

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.

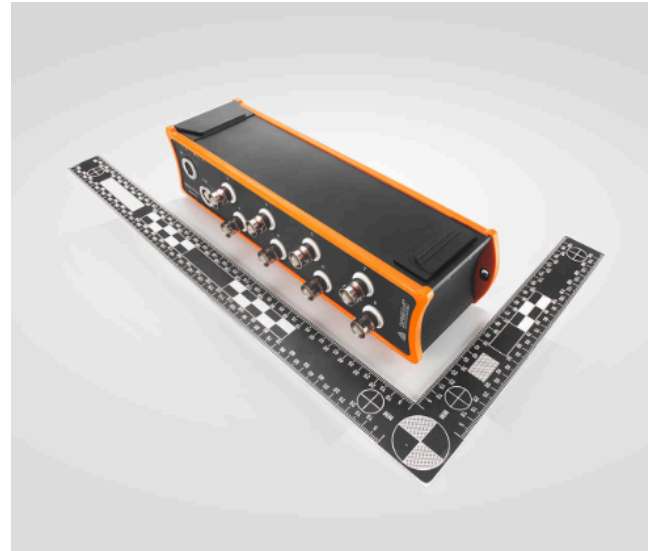
There is the single cable required for data, power, and synchronization which can run up to 100 meters (328 feet) from module to module connecting amplifiers together.

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.

5.4. STRAIN AND STRESS MEASUREMENT

KRYPTON STG modules have universal differential voltage and Full / Half / Quarter bridge input. STG modules are available in 1, 3 and 6 channel configurations and are compatible with DSI adapters:

- KRYPTON-3xSTG, KRYPTON-3xSTG-L2B10f,
- KRYPTON-6xSTG, KRYPTON-6xSTG-L2B10f, KRYPTON-6xSTG-L1T7f
- KRYPTONi-1xSTG.

5.4.1. KRYPTON-3xSTG, 6xSTG

KRYPTON-6xSTG module has 6 DSUB-9 female connectors for voltage or strain measurement.



KRYPTON-6xSTG

KRYPTON-3xSTG module has 3 DSUB-9 female connectors for voltage or strain measurement.



KRYPTON-3xSTG

KRYPTON-6xSTG-L2B10f module has 6 LEMO L2B10f connectors for voltage or strain measurement.



KRYPTON-6xSTG-L2B10f

KRYPTON-3xSTG-L2B10f module has 3 LEMO L2B10f connectors for voltage or strain measurement.



KRYPTON-3xSTG-L2B10f

KRYPTON-6xSTG-LIT7f module has 6 LEMO LIT7f connectors for voltage or strain measurement.



KRYPTON-6xSTG-LIT7f

5.4.1.1. KRYPTON-3xSTG, 6xSTG: Specifications

Analog inputs	KRYPTON-3xSTG			
Input type	Voltage Full / half / quarter strain			
Number of channels	3			
ADC Type	24-bit oversampled SAR with 41 kHz anti-aliasing filter			
Sampling Rate	Simultaneous 20k, 10k, 5k, 2k, 1k, 500, 200, 100 S/s (software-selectable)			
Voltage Mode				
Ranges	±10 V	±1 V	±100 mV	±10 mV
Input Accuracy	±0.03 % of reading, ±0.02 % of range, ±0.1 mV			
Typical Dynamic Range @ 10 kS/s	-139 dB	-139 dB	-129 dB	-110 dB
Typical Noise Floor @ 10 kS/s	-106 dB	-105dB	-97 dB	-78 dB
Typical CMR @ 400 Hz / 1 kHz	86 dB / 84 dB	96 dB / 95 dB	112 dB / 102 dB	112 dB / 102 dB

