

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.

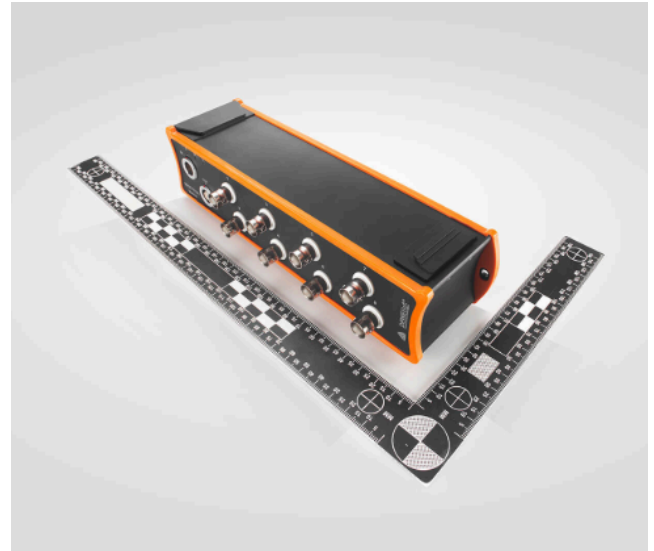
There is the single cable required for data, power, and synchronization which can run up to 100 meters (328 feet) from module to module connecting amplifiers together.

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.

4.1.5. KRYPTON ONE - Single channel Data Acquisition

KRYPTON ONE is the smallest IP67 DAQ module in the world. The pocket-size allows the modules to be mounted in tight places, right next to the sensors. Units are highly distributable, connected with a single cable for power, data, and synchronization.

KRYPTON ONE data acquisition modules are completely compatible with every other KRYPTON, SIRIUS and other data acquisition systems from Dewesoft.



KRYPTONi-1xACC

Main characteristics of KRYPTON ONE modules:

- The fastest KRYPTON: single-channel architecture allows a maximum sample rate of 40 kS/s.
- Isolation: all analog KRYPTON ONE modules are fully isolated.
- Current input: 1xSTG includes an internal shunt for two current input ranges (20 mA, 2 mA).
- High current drive: 4xDO is capable of sinking 2 A current to drive high loads.
- Easy stacking: modules can be stacked and tightened together with M4 hex key screws

4.1.6. Works with 3rd-party Real-Time EtherCAT Master

The entire KRYPTON product line can be used with any 3rd-party real-time EtherCAT master for real-time data acquisition and control applications.

Because KRYPTON offers perfect signal conditioning and offers very rugged distributed units it is a perfect device that can be used in most demanding real-time test and control applications.

4.1.7. DAQ Synchronization

KRYPTON data acquisition hardware is capable of acquiring different signals like voltage, bridge, IEPE, thermocouple, digital, and more. With included DewesoftX® software, you can easily acquire data from additional interfaces like GPS, Flexray, Ethernet, Serial, PCM telemetry, and many more.

Even though each data source can have different sampling rates (software selectable for each channel), all data is always perfectly synchronized down to microsecond accuracy. The synchronization between KRYPTON modules runs through the same cable as power and data.

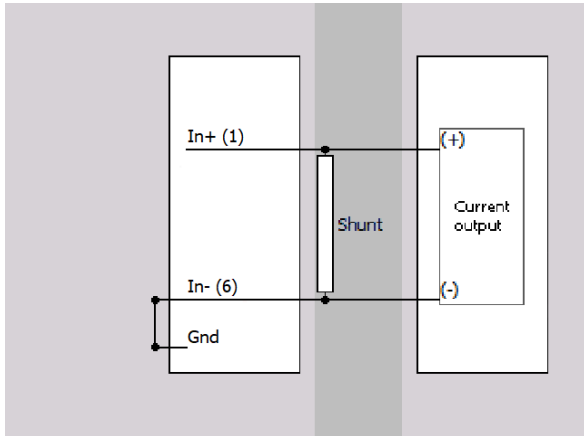
KRYPTON DAQ modules can also be combined and synchronized with our fast USB DAQ devices like **SIRIUS**, **IOLITE**, **MINITAURS** or **DEWE-43-A**. For this we have a small accessory called **EtherCAT SYNC JUNCTION**. This box will provide a clock source for synchronization. External timing sources like GPS or IRIG can be connected and used.

