



IPEmotion PlugIn IPETRONIK-X V02.14.02

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1 Important and general information

1.1 Important information (extract)

Please follow these instructions before and during the use and application on any IPETRONIK product!

1.1.1 Safety and Warning instructions

Please follow the instructions and information as contained in the user manual!

- 1. The user can **influence an electronic system by applying the IPETRONIK product**. This might cause risk of personal injury or property damages.
- 2. The use and application of the IPETRONIK product is permitted only to qualified professional staff, as well as, only in appropriate manner and in the designated use.
- Before using an IPETRONIK measurement system in the vehicle it has to be verified that no function of the vehicle, which is relevant for secure operation, might be influenced:
 by the installation of the IPETRONIK measurement system in the vehicle,

- by an potential malfunction of the IPETRONIK system during the test drive.

In order to avoid possible danger or personal injury and property damages, appropriate actions are to be taken; such actions have to bring the entire system into a secured condition (e.g. by using a system for emergency stop, an emergency operation, monitoring of critical values).

Please check the following points to avoid errors:

- Adaption of sensors to components of the electrical system / electronics, brake system, engine and transmission control, chassis, body.
- Tap of one or several bus systems (CAN, LIN, ETHERNET) including the required electrical connection(s) for data acquisition.
- Communication with the vehicle's control units (ECUs), especially with such of the brake system and/or of the engine and transmission control (power train control system).
- Installation of components for remote data transmission (mobiles, GSM/GPRS modems, WiFi and Bluetooth components).



IPETRONIK devices are designed for applications in **extended temperature ranges** > 70 °C (158 °F). A high environmental temperature and the module's self-heating may cause burns of the skin when touching the hot surface. In order to avoid the risk of injury we recommend to take care for appropriate safety precautions (e.g. contact protection, covering/enclosure, warning sign, ...)..

- 5. Before directly or indirectly using the data acquired by an IPETRONIK measurement system to calibrate control units, please review the data regarding to plausibility.
- 6. With regard to the application of IPETRONIK products in vehicles during use on public roads the manufacturer and/or registered user of the vehicle has to ensure that all changes/modifications have no influence concerning the license of the vehicle or its license of operation.
- 7. User does agree to the instructions and regulations as mentioned above. In case the user does not agree with the instructions and regulations as mentioned above, he has to notify this expressly and immediately in writing to IPETRONIK before confirming the sales contract.

1.1.2 Liability, Warranty, Copyright, License agreement

Limitation of liability

Any liability of IPETRONIK, its representatives, agents and the like, especially with regard to personal injury or damage to property of any kind, shall be excluded (within the legally admissible framework), as far as, the instructions and warnings, as mentioned below, have not been followed.



Warranty

Products, accessories and services have a 24 months warranty.

All product data, specifications, drawings, etc., correspond to the current condition of the indicated creation date. For the purpose of optimizing technical processes and production, some details of our modules and accessory components may be modified at any time without prior notification.

Although the present document has been prepared with the utmost attention to detail, it may not be exempt of misprints, typing or transcription errors. These errors are not covered by any warranty.

1.2 General information

1.2.1 About this manual

This manual describes the X-System structure and how to use the IPETRONIK IPEmeasure modules Mx-SENS2 4, Mx-SENS2 8, Mx-SENS 8, Mx-STG2 and Sx-STG with IPEmotion (PlugIn IPETRONIK-X).

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System requirements

PC component	minimum	recommended
Screen resolution	1080 x 800 pixel	1920 x 1200 pixel
Processor	2 GHz	3 GHz Multi-Core
RAM	2048 MB	6144 MB
Storage medium type		SSD
IPEmotion	IPEmotion 2020 R1	IPEmotion 2020 R2

IPEmotion PlugIn IPETRONIK-X

Descriptions in this documentation refer to the current release. In contrast to previous versions (< V02.00), current and subsequent releases also support a configuration and data acquisition with IPETRONIK CAN modules which are connected to the PC by a CAN interface. So far the PlugIn IPETRONIK CAN was necessary for this operation mode. Please note, that modules require the latest firmware.

This PlugIn is supported by IPEmotion 2017 / IPEmotion 2018 (≥ V07.00.00) and Windows 7 / 8.1 / 10 (32 bit and 64 bit systems). Microsoft .NET 4.5.1 Framework is required!

Please follow the recommendations at 5.1 PlugIn IPETRONIK-X.

PTP driver and Windows 7

In case of an error message during the PlugIn installation under Windows 7 (Windows requires a digital signed driver.), Windows needs to be updated in order to ensure the identification of the driver signature certificate. Refer to <u>5.1.4 PTP driver > Driver signature</u>



Some firewall settings might block the PTP communication. In this case, the PlugIn uses an alternative algorithm to synchronize the measurement between X devices and PC. However, timestamps would be more inaccurate, this should be avoided by configuring the firewall in a way to accept PTP communication.



IPEmotion

Descriptions in this documentation refer to releases with the version numbers from IPEmotion 2015 R1 (V05.00.00) to IPEmotion 2017 R3.1 (V07.02.01).

Firmware

Using the PlugIn IPETRONIK-X V02.00 and higher versions, modules require the following firmware:

- ▶ X-Modules: firmware version (≥ V02.00)
- ► CAN-Modules firmware version (≥ V04.00) Update using CAN download ≥ V02.03.03 and latest M-FW-Update-Library

Refer to 5.1.1 System requirements Firmware PlugIn IPETRONIK-X V02.xx

Software components

that will be installed during PlugIn setup:

- Microsoft Visual C++ 2013 Redistributable
- CAN-Server V01.17.04
- ▶ IPETRONIK PTP driver V1.6.0.0

Network adapter



Make sure that the network adapter connected to the Mx/Sx devices is correctly configured as DHCP client!



Depending on the interface settings, the use of several network adapters may cause network communication errors. Please disable unused network adapters at your PC!

CAN interface



IPEcan requires a Firmware version > 2.8!

1.2.2 Legend of used icons

Tip

This icon indicates a useful tip that facilitates the application of the software.



Information This icon indicates additional information for a better understanding.



Attention! This icon indicates important information to avoid potential error messages.



1.2.3 Support

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Limited commercial partnership with its head office in Baden-Baden, registry court HRA No. 201313

IPETRONIK Verwaltungs-GmbH Baden-Baden is an individually liable society, registry court Mannheim HRB No. 202089

CEOs: Andreas Wocke, Christian Buchholz

Technical support and product information

www.ipetronik.com e-mail: support@ipetronik.com

2 System

2.1 Features

The IPEmotion PlugIn IPETRONIK-X offers you the ability to use IPEmeasure Ethernet technology within IPEmotion. The devices of the Mx-/Sx-Series in combination with IPEmotion software allows an unlimited and clear use of the IPEmotion main navigation tabs Acquisition, View, and Analysis.

The Ethernet technology of the X-Series modules offers the following user benefits:

- Significantly higher performance compared to CAN
- > No separate hardware for the connection of a notebook / a PC is required
- High market acceptance in office communication and industry

The X-Serie modules, basing on the well-proven IPETRONIK M and SIM modules have been extended to meet higher requirements, e.g. in the field of the service strength (RLDA = Road Load Data Acquisition). The specific properties are:

- Higher channel sampling rates (Mx-SENS up to 10 kHz, Sx-STG up to 40 kHz,
- Mx-SENS2 4 fast up to 400 kHz)
- ▶ Higher aggregate sampling rates (Mx-SENS: up to 80 kHz, Sx-STG: up to 320 kHz, Mx-SENS2 4 up to 400 kHz)
- > 4 MHz total sampling rate within a system:
- Support of higher numbers of fast channels
- Smaller housing construction

IPETRONIK X system distinguishes currently between the following devices:

- ▶ Mx-SENS 8, Mx-SENS2 4, Mx-SENS2 4 (PlugIn ≥ V02.01 required)
- ▶ Sx-STG, Mx-STG2 (PlugIn ≥ V02.04 required)

Each device is an independent acquisition system and can be used as a stand-alone devices, as well as, in combination with other modules (Mx-SENS and Sx-STG in the system network).

2.2 Accessories

2.2.1 USB2ETH Mx/Sx

It is possible to use the USB2ETH adapter for notebooks and PCs which don't have any free Ethernet interface, This adapter allows a connection of the module chain to a free USB interface.





2.3 System overview

2.3.1 Mx-System (ETH)





First daisy-chain all modules using the respective cables, then switch on the power supply!



You can mix Mx- and Sx-Modules within a system. Connection cable 630-500.003 (length 30 cm) can be also used for mixed Mx/Sx systems.

Synchronization PlugIn IPETRONIK X with Mx-SENS / Sx-STG 25 - 50 μs (Depends on the accuracy of the HF input filter)

2.3.3 X-System with CAN modules (ETH)





PlugIn synchronization between IPETRONIK X / IPETRONIK-CAN1 - 2 msPlugIn synchronization between IPETRONIK X / CAN Measurement1 - 2 ms

2.3.4 X-System with CAN modules (ETH + CAN)





Depending on the channel settings, X-Series modules support data output to Ethernet and/or CAN bus. In addition to the Ethernet connection, CAN data can be collected by a PC with CAN interface or a CAN data display at the other end of the daisy chain.

2.3.5 Using X modules within a CAN-System





X-Series modules can be used as CAN device within a CAN bus system with other devices (M-Series). Although the configuration of the X modules requires an Ethernet connection, the CAN bus is used for data acquisition. We recommend to setup the CAN bus data acquisition by the import of a CANdb file (xxx.dbc). Detecting and setting up X devices via CAN bus (PlugIn IPETRONIK-X, IPETRONIK-CAN is not supported).

2.4 Connecting two X-Systems to the PC

By using two network adapters, a simultaneous operation of two independent X-Sytems connected to one notebook / PC is supported. Please consider, that the IP ranges have to differ from one another.

Proceed as follows:

- Connect the 1st system and define its IP range.
- Connect the 2nd system and configure an IP range that differs from the 1st system.

2.5 System LED indication

2.5.1 Status

STATUS LED	Meaning
Off	No power supply
Green continuous	Power supply switched on, ready for operation
Green 1 Hz 25% / 75% flashing	Measurement running
Green 5 Hz 50% / 50% flashing	Boot up, Initialization, Firmware download running
Red continuous	Internal error (hardware)
Red 1 Hz 50% / 50% flashing	Communication error, e.g. connector unplugged resp. not fully plugged in, cable broken or squeezed, faulty bus communication Firmware download successfully completed
Redt 5 Hz 25% / 75% flashing	Bus overload
Green/Red 1 Hz 50% / 50% flashing	Supply voltage out of range, check voltage level

2.5.2 Link

LINK LED	Meaning
Off	Status IN:Ethernet disconnectedStatus OUTEthernet disconnected
Green 1 Hz 50% / 50% flashing	Status IN:Ethernet connectedStatus OUTEthernet disconnected
Yellow 1 Hz 50% / 50% flashing	Status IN:Ethernet disconnectedStatus OUTEthernet connected
Green/Yellow 1 Hz 50% / 50% flashing	Status IN: Ethernet connected Status OUT Ethernet connected

2.6 Automatic Rebooting / Restarting of X Devices

Beginning with V02.14.00, the plugin is able to reboot X devices in certain situations.

The intention is to support the user in such cases, that changing certain device or system settings require restarting the whole device chain. In these case the reboot is done automatically by the software such that it is no further action is needed by the user (here, powering off and on the X device chain after changing certain settings and doing a hardware initialisation).

