

TECHNICAL REFERENCE MANUAL

KRYPTON V26-1



4. System overview

KRYPTON®

Rugged and distributed EtherCAT data acquisition system for field measurement in extreme and harsh environments. KRYPTON DAQ systems offer IP67 degree of protection and can operate in the extreme temperature range from -40 °C to +85 °C and offer high shock protection.



Voltage



Strain / Stress



Quarter Bridge



Half Bridge



Full Bridge



Thermocouple



Digital IO



IEPE



Charge



Current



Shock rating



RTD



Resistance



DSI
Compatible



TEDS
Compatible



EtherCAT



IP67



-10 °C to +50 °C

4.1. Main features

DISTRIBUTED DAQ: KRYPTON DAQ modules were designed for distributed measurements to bring data acquisition closer to sensors. This introduces many advantages as opposed to traditional DAQ systems. KRYPTON allows distributing DAQ units down to a single channel.

ETHERCAT DAQ: EtherCAT protocol with 100 Mbit/s bus speed is used for data transmission, data synchronization, and power supply. KRYPTONs are connected with a single cable for data, power, and sync.

UP TO 100m BETWEEN UNITS: KRYPTON units can be distributed over the large area with the distances up to 100 meters between DAQ nodes.

RUGGED IP67: All KRYPTON modules are rugged with the IP67 degree of protection and ready for testing in extreme weather and harsh environments.

1, 3, 4, 6, 8 and 16 CHANNEL UNITS: KRYPTON DAQ modules are available in various configurations spanning from tiny single channel units up to bigger 16-channel units. Instruments can be distributed down to the single channel.

UP TO 40 kHz/CH SAMPLING RATE: Most KRYPTON ONE channel units can achieve in the EtherCAT line sampling rate up to 40 kS/s. Most KRYPTON MULTICHANNEL units can achieve in the EtherCAT line sampling rate up to 20 kS/s.

UNIVERSAL ANALOG INPUTS: Universal analog inputs are available that can accept voltage and full/half/quarter bridge signals natively as well as IEPE, charge, thermocouples, RTD, current, resistance and LVDT signals with the use of DSI adapters.

SOFTWARE INCLUDED WITH FREE LIFETIME UPGRADES: Easy to use, yet very robust in functionality, award-winning DewesoftX® software is included. The software comes with lifetime free upgrades and no hidden costs, bringing you intuitive configuration, smart sensors, advanced storage and analysis capabilities.

4.1.1. EtherCAT Distributed DATA Acquisition

KRYPTON data acquisition systems are using 100 Mbit/s datalink based on EtherCAT protocol technology. Fast data bus allows many of the KRYPTON units to be daisy-chained together in the single measurement chain. At the end of the chain, RJ45 cable is used to plug into the Ethernet port of your PC computer or special, more rugged 8-pin LEMO connector to connect to our robust, powerful computers like KRYPTON CPU, SBOX, R2DB, R4 or R8.

EtherCAT brings another big advantage - zero configuration. KRYPTON devices do not require any complex IP setup. Simply connect them together into a PC and DewesoftX® software will recognize and set up devices automatically.

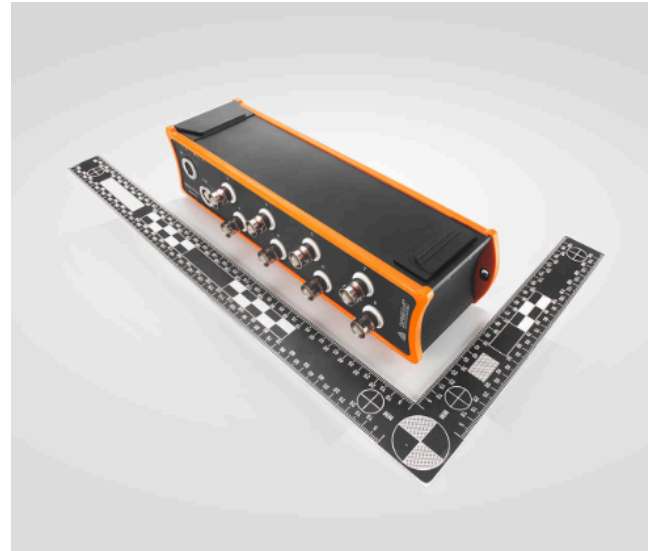
There is the single cable required for data, power, and synchronization which can run up to 100 meters (328 feet) from module to module connecting amplifiers together.

