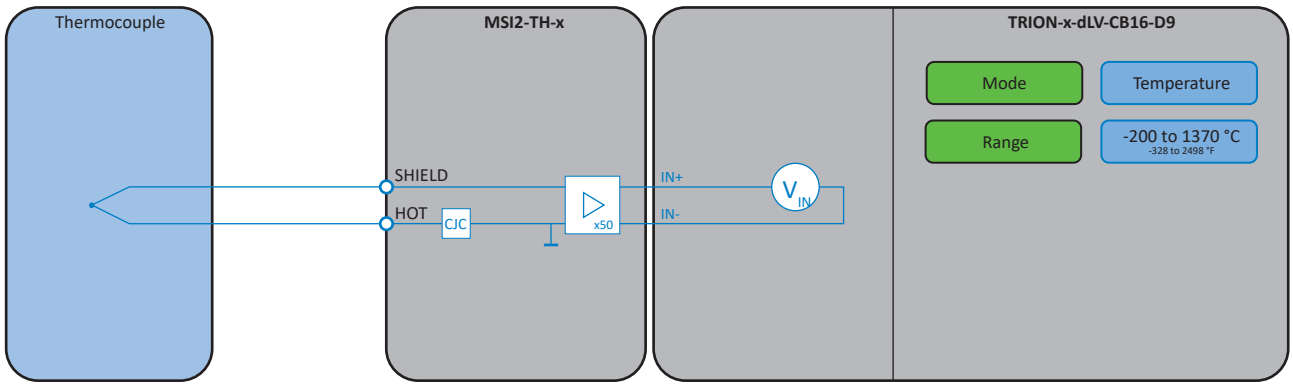
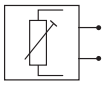


Fig. 21: Signal connection MSI2-TH-x



MSI-BR-RTD

Resistance temperature detector

- Support of Pt100, Pt200, Pt500, Pt1000, Pt2000
- 2-, 3- or 4 wire connection

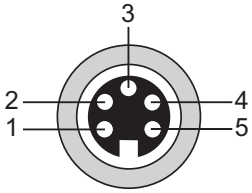
MSI-BR-RTD	
Supported sensors	Resistance, Pt100, Pt200, Pt500, Pt1000, Pt2000
Temperature range	-200 °C to 850 °C
Constant current	1.25 mA
Constant current accuracy	±0.02 % from calibrated value
Constant current drift	22 ppm/ °C
Linearization	Through software according to sensor type
Connection types	2-, 3- or 4-wire
Isolation	
– Use with TRION-1802-dLV	Not isolated
– Use with TRION-MULTI series	350 V
Typical peak to peak noise for Pt100	
– 1 kHz bandwidth	0.25 °C
– 100 Hz bandwidth	0.08 °C
– 10 Hz bandwidth	0.02 °C
Sensor connection	5-pin BINDER connector series 712
TEDS	For adapter identification and calibration data

Tab. 11: Signal connection MSI-BR-RTD

Accuracy		
Type	**Range**	**Accuracy**
Pt100 (DIN EN 60751)	-200 to 850 °C	0.05 % of reading ±0.65 °C
Pt200 (DIN EN 60751)	-200 to 850 °C	0.05 % of reading ±0.36 °C
Pt500 (DIN EN 60751)	-200 to 850 °C	0.04 % of reading ±0.17 °C
Pt1000 (DIN EN 60751)	-200 to 850 °C	0.04 % of reading ±0.11 °C
Pt2000 (DIN EN 60751)	-200 to 260 °C	0.04 % of reading ±0.10 °C

