KRYPTON®

DEWESoft®

TECHNICAL REFERENCE MANUAL

KRYPTON V23-5

1. Table of Contents

2. About this document

This is the Technical Reference Manual for KRYPTON devices.

The manual is divided into several chapters. You will find:

- A description of the system and the main combination and expansion options
- The description of the connection variants and the pin assignments on the inputs and outputs
- A comprehensive introduction to the configuration of the slices using DewesoftX® software.
- Technical data

Only Dewesoft Version X2-SP4 or higher support KRYPTON.
Only Dewesoft Version X3-SP1 or higher support KRYPTON One.

2.1. Legend

The following symbols and formats will be used throughout the document.

Important
Gives you important information about a subject.
Please read carefully!

Hint
Gives you a Hint or provides additional information about a subject.

Example
Gives you an example of a specific subject.

Safety symbols in the manual:

Warning
Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution
Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

2.2. Online versions

2.2.1. KRYPTON® Technical Reference Manual

The most recent version of this manual can be downloaded from our homepage:
https://download.dewesoft.com/list/manuals-brochures/hardware-manuals
In the *Hardware Manuals* section click the download link for the *KRYPTON® technical reference manual*.

2.2.2. DewesoftX® User Manual

The DewesoftX® User Manual document provides basics and additional information and examples for working with DewesoftX® and certain parts of the program.
The latest version of the DewesoftX® tutorials can be found here:
https://download.dewesoft.com/list/manuals-brochures/software-manuals
In the Software Manuals section click the download link of the DewesoftX® User Manual entry.

Important
Read safety instructions first in chapter Safety instructions.

3. Getting started

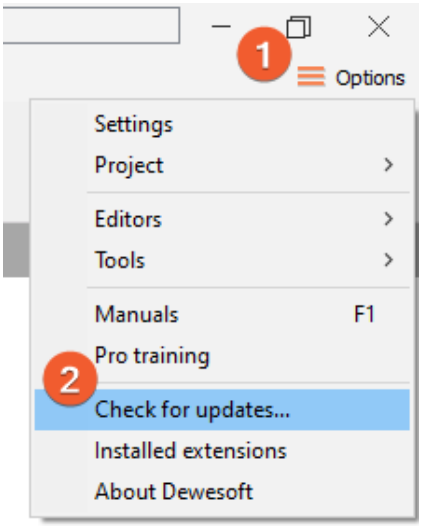
This chapter will help you to install the software, connect your KRYPTON system to the PC via EtherCAT, and will show you how to configure DewesoftX®.

To follow these steps, you need the following items:

- your brand new KRYPTON system (included in the shipment)
- your KRYPTON EtherCAT cable (included in the shipment)
- your PC with Windows 10
- Note: older versions like Windows® 7 may also work

3.1. Software installation

For optimal working, we recommend that you install the latest version of DewesoftX®. If you already have DewesoftX® installed, please check if a newer version is already available. You can either check on the website under Support/Downloads/DewesoftX directly in software under the Options/Check for updates. In both cases the changelog is included

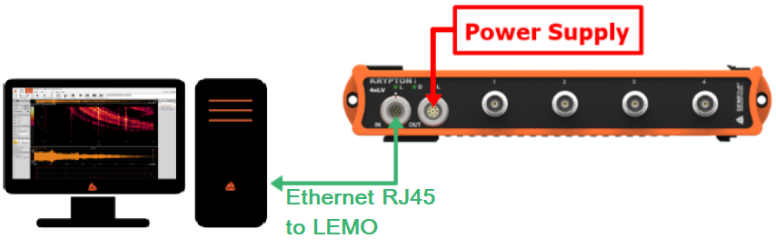


Check for updates

3.2. Connecting KRYPTON

In this chapter, you can see the basic instructions for connecting KRYPTON devices. Advanced connections are described in the following chapters.

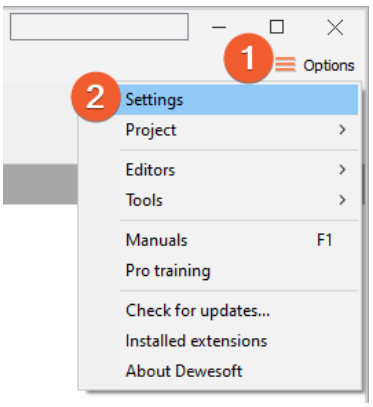
First connect the power supply cable (the standard PS cable is PS-120-L1T8m) to the OUT (8-pin LEMO) connector. Then connect the ethernet cable (L1T8f-RJ45-1M) to the IN connector of the KRYPTON device. Finally connect the other side of the ethernet cable (RJ-45) to the LAN port of the PC. Since EtherCAT is compatible with ethernet any standard ethernet card should work. As soon as you have connected the data-cable the L-LED will be active. You can find advanced connections in chapter 9. Connection overview.



Connection of KRYPTON device to PC

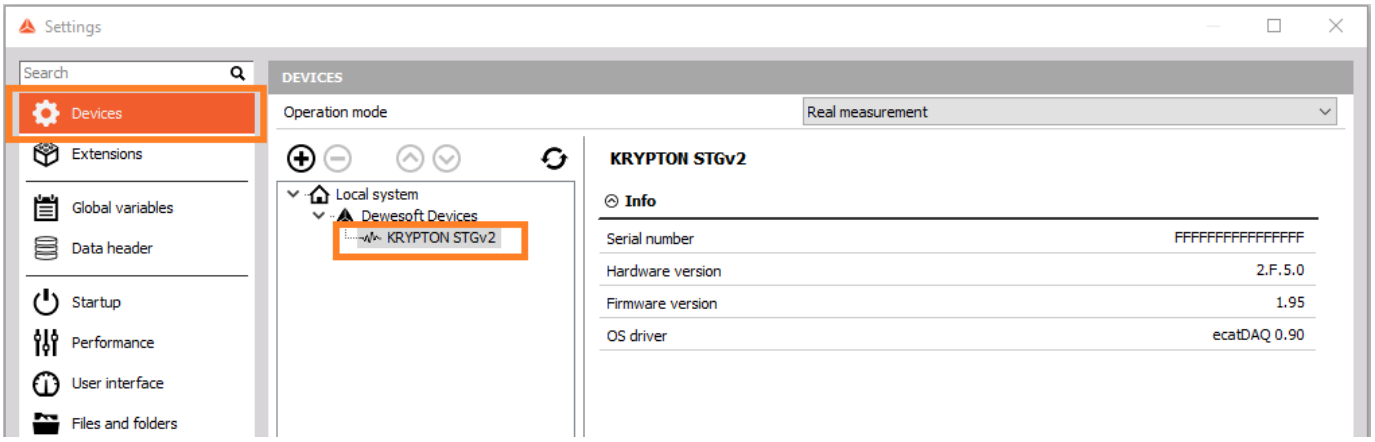
3.2.1. DewesoftX® Settings for KRYPTON

The connected device will show up in DewesoftX® settings. Click on the Options button at the top right, and then on the Settings item in the pop-up to open the DewesoftX® settings dialogue.



DewesoftX® settings

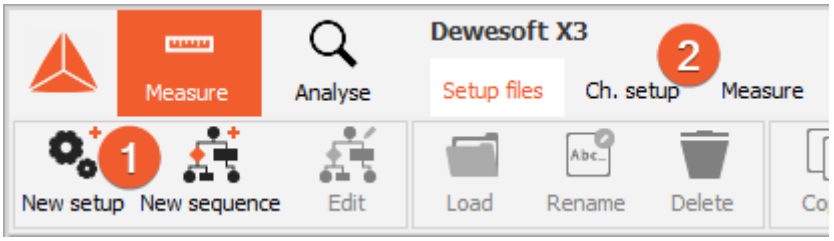
In the Devices section, you can see the connected KRYPTON device. When you select one of them, the properties pane at the right will show the related data e.g. Serial number, Firmware version, etc.



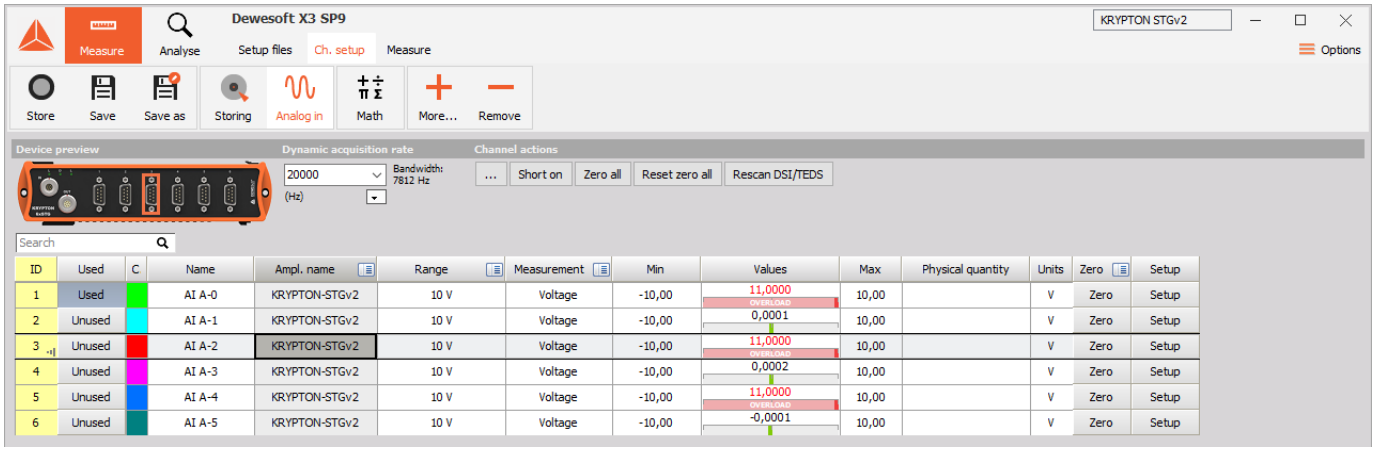
DewesoftX® settings: Devices

3.2.2. Channel setup KRYPTON

When DewesoftX® has started up, you will be in Measure mode and see the Setup files list or you can create a New setup ❶. Click on Ch. setup (on the right of Setup files) to switch to the Channel setup mode ❷. In the channel setup you can see a preview of the connected devices on the upper left side.



Setup files



Channel setup KRYPTON

Hint

When you click on a connector in the image the corresponding channel in the Channel setup grid will automatically be selected. This also works the other way around: when you select a channel (or multiple channels) in the setup grid, the corresponding connectors in the image will be highlighted.

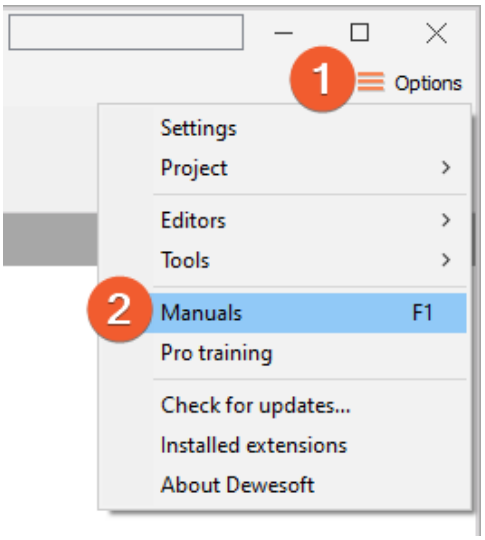
The sampling rate will be set for all connected KRYPTON devices: of course only up to the max. sampling rate of the individual slices.

3.3. Simple Measurement

This chapter describes measurement basics, how to configure KRYPTON and gives some details on the measurement setup.

3.3.1. Help - manual

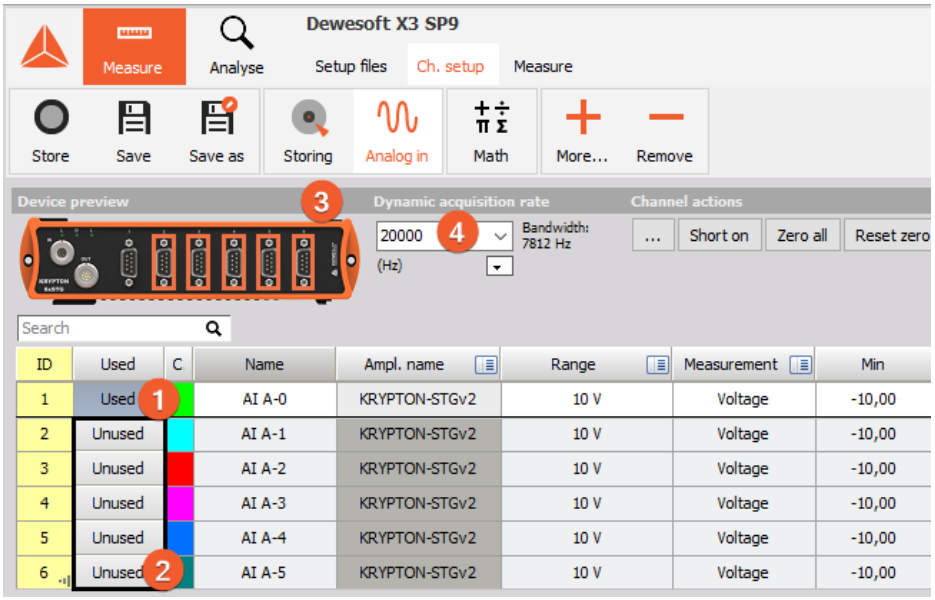
Note that this document is just a quick start guide. For detailed information about DewesoftX® consult the Manual. To open the manual press the F1 button or click on the Options button ❶ and then select Manual from the pop-up menu ❷.



Help - Manual

3.3.2. Analogue channel setup

In the analogue channel setup screen you can see all channels of your connected KRYPTON systems. Per default only the first channel will be set to Used. Unused channels will not show up in measure mode and can not be used for display, calculations or storing: thus, we will also set the other channels to the used. You can left-click on the Used column of channel 2 ❶, hold the mouse button and move the mouse down to channel 6 ❷: then release the mouse button and all channels will be selected – this is shown by the black rectangle around the buttons. Then you can click into the selected region to toggle Used/Unused for all channels at once. The selected channels will also be highlighted in the small preview image of the device ❸.
When you press the Setup button of a channel (the column at the right edge of the channel table – not shown in the Channel setup screen image), you can change all the settings of the channel amplifier. You can also change the sample rate of KRYPTON ❹.

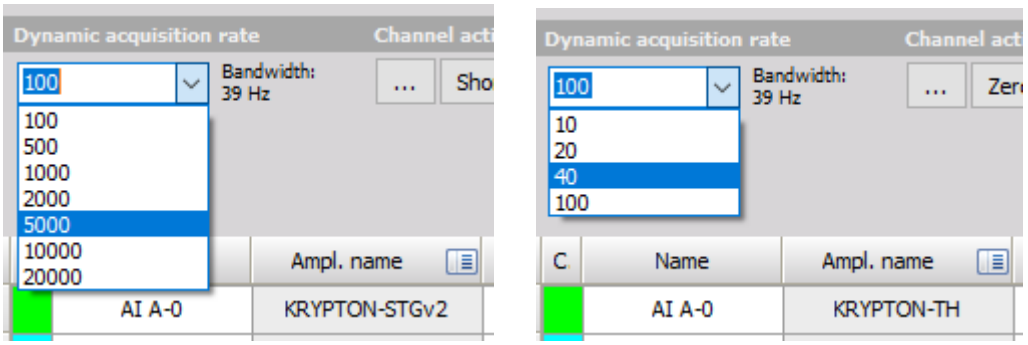


Channel setup screen

3.3.3. Sample rate

One of the most important settings is the sample rate. The sample rate defines how many data points KRYPTON will transfer to the DewesoftX®. Higher sample rate also means that more data needs to be transferred via EtherCAT to your computer.

The sampling speed mainly depends on your application. To display your signal in a time domain with a good time resolution, you should sample 10 to 20 times faster than the frequency of the signal that you want to measure, e.g. 1000 S/sec for a 50 Hz sine-wave. If you have a lot of high frequency components, it may be necessary to sample 100 times faster, e.g. 5000 S/sec for the 50 Hz sine-wave, or even more. If you display only the frequency domain (FFT analysis), a 2.5 times faster sampling would be sufficient (125 S/sec for the 50 Hz sine-wave). The higher the sampling rate, the better the time resolution. But also the file size will increase. In the following image you can see that the maximum sample rate is different for KRYPTON devices. For example the STG module has max. 20 kS/sec and TH module has a max. 100 S/sec of sampling rate. The KRYPTON ONE family has a 40 kS/sec maximum sample rate with the KRYPTON 1xACC exception which has a sample rate up to 50 kS/sec.



Sample rate comparison of STG and TH slices

3.3.4. Measurement Mode

A click on Measure (at the right side of Ch. setup option) will take you to the Recorder screen measure mode where you can already see live data.

Important
When switching to Measure mode the data will not be stored automatically.

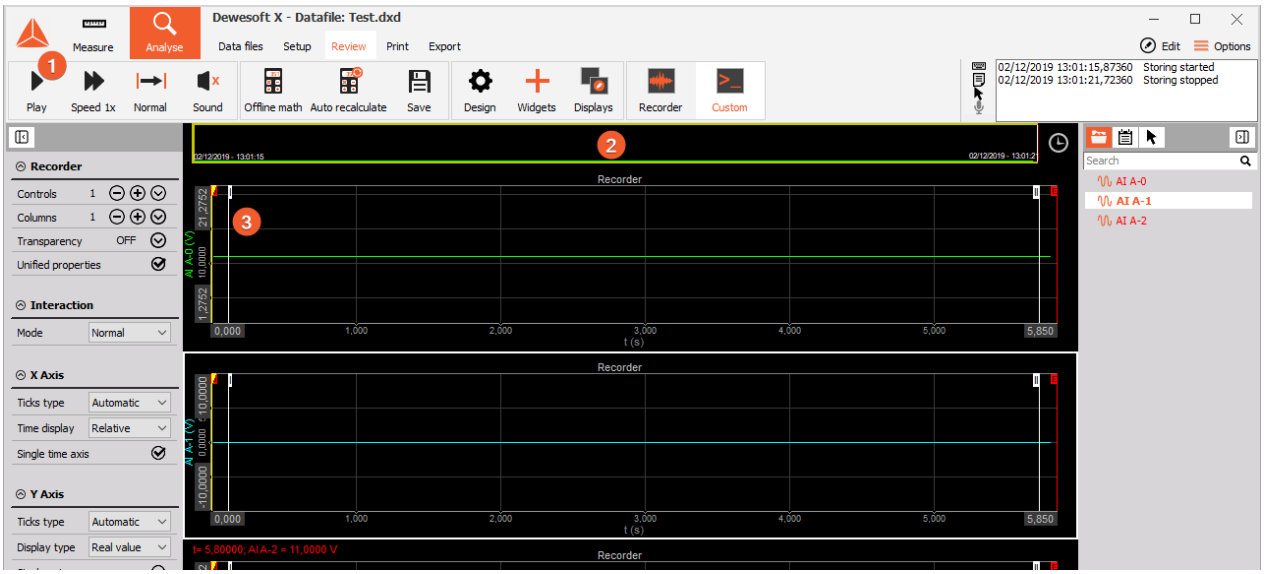
Measure mode

In measure mode you can have several measurement displays ❺. DewesoftX® will create 2 default displays: Recorder and Custom but you can also create new displays or change the widgets on existing displays as you like.
The most important sections of the Measure mode are highlighted in the Measure mode image:
❶ shows the live measurement data in different widgets which are depending on the selected measurement screen. In this case we see a simple recorder widget where data is presented in the time domain. You can use the channel-selector list ❷ to assign measurement channels to the widgets. Each widget has different settings, ❸ shows the settings of the currently selected recorder widget.
To start storing the data, press the Store button ❹. When you are done with recording, press the Stop button.

Now DewesoftX® has created a datafile with all the data that you have seen during the recording session. You can now click the Analyze button (on the left-top of the screen to the right of the Measure button) to go to Analyze mode.

3.3.5. Analyze Mode

When you have just stopped a measurement and switched to Analyze mode, DewesoftX® will automatically open the last recorded data file in Review mode, so that you can start the analysis right away.



Analyze mode

The Review mode is much like the measurement mode. You will see the same measurement displays, the channel-selector list and the properties of the currently selected widget.
Differences are:

❶ you have additional tool-buttons

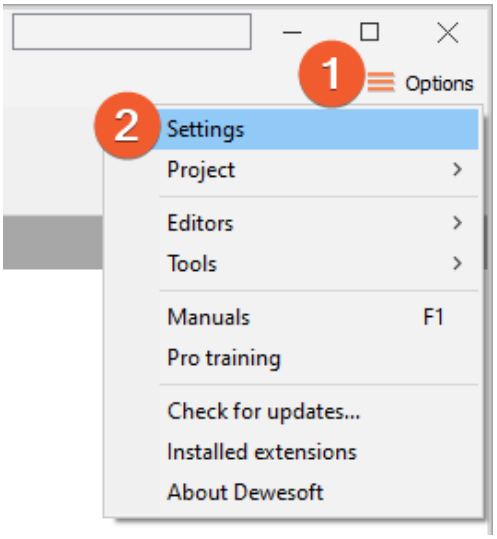
❷ there is a Signal overview window which will show you the whole data of one selected channel of the data file

❸ there are additional cursors (Yellow and two white cursors)

Now you can use the cursors to analyze your data, zoom in and out of the data, click Offline math to add computations based on your data, etc. You can also change the design of your measurement displays, print reports based on your data and export the data to other file formats for further analysis.

3.4. Advanced configuration

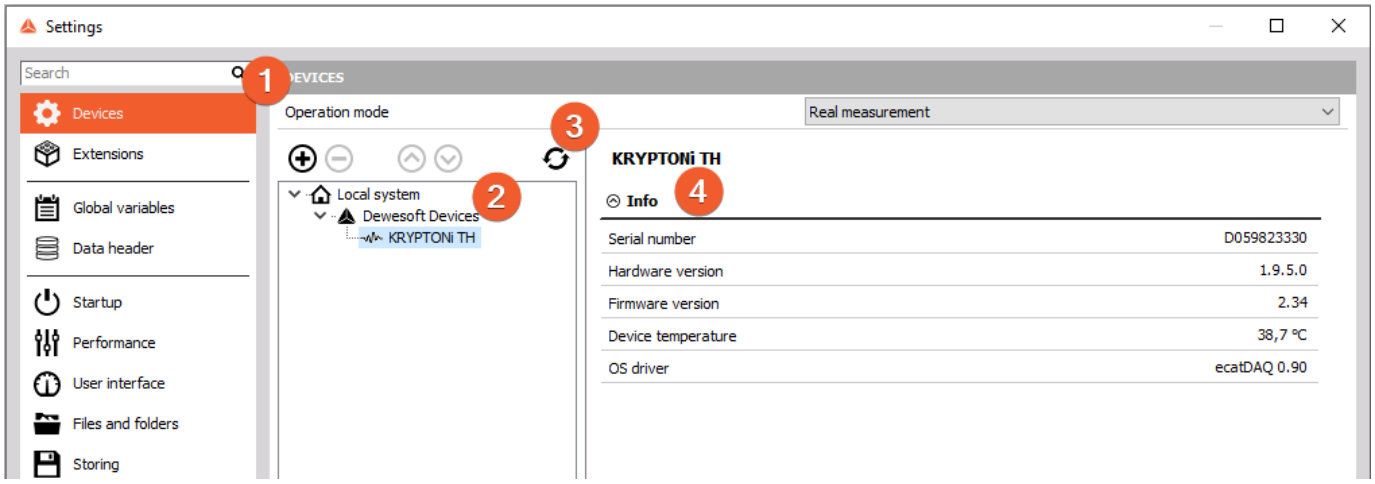
Note, that the Dewesoft's launcher has already done the hardware setup for you – you can check this in the Settings dialogue. Click the Options button ❶ – and then click the Settings menu item ❷ .



Open settings dialogue

The settings window will appear where all the currently connected devices will be seen.

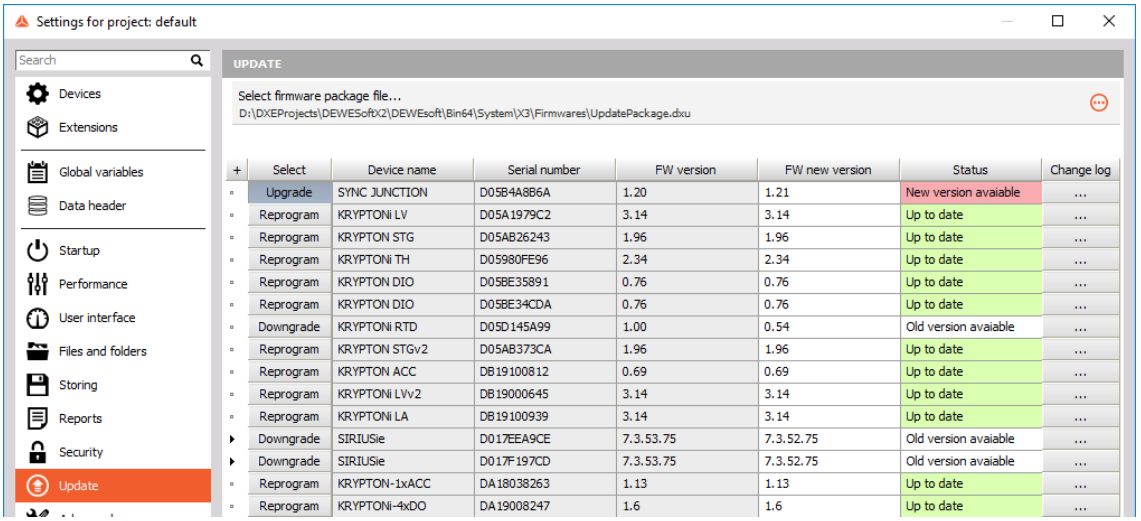
If you add a device while this screen is open (or if your device is not shown yet), you can press the Refresh button ❸ to scan for devices. When you select a device from the list you will see all the device details and settings in the right area ❹.



Real measurement mode

3.5. Firmware upgrade

- Download the Dewesoft upgrade package (.dxu file) from the Dewesoft downloads page under the section Drivers.
- As the file is zipped, you need to first unzipped it and then copied it into the Firmwares folder of your DewesoftX® installation (e.g. D:\DewesoftX\System\Firmwares).
- Connect the Dewesoft instrument to the PC and run DewesoftX®.
- Go to settings under the Update tab:



+	Select	Device name	Serial number	FW version	FW new version	Status	Change log
▫	Upgrade	SYNC JUNCTION	D05B4A8B6A	1.20	1.21	New version avaiable	...
▫	Reprogram	KRYPTONi LV	D05A1979C2	3.14	3.14	Up to date	...
▫	Reprogram	KRYPTON STG	D05AB26243	1.96	1.96	Up to date	...
▫	Reprogram	KRYPTONi TH	D05980FE96	2.34	2.34	Up to date	...
▫	Reprogram	KRYPTON DIO	D05BE35891	0.76	0.76	Up to date	...
▫	Reprogram	KRYPTON DIO	D05BE34CDA	0.76	0.76	Up to date	...
▫	Downgrade	KRYPTONi RTD	D05D145A99	1.00	0.54	Old version avaiable	...
▫	Reprogram	KRYPTON STGv2	D05AB373CA	1.96	1.96	Up to date	...
▫	Reprogram	KRYPTON ACC	DB19100812	0.69	0.69	Up to date	...
▫	Reprogram	KRYPTONi LVv2	DB19000645	3.14	3.14	Up to date	...
▫	Reprogram	KRYPTONi LA	DB19100939	3.14	3.14	Up to date	...
▸	Downgrade	SIRIUSie	D017EEA9CE	7.3.53.75	7.3.52.75	Old version avaiable	...
▸	Downgrade	SIRIUSie	D017F197CD	7.3.53.75	7.3.52.75	Old version avaiable	...
▫	Reprogram	KRYPTON-1xACC	DA18038263	1.13	1.13	Up to date	...
▫	Reprogram	KRYPTONi-4xDO	DA19008247	1.6	1.6	Up to date	...

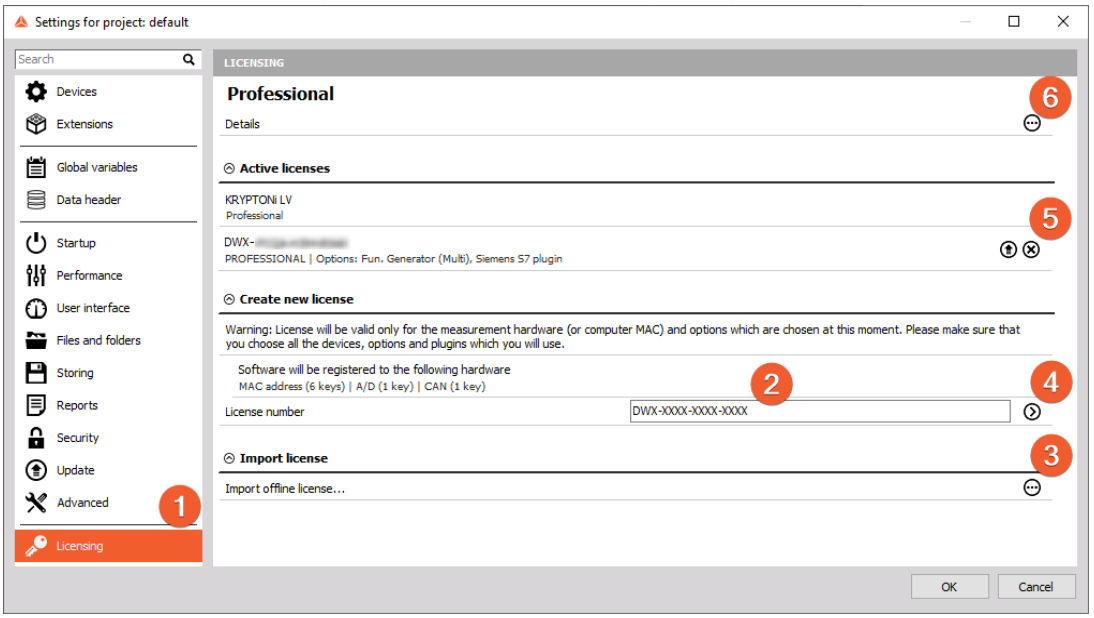
Update options

- If the firmware package isn't selected, select it by pressing the button and find the folder with the firmware file in it.
- Select the device you want to upgrade and start the firmware upgrade by pressing the "Upgrade" button.

3.6. Licensing

KRYPTON or any other Dewesoft device already comes with an embedded Dewesoft license. You can check the license details with all the available options in the Licensing tab ❶ by pressing the three dotted buttons ❻. However if the user decides to upgrade the license with an additional extension, DewesoftX® will require a new license registration. The registration can be made online ❷ or offline by importing an offline license ❸ in case the system doesn't have an internet connection. Offline licenses can be pre-registered on a different PC with the internet connection. If needed, the license can also be written on the actual device ❺.

Active and embedded licenses are seen under the Active licenses tab. If the license is recognized as none active, it usually means that the wrong license was entered.



Licensing options

Hint

All licenses regarding KRYPTON will only work when the KRYPTON system is connected to your PC and the device has been activated in the hardware setup.