4.1.2. Small and Flexible Data Acquisition

KRYPTON data acquisition modules are designed to be small, rugged and modular especially made perfect for field measurements in any environment. The small size of KRYPTON modules allows them to fit perfectly in tight places and can be placed very near the sensors.

Traditional data acquisition systems are big boxes with many input channels, which means long and expensive sensor cabling is needed in order to perform data acquisition.

KRYPTON takes the opposite approach. We kept the same advantages of other Dewesoft DAQ devices like plug and play and sensor auto-detection), but with KRYPTON we are bringing data acquisition systems closer to the origin of data - near the sensors. This greatly reduces the **cost of the sensor cabling**, chances of wiring errors and greatly **improves the signal quality**.



KRYPTON-8xACC

4.1.3. Robust and rugged Data Acquisition

KRYPTON DAQ modules are extremely robust. We machine each one out of aluminium bricks and install industrial-grade electronics. Units are then sealed with thermally conductive and electrically insulative rubber. As a final touch, we add rubber bands around the KRYPTON chassis to further protect the unit from the shocks. The result is an **IP67 degree of protection**. Units are waterproof, shockproof, and can withstand **shocks up to 100g**.

KRYPTON can operate in extremely harsh environments and is rated to work in a temperature span from **-40°C to +85 °C**.

Extensive testing in our laboratories ensures bulletproof quality and worry-free testing under extreme conditions.

5.5. TEMPERATURE MEASUREMENT

KRYPTON TH and KRYPTON TH-HS modules are isolated rugged DAQ devices for temperature measurements using thermocouples.

Below is the list of the products:

- KRYPTONi-8xRTD,
- KRYPTONi-8xTH, KRYPTONi-8xTH-HS,
- KRYPTONi-16xTH, KRYPTONi-16xTH-HS,
- KRYPTONi-1xTH-HV.

5.5.1. KRYPTONi-8xRTD

KRYPTONi-8xRTD module with 6-pin LEMO input connectors is used for measurements with universal platinum thermometer probes, thermistors, as well as for resistance and voltage measurements.



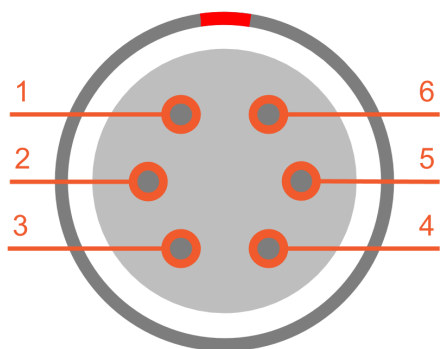
KRYPTONi-8xRTD

5.5.1.1. KRYPTONi-8xRTD: Specifications

Analog inputs		KRYPTONI-8xRTD	
Input types	voltage, resistor or universal Ptxxx inputs		
Number of channels	8		
ADC Type	24-bit delta-sigma		
Sampling Rate	Simultaneous 100 S/s		
Voltage Mode			
Ranges	±1 V		±100 mV
Input Accuracy	±0.02 % of reading ±0.01 % of range ±10 µV		±0.02% of reading ±0.01% of range ±10 µV
Typical Noise floor @ 10/100 S/s	-108 dB / -98 dB		-108 dB / -98 dB
Gain Drift	Typical 3 ppm/K (max. 10 ppm/K)		
Offset Drift	Typical 0.05 µV/K (max. 0.2 µV/K)		
Gain Linearity	< 0.01 %		
Input Coupling	DC		
Input Impedance	1 MΩ		
Temperature Mode			
Ranges	PT500, PT1000, PT2000		PT100, PT200
Measurement range	-200 °C to +850 °C		

Accuracy	±0.05 % of reading ±0.2 °C	
Temperature Drift	typ. ±5 ppm/K (max. ±12 ppm/K ±0.003 °C/K)	
Input Connection	3 wire or 4 wire	
Resistance mode		
Ranges	0...10 kΩ	0...1 kΩ
Accuracy	±0.02 % of reading ±0.01 % of range	
Input Connection	3 wire or 4 wire	
Additional Specifications		
Input connector	Lemo 0B 6pin EEA.0B.306.CLN	
Isolation voltage	1000 Vpeak channel/ground & channel/channel	
Power		
Power Supply	9 - 48 V DC	
Power consumption	2.5 W	
Environmental		
IP rating (see 1)	IP65	
Physical		
Weight	720 g	
Dimensions	213 x 39 x 58 mm	
1) Depending on the mating connector types		