4.2. General specifications

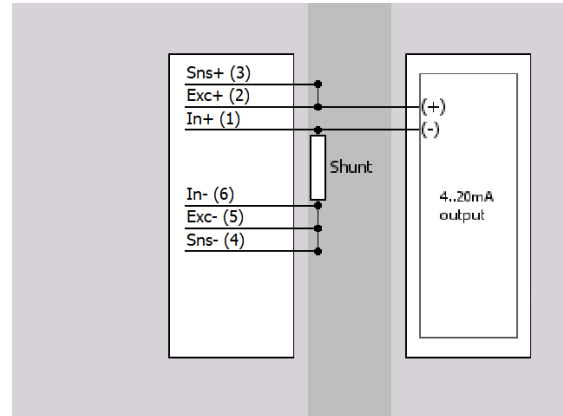
Interface	
Data interface	EtherCAT®
Data Rate	100 Mbps Full Duplex bus speed
Max. Throughput per Chain	From 6 MB/s to 10 MB/s (see 1)
Sync Accuracy	below 1 sample to Sirius®
EtherCAT®	Max. Cable Length 100 m
Max. Number of Units	64 or more (power injectors may be required)
Data Interface Connection	LEMO 1T EtherCAT® hybrid cable Single cable for data, power and sync, daisy chainable
Additional Specifications	
Power supply ground to mechanical ground (housing) resistance	> 100 kΩ
Power	
Power Supply	9 - 48 V DC
Environmental	
Operating Temperature	-40 to 85°C
Storage Temperature	-40 to 85°C
Humidity	5 to 100 % RH
IP rating	IP65 / IP67
Shock	Shock: SIST EN 60068-2-27:2009 100 g, 6 ms, half-sine 100x pos./neg in each axis 600x total
Vibration	Random vibration: MIL-STD-202G Method 214A, test condition II-D Profile break points: 50 Hz @ 0.025 g ² /Hz 100 Hz @ 0.1 g ² /Hz 2000 Hz @ 0.1 g ² /Hz Profile RMS / Peak = 13.9 g / 41.7 g 8 hrs in each axis, 24 hrs total
1) It depends on the devices connected, numbers of channels, configuration, length of cables and other parameters.	

Current

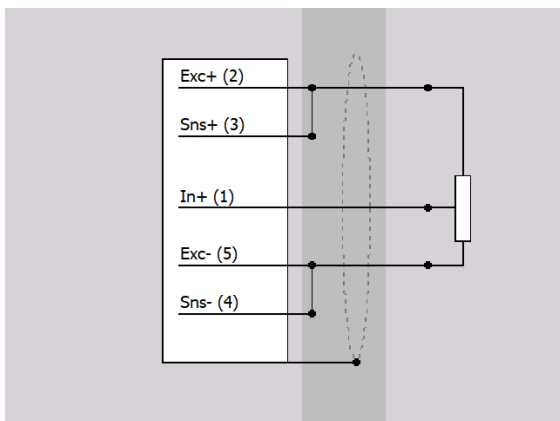
External direct shunt



External loop powered shunt



Potentiometer



5.4.2. KRYPTONi-1xSTG

KRYPTONi-1xSTG is the world's only single channel perfect strain gauge DAQ device. KRYPTONi-1xSTG is isolated and includes an internal shunt for two current input ranges (20 mA, 2 mA). KRYPTON-1xSTG module has one DSUB-9 female connector for voltage or strain measurement.



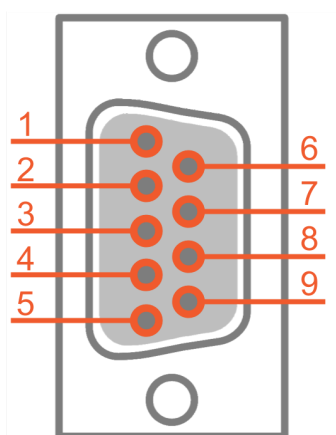
KRYPTONi-1xSTG

5.4.2.1. KRYPTONi-1xSTG: Specifications

Analog input				
Input types	Voltage, current, full bridge strain, half bridge strain, quarter bridge strain			
Number of channels	1			
ADC Type	24-bit SAR with anti-aliasing filter			
Sampling Rate	Simultaneous 40 kS/s per channel (software-selectable)			
Voltage Mode				
Ranges	±50 V	±10 V	±1 V	±100 mV
Input Accuracy	±0.03 % of reading, ±0.02 % of range, ±0.1 mV			
Typical SNR @ 10 kS/s	89 dB	88 dB	88 dB	87 dB
Typical SFDR @ 10 kS/s	100 dB	99 dB	100 dB	96 dB
Typical Noise floor @ 10 kS/s	-103 dB	-99 dB	-103 dB	-96 dB
Typical CMR @ 400 Hz / 1 kHz	71 dB / 66 dB	72 dB / 66 dB	96 dB / 88 dB	96 dB / 87 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, AC 1 Hz			
Input Impedance	1 MΩ		20 MΩ	
Overvoltage Protection	200 V		50 V	
Current Mode				
Ranges	20 mA		2 mA	
Input Accuracy	±0.03 % of reading, ±0.02 % of range, ±2.1 µA			
Internal Shunt Resistor	50 Ω			
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	Unipolar 0 - 24 V, Bipolar 0 - 12 V			
Accuracy	±0.05 % ±2 mV			
Drift	±50 ppm/K ±100 µV/K			
Stability 10 % to 90 % Load	< 0.01 %			
Current Limit	42 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)			