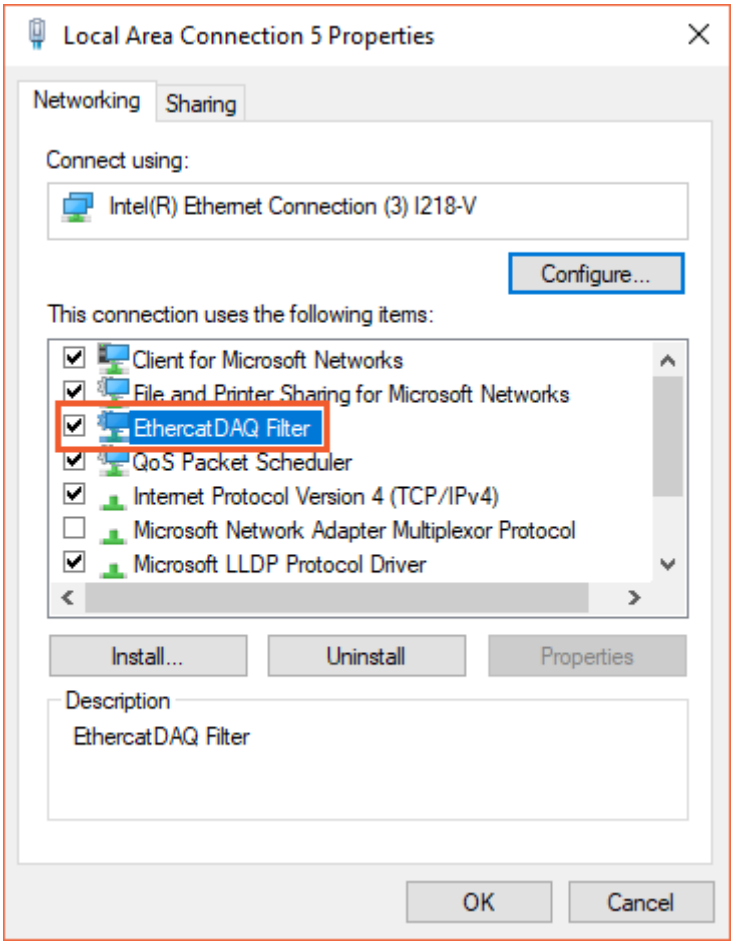
3.7. Troubleshooting

If your KRYPTON device is not found by DewesoftX®:

- If you did not restart Windows after the software installation, restart now
- Make sure that you have started Dewesoft version X3 SP8 or higher
- Make sure that the external power supply is connected and okay
- Disconnect the EtherCAT cable and reconnect it. If this does not work, try to connect the EtherCAT cable to another Ethernet port of your PC
- Try to restart DewesoftX®
- Try to restart the PC
- Make sure to connect the data-cable directly to the Ethernet card of your PC. Do not use any switches or hubs

If the computer is still having trouble recognizing the Dewesoft EtherCAT devices, here are some additional steps:

- Check if there is an Ethercat DAQ Filter driver installed on your computer as shown in the picture below. If the driver is installed, make sure the checkbox is checked in front of the driver.

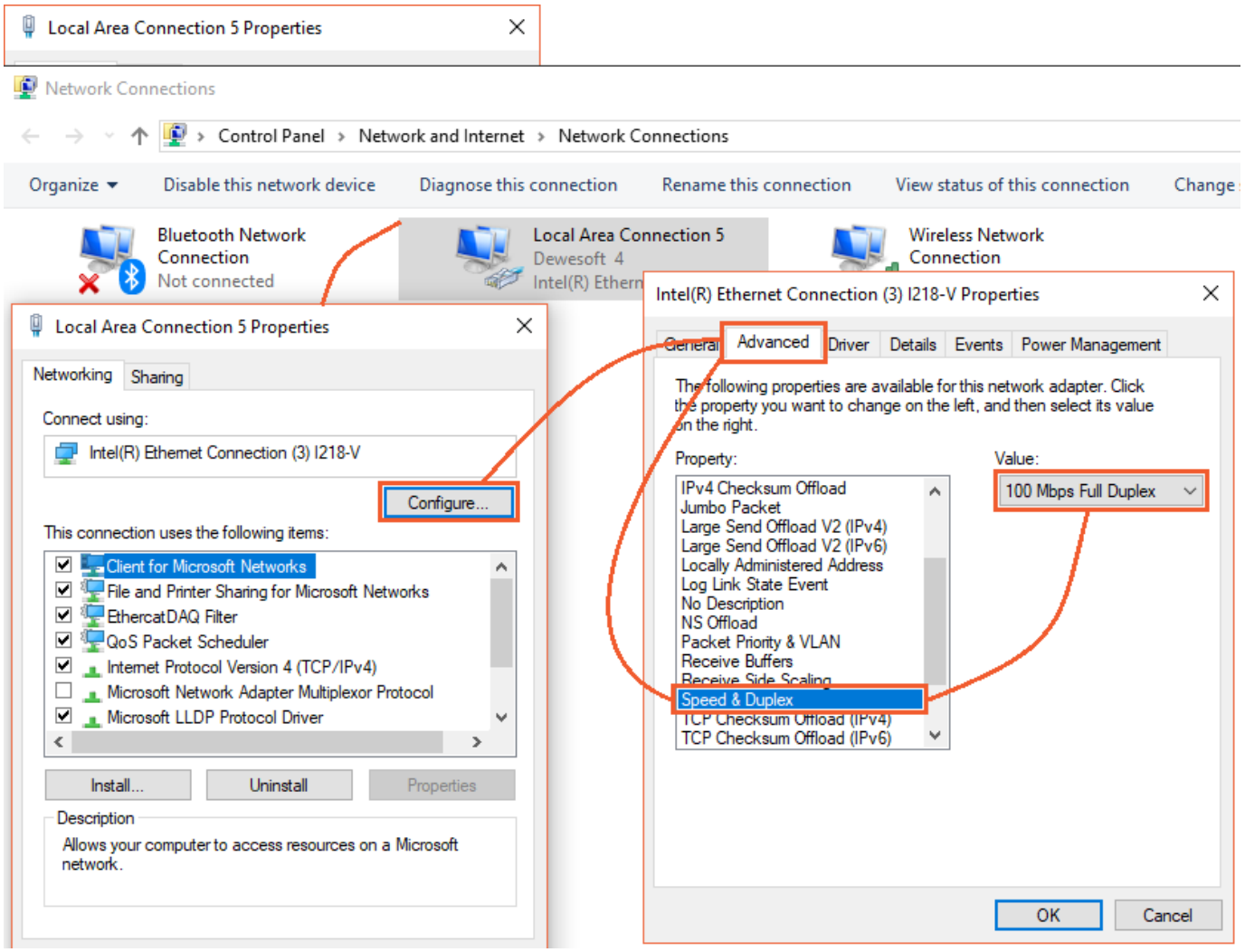


If the driver is not installed, it can be downloaded from our web page.

EthercatDAQ Filter Driver v0.90

Signed drivers (ver. 0.90 / 06/04/2017) for all Dewesoft EtherCAT devices. Works on Microsoft Windows 7, 8 and 10 (32 and 64 bit OS). Works only with Dewesoft X2 SP8 or newer. Warning: Please uninstall the old EthercatDAQ driver version before installing the new one.

- If the driver is already installed and the devices are still not recognized, the Speed & Duplex of the network card needs to be adjusted manually.
  - Go to network connections
  - Right-click on the connection where the EtherCAT devices are connected
  - Go to configure, advanced options, find Speed & Duplex, change the value to 100 Mbps Full Duplex, since EtherCAT is a standard defined for 100Mbit/s



- In case Windows 7 is used, it needs to be updated to Service pack 1 which accepts the 256-bit certificates. You can find the proper update versions on the Microsoft web page, for both the 32-bit and 64-bit versions.

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.

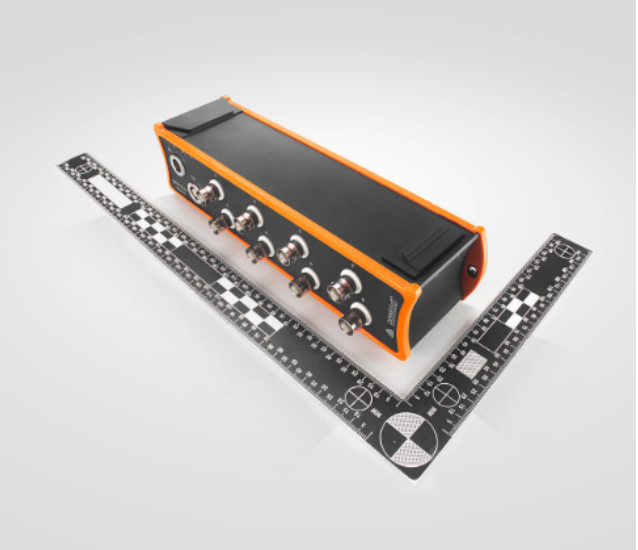
There is the single cable required for data, power, and synchronization which can run up to 100 meters (328 feet) from module to module connecting amplifiers together.

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.

4.1.4. High-end signal conditioning

KRYPTON is not just small and rugged but also has quality analog amplifiers for precise signal measurement. An array of different modules are available for almost any sensor:

- **STG**: Universal differential voltage and Full / Half / Quarter bridge input. Available in 1, 3 and 6 channel configurations. Compatible with DSI adapters.
- **TH, TH-HS**: Universal isolated thermocouple input module. Accepts all thermocouple types. Available in 8 and 16 channel configurations and as a single channel for high voltage thermocouple measurements.
- **RTD**: Universal differential PTx temperature, resistance and voltage. Available in 8 and 16 channel configurations.
- **LV**: Isolated voltage input module. Available in 1, 4 and 8 channel configurations.
- **LA**: Isolated low current measurement module. Available in 8 channel configuration.
- **ACC** - IEPE accelerometer and microphone input unit in 1, 4 and 8 channel configuration.
- **DI / DO** - Digital I/O module. Available in **4xDI, 4xDO, 16xDI, 16xDO** or **8xDI/8xDO** channel configurations.
- **AO** - analog output is available in single-channel configurations.
- **CNT** - a single channel DewesoftX's SUPERCOUNTER® module.

KRYPTON-6xSTG

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.	

5. Module overview

KRYPTON DAQ modules are small, rugged and modular data acquisition modules for field measurements and harsh environments. Traditional DAQ systems are single boxes with many input channels, which means long and expensive sensor cabling is needed. KRYPTON takes the opposite approach. We kept the same advantages of other Dewesoft DAQ devices (plug and play, sensor auto-detection), but we are bringing DAQ units closer to the origin of data, near the sensors. That greatly reduces the cost of the sensor cabling, chances of wiring errors and greatly improves the signal quality.

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 IP67 degree of protection. Units are waterproof, vibration proof, and can withstand shocks up to 100 G. 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.

KRYPTON DAQ modules are designed to be as small as possible and very flexible. Their small size allows them to fit perfectly in tight places and can be placed near the sensors. This results in short sensor cables which will not only save cost but also improve the signal quality.

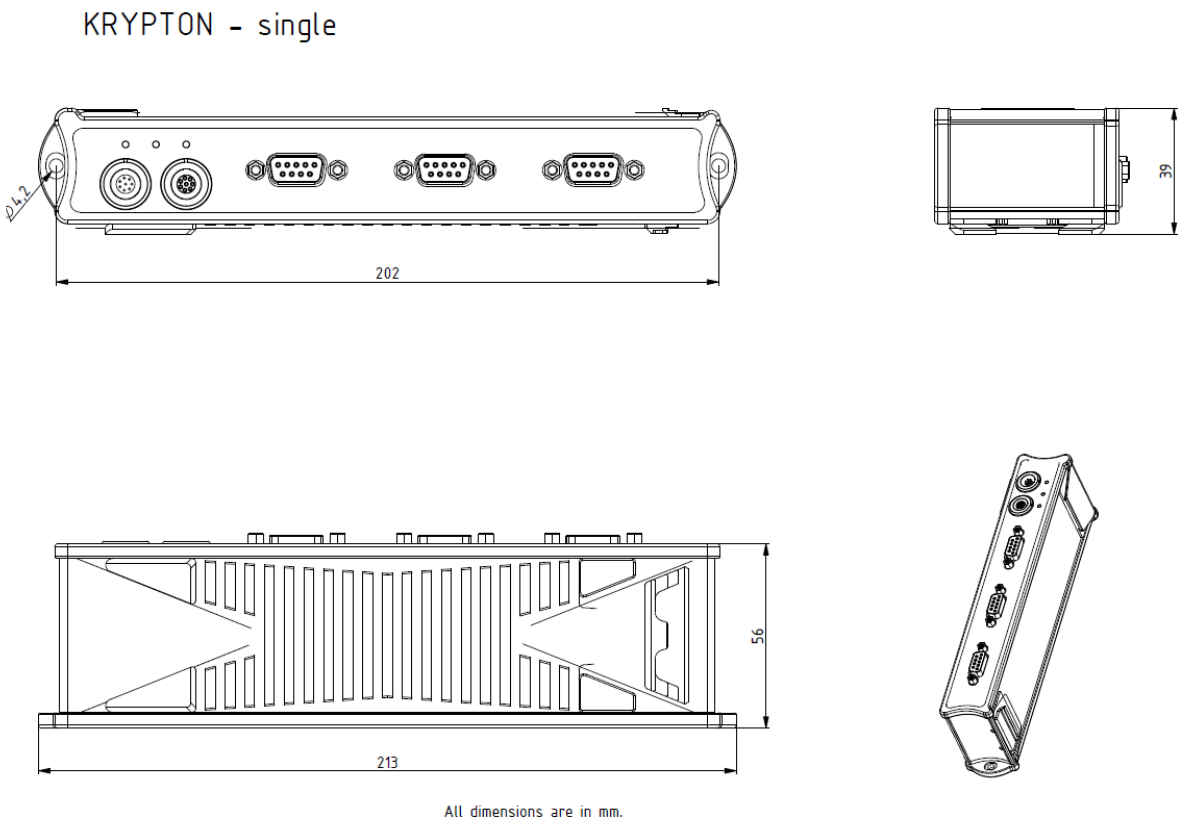
5.1. Technical specifications

5.1.1. KRYPTON Multichannel

	STG	TH	TH-HS	RTD	ACC	LV	LA	DIO	CNT
Connectors	DB9, L2B10f	Thermocouple	Thermocouple	L0B6f	BNC	BNC	BNC	DB25	L1T7f
#ch per module	3x, 6x	8x, 16x	8x, 16x	8x	4x, 8x	4x, 8x	8x	16xDI, 16xDO 8xDI, 8xDO	4xCNT
Data rate / channel	20 kS/s	100 S/s	100 S/s, upgradable to 10 kS/s	100 S/s	20 kS/s	20 kS/s	20 kS/s	40 kS/s	20 kS/s
Resolution	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	24-bit	digital	100 MHz timebase 5 ppm, 20 ppm max
Bandwidth	0.49*fs	✗	0.49*fs (max. 1 kHz)	✗	0.49*fs	0.49*fs	0.49*fs	✗	10 MHz
Voltage ranges	±10 V, ±1 V, ±100 mV, ±10 mV	±1 V, ±100 mV	±1 V, ±100 mV	±1 V, ±100 mV	±10 V, ±5 V, ±1 V, ±200 mV	±50 V	±20 mA	CMOS compatible	TTL (Low: <0.8 V, High > 2 V)
Input coupling	DC	DC	DC	DC	DC, AC 0.1 Hz, 1 Hz	DC	DC	DC	
Sensor excitation	0...15 V max. 0.4 W/ch (45 mA limit)	✗	✗	✗	IEPE 4 mA, 8 mA	-	-	5 V / 300 mA 12 V / 120 mA Vsupply / 200 mA	5 V /100 mA 12 V / 50 mA
Bridge connection	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	✗	✗	✗	✗	✗	✗	✗	✗
Programmable shunt	100 kΩ	✗	✗	✗	✗	✗	✗	✗	✗
IEPE input	DSI-ACC	✗	✗	✗	✓	✗	✗	✗	✗
Resistance	✗	✗	✗	10 kΩ	✗	✗	✗	✗	✗
Temperature (PTx)	DSI-RTD	✗	✗	PT100, 200, 500, 1000, 2000	✗	✗	✗	✗	✗
Thermocouple	DSI-TH	K, J, T, R, S, N, E, C, B	K, J, T, R, S, N, E, C, B	✗	✗	✗	✗	✗	✗
Current	ext. shunt DSI-20mA, DSI-5A	✗	✗	✗	ext. shunt	✗	✗	✗	✗
Potentiometer	✓	✗	✗	✗	✗	✗	✗	✗	✗

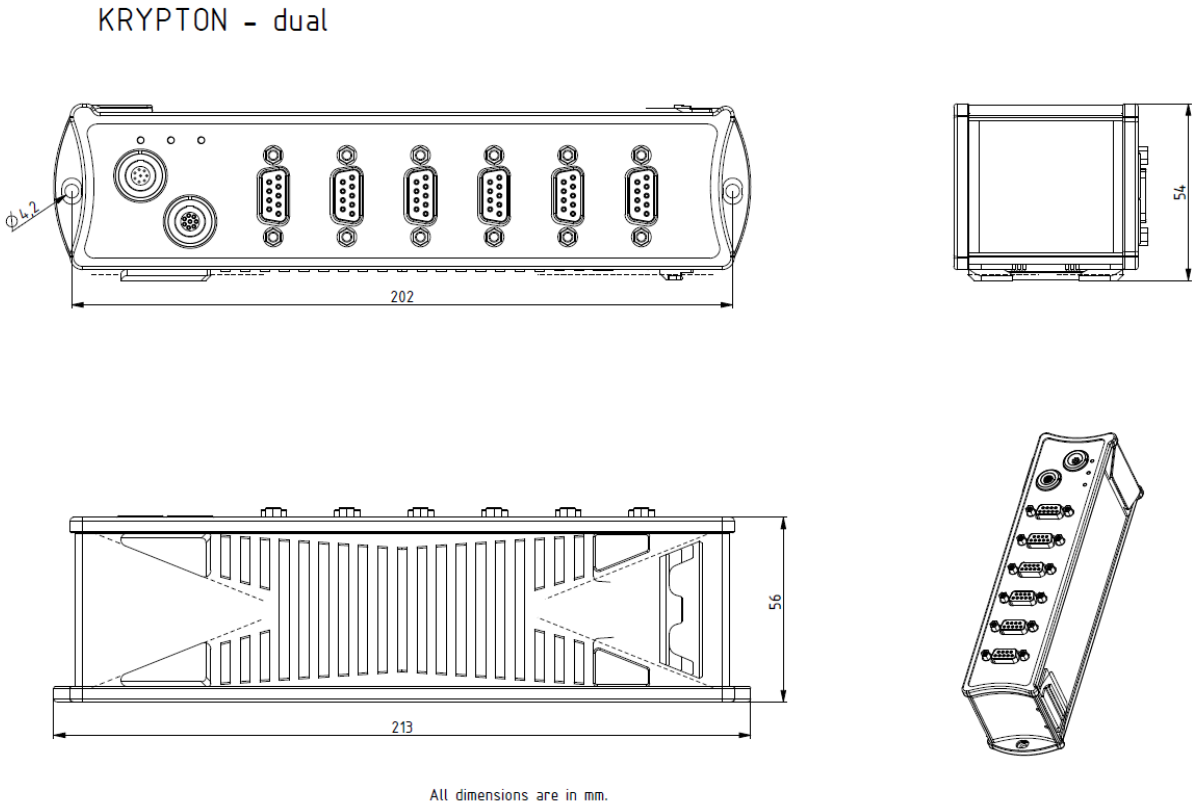
LVDT	DSI-LVDT	✗	✗	✗	✗	✗	✗	✗	✗
Charge	DSI-CHG	✗	✗	✗	✗	✗	✗	✗	✗
TEDS	✓	✗	✗	✗	✓	✗	✗	✗	✗
Isolation voltage	Differential	1000 V	1000 V	1000 V	Differential	1000 V	1000 V	250 V	✗
Isolation arrangement	None	Ch-Ch & Ch-GND	Ch-Ch & Ch-GND	Ch-Ch & Ch-GND	None	Ch-Ch & Ch-GND	Ch-Ch & Ch-GND	Isolated common GND	Isolated common GND
Power consumption per module	2.4 W (4 W 120 Ω @ 5 V load) 3xSTG; 5.9 W (8.9 W 120 Ω @ 5 V load) 6xSTG	2.5 W (8xTH) 4 W (16xTH)	2.6 W (8xTH-HS) 4.3 W (16xTH-HS)	2.5 W	4.6 W	3.5 W (4xLV) 6.7 W (8xLV)	6.8 W	2 W	2.3W

5.1.1.1. KRYPTON single width



Dimensions : KRYPTON single

5.1.1.2. KRYPTON dual width



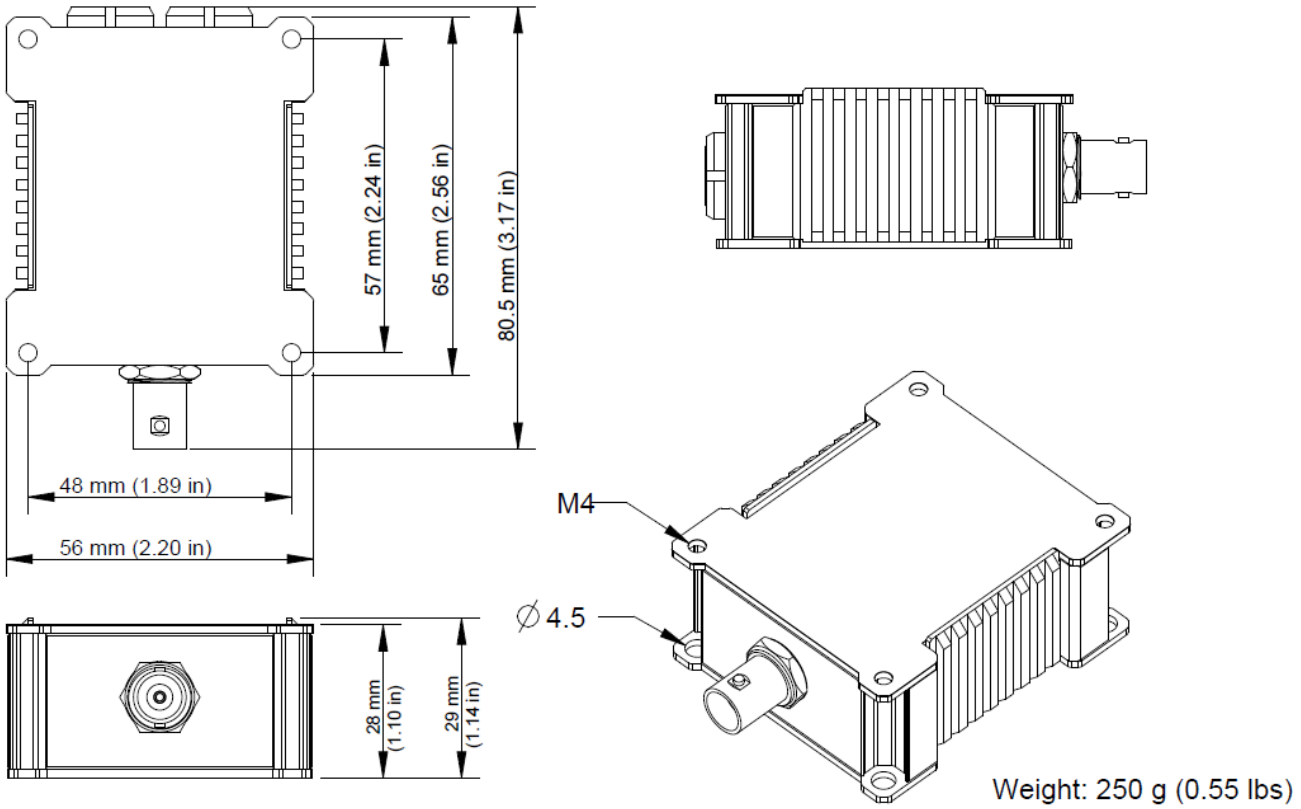
Dimensions : KRYPTON dual

5.1.2. KRYPTON ONE

	AO	DI	DO	ACC	STG	LV	HV	TH-HV	CNT
Connector	BNC	DSUB15HD Male	DSUB15HD Female	BNC	DB9	BNC	Banana jack	K-type Thermocouple LEMO REDEL	LEMO T-type 7 pin female
Number of channels per module	1	4	4	1	1	1	1	1	1
Data rate per channel	✗	40 kS/s	✗	40 kS/s	40 kS/s	40 kS/s	40 kS/s	100 S/s	20 kS/s
Resolution	18 bit	Digital	Digital	24-bit	24-bit	24-bit	24-bit	24-bit	100 MHz timebase 5 ppm, 20 ppm max
Bandwidth	✗	✗	✗	0.49 fs	0.49 fs	0.49 fs	0.49 fs	0.49 fs	10 MHz
Voltage ranges	✗	Digital (Low: < 1 V, High: > 2 V)	✗	±10 V ±5 V ±1 V ±200 mV	±50 V ±10 V ±1 V ± 100 mV	±50 V ±10 V ±1 V ±100 mV	±1000 V	Thermocouple	TTL (Low: <0.8 V, High > 2 V)
Input coupling				DC, AC 0.1 Hz, 1 Hz	DC, AC 1 Hz	DC, AC 1 Hz	DC		
Sensor excitation	±10 V	✗	✗	IEPE 4 mA, 8 mA	Unipolar 0 - 24 V Bipolar 0 - 12 V	✗	✗	✗	5 V (100 mA max.), 12 V (90 mA max.)
Bridge connection	✗	✗	✗	✗	Full, ½, ¼ 350 Ω, ¼ 120 Ω 3 wire	✗	✗	✗	✗
Programmable shunt	✗	✗	✗	✗	100 kΩ	✗	✗	✗	✗
IEPE input	✗	✗	✗	✓	DSI-ACC	✗	✗	✗	✗
Resistance	✗	✗	✗	✗	✓	✗	✗	✗	✗
Temperature (PTx)	✗	✗	✗	✗	DSI-RTD	✗	✗	✗	✗
Thermocouple	✗	✗	✗	✗	DSI-TH	✗	✗	K-type	✗
Current	✗	✗	✗	✗	20mA (internal shunt), DSI-5A, ext. shunt	ext. shunt	✗	✗	✗
Potentiometer	✗	✗	✗	✗	✓	✗	✗	✗	✗
LVDT	✗	✗	✗	✗	DSI-LVDT	✗	✗	✗	✗
Charge	✗	✗	✗	✗	DSI-CHG	✗	✗	✗	✗
TEDS	✗	✗	✗	✓	✓	✗	✗	✗	✗

Isolation	None	Galvanic isolation CH, GND	Galvanic isolation CH, GND	125 Vrms Isolation CH, GND	125 Vrms Isolation CH, GND	125 Vrms Isolation CH, GND	CAT III 600 V CAT II 1000 V	CAT III 600 V CAT II 1000 V	None
Power consumption	2 W	1.5 W	2 W	2 W	3 W	1.5 W	1 W	1.3 W	1.2 W
Rev: 1673622000									

5.1.2.1. KRYPTON ONE form factor

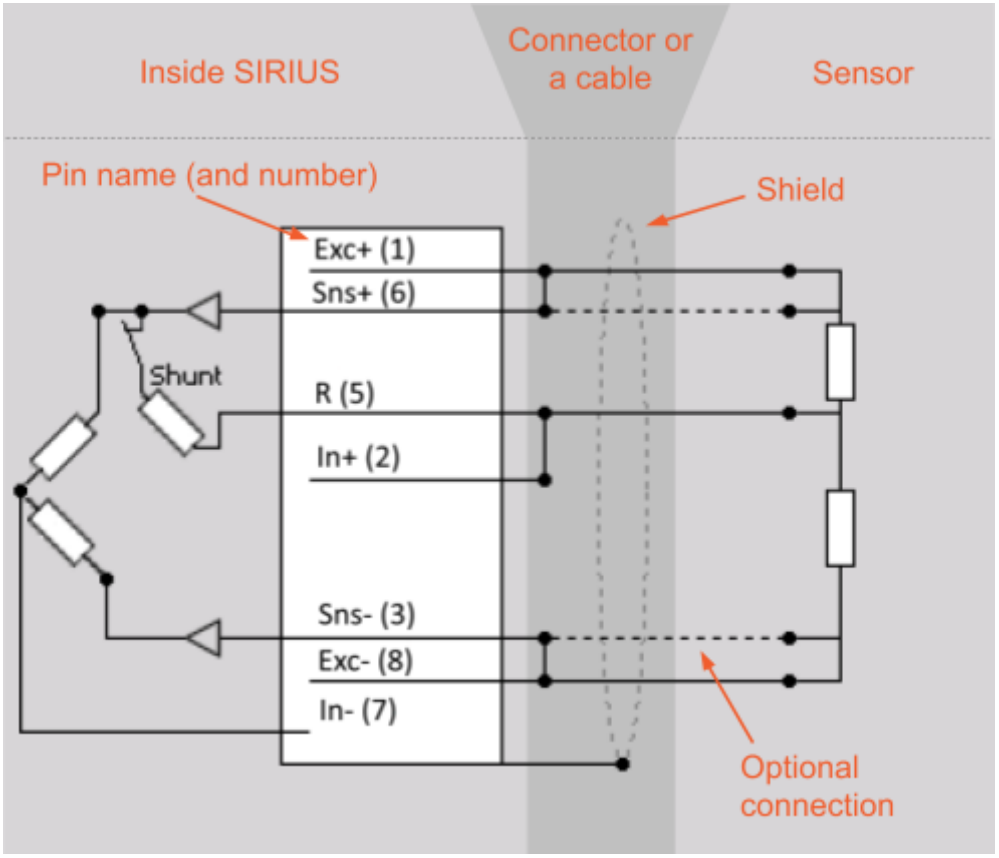


Dimensions : KRYPTON one

5.1.3. General connection diagrams

In illustration below "*Typical connection diagrams*" parts of the measurement chain are shown:

- Amplifier
- Connections
- Sensor



Typical connection diagrams

5.2. VOLTAGE MEASUREMENT

KRYPTON product family includes three types of low voltage (LV) modules and one type of high voltage (HV) modules. KRYPTON LV modules are rugged isolated DAQ devices for low voltage measurements.

Below is the list of the products:

- KRYPTONi-8xLV,
- KRYPTONi-4xLV,
- KRYPTONi-1xLV,
- KRYPTONi-1xHV.

5.2.1. KRYPTONi-4xLV, KRYPTONi-8xLV

KRYPTONi-4xLV has 4 BNC input connectors for voltage measurement.

KRYPTONi-4xLV

KRYPTONi-8xLV has 8 input connectors for voltage measurement.

KRYPTONi-8xLV

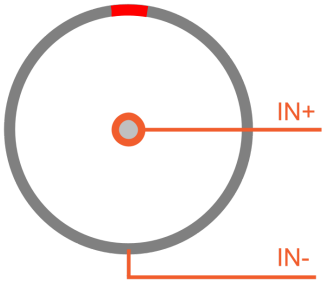
KRYPTONi-8xLV-100V-L1T2m

5.2.1.1. KRYPTONi-4xLV, KRYPTONi-8xLV: Specifications

Analog input	KRYPTONi-4xLV	KRYPTONi-8xLV
Input type	Isolated voltage	Isolated voltage
Number of channels	4	8
ADC Type	24-bit oversampled SAR with 41 kHz anti-aliasing filter	24-bit oversampled SAR with 41 kHz anti-aliasing filter
Sampling Rates	Simultaneous 20k, 10k, 5k, 2k, 1k, 500, 200, 100 S/s (software-selectable)	Simultaneous 20k, 10k, 5k, 2k, 1k, 500, 200, 100 S/s (software-selectable)
Voltage Mode		
Range	**±50 V**	**±50 V, ±100 V (See 2)**
Accuracy	±0.03 % of reading ±5 mV	±0.03 % of reading ±5 mV
Typ. SNR (10 kS/s, -1 dBFS sine wave @ 1 kHz)	104 dB	104 dB
Typical noise floor @ 10 kS/s	-106 dB	-106 dB
Type. THD (10 kS/s, -1 dBFS sine wave @ 1 kHz)	-104 dB	-104 dB
Type. SFDR (10 kS/s, -1 dBFS sine wave @ 1 kHz)	105 dB	105 dB
Typical CMR @ 400 Hz / 1 kHz	105 dB / 94 dB	105 dB / 94 dB
Gain Drift	Typical 10 ppm/K, max. 20 ppm/K	Typical 10 ppm/K, max. 20 ppm/K
Offset Drift	Typical 5 µV/K, max. 10 µV/K	Typical 5 µV/K, max. 10 µV/K
Gain Linearity	< 0.01 %	< 0.01 %
Input Coupling	DC	DC
Input Impedance	1 MΩ	1 MΩ
Noise	0.7 mVRMS	0.7 mVRMS
Overvoltage Protection	In+ to In-: 200 V continuous, 350 Vpeak (100 msec)	In+ to In-: 200 V continuous, 350 Vpeak (100 msec)
Analog input performance		
Bandwidth (-3dB)	0.49 fs	0.49 fs
Alias-free Bandwidth	DC to 0.453 fs	DC to 0.453 fs
Alias Rejection	-100 dB (all sample rates)	-100 dB (all sample rates)
Delay Through ADC	37 / fs	37 / fs
Oversampling	32	32
Additional Specifications		
Input Connector	BNC	BNC, LEMO 2pin (See 2)
Isolation Voltage	1000 Vpeak channel/ground & channel/channel	1000 Vpeak channel/ground & channel/channel
Power		
Power Supply	9 - 48 V DC	9 - 48 V DC
Power Consumption	3.8 W	6.8 W

Environmental		
IP Rating (see 1)	IP67	IP67
Physical		
Weight	700 g	1000 g
Slice Dimensions	213 x 39 x 56 mm	213 x 54 x 56 mm
Dimensions with Connectors	213 x 39 x 66.8 mm	213 x 54 x 66.8 mm
1) Depending on the mating connector types 2) Upon request		

5.2.1.2. KRYPTONi-4xLV, KRYPTONi-8xLV: BNC connector: Pinout

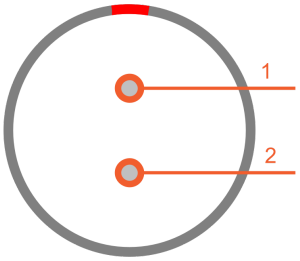


BNC connector: pinout (BNC)

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

Note
KRYPTONi-4xLV and KRYPTONi-8xLV have a single-ended input where IN- (Analog input -) represents isolated ground.