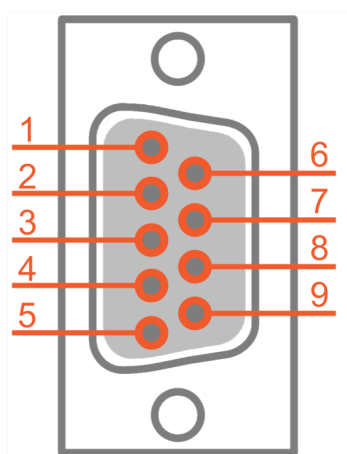
Gain Drift	Typical 10 ppm/K (max. 40 ppm/K)
Offset Drift	Typical 0.3 μ V/K + 5 ppm of range/K, max 2 μ V/K + 10 ppm of range/K
Gain Linearity	< 0.02 %
Input Coupling	DC
Input Impedance	10 M Ω
Overvoltage Protection	In+ to In-: 50 V continuous, 200 V peak (10 ms)
Analog input performance	
Bandwidth (-3 dB)	0.49 fs
Alias-free Bandwidth	DC to 0.453 fs
Alias Rejection	-100 dB (all sample rates)
Delay Through ADC	37 / fs
Oversampling	32
Excitation Voltage	
Excitation voltage	Free programmable (16-bit DAC)
Predefined Levels	0, 1, 2.5, 5, 10 and 15 VDC
Accuracy	± 0.05 % ± 2 mV
Drift	± 50 ppm/K ± 100 μ V/K
Stability 10 % to 90 % Load	< 0.01 %
Current Limit	45 mA (400 mW max. Power)
Protection	Continuous short to ground
Bridge mode	
Bridge Connection Types	full bridge strain, $\frac{1}{2}$ bridge strain, $\frac{1}{4}$ bridge strain (3 wire)
Ranges	2...1000 mV/V free programmable
Internal Bridge Completion	$\frac{1}{2}$ bridge and $\frac{1}{4}$ bridge 120 and 350 Ω
Bridge Completion Accuracy	0.05 %; TCR: 2 ppm/K (others on request)
Internal Shunt Resistor	100 k Ω (others on request)
Shunt Resistor Accuracy	0.1 %; TCR: 10 ppm/K (others on request)
Input Short, Sensor Offset Adjust	Software-selectable
Additional Specifications	
Input connector	DB9; L1T7f; L2B10f
TEDs support	Standard + DSI adapters
Power Consumption	3.5 W (4.8 W 120 Ω @ 5 V load)
Power Supply	9 - 48 V DC
IP rating	IP67
Weight	740 g
Slice Dimensions	213 x 39 x 56 mm
Dimensions with Connectors	213 x 39 x 58.2 mm

Analog inputs		KRYPTON-6xSTG			
Input type	Voltage Full / half / quarter strain				
Number of channels	6				
ADC Type	24-bit oversampled SAR with 41 kHz anti-aliasing filter				
Sampling Rate	Simultaneous 20k, 10k, 5k, 2k, 1k, 500, 200, 100 S/s (software-selectable)				
Voltage Mode					
Ranges	±10 V	±1 V	±100 mV	±10 mV	
Input Accuracy	±0.03 % of reading, ±0.02 % of range, ±0.1 mV				
Typical Dynamic Range @ 10 kS/s	-139 dB	-139 dB	-129 dB	-110 dB	
Typical Noise Floor @ 10 kS/s	-106 dB	-105dB	-97 dB	-78 dB	
Typical CMR @ 400 Hz / 1 kHz	86 dB / 84 dB	96 dB / 95 dB	112 dB / 102 dB	112 dB / 102 dB	
Gain Drift	Typical 10 ppm/K (max. 40 ppm/K)				
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K				
Gain Linearity	< 0.02 %				
Input Coupling	DC				
Input Impedance	10 MΩ				
Overvoltage Protection	In+ to In-: 50 V continuous, 200 V peak (10 ms)				
Analog input performance					
Bandwidth (-3 dB)	0.49 fs				
Alias-free Bandwidth	DC to 0.453 fs				
Alias Rejection	-100 dB (all sample rates)				
Delay Through ADC	37 / fs				
Oversampling	32				
Excitation Voltage					
Excitation voltage	Free programmable (16-bit DAC)				
Predefined Levels	0, 1, 2.5, 5, 10 and 15 VDC				
Accuracy	±0.05 % ±2 mV				
Drift	±50 ppm/K ±100 µV/K				
Stability 10 % to 90 % Load	< 0.01 %				
Current Limit	45 mA (400 mW max. Power)				
Protection	Continuous short to ground				
Bridge mode					
Bridge Connection Types	full bridge strain, ½ bridge strain, ¼ bridge strain (3 wire)				
Ranges	2...1000 mV/V free programmable				
Internal Bridge Completion	½ bridge and ¼ bridge 120 and 350 Ω				
Bridge Completion Accuracy	0.05 %; TCR: 2 ppm/K (others on request)				

Internal Shunt Resistor	100 kΩ (others on request)
Shunt Resistor Accuracy	0.1 %; TCR: 10 ppm/K (others on request)
Input Short, Sensor Offset Adjust	Software-selectable
Additional Specifications	
Input connector	DB9; LIT7f; L2B10f
TEDs support	Standard + DSI adapters
Power Consumption	5.9 W (8.9 W load 120 Ω @ 5 V)
Power Supply	9 - 48 V DC
IP rating	IP67
Weight	1100 g
Slice Dimensions	213 x 54 x 56 mm
Dimensions with Connectors	213 x 54 x 58.2 mm

5.4.1.2. KRYPTON-3xSTG, 6xSTG: Connectors

5.4.1.2.1. KRYPTON-3xSTG, 6xSTG Connector: DSUB Connector: Pinout

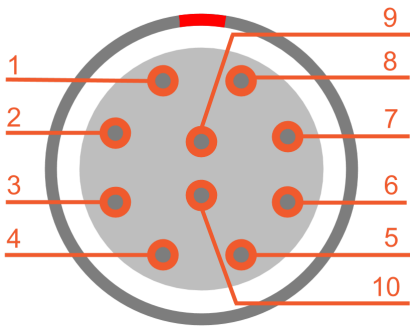


STG connector:pinout (DSUB-9 female)