Tab. 12: Accuracy MSI-BR-RTD

Sensor connector



Pin assignment

1. EXC+
2. SENSE+
3. EXC-
4. SENSE-
5. 3-wire connector

Fig. 22: Sensor connection MSI-BR-RTD

RTD 4-wire sensor

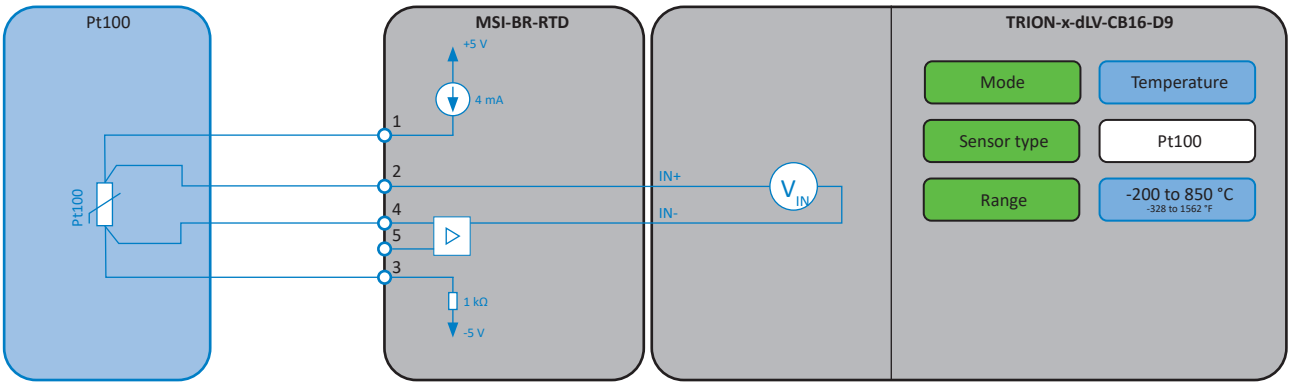


Fig. 23: RTD 4-wire sensor

RTD 3-wire sensor

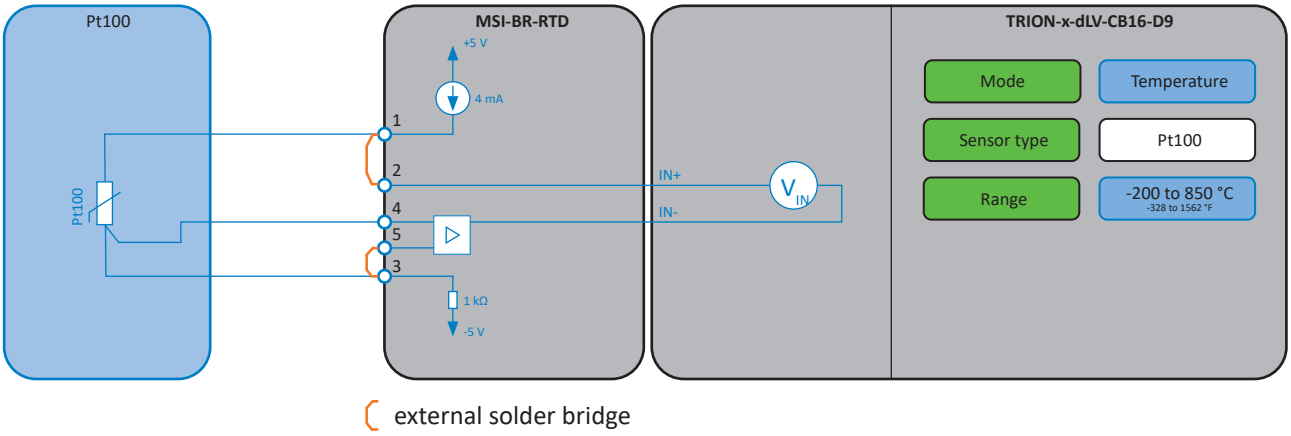


Fig. 24: RTD 3-wire sensor

RTD 2-wire sensor

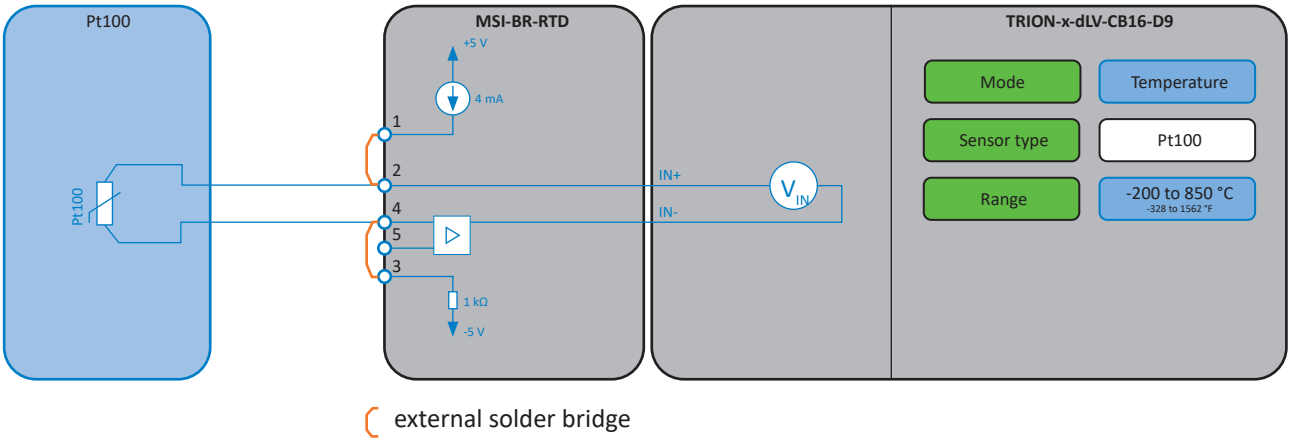


Fig. 25: RTD 2-wire sensor

MSI2-LVDT

Linear variable differential transformer

MSI2-LVDT	
Transducer type	LVDT with 5 or 6 electrical connections (wires)
Sensor connection	Soldering
Excitation voltage	3 V_{RMS}
Excitation frequency	2.5 kHz, 5 kHz, 18 kHz selectable by jumper (H, M, L; ±5 %)
Output at stroke ends	280 mV/V to 1666 mV/V at full scale (±5 V), adjustable by gain-potentiometer

Tab. 13: Signal connection MSI2-LVDT

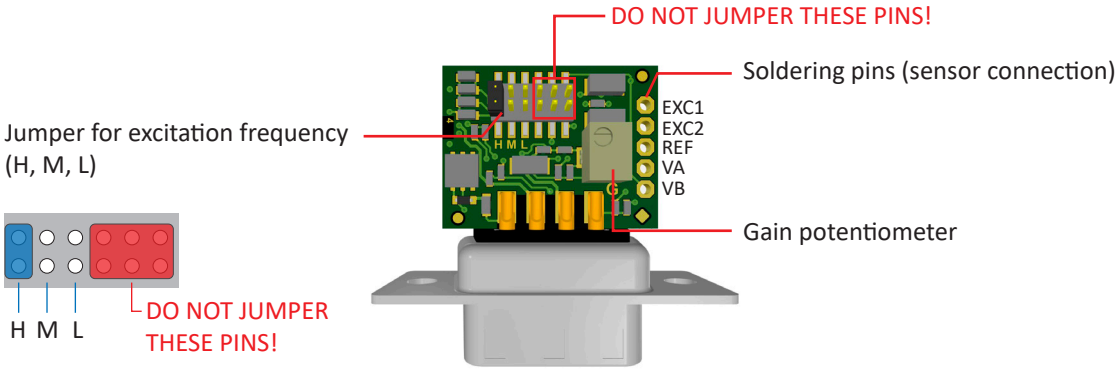
Functional description

The MSI2-LVDT is a high reliability conditioner for measurement of displacement with an LVDT (Linear Variable Differential Transformer). It can be used with 5- or 6-wire transducers.

The MSI2-LVDT provides the sine wave sensor excitation and converts the sensor output into a linear voltage output. With the gain potentiometer the MSI2-LVDT can be adjusted to a measuring range from 280 mV/V to 1666 mV/V. This allows a rough adjustment to the sensor. The best way is to bring the sensor to the end position and adjust the output to about 4.5 V. The exact adjustment of the sensor should be done by two point scaling in the software.

Thereby the MSI2-LVDT sensitivity is equivalent to 5 V/stroke end length (in mm or inch) [V/mm(inch)]. Once that is done apply the strain relief brackets and close the MSI.

Sensor connector



H = 18 kHz
M = 5 kHz
L = 2.5 kHz

Fig. 26: Sensor connector MSI2-LVDT (1)