5.5.1.2. KRYPTONi-8xRTD: LEMO Connector: Pinout



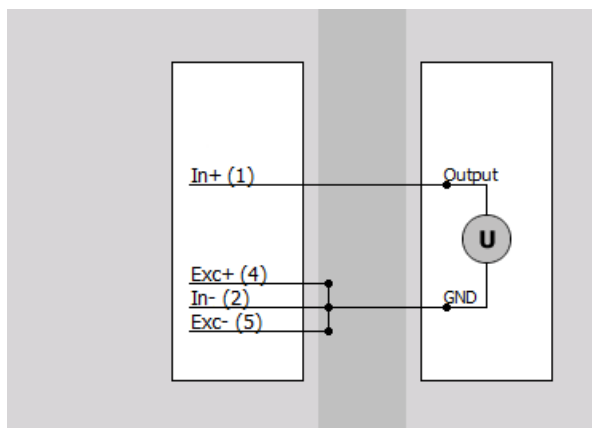
RTD connector: pinout (6-pin LEMO)

Pin	Name	Description
1	In+	Input +
2	In-	Input-
3	NC	Do not connect
4	EXC+	Excitation +
5	EXC-	Excitation-
6	GND	Ground Isolated

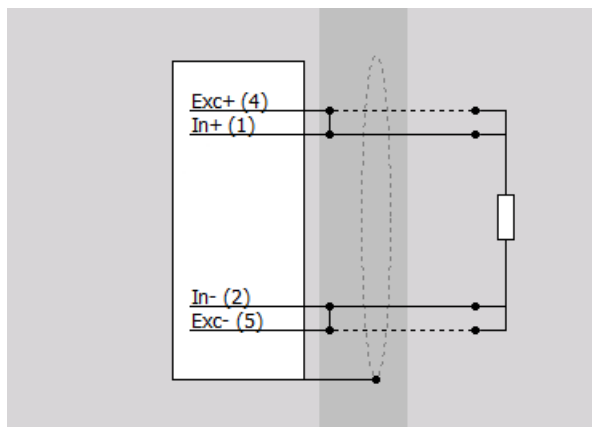
Connector type LEMO L0B6f
Mating connector: FGA.0B.306.CLAD52Z

5.5.1.3. KRYPTONi-8xRTD: Wiring diagrams

Voltage

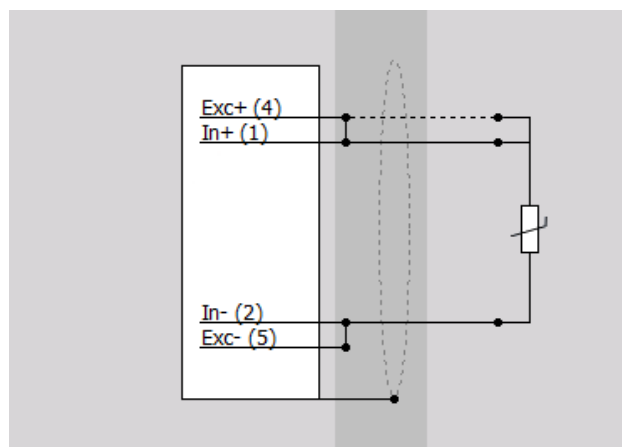


Resistance

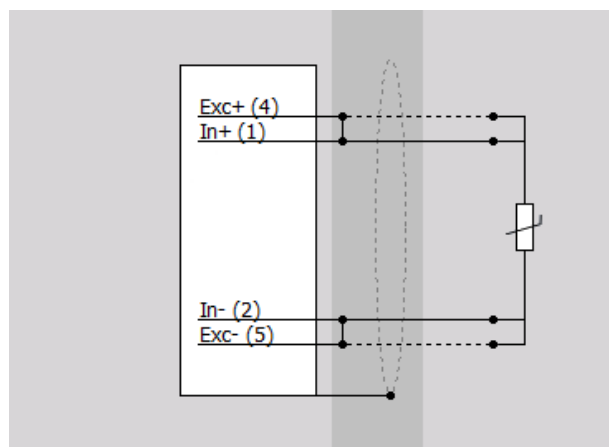


Temperature

3-wire



4-wire



5.5.2. KRYPTONi-8xRTD-HS

KRYPTONi-8xRTD module with 6-pin LEMO input connectors is used for measurements with universal platinum thermometer probes, thermistors, as well as for resistance and voltage measurements.