Pin	Name	Description
1	Exc+	Excitation +
2	In+	Input +
3	Sns-	Sense-
4	GND	Ground
5	R+	¼ Bridge / Shunt
6	Sns+	Sense+
7	In-	Input-
8	Exc-	Excitation-
9	TEDS	TEDS

5.4.1.2.2. KRYPTON-3xSTG, 6xSTG Connector: LEMO L2B10f Connector: Pinout

Pin	Name	Description
-----	------	-------------

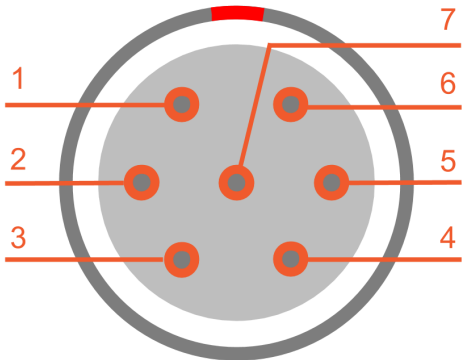


STG-L2B10f connector: pinout (10-pin LEMO female)

Connector type: EEG.2B.310.CLN
Mating connector: FGG.2B.310.CLAD72

1	TEDS	TEDS
2	R+	¼ Bridge / Shunt
3	NC	Not connected
4	SNS-	Sense-
5	EXC-	Excitation-
6	SNS+	Sense+
7	EXC+	Excitation +
8	GND	Ground
9	IN-	Input-
10	IN+	Input +

5.4.1.2.3. KRYPTON-3xSTG, 6xSTG Connector: LEMO L1T7f Connector: Pinout



STG-L1T7f connector: pinout (7-pin LEMO female)

Connector type: EEG.1T.307.CLN
Mating connector: FGG.1T.307.CLAC45

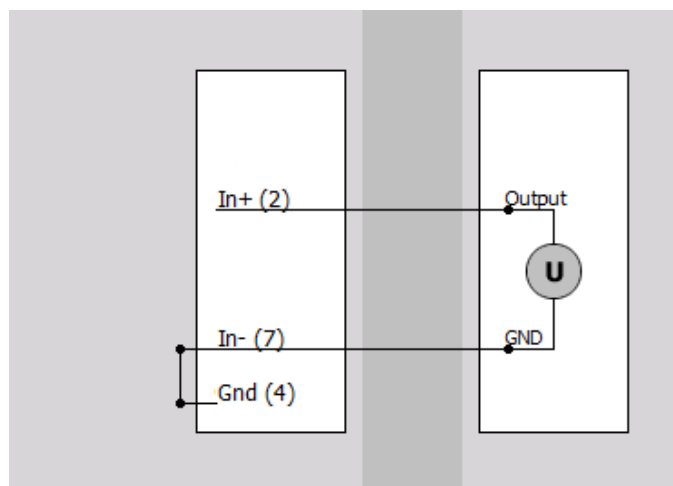
Pin	Name	Description
1	In+	Input +
2	Exc+	Excitation +
3	Sns+	Sense +
4	Sns-	Sense -
5	Exc-	Excitation -
6	In-	Input -
7	R+	¼ Bridge / Shunt