Bridge 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
Isolation	125 Vrms channel to ground isolation
TEDS support	Standard + DSI adapters
Power	
Power Supply	9 - 48 V DC
Power consumption	2.8 W (typ.)
Physical	
Dimensions	62 x 56 x 29 mm
Weight	250 g

5.4.2.2. KRYPTONi-1xSTG: DSUB Connector: Pinout



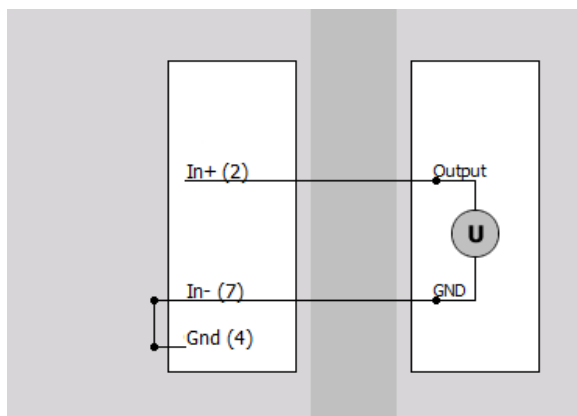
STG connector:pinout (DSUB-9 female)

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

5.4.2.3. KRYPTONi-1xSTG: Wiring diagrams

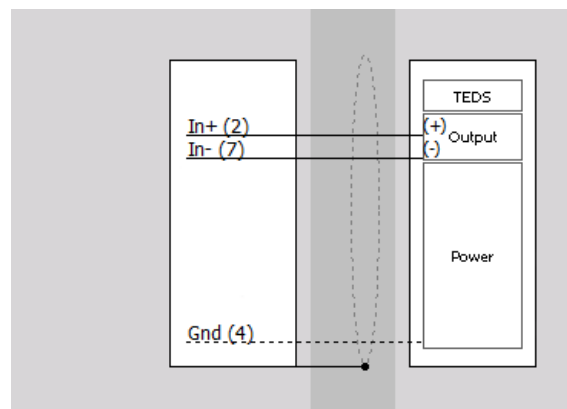
Voltage

Single ended