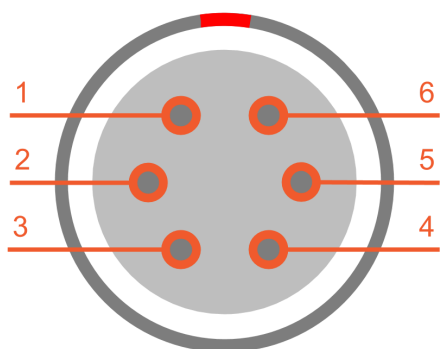
KRYPTONi-8xRTD

5.5.2.1. KRYPTONi-8xRTD-HS: Specifications

Analog inputs	KRYPTONi-8xRTD-HS	
Input types	Voltage, Resistance or Universal PTxxx inputs	
Number of channels	8	
ADC Type	24-bit delta-sigma	
Sampling Rate IOLITE	Simultaneous 10, 20, 40, 50, 80, 100, 200, 500, 1k, 2k, 5k, 10k S/s (optional)	
Sampling Rate OBSIDIAN	100 S/s	
Voltage Mode		
Ranges	±1 V	±100 mV
Input Accuracy	±0.02 % of reading ±0.01 % of range	±0.02 % of reading ±0.02 % of range
Typical Noise Floor @ 10 / 100 / 1k / 10k S/s	-130 dB / -120 dB / -110 dB / -104 dB	-120 dB / -108 dB / -98 dB / -90 dB
Offset Drift	Typ. 0.05 µV/K (Max. 0.2 µV/K)	Typ. 0.01 µV/K (Max. 0.1 µV/K)
Gain Drift	Typ. 2 ppm/K (Max. 10 ppm/K)	
Gain Linearity	< 0.007 %	
Input Coupling	DC	
Input Impedance	10 MΩ	
Temperature		
Ranges	PT500, PT1000, PT2000	PT100, PT200
Excitation current	150 uA	400 uA
Measurement range	-200 °C to +850 °C	
Accuracy	±0.02 % of reading ±0.2 °C	
Temperature Drift	Typ. ±2 ppm/K (Max. ±10 ppm/K)	
Input Connection	3-wire or 4-wire	
Resistance Mode		
Ranges	0...10 kΩ	0...1 kΩ
Excitation current	150 uA	400 uA
Accuracy	±0.02 % of reading ±0.008 % of range	

Input Connection	3-wire or 4-wire
Additional Specifications	
Input connector	Lemo 0B 6pin EEA.0B.306.CLN
Isolation voltage	1000 Vpeak channel/ground & channel/channel
Power	
Power Supply	9 - 48 V DC
Power consumption	Typ. 3.5 W (Max. 4.7 W)
Environmental	
IP rating (see 1)	IP65
Physical	
Weight	755 g
Dimensions	213 x 39 x 58 mm
1) Depending on the mating connector types	

5.5.2.2. KRYPTONi-8xRTD-HS: LEMO Connector: Pinout



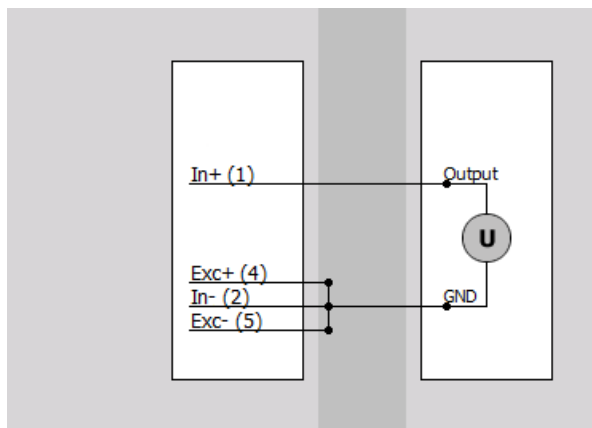
RTD connector: pinout (6-pin LEMO)

Pin	Name	Description
1	In+	Input +
2	In-	Input-
3	NC	Do not connect
4	EXC+	Excitation +
5	EXC-	Excitation-
6	GND	Ground Isolated