The automatic reboot is done per (X) system (ethernet connector). It requires, that ALL X devices that are connected on the same ethernet interface have a firmware of V02.12.00 or newer.

The reboot command is sent in following situations:

Changing the IP-Address settings from the PlugIn's options dialog (and at least one device responded on that command)

At the end of the hardware initialisation.

In the situation of (1), the command is sent always!

This is due to the fact, that it possible to call the command for changing the IP-Address independent from any configuration, hardware detection or initialisation - therefore it is unknown, how many or which devices are connected to the bus or not.

In the situation of (2), the command is executed directly after the hardware initialisation in following situations:

- > The system is a X system, meaning there is at least one X-Device in the system
- All configured X devices do have a firmware version of V02.12 or newer installed and
- > Prior to the initialisation on of the following has been done
- The system parameter "Internal time synchronisation" has been changed
- > The front number of any X device has been changed
- > The device type has been changed into any of the X device types
- > The configuration has been loaded and is yet not initialised
- A device has been manually added

The options dialog has been closed with "OK" (this automatically reloads the configuration and such the situation above is encountered)

However, there are some limitations and drawbacks:

The X-PlugIn does not know anything about the devices, that are NOT in the configuration but are connected to the same ethernet connector.

Therefore, it is possible, that all devices in the configuration have a firmware V02.12 or newer, but there are further devices connected with firmware smaller than V02.12. In such situations, the PlugIn does send the reboot command on the bus. However, the devices not supporting the command do not restart. This leads into the situation, that the IP addresses / bus master / PTP operation mode are set new in the rebooting devices but not in the others. After such situation, the device chain has to be restarted manually by powering off and on the whole chain. Otherwise, the communication is corrupted and the whole chain is no more working!

Further, the reboot is always executed in above situations since the plugin does not know the device states (hardware) after loading or manually editing a a configuration. Therefore, the reboot is done always.

The rebooting itself takes approximately 6 seconds. If changing the IP address, the process takes a bit longer, since the PlugIn does not know, which devices are connected and has no information about the time, when the devices are restarted and ready for measurement again. Therefore, a time out value of 10s is used here.



2.7 CAN ID range notification

A warning message is added to channels with a manually configured CAN ID in the range of 0x0280 ... 0x02FF. Since this range is being reserved for communication by IPETRONIK measurement devices, configuring these for measurement messages leads to problems in the general communication (measurement start, stop, detection, initialisation and resetting).

However, if such IDs are configured, a CANdb measurement with e.g. the IPEmotion PlugIn Protocols is possible (a device restart might be needed).

2.8 Resetting Sensor Excitation after Change of Sensor Mode

If the sensor mode of a channel has been changed, the sensor excitation (if supported) is automatically changed to 0 V. This is done to prevent sensors from potential damage.

Note that there are some channels and sensor modes with a fix sensor excitation. If the sensor mode is changed to such mode (e.g. IEPE) or on such channel (e.g. channels 1-20 of a M-SENS 24), the specific sensor excitation is applied as has been before.

3 X-LINK modules

3.1 Mx-SENS2 4 fast

Fast 4-Channel Analog Measurement Device with Excitation

• 4 fast analog signal inputs for voltage / current supporting channel sample rates up to 400 kHz

4 galvanically isolated sensor excitations (up to ±15 V, ±60 mA), supply voltage selectable

- > 10 bipolar voltage measurement ranges
- Current measurement range ±20 mA
- ICP mode supporting IEPE sensors (Integrated Electronics Piezo Electric)
- TEDS support
- Offset and target value adjust functions
- Status LED at each input channel (sensor break indication and configuration aid)
- Measurement data output to Ethernet using XCPonEthernet

Measurement data output to CAN

• Complete galvanic isolation (inputs, excitation, CAN, Ethernet, power supply, enclosure)

- Designed for automotive in-vehicle use
- Toolless module to module connection









3.1.1 Input cables

Standard (open)

670-810.xxx M-SENS (TEDS) Cable open



LEMO 1B,7-pol./P,black

Cable Marking

	VIN+		wihte ,
	VIN-/IIN-		brown
	11N+		red
	+VOUT		black
	⊥GND		green ,
	-VOUT		vellow
	TEDS		violett -
Ľ –			· · · · · · · · · · · · · · · · · · ·
		Ť	blue

Specific (assembled, open)

- 620-695.xxx Mx-SENS 1B 7pin Adapter BNC/S-ICP/TEDS for ICP measurement
- 670-807.xxx SENS 1B 6pin Cable open (compatible to 670-810, no TEDS support)
- 600-861.xxx SENS 1B 6pin Cable Banana 6 (compatible to 670-810, no TEDS support, all lines connected to banana plugs)
- 600-864.xxx SENS 1B 6pin Cable Banana 2 (VIN+/VIN- via banana plugs)

3.2 Mx-SENS2 8

Fast 8-Channel Analog Measurement Device with Excitation

▶ 8 analog signal inputs for voltage / current

 8 separate sensor excitations, supply voltage individually selectable (up to ±15 V, ±45 mA)

- 12 unipolar and 12 bipolar measuring ranges
- > 2 current measuring ranges
- 10 mV range, e.g. for stanby current applications
- Offset and target value adjust functions
- Status LED at each input channel
- (channel identification / channel error idication)
- Measurement data output to Ethernet using XCPonEthernet,

Measurement data output to CAN

- Complete galvanic isolation (inputs, excitation, CAN, Ethernet, power supply, enclosure)
- Designed for automotive use
- Toolless module to module connection





IPETRONIK



3.2.1 Input cables

Standard (open)

670-810.xxx M-SENS (TEDS) Cable open



LEMO 1B,7-pol./P,black

Cable Marking

VIN+	wihte
VIN-/IIN-	brown
lin+	red
+VOUT	black
⊥GND	areen a
-VOUT	vellow
TEDS	violett -
	·
	blue

Specific (assembled, open)

- 670-807.xxx SENS 1B 6pin Cable open (compatible to 670-810, no TEDS support)
- 600-861.xxx SENS 1B 6pin Cable Banana 6 (compatible to 670-810, no TEDS support, all lines connected to banana plugs)
- 600-864.xxx SENS 1B 6pin Cable Banana 2 (VIN+/VIN- via banana plugs)

3.3 Mx-STG2

Fast 6-Channel Analog Measurement Device with Excitation

6 fast analog signal inputs for voltage supporting channel sample rates up to 100 kHz

- STG measurement mode supports different bridge types ▶
- 6 separate dual sensor excitations (up to \pm 5 V, up to \pm 45 mA)
- Offset and target adjust functions within the measurement range
- Shunt check ▶
- 6-wire and 4-wire bridge connection (full / half bridge)
- Internal resistors for bridge completion selectable
- TEDS class 2 support (input connectors Lemo 2B 10-pin)
- Channel status-LED for channel identification and error indication ▶
- Measurement data output to Ethernet using XCPonEthernet, ▶

Measurement data output to CAN

- Complete galvanic isolation (signal inputs, excitation, CAN, Ethernet, power supply)
- Designed for automotive applications
- Toolless module to module connection ▶

3.3.1 Input cables

Standard (open)

600-747.xxx STG 2B 10p. Cable open (10-pin TEDS)



LEMO 2B, 10-pol./P

Cable Marking

	INPUT +	(blue)	\square	IND
	INPUT -	(orange)		- 11NT
2	EXCIT +	(white)		- IN -
	SENS +	(brown)		- 001
				- 3EN
	TEDS +	(violett)		_ TER
	EXCIT -	(green)		
	SENS -	(yellow)		- 00 SEN
	INPUT GND	(black)		
	Shield		U	- GNL
			(blue)	

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If you do not use IPETRONIK input cables, please pay attention to the correct pin configuration! The connection Pin 5 <> Pin 10 is always required as the module identifies by this, when a sensor has been plugged in.

670-850.xxx DMS/STG Cable open (7-pin DMS compatible)



Lemo-Stecker 1B, 7-pol. (schwarz) Lemo-male 1B, 7-pol. (black) Litze-Nr. / Farbe Wire-№ / Colour

1	IN+ -VOUT +VOUT IN- -SENS +SENS GND + Shield	white brown red black green yellow violet (blue)	1 2 3 4 5 6 7
7	GND + Shield	violet (blue)	7

620-700.xxx STG SubD9/P Cable open (9-pin DSUB)



SubD9-pol./P

Cable Marking

1	Π	EXCIT +	\bigcap	(white)
2		INPUT +	\square	(blue)
2		SENS -	Π	(yellow) 2
3		INPUT GND	Π	(black) 3
4		TEDS-Info+	\square	(red) 4
6		SENS +	Π	(brown) 5
7		INPUT -	Π	(orange) 7
6		EXCIT -	Π	(green)
a		TEDS+		(violett) o
3	Y		Ų	9

3.3.2 STG operation mode

Application

Measurement with strain gages (full / half / quarter bridges)

 Measurement with sensors which provide a fixed ground (GND) reference (with no definite ground reference the input may drift, because of the high impedance of the signal input)

Features

- Bridge connection supporting 2-wire,
- 4-wire and also 6-wire technique
- Bridge completion using internal resistors
- Shunt check in configuration mode as well as in measurement mode

Adjustable shunt resistor $5 \text{ k}\Omega$ to $500 \text{ k}\Omega$ (minimum and maximum value depends on the current setting of the excitation voltage), connectable to each bridge section (quadrant). The complete adjust data can be output to the software (CSV format) and can be loaded and applied to the sensor for verification of stability and repeatability.

▶ Sensor break detection for all 6 wires (IN [up to an input range of 200 mV], VOUT, SENS) indication by output of –Full Scale

Measurement ranges

- ▶ ±5 mV to ±1 V in 8 bipolar measurement ranges
- Measurement ranges ±5/ 10/ 20/ 50/ 100/ 200 mV, ±0.5/ 1,0 V

Adjustable differential voltages

Mx-STG2 adjusts offset voltages up to ±0.9 x Full Scale (FS).

Common Mode Rejection Ratio (CMRR)

To guarantee a correct measurement of the input signal over the complete measurement range (uncropped signal amplitude), the input voltage on IN+ resp. IN- relating to the GND potential should not exceed 4 V.