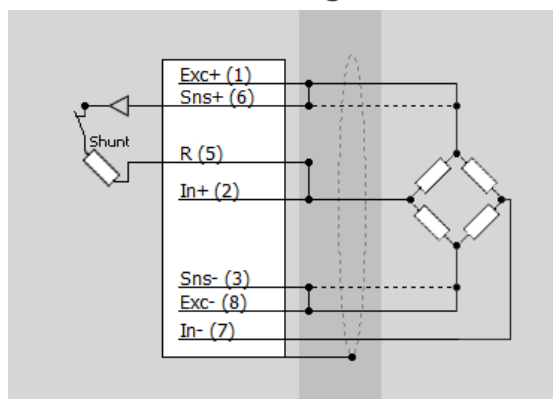
Differential

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

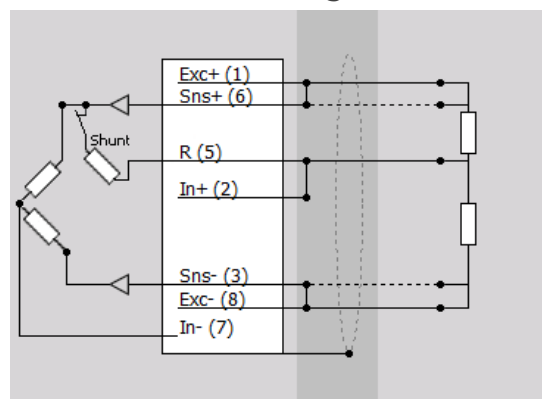


Bridge

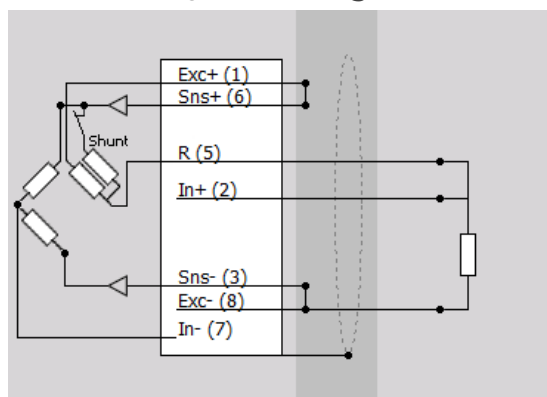
Full-bridge



Half-bridge

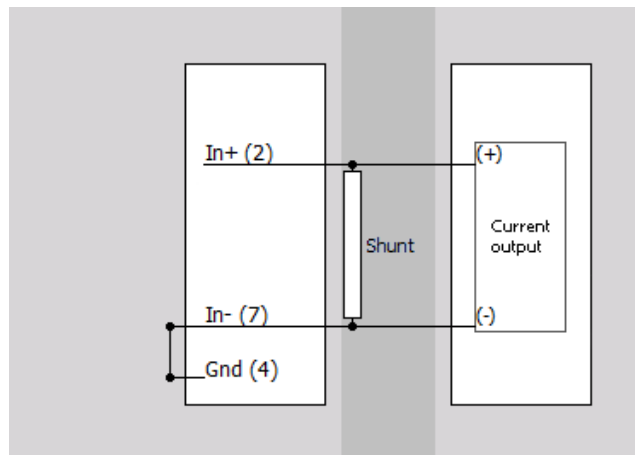


Quarter-bridge

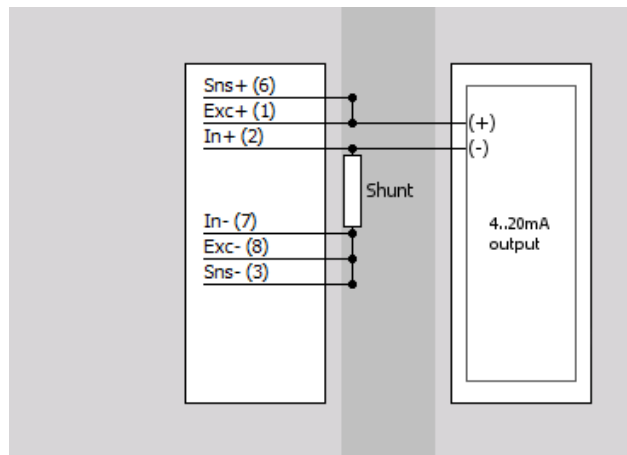


Current

External direct shunt

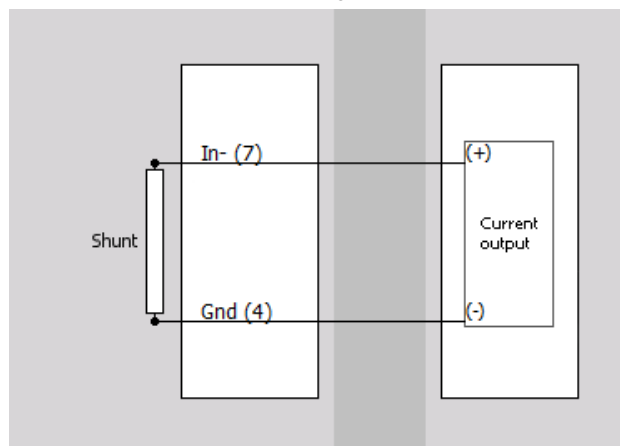


External loop powered shunt

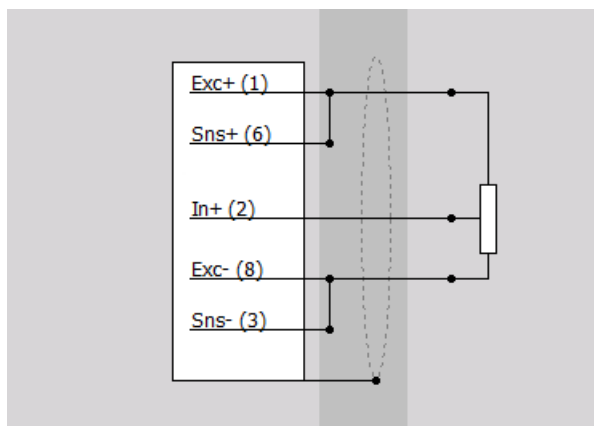


Internal shunt

This feature is limited only to KRYPTONi-1xSTG.