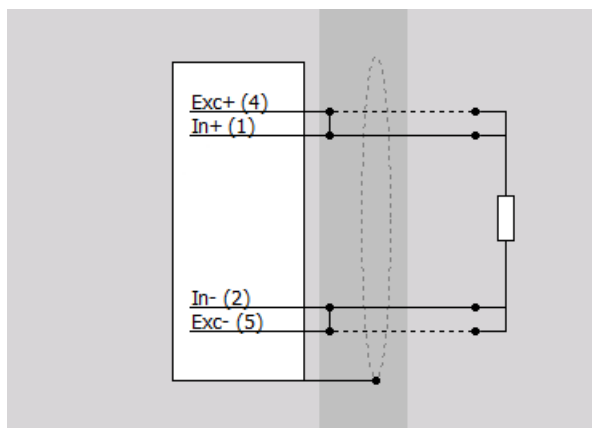
Connector type: LEMO L0B6f
Mating connector: FGA.0B.306.CLAD52Z

5.5.2.3. KRYPTONi-8xRTD-HS: Wiring diagrams

Voltage

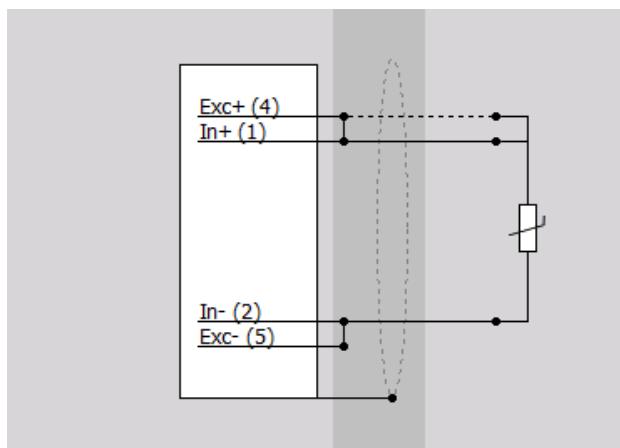


Resistance

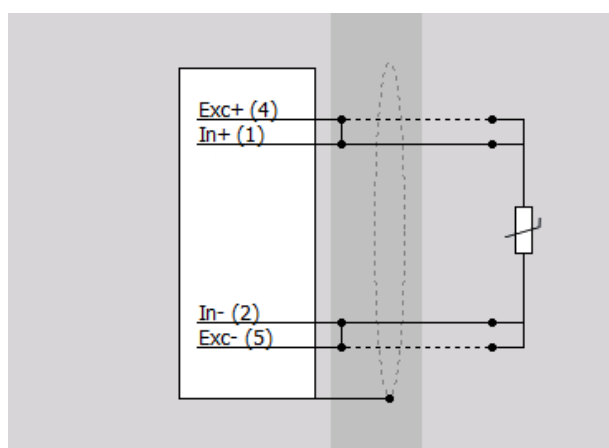


Temperature

3-wire

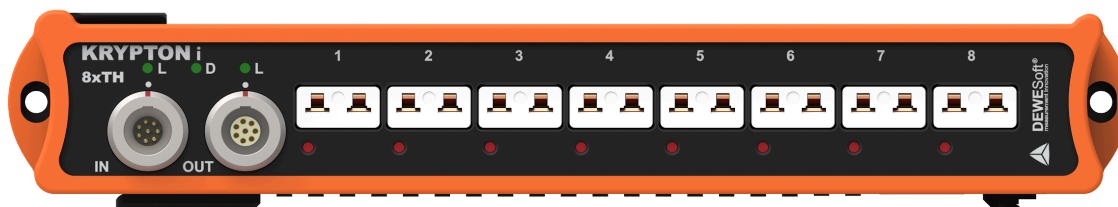


4-wire



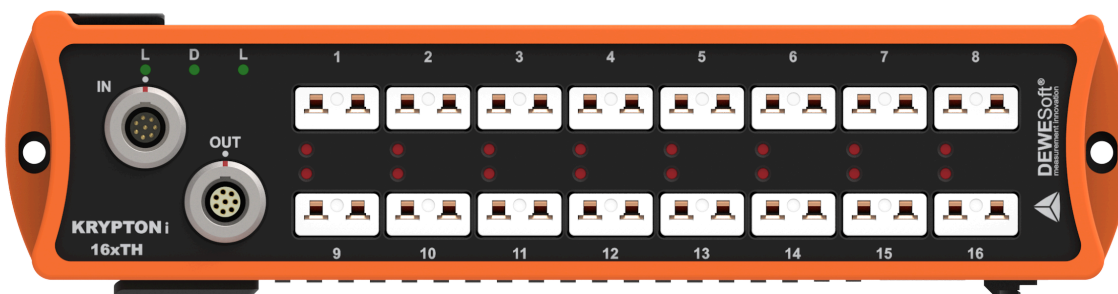
5.5.3. KRYPTONi-8xTH, KRYPTONi-16xTH

KRYPTONi-8xTH module has 8 thermocouple-connectors for temperature measurement.