5.4.1.3. KRYPTON-3xSTG, 6xSTG: Wiring diagrams

5.4.1.3.1. KRYPTON-3xSTG, 6xSTG: DSUB Connector: Wiring diagrams

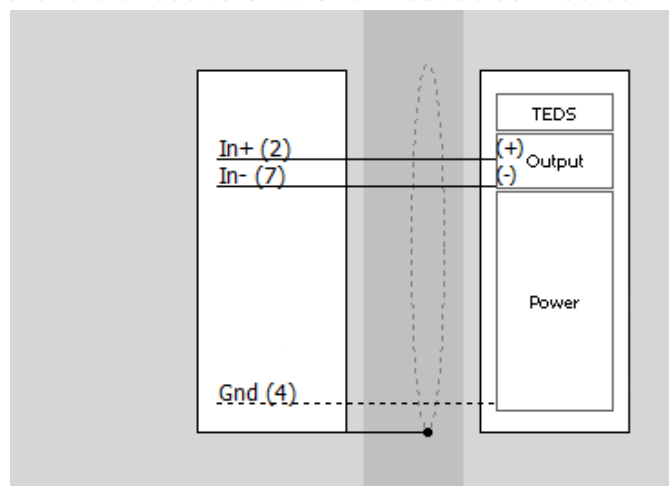
Voltage

Single ended



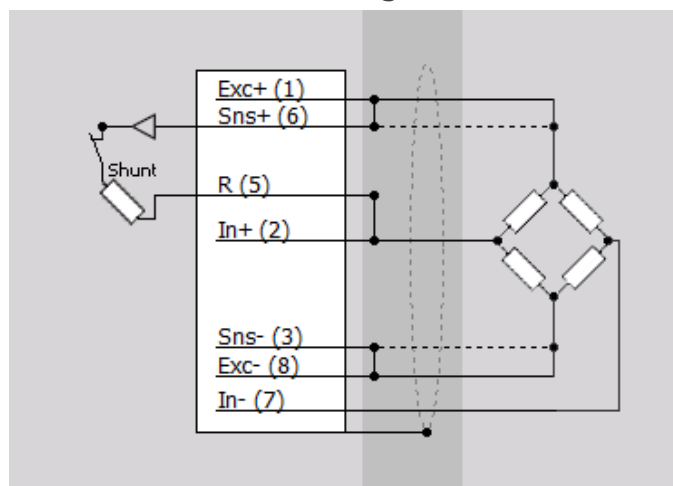
Differential

Use only when sensor Output (+) and Output (-) are referenced to Gnd. Gnd must be connected.