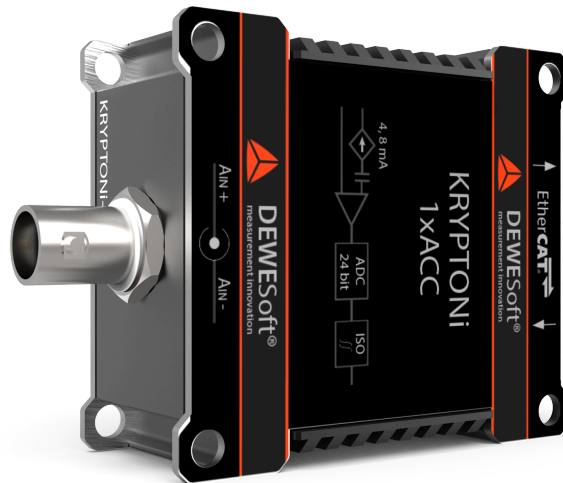


Potentiometer



5.6.2. KRYPTONi-1xACC

Single channel isolated KRYPTON module with IEPE and voltage input. KRYPTONi-1xACC has a BNC connector.



KRYPTONi-1xACC



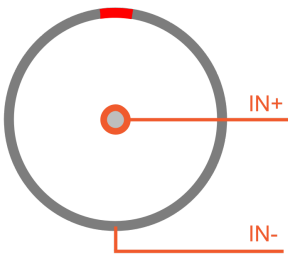
KRYPTON-1xACC can work with 50 kHz if it is the only one in the EtherCAT chain. This feature is useful for the microphone measurements where 50 kHz sampling rate is required.

5.6.2.1. KRYPTONi-1xACC: Specifications

Analog inputs				
Input types	Voltage, IEPE			
Number of channels	1			
ADC Type	24-bit SAR with anti-aliasing filter			
Sampling Rate	Simultaneous 40 kS/s (50 kS/s while using it standalone) software-selectable			
Voltage Mode				
Voltage Ranges	±10 V	±5 V	±1 V	±200 mV
Typ. Input Accuracy	±0.03 % of reading ±0.02 % of range ±0.1 mV			
Typ. SNR (10 kS/s, -1 dBFS sine wave @ 1 kHz)	90 dB	90 dB	89 dB	88 dB
Type. SFDR (10 kS/s, -1 dBFS sine wave @ 1 kHz)	100 dB	99 dB	99 dB	98 dB
Typ. Noise floor @ 10 kS/s	-100 dB	-99 dB	-99 dB	-98 dB
Typical CMR @ 400 Hz / 1 kHz	130 dB / 120 dB	122 dB / 119 dB	104 dB / 97 dB	90 dB / 84 dB
Gain Drift	typ. 10 ppm/K (max. 40 ppm/K)			
Offset Drift	typ. 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, 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	24 V			
Sensor detection	Shortcut: <4 V; Open: >19 V			
TEDS support	IEPE mode only			
Additional specifications				
Input connector	BNC			
Isolation	125 Vrms channel to ground isolation			
Power				
Power supply	9 - 48 V DC			
Power consumption	2 W (typ.)			
Environmental				
IP rating	IP65 / IP67 (see 1)			
Physical				

Dimensions	62 x 56 x 29 mm
Weight	250 g
1) Depending on the mating connector types	

5.6.2.1. KRYPTONi-1xACC: BNC Connector: Pinout

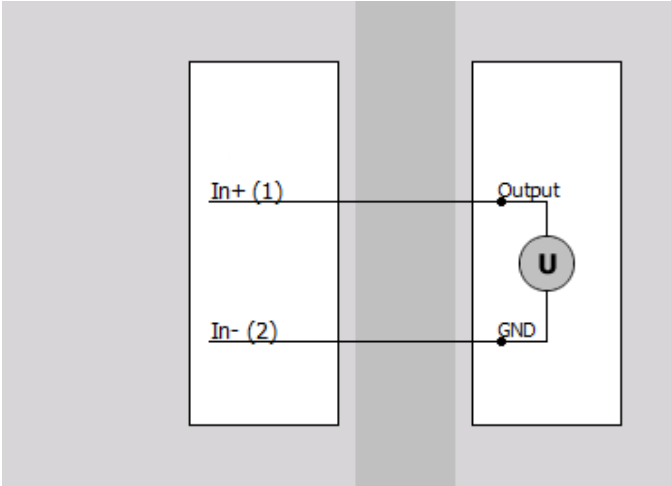


ACC connector: pinout (BNC)

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

5.6.2.3. KRYPTONi-1xACC: Wiring diagrams

Voltage



IEPE