Sensor excitation

- ▶ selectable bipolar voltage ±0.50 / ±1.25 / ±2.50 / ±5.00 V
- current load up to 45 mA per channel



Bridge completion

Refer to Sx-STG Bridge completion

Shunt check

Refer to Sx-STG Shunt check

TEDS

Refer to Sx-STG TEDS Class 2

3.4 Sx-STG

Fast 8-Channel Multi-Analog Measurement Device with Excitation

- 8 analog signal inputs for voltage measurement
- Measurement modes: SENS, STG, ICP, individual for each input
- ▶ 8 separate dual sensor excitations (up to ±15 V, up to ±45 mA)
- Offset and target adjust functions by hardware

(maximum accuracy)

- Shunt check
- 6-wire and 4-wire bridge connection (full / half bridge)
- Internal resistors for bridge completion selectable
- TEDS support (input connectors Lemo 2B)
- > Channel status-LED for channel identification and error indication

Measurement data output to Ethernet using XCPonEthernet,

Measurement data output to CAN

• Complete galvanic isolation (signal inputs, excitation, CAN, Ethernet, power supply)

- Designed for automotive in-vehicle use
- Toolless module to module connection as option



3.4.1 Input cables

Standard (open)

670-850.xxx DMS/STG Cable open (7-pin DMS compatible)

	DMS/STG 7	
DMS/STG		

Lemo-Stecker 1B, 7-pol. (schwarz) Lemo-male 1B, 7-pol. (black)

Litze-Nr. / Farbe Wire-Nº / Colour

IN+ -VOUT +VOUT IN- -SENS +SENS GND + Shield	white brown red black green yellow violet (blue)	1 2 3 4 5 6 7

600-747.xxx STG 2B 10p. Cable open (10-pin TEDS)



LEMO 2B, 10-pol./P

10 20, 10-001./1			Cable Marking
	INPUT +	(blue)	
	INPUT -	(orange)	IN+
	EXCIT +	(white)	
	SENS +	(brown)	
			SENT
	TEDS +	(violett)	TEDS
	EXCIT -	(green)	TEDS
	SENS -	(yellow)	001- SEN
	INPUT GND	(black)	SEN-
	Shield		GIND GIND
			(blue) S



If you do not use IPETRONIK input cables, please pay attention to the correct pin configuration! The connection Pin 5 <> Pin 10 is always required as the module identifies by this, when a sensor has been plugged in.

3.4.2 Signal input modes

Each input channel can be set to one of three different signal input modes:

- **STG mode** strain gage applications (4-wire and 6-wire bridge connection)
- SENS-Mode sensors with integrated amplifier unit (3-wire, 4-wire connection), and common voltage measurement
- ICP-Mode ICP sensors (Integrated Circuit Piezoelectric, eg. acceleration transducers)

STG-Mode

Application

 Measurement with strain gages (full / half / quarter bridges)

Measurement with sensors which provide a fixed ground (GND) reference (with no definite ground reference the input may drift, because of the high impedance of the signal input)

Features

Bridge connection supporting 2-wire,
4-wire and also 6-wire technique

Bridge completion using internal resistors

> Shunt check in configuration mode as well as in measurement mode

Adjustable shunt resistor $5 k\Omega$ to $500 k\Omega$ (minimum and maximum value depends on the current setting of the excitation voltage), connectable to each bridge section (quadrant). The complete adjust data can be output to the software (CSV format) and can be loaded and applied to the sensor for verification of stability and repeatability.

-1.25/ -2.5/ -5 V

▶ Sensor break detection for all 6 wires (IN [up to an input range of 200 mV], VOUT, SENS) indication by output of –Full Scale

Measurement ranges

- 0 ... 2 mV to 0 ... 2 V in 2 mV steps
- ▶ ±2 mV to ±2 V in 2 mV steps

Adjustable differential voltages (hardware adjust)

STG measurement ranges		STG measurement ranges		STG adjust ranges
unipolar min	unipolar max	bipolar min	bipolar max	Full Scale (FS) means the upper range limit of the corresponding measurement range
2 mV	30 mV	±2 mV	±30 mV	±3125 mV ±0,9 FS
32 mV	62 mV	±32 mV	±62 mV	±62.50 mV ±0,9 FS
64 mV	124 mV	±64 mV	±124 mV	±125.00 mV ±0,9 FS
126 mV	250 mV	±126 mV	±250 mV	±250.00 mV ±0,9 FS
252 mV	500 mV	±252 mV	±500 mV	±500.00 mV ±0,9 FS
502 mV	1000 mV	±502 mV	±1000 mV	±1000.00 mV ±0,9 FS
1002 mV	2000 mV	±1002 mV	±2000 mV	±2000.00 mV ±0,9 FS

Common Mode Rejection Ratio (CMRR)

To guarantee a correct measurement of the input signal over the complete measurement range (uncropped signal amplitude), the input voltage on IN+ resp. IN- relating to the GND potential should not exceed 4 V.

Sensor excitation

- selectable bipolar voltage
- ±0.50 / ±1.25 / ±2.50 / ±5.00 V
- current load up to 45 mA per channel

26/87



-SENS

-VOUT



Bridge completion



Sx-STG supports the following types of bridge completion:

- quarter bridge to full bridge (fixed half bridge + selectable supplementation resistor)
- half bridge to full bridge (fixed half bridge)

Shunt check



With the shunt check an internal resistor is temporarily connected to one quadrant (section) or consecutively to all sections of the bridge circuit. This has a definite affect on the output of the bridge. Is the shunt check executed before start and after the end of each measurement task, the correct function (offset, gain, stability) of the sensor can be validated by comparing the results.

The shunt check can be initiated during

- the configuration mode
- the measurement mode

The parameters of the shunt check can be output in CSV format to the software to be stored and used later on. In order to identify the shunt check results within the data record, start and end of the shunt check process is marked with a series of -FS (Minus Full Scale) values.



SENS-Mode



Potentiometer single supply



Applications

- Measurement with sensors without a direct ground (GND) reference
- ▶ Voltage measurement up to ±50 V

Features

Sensor connection supporting 3-wire and 4-wire technique

 Sensor break detection for the 4 wires (IN, VOUT) indication by output of –Full Scale

Measurement ranges

- 0.01 / 0.02 / 0.05 / 0.1 / 0.2 / 0.5 / 1 / 2 / 5 / 10 / 20 / 50 V
- ±0.01/±0.02/±0.05/±0.1/±0.2/±0.5/±1/±5/±10/±20/±50V

Adjustable differential voltages (hardware adjust)

SENS measurement ranges		SENS adjust ranges
unipolar	bipolar	
5 V	±5 V	±2.25 V
10 V	±10 V	±4.50 V
20 V	±20 V	±9.00 V
50 V	±50 V	±22.50 V

Common Mode Rejection Ratio (CMRR)

To guarantee a correct measurement of the input signal over the complete measurement range (uncropped signal amplitude), the input voltage on IN+ resp. IN- relating to the GND potential should not exceed the limits listed in the table below.



SENS measurement ranges		max. input voltages	
unipolar	bipolar	IN+, IN- related to channel GND	
5 V	±5 V	±20 V	
10 V	±10 V	±20 V	
20 V	±20 V	±40 V	
50 V	±50 V	±100 V	

Sensor excitation

adjustable unipolar voltage

0.50 / 1.25 / 2.50 / 5.00 / 10.00 / 15.00 V

- ▶ adjustable bipolar voltage ±0.50 / ±1.25 / ±2.50 / ±5.00 / ±10.00 / ±12.00 / ±15.00 V
- current load up to 45 mA per channel



Applications

• Measurement with ICP sensors (Integrated Circuit Piezoelectric), mainly dynamic acceleration transducers

> Other piezo electric sensors (e.g. condenser microphone) can be supported

Features

DC decoupling through input capacitor

• Output of the actual measurement value depending on the configured sampling rate (output rate to LAN). In order to avoid measurement errors (aliasing) it may be reasonable to set the sampling rate to a higher frequency.

High speed regulation for sensor excitation current

Measurement ranges

- ▶ ±0.1/±0.2/±0.5/±1.0/±2.0/±5.0 V
- Frequency response 5 Hz ... 16 kHz



Sensor excitation

 regulated supply current of typically 4.5 mA, at a maximum off-load voltage of approx. 24 V

3.4.3 TEDS Class 2

The LEMO 2B version of Sx-STG is capable of supporting the use of Transducer Electronic Data Sheet (TEDS) enabled transducers. As a globally recognized industry Plug & Play standard, TEDS is defined under IEEE 1451.4 and distinguishes between two interface classes.

As soon as the input connector is plugged in, the Sx-STG module automatically detects Class II TEDS sensors (e.g. multi-wire interfaces with bridge-type sensors) and is able to read out sensorspecific data about the TEDS +/- interface, using a serial, master/slave model of communication.



3.4.4 Channel LED indication

Channel LED	Meaning	
Off	Device start up, channel inactive	
Yellow 1 Hz flashing	Identification of the selected channel during configuration.	
Yellow continuous	Waiting for user action! Sensor has been pluged in, but channel has not been initialized resp. channel is still inactive	
Green continuous	OK - Signal measurement is running. (Sensor connected)	
Red 1 Hz flashing	Error - source of fault could be: - over-current on excitation detected - sensor break or bridge break detected - counter overflow - general hardware error	
Red continuous	No sensor pluged in although channel is active	

4 CAN modules

4.1 M-THERMO2

8-Channel Temperature Measurement for K-Type Thermocouples

- ▶ 8 Thermocouple measurement inputs type K (NiCr/NiAl)
- Cold junction compensation per channel
- Separate ADC for each channel
- Status LED at each input channel (sensor break indication and configuration aid)
- Measurement data output to CAN
- Complete galvanic isolation (inputs, CAN, power supply, enclosure)
- Designed for engine compartment applications
- > Toolless module to module connection





4.1.1 Input cables

Standard (open)

600-888.xxx SIM-TH-MIN Cable open



Anschlußbelegung / Connection

SUB-MIN-Stecker, 2-pol. (grün) SUB-MIN-male, 2-pol. (green)

Pin-Nr. Pin-N <u>0</u>	Bezeichnung Designation	Litze-Nr. / Farbe Wire-№ / Colour
+	NiCr	grün / green
-	Ni	weiß / white

4.2 M-THERMO2 u

8-Channel Universal Thermocouple Inputs

▶ 8 Universal thermocouple inputs supporting type J, K, N, R, S, T, E

- Cold junction compensation for each channel
- Separate ADC for each channel
- Status LED at each input channel (sensor break indication and configuration aid)
- Measurement data output to CAN
- Complete galvanic isolation (inputs, CAN, power supply, enclosure)
- Designed for automotive use
- Toolless module to module connection





4.2.1 Input cables

Standard (open)

600-888.xxx SIM-TH-MIN Cable open



Anschlußbelegung / Connection

SUB-MIN-Steck	er, 2-p	ol. (grün)
SUR-MIN-male	2-nol	(green)

Pin-Nr. Pin-Nº	Bezeichnung Designation	Litze-Nr. / Farbe Wire-№ / Colour
+	NiCr	grün / green
-	Ni	weiß / white



4.3 M-UNI2

8-Channel Multi Input for K-Type Thermocouples and Voltage

- ▶ 8 analog measuring inputs for:
- K-Type thermocouples (NiCr/NiAl)
- Voltage up to ±30 V
- Cold junction compensation per channel
- Separate 24 Bit ADC for each channel
- Status LED at each input channel (sensor break indication and configuration aid)



- Measurement data output to CAN
- > Complete galvanic isolation (inputs, CAN, power supply, enclosure)
- Designed for engine compartment applications
- Toolless module to module connection

4.3.1 Input cables

Standard (open)

620-644.xxx Mc-THERMO VIN CL Cable open







Specific (assembled) 620-645.xxx Mc-THERMO VIN CL Cable Banana





620-643.xxx Mc-THERMO VIN CL Cable BNC/S




4.4 M-TDC

8-Channel Thermocouple Measurement

▶ 8 Thermocouple measurement inputs type K (NiCr/NiAl)

- Cold junction compensation per channel (RTD)
- Separate 24 bit ADC for each channel

Complete galvanic isolation (inputs, CAN, power supply, enclosure)

- Designed for engine compartment applications
- Direct connection of thermocouple cables
- (no plugs required)
- Toolless module to module connection



4.4.1 Input cables

Standard (open)