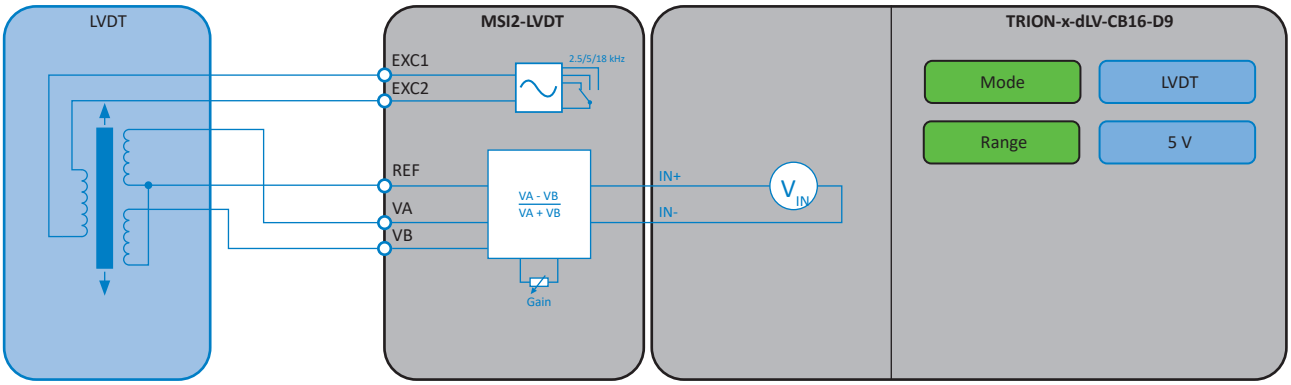


Fig. 27: Sensor connector MSI2-LVDT (2)

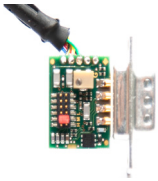
Connecting a sensor

In order to connect a sensor proceed as follows:

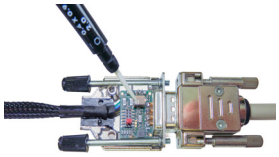
1. Check the sensor datasheet and determine the correct connection.

2. Prepare the sensor cable.

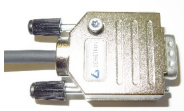
3. Solder the wires onto the printed circuit board.



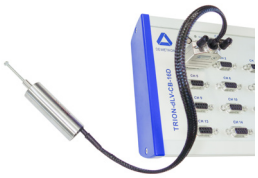
4. Connect the MSI2-LVDT to the measurement system with an extension cable.



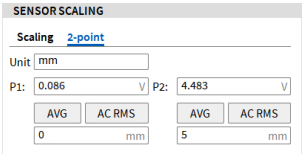
5. Adjust the gain-potentiometer roughly.
6. Close the housing.



7. Connect the sensor directly or via extension cable.



8. Fine adjust sensor with sensor scaling.



INFORMATION For more information refer to chapter *MSI in OXYGEN on page 36.*

The sensor is now connected.

MSI2-LA-250R-20mA

4 to 20 mA sensor

- Direct connection of loop powered sensors
- Simple connection without soldering

MSI2-LA-250R-20mA	
Supported sensors	4 to 20 mA, loop powered sensors
Sensor connection	Push-in spring connection, 0.14 to 0.5 mm², AWG 26 to 20
Input range	±25 mA
Accuracy	0.05 % of reading ±4 µA
Excitation voltage	AUX power, refer to simplified power schematic
Shunt resistor	250 Ω, 0.4W, 25 ppm/°C