KRYPTONi-8xTH

KRYPTONi-16xTH module has 16 thermocouple-connectors for temperature measurement.



KRYPTONi-16xTH

5.5.3.1. KRYPTONi-8xTH, KRYPTONi-16xTH: Specifications

Analog inputs	KRYPTONi-8xTH	KRYPTONi-16xTH
Input type	Isolated universal thermocouple and voltage	
Number of channels	8	16
ADC Type	24-bit delta-sigma	
Sampling rates	Simultaneous 100, 80, 40, 20, 10 S/s (software selectable)	
Voltage Ranges	±1 V	±100 mV
Input Accuracy	±0.02 % of reading ±100 µV	±0.02 % of reading ±10 µV
Typical Noise Floor @ 10 / 100 S/s	-114 dB / -105 dB	-109 dB / -100 dB
Gain Drift	Typical 3 ppm/K (max. 10 ppm/K)	
Offset Drift	0.03 µV/K	
Gain Linearity	< 0.01 %	
Input Coupling	DC	
Input Impedance	100 MΩ	
Thermocouple		
Input type	TC Types: K, J, T, R, S, N , E, C, B	

Accuracy	±0.02 % of reading ± 0.5 °C ± 10 µV	
Resolution	< 0.001 °C	
Typical Noise	0.007 °C RMS @ Type K @ 10 S/s	0.02 °C RMS @ Type K @ 100 S/s
Additional Specifications		
Input connector	Mini Thermocouple connector (copper)	
Isolation voltage	1000 Vpeak channel/ground & channel/channel	
Power		
Power supply	9 - 48 V DC	
Power consumption	2.5 W	4 W
Environmental		
IP rating (see 1)	IP67	
Physical		
Weight	720 g	1000 g
Dimensions	213 x 39 x 56 mm	213 x 54 x 56 mm
1) Depending on the mating connector types, for non corrosive liquids only, IP65 standard		

5.5.3.1.1. KRYPTONi-8xTH, KRYPTONi-16xTH: Specifications: Accuracy table

Temperature	Type K	Type J	Type T	Type R	Type S	Type N	Type E	Type B	Type C
-200 °C	1.19 °C	1.00 °C	1.17 °C			1.54 °C	0.83 °C		
-100 °C	0.85 °C	0.76 °C	0.87 °C			1.00 °C	0.74 °C		
0 °C	0.75 °C	0.70 °C	0.76 °C	2.38 °C	2.34 °C	0.89 °C	0.67 °C		1.27 °C
100 °C	0.76 °C	0.70 °C	0.73 °C	1.85 °C	1.88 °C	0.86 °C	0.67 °C	10.96 °C	1.15 °C
400 °C	0.82 °C	0.76 °C	0.74 °C	1.54 °C	1.63 °C	0.85 °C	0.71 °C	3.03 °C	1.11 °C
700 °C	0.88 °C	0.80 °C		1.49 °C	1.59 °C	0.89 °C	0.77 °C	2.11 °C	1.17 °C
1000 °C	0.96 °C	0.87 °C		1.46 °C	1.57 °C	0.96 °C	0.85 °C	1.80 °C	1.23 °C
1300 °C	1.05 °C			1.47 °C	1.59 °C	1.04 °C		1.68 °C	1.35 °C
1700 °C				1.58 °C	1.71 °C			1.70 °C	1.65 °C



Hint

Linearisation curves used are based on international standards:

- IEC 60584-1 Thermocouples – Part 1: EMF specifications and tolerances.
- IEC 60751 Industrial platinum resistance thermometers and platinum temperature sensors
- EN standards or national SIST EN, DIN EN or others are the same as IEC standards.