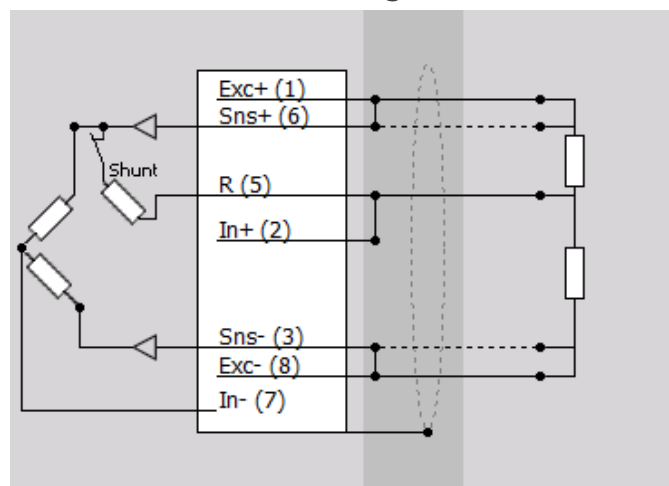


Bridge

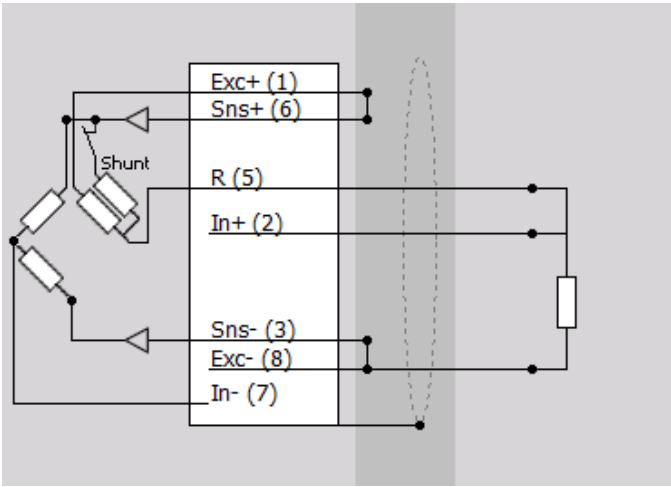
Full-bridge



Half-bridge

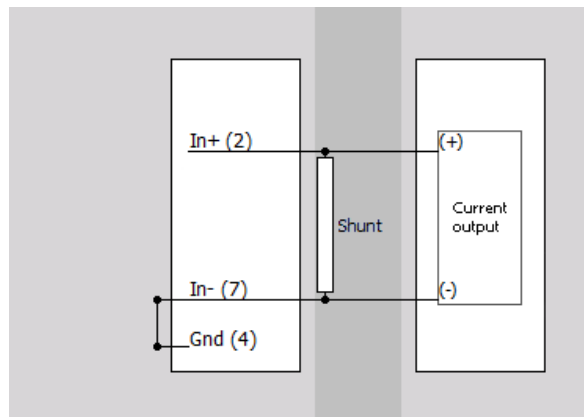


Quarter-bridge

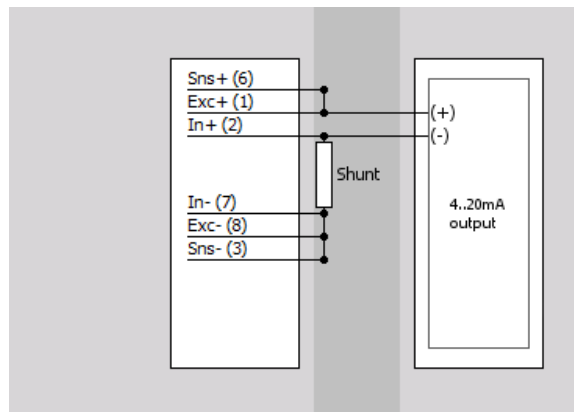


Current

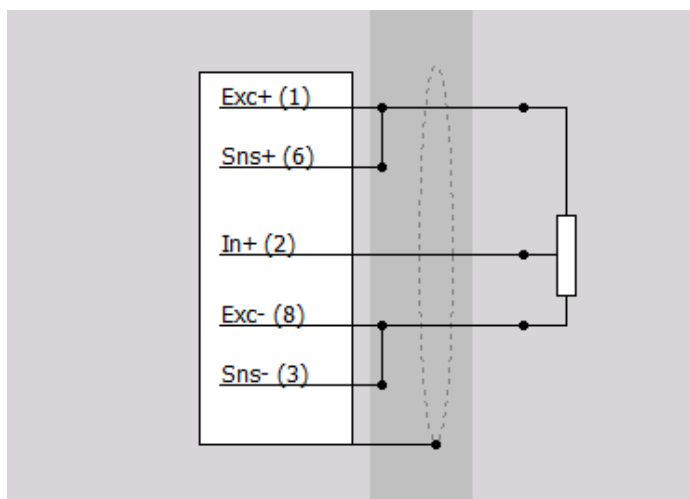
External direct shunt



External loop powered shunt

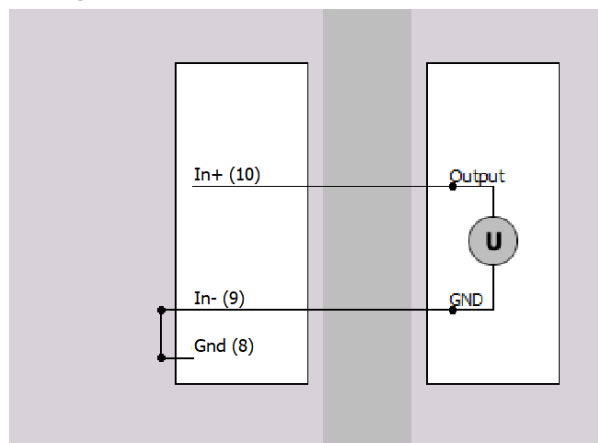


Potentiometer



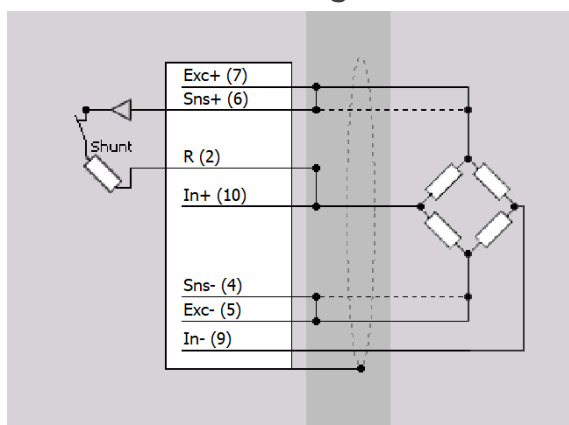
5.4.1.3.2. KRYPTON-3xSTG, 6xSTG: LEMO L2B10f Connector: Wiring diagrams