Tab. 14: Signal connection MSI2-LA-250R-20mA

Sensor connector

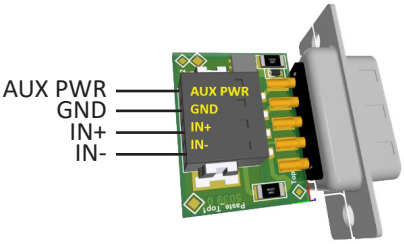


Fig. 28: Sensor connector MSI2-LA-250R-20mA

Loop powered 4 to 20 mA transmitter

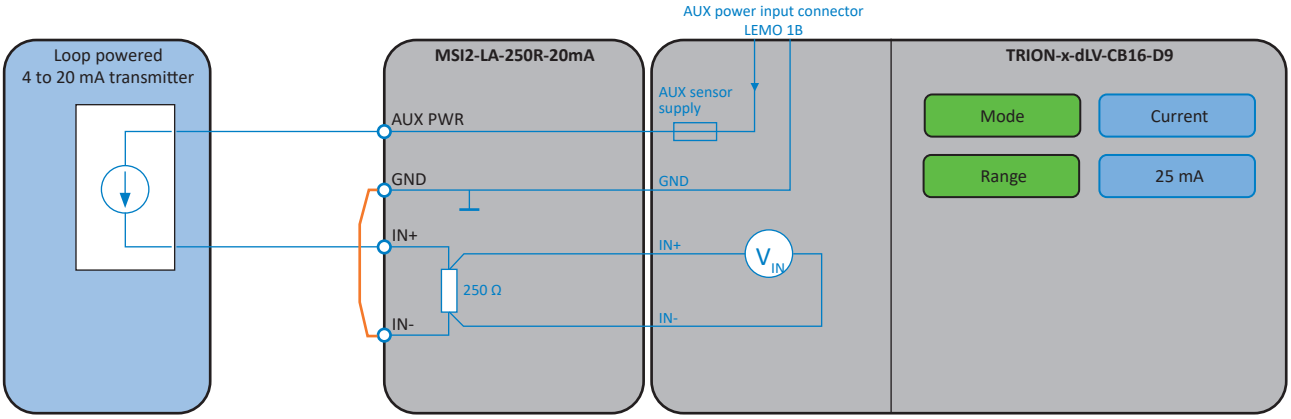


Fig. 29: Loop powered 4 to 20 mA transmitter

Current output sensor

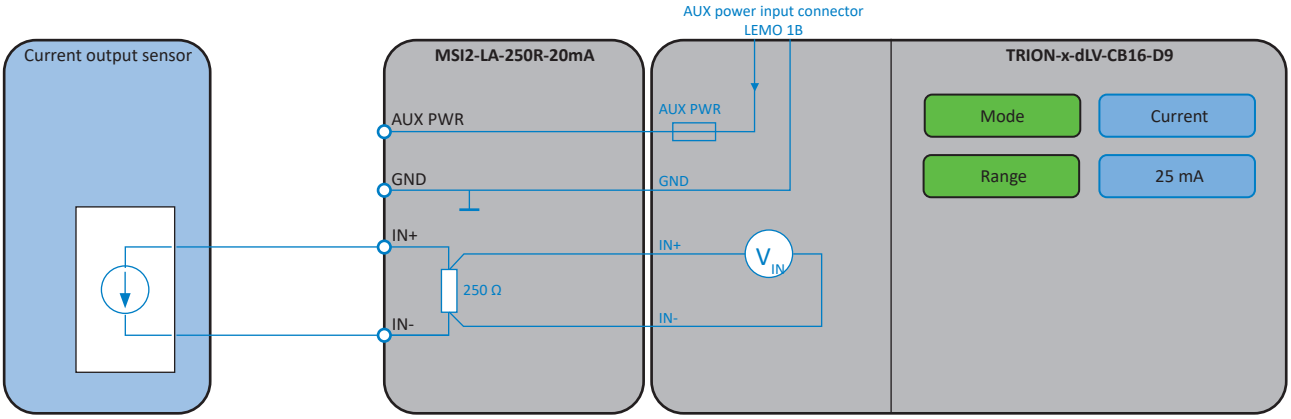


Fig. 30: Current output sensor

MSI in OXYGEN

This section shortly explains how to connect or rather set up MSIs in OXYGEN.

General information

INFORMATION For a detailed explanation of the OXYGEN software and other software functionalities refer to the OXYGEN Technical Reference Manual available on our website (www.dewetron.com) or the CCC portal (https://ccc.dewetron.com).

MSI setup in OXYGEN

Any MSI will get detected automatically and the settings are adjusted accordingly in OXYGEN. It is not necessary to enter all the setting manually since this information is read from the TEDS chip directly.

When the MSI is connected to the device it will get detected and displayed in the *Data Channel List*. The plugged-in MSI is displayed in the *Overview* and the mode, range etc. are applied accordingly (see *Fig. 31: OXYGEN overview*).