5.5.3.2. KRYPTONi-8xTH, KRYPTONi-16xTH: Thermocouple connector: Pinout

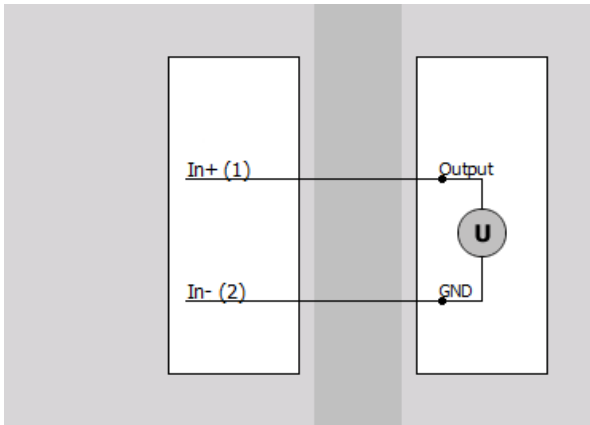


Thermocouple connector: pinout (Mini TC)

Pin	Name	Description
1	In+	Input+
2	In-	Input-

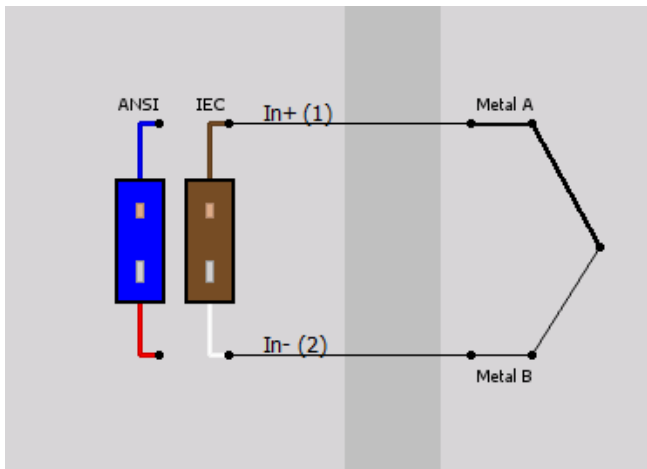
5.5.3.3. KRYPTONi-8xTH, KRYPTONi-16xTH: Wiring diagrams