Voltage

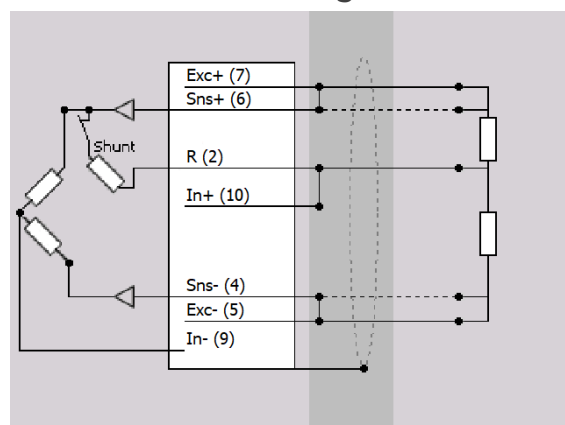


Bridge

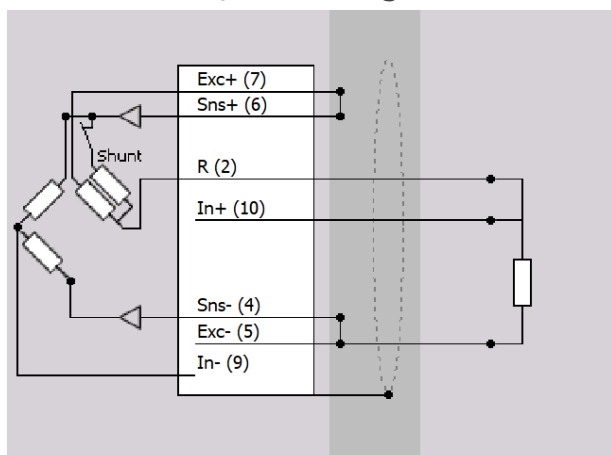
Full-bridge



Half-bridge

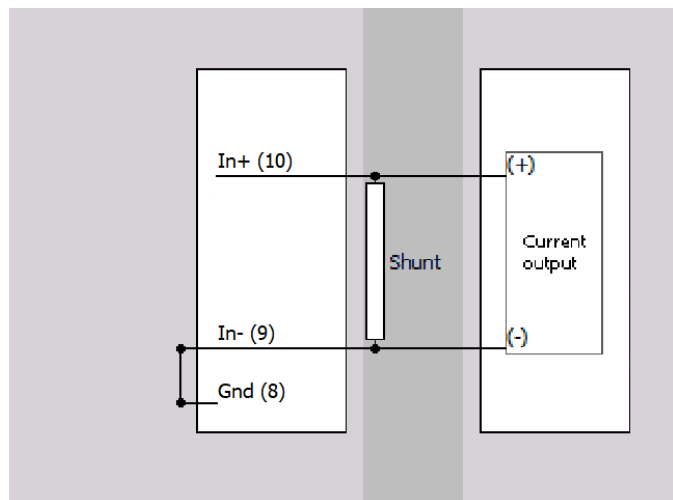


Quarter-bridge

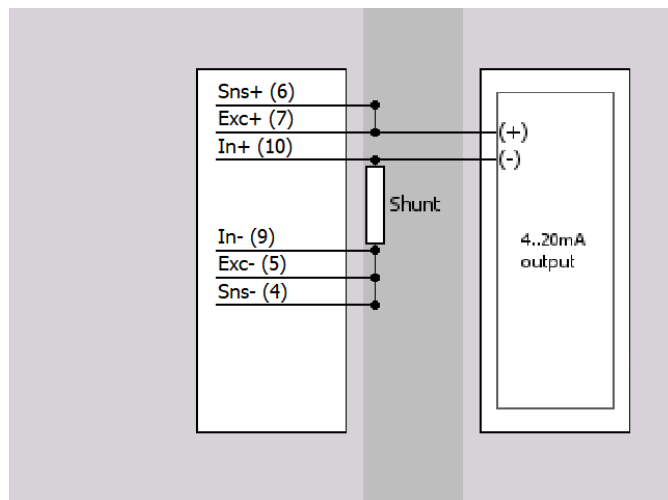


Current

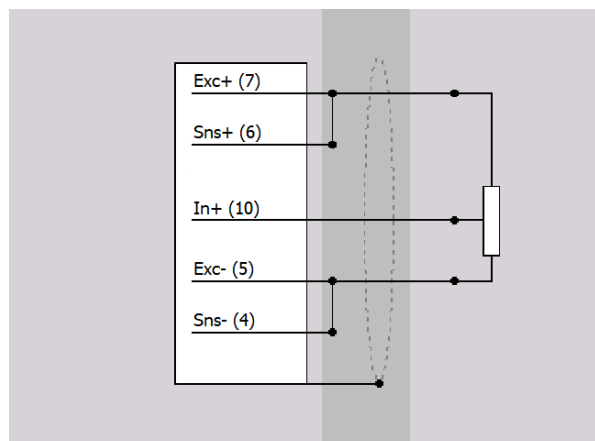
External direct shunt



External loop powered shunt

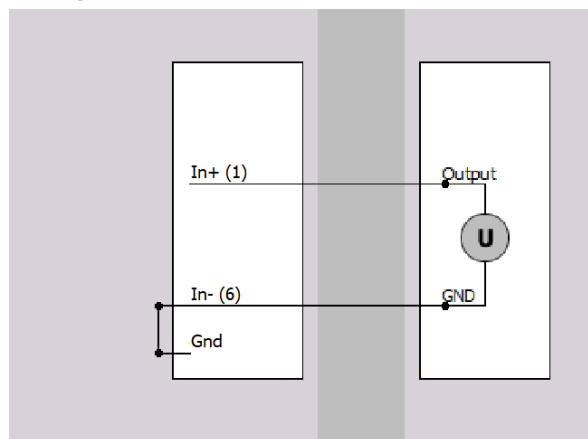


Potentiometer



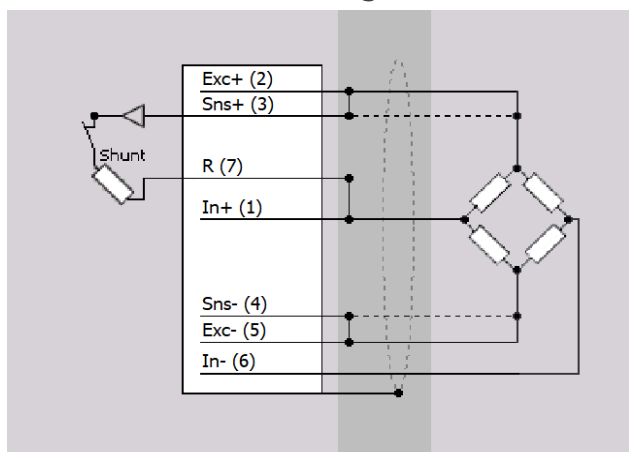
5.4.1.3.3. KRYPTON-3xSTG, 6xSTG: LEMO LIT7f Connector: Wiring diagrams