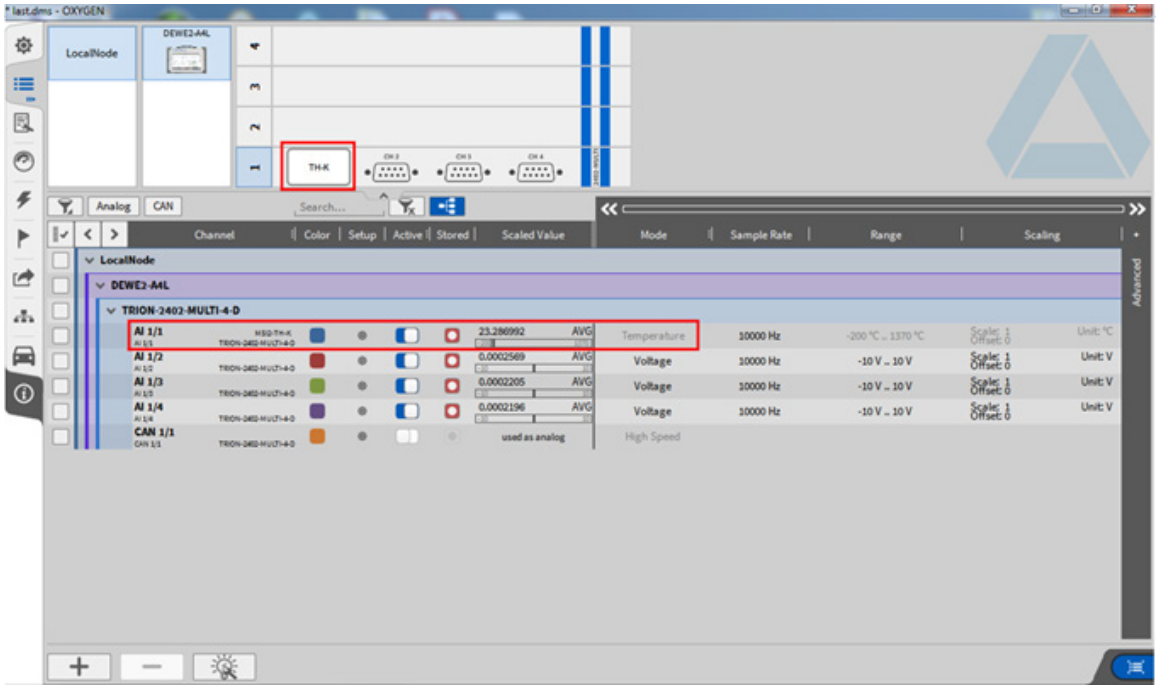


Fig. 31: OXYGEN overview

This behavior can also be seen for other MSI types (see *Fig. 32: Automatic detection of MSIs in OXYGEN*).

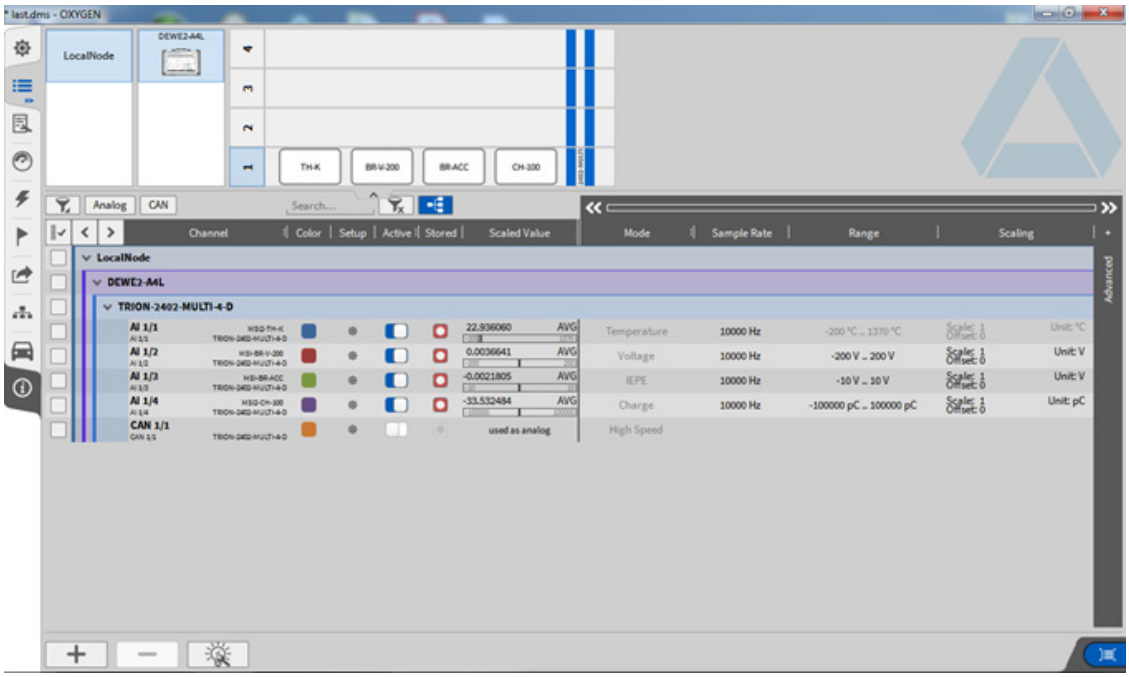


Fig. 32: Automatic detection of MSIs in OXYGEN

By clicking on the small gear button of the channel (see *Fig. 33: Channel settings*), the channel settings can be opened. Since all the according information is set automatically for MSIs, limited settings are available here, depending on the type of MSI (see the examples below).

EXAMPLE For the MSI2-TH-K only the lowpass filter can be changed in the settings as seen in *Fig. 33: Channel settings*). The thermocouple type is automatically set, since the MSI is not designed for other types.