5.2.1.2. KRYPTONi-8xLV-100V-L1T2m: LEMO connector: Pinout

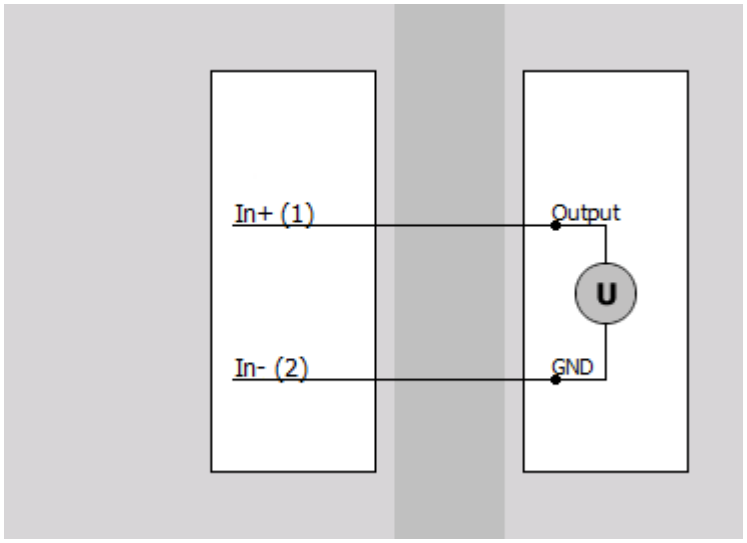


LEMO connector: EGJ.1T.302.CLD

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

5.2.1.3. KRYPTONi-4xLV, KRYPTONi-8xLV: Wiring diagrams

Voltage



5.2.2. KRYPTONi-1xLV

KRYPTONi-1xLV is a single channel low voltage module with BNC connector.

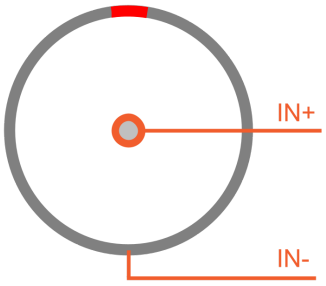
KRYPTONi-1xLV

5.2.2.1. KRYPTONi-1xLV: Specifications

Analog input				
Input types	Voltage			
Number of channels	1			
ADC Type	24-bit SAR with anti-aliasing filter			
Sampling Rate	Simultaneous 40 kS/s per channel (software-selectable)			
Voltage 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	96 dB	96 dB	94 dB	88 dB
Typical Dynamic Range @ 10 kS	-130 dB	-132 dB	-137 dB	-138 dB
Typical Noise floor @ 10 kS	-108 dB	-102 dB	-107 dB	-100 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	
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			
Additional specifications				
Input connector	BNC			

Isolation	125 Vrms channel to ground isolation
Power	
Power Supply	9 - 48 V DC
Power consumption	1.5 W (typ.)
Physical	
Dimensions	62 x 56 x 29 mm
Weight	250 g

5.2.2.2. KRYPTONi-1xLV: BNC connector: Pinout



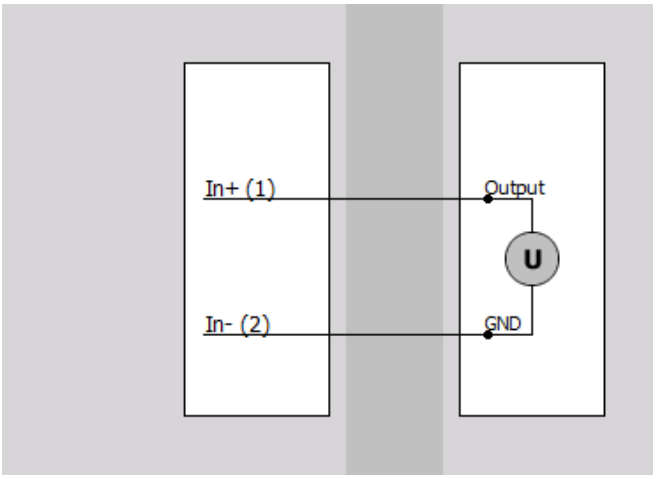
BNC connector: pinout (BNC)

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

Note
KRYPTONi-1xLV has a single-ended input where IN- (Analog input -) represents isolated ground.

5.2.2.3. KRYPTONi-1xLV: Wiring diagrams

Voltage



5.2.3. KRYPTONi-1xHV

KRYPTONi-1xHV has two banana front connectors for single channel high voltage measurement.

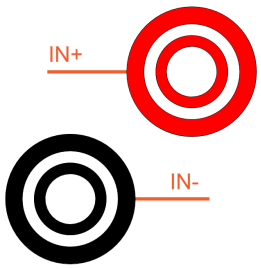
KRYPTONi-1xHV

5.2.3.1. KRYPTONi-1xHV: Specifications

Analog Input	
Input types	Voltage
Number of channels	1
ADC Type	24-bit SAR with anti-aliasing filter
Sampling Rate	40 kS/s (software-selectable)
Input range	±1000 V
Input accuracy	±0.03 % of reading ±0.2 V
Typ. Noise floor @ 10 kS/s	-96 dB
Typ. Noise floor @ 40 kS/s	-90 dB
Typ. CMR @ 400 Hz / 1 kHz	-
Gain Drift	Typ. 50 ppm (Max. 150ppm)
Offset Drift	Typ. 1.5 mV/K (Max. 4 mV/K)
Gain Linearity	-
Input Coupling	DC
Input Impedance	10 MΩ
Protection class	CAT IV 600 V, CAT III 1000 V
Overvoltage Protection	+-2 kVpeak
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
Additional specifications	
Input connector	4 mm safety banana jack
Power	
Power Supply	9 - 48 V DC
Power consumption	1 W (typ.)
Environmental	
IP rating	IP65 / IP67 (see 1)
Physical	
Dimensions	62 x 56 x 36 mm
Weight	300 g
1) Depending on the mating connector types	

5.2.3.2. KRYPTONi-1xHV: Banana Connector: Pinout

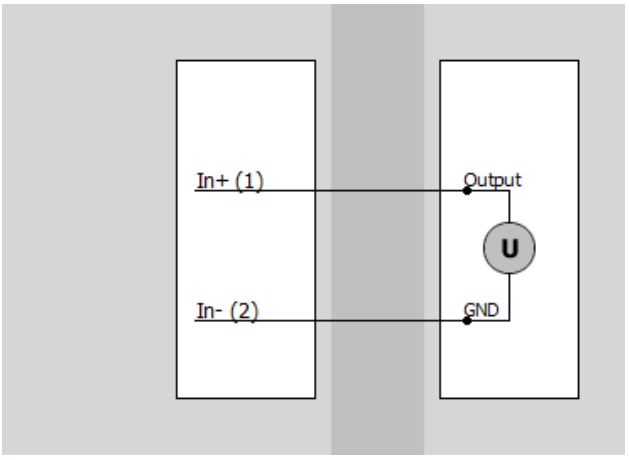


HV connector: pinout (Banana plug)

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

5.2.3.3. KRYPTONi-1xHV: Wiring diagrams

Voltage



5.3. CURRENT MEASUREMENT

KRYPTON LA modules are rugged isolated DAQ devices for low amperage measurements. Currently, KRYPTONi-8xLA is available.

5.3.1. KRYPTONi-8xLA

KRYPTONi-8xLA has 8 BNC input connectors for current measurement.

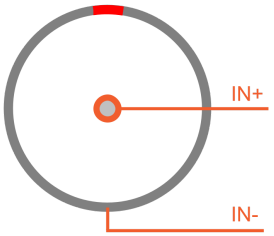
KRYPTONi-8xLA

5.3.1.1. KRYPTONi-8xLA: Specifications

Analog input	KRYPTONi-8xLA
Input type	Isolated current
Number of channels	8
ADC Type	24-bit oversampled SAR with 41 kHz anti-aliasing filter
Sampling Rates	Simultaneous 20k, 10k, 5k, 2k, 1k, 500, 200, 100 S/s (software-selectable)
Current Range	±20 mA
Accuracy	±0.02 % of reading ±8 µA
Typical noise floor @ 10 kS/s	-95 dB
Crosstalk (20 kS/s, -1 dBFS @ 1 kHz)	-124 dB
Gain Drift	Typical 10 ppm/K, max. 20 ppm/K
Offset Drift	Typical 100 nA/K, max. 200 nA/K
Gain Linearity	< 0.01 %
Input Coupling	DC
Input Impedance	50 Ω
Noise	0.3 µARMS
Overvoltage Protection	50 V
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
Additional Specifications	
Input Connector	BNC
Isolation Voltage	1000 Vpeak channel/ground & channel/channel
Power	
Power Supply	9 - 48 V DC
Power Consumption	6.8 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	

5.3.1.2. KRYPTONi-8xLA: BNC Connector: Pinout



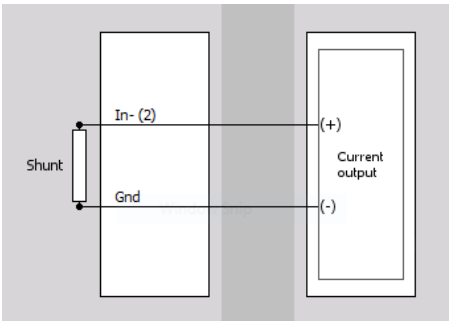
BNC connector: pinout (BNC)

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

Note
KRYPTONi-8xLA has a single-ended input where IN- (Analog input -) represents isolated ground.

5.3.1.3. KRYPTONi-8xLA: Wiring diagrams

Current



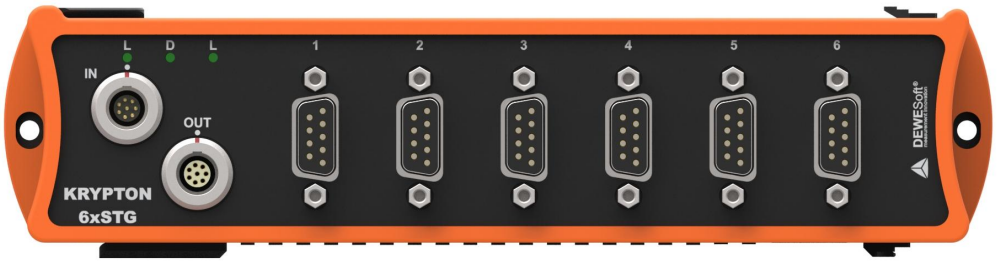
5.4. STRAIN AND STRESS MEASUREMENT

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-L1T7f module has 6 LEMO L1T7f connectors for voltage or strain measurement.

KRYPTON-6xSTG-L1T7f

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

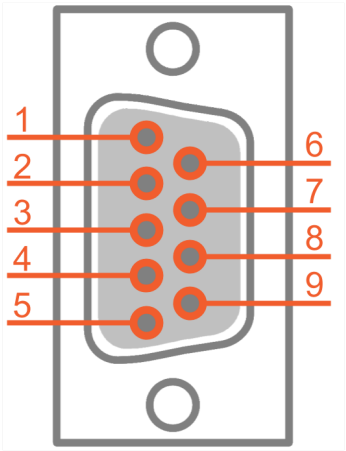
Gain Drift	Typical 10 ppm/K (max. 40 ppm/K)
Offset Drift	Typical 0.3 µV/K + 5 ppm of range/K, max 2 µV/K + 10 ppm of range/K
Gain Linearity	< 0.02 %
Input Coupling	DC
Input Impedance	10 MΩ
Overvoltage Protection	In+ to In-: 50 V continuous, 200 V peak (10 ms)
Analog input performance	
Bandwidth (-3 dB)	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; 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; L1T7f; 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

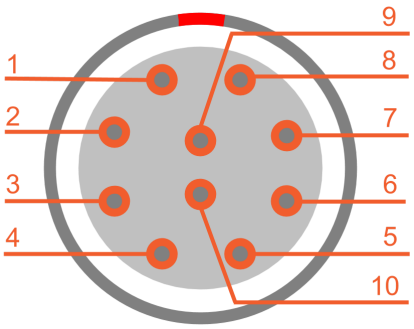


STG connector:pinout (DSUB-9 female)

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

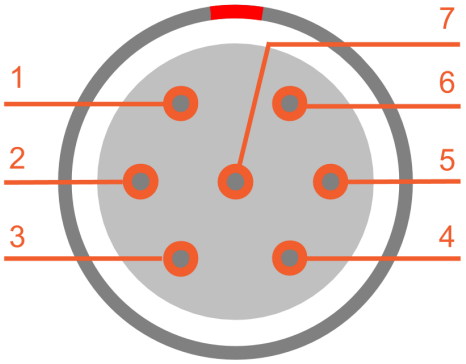


STG-L2B10f connector: pinout (10-pin LEMO female)

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

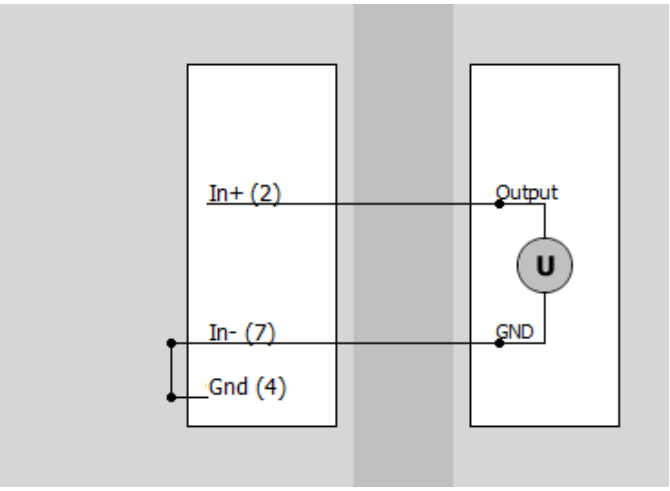
Pin	Name	Description
1	In+	Input +
2	Exc+	Excitation +
3	Sns+	Sense +
4	Sns-	Sense -
5	Exc-	Excitation -
6	In-	Input -
7	R+	¼ Bridge / Shunt

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

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

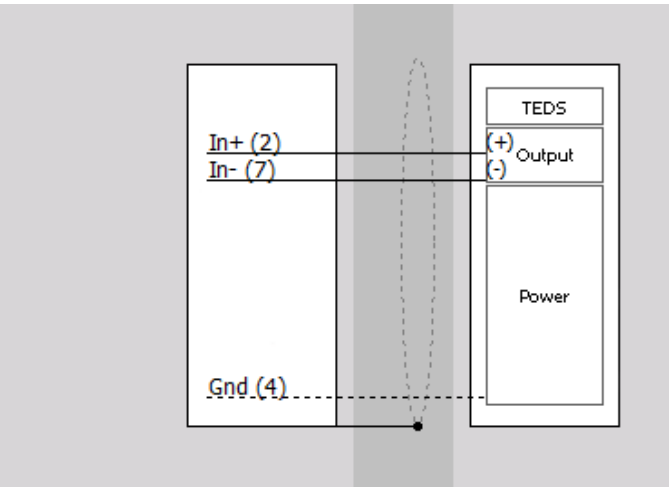
Voltage

Single ended



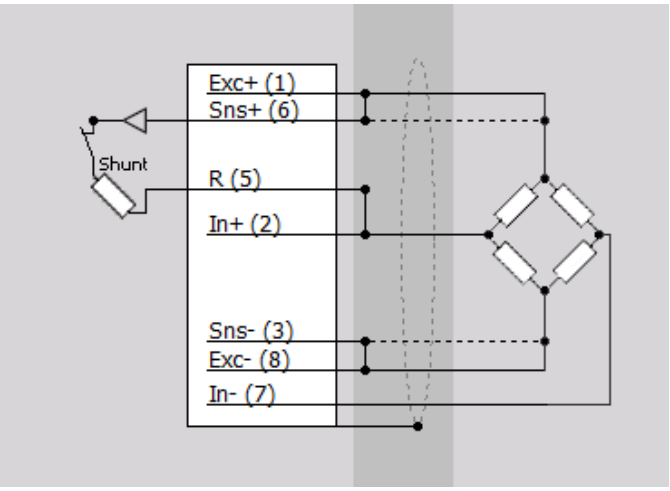
Differential

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

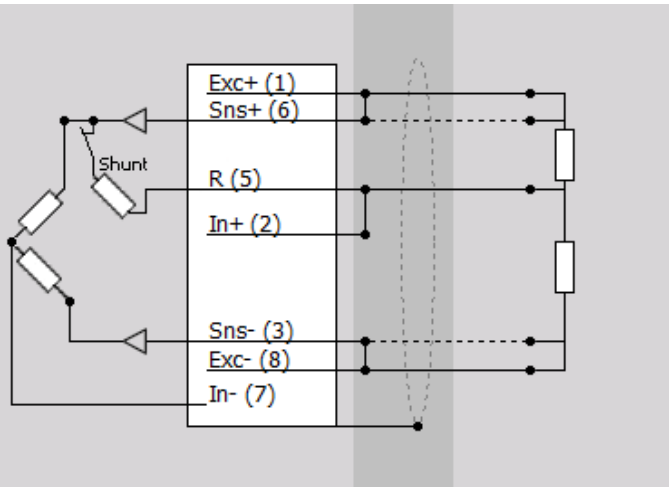


Bridge

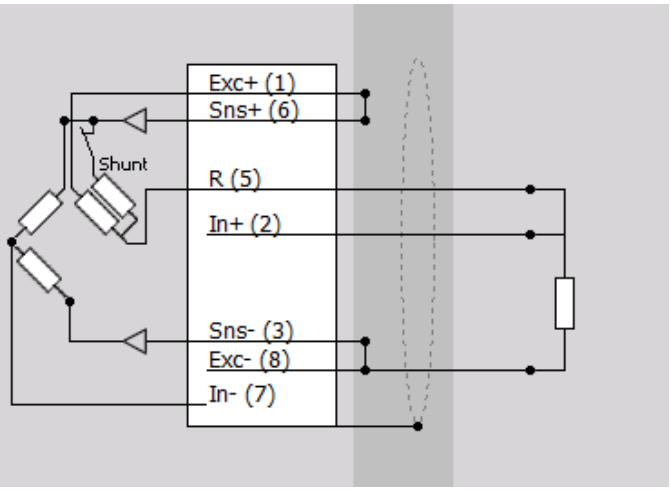
Full-bridge



Half-bridge

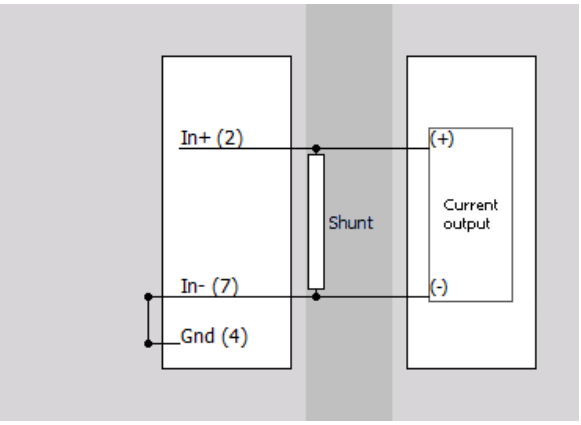


Quarter-bridge

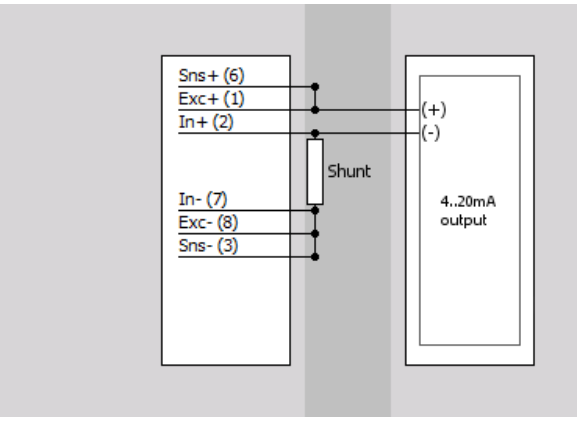


Current

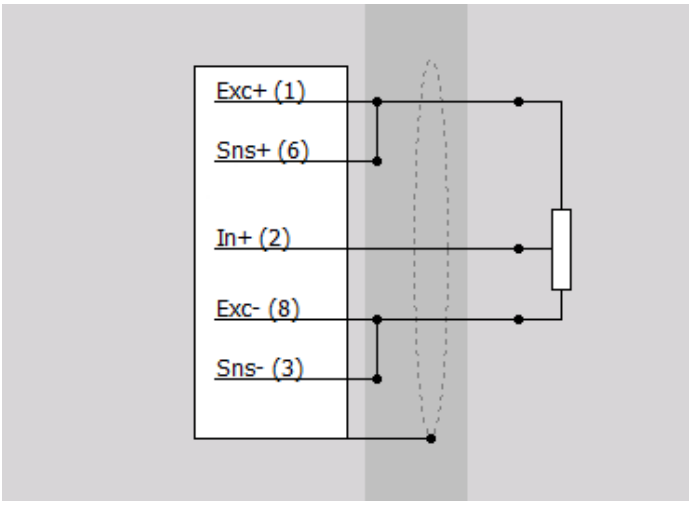
External direct shunt



External loop powered shunt

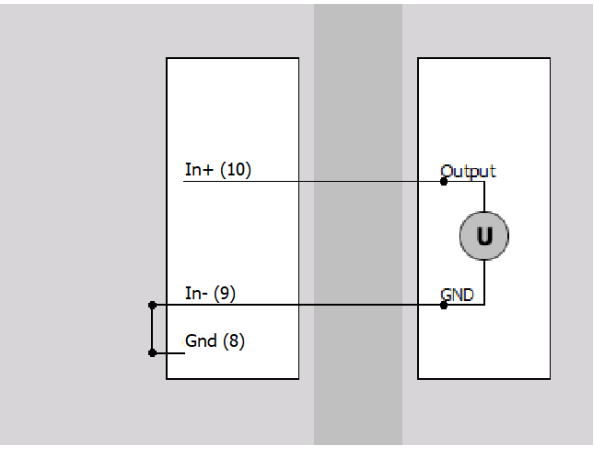


Potentiometer



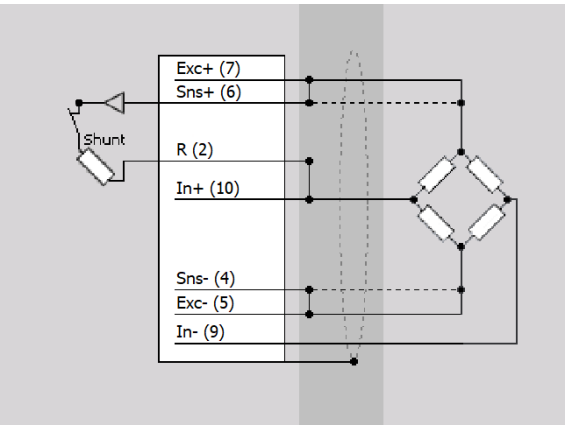
5.4.1.3.2. KRYPTON-3xSTG, 6xSTG: LEMO L2B10f Connector: Wiring diagrams

Voltage

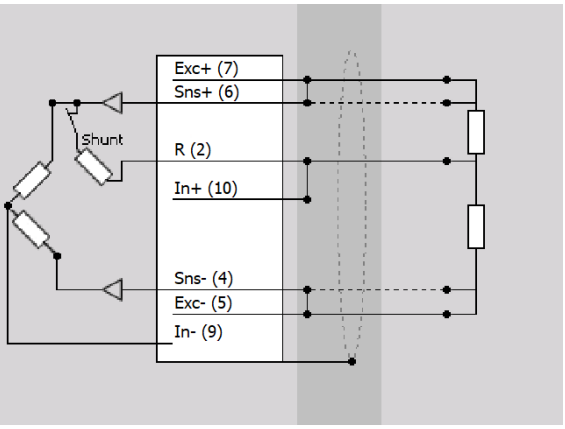


Bridge

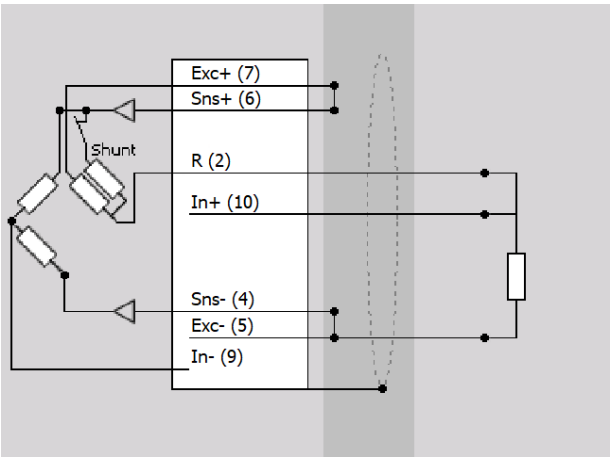
Full-bridge



Half-bridge

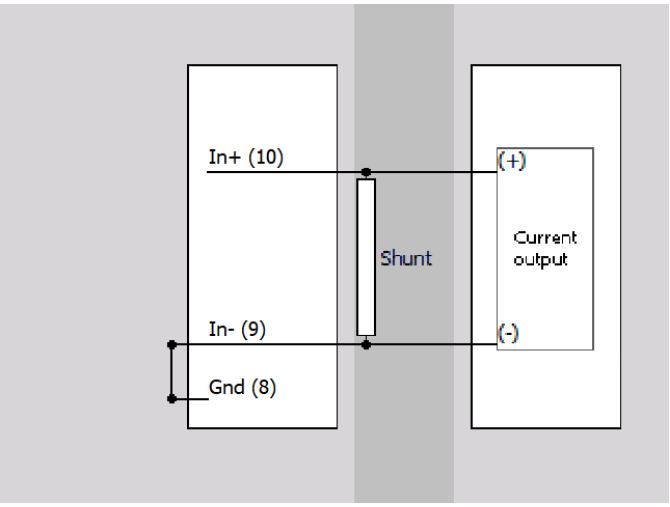


Quarter-bridge

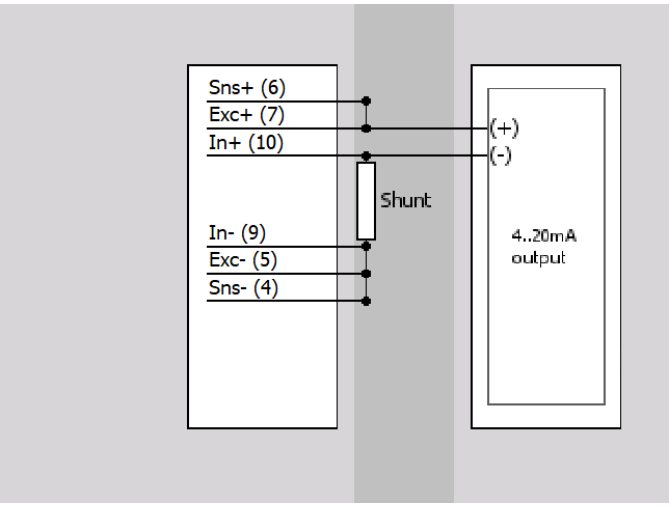


Current

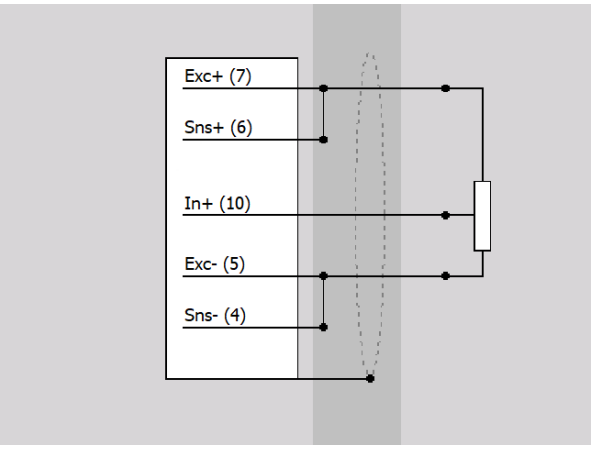
External direct shunt



External loop powered shunt

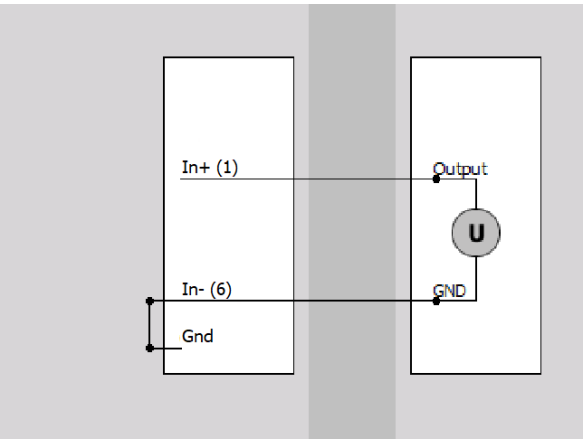


Potentiometer



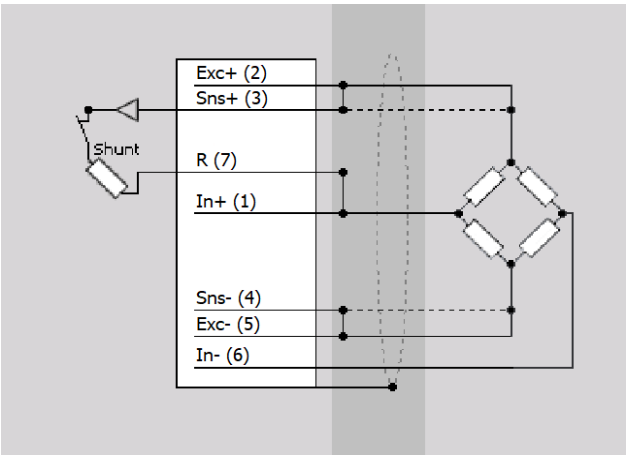
5.4.1.3.3. KRYPTON-3xSTG, 6xSTG: LEMO L1T7f Connector: Wiring diagrams

Voltage

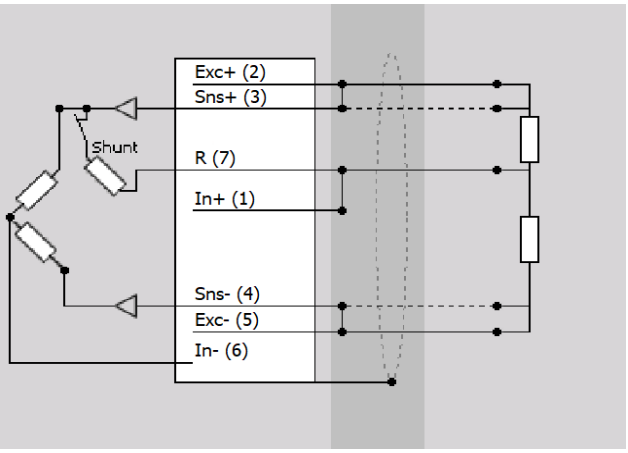


Bridge

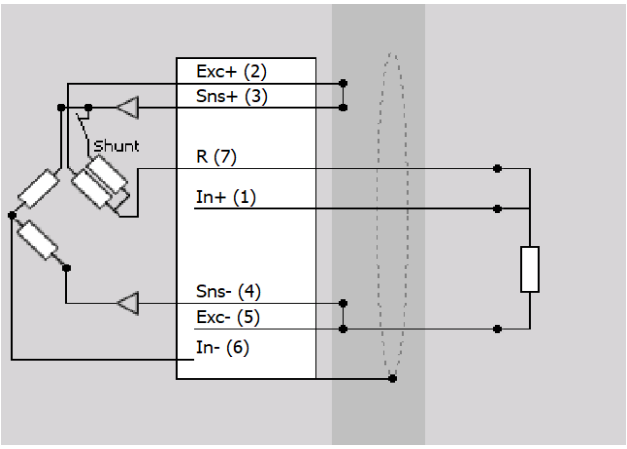
Full-bridge



Half-bridge

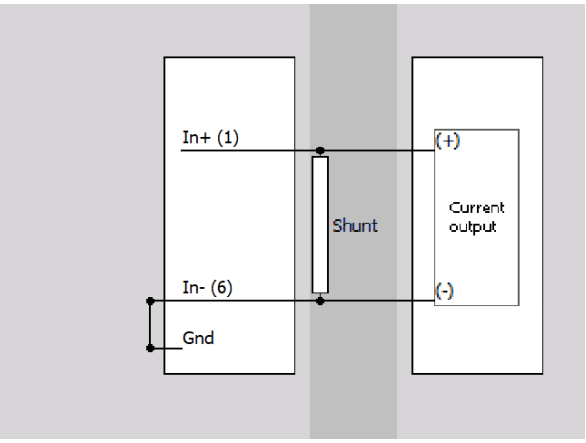


Quarter-bridge

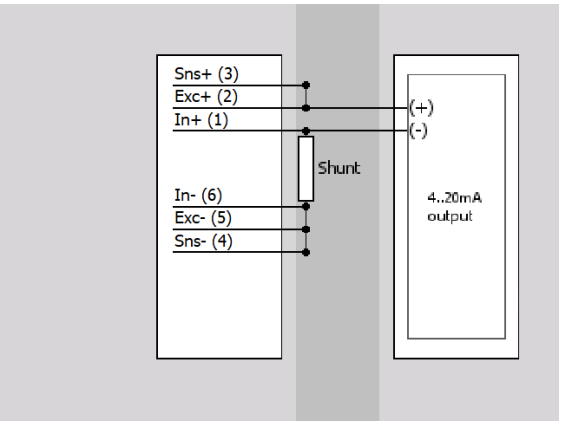


Current

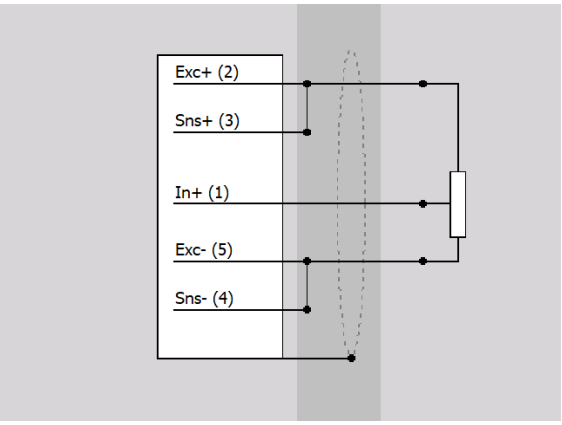
External direct shunt



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.