Voltage

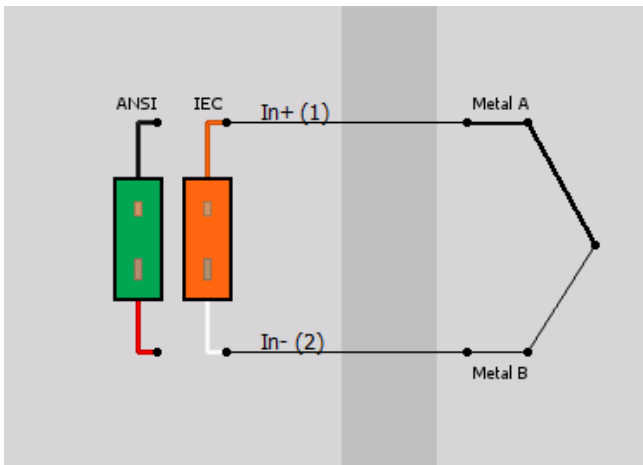


Temperature

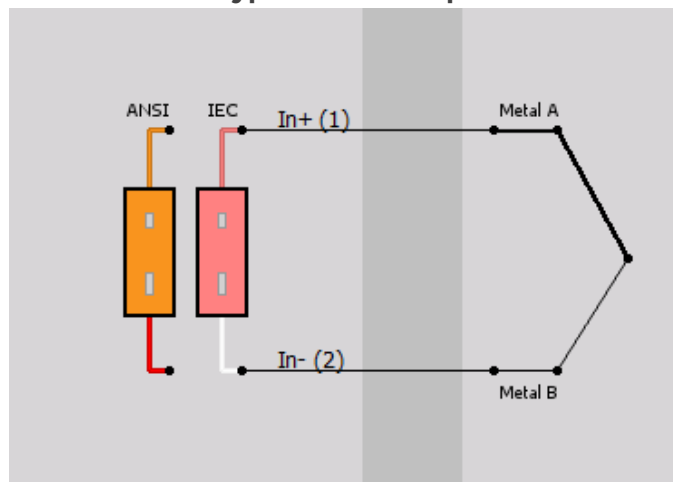
T-type thermocouple



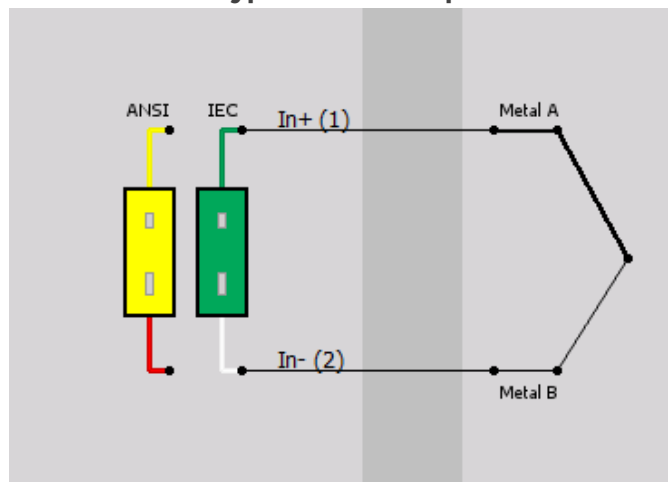
S-type, R-type thermocouple



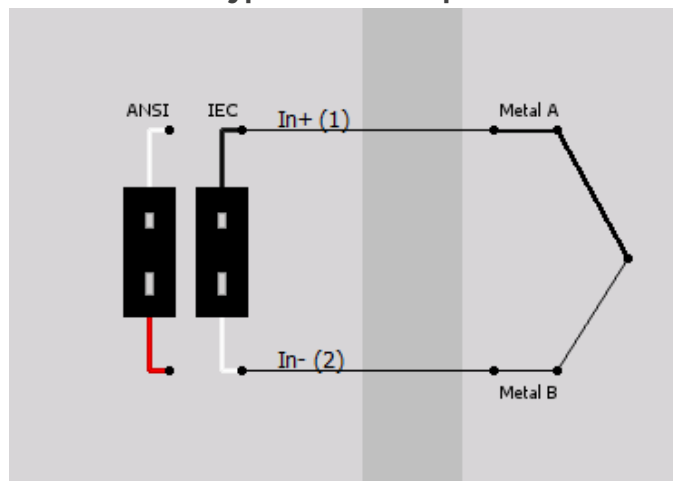
N-type thermocouple



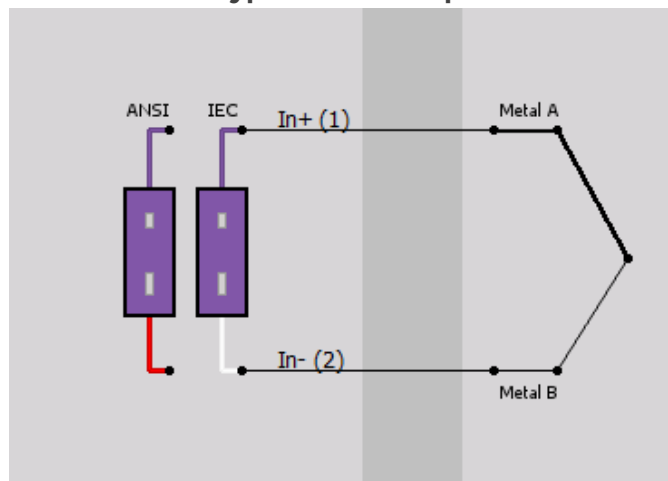
K-type thermocouple



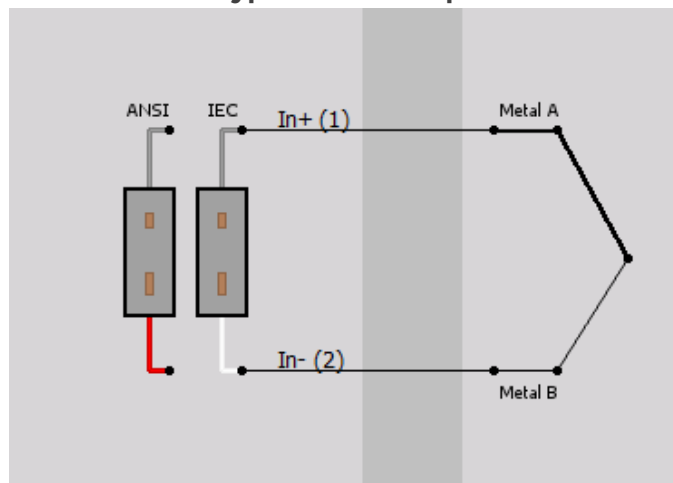
J-type thermocouple



E-type thermocouple



B-type thermocouple



C-type thermocouple