Voltage

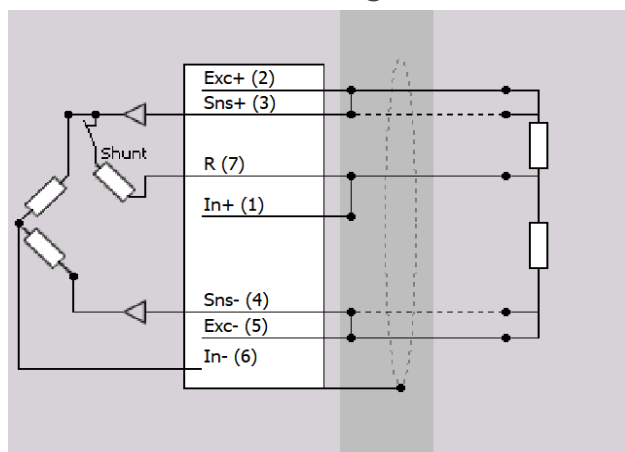


Bridge

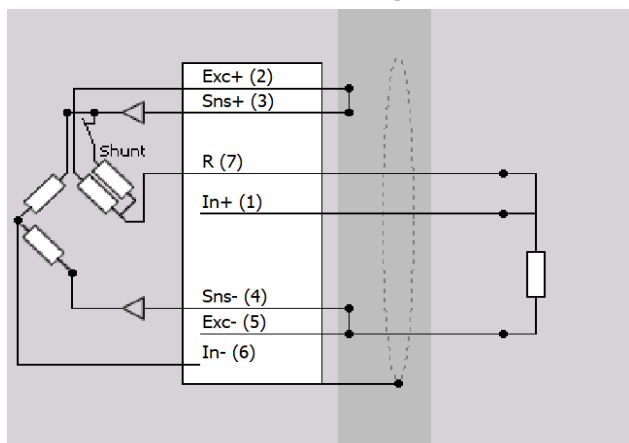
Full-bridge



Half-bridge



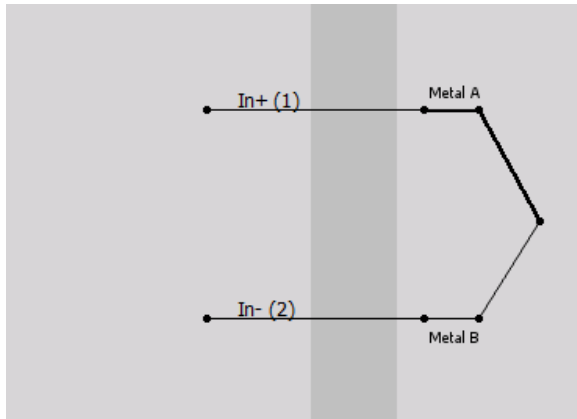
Quarter-bridge



5.5.5.3. KRYPTONi-1xTH-HV: Wiring diagrams

Temperature

K-type thermocouple



5.6. VIBRATION AND SOUND

The ACC modules have BNC input connectors and are perfect for sound and vibration IEPE channels.

Currently available:

- KRYPTON-8xACC, KRYPTON-4xACC,
- KRYPTONi-1xACC.

5.6.1. KRYPTON-4xACC, KRYPTON-8xACC

KRYPTON-4xACC module has 4 BNC connectors for voltage and IEPE measurements.



Caution

Inputs are single-ended, if isolation is required isolated sensors have to be used.



KRYPTON-4xACC

KRYPTON-8xACC module has 8 BNC connectors for voltage and IEPE measurements.



Caution

Inputs are single-ended, if isolation is required isolated sensors have to be used.



KRYPTON-8xACC

5.6.1.1. KRYPTON-4xACC: Specifications

Analog inputs		KRYPTON-4xACC			
Input type	Voltage, IEPE				
Number of channels	4				
ADC Type	24-bit delta-sigma with anti-aliasing filter				
Sampling Rate	Simultaneous 20 kS/s per channel (software-selectable)				
Voltage Mode					
Ranges	±10 V	±5 V	±1 V	±200 mV	
Input Accuracy	±0.03 % of reading ±0.02 % of range ±0.2 mV				
Typical Dynamic Range @ 10 kS/s	-140 dB	-137 dB	138 dB	-134 dB	
Typical noise floor @ 10 kS/s	-106 dB	-106 dB	106 dB	-102 dB	
Type. THD (20 kS/s, -1 dBFS sine wave @ 1 kHz)	-94 dB	-94 dB	-93 dB	-95 dB	
Type. SFDR (10 kS/s, -1 dBFS sine wave @ 1 kHz)	96 dB	96 dB	96 dB	93 dB	
Gain Drift	Typical 10 ppm/K, max. 20 ppm/K				
Offset Drift	Typical 0.5 µV/K + 1 ppm of range/K, max 2 µV/K + 3 ppm of range/K				
Input Coupling	DC, AC 0.1 Hz, 1 Hz				
Input Impedance	1 MΩ				
Overvoltage Protection	In+ to In-: 50 V continuous, 200 V peak (10 msec)				
Analog input performance					
Bandwidth (-3 dB)	0.49 fs				
Alias-free Bandwidth	DC to 0.453 fs				
Alias Rejection	-100 dB (all sample rates)				
Delay Through ADC	37 / fs				