Thermocouple cable

- ▶ Type K accuracy class 1 DIN IEC 584 (1.5°C)
- Teflon based shell material
- Shell material operating temperature range
- -190 260 °C (-310 ... 500 °F)
- Cable core: 7 line wires à Ø 0.2 mm
- Cable cross section Ø 0.22m²
- Accessory: Pincer



4.5 M-RTD2

4-Channel RTD Temperature Input

- 4 measurement inputs for RTD
- Measurement data output to CAN
- Complete galvanic isolation (inputs, excitation, CAN, power supply, enclosure)
- Designed for engine compartment applications
- Toolless module to module connection



4.5.1 Input cables

Standard (open)

670-937.xxx PT100/RTD 0S Cable open

|--|

Lemo-Stecker OS, 4-pol. (schwarz) Lemo-male OS, 4-pol. (black)

Pin-Nr. Pin-N⁰	Bezeichnung Designation	Litze-Nr. / Farb Wire-Nº / Colo	
1 (P)	PT IN +	1 white	
2 (P)	I OUT+	2 brown	
3 (S)	PT IN -	3 red	
4 (S)	I OUT-	4 black	
Chassis	Shield	S (Shield, thick) blue	

4.6 M-SENS2

4-Channel Analog Input with Sensor Excitation

4 measurement inputs for voltage / current

▶ 4 separate sensor excitations, supply voltage individually selectable (up to 15 V, 60 mA)

- 12 unipolar and 12 bipolar measuring ranges
- TEDS support (optional)
- Measurement data output to CAN

• Complete galvanic isolation (signal inputs, excitation, CAN, power supply, enclosure)

- Designed for engine compartment applications
- Toolless module to module connection





4.6.1 Input cables

Standard (open)

670-807.xxx SIM-SENS Kabel offen (M-SENS, M-SENS2)

	SIM-SENS ?	
V IN or I IN		

Anschlußbelegung / Connection

Lemo-Stecker 1B, 6-pol. (schwarz) Lemo-male 1B, 6-pol. (black)

Pin-Nr. Pin-NՉ		Bezeichnung Designation	Litze-Nr. / Farbe Wire-Nº / Colour
1		VIN +	1 white
2	Shield	VIN -/ IIN -	2 brown
3		IIN +	3 red
4		+ VOUT	4 black
5		⊥GND	5 green
6		- VOUT	6 yellow
			S (Shield, thick) blue

CAN modules

4-Channel Universal Counter with Sensor Excitation

> 4 signal inputs with adjustable ON and OFF thresholds

• Measurement modes: frequency from period duration, period duration, pulse duration, pause duration, duty cycle, event counter, detection of rotating direction (mode frequency and event counter)

• 4 separate sensor excitations, supply voltage individually selectable (up to 15 V, 60 mA)

- Status LED at each input channel indicates signal processing
- Measurement data output to CAN

• Complete galvanic isolation (signal inputs, excitation, CAN, power supply)

- Designed for engine compartment applications
- Toolless module to module connection



IPETRONIK



4.7.1 Input cables

Standard (open)

670-858.xxx CNT/FRQ-IN Cable open



CNT IN

Anschlußbelegung / Connection

Lemo-Stecker 1B, 7-pol. (schwarz) Lemo-male 1B, 7-pol. (black)

Pin-Nr. Pin-N⁰	Bezeichnung Designation	Litze-Nr. / Farbe Wire-№ / Colour
1	IN +	1 white
2	GND	2 brown
3	IN -	3 red
4	+ Power	4 black
5	POWER GND	5 green
6	TEDS	6 <u>y</u> ellow
7	NC	7 violet
Chassis	Shield	S (Shield, thick) blue

4.7.2 Input / Principle details

Measuring method

The analog and digital input signal is evaluated with a programmable comparator threshold (switching threshold, hysteresis) and the following 48 bit counter. The FPGA and the digital signal processor (DSP) convert the respective counter values online into a frequency output (and duty cycle or time period).



The input signal is compared with the defined switching thresholds by using a comparator (see image). The result is a square wave voltage similar to the frequency at the comparator output. The pulse and the interval duration of this square wave voltage is detected with the internal 100 MHz counter.

If the timeout expires without any detection of an ON threshold, the zero indication will output the user defined minimal value. The setting of the timeout is recommended in order to avoid time delays in signal evaluation. A correct signal evaluation is supported only with sequent detections of ON and OFF thresholds.

Frequency

The frequency is acquired with the interval duration acquisition described above. The reciprocal value of the counter result of the interval duration measurement is scaled and sent correspondingly to the measuring range setting.

Duty cycle

The counter value of the pulse duration is divided by the counter value of the interval duration and correspondingly scaled and sent to the measuring range setting.

If the frequency is too low (or 0 Hz), 0 % (low level) or 100 % (high level) is sent depending on the signal level.

The thresholds on and off do usually differ and cause different results of the pulse duration and the duty cycle if the signal edges are low, depending on the defined thresholds.

Interval duration

The interval duration is acquired with the acquisition described above. The counter value between two thresholds on is detected, scaled, and sent correspondingly to the measuring range setting.

Pulse duration

The pulse duration is acquired with the acquisition described above. The counter value between the threshold on and the threshold off is detected, scaled, and sent correspondingly to the measuring range setting.

The thresholds on and off do usually differ and cause different results of the pulse duration if the signal edges are low, depending on the defined thresholds.

Pause duration

The pause duration acquisition corresponds to the pulse duration acquisition with inverted input signal.

Mode – Ignore Frequency Drop

The module supports in the mode tab sheet a function called: "Ignore frequency drop". With this function it is possible to measure RPM when several teeth on the reflector or missing.



The drop voltage can be configured in the PlugIn options:

IPEmotion settings - IPETF	RONIK X
Ethernet interfaces CAN in	terfaces Options Components
Aliasing-free filter settings	
Aliasing-free filter setti	ings:
CSV import mode	
CSV import mode:	Default 👻
Calibration interval	
Interval:	2 Years
Warning:	30 days before expiration 🔹
TEDS sensors	
Live-Zero settings:	
Special measurement modes	
Frequency drop tolerance:	1,75



Status LED at the input

The status LED at the respective input indicates the acquisition of a frequency signal. This is the case if both switching thresholds of every value are reached (threshold on and off).

The status LED is on / flashes in time with the signal frequency if:

- the corresponding channel is active and
- the device is in the acquisition mode (acquiring data) and
- the switching thresholds are correctly defined.

Due to the slowness of visual proceeding, only frequencies under approx. 10 Hz can be seen as a flashing. The LED is permanently on at higher signal frequencies.

4.8 CANpressure

Automotive Pressure Sensor with Data Output to CAN

Absolute or relative pressure gauge

▶ Various types of CANpressure covering a pressure range of 0 ... 1 bar to 0 ... 250 bars available

- Built-in sensor to measure the temperature at the gauge point
- Measurement data output to CAN
- Complete galvanic isolation (amplifier, CAN, power supply, enclosure)
- Designed for engine compartment applications



4.8.1 Pressure connections





Dimensions	D	L1	L2	Fastening torque	Wrench size
M 10 x 1 male	10 mm	8.5 mm	25.5 mm	17 23 Nm	24 mm / 0.94 in
M 10 x 1 female	10 mm	9.5 mm	26.5 mm	17 23 Nm	24 mm / 0.94 in
M 14 x 1,5 male	14 mm	9.5 mm	25.5 mm	17 23 Nm	24 mm / 0.94 in
M 14 x 1,5 female	14 mm	10.5 mm	26.5 mm	17 23 Nm	24 mm / 0.94 in
G ¼ male	13.2 mm	9.5 mm	25.5 mm	17 23 Nm	24 mm / 0.94 in
G ¼ female	13.2 mm	10.5 mm	26.5 mm	17 23 Nm	24 mm / 0.94 in



Keep the stated range of the fastening torque when mounting CANpressure to ensure full accuracy!

Do not exceed the upper limit of the fastening torque to avoid an irreversible damage of the pressure transmitter!



Pressure transdu (relative, absolut	ıcer)	Overload pressure	Burst pressure
0 1 bar / 0 . 0 2 bar / 0 . 0 5 bar / 0 . 0 10 bar / 0 . 0 20 bar / 0 . 0 25 bar / 0 .	 14.5 psi 29.0 psi 72.5 psi 145 psi 290 psi 363 psi 	3 x FS (Full Scale) 3 x FS 3 x FS 3 x FS 3 x FS 3 x FS 3 x FS	 > 200 bar / 2,901 psi
0 50 bar / 0 . 0 100 bar / 0 . 0 150 bar / 0 . 0 250 bar / 0 .	725 psi 1,450 psi 2,175 psi 3,626 psi	3 x FS (Full Scale) 3 x FS 3 x FS 3 x FS 3 x FS	> 850 bar / 12,328 psi > 850 bar / 12,328 psi > 850 bar / 12,328 psi > 850 bar / 12,328 psi
other pressure rar Medium compati	nges on req	uest	

Gases and fluids (also fuels and break fluids) up to 200 bar / 2,901 psi, other conditions on request

4.9 SIM-STG

Fast 8-Channel Multi-Analog Measurement Device with Excitation

- 8 analog signal inputs for voltage measurements
- Measurement modes: SENS, STG, ICP, individual for each input
- Hardware filter and DSP software filter
- > 8 separate dual sensor excitations (up to \pm 15 V, up to \pm 45 mA)
- Offset and target adjust functions, shunt check
- Internal resistors for bridge completion selectable
- Measurement data output to CAN
- Complete galvanic isolation (inputs, excitation, CAN,

power supply, enclosure)

Designed for automotive in-vehicle use



4.9.1 Input cables

Standard (open)

670-850.xxx DMS/STG Cable open (7-pin DMS compatible)



Lemo-Stecker 1B, 7-pol. (schwarz) Lemo-male 1B, 7-pol. (black)

Litze-Nr. / Farbe Wire-Nº / Colour

1	IN+	white	1
	-VOUT	brown	2
	+ VOUT	red	2
3	IN-	black	7
4 <u> </u>	-SENS	green	5
	+ SENS	vellow	e
	GND + Shield	violet (blue)	7
		J	'



4.9.2 Signal input modes Refer to Sx-STG

STG-Mode Refer to Sx-STG

SENS-Mode Refer to Sx-STG

ICP-Mode Refer to Sx-STG

4.10M-SENS 24

The M-SENS 24 module is based on 3 M-SENS modules which are integrated to one box.





4.11 Multi DAQ

The Multi DAQ is a universal module including counter inputs, analog inputs and temperature inputs.



For technical specifications refer to the following modules:

- M-SENS
- M-THERMO
- M-FRQ

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5 IPEmotion 5.1 PlugIn IPETRONIK-X

5.1.1 Installation

• Copy the installation file **Setup IPEmotion PlugIN IPETRONIK X.exe** to a local subdirectory on your PC.

- In case you do not have this file, at fist visit <u>http://www.ipetronik.com/en/software/plug-ins</u>.
- Search the PlugIn IPETRONIK-X and download latest version
- Start the file Setup IPEmotion PlugIN IPETRONIK X.exe located on your PC.

• Follow the steps provided by the InstallShield Wizard (Confirm the destination folder or define an individual directory).

5.1.2 Activation

Start IPEmotion.

• Select **Options** from the top icon bar.

• Select **Plugins** from the left-hand lower area.

• Activate the PlugIn **IPETRONIK-X**

• Click **OK** to confirm your selection.