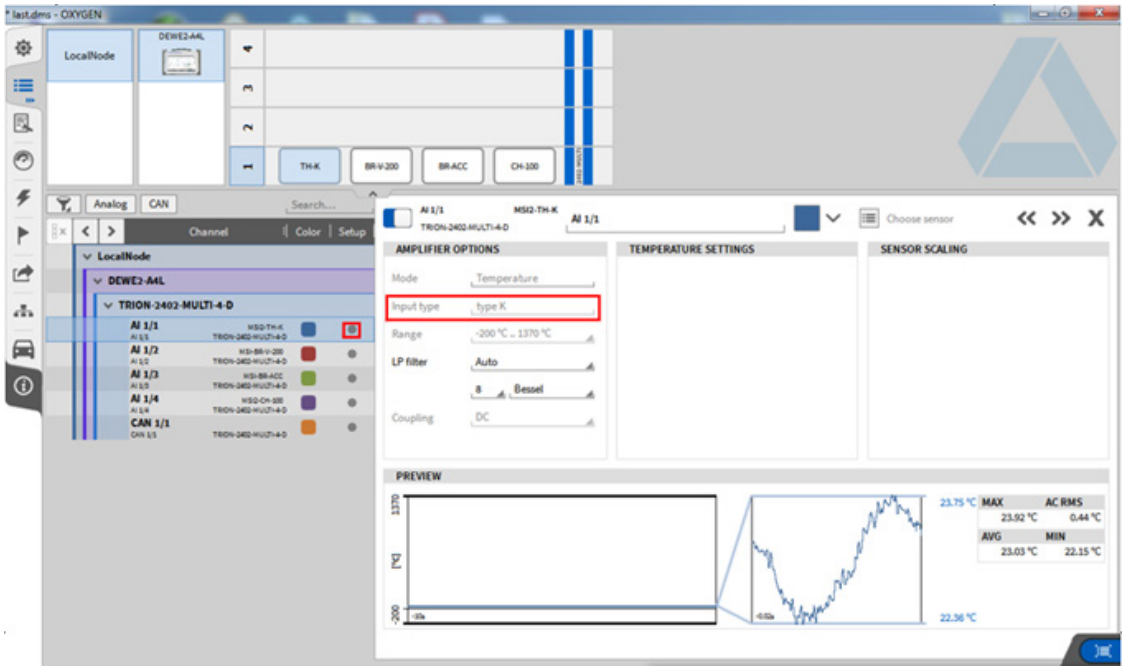


Fig. 33: Channel settings

The range is automatically set to the highest possible range but can be adjusted for some MSI types.

EXAMPLE The range of the MSI-BR-V-200 can be set to ±200 V, ±100 V or ±50 V or an individual value can be typed into the field, which lies within the maximum range (see *Fig. 34: Adjusting range*). Additionally, scaling settings are available.