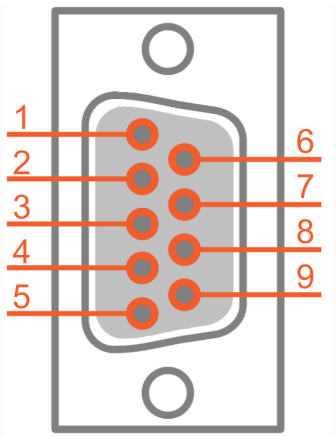
KRYPTONi-1xSTG

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 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 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 Connection Types	full bridge strain, ½ bridge strain, ¼ bridge strain (3 wire)			
Bridge ranges	20...10000 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



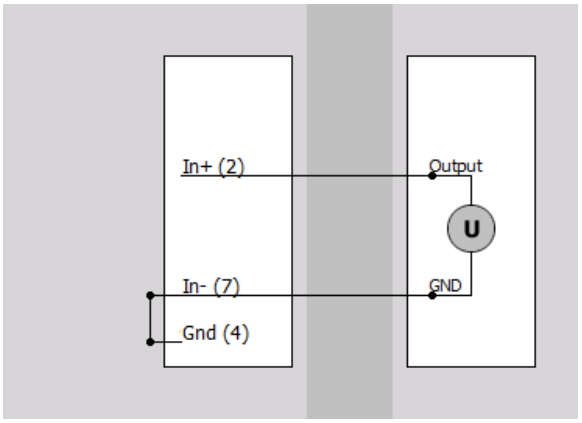
STG connector:pinout (DSUB-9 female)

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

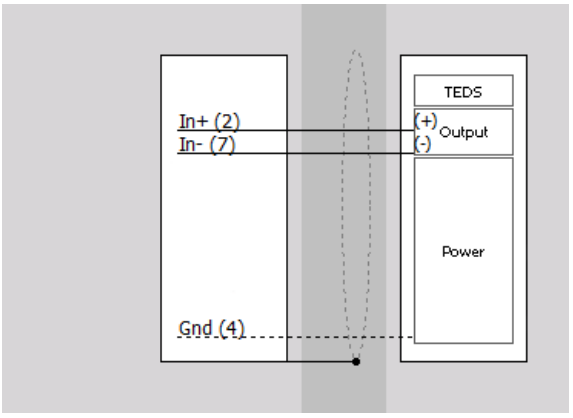
Voltage

Single ended



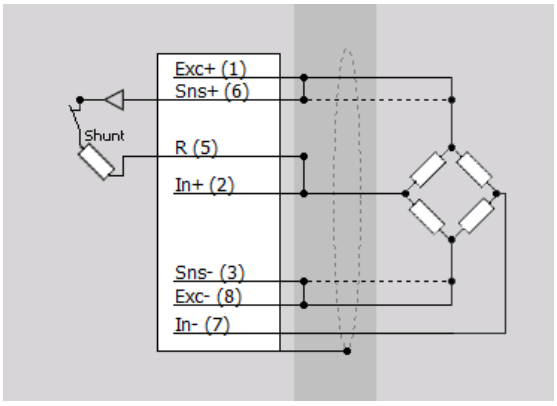
Differential

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

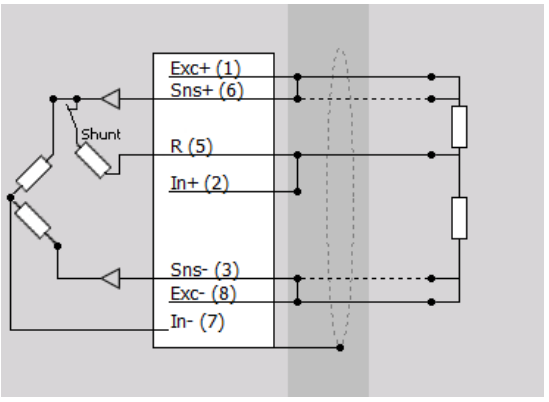


Bridge

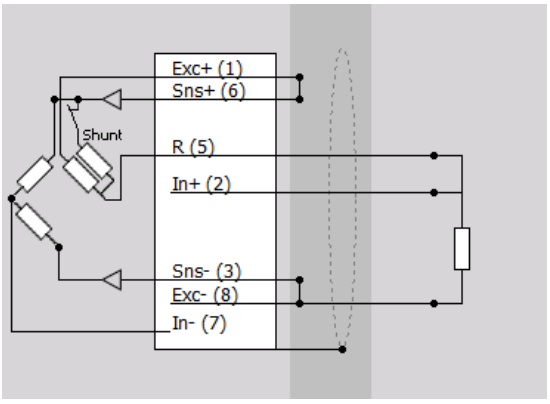
Full-bridge



Half-bridge

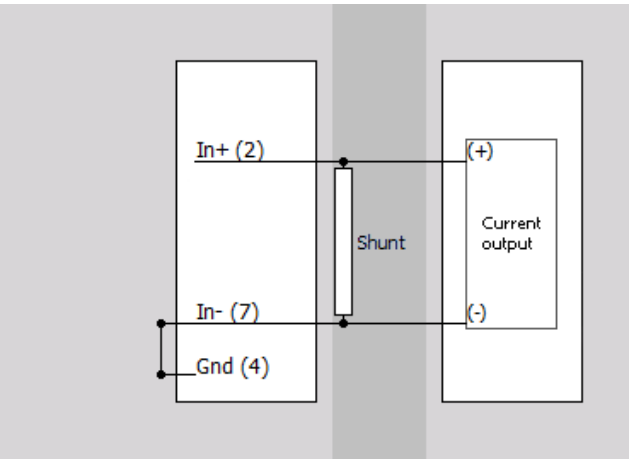


Quarter-bridge

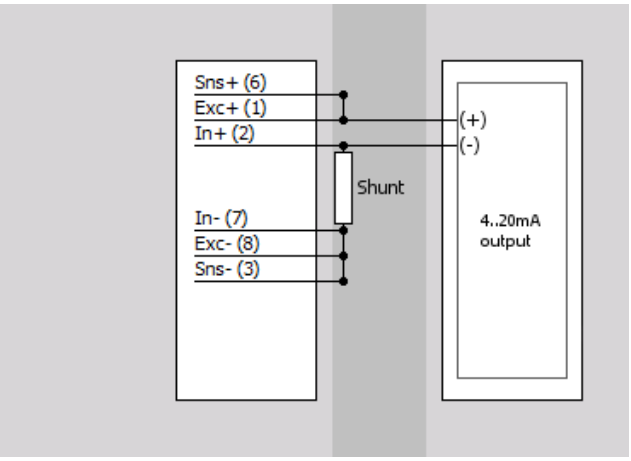


Current

External direct shunt

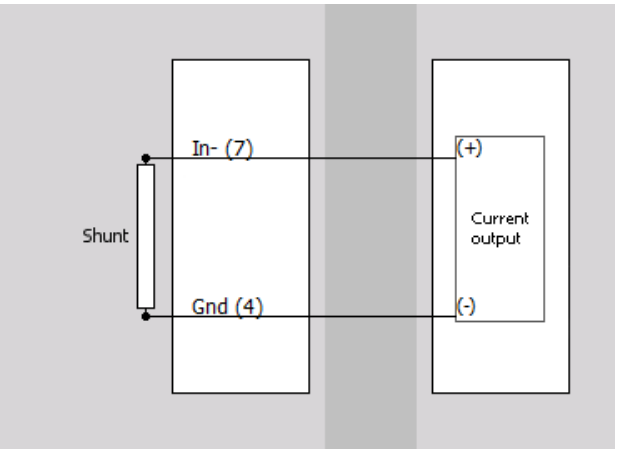


External loop powered shunt

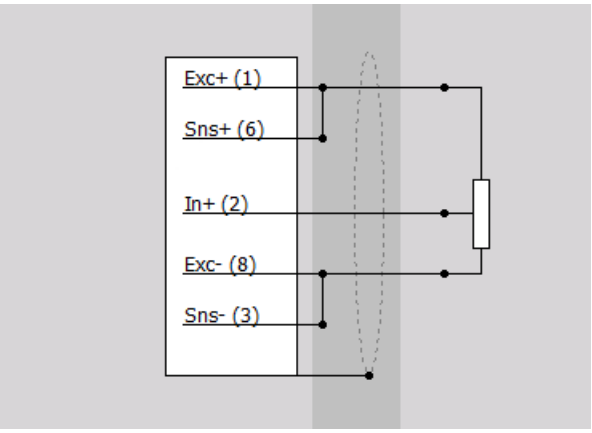


Internal shunt

This feature is limited only to KRYPTONi-1xSTG.



Potentiometer



5.5. 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.

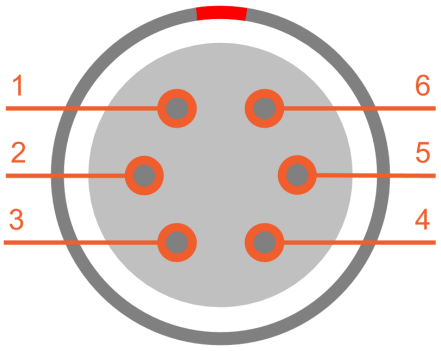
KRYPTONi-8xRTD

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 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	**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	
Resolution	< 0.001 °C	
Resistance	**0...10 kΩ**	**0...1 kΩ**
Accuracy	±0.02 % of reading ±0.01 % of range	
Input Connection	3 wire or 4 wire	
Resolution	-	
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



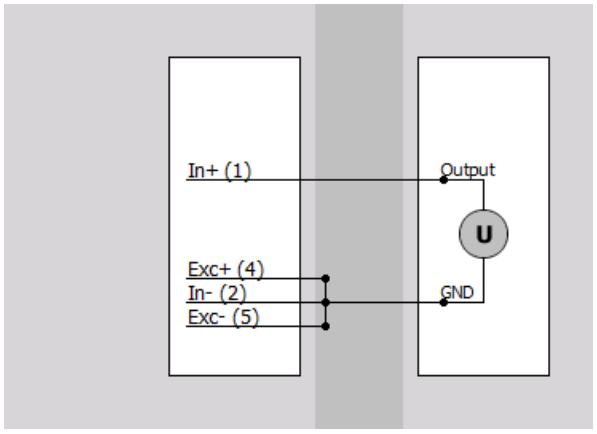
RTD connector: pinout (6-pin LEMO)

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

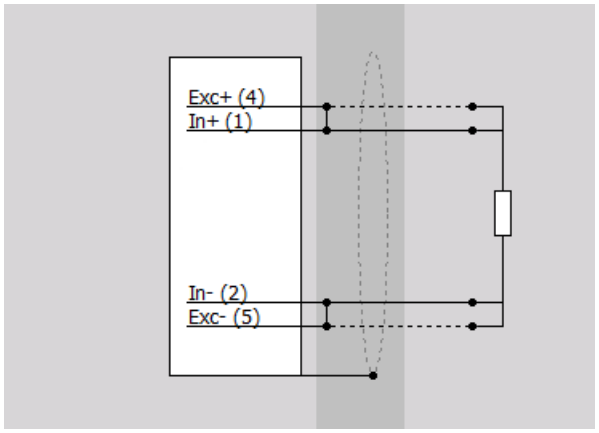
Connector type LEMO L0B6f
Mating connector: FGA.0B.306.CLAD52Z

5.5.1.3. KRYPTONi-8xRTD: Wiring diagrams

Voltage

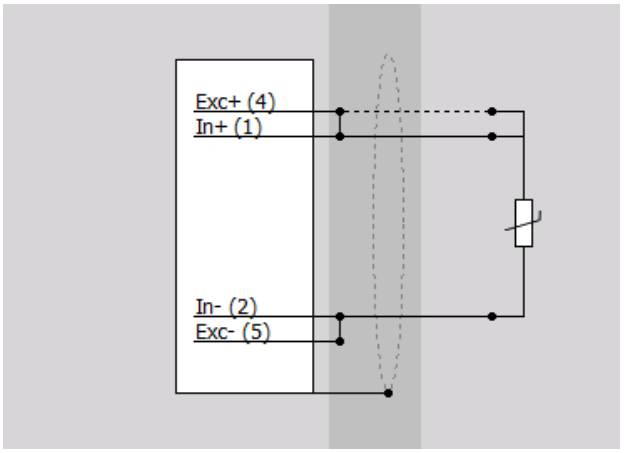


Resistance

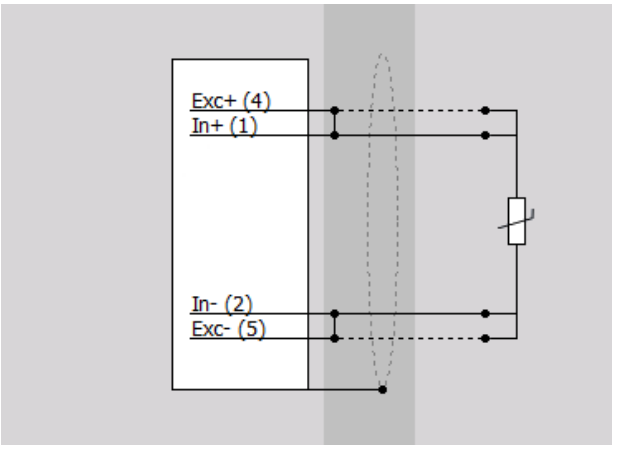


Temperature

3-wire



4-wire



5.5.1. 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.

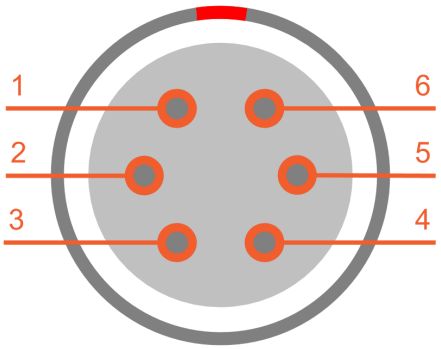
KRYPTONi-8xRTD

5.5.1.1. 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	
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	

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



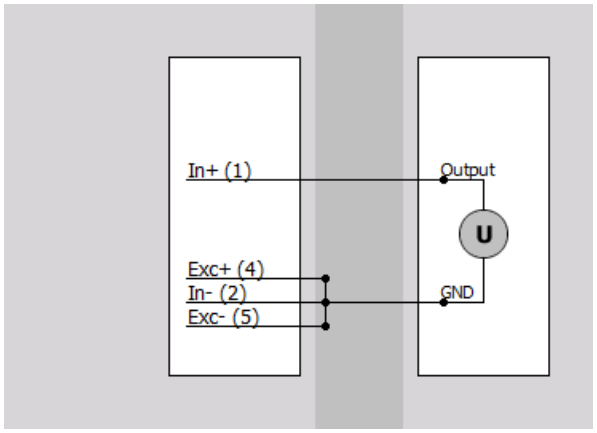
RTD connector: pinout (6-pin LEMO)

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

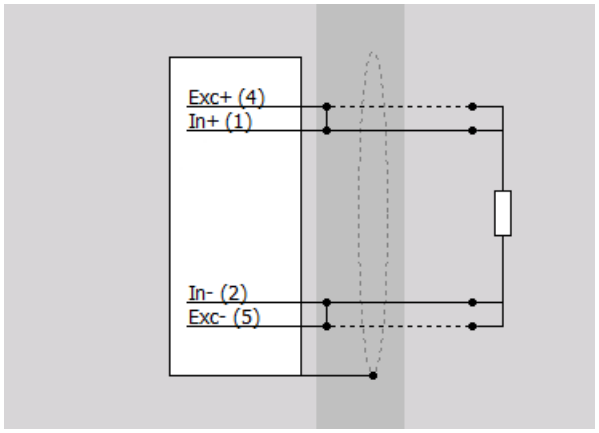
Connector type: LEMO L0B6f
Mating connector: FGA.0B.306.CLAD52Z

5.5.1.3. KRYPTONi-8xRTD-HS: Wiring diagrams

Voltage

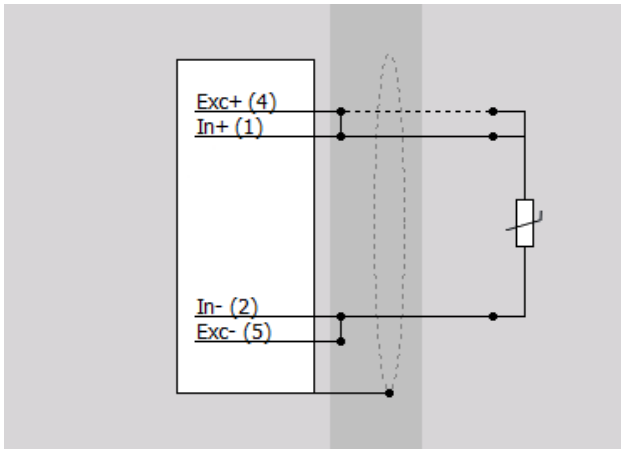


Resistance

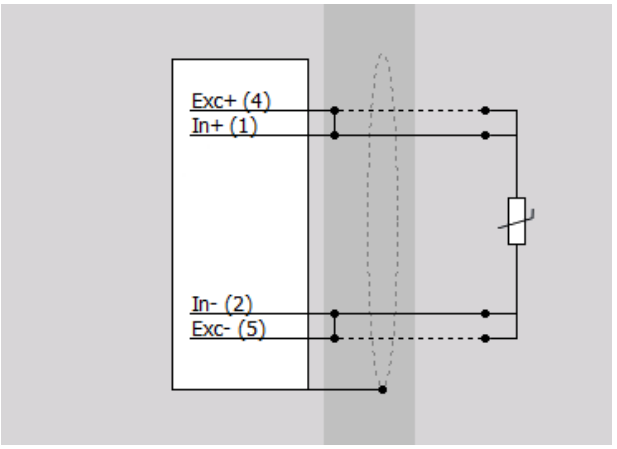


Temperature

3-wire

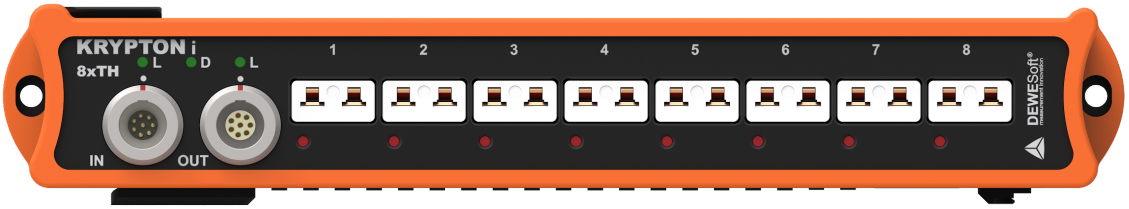


4-wire



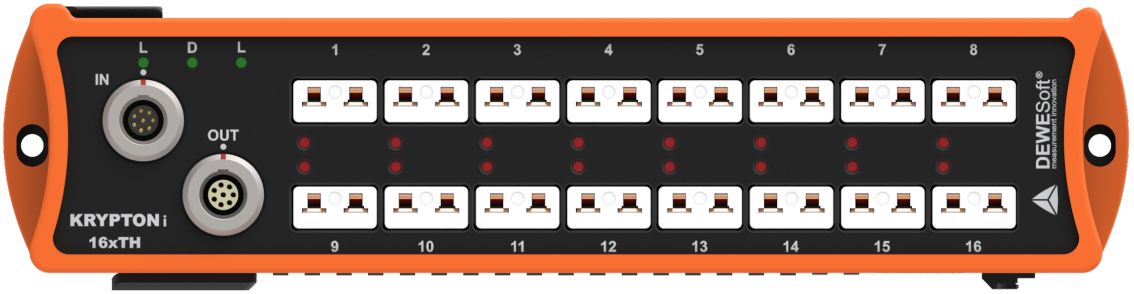
5.5.2. KRYPTONi-8xTH, KRYPTONi-16xTH

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



KRYPTONi-8xTH

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



KRYPTONi-16xTH

5.5.2.1. 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		

5.5.2.1.1. 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.

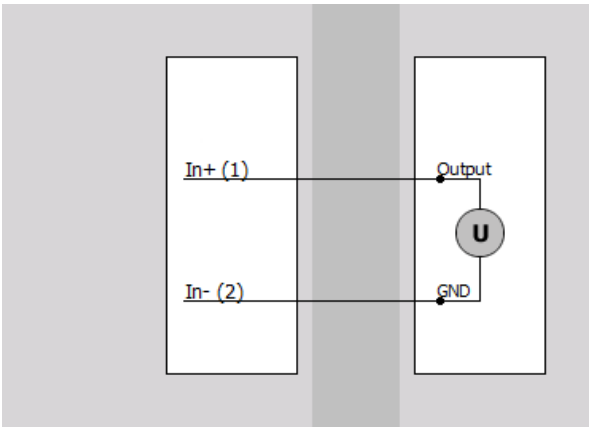
5.5.2.2. KRYPTONi-8xTH, KRYPTONi-16xTH: Thermocouple connector: Pinout

Thermocouple connector: pinout (Mini TC)

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

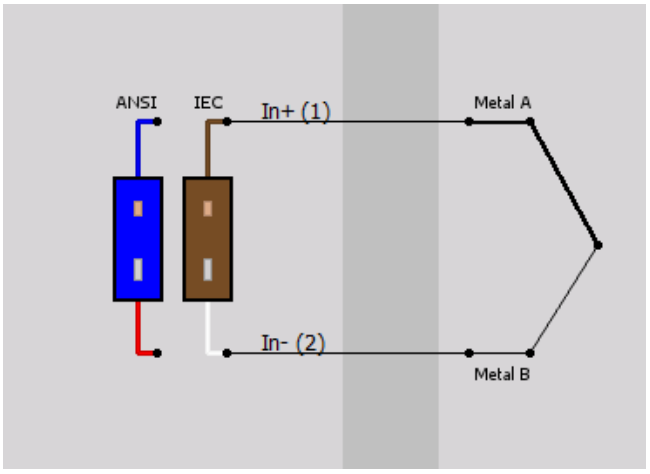
5.5.2.3. KRYPTONi-8xTH, KRYPTONi-16xTH: Wiring diagrams

Voltage

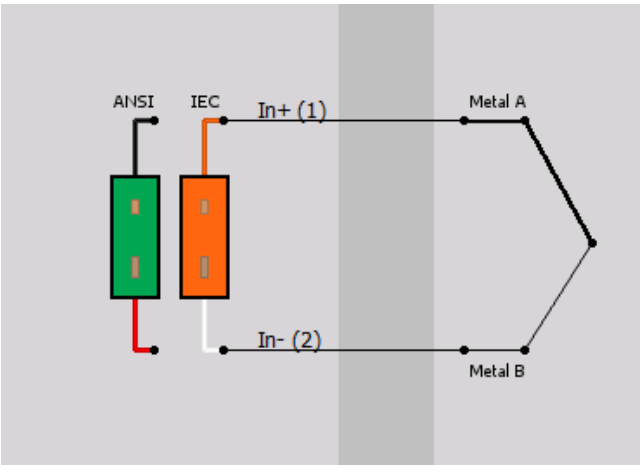


Temperature

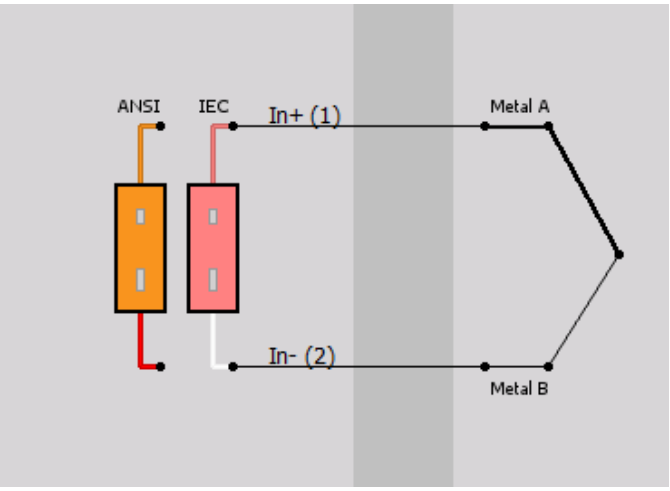
T-type thermocouple



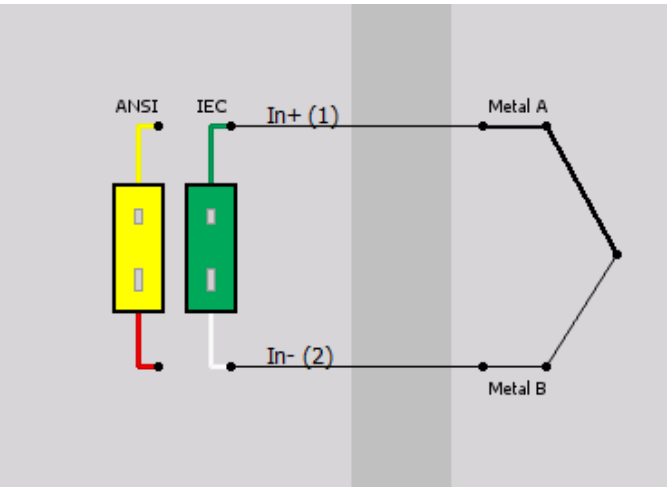
S-type, R-type thermocouple



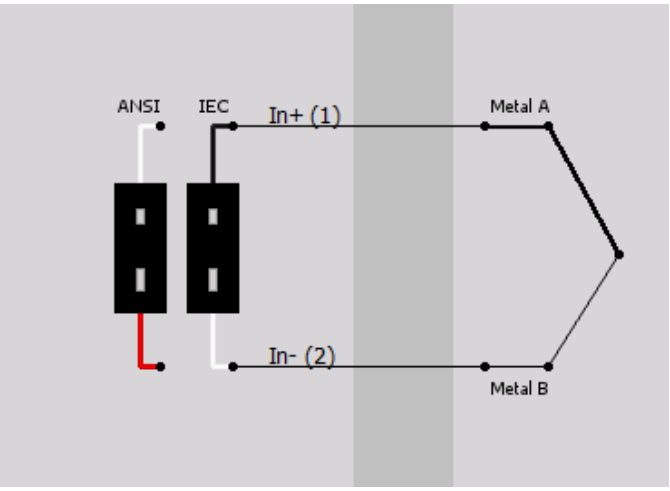
N-type thermocouple



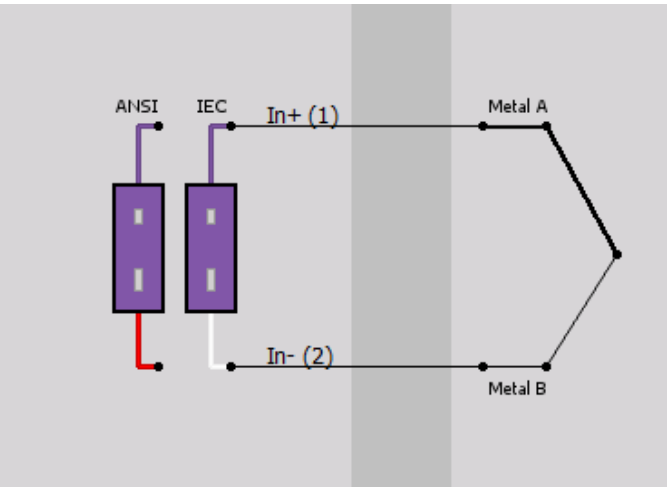
K-type thermocouple



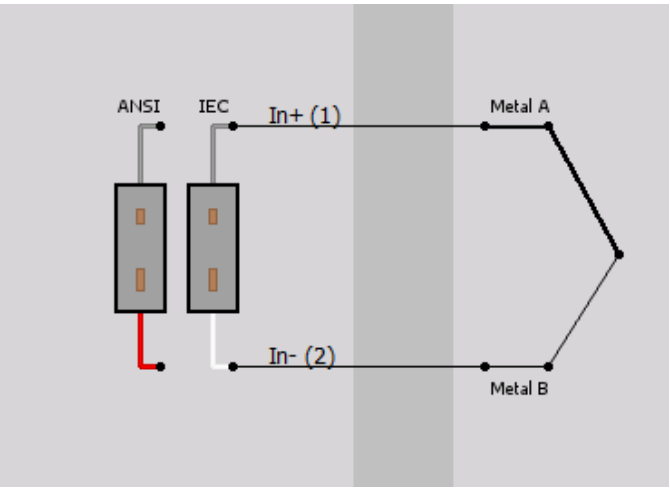
J-type thermocouple



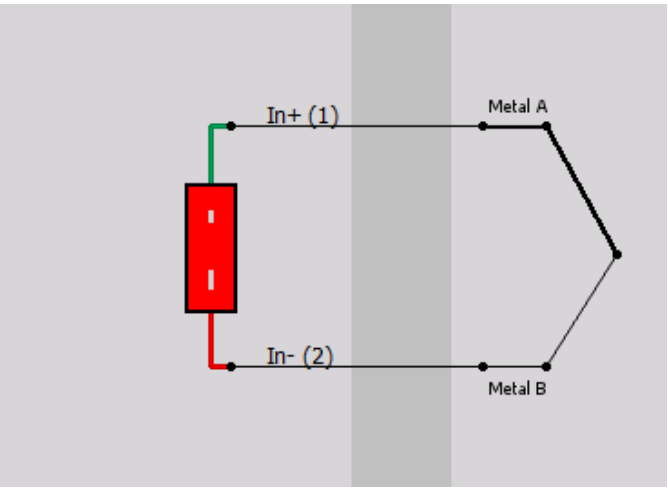
E-type thermocouple



B-type thermocouple

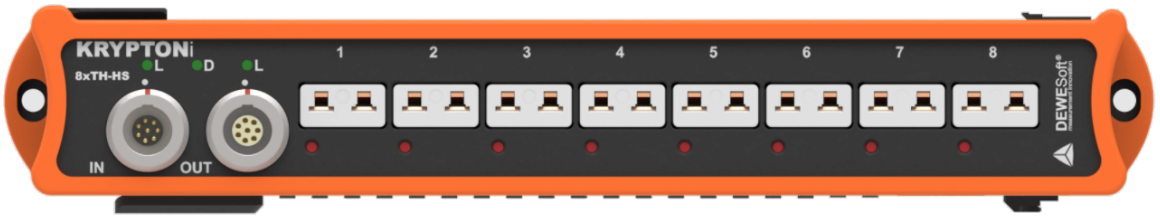


C-type thermocouple



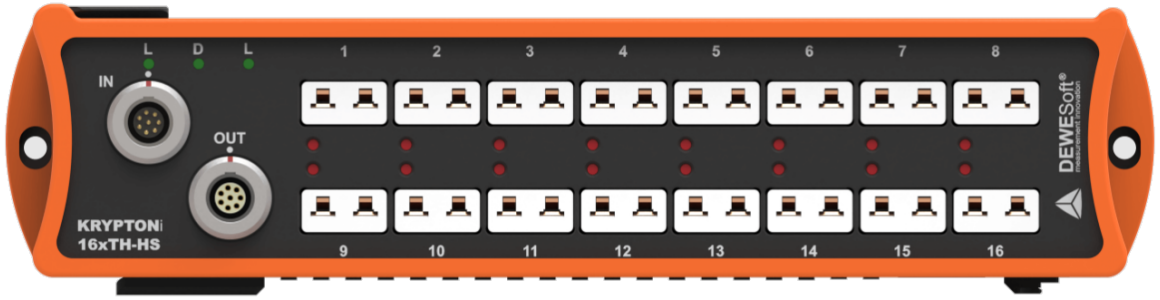
5.5.3. KRYPTONi-8xTH-HS, KRYPTONi-16xTH-HS