Open the PlugIn specific settings by clicking to the wrench tool symbol if you need to modify settings for the ETH or CAN interface, e.g. to set the Ethernet IP range.

equently used	Active		Title		Version	Description	1
asic settings		i i	IPETRONIK CAN		01.14.01	Connection of IPETRONIK CAN acquisition modules	-
ppearance			IPETRONIK X	9	02.03.00 -	IPETRONIK CAN and Ethernet devices	
ew		ana -	IPETRONIK LOG		03.57.01	IPETRONIK Data logger (M-LOG, S-LOG, FLEETlog,	
ata manager		1	CAN-Send		01.00.01	CAN-Send with IPETRONIK CAN server	1
nport		.	CAN-Acquisition		01.06.00	CAN-Acquisition with IPETRONIK CAN-Server	
kport		<u>el</u>	IPEsensors		01.00.00	IPETRONIK sensors	
nalysis		0	Video		01.01.00	Synchronic recording of video data for cameras su	
aps		1	WAGO PLC		01.00.00	WAGO Controller	1
rectories		a.	Protocols		01.05.00	Protocol acquisition with any CAN hardware or ETH	L
nits		<->	ETH		01.01.00	UDP or TCP socket connection	
otkey		tm 201	technikmedia Universal .		01.01.07.0000	Universal Modbus PlugIn	
ser administration	•				III	•	
Ecloud						Download	
ugIns	Plugin s Specify the The used no autom	e ttings ne plugin plugin v atic upd	is to be used. ersion can be changed wi ate is run at installing late	thi r p	in the list. If a versio olugin versions.	n number is selected that ends with a '=' character,	

thernet hardw	are detection interfaces		
	Detection mode	Enable all 🔹	
Enable	IP4 address rang	e Network interface	
192	. 168. 232. 1 - 40	Not connected	Address range
192	. 168. 233. 1 - 40	Not connected	Address range
192	. 168. 234. 1 - 40	Not connected	Address range
192	. 168. 235. 1 - 40	Not connected	Address range
		Set all IP address ranges	



In order to operate the PlugIn IPETRONIK-X and IPETRONIK-CAN in parallel, you have to disable the use of the CAN modules (through the CAN interface) for the PlugIn IPETRONIK-X.

IPEmotio	on settings -	- IPETRO	NIK X				x
hernet in	terfaces C	AN interfa	ces Options	Components			
CAN hard	ware detection	on interfac	es			CAN hardware detection baud rates	
	Detectio	on mode:	Enable all		•	1 Mbd 💌	
Enable		Medium	S	Gerial	CAN bus	500 kBd 🗵	
	IPEcan	τ.	0	d CAN-1	.	250 kBd 📃	
	IPEcan	Ŧ	0	d CAN-2	.	125 kBd 📃	
	IPEcan	Ŧ	0	d CAN-3	.	100 kBd 📃	
	IPEcan	Ψ.	0	d CAN-4	Ŧ	50 kBd 📃	
AN devic	e synchronis	ation mod	2				
		Mode:	Free-running		•	CAN interface	pre-sett
						OK Ca	ancel



Basic settings for the software filters (aliasing free sampling) and the CSV import (standard, device creation).

IPEmotion settings - IPETRONIK >	<	x
Ethernet interfaces CAN interfaces	Options Components	
Туре	Priority	
🚔 IPETRONIK X		-
B Sx-STG	Normal	≡
🖙 Mx-SENS2 8	Normal	
mx-SENS2 4	Normal	
🚍 M-SENS2	Normal	
🚔 M-SENS2 DSP	Normal	
🚔 M-SENS2 250HZ	Normal	
🚔 M-SENS2 250HZ DSP	Normal	
M-SENS	Normal	
M-SENS DSP	Normal	
M-SENS 8	Normal	Ŧ
	OK Cancel	

Basic settings for the device pool. Reduce the number of device types to be used by assigning a priority: High, Normal, Low, Not used.



5.1.3 PTP driver

For data synchronization and optimized data processing the IPEmotion PlugIn IPETRONIK-X makes use of the Windows 7 PTP driver. An accurate measurement data processing requires the correct operation of this driver.

Digital driver signature

The IPETRONIK PTP driver is digital signed with a certificate contaning a SHA-2 hashing algorithm. The SHA-2 code signing and verification functionality was not available with former Windows 7 installations. If Windows updates have not been executed regularly, an error message may occur when installing the driver.



Windows requires a digital signed driver.

In this case you have to update your computer manually.

Please visit this Microsoft website for detailed information: https://technet.microsoft.com/en-us/library/security/3033929

Please check if the following security updates have been installed on the PC:

- KB 3035131
- KB 3033929

If not, please install them manually with the following order: 1. KB 3035131, 2. KB 3033929

It can be that the installation of the KB 3035131 reports that the patch is already installed (even if it is not displayed in the update list). Install the second patch and start the PlugIn IPETRONIK-X installation again.



5.1.4 System overview

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File Project Signals Acquisit	on View	Data manage	er Ana	alysis R	eporting	Scripting	Info	(0
System Components Functions Import Export	Check Adjust	Detect Initializ	e Display	Details					
Configuration		Acces	s	View					
V02.05.00	Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling rate	
Name	9								*
	91200495_	1 🗹	V	-1,00000	1,00000	-1	1	1 kHz	
🖬 👬 X-1 26	91200495_	2 🖌	V	-1	1	-1	1	1 kHz	
91200495 Mx-STG2 6 6	91200495_	3 🖌	V	-1	1	-1	1	1 kHz	
91600756 Mx-SENS2 4 4	91200495_	4 🖌	V	-1	1	-1	1	1 kHz	
91101293 Mx-SENS2 8 8	91200495_	5 🖌	V	-1	1	-1	1	1 kHz	
1 92000634 Sx-STG 8	91200495_	6 🖌	V	-1	1	-1	1	1 kHz	
4 mm X-2 16	91600756_	1 🖌	V	-100,000	100,000	-100	100	1 kHz	
57801711 M-THERMO2 8	91600756_	2 🖌	V	-100,000	100,000	-100	100	1 kHz	+
58600863 M-CNT2 4	Conoral		Diselari	erre anda	Tourite Kee	Cites De			
⊿ 🚠 X-3 26	General Foi	rmat scaling	Display	SIG mode	Excitation	Hiter Da	ata output		
🚔 56601978 M-THERMO 16 16	Acti	ve: 🗸							
🏂 59503087 CANpressure 2	Nan	ne: 91200495_	1						
🚔 57901354 M-THERMO2 u 8	Descriptio	on: Analoger Me	esseingang fi	ür DMS und Di	fferenzsignale	2			
	Referen	ce: 91200495	1///9120049	5 Mx-STG2 6/)	(-1				
	Sampling ra	-							
	sampling ra	ILE: I KHZ		•					
									2

Ethernet hardware

General	Ethernet hardwa	are CAN hardware	Options
IP	4 address range:	192.168.232.1	192.168.232.40
Ne	etwork interface:	Not connected	

System tree – column chooser function

In the system tree you can use the column chooser to add additional information to the devices.



Customization	×
Automatic CAN-ID configuration	
Base type	
Bus load	
CAN send rate	
Clock	
Com. ID	
Configuration version	
Device production date	
Download kernel version	
Firmware version	
First CAN-ID	
FPGA version	
Front number	
Hardware version	
High sampling rate	
Index	
IP address	
Last calibration date	
License information:	
Network interface	
PIC-Firmware version	
Туре	
Using 29-bit identifiers	
X-Link load	

CAN hardware

General	Ethernet hardwa	are	CAN hardware	Option	าร
	Medium:	Х		Ŧ	
	Serial number:	0			
	CAN bus:	CAN	-1	Ŧ	
C	Device baud rate:	500	kBd	*	
	Bus load:	0,0	%		
Baud	rate initialization:	~			

Data communication betwee	en modules
and PC:	

Medium: X via X-LINK system and LAN interface

Medium: CAN via CAN interface



The PlugIn IPETRONIK-X also supports a data acquisition from the CAN modules by the CAN interface only. This means it can be used as an alternative to the PlugIn IPETRONIK-CAN.

If you do so, please take care that the respective firmware (\geq V04.00) is loaded on the modules.

Options – Define start CAN ID

On interface level the start CAN ID can be defined. You can use the column chooser to add the column CAN ID the channel grid to get an overview of the defined CAN IDs. By default the first module will get CAN ID A.

	- 8 6	2 AUTO A	4 X	i b	Ĩł	Ľ	e e	\times §	×	2		()	S ?		- 🧄	Ŧ
File	Project	Signal	A A	cquisi	ition		View	Data	man	ager		Analy	sis	Repo	rting	Scriptin
			↓	1		Ô		K	ł)				
System	Components	Functions	Import	Expo	ort (Check	Adjust	Detect	Init	tialize	Displa	ay I	Details			
		Config	uration						A	ccess			View			
V02.07.00	0.25207 RC				N	Name				Active	C	AN ide	ntifier [d	ec]		Unit
Name			Σ		9									<		
					► 5	587001	67_1			~					10	V
4 👬	X-2			8	5	587001	67_2			~					10	V
-	5870016	7		4	5	587001	67_3			~					10	V
-	\$ 5870013	9		4	5	587001	67_4			4					10	V
					5	587001	39_1			4					11	V
					5	587001	39_2			~					11	V
					5	587001	39_3			~					11	V
					Gen	eral	Ethernet	hardwar	e	CAN	ardwa	are	Options	;		U.
							Automa	tic CAN I	D pla	acing:	~					
								Star	t CA	N ID:	10					d
												Name	es out of	serial n	umbers	

In the example below the start CAN ID was set to 100. You can witch the CAN ID format from Hex. To decimal or binary format.

2 1 🔒 🗄 🗟 🎰 🖨	χ Γ	1	6 🔒 🖪	× 🕺	50	i 🖚 🕙 ?) 📠 💩 -	÷
File Project Signals	Acqu	uisitio	n View	Data ma	anager	Analysis	Reporting	Scripti
System Components Functions I	mport Ex	port	Check Adjust	Detect I	Access	isplay Details		
V02.07.00.25207 RC			Name		Active	CAN identifier [dec] 🔺	Unit
Name	Σ	Ŷ						
			58700167_1		~		_ 100	v
- 🏯 X-2	8		58700167_2		~		100	v
58700167	4		58700167_3		~		100	V
58700139	4		58700167_4		~	std	100 d	٧
			58700139_1		~		101	v
			58700139_2		~		101	V
			58700139_3		~	/	101	v
			58700139_4		~	1	101	V
					CALIF			
		G		atic CAN ID		uware Optor		
			Automa	Start (CAN ID: 1	00		d
						Names out of	fserial numbers	

If you take the checkbox "Automatic CAN ID placing" out you can add individual CANID via the channel grid.