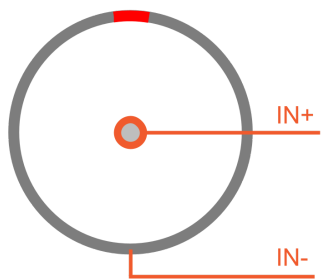
Oversampling	32
IEPE input	
Excitation	4 mA, 8 mA
Compliance voltage	25 V
Output Impedance	>100 kΩ
Sensor detection	Shortcut: <4 V; Open: >19 V
Additional Specifications	
Input connector	BNC
TEDs support	IEPE mode only
Power	
Power Supply	9 - 48 V DC
Power Consumption	3 W
Environmental	
IP rating (see 1)	IP67
Physical	
Weight	700 g
Slice Dimensions	213 x 39 x 56 mm
Dimensions with Connectors	213 x 39 x 66.8 mm

5.6.1.2. KRYPTON-8xACC: Specifications

Analog inputs		KRYPTON-8xACC			
Input type	Voltage, IEPE				
Number of channels	8				
ADC Type	24-bit delta-sigma with anti-aliasing filter				
Sampling Rate	Simultaneous 20 kS/s per channel (software-selectable)				
Voltage Mode					
Ranges	±10 V	±5 V	±1 V	±200 mV	
Input Accuracy	±0.03 % of reading ±0.02 % of range ±0.2 mV				
Typical Dynamic Range @ 10 kS/s	-140 dB	-137 dB	138 dB	-134 dB	
Typical noise floor @ 10 kS/s	-106 dB	-106 dB	106 dB	-102 dB	
Type. THD (20 kS/s, -1 dBFS sine wave @ 1 kHz)	-94 dB	-94 dB	-93 dB	-95 dB	
Type. SFDR (10 kS/s, -1 dBFS sine wave @ 1 kHz)	96 dB	96 dB	96 dB	93 dB	
Gain Drift	Typical 10 ppm/K, max. 20 ppm/K				
Offset Drift	Typical 0.5 μV/K + 1 ppm of range/K, max 2 μV/K + 3 ppm of range/K				
Input Coupling	DC, AC 0.1 Hz, 1 Hz				
Input Impedance	1 MΩ				
Overvoltage Protection	In+ to In-: 50 V continuous, 200 V peak (10 msec)				
Analog input performance					
Bandwidth (-3 dB)	0.49 fs				

Alias-free Bandwidth	DC to 0.453 fs
Alias Rejection	-100 dB (all sample rates)
Delay Through ADC	37 / fs
Oversampling	32
IEPE input	
Excitation	4 mA, 8 mA
Compliance voltage	25 V
Output Impedance	>100 kΩ
Sensor detection	Shortcut: <4 V; Open: >19 V
Additional Specifications	
Input connector	BNC
TEDs support	IEPE mode only
Power	
Power Supply	9 - 48 V DC
Power Consumption	4.6 W
Environmental	
IP rating (see 1)	IP67
Physical	
Weight	1000 g
Slice Dimensions	213 x 54 x 56 mm
Dimensions with Connectors	213 x 54 x 66.8 mm
1) Depending on the mating connector types	

5.6.1.3. KRYPTON-4xACC, KRYPTON-8xACC: BNC Connector: Pinout

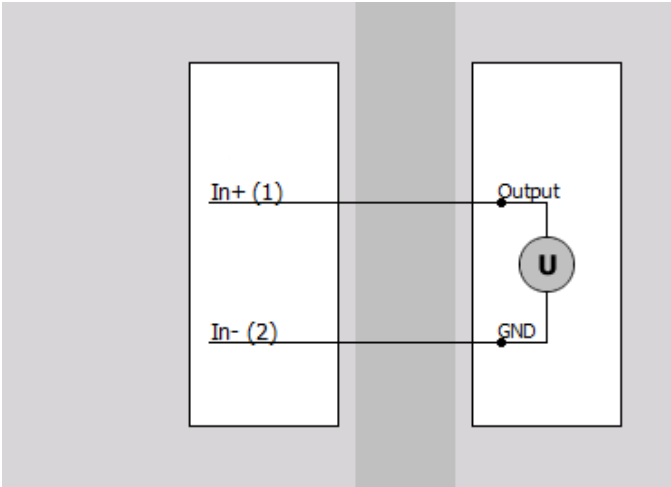


Pin	Name	Description
1	IN+	Input +
2	IN-	Input -

ACC connector: pinout (BNC)

5.6.1.4. KRYPTON-8xACC, KRYPTON-4xACC: Wiring diagrams

Voltage



IEPE