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



KRYPTONi-8xTH-HS

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



KRYPTONi-16xTH-HS

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

Analog inputs	**KRYPTONi-8xTH-HS**	
Input type	Isolated universal thermocouple and voltage	
Number of channels	8	
ADC Type	24-bit delta-sigma	
Sampling rates	Simultaneous 10, 20, 40, 50, 80, 100, 200, 500, 1k, 2k, 5k, 10k S/s (optional)	
Voltage Mode		
Ranges	**±1 V**	**±100 mV**
Input Accuracy	±0.02 % of reading ±50 µV	±0.02 % of reading ±7 µV
Typical Noise Floor @ 10 / 100 / 1k / 10k S/s	-130 dB / -120 dB / -110 dB / -104 dB	-120 dB / -110 dB / -100 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	100 MΩ	
Thermocouple		
Input type	TC Types: K, J, T, R, S, N , E, C, B	
Accuracy	±0.02 % of reading ±0.5 °C ±7 µV	

Typical Noise	0.002 °C RMS @ Type K @ 10 S/s 0.006 °C RMS @ Type K @ 100 S/s 0.02 °C RMS @ Type K @ 1 kS/s 0.05 °C RMS @ Type K @ 10 kS/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	Typ. 2.6 W (Max. 3 W)
Environmental	
IP rating	IP67
Physical	
Weight	750 g
Dimensions	213 x 39 x 56 mm

Analog inputs	**KRYPTONi-16xTH-HS**	
Input type		
Number of channels	16	
ADC Type	24-bit delta-sigma	
Sampling rates	Simultaneous 10, 20, 40, 50, 80, 100, 200, 500, 1k, 2k, 5k, 10k S/s (optional)	
Voltage Mode		
Ranges	**±1 V**	**±100 mV**
Input Accuracy	±0.02 % of reading ±50 µV	±0.02 % of reading ±7 µV
Typical Noise Floor @ 10 / 100 / 1k / 10k S/s	-130 dB / -120 dB / -110 dB / -104 dB	-120 dB / -110 dB / -100 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	100 MΩ	
Thermocouple		
Input type	TC Types: K, J, T, R, S, N , E, C, B	
Accuracy	±0.02 % of reading ±0.5 °C ±7 µV	
Typical Noise	0.002 °C RMS @ Type K @ 10 S/s 0.006 °C RMS @ Type K @ 100 S/s 0.02 °C RMS @ Type K @ 1 kS/s 0.05 °C RMS @ Type K @ 10 kS/s	
Additional Specifications		
Input connector	Mini Thermocouple connector (copper)	
Isolation voltage	1000 Vpeak channel/ground & channel/channel	

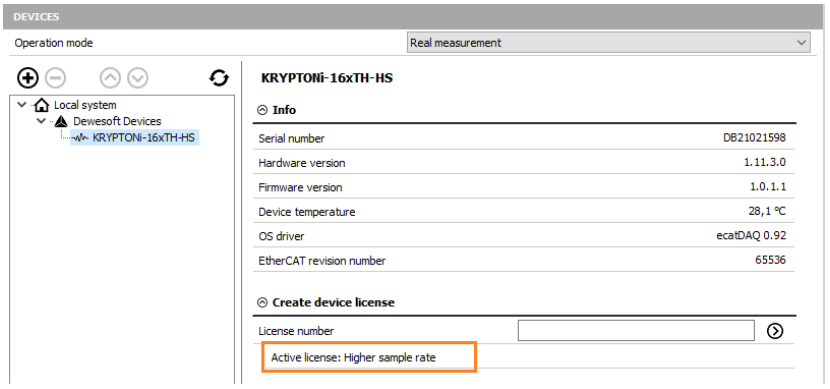
Power	
Power Supply	9 - 48 V DC
Power consumption	Typ. 4.3 W (Max. 5 W)
Environmental	
IP rating	IP67
Physical	
Weight	1060 g
Dimensions	213 x 54 x 56 mm

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

Temperature	Type K	Type J	Type T	Type R	Type S	Type N	Type E	Type B	Type C
-200 °C	1.00 °C	0.86 °C	0.98 °C	✗	✗	1.24 °C	0.71 °C	✗	✗
-100 °C	0.75 °C	0.69 °C	0.77 °C	✗	✗	0.85 °C	0.67 °C	✗	✗
0 °C	0.68 °C	0.64 °C	0.68 °C	1.82 °C	1.79 °C	0.77 °C	0.62 °C	✗	1.07 °C
100 °C	0.69 °C	0.65 °C	0.67 °C	1.46 °C	1.47 °C	0.76 °C	0.62 °C	7.96 °C	0.96 °C
400 °C	0.75 °C	0.71 °C	0.72 °C	1.26 °C	1.31 °C	0.77 °C	0.67 °C	2.30 °C	0.95 °C
700 °C	0.81 °C	0.75 °C	✗	1.23 °C	1.30 °C	0.82 °C	0.73 °C	1.67 °C	1.01 °C
1000 °C	0.88 °C	0.82 °C	✗	1.23 °C	1.31 °C	0.88 °C	0.83 °C	1.47 °C	1.07 °C
1300 °C	0.96 °C	✗	✗	1.26 °C	1.34 °C	0.98 °C	✗	1.40 °C	1.17 °C
1700 °C	✗	✗	✗	1.36 °C	1.45 °C	✗	✗	1.45 °C	1.34 °C

Hint

The higher sample rate is unlocked with a device license key as it is shown on the image below. This upgrade raises the maximum possible sample rate of the KRYPTONi-8xTH-HS or the KRYPTONi-16xTH-HS from 100 S/s to 10 kS/s.



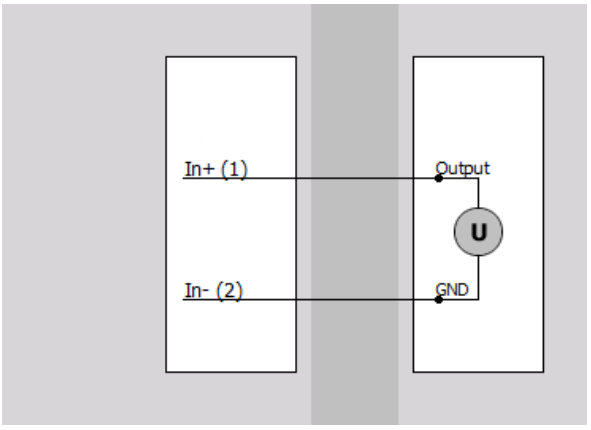
5.5.3.2. KRYPTONi-8xTH-HS, KRYPTONi-16xTH-HS: Thermocouple connector: Pinout

Thermocouple connector: pinout (Mini TC)

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

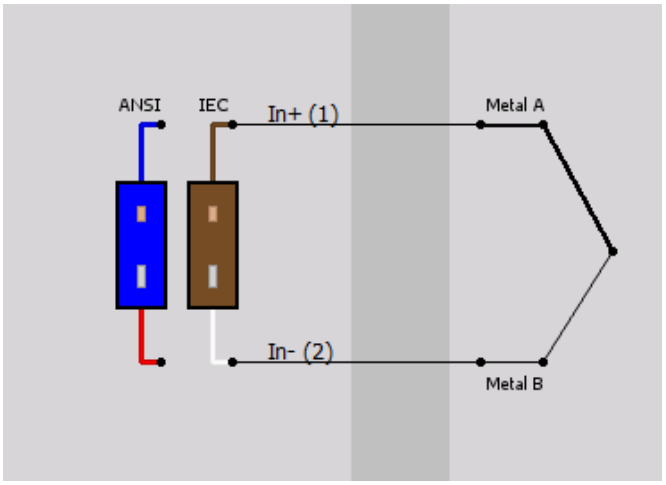
5.5.3.3. KRYPTONi-8xTH-HS, KRYPTONi-16xTH-HS: Wiring diagrams

Voltage

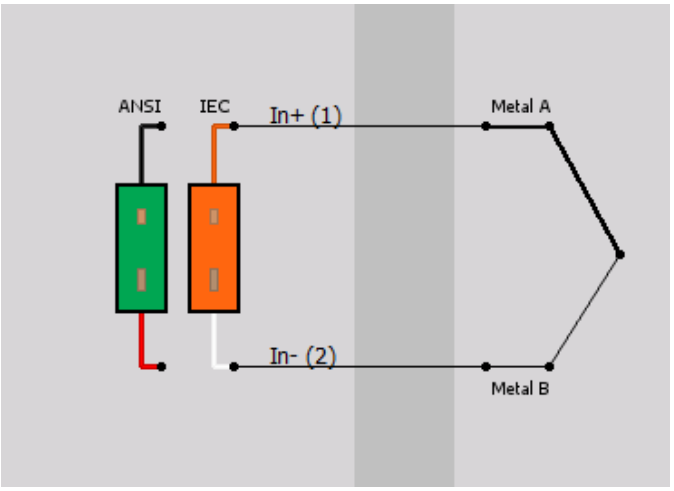


Temperature

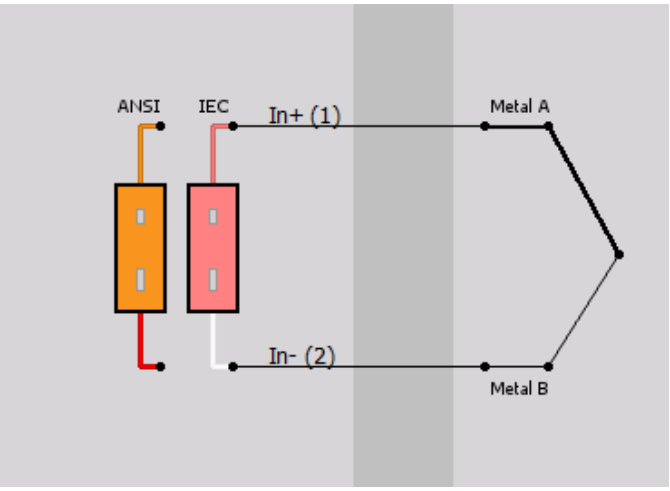
T-type thermocouple



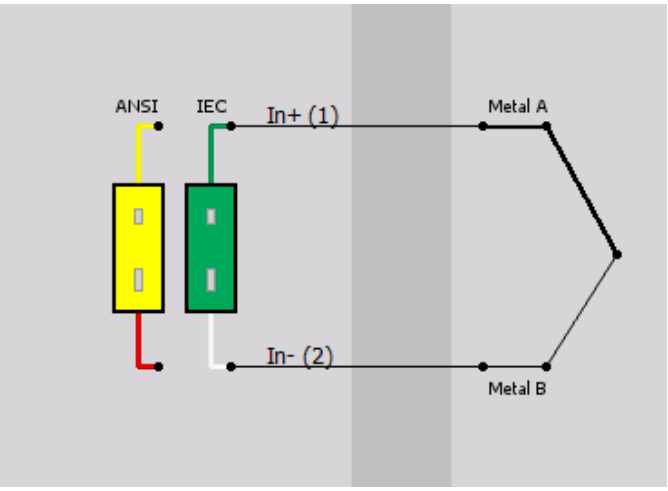
S-type, R-type thermocouple



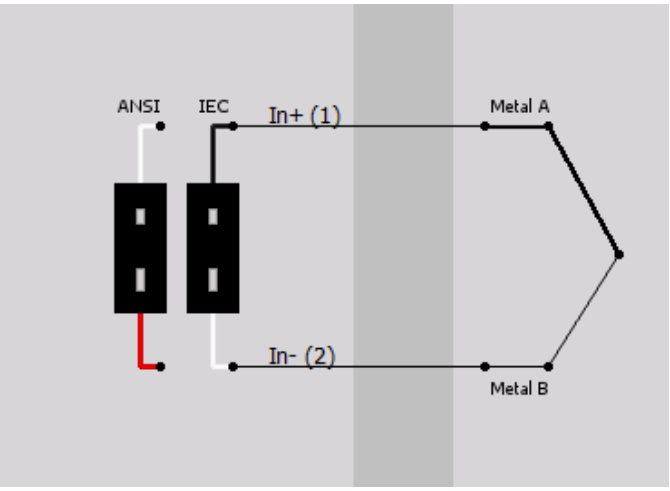
N-type thermocouple



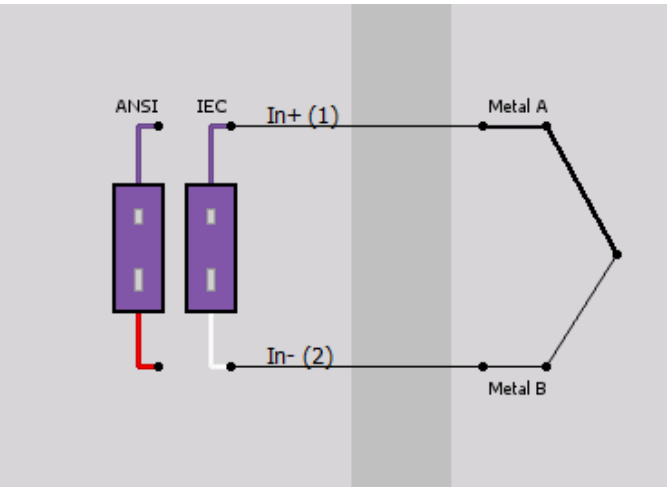
K-type thermocouple



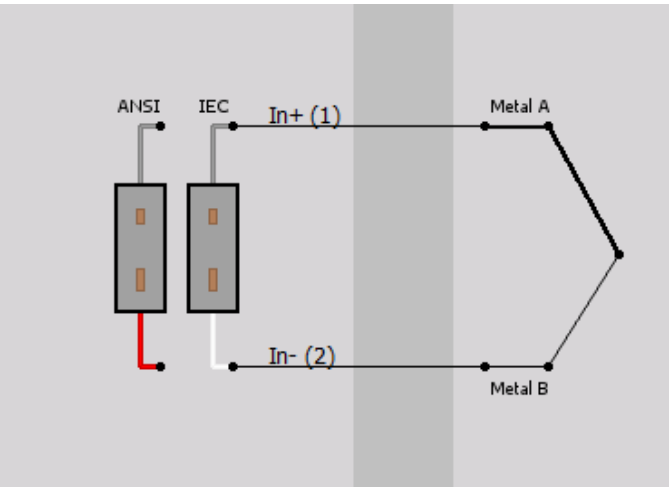
J-type thermocouple



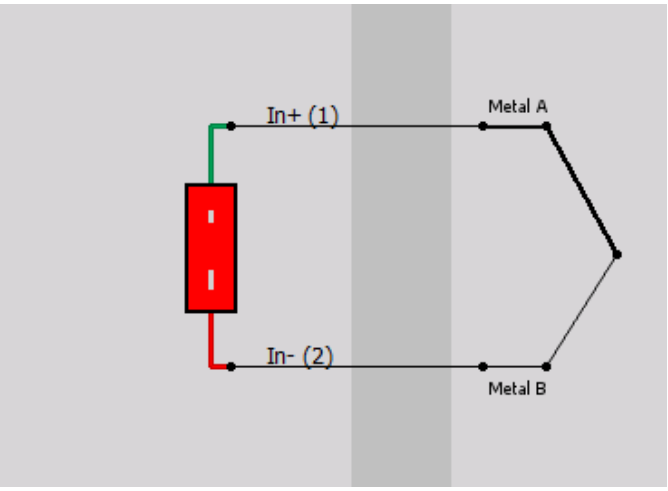
E-type thermocouple



B-type thermocouple

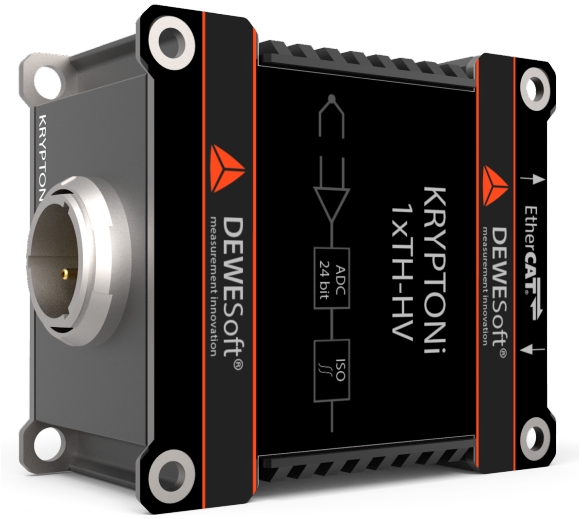


C-type thermocouple



5.5.4. KRYPTONi-1xTH-HV

KRYPTONi-1xTH-HV is a single channel isolated module with LEMO REDEL H02 input connector for thermocouple temperature measurement. KRYPTONi-1xTH-HV is a perfect solution as a thermocouple input for high voltage potential for battery measurements.



KRYPTONi-1xTH-H

5.5.4.1. KRYPTONi-1xTH-HV: Specifications

Inputs	
Input types	Thermocouple
Number of channels	1
ADC Type	24-bit delta-sigma
Sampling Rate	Simultaneous 100 S/s
Input Impedance	100 MΩ
Thermocouple	
TC type	Type K
Accuracy	±0.02 % of reading ±0.5 °C ±10 µV
Resolution	< 0.001 °C
Sampling rates	100, 80, 40, 20, 10 S/s
Typical Noise	0.007°C RMS @ Type K @ 10 S/sec
Additional specifications	
Input connector	K-type Thermocouple LEMO REDEL 2P series
Isolation voltage	CAT III 600 V, CAT II 1000 V
Power	
Power Supply	9 - 48 V DC
Power consumption	1.3 W (typ.)

Physical	
Dimensions	62 x 56 x 36 mm
Weight	300 g

5.5.4.1.1. KRYPTONi-1xTH-HV: Specifications: Accuracy table

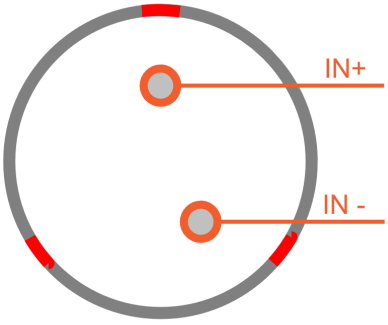
Temperature	Type K
-200 °C	1.19 °C
-100 °C	0.85 °C
0 °C	0.75 °C
100 °C	0.76 °C
400 °C	0.82 °C
700 °C	0.88 °C
1000 °C	0.96 °C
1300 °C	1.05 °C
1700 °C	✗

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.

5.5.4.2. KRYPTONi-1xTH-HV: LEMO REDEL: Pinout



Thermocouple connector: pinout (2-pin LEMO REDEL H02 male)

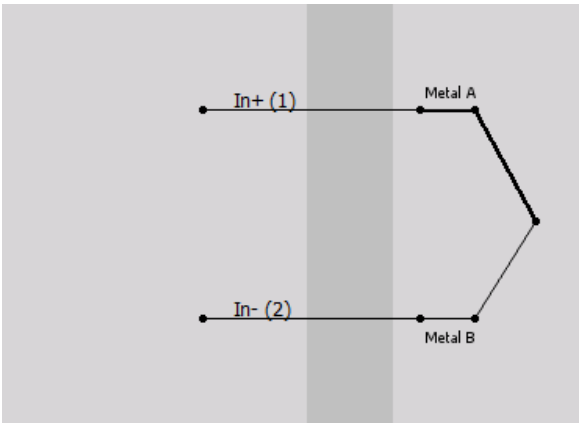
Pin	Name	Description
1	In+	Input +
2	In-	Input -

Connector type LEMO CKC.H02.SLKGY
Mating connector: CFC.H02.SLK.C52GZY

5.5.4.3. 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.

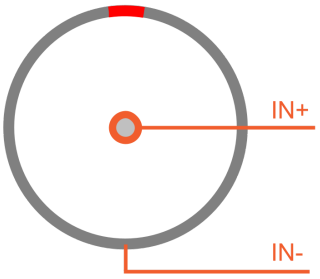
KRYPTON-8xACC

5.6.1.1. KRYPTON-4xACC, KRYPTON-8xACC: Specifications

Analog inputs	**KRYPTON-4xACC**		**KRYPTON-8xACC**	
Input type	Voltage, IEPE			
Number of channels	4 (4xACC)		8 (8xACC)	
ADC Type	24-bit delta-sigma with anti-aliasing filter			
Sampling Rate	Simultaneous 20 kS/s per channel (software-selectable)			
Voltage 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	4.6 W
Environemental		
IP rating (see 1)	IP67	
Physical		
Weight	700 g	1000 g
Slice Dimensions	213 x 39 x 56 mm	213 x 54 x 56 mm
Dimensions with Connectors	213 x 39 x 66.8 mm	213 x 54 x 66.8 mm
1) Depending on the mating connector types		

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

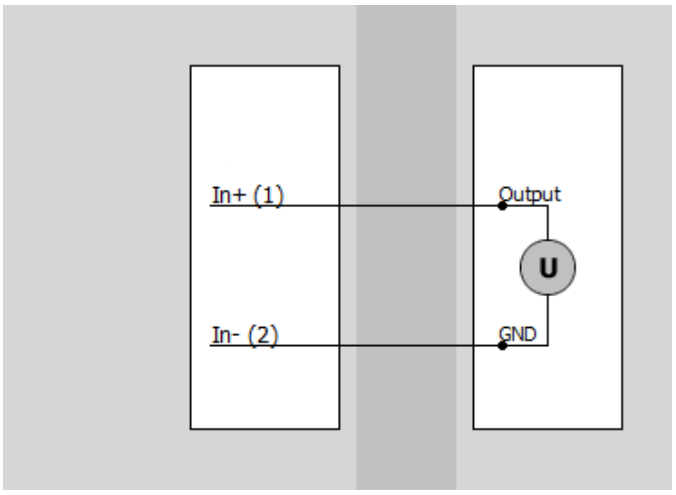


ACC connector: pinout (BNC)

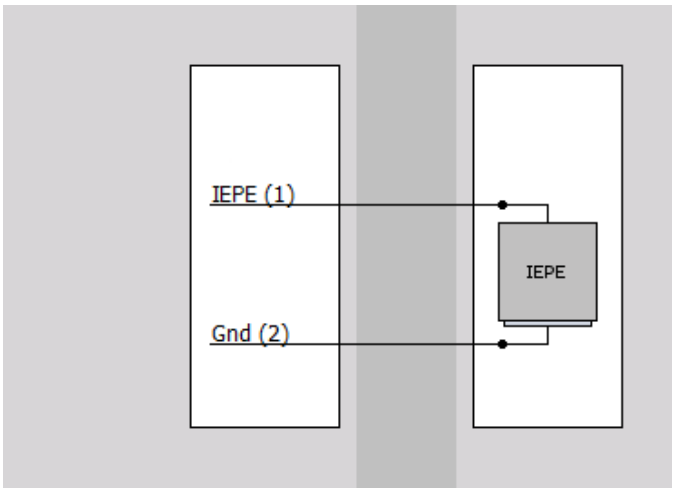
Pin	Name	Description
1	IN+	Input +
2	IN-	Input -

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

Voltage



IEPE



5.6.2. KRYPTONi-1xACC

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

KRYPTONi-1xACC

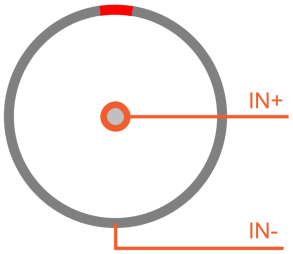
KRYPTON-1xACC can work with 50 kHz if it is the only one in the EtherCAT chain. This feature is useful for the microphone measurements where 50 kHz sampling rate is required.

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 per channel (software-selectable)			
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			
Output Impedance				
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

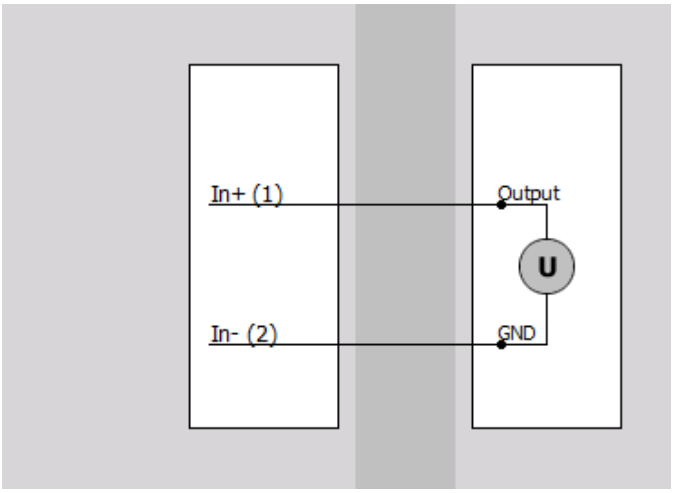


ACC connector: pinout (BNC)

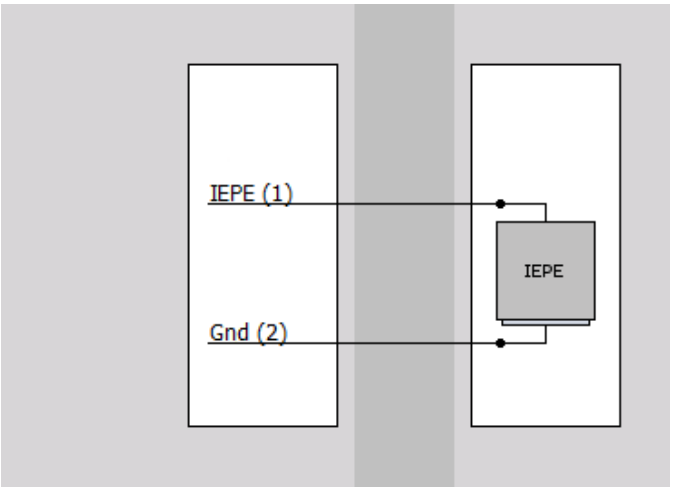
Pin	Name	Description
1	IN+	Input +
2	IN-	Input -

5.6.2.3. KRYPTONi-1xACC: Wiring diagrams

Voltage



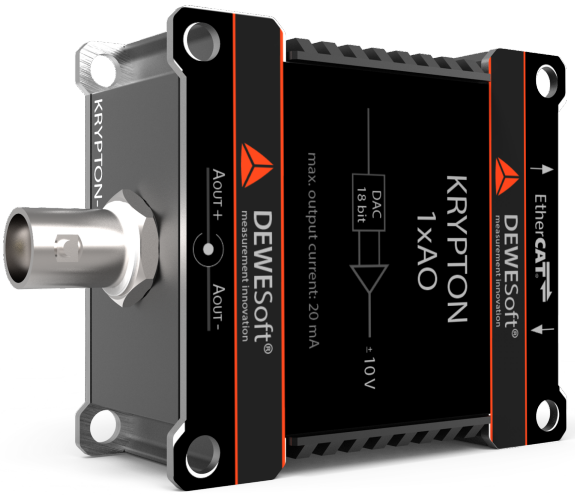
IEPE



5.7. ANALOG OUTPUT (AO)

Single channel analog output module has a BNC connector and is the perfect module for output of voltage levels, or slow analog signals, e.g. calculated channels.
Currently, the module available is KRYPTON-1xAO.

5.7.1. KRYPTON-1xAO



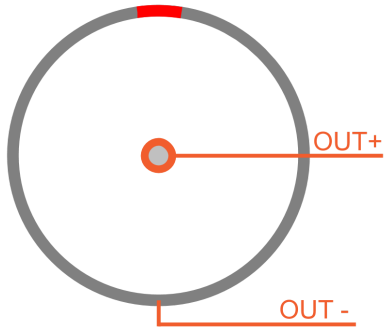
KRYPTON - 1xAO

5.7.1.1. KRYPTON-1xAO: Specifications

Analog Output	
Output types	Voltage
Number of channels	1
DAC Resolution	18 bit
Function	File replay, conditioned AI output, FGEN (software option), channel output
Update Rate	1000 S/s
Full Scale Output Range	±10 V
Accuracy (typ.)	0.1 % ±1 mV (0 to 20 mA load)
Temperature gain drift (typ.)	±10 ppm/K
Temperature offset drift (typ.)	±5 uV/K
SNR @ 1000 S/s output rate	92 dB (sine wave, 250 Hz, ±9 V)
THD	-90 dB
Output impedance	0.45 Ω DC
Maximum output current	20 mA
Settling time (0.05 % of set value)	30 µs @ 1000 Ω load, -10 V to 10 V step
Max slew rate	2.5 V/µs @ 1000 Ω load
Max capacitive load (2 % overshoot)	10 nF

Maximum load	500 Ω
Output protection	Short circuit protected
Additional specifications	
Output connector	BNC
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	

5.7.1.2. KRYPTON-1xAO: BNC Connectors: Pinout



ACC connector: pinout (BNC)

Pin	Name	Description
1	Out +	Output +
2	Out -	Output -

5.8. DIGITAL AND COUNTER MEASUREMENT

KRYPTON counter modules utilize a patented technology called SUPERCOUNTER® in every of its counter/encoder inputs and in the smallest possible form. It supports counting, waveform timing, encoder, tacho, gear-tooth sensor.
KRYPTON digital input/output modules are perfect choices for control applications:

- KRYPTON-4xCNT, KRYPTON-1xCNT,
- KRYPTONi-16xDI, KRYPTONi-16xDO,
- KRYPTONi-8xDI-8xDO,
- KRYPTONi-4xDI, KRYPTONi-4xDO.

5.8.1. KRYPTON-4xCNT

KRYPTON-4xCNT has four LEMO 7-pin L1T7f connectors.