2 1 🔒 🗄 😹 🚔 🗄	X 1		i 🖻 🗿 R	× 🗶	5	i 🗱 🕙 🕐	🔊 🖗 -	Ŧ
File Project Signals	Acqu	isitio	on View	Data mar	nager	Analysis F	Reporting	S
System Components Functions	Import Ex	port	Check Adjust	Detect In	itialize Di	Details View		
V02.07.00.25207 RC			Name		Active	CAN identifier [de	c]	Unit
Name	Σ	9						
			58700139_1		~	std	110 d	v
⊿ 📩 X-2	8		58700139_2		~		111	۷
58700167	4		58700139_3		~		112	V
58700139	4		58700139_4	Indicidua	CAN		113	۷
			58700167_1	multituda	CAN	ib deminiori	100	V
			58700167_2		~		101	٧
			58700167_3		~		102	۷
			58700167_4		~		103	V
		G	eneral Ethernet	hardware atic CAN ID pl Start C/	CAN har lacing:	dware Options		d
				our co		Names out of se	erial numbers	u

5.1.5 Using several DAQ systems and interfaces

The PlugIn IPETRONIK-X supports a simultaneous data acquisition using different Ethernet and/or CAN interfaces. The PlugIn will identify all interfaces (and connected devices), if they are available and if they have been installed correctly.

Alternatively you may create virtual systems (no real hardware connected) by the software.

🔤 🔁 🖴 🗃 🖻	🏥 🔒 🐰		Ê	A 🖪	X	× 🖌		80	n 🕹 -	⇒ X-IF	Emotion		3
File Project	Signals	Acquisitio	n	View	Da	ta manag	er Ana	alysis F	Reporting	Scripting	Info	\bigcirc	0
System Components	Functions Import	t Export	Ched	k Adjust	Dete	t 🗱	ze Display	Details					
	Configuration					Acce	SS	View					
V02.05.00				Name		Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling rate	
Name		Σ	۴										*
			•	91200495_1	L		V	-1,00000	1,00000	-1	1	1 kHz	
🔺 📩 X-1		26		91200495_2	2	~	V	-1	1	-1	1	1 kHz	
91200495	Mx-STG2 6	6		91200495_3	3	~	V	-1	1	-1	1	1 kHz	
91600756	Mx-SENS2 4	4		91200495_4	ł	~	V	-1	1	-1	1	1 kHz	
91101293	Mx-SENS2 8	8		91200495_5	;	4	V	-1	1	-1	1	1 kHz	
92000634	Sx-STG	8		91200495_6	5	4	V	-1	1	-1	1	1 kHz	
-4 == X-2	M CENCO	16		91600756_1		4	V	-100,000	100,000	-100	100	1 kHz	
58/01652	M-SENSZ	4		91600756_2	2	~	V	-100,000	100,000	-100	100	1 kHz	
58600863	M-CNT2	4								-			
⊿ 🏥 X-3		26	Ger	Forr	mat	Scaling	Display	SIG mode	Excitation	Hilter Da	ata output		
56601978	M-THERMO 16	16		Activ	e: v	•							
59503087	CANpressure	2		Name	e: 9	91200495_	1						
57901354	M-THERMO2 u	8		Description	n. []	Analoger M	esseinaana fi	iir DMS und D	ifferenzsional	P			
				Description		andiogen	coocingung n		interenzaignar	-			
				Reference	e: [91200495_	1///9120049	5 Mx-STG2 6/	X-1				
				Sampling rat	te:	1 kHz	X-1 X-LINK	and CA	N modu	les via E	thernet ir	nterface	
							X-2 CAN mo	odules (M2-Serie	es) via 1	st CAN ir	nterface	2
							X-3 CAN mo	odules (M-Serie	s) via 2n	d CAN in	terface	

Refer to **Options** > **PlugIns** > **IPETRONIK-X** for interface settings on LAN and CAN bus.

Detect

5.2 Using modules

5.2.1 PC network settings

IPETRONIK-X modules are supporting DHCP (Dynamic Host Configuration Protocol) and manage the IP addresses of the clients connected to the local network. Check and verify the **Properties of the LAN connection** from the system control of your PC:

Windows 7:Network and Services,Windows XP:Settings > Network Connections)

Verify the setting Receive IP-Address automatically at the network settings Internet protocol properties.



For Windows 7 we recommend to switch the User Account Control (UAC) off resp. to set it to the lowest level.

5.2.2 Connecting modules

- > Daisy-chain all required modules using the respective cables as shown in the diagram System overview .
- Connect the data cable to the Ethernet interface of your DAQ PC.
- Connect the PWR cable with an appropriate power supply (output voltage 9 V_{DC} to 36 V_{DC}),
- Connect the sensors with the respective input cables to the measurement inputs.
- Switch on the power supply.

5.2.3 Detecting modules

Move to the main tab **Signals**.

		₩ 41 G)	< i	× 🖸 🖻 🚳	8 9 <u>/</u>	8 🖕	- -	IPE	motion			
File Project Sign	als Acquisition	n View Da	ta m	anager Analys	sis Repo	rting	Scripting	Info			6	5
System Components	Functions Im	port Export	C	heck Adjust	Detec	t Initi	alize Displ) Lay Det	ails			
	Configura	tion				Acc	iess	Vie	W			
V02.03.00				Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling	ra
Name		Σ	7									
			>	91100834_1								
🔺 🄜 X-1		20		91100834_2	V	V	-100,000	100,000	-100	100	10 Hz	
🚔 91601735 M	1x-SENS2 4	4		91100834_3	2	V	-100,000	100,000	-100	100	10 Hz	
91100834 M	1x-SENS2 8	8		91100834_4	1	V	-100,000	100,000	-100	100	10 Hz	
3 92001059 S	x-STG	8		91100834_5	2	V	-100,000	100,000	-100	100	10 Hz	
			₹									Þ
			G	eneral Format	Scaling	Displa	ay Excitat	ion Filter	Data output	t		
				Active	: 🗸							
				Name	911008	34 1						_
				Description	Apples	-	ion innut for	tonsion loou	or			_
				Description	: Analog	acquisii	Jon Input for	tension/pow	er			_
				Reference	911008	34_1///	91100834 M	Ix-SENS2 8/X	-1			
				Sampling rate	: 5 kHz			*				

5.2.4 Add new modules manually

- Go to the main tab Signals.
- Add an IPETRONIK X system (Add system)
- Select Add components from the menu bar. ▶



Database

5.2.5 Adjust

SIM-STG

System

M-SENS (with DSP)

Mx-STG2 6 / Sx-STG

Project

₽.

•

▶

▶

Adjusts the channel scaling settings with sensor settings from the sensor database.

Signals

Components Functions Import Export Check

Configuration

TEDS

sensors. Offset

Shunt Check

Adjust the channel scaling with TEDS

Run channel offset adjustment

Run channel shunt check

Adjust

TEDS

Adjusts the channel scaling settings with sensor settings from the TEDS chip of the connected sensor.

Offset

Executes an offset adjust for selected channels, resp. for all channels defined within a group. The reference value or target value can be defined by the user. As soon as the adjustment has finished, offset values, available measurement ranges and results of the adjustment command are displayed.



All active channels which support the offset adjust are displayed.

• Select those channels who need to be adjusted:

all channels, the highlighted channels, all channels of a group.

- Press Start to execute adjustment.
- > Offset values, available measurement ranges and results of the adjustment command are displayed.
- > Press Export to save adjustment values to CSV or HTML file. These values will not saved in the module.





Sx-STG supports a real adjustment by hardware. This provides the user a full measurement range. (refer to <u>Adjustable differential voltages</u> for more information)



Offset adjust reports error warning (Sx-STG Lemo 2B)

Executing an offset adjust for one or several channels while not all active inputs are connected to a sensor will lead to an adjustment error. Because of this incorrect adjustment procedure a potential offset will not be aligned and no adjustment values will be stored.

Shunt Check

The Shunt check feature verifies the correct operation of a strain gage sensor. Refer to Sx-STG > STG mode > <u>Shunt check</u> for more information.

2	Shunt check										? 💌		
Dr	Drag a column header here to group by that column												
	Name	Bridge type	Bridge resistance	Shunt resistance	%	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Offset	Result		
7			-			-							
>	Stimmgabel	Quarter bridge	350 Ω	174,65 kΩ	10 %						OK		
	DMS_1	Half bridge, 2 active STG	350 Ω	98 kΩ	10 %						OK		
	DMS_2	Half bridge, 2 active STG	1 kΩ	98 kΩ	10 %						OK		
	92000052_4	Full bridge, 4 active STG	350 Ω	100 kΩ	10 %						OK		
	Stimmgabel	Quarter bridge	350 Ω	174,65 kΩ	10 %						OK		
	92000052_6	Quarter bridge	350 Ω	100 kΩ	10 %						OK		
	92000052_7	Full bridge, 4 active STG	120 Ω	100 kΩ	10 %						OK		
	92000052_8	Quarter bridge	350 Ω	100 kΩ	10 %						OK		
						The p calcul Refer resist	ercentag ated valu to the se ance and	e of the t ue based ensor data I the requ	olerance on the cu a sheet fo ired shur	releat urrent or the l nt resis	es to the settings. oridge stance.		
① ② ③ ④ ① ② ③ ④ □ ② ③ ● □ ② ③ ● □ ○ ○ ● □ ○ ○ ● □ ○ ○ ● □ ○ ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● □ ● ● ● ● □ ● ● ● ● □ ● ● ● ● □ ● ● ● ● □ ● ● ● ● □ <td< th=""><th>ge Calibration ridge ne of the R. The slues. The range</th></td<>											ge Calibration ridge ne of the R. The slues. The range		

- All active channels which support the shunt check are displayed..
- Select those channels who need to be checked:
- all channels, the highlighted channels
- Press **Start** to execute the shunt check.
- The shunt check results depend on these settings
- Bridge type
- Bridge resistance
- Excitation (sensor)
- Shunt resistance
- > The shunt check is executed consecutively on all arms of the bridge.
- Current values for each quadrant, as well as status results are displayed with the shunt check.
- Press Export to save shunt-check values to CSV or HTML file.

🖻 🎦 🖴 🗃 🔛	🍰 🔒 🔀 🖻 💼 🖡	i 🐴 🕻	X X 🗠 🗠 🐝	89	8 🌜	- = M	x_Sx - IPEm	otion 😐		X			
File Project	Signals Acquisition	View	Data manager Analy	/sis Repo	orting	Scripting	Info		\diamond	0			
System Compone	System Components Functions Import Export Check Adjust												
· · ·													
	Configuration	1	1-		Aco	cess	V	liew					
V02.02.00			Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Ma	ax			
Name		Σ	8										
			91601735_1		V	-100,000	100,000	-100	100	≡			
🔺 🏥 X-1		22	91601735_2		V	-100,000	100,000	-100	100				
91 🗄	Components	6	91601735_3		V	-100,000	100,000	-100	100				
1 91 F	Change into	8	91601735_4		V	-100,000	100,000	-100	100				
11 921	Functions	0	91699999			0	65535	0	65535				
4	Import 🕨		> 91699999		4	100.000	65535	100	05535				
	Export •		A2L		W I	100,000	100,000	-100	100				
	Use as default		Export to A2L file (com	press)		100,000	100,000	-100	100	Ť			
X	Cut Ctrl+X		CANdb export			dware (Options			_			
E	Copy Ctrl+C	2	Export of the system of into a CANdb	onfiguration	' D								
	Paste Ctrl+V		XML CANdb-Export										
Ē	Paste behind		Export of the system of into an XML CANdb	onfiguration	1		+						
×	Delete		BLOB Export				+						
2	🤇 Clean		onfiguration	1									
e e e e e e e e e e e e e e e e e e e	Copy to file		App-Export for IPEh	ub2									
G	Paste from file Export CAN configuration for IPEmotion App												
4	Properties									~			

Export of a CANdb

- Highlight the X-System at the left-hand system structure.
- Select **Export** from the tool bar or from the context menu (right-hand mouse button).
- Select **CANdb export** or **XML CANdb export** and enter an individual file name to save the settings of all CAN signals used in the system (CAN output channel and CAN-Monitoring signals) to the DBC description file.