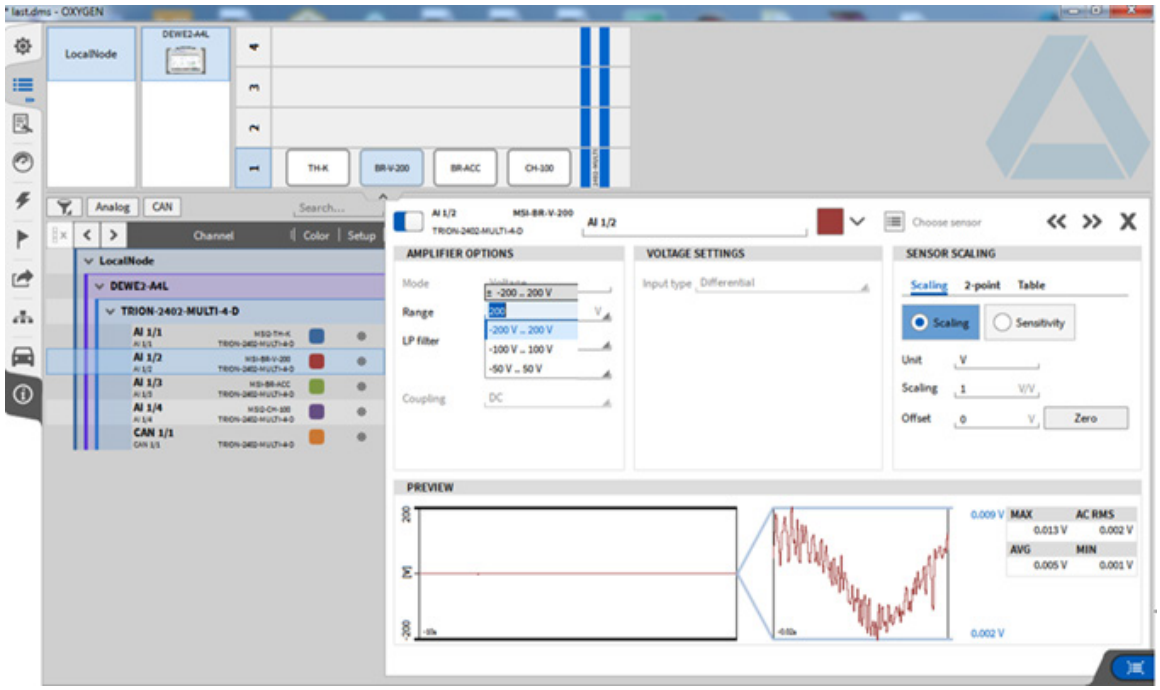


Fig. 34: Adjusting range

Those channels can be used like any other channels in OXYGEN.

INFORMATION For a detailed explanation of the OXYGEN software and other software functionalities refer to the OXYGEN Technical Reference Manual available on our website (www.dewetron.com) or the CCC portal (https://ccc.dewetron.com).

Maintenance and service

The information in this section is designed for use by qualified service personal.

Service interval

Clean dust from the chassis exterior/interior based on the operating environment.

Cleaning

- Clean surface of the chassis with dry lind-free cloth.
- Use a dry velocity stream of air to clean the chassis interior.

  Do not use harsh chemical cleaning agents.

NOTICE

Many components within the chassis are sensitive to static discharge damage. Always wear a ground wrist strap and service the unit only in static-free environment.

WARNUNG

Risk of injury

Disconnect all cables before servicing the unit.

Training

DEWETRON offers training at various offices around the world several times each year. DEWETRON headquarters in Austria have a very large and professional conference and seminar center, where training classes are conducted on a regular basis starting with sensors and signal conditioning, A/D technology and software operation.

Dewetron Inc. in the USA also has a dedicated training facility connected to its headquarters, located in Rhode Island.

For more information about training services visit https://www.dewetron.com/academy.

Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your DEWETRON data acquisition system is delivered, it is calibrated at our DEWETRON headquarter. Each of this system is delivered with a certificate of compliance with our published specifications.

Detailed calibration reports from our calibration system are available for purchase with each order. We retain them for at least one year, hence calibration reports can be purchased for up to one year after your system was delivered.

Service and repairs

Only the team of DEWETRON is allowed to perform any kinds of repairs to your system to assure a safe and proper operation in future. For information regarding service and repairs please contact your local distributor first or DEWETRON directly.

INFORMATION

Any spare parts (screws, backplanes, cables etc.) must be obtained from DEWETRON only.

Support

DEWETRON has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support contact your local distributor first or DEWETRON directly.

For Asia and Europe contact:

DEWETRON GmbH
Parkring 4
8074 Grambach
AUSTRIA

Tel.: +43 316 3070
Fax: +43 316 3070-90
E-Mail: support@dewetron.com
Web: http://www.dewetron.com

The telephone hotline is available
Monday to Friday between
08:00 and 17:00 CET (GMT +1:00).

For the Americas contact:

DEWETRON Inc. (HQ USA)
2850 South County Trail, Unit 1
East Greenwich, RI 02818
USA

Tel.: +1 401 284 3750
Toll-free: +1 866 598 3393
Fax: +1 401 284 3750
Email: support@dewetron.com
Web: http://www.dewetron.com

The telephone hotline is available
Monday to Friday between
08:00 and 16:30 EST

Certificate of conformity

CE

Manufacturer	DEWETRON GmbH
Address	Parkring 4 8074 Grambach, Austria Tel.: +43 316 3070-0 Fax: +43 316 3070-90 Email: sales@dewetron.com http://www.dewetron.com
Name of product	**TRION-x-dLV-CB16-D9 / MSI series**
Kind of product	*Sensor connection box for modular smart interfaces*

The product meets the regulations of the following EC-directives:

2014/35/EU

"Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits"

2014/30/EU

"Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (recast)"

The accordance is proved by the observance of the following standards:

LVEMC	**Safety**	IEC 61010-1:2010, Pol. Deg. 2	
	Emissions	EN 61000-6-4	EN 55011 Class B
	Immunity	EN 61000-6-2	Group standard

Graz, August 23, 2019

Place / Date of the CE-marking

Ing. Thomas Propst / Manager Total Quality