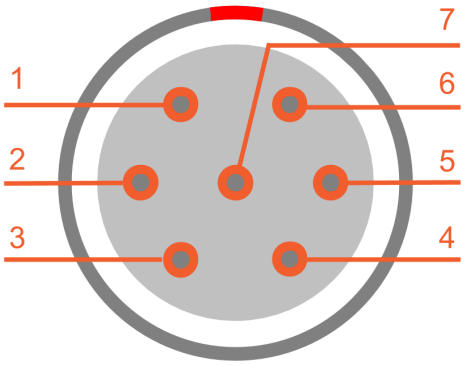
KRYPTON-4xCNT

5.8.1.1. KRYPTON-4xCNT: Specifications

Digital inputs	
Input type	Digital
Number of channels	4
Input connector	LEMO 1T series 7-pin
Timebase	100 MHz
Time base accuracy	Typical: 5 ppm, Max: 20 ppm
Max. bandwidth	10 MHz
Input Filter	500 ns, 1 µs, 2 µs, 4 µs, 5 µs and 7.5 µs
Input Level Compatibility	TTL (Low: < 0.8 V, High > 2 V)
Input impedance	100 kΩ pull-up to +3.3 V
Input Protection	±25 V continuous
Isolation	Ch to GND isolation
Isolated Sensor Power Supply	
Output Voltage +5 V	5 V +/- 10 % 100 mA max. (400 mA to supply 4 channels)
Output Voltage +12 V	12 V +/-10 % 50 mA max. (100 mA to supply 4 channels)
Isolation	Ch to GND isolation

Power	
Power Supply	9 - 48 V DC
Power consumption	Typ 2.3 W (Max 2.7 W)
Physical	
Dimensions	213 x 39 x 56 mm
Weight	700 g

5.8.1.2. KRYPTON-4xCNT: LEMO L1T7f Connector: Pinout



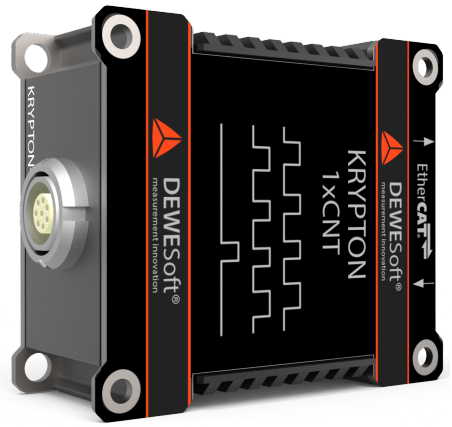
CNT connector: pinout (7-pin LEMO female)

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

Pin	Name	Description
1	IN0/A	Input A
2	IN1/B	Input B
3	IN2/Z	Input Z
4	GND	Ground
5	+5 V	5 V supply max. current: 100 mA
6	+12 V	12 V supply max. current: 90 mA
7	GND	Ground

5.8.2. KRYPTON-1xCNT

KRYPTON-1xCNT has a LEMO 7-pin L1T7f connector.

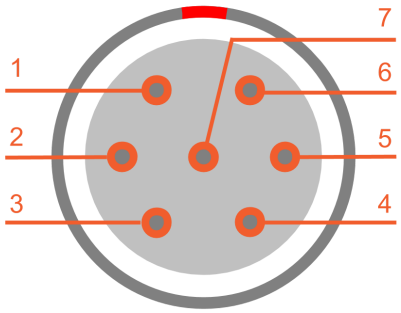


KRYPTON-1xCNT

5.8.2.1. KRYPTON-1xCNT: Specifications

Counter	
Input type	Digital
Number of channels	1
Timebase	100 MHz
Time base accuracy	Typical: 5 ppm, Max: 20 ppm
Max. bandwidth	10 MHz
Input Filter	500 ns, 1 µs, 2 µs, 4 µs, 5 µs and 7.5 µs
Input Level Compatibility	TTL (Low: < 0.8 V, High > 2 V)
Input impedance	100 kΩ pull-up to +3.3 V
Input Protection	±25 V continuous
Isolated Sensor Power Supply	
Output Voltage +5 V	5 V +/- 10 % 100 mA max.
Output Voltage +12 V	12 V +/-10 % 90 mA max.
Additional specifications	
Input connector	LEMO 1T series 7-pin
Isolation	-
Power	
Power Supply	9 - 48 V DC
Power consumption	1.2 W (typ.)
Physical	
Dimensions	62 x 56 x 29 mm
Weight	250 g

5.8.2.2. KRYPTON-1xCNT: LEMO L1T7f Connector: Pinout



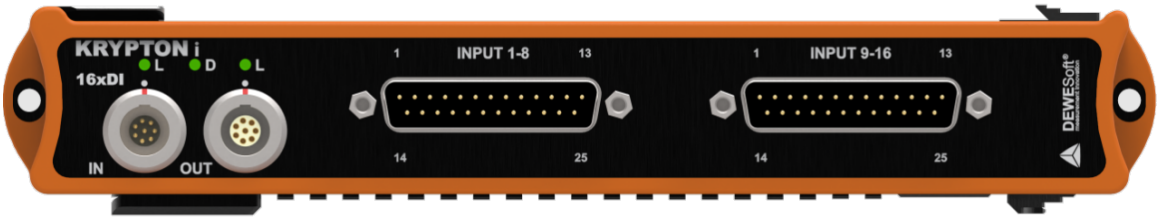
CNT connector: pinout (7-pin LEMO female)

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

Pin	Name	Description
1	IN0/A	Input A
2	IN1/B	Input B
3	IN2/Z	Input Z
4	GND	Ground
5	+5 V	5 V supply max. current: 100 mA
6	+12 V	12 V supply max. current: 90 mA
7	GND	Ground

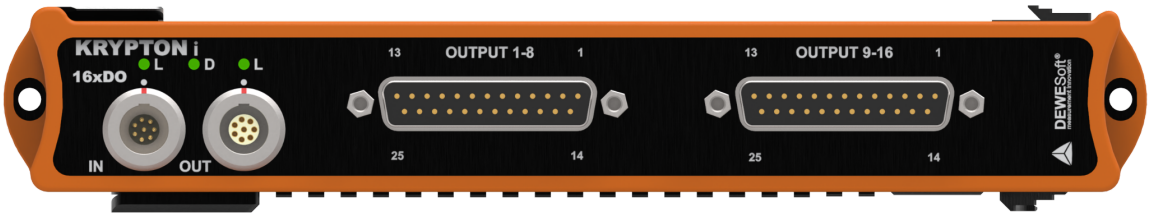
5.8.3. KRYPTONi-16xDI, KRYPTONi-16xDO, KRYPTONi-8xDI-8xDO

KRYPTONi-16xDI
KRYPTONi-16xDI module has 16 digital input channels: 8 on each of the two 25-pin DSUB male connectors.



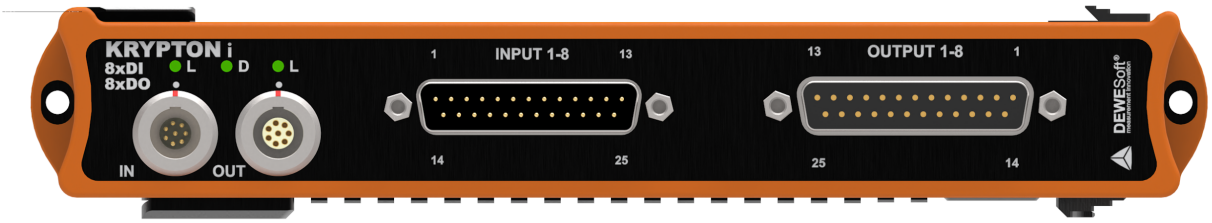
KRYPTONi-16xDI

KRYPTONi-16xDO
KRYPTONi-16xDO module has 16 digital output channels: 8 on each of the two 25-pin DSUB female connectors.



KRYPTONi-16xDO

KRYPTONi-8xDI-8xDO
KRYPTONi-8xDI-8xDO module has 8 digital input channels (25-pin DSUB male connector) and 8 digital output channels (25-pin DSUB female connector).



KRYPTONi-8xDI-8xDO

5.8.3.1. KRYPTONi-16xDI, KRYPTONi-16xDO, KRYPTONi-8xDI-8xDO: Specifications

	KRYPTONi-16xDI	KRYPTONi-8xDI-8xDO	KRYPTONi-16xDO
Digital Input			
Isolated Input Channels	16	8	-
Compatibility	CMOS Configuration		-
Input low level	UIN < 0.8 V		-
Input high level	UIN > 2.4 V		-
Input high current @ 5 V	IIN < 1.8 mA		-
Input high current @ 30 V	IIN < 6 mA		-
Propagation delay	< 1 µs		-
Sampling rate	Simultaneous 40 kS/s		-
Overvoltage protection	40 V continuous (65 V peak)		-
Isolation voltage peak	250 V channel/ground & channel/channel		-
Digital Output			
Isolated Output Channels	-	8	16
Compatibility	-	Open collector with 10 kΩ pull-up to +5 V	
Maximum sink current	-	150 mA (not protected)	
Maximum switching voltage	-	50 V	
Propagation delay	-	< 20 µs	
Maximum update rate	-	depending on EtherCAT master	
Isolation voltage peak	-	250 V channel to ground, no channel to channel isolation	
Power			
Power Supply	9 - 48 V DC		
Power consumption	2 W		
Environmental			
IP rating	IP67		
Physical			
Weight	700 g		
Slice Dimensions	213 x 39 x 56 mm		
Dimensions with Connectors	213 x 39 x 58.2 mm		

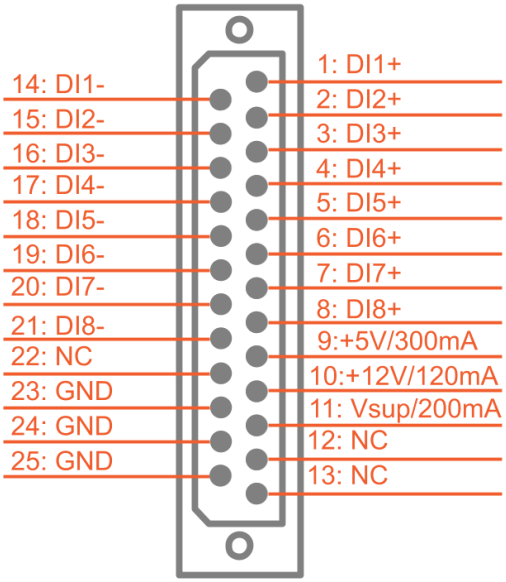
5.8.3.2. KRYPTONi-16xDI, KRYPTONi-16xDO, KRYPTONi-8xDI-8xDO: DSUB Connector: Pinout

DIO modules are available with two different kinds of connectors, DSUB-25 and DSUB-15.

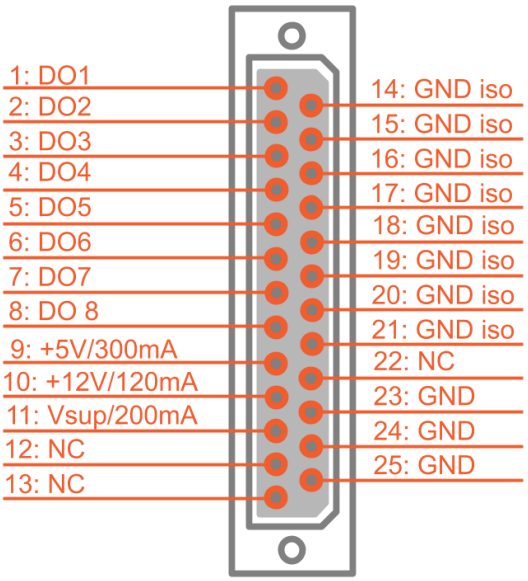
Note
When using the supply from the KRYPTON module (pin 9, 10 or 11 on DSUB-25) please keep in mind to connect the GND iso with GND.

More information is available on our Solutions website.

Note
Wiring diagrams for DO connections are available as a Solution.



Digital input: DSUB-25 female



Digital output: DSUB-25 male

Pin	16xDI INPUT 1-8		16xDI INPUT 9-16	
	Name	Description	Name	Description
1	DI1+	Digital input CH1 +	DI1+	Digital input CH9 +
2	DI2+	Digital input CH2 +	DI2+	Digital input CH10 +
3	DI3+	Digital input CH3 +	DI3+	Digital input CH11 +
4	DI4+	Digital input CH4 +	DI4+	Digital input CH12 +
5	DI5+	Digital input CH5 +	DI5+	Digital input CH13 +
6	DI6+	Digital input CH6 +	DI6+	Digital input CH14 +
7	DI7+	Digital input CH7 +	DI7+	Digital input CH15 +
8	DI8+	Digital input CH8 +	DI8+	Digital input CH16 +
9	+5V/300mA	5 V supply, max. 300 mA	+5V/300mA	5 V supply, max. 300 mA
10	+12V/120mA	12 V supply, max.120 mA	+12V/120mA	12 V supply, max.120 mA
11	V_{supply}/200mA	Supply voltage, max. 200 mA	V_{supply}/200mA	Supply voltage, max. 200 mA
12	NC	-	NC	-
13	NC	-	NC	-
14	DI1-	Digital input CH1 -	DI1-	Digital input CH9 -
15	DI2-	Digital input CH2 -	DI2-	Digital input CH10 -
16	DI3-	Digital input CH3 -	DI3-	Digital input CH11 -
17	DI4-	Digital input CH4 -	DI4-	Digital input CH12 -
18	DI5-	Digital input CH5 -	DI5-	Digital input CH13 -
19	DI6-	Digital input CH6 -	DI6-	Digital input CH14 -
20	DI7-	Digital input CH7 -	DI7-	Digital input CH15 -
21	DI8-	Digital input CH8 -	DI8-	Digital input CH16 -
22	NC	-	NC	-
23	GND	Ground	GND	Ground
24	GND	Ground	GND	Ground
25	GND	Ground	GND	Ground

Pin	16xDO OUTPUT 1-8		16xDO OUTPUT 9-16	
	Name	Description	Name	Description
1	DO1	Digital output CH1	DO1	Digital output CH9
2	DO2	Digital output CH2	DO2	Digital output CH10
3	DO3	Digital output CH3	DO3	Digital output CH11
4	DO4	Digital output CH4	DO4	Digital output CH12
5	DO5	Digital output CH5	DO5	Digital output CH13
6	DO6	Digital output CH6	DO6	Digital output CH14
7	DO7	Digital output CH7	DO7	Digital output CH15
8	DO8	Digital output CH8	DO8	Digital output CH16
9	+5V/300mA	5 V supply, max. 300 mA	+5V/300mA	5 V supply, max. 300 mA
10	+12V/120mA	12 V supply, max. 120 mA	+12V/120mA	12 V supply, max. 120 mA
11	V_{supply}/200mA	Supply voltage, max. 200 mA	V_{supply}/200mA	Supply voltage, max. 200 mA
12	NC	-	NC	-
13	NC	-	NC	-
14	GNDiso	Isolated ground	GNDiso	Isolated ground
15	GNDiso	Isolated ground	GNDiso	Isolated ground
16	GNDiso	Isolated ground	GNDiso	Isolated ground
17	GNDiso	Isolated ground	GNDiso	Isolated ground
18	GNDiso	Isolated ground	GNDiso	Isolated ground
19	GNDiso	Isolated ground	GNDiso	Isolated ground
20	GNDiso	Isolated ground	GNDiso	Isolated ground
21	GNDiso	Isolated ground	GNDiso	Isolated ground
22	NC	-	NC	-
23	GND	Ground	GND	Ground
24	GND	Ground	GND	Ground
25	GND	Ground	GND	Ground

Pin	8xDI		8xDO	
	Name	Description	Name	Description
1	DI1+	Digital input CH1 +	DO1	Digital output CH1
2	DI2+	Digital input CH2 +	DO2	Digital output CH2
3	DI3+	Digital input CH3 +	DO3	Digital output CH3
4	DI4+	Digital input CH4 +	DO4	Digital output CH4
5	DI5+	Digital input CH5 +	DO5	Digital output CH5
6	DI6+	Digital input CH6 +	DO6	Digital output CH6
7	DI7+	Digital input CH7 +	DO7	Digital output CH7
8	DI8+	Digital input CH8 +	DO8	Digital output CH8
9	+5V/300mA	5 V supply, max. 300 mA	+5V/300mA	5 V supply, max. 300 mA
10	+12V/120mA	12 V supply, max.120 mA	+12V/120mA	12 V supply, max. 120 mA
11	V_{supply}/200mA	Supply voltage, max. 200 mA	V_{supply}/200mA	Supply voltage, max. 200 mA
12	NC	-	NC	-
13	NC	-	NC	-
14	DI1-	Digital input CH1 -	GNDiso	Isolated ground
15	DI2-	Digital input CH2 -	GNDiso	Isolated ground
16	DI3-	Digital input CH3 -	GNDiso	Isolated ground
17	DI4-	Digital input CH4 -	GNDiso	Isolated ground
18	DI5-	Digital input CH5 -	GNDiso	Isolated ground
19	DI6-	Digital input CH6 -	GNDiso	Isolated ground
20	DI7-	Digital input CH7 -	GNDiso	Isolated ground
21	DI8-	Digital input CH8 -	GNDiso	Isolated ground
22	NC	-	NC	-
23	GND	Ground	GND	Ground
24	GND	Ground	GND	Ground
25	GND	Ground	GND	Ground

5.8.4. KRYPTONi-4xDI

KRYPTON ONE isolated module with 4 digital inputs and power supply on the front 15-pin DSUB male connector.

KRYPTONi-4xDI

5.8.4.1. KRYPTONi-4xDI: Specifications

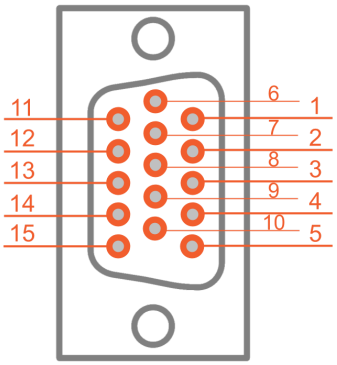
Digital Inputs	
Input type	Digital
Number of channels	4
Compatibility	TTL / CMOS Voltage Levels
Input low level	UIN < 1 V
Input high level	UIN > 2 V
Input high current @ 5 V UIN	3 mA typ.
Input high current @ 30 V UIN	6 mA typ.
Propagation delay	< 1 µs
Max. sampling rate	40 kS/s
Non-Isolated Sensor Power Supply	
Output Voltage +5 V	5 V +/- 10 % 300 mA max. (see 1)
Output Voltage +12 V	12 V +/-10 % 100 mA max. (see 1)
Output Voltage +Vecat	EtherCAT Bus Supply Voltage 200 mA max. (see 1)
Additional specifications	
Connector	DSUB15HD Male
Overvoltage protection	30 V Continuous, 65 V peak
Isolation	Galvanic isolation CH, GND

Power	
Power supply	9 - 48 V DC
Power consumption	1.5 W (typ.)
Physical	
Dimensions	62 x 56 x 29 mm
Weight	250 g
1) Max. combined load on +5 V and +12 V pins: 1.5 W reduced by the load already present on +Vin pin	

5.8.4.2. KRYPTONi-4xDI: DSUB Connector: Pinout

Note

When using the supply from the KRYPTON module (pin 11, 12 or 15 on DSUB-15) please keep in mind to connect the GND iso with GND.
More information is available on [our Solutions website.]



DSUB-15 HD male for KRYPTON 4xDI

Pin	4xDI	
	Name	**Description**
1	DI1 +	Digital input CH1 +
2	DI2 +	Digital input CH2 +
3	DI3 +	Digital input CH3 +
4	DI4 +	Digital input CH4 +
5	NC	-
6	DI1 -	Digital input CH1 -
7	DI2 -	Digital input CH2 -
8	DI3 -	Digital input CH3 -
9	DI4 -	Digital input CH4 -
10	NC	-
11	+5V/300mA	5 V supply, max. 300 mA
12	+12V/130mA	12 V supply, max.130 mA
13	GND	Ground
14	GND	Ground
15	V_{supply}/200mA	Supply voltage, max. 200 mA

5.8.5. KRYPTONi-4xDO

KRYPTON ONE isolated module with 4 digital outputs and power supply on the front 15-pin DSUB female connector. Output type is an open collector with max 2 A sink current.

KRYPTONi-4xDO

Hint
The PWM option is currently only supported on KRYPTON 4xDO devices. You can see the settings of the PWM signal in the 10.1. PWM output on KRYPTON 4xDO chapter.

5.8.5.1. KRYPTONi-4xDO: Specifications

Digital Outputs	
Output type	Digital
Number of channels	4
Maximum update rate	depends on EtherCAT master cycle time
Output type	open collector with active internal pullup to 5 V
Sink	max 50 V, 2 A (resistive load, unprotected)
Source:	5 V, max. 40 mA (internally limited)
Max. switching frequency for internal PWM	100 kHz
Non-Isolated Sensor Power Supply	
Output Voltage +5 V	5 V +/- 10 % 300 mA max. (see 1)
Output Voltage +12 V	12 V +/-10 % 100 mA max. (see 1)
Output Voltage +Vecat	EtherCAT Bus Supply Voltage 200 mA max. (see 1)
Additional specifications	
Connector	DSUB15HD Female
Isolation	Galvanic isolation CH, GND
Power	
Power supply	9 - 48 V DC
Power consumption	2 W (typ.)

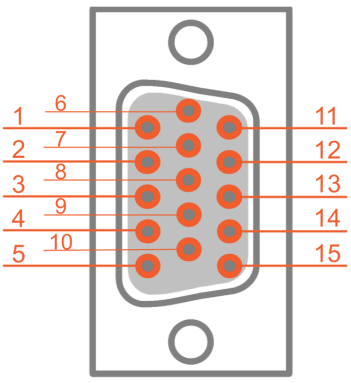
Physical	
Dimensions	62 x 56 x 29 mm
Weight	250 g

5.8.5.2. KRYPTONi-4xDO: DSUB Connector: Pinout

Note
When using the supply from the KRYPTON module (pin 11, 12 or 15 on DSUB-15) please keep in mind to connect the GND iso with GND.
More information is available on our Solutions website.

Note
Wiring diagrams for DO connections are available as a Solution

Caution
Pin 5 (Vext+) on KRYPTONi-4xDO is not recommended to be connected, because it outputs the input voltage of the device. Pin Vext+ is used in case digital outputs are driving large inductive loads. In that case, connecting the power supply of the load to Vext+ takes care of large current spikes when switching the outputs. Apart from that application, this pin should not be used.



DSUB-15 HD female for KRYPTON 4xDO

Pin	4xDI	
	Name	Description
1	DO1	Digital output CH1
2	DO2	Digital output CH2
3	DO3	Digital output CH3
4	DO4	Digital output CH4
5	Vext +	External voltage
6	GNDi	Isolated ground
7	GNDi	Isolated ground
8	GNDi	Isolated ground
9	GNDi	Isolated ground
10	NC	-
11	+5V/300mA	5 V supply, max. 300 mA
12	+12V/130mA	12 V supply, max.130 mA
13	GND	Ground
14	GND	Ground
15	V_{supply}/200mA	Supply voltage, max. 200 mA

5.9. CAN: Controller Area Network

KRYPTON CAN interfaces are intended for CAN-FD and CAN acquisition in harsh environments. KRYPTON CAN devices support OBDII, J1939 standard protocols and can output CAN messages:

- KRYPTONi-2xCAN-USB,
- KRYPTONi-1xCAN, KRYPTONi-1xCAN-FD.

5.9.1. KRYPTONi-2xCAN-USB

KRYPTONi-2xCAN-USB has 2 CAN ports and it uses USB 2.0 as an interface.

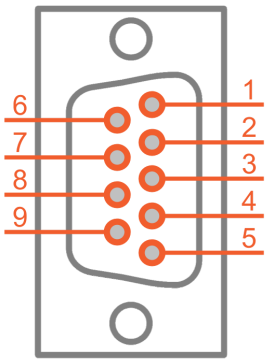
KRYPTONi-2xCAN-USB

5.9.1.1. KRYPTONi-2xCAN-USB: Specifications

CAN ports specification	
Number of ports	2
Interface type	CAN 2.0B
Interface data rate	up to 1 Mbit/sec
Special protocols	OBDII, J1939, CAN out
Galvanic isolation (Sensor supply not isolated)	Isolated
Bus pin fault protection	±36 V
Power specification	
Power supply	6 - 36 V DC Startup voltage 7 V
Maximum sensor power consumption	3 W max total (max 2 W on 15 V)
Maximum power consumption	5.5 W
Environmental specification	
Interface	USB 2.0
Connector type	9 pin D-SUB
Physical dimensions	105 x 90 x 30 mm 3.94 x 3.54 x 1.18 inch
Weight	Weight 230 g 0.51 lbs
Operating temperature	-20°C to +60°C

Storage temperature	-40°C to +70°C
Humidity	5 to 95 % RH non-condensing at 50 °C
IP protection	IP50

5.9.3. KRYPTONi-2xCAN-USB: DSUB Connectors: Pinout



CAN connector: pinout (DSUB-9 male)

Pin	Name	Description
1	+5V	5 V supply max. current: 500 mA
2	CAN_LOW	CAN low
3	DGND	Digital Ground
4	RES	Reserved
5	RES	Reserved
6	DGND	Digital Ground
7	CAN_HIGH	CAN high
8	RES	Reserved
9	+15V	15 V supply max. current:

5.9.2. KRYPTONi-1xCAN, KRYPTONi-1xCAN-FD

KRYPTONi-1xCAN is a single port CAN device that uses EtherCAT as an interface.

KRYPTONi-1xCAN-FD is a single port CAN-FD device that uses EtherCAT as a data interface. The CAN-FD supports high-speed CAN interface with data rates up to 8 Mbps. KRYPTONi-1xCAN-FD has galvanically isolated communication lines and an isolated sensor supply of +5 V and +12 V. Power limit for the sensor supply is 1.4 W.

KRYPTONi-1xCAN

KRYPTONi-1xCAN-FD

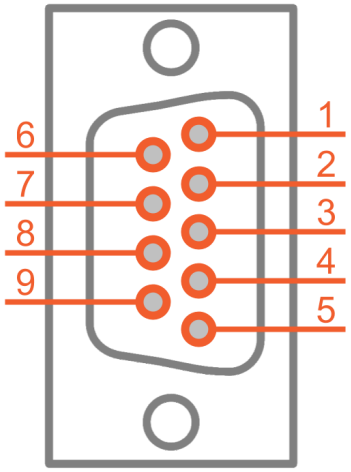
Note
Transmit mode of both modules is not supported yet. OBDII and XCP plugins not supported yet.

5.9.2.1. KRYPTONi-1xCAN, KRYPTONi-1xCAN-FD: Specifications

	KRYPTONi-1xCAN	KRYPTONi-1xCAN-FD
CAN ports specification		
Number of ports	1	1
Interface type	CAN 2.0B	CAN-FD, CAN 2.0B
Interface data rate	up to 1 Mbit/sec	up to 8 Mbit/sec
Special protocols	J1939 (see 1)	J1939 (see 1)
Galvanic isolation	Isolated	Isolated
Bus pin fault protection		±28 V
Power specification		
Power supply	9 - 50 V DC	9 - 50 V DC
Maximum sensor power consumption	5 V / max. 250 mA (1.25 W) 12 V / max. 90 mA (1.1 W)	5 V / max. 250 mA (1.25 W) 12 V / max. 90 mA (1.1 W)
Maximum power consumption		max. 2 W (no load)

Environmental specification		
Interface	EtherCAT, 100 Mbit/s LEMO 1T (1 cable for data, power and sync, daisy chainable)	EtherCAT, 100 Mbit/s LEMO 1T (1 cable for data, power and sync, daisy chainable)
Connector type	DSUB-9	DSUB-9
Physical dimensions	62 x 56 x 29 mm	62 x 56 x 29 mm
Weight	200 g 0.44 lbs	200 g 0.44 lbs
Operating temperature	-40 °C to +85 °C	-40 °C to +85 °C
Storage temperature	-40 °C to +85 °C	-40 °C to +85 °C
Humidity	-	-
IP protection	IP65 / IP67	IP65 / IP67
1) Transmit mode not supported yet. OBDII and XCP plugins not supported yet. No cables included.		

5.9.2.2. KRYPTONi-1xCAN, KRYPTONi-1xCAN-FD: DSUB Connector: Pinout



CAN connector: pinout (DSUB-9 male)

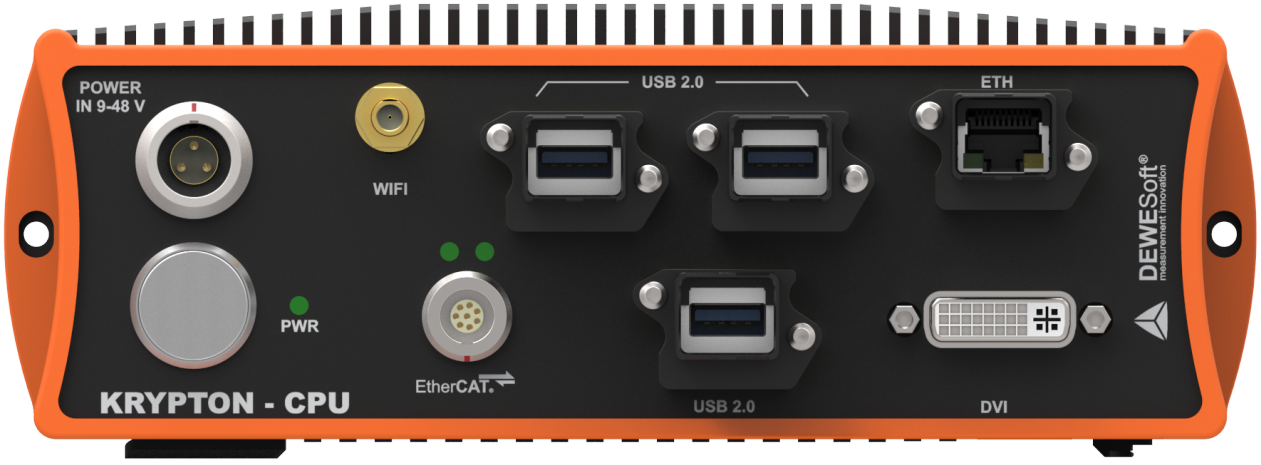
Pin	Name	Description
1	+5V	5 V supply max. current: 500 mA
2	CAN_LOW	CAN low
3	DGND	Digital Ground
4	RES	Reserved
5	RES	Reserved
6	DGND	Digital Ground
7	CAN_HIGH	CAN high
8	RES	Reserved
9	+12V	12 V supply max. current: 200 mA

6. KRYPTON CPU

Small, highly portable and extremely rugged IP67 data logger for data recording in harsh environments.

Main features:

IP67 DEGREE OF PROTECTION: KRYPTON CPU is designed for testing in extremely harsh environments. The unit is fully waterproof, dustproof and can withstand shocks up to 100G.
EXTREME OPERATING TEMPERATURE: KRYPTON CPU is able to operate in extreme temperatures ranging from -40 °C to 70 °C.
SMALLEST DATA LOGGER: KRYPTON CPU is a very small data logger and is ready to be placed in tight places and for applications where space is limited.
QUAD CORE CPU: KRYPTON CPU is equipped with powerful Intel Atom quad-core CPU and fast 4GB memory.
SSD STORAGE: Internal SSD drive provides fast and reliable data storage for all your measurement channels.
3 USB PORTS: KRYPTON CPU has 3 USB 2.0 ports for connecting USB peripheral devices or any of our USB data acquisition systems like DEWE-43-A and/or SIRIUS.
GLAN AND WiFi INTERFACES: One Gigabit LAN port with RJ45 connector and WiFi adapter ensure a fast and reliable network connection.
ETHERCAT INTERFACE: Built-in EtherCAT interface port with power output and synchronization for directly connecting EtherCAT DAQ devices like SIRIUS waterproof and KRYPTON.