5.3 Module settings

5.3.1 Overview

👝 🏠 🔒 🗄 🗟 🚵 🖶 🗶 🖻 🖺 🗳 🏝	3	X 🕅 🗖 🗖	🦚 🕙	0 🔊	🎂 - 📼	I	PEmotion			x
File Project Signals Acquisition View	D	ata manager 🛛 A	nalysis	Reporti	ing Script	ing Info			\sim	0
System Components Functions Import Ex Configuration	port	Check Adju	ust	K Detect	Initialize Access	Display	Details View			
V02.03.00		Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling r	ate
Name S	7									-
	>	57802011_1	V	°C	-60,00	1370,00	-60	1370	10 Hz	
🖌 🚎 X-1 20		57802011_2	V	°C	-60,00	1370,00	-60	1370	10 Hz	
🖙 91601735 Mx-SENS2 4 4		57802011_3	V	°C	-60,00	1370,00	-60	1370	10 Hz	Ξ
🖙 91100834 Mx-SENS2 8 8		57802011_4	V	°C	-60,00	1370,00	-60	1370	10 Hz	
1 92001059 Sx-STG 8		57802011_5		°C	-60,00	1370,00	-60	1370	10 Hz	
▲ 🚎 X-2 18		57802011_6	~	°C	-60,00	1370,00	-60	1370	10 Hz	
57802011 M-THERMO2 8		57802011_7		°C	-60,00	1370,00	-60	1370	10 Hz	+
58601285 M-CNT2 4	•					1		1	•	
59504097 CANpressure 2	G	General Extende	ed Info	rmation	1					
÷		Active	. 🖂		1					
		Active	• •							
		Name:	57802	011 M-T	HERMO2					
		Description:	8 anal	og therm	ocouple acq	uisition input	s			
		Reference:	57802	011 M-TI	HERMO2/X-2	2				
		Compliant rate	. 10.4-							
		Sampling rate	. 10 HZ			Ŧ				
								🔲 🕞 Lise d	av 8 of 60	2

5.3.2 Extended module settings

- Switch to the main tab **Signals**.
- > Select the respective module at the left-hand system structure.
- > Enter the **Extended** tab from the configuration area at the right-hand down area.

General	Extended	Information	
		Front number:	753
	E	nable simulation signals:	
		Sampling rate mode:	🔾 Normal (10 Hz - 10 kHz)
		ß	High (1 kHz - 100 kHz)
	Bus	load: 0,0 %	

Front number

The front number defines the last 5 digits of the device number.

Enable simulation signals

This simulation tests the connected measurement chain including all devices. During simulation, a ramp of all signals is generated and an acquisition with all available sampling rates is run. Please note that this simulated test of the complete hardware does not include the AD converter.

Sampling rate mode (Sx-STG, Mx-STG2, Mx-SENS2 4)

Normal

- Sampling rates 1 Hz to 10 kHz supported
- up to 4 different sampling rates per module
- A2L-Export of the current settings supported to output measurement data to

external software (CANape, INCA)

High

- Sampling rates 1 kHz to 40 kHz (100 kHz with Mx-SENS2 4, Mx-STG2) supported (IPEmotion)
- > a single sampling rate valid for all channels of the module



5.4 Channel settings

5.4.1 Common settings

General

General	Format	Scaling	Display	Excitation	Filter	Data output					
	Active:	V									
	Name:	916017	91601735_1								
De	escription:										
R	eference:	916017	91601735_1///91601735 Mx-SENS2 4/X-1								
Sam	pling rate:	50 kHz		+							

Format

General	Format	Scaling	Display	Excitation	Filter	Data output	:		
Data ty	/pe								
	Type:	16-Bit	integer un:	signed		- Ta	sk:	Default	-
N	10 C Inc.	32-Bit	floating po	int				L	
Novalue	e / Detaultval	u 16-Bit	integer un	signed					
	Value:	-FullSc	ale			Deactiv	ate	NoValue and use Default Value	
Channe	el type								
	Input:	1		C	Dutput:		N	Ax-STG2 6 supports in addition the	
-							d	ata format 32 bit floating point	

Display

General Format S	caling Display Excitation Filter Data output
Displaying area	
Min:	-100,000 Max: 100,000
Formatting	
Decimal places:	Automatic 👻
Name	
Name:	91601735_1





Deactivating the hardware filter causes the risk of incorrect acquisition through aliasing effects! The hardware filter blocks interfering frequency spectra (harmonics) in periodic signals.



 Go to PlugIn Options and activate Aliasing-free filter settings (Options tab)

 Image: Contract of the setting of the setti

in order to automatically adapt software filter settings for aliasing free measurement.

Data output (Ethernet, CAN)

Use the **Data output** tab of the respective channel to output measurement signals to CAN and/or Ethernet. Highlight an input channel and enter the **Data output** tab to select the signal output medium.

General	Format Scali	ng Display STG mod	le Excitation	Filter	Data o	utput			
Signal out	out configuration								
	Output medium:	Ethernet	*						
	CAN send rate:	CAN							
		Ethernet + CAN							
CAN settir	igs								
	CAN-ID:	std O	d						
	LSB:	0							
General Signal out	Format Scali	ng Display STG mod	de Excitation	Filter	Data o	output			
	output medium;	CAN				CAN	I send rate	es	
	CAN send rate:	1 kHz	~			Outr	ut modium	CAN	
		50 Hz	E .			Uut		I CAN.	
CAN settir	igs	100 Hz				upic			
	CAN-ID:	500 Hz				Outp	out medium	Ethernet + C	AN:
	LSB:	1 kHz				50 H	lz, 100 Hz		
		2 kHz							



The system assigns CAN IDs automatically based on the following:

- channels/modules with high data rate get a low CAN ID
- within the same data rate, a descending sequence based on the serial number is used
- CAN IDs of unused channels will be reserved
 - (e. g. with an 8 channel device, but only 4 channels activated:
 - channel 1 ... 4 activated > ID 11 start bit 0, 8, 16, 32
 - channel 5 ... 8 inactive > ID 12 start bit 0, 8, 16, 32).

М		oin	t pur	nhor		Cus LSB	stomiza	tion		×			
IVIC	asunny p		ınur	innei		Mea	suring po	oint number					
						NoV	alue		13				
	Name	Unit	Active	Phys Min	Phys	Offs	et				ate Measuring point r	number	
٩						Out	put						
I	91600756_1	۷	~	-100,000	100,	Phys	s High					15	
	91600756_2	V	~	-100,000	100,	Phy:	s Low			Ŧ		0	
	91600756_3	V	~	-100,000	100,0	000	-100	100	1 kHz			0	
	91600756_4	V	>	-100,000	100,0	000	-100	100	1 kHz	A t s ii c	After selection by the an individual number of each channel. The sorting abilities or a me of the sorting abilities or a me of the sorting abilities of a me of the sorting abilities or a me of the sorting and the sorting about t	ne colui er can l nis can is chara easurini	mn chooser, be assigned be used for acter g point

5.4.2 Mx-SENS2 4, Mx-SENS2 8, Mx-SENS

📧 🔁 🖴 🖶 🔀 🏯 🗛 🗶 🖻 🛍	🖻 🔁 🖪 🗙 🔌	() () () () () () () () () ()	🛇 🖓 🖉 🌜	- ∓ M	lx_Sx - IPEmo	otion 😐					
File Project Signals Acquisition	n View Data ma	anager Analysi	is Reporting	Scripting	Info		⇔ 😮				
Image: System Image: Components Image: Functions Image: Functions											
V02.01.00	Name	Active	Unit Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling rate				
Name	Σ 🕈										
	> 9160173	35_1 🔽	V -100,000	100,000	-100	100	100 kHz				
▲ 🔜 X-1	20 9160173	35_2	V -100,000	100,000	-100	100	100 kHz				
91601735 Mx-SENS2 4	4 9160173	35_3 💌	V -100,000	100,000	100	100	100 kHz				
91100834 Mx-SENS2 8	8 9160173	35_4	V -100,000	100,0	Channels		100 kHz				
Systems	General Des Re Samp	Format Scaling Active: Name: 91601 scription: ference: 91601 ling rate: 100 kg	g Display Exc 1735_1 1735_1///9160173 Hz	itation Filt 35 Mx-SENS2	er Data ou 4/X-1	tput					
			Confi	guration	tabs						

5.4.3 Multipoint Scaling – stored in the X-device

The X-devices Mx-SENS2 4, Mx-STG2 6, Mx-SENS2 8, and Sx-ST support multipoint scaling function in the device. The scaling points are stored in the device and are there available in 3rd party software tools like INCA or CANape where the modules are integrated via A2L file.





Channel scaling

General Format Scaling Display Excitation	Filter Data output	
Sensor mode		
Mode: Voltage including sensor excit	tation 👻	Scaling calculator
Sensor range		
Min: -100 -	Max: 100 🗸	Unit: V 🗸
Physical range		
Min: -100,000	Max: 100,000	Unit: V
Entry mode: 2-point scaling	Sensor database	Channel settings
100 2-point scaling	Sensor range	Sensor mode: Voltage including sensor excit 🔻
80 Factor/Offset scaling Multipoint scaling	Min: -100 V	Sensor range: -100 ; 100 V 🔹
60 - Active sensors	Max: 100 V	Min: -100 V
40 V-TAB	Physical range	Max: 100 V
20	Min: -100 V	Unit: V 🔻
aj vajr	Max: 100 V	Measure value
-20 	Linear equation: y = m * x + b	1.0
-40	Factor: 1	5
-60	Offset: 0	
-80		
-100		0,0
Value [V]		Acquisition accuracy decimal places: 3 🗘
Physical range		Snapshot •
Min:100 V		Test acquisition
Max: 100 V		
91100175_1 • 😽 🔸 🕨	H	OK Cancel

With the scaling calculator, you can also perform a 2-point scaling by defining real signals. Proceed as follows:

- > set the lower pressure value
- > set higher pressure value

Measured signal corresponds to x bar (calculate value pair 1) Measured signal corresponds to y bar (calculate value pair 2)

Depending on the setting, the test acquisition is detected as a unique value (snapshot) or as an average value (average over values, average over time).