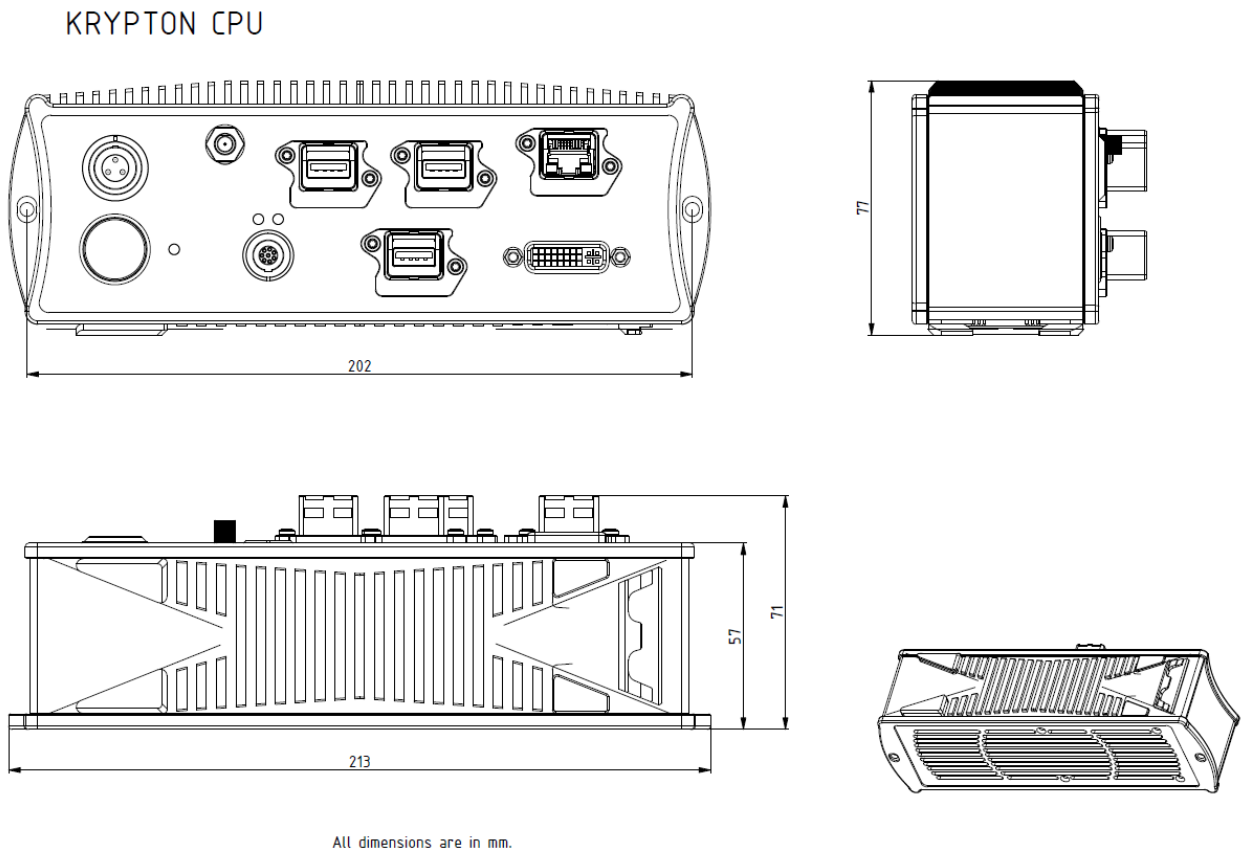


KRYPTON-CPU

6.1. KRYPTON CPU: Specifications

Computer	
Processor	Intel® Atom™ Quad Core at 1.91 GHz
Memory	4 GB
Storage	Non-removable 240 GB mSATA SSD
Interfaces and options	
USB	3x USB 2.0
Ethernet	1x GLAN (Push-Pull), 1x WLAN (RP-SMA Female Jack)
EtherCAT®	1x EtherCAT® 100 Mbps Full Duplex, LEMO 8 pin female (Power Out: max. 10 A)
Video	DVI-D (See 1)
Power	
Power supply	9 - 48 V DC
Power consumption	Min. 7.7 W Max. 19.9 W
Environmental	
Operating Temperature	-40 °C to 70 °C
Storage Temperature	-40 °C 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: MIL-STD-202G Method 214A, test condition II-D Profile breakpoints: 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
Physical	
Dimension	231 x 77 x 57 mm
Weight	1.0 kg (1.5 kg before Q3 2018)
1) Only digital output. If using a VGA monitor, an adapter is needed.	

6.2. KRYPTON CPU: Dimensions

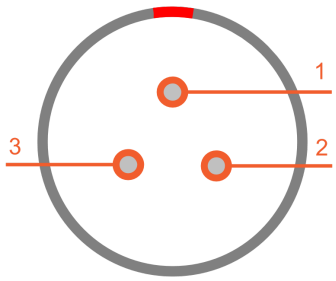


Dimensions-KRYPTON CPU

6.3. KRYPTON CPU: Connectors

Name	Description
Power In	3-pin LEMO male connector
USB	3x USB 2.0 connector
Ethernet	RJ-45 connector
EtherCAT	8-pin LEMO connector
DVI	DVI connector
WiFi	RP-SMA Female WLAN antenna

6.3.1. KRYPTON CPU: Power In Connector: Pinout



Pin	Name	Description
1	V +	Supply
2	GND	Ground
3	Remote - On	Remote - On pin

Power in connector: pinout (3-pin LEMO male)

PWR IN connector (on the device): EGJ.2T.303.CLA
Mating connector (for the cable): FGJ.2T.303.CLL75Z

Hint
To power the system on, press the Power switch OR apply a voltage between 3 V to 30 V to the Remote-on pin. To power off the system press Power switch or reduce the voltage on Remote-on below 0.5 V for more than one second. If you hold the Power switch or force Remote-on below 0.5 V for more than 5 seconds the KRYPTON CPU will commence forced shut down.

Important
When you lower the Voltage on the Remote - On, the KRYPTON CPU will start the shut-down procedure. If the KRYPTON CPU does not turn off in 60 seconds, it is suspected that something went wrong and the power is taken from the system (Forced shut-down).

7. KRYPTON Accessories

Optional KRYPTON Accessories and Sensors can be found in a separate documents depending on the functionality, which are available for download from our homepage:
https://dewesoft.com/download/manuals

7.1. KRYPTON Power Supply

The KRYPTON Power Supply is available as an option. You can connect the LEMO 8-pin connector of the KRYPTON Power Supply directly to the OUT connector of the KRYPTON module.

Article number	PS-120-L1T8m	PS-200-L1t8m
Output Voltage	24 VDC	24 VDC
Current	5 A	8.3 A
Power	120 W	200 W
Connector	8-pin LEMO male (L1T8m)	8-pin LEMO male (L1T8m)

7.2. KRYPTON-CPU Power Supply

AC/DC power supply adapter with waterproof connector

Article number	PS-200-L2T3f
Output Voltage	24 VDC
Current	8.3 A
Power	200 W
Connector	3-pin LEMO female (L2T3f)

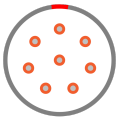
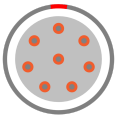
7.3. Other accessories

Optional KRYPTON Accessories and Sensors, such as EtherCAT accessories and others can be found in a separate documents depending on the functionality, which are available for download from our homepage:
https://dewesoft.com/download/manuals

8. Hardware overview

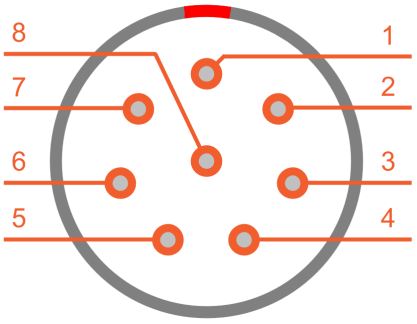
8.1. EtherCAT connector

8.1.1. Cable

Device Connector	Cable Image Type Art. Number-Example	Device Connector	Description
 DS-EtherCAT device IN (8-pin LEMO)	ECAT to ECAT L1T8m - L1T8f	 DS-EtherCAT device OUT (8-pin LEMO)	Data, Sync and Power connection between the KRYPTON™ slices, the Sirus EtherCAT slice and the KRYPTON CPU.

8.1.2. IN connector: Pinout

The connector for EtherCAT is a LEMO 1T 8-pin male connector.



IN connector: pinout (8-pin LEMO male)

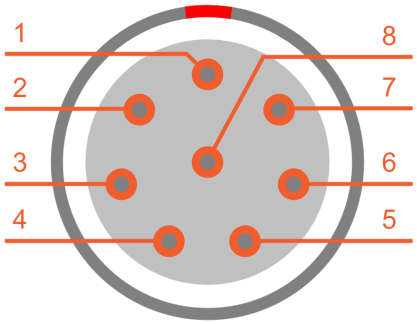
Pin	Name	Description
1	TX_P	Transmission +
2	TX_N	Transmission -
3	RX_P	Reception +
4	RX_N	Reception -
5	VCC	PWR IN
6	VCC	PWR IN
7	GND	Ground
8	GND	Ground

IN connector (on the device): EGJ.1T.308.CLD

Mating connector (for the cable): FGJ.1T.308.CLL.1433

8.1.3. OUT connector: Pinout

OUT connector for EtherCAT is a LEMO 1T 8-pin female connector.



OUT connector: pinout (8-pin LEMO female)

Pin	Name	Description
1	TX_P	Transmission +
2	TX_N	Transmission -
3	RX_P	Reception +
4	RX_N	Reception -
5	VCC	PWR OUT
6	VCC	PWR OUT
7	GND	Ground
8	GND	Ground

OUT connector (on the device): EGG.1T.308.CLN
Mating connector (for the cable): FGG.1T.308.CLA.1433

8.2. LEDs blinking codes

Each KRYPTON slice has 3 green LEDs: **L - D - L**. The LED blinking codes adhere to the EtherCAT specification.

- **L means Link**: i.e. the In- (left L-LED) or Out-connector (right L-LED) is linked to another KRYPTON slice or to the measurement PC,
- **D is for Data**: it is active only when the Data transfer is active; this requires that power is connected AND the slice is linked to another slice or a PC Note: older versions may have the label P (for Protocol) instead of D.

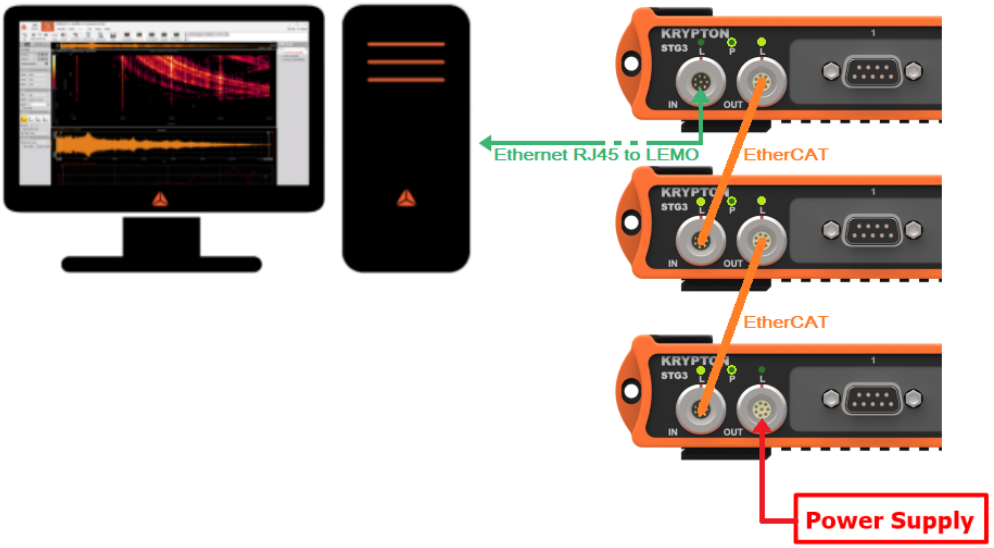
8.2.1. INIT state

When you power the KRYPTON slice and there is no EtherCAT master connected (i.e. DewesoftX® is not running or the slice is not connected to the PC), then the slice will be in the INIT state. In this state, the D LED will be OFF. The L LED will be ON when you connect another KRYPTON slice.

INIT state

When the connection to the PC is lost while the configuration was in the operation state the LED state will change:

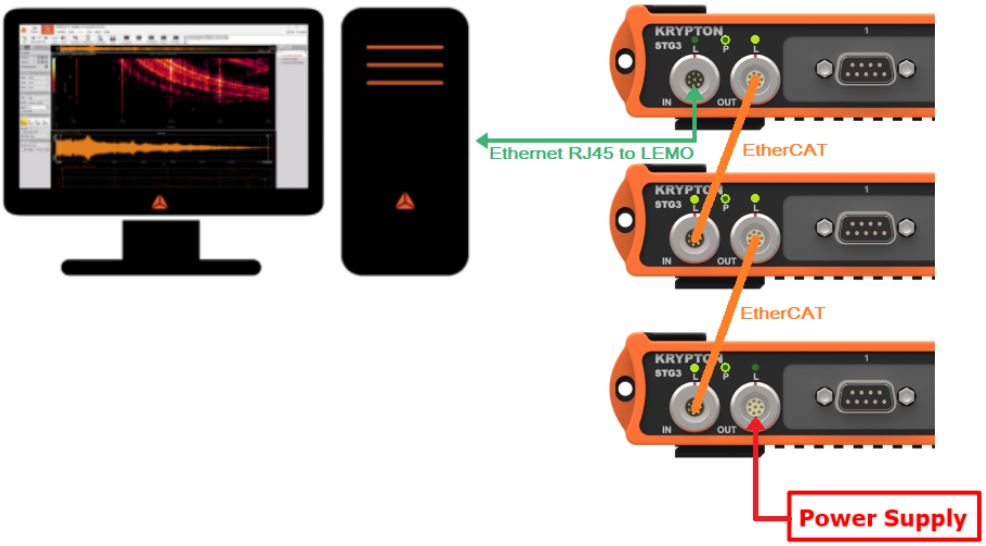
The L LED will be ON and the D LED will be slowly blinking.



Lost PC connection

8.2.2. PRE-OP state

In this state the EtherCAT master is detecting the slaves and reads their basic information: the **D** LED is blinking fast. DewesoftX® will set the KRYPTON slice in the PRE-OP state when you enter the Device settings or when you are loading the setup.



PRE-OP state

8.2.3. SAFE-OP state

In this state the EtherCAT master is already reading the data from the slice/s at a slow sampling rate: the D LED is slowly blinking. DewesoftX® will set the KRYPTON slice/s in the SAFE-OP state when you are in Channel Setup.

SAFE-OP state

8.2.4. OP state

In this state the EtherCAT master is reading the data from the slice/s at the desired sampling rate: the D LED is turned ON. DewesoftX® will set the KRYPTON slice/s in the OP state when you are in Measure Mode.

OP state

8.3. Mechanical locking of modules

KRYPTON modules can easily be stacked together. The mechanical lock mechanism is on the top and bottom of each KRYPTON module. Here is a view of the bottom lock mechanism:

Bottom lock mechanism

To lock 2 KRYPTON modules, first fit the nose of the bottom part ❶ into the matching part of the other KRYPTON module. Now apply a little force to move the module to the right ❷, until the 2nd part of the mechanism can move down.

Bottom lock mechanism

Now release the force and the spring in the mechanism will move back to the left and both modules are now locked ❸.

To release the lock, just reverse the locking-procedure. Move the top slice to the right, until you can lift it up a little. Then the KRYPTON modules are separated again.

8.3.1. Mount KRYPTON on SIRIUS R2DB, R1DB, R1B, R2B

It is possible to mount KRYPTON devices on modules from SIRIUS product line.

Important
For this connection you need a custom L1T8m-L1T8f-Xm, where the length shouldn't be less than 0.8m.

KRYPTON-3xSTG mounted on R2DB

The procedure of mounting a KRYPTON device to SIRIUS system

9. Connection overview

This chapter shows some connection examples to give an idea of what combinations are possible and what are the important limitations you need to consider before mounting the Dewesoft system.

When you set up your system you have to be careful about the system limitations, such as **bandwidth** (maximum rate of data transfer), **cable length** between devices (power supply cable and ECAT cables) and **power consumption** of devices.

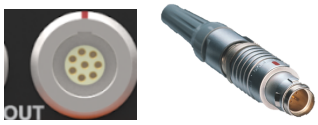
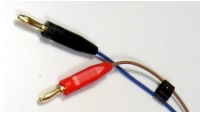
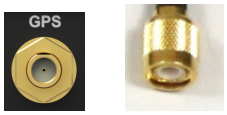
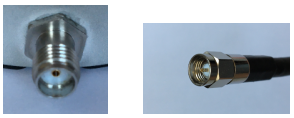
We recommend that you calculate the Bandwidth of the system with our Dewesoft calculator, which you find on our web-page. The recommendable upper limitation for KRYPTON ECAT devices is around 6Mb/s, if you exceed the maximum bandwidth you will need additional data (ECAT or USB) lines.

If the system needs very long cables between devices, the voltage drop is bigger consequently the output voltage is smaller, which means fewer devices can be supplied in the further chain. If the system requires a long power supply cable, you should consider using a thicker cable (e.g M10).

In the specification tables you can find a power consumption of each KRYPTON device and calculate approximate consumption. You can also calculate the collective consumption with our EtherCAT calculator (implemented in the configurator), where also a voltage drop on cables is taken into account. If there isn't enough PS for all devices, a **power injector** must be added in the middle of the chain.

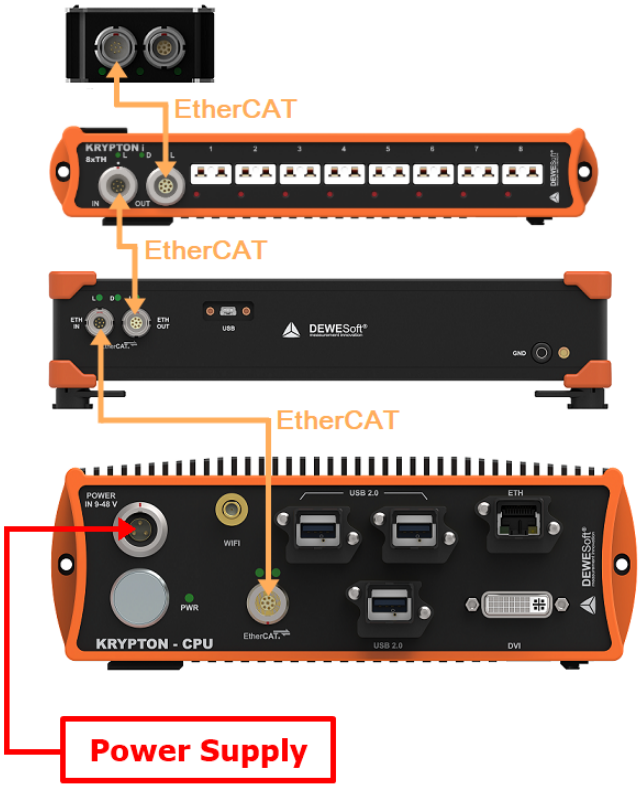
All cables

The following table shows the signal line coding that will be used in the following system connection examples.

Device / Connector	Cable	Device / Connector	Description
	Ethernet RJ45 to LEMO 1T 8pin female		EtherCAT connection from PC to the KRYPTON EtherCAT device.
	Sync LEMO 00B 4pin male to male		Input / Output of the synchronization signal.
	EtherCAT LEMO 1T 8pin male to female		Data, Sync and Power connection between the KRYPTON device.
	DC-power supply LEMO 1T 8 pin male		Power supply connection to the KRYPTON device.
	DC-power supply LEMO 1B 2 pin female		Power supply connection to the SIRIUS device and IOLITEs.
	DC-power supply Banana to LEMO 1T 8 pin male		Banana DC power supply cable
	USB type A to USB type B mini		USB data connection from PC to the SIRIUS USB device.
	HF-GPS cable with low noise		GPS antenna

9.1. Only EtherCAT devices

When you only use Dewesoft EtherCAT devices (KRYPTON or Sirius EtherCAT), the connection is straightforward via ECAT to ECAT cable.



A system with only ECAT devices (KRYPTON ONE, KRYPTON-8xTH, SIRIUSe, and KRYPTON-CPU)

List of required cables:

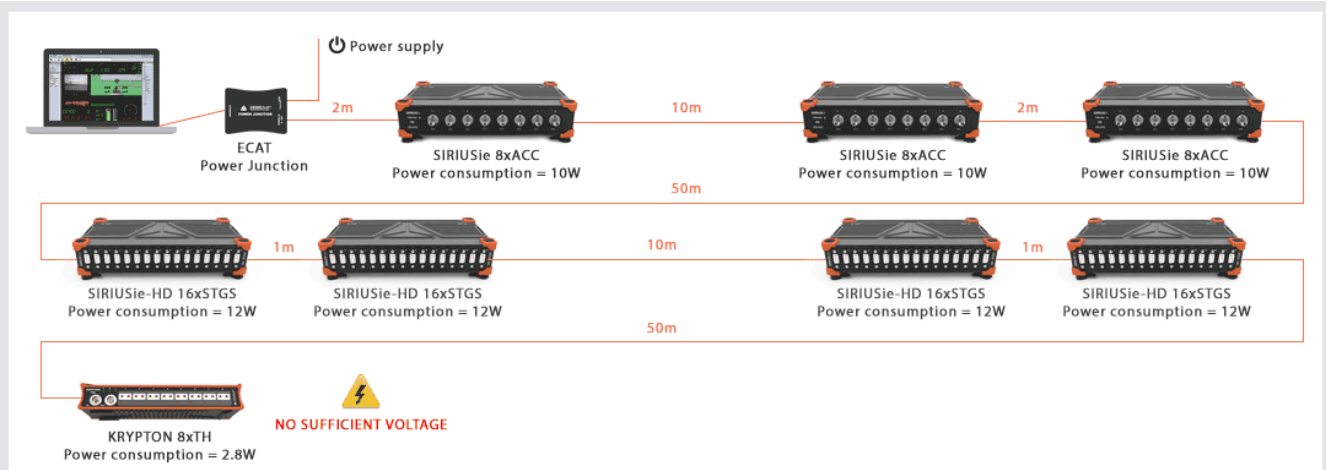
Function	Dewesoft order code
Power supply	PS-200-L2T3f
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f

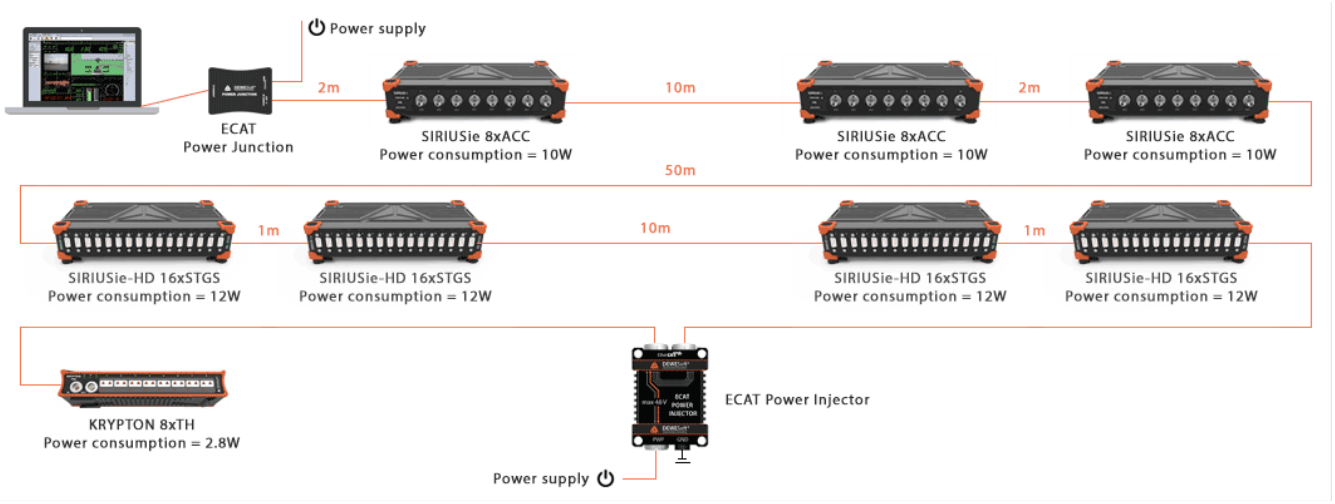
Hint

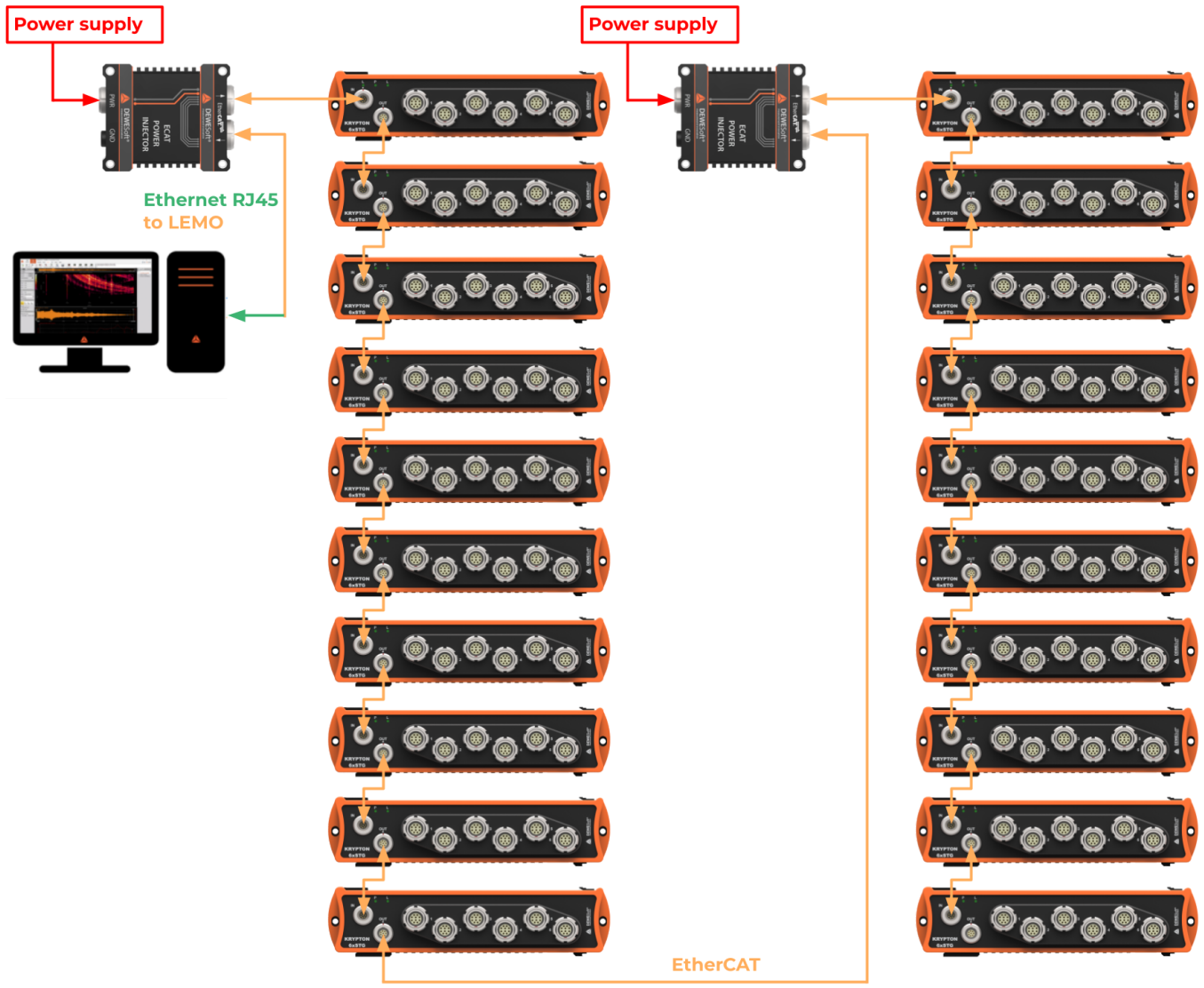
When you use EtherCAT Sirius devices, you can transfer the data through USB cable (Higher speed - 200 kS/s), but the configuration and control still run through ECAT cable - Speed boost mode. With speed boost mode the ECAT data line is less loaded.

9.2. Power Injector

The Power Injector box can be used to inject power to long EtherCAT measurement chains.
The Power Injector box needs an external power supply and must be connected directly between the EtherCAT devices.







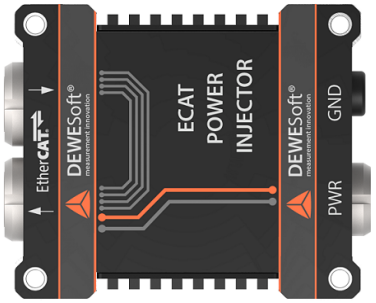
A system with Power Injector

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1T8m
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45

Hint

To transfer the most power, you should connect a longer ECAT cable (e.g. 50 m) before the power Injector and shorter ECAT cable (e.g. 1 m) to the next device, so the voltage drop will be on the shorter cable.



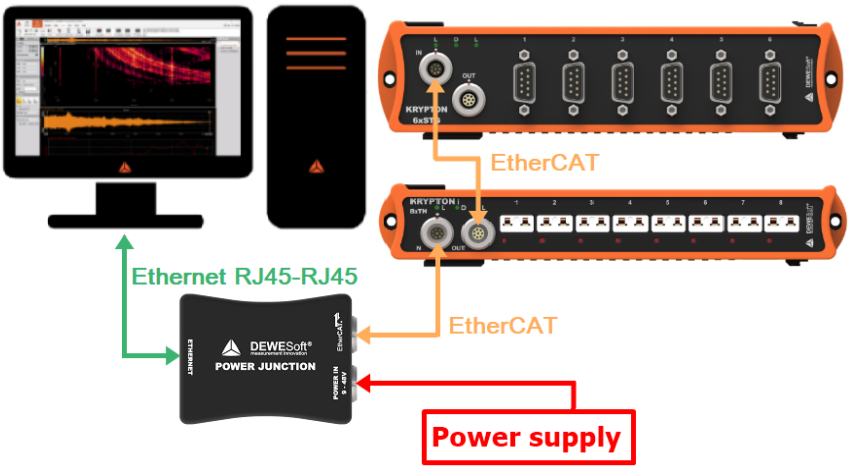
Power injector

Hint

When preparing a system please use our ECAT calculator, which you can find in the configurator, to calculate the power consumption of the system, and make sure if any additional ECAT power injector is needed in the KRYPTON chain.

9.3. Power Junction

The Power Junction box can be used to join the Ethernet and the Power lines in a single 8-pin ECAT cable. In the example we connect a PC to the KRYPTON chain. Effective use of the Power Junction is when the KRYPTON devices are far away from the PC or a system and there is no power supply available (i.e. in a temperature measurement chamber).



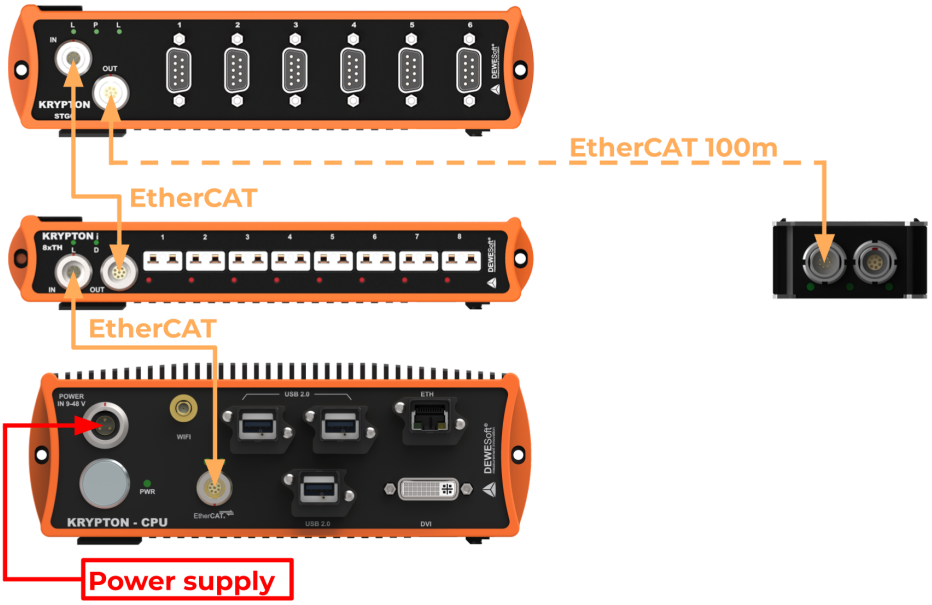
System with Power Junction

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1B2f
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f
Ethernet	RJ45-RJ45

9.4. Distributed system with KRYPTON ONE

KRYPTON ONE devices can be used in a remote area from other used devices connected with a ECAT-ECAT cable up to **100 m** length. The pocket-size allows the modules to be mounted in tight places, right next to the sensors. Therefore the signal is amplified closer to the place of measurement, and this helps to amplify only a small amount of signal noise, then the already digitized signal goes through the long shielded cable, so there is less data loss.



System with KRYPTON ONE

List of required cables:

Function	Dewesoft order code
Power supply	PS-200-L2T3F
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f

9.5. ECAT Sync Junction/ECAT GPS Junction

The ECAT Sync Junction and ECAT GPS Junction are very similar accessories for the EtherCAT line. The main differences are:

- the GPS Junction has an additional GPS connector
- the GPS Junction enables additional GPS channels

Important
To use the Junction device properly we need to connect it as the first device in the EtherCAT chain.

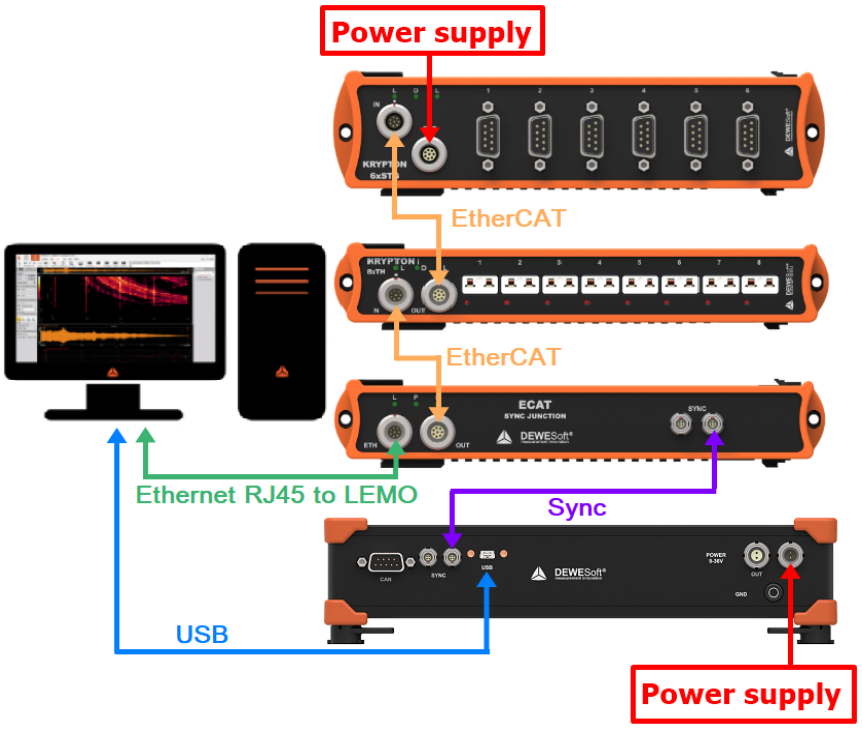
The junctions can be used for different purposes. One of them is to inject the external sync signal into the EtherCAT line such as IRIG-B-DC (both) or GPS PPS signal (GPS junction).

Left system with Sync Junction - Right system with GPS EtherCAT junction

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1T8m
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45
Synchronization	L00B4m-L00B4m
HF-GPS cable	SMA-TNC

The second purpose is to synchronize data between **EtherCAT data lines** (e.g KRYPTON line) with **USB data line** (e.g. Sirius USB or DEWE-43-A).



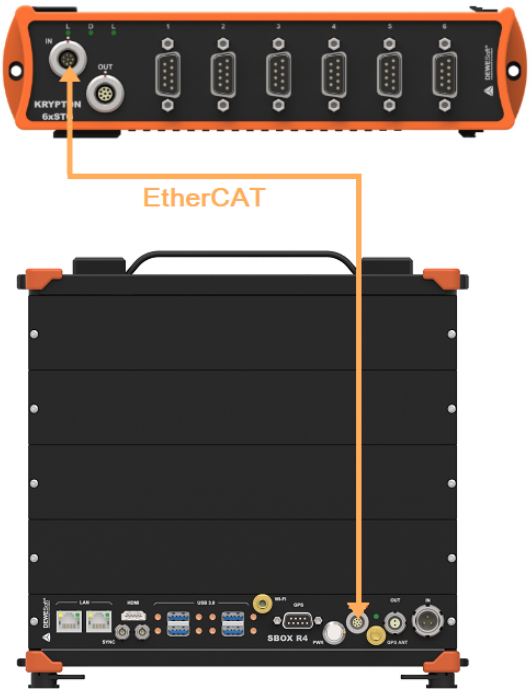
Synchronising data from USB and ECAT data lines with Sync junction

List of required cables:

Function	Dewesoft order code
Power supply	KRYPTON: PS-120-L1T8m Sirius: PS-120-L1B2f
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45
Synchronization	L00B4m-L00B4m
USB	USB1-USB2s or USB1s-USB2s

9.6. Connecting SIRIUS-R4 and KRYPTON STG

The ECAT sync junction is not required with IOLITE, SIRIUSe, R1, R2, R4, R8 or MINITAURs DAQ systems when extended with EtherCAT devices, because the sync junction is already built into the systems.



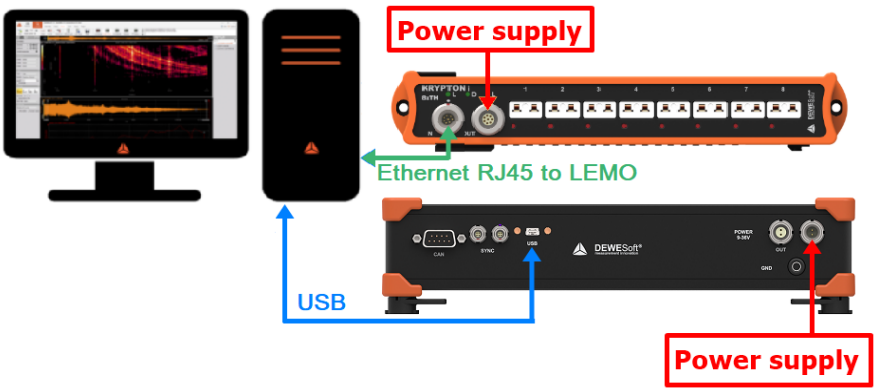
Connection between SIRIUS-R4 and KRYPTON-6xSTG

List of required cables:

Function	Dewesoft order code
EtherCAT	EtherCAT to EtherCAT: L1T8m-L1T8f

9.7. Soft-Sync connection

When you expand your USB based measurement system with a single KRYPTON slice for temperature measurement (KRYPTON-TH or RTD device), you don't need any junction devices at all (i.e. for the slow temperature measurement synchronization is automatically done by software).



Connecting KRYPTON TH and Sirius USB to PC

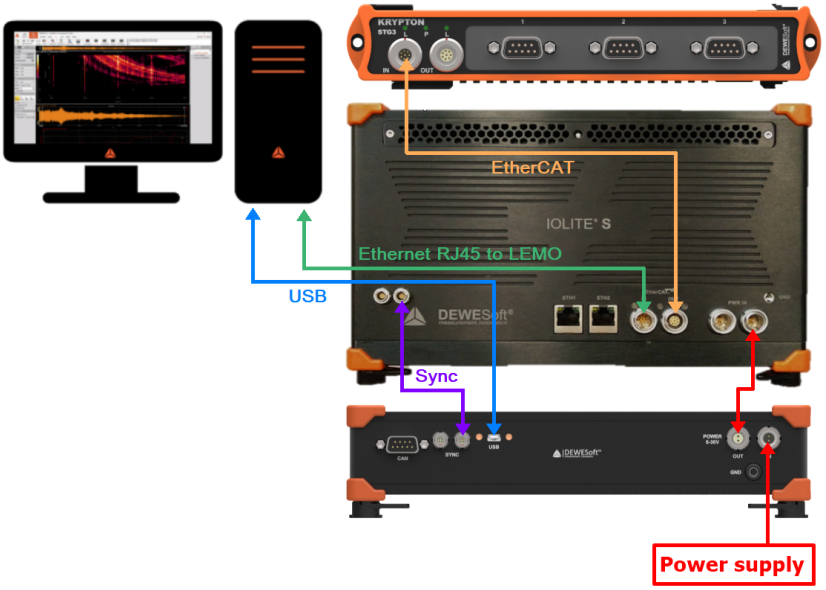
List of required cables:

Function	Dewesoft order code
Power supply	KRYPTON: PS-120-L1T8m Sirius: PS-120-L1B2f
EtherCAT	ECAT - PC connection: L1T8f-RJ45
USB	USB1-USB2s or USB1s-USB2s

Of course, other KRYPTON devices can be used, but you need to take into account that modules can only run up to 100 Hz in the Soft-Sync mode. When a higher sample rate is chosen the synchronization won't be perfect.

9.8. Mixed system

When we calculate the bandwidth of a system we need to acknowledge that we have two data lines in our system - USB and EtherCAT. Take into consideration that IOLITEs has an internal sync junction for synchronization.



A mixed system with a built-in sync junction

List of required cables:

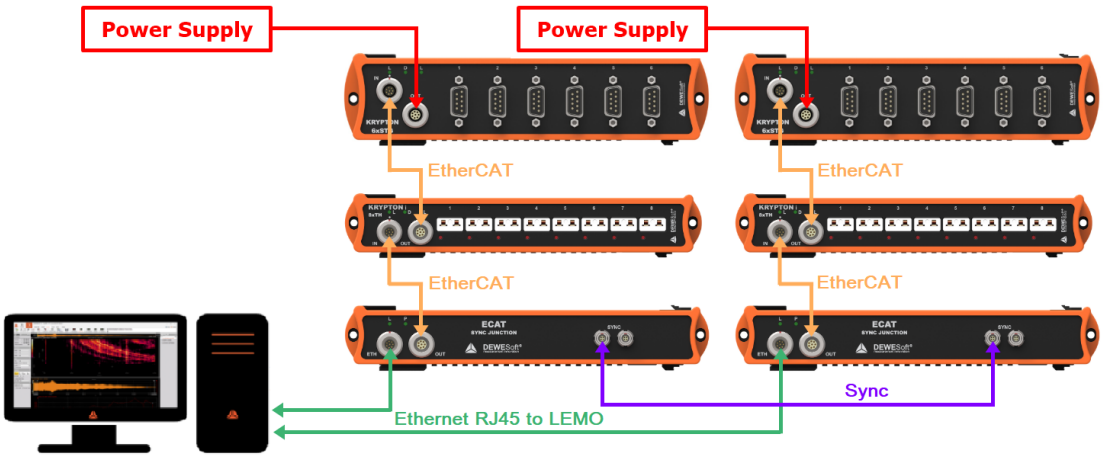
Function	Dewesoft order code
Power supply	PS-120-L1B2f
Supply Daisy chain	L1B2m-L1B2f
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45
Synchronization	L00B4m-L00B4m
USB	USB1-USB2s or USB1s-USB2s

9.9. Two EtherCAT lines

When we need more than one EtherCAT chain, switches can not be used. We recommend using one of the following two solutions.

9.9.1. Use computer which has more than one Ethernet port

Every chain will work as an individual which allows you to use full 100 Mbps on each.
In this configuration, the EtherCAT chains need to be synchronized to each other, so every chain also needs a Sync junction.



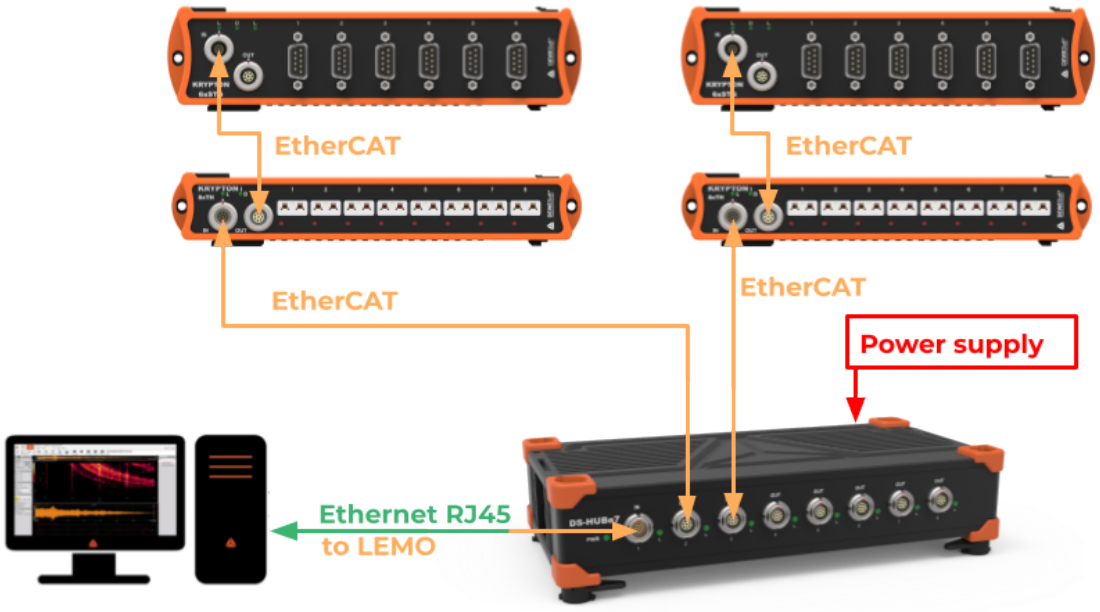
Connection done with two Ethernet ports

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1T8m
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45
Synchronization	L00B4m-L00B4m

9.9.2. Use the DS-HUBe7 junction

In this case, it is possible to use multiple chains, but the speed will be limited to the speed of a single chain. The chains will behave as one, so no additional synchronization is needed.



Connection done with DS-HUBe7

List of required cables:

Function	Dewesoft order code
Power supply	PS-120-L1T8m
Ethercat	EtherCAT to EtherCAT: L1T8m-L1T8f, ECAT - PC connection: L1T8f-RJ45

10. Advanced

10.1. PWM output on KRYPTON 4xDO

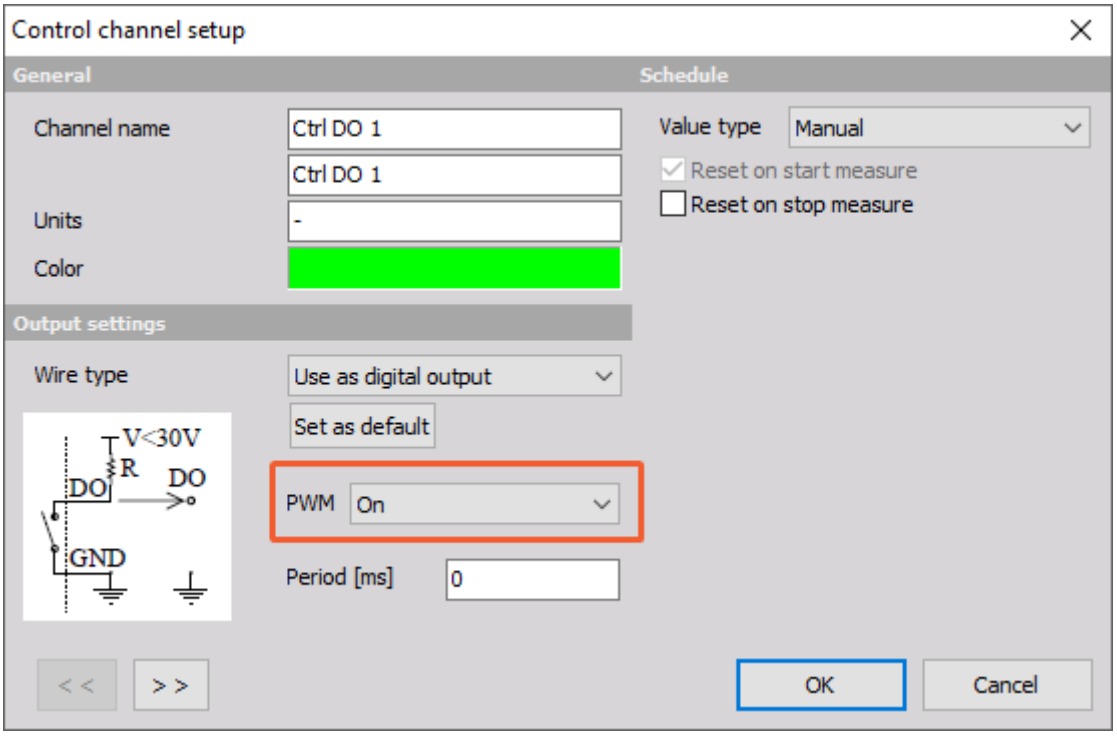
The KRYPTON 4xDO module has integrated an additional option for the PWM signal output. The option is supported with the Dewesoft X3 SP5 release or newer.

The PWM can be enabled in the A/D out module. Go to Settings of the digital out channel and choose the "On" option from the PWM drop down menu. Additional fields will appear where you can type the **period**. The maximum output Frequency is *100kHz*, which is *0.01ms* and the lowest output Frequency is *7Hz* which is approximately *140 ms*.

Wire type can be "Use as switch" or "Use as digital output".

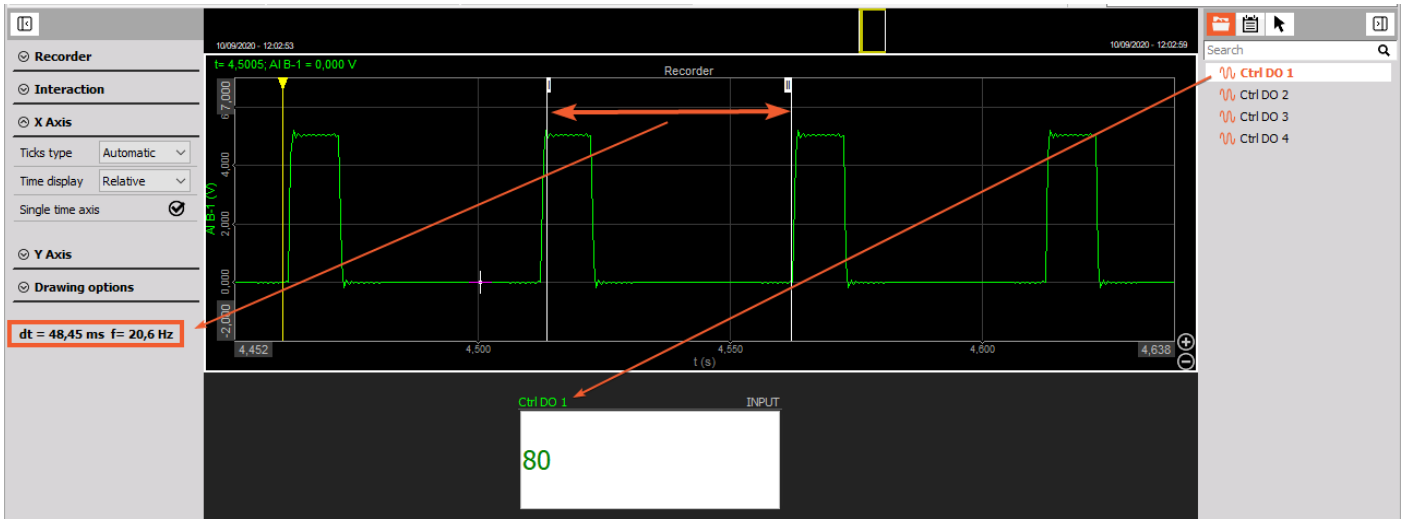
There are two different Value types:

- *Manual* - Additional User control channel will be created, with which you can regulate the duty cycle in measure mode
- *From Channel* - The Duty cycle is defined by the selected channel



PWM output settings

When Value type is selected use Input control widgets for controlling the duty cycle. It is 0 by default, but it can be adjusted with the input control display (0-100%):



Adjusting Duty Cycle in Measure mode

For more information about enabling PWM output please visit our knowledge base.

11. Appendix

11.1. Glossary and abbreviations

This glossary includes explanations of some of the most important terms and abbreviations that are used in documentation.

AAF

AAF or Anti Aliasing Filter in short.

Bit

Bit, the basic unit of information storage, a single binary digit that is either 0 or 1.

Baud (Bd)

Baud is synonymous to symbols per second. It is the unit of symbol rate, also known as baud rate or modulation rate; the number of distinct symbol changes.

A baud rate, by definition, means the number of times a signal in a communications channel changes state or varies.

Example
A 2400 baud rate means that the channel can change states up to 2400 times per second. This is often confused with the bit rate (expressed in bit/s), which is related, but may be different. The number of bits per baud is determined by the modulation technique.

Example
If we use a baud rate of 2400 and a phase modulation (which can transmit four bits per baud), this means that we can transfer 9600 bit/s. 2400 baud x 4 bits per baud = 9600 bps.

The baud rate (communication speed) between the DS GATE and the measurement modules can be configured via software.

CJC

Cold junction compensation.

Thermocouples measure the temperature difference between two points, not absolute temperature. To measure a single temperature one of the junctions - normally the cold junction - is maintained at a known reference temperature, and the other junction is at the temperature to be sensed.

Having a junction of known temperature, while useful for laboratory calibration, is not convenient for most measurement and control applications. Instead, they incorporate an artificial cold junction using a thermally sensitive device such as a thermistor or diode to measure the temperature of the input connections at the instrument, with special care being taken to minimize any temperature gradient between terminals. Hence, the voltage from a known cold junction can be simulated, and the appropriate correction applied. This is known as cold junction compensation.

dB

The decibel (dB) is a logarithmic unit that indicates the ratio of a physical quantity (usually power or intensity) relative to a specified or implied reference level. A ratio in decibels is ten times the logarithm to base 10 of the ratio of two power quantities.

Dewesoft

Dewesoft refers to the company.

DewesoftX® refers to the software suite for data acquisition, data processing, data analysis and much more.

Dynamic Range

Dynamic Range is the ratio of a specified full scale input range to the minimum detectable value (peak spurious signal). The value for dynamic range is expressed in decibels (dB).

DSP

A digital signal processor (DSP) is a specialized microprocessor with an optimized architecture for the fast operational needs of digital signal processing.

The measurement modules use DSPs to process the measured data.

FFT

Fast Fourier transformation (FFT) can be used to show the frequency components of the acquired signals in amplitude and frequency. DewesoftX® has a built-in visual control that makes FFT easy to use.

FPGA

A field-programmable gate array (FPGA) is an integrated circuit designed to be configured by the customer or designer.

After manufacturing: hence *field-programmable*.

GND

The electrical ground (aka. earth).

GPS

The Global Positioning System (GPS) is a space-based global navigation satellite system that provides reliable location and time information in all weather and at all times and anywhere on or near the Earth when and where there is an unobstructed line of sight to four or more GPS satellites.

Hz

The hertz (symbol: Hz) is the SI unit of frequency defined as the number of cycles per second of a periodic signal.

IRIG-B

The Inter Range Instrumentation Group (IRIG) is the standards body of the Range Commanders Council (RCC). They publish a number of standards: e.g. IRIG time-codes The different time-codes defined in the Standard have alphabetic designations. A, B, D, E, G, and H. IRIG-B has a Bit rate of 100 Hz.

LED

A light-emitting diode is a semiconductor light source. It is used in all modules of the SIRIUS® system to indicate the status of the modules.

LEMO

LEMO is the name of the high quality push-pull connectors that are used for cable connections: e.g. the power-supply cable and the sync cables of the SIRIUS® system. The company that produces these connectors is also called LEMO (www.lemo.com)

Microsoft®

Corporation is a public multinational corporation head-quartered in Redmond, Washington, USA that develops, manufactures, licenses, and supports a wide range of products and services predominantly related to computing through its various product divisions.

DewesoftX® is a Windows® based application and thus a Windows® operating system must be installed on the measurement PC where DewesoftX® is installed.

NET Option

aka. DewesoftX NET, DEWE NET

With DEWE-NET your measurement system can be controlled remotely with ease of use you couldn't imagine before. DEWE-NET also serves as the center of Distributed Data Acquisition systems where you have multiple systems located either together or scattered across an entire continent. IRIG and GPS time will take care that data will stay synchronized, no matter how long the acquisition runs.

OS

An operating system (OS) is a set of system software running on a device that manages the system hardware.

This may refer to the operating system of a PC (Windows is required for DewesoftX®) or to the operating system of the SIRIUS® system.

PC

SIRIUS® systems are typically connected to a Personal Computer which runs DewesoftX® to fetch the measurement data.

RMS

Root Mean Square (RMS), also known as the quadratic mean, is a statistical measure of the magnitude of a varying quantity. It is especially useful when variables are positive and negative, e.g., sinusoids. RMS is used in various fields, including electrical engineering.

RTD

Resistance thermometers, also called resistance temperature detectors or resistive thermal devices (RTDs), are temperature sensors that exploit the predictable change in electrical resistance of some materials with changing temperature; e.g. Pt100 and Pt1000.

SNR

Signal to Noise Ratio (SNR) is the ratio of the RMS value of the full scale input range to the total RMS noise measured with the inputs shorted together. The value for SNR is expressed in decibels (dB).

SNTP

Simple Network Time Protocol (SNTP) is a protocol for synchronizing the clocks of computer systems over packet switched, variable-latency data networks. It is a simpler and less accurate version of the Network Time Protocol (NTP).

Synchronization cable

These synchronization cables can be used to synchronize several SIRIUS® chassis with each other.

USB

Universal Serial Bus is a specification to establish communication between devices and a host controller (usually PCs). SIRIUS® systems use a USB connection to connect to a PC.

Windows®

A PC operating system by Microsoft®. DewesoftX® will work on Windows® 10, Windows® 7 Windows® XP, Windows® Vista and Windows®. Windows® is a registered trademark of Microsoft Corporation in the United States and other countries.

12. Warranty information

Notice
The information contained in this document is subject to change without notice.

Note:
Dewesoft d.o.o. shall not be liable for any errors contained in this document. Dewesoft MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWESOFT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Dewesoft shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

12.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

12.2. Support

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

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

12.3. Service/repair

The team of Dewesoft also performs any kind of repairs to your system to assure safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

12.4. Restricted rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

12.5. Copyright

12.6. Trademarks

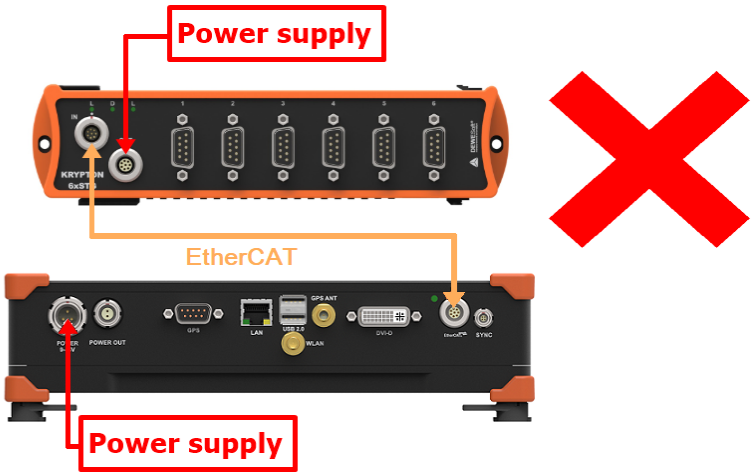
We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET, IOLITE) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

13. Safety instructions

Your safety is our primary concern! Please be safe!

Caution

Be careful to not connect the power supply on both ends of the EtherCAT chain. This connection will permanently damage the devices.



*How to **not** connect the PS in ECAT chain*

13.1. General Safety Instructions

Warning

The following general 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. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

13.1.1. Environmental Considerations

Information about the environmental impact of the product.

13.1.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

System and Components Recycling
Production of these components 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 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 electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances
This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

General safety and hazard warnings for all Dewesoft systems

- Safety of the operator and the unit depend on following these rules.
- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and -connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- 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.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.

- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are moisture or high humidity dust, flammable gases, fumes or dissolver, thunderstorm or thunderstorm conditions (except assembly PNA), electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- DO NOT service or adjust alone. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
- 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 environments. The system has been exposed to heavy shipment strain.
- 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 circuit and fire hazard!
- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty 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).
- 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.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.

- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- 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.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use by humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.

This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

14. Documentation version

Doc-Version	Date [dd.mm.yyyy]	Notes

v20-1	15.06.2020	• The NEW KRYPTON manual - Reworked and revised version
		• Added products:
		  ○ KRYPTONi-1xCAN-FD
		  ○ KRYPTONi-8xLA
		  ○ Mounting plates

V20-2	25.11.2020	• Remote-on pin description for KRYPTON CPU • PWM option explanation

V22-1	24.01.2022	• Updated picture of KRYPTON chain connected to PC (page 118)
		• 5.5.3. CNT: connectors, change max current
		• Updated DS-HUBe7 junction picture (Chapter 9.9.2.)
		• Added LEMO connector type for 1xTH
		• Added products:
		  ○ KRYPTON-4xCNT
		  ○ KRYPTONi-8xTH-HS
		  ○ KRYPTONi-16xTH-HS

V23-1	19.01.2023	• Rearranged the manual based on type of measurement
		• 10.1. Added link to the knowledge base about enabling PWM output
		• 5.8 Added notes and more information on DIO modules.
		• 5.5 Specified standards for linearization curves for TH and RTD modules.
		• 8.3.1 Added how to mount KRYPTON units to SIRIUS systems
		• Added products:
		  ○ KRYPTON-6xSTG-L1T7f
		  ○ ECAT Repeater
		  ○ DS-HUBe7
		• Updated specification and other information for:
		  ○ ECAT GPS Junction, ECAT Sync Junction
		  ○ KRYPTON-1xSTG, KRYPTON-3xSTG, KRYPTON-6xSTG
		  ○ KRYPTON-4xCNT
		  ○ KRYPTONi-8xTH-HS, KRYPTONi-16xTH-HS
		  ○ KRYPTONi-2xCAN-USB, KRYPTONi-1xCAN, KRYPTONi-1xCAN-FD
		• Corrected renders and connector code numbers for:
		  ○ KRYPTONi-1xCAN-FD,
		  ○ KRYPTON Power Junction
		  ○ Multiple ECAT modules
		  ○ KRYPTON-1xTH-HV
		• Corrected pinout for BNC connectors

V23-2	14.2.2023	• KRYPTON-1xAO: changed the specification, now function generator option is supported • Corrected the mating connector for EtherCAT OUT connectors
V23-3	28.7.2023	• 9.2. Power Injector - updated connection picture • KRYPTON-8xTH-HS; Power consumption specifications change • Added power supply PS-120W-L1B2f • KRYPTON-1xAO: Update Rate, Function generator function • Corrected the code for ECAT connectors
V23-4	2.10.2023	• Modified the Accessories section - added a link to the new Accessories manuals and deleted some of them from this manual. • Open sky conditions added in technical specifications
V23-5	28.10.2023	• Added KRYPTONi-8xLV-100V-L1T2m • Added KRYPTONi-8xRTD-HS • Modified specifications for KRYPTONi-1xHV

14.1. Previous versions history

Doc-Version	Date [dd.mm.yyyy]	Notes
1.0.0	23.11.2015	• Initial version
1.1.0	14.04.2016	• Added RTD module • Added ECAT Power Injector • Added “Table 7: Max. Error by Thermocouple type”

1.1.1	02.06.2016	• Table 11: KRYPTON RTD Specifications
		  ○ Updated Accuracy
		  ○ Added Temperature drift

1.1.2	17.07.2018	• Added excitation information for RTD and TH

2.0.0	20.09.2018	• Added KRYPTON-4xACC,KRYPTON-8xACC
		• Added KRYPTON-6xSTG
		• Added KRYPTONi-2xCAN-USB
		• Added KRYPTON ONE product line:
		  ○ KRYPTONi-1xACC
		  ○ KRYPTON-1xAO
		  ○ KRYPTONi-1xCAN
		  ○ KRYPTON-1xCNT
		  ○ KRYPTONi-4xDI
		  ○ KRYPTONi-4xDO
		  ○ KRYPTONi-1xHV
		  ○ KRYPTONi-1xLV

		○ KRYPTONi-1xSTG ○ KRYPTONi-1xTH-HV • Added KRYPTON-CPU • Added ECAT GPS Junction
2.0.1	23.01.2019	• Changed figure 4.7.3.1. KRYPTON Multichannel DIO modules: connectors
--- THE END ---		