Excitation

General	Format	Scaling	Display	Excitation	Filter	Data output
	Sensor ex	citation:	0 V		-	
			±2,5 V			
			±5 V ±7,5 V			
			±8 V +10 V		≡	
			±12,5 V			
			±15 V		T	

5.4.4 Mx-STG2, Sx-STG

🖻 🗅 🔒 🗄 🗟 🏯 👌	(Pa Ta	û 🐴	$\mathbb{B} \times$	× 1	0 0	i 🦚 🛇	0 🔊	🐌 + 📼 =	X - IPEmotion	
File Project Signals Acquisition View Data manager Analysis Reporting Scripting Info 💮 🌀							fo 💮 🕐			
System Components Functions Import Export Check Adjust										
Configuration Access View										
V02.05.00	V02.05.00 Name Unit Active Phys Min Phys Max Sensor Min Sensor Max Sampling rate 🔺									Sampling rate 🔺
Name	Σ	٩								
		• 91200	0495_1	٧	4	-1,00000	1,00000	-1	1	1 kHz
🔺 🧮 X-1	26	91200)495_2	V	~	-1	1	-1	1	1 kHz
91200495 Mx-STG2 6	6	91200	0495_3	V	4	-1	1	-1	1	1 kHz
91600756 Mx-SENS2 4	4	91200	0495_4	V	~	-1	1	-1	1	1 kHz
91101293 Mx-SENS2 8	8	91200	495_5	V	4	-1	1	-1	1	1 kHz
92000634 Sx-STG	8	91200	0495_6	V	~	-1	1	-1	1	1 kHz
⊿ 🊎 X-2	16						Chan	nels		
58701652 M-SENS2	4									
57801711 M-THERMO2	8	General	Format	at Scaling Display STG mode Excitation Filter Data output						
2-3 Y-3	26	General	Format	Scall	ng D	ispiay 51	a mode - L	XCICaUOTI T		αφαι
- 5660 1978 M-THERMO 16	16		Active: 🗹	-						
59503087 CANpressure	2	Name: 91200495_1								
image: space of the space o										
		Re	ference:	912004	95_1///9	1200495 Mx	-STG2 6/X-1			
Systems	Sampling rate: 1 kHz T									
Configuration tabs										



Channel scaling

General	Format	Scaling	Display	STG mode	Excitation	Filter	Data ou	tput		
Sensor mode										
	Mode	e: Strain	gage				+		Scalin	g calculator
Sensor	range							/		
	Mir	n: -2			Max:	2			Unit:	V
Physical	range						/			
	Mir	n: -2,000	00		Max:	2,00000			Unit:	V
Scaling calc	ulator: 9200	0107_1								x
Entry mo	de: 2-point	scaling	-			Sensor	database	Channel s	ettings	
2,0 -	2-point Free 2-	scaling point scaling			Sensor range			Sens	or mode: Strain gag	je 👻
15	Factor/ Multipoi	Offset scaling nt scaling	,		Min:	-2 V		Senso	or range: ± [0,002	2] V 👻
1,5 Hutupoint scaing STG Active sensors			Max:	2٧			Min:	-2 V		
	V-TAB				Physical range	e			Max:	2 V
∑ 0,5 ⊴					Min:	-2 V			Unit:	۷ -
al al			/		Max:	2 V		Measure \	value	
Jysica					Linear equation	on: v = m *	x + b	1,0 -]	
± -0,3					Factor:	1		5	1	
-1,0					Offset:	0] ang ang	-	
-1,5									-	
-2,0	<u> </u>							0,0 -	1	
-2	-	1	0 IN [V]	1 2					Acquisition accura	cy decimal places: 3 💲
Physical rat	nae	valu	ie [v]					Snapshot	•	
Min:	-	-2 V						Test	t acquisition	
Max:		2 V								
92000107_1			→ H4 →	H						OK Cancel

Using the scaling calculator, you can perform 1-point (factor/offset), 2-point and multi point scalings.

Proceed as follows for a 2-point scaling with real signals (e.g. for a pressure measurement): > set the lower force value Measured signal corresponds to x N

> set higher force value

(calculate value pair 1) Measured signal corresponds to y N (calculate value pair 2)

Depending on the setting, the test acquisition is detected as a unique value (snapshot) or as an average value (average over values, average over time).

Scaling: Mode selection (Sx-STG only)

General F	Format S	Scaling Display STG mode Ex	citation Filter Data outp	ut
Sensor mo	ode			
	Mode:	Strain gage	•	Scaling calculator
Sensor ran	nge	Strain gage Voltage including sensor excitation		
	Min:	ICP sensor	PIGAT 2	Unit: V
Physical ra	ange			
	Min:	-2,00000	Max: 2,00000	Unit: V



For Sx-STG the tab **STG mode** is displayed only when the Sensor mode **Strain gage** is selected!

For Mx-STG2 the sensor mode is set to Strain gage (fixed setting).

STG mode

General Format	Scaling Display STG mode Excitation Filter Data output
Bridge	
Type:	Full bridge Resistance: 350 Ω Connection: 6 wire •
	Quarter bridge Half bridge Full bridge

Excitation

General Format Scaling	Display STG mode	Excitation	Filter Data output
Sensor excitation:	0 V +/-5 V +/-2,5 V +/-1,25 V +/-500 mV 0 V		



As the supply voltagel +/- 5 V may cause a damage of the bridge circuit when selecting the setting **Resistance 120** Ω in the **STG mode** tab, this voltage is available only for **350** Ω and **1 k** Ω bridge resistors!
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Using TEDS sensors

Mx-STG2 and Sx-STG type LEMO 2B (TEDS) support the use of TEDS sensors once the input connector has been plugged in.

- Connect the TEDS sensor with a free input channel of Mx-STG2/Sx-STG.
- Move to the **Signals** tab.
- > Click Detect from the icon bar at the upper area of the channel grid, alternatively

• Click **Synchronize** from the icon bar at the upper area of the channel grid (drop down menu **Detect**) to reload latest settings.

• Mx-STG2/Sx-STG now reads all configuration data from the sensor's chip and provide them with the Scaling Calculator (Entry mode: **TEDS Sensor**).

Scaling calculator: a_cross			:
Entry mode: TEDS Sensor 🔹			Channel settings
Hersteller: ASC GmbH			Sensor mode: Voltage including sensor excita 👻
Name: 4421 1			Sensor range: -2 ; 2 V 🔹
Seriennummer: 91144			Min: -2 V
Sensorproperties			May: 21
Calibration		×	
Calibration	Valid		Unit: G 🗸
Calibration date	29.09.2011		
Expiration date	28.09.2012		Measure value
Physical value		×	1 -
Physical value	Acceleration		-
Minimum	-98,0665 m/s²		
Maximum	98,0665 m/s²		
Output size		×	<u></u> ወ 0,5 –
Output size	voltage		, ja
Minimum	-2 V		j
Maximum	2 V		
Sensor supply		×	0
Excitation	30 V		Acquisition accuracy desimal places:
			Acquisition accuracy decimal places.
			Schnappschuss 👻
			Test acquisition
			¥
a_cross	★ ► ₩ ₩		OK Cancel

5.4.5 M-THERMO2, M-THERMO2 u

Averaging, Break detection

	Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling	rate
9									
	57801711_1	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	57801711_2	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	57801711_3	4	°C	-60,00	1370,00	-60	1370	10 Hz	
	57801711_4	~	°C	-60,00	1370,00	-60	1370	10 Hz	
Þ	57801711_5	Z	°C	-60,00	1370,00	-60	1370	10 Hz	
	57801711_6	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	57801711_7	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	57801711 8	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	-			/					
(-							Þ	
Ge	neral Format	Scaling	Te	erminal [Display T	hermo		•	
Ge	neral Format Ave	Scaling	Te	erminal [Display T	hermo		•	
Ge	neral Format Ave	Scaling	Te	erminal [Display T	hermo		•	
Ge	neral Format Ave Break det	Scaling raging:	Te	erminal [Display T	hermo		4	
Ge	neral Format Ave Break det	Scaling raging:	1 Te	erminal [Display T	hermo			
Ge	neral Format Ave Break det	Scaling raging:	Te	erminal [Display T	hermo			
Ge	neral Format Ave Break det	Scaling raging:	Te	erminal [Display T	hermo			
Ge	neral Format Ave Break det	Scaling raging:	I Te	erminal [Display T	hermo			
Ge	neral Format Ave Break det	Scaling raging:	Te	erminal [Display T	hermo			

Thermocouple (M-THERMO2 u only)

	Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor	Sampling	rat					
۴									*					
	57901354_1	~	°C	-50,00	1300,00	-50	1300	1 Hz						
	57901354_2	~	°C	-60,00	1370,00	-60	1370	1 Hz						
	57901354_3	4	°C	-60,00	1370,00	-60	1370	1 Hz						
	57901354_4	~	°C	-60,00	1370,00	-60	1370	1 Hz						
►	57901354_5	~	°C	-60,00	1370,00	-60	1370	1 Hz						
	57901354_6	~	°C	-60,00	1370,00	-60	1370	1 Hz						
	57901354_7	~	°C	-60,00	1370,00	-60	1370	1 Hz						
	57901354_8	~	°C	-60,00	1370,00	-60	1370	1 Hz	-					
4				-				Þ						
General Format Scaling Terminal Display Thermo														
Ge									Sensor mode					
Se	ensor mode													
Se	ensor mode Mod	le: The	ermo ele	ement of ty	pe K			•						
Se	ensor mode Moc	le: The	ermo ele	ement of ty	pe K Thermo e	element of ty	pe K	Ŧ						
Se	ensor mode Mod ensor range	le: The	ermo ele	ement of ty	pe K Thermo e Thermo e	element of ty	pe K pe J	Ŧ						
Se	ensor mode Moc ensor range M	in: -60	ermo ele	ement of ty	pe K Thermo e Thermo e Thermo e Thermo e	element of ty element of ty element of ty element of ty	pe K pe J pe N pe R	•						
Se	ensor mode Mod ensor range M	in: -60	ermo ele	ement of ty	pe K Thermo e Thermo e Thermo e Thermo e	element of ty element of ty element of ty element of ty element of ty	pe K pe J pe N pe R pe S	T						
Se	ensor mode Moc ensor range M nysical range	de: The	ermo ele	ement of ty	pe K Thermo e Thermo e Thermo e Thermo e Thermo e	element of ty element of ty element of ty element of ty element of ty element of ty	pe K pe J pe N pe R pe S pe T	•						

5.4.6 M-UNI2

Mode(Thermo, Voltage)

	Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling r	ate
۴									*
Þ	58403108_1	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_2	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_3	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_4	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_5	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_6	~	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_7	\checkmark	°C	-60,00	1370,00	-60	1370	10 Hz	
	58403108_8	~	°C	-60,00	1370,00	-60	1370	10 Hz	Ŧ
4								•	
Ge	neral Form	at S	caling	Termin	al Displa	y Thermo)		
Se	ensor mode								
	Mod	le: The	ermo e	element of t	type K			-	
Se	ensor range	The Vol	ermo tage	element of	type K				
	м	in: -60		Ŧ		Max:	1370	-	
Pł	nysical range								
	М	in: -60	,00			Max:	1370,00		

5.4.7 M-RTD2

Filter, Averaging

	Name	Active	Unit	Phys Min	Phys Max	Sensor Min	Sensor Max	Sampling rate	:
۴									*
	58101057_1	~	°C	-50,000	450,000	-50	450	100 Hz	
	58101057_2	~	°C	-50,000	450,000	-50	450	100 Hz	
•	58101057_3	~		-50,000	450,000		450	100 Hz	
	58101057_4	~	°C	-50,000	450,000	-50	450	100 Hz	-
4									
Ge	neral Form	at S	caling	Display	Filter				
Ha	ardware filter					A	veraging		
	Hardw	are filte	r: 1	50 Hz		-		Averaging:	/
Se	oftware filter								
		Тур	e: B	utterworth		-			
	Fr	equenc	y: 1	0 Hz		-			

IPEmotion	IPTRONIK
5.4.8 M-SENS2	10 5 2 1
General Format Scaling Display Excitation Filter Adjustment	0,5 0,2 0,1
Sensor mode Mode: Voltage including sensor excitation	Scaling calculator
Sensor range Min: -30 Max: 30	Unit: V -
Physical range Scaling	

Scaling

Select the voltage or current acquisition. 1. Select a sensor range. Depending on the device/channel, different ranges are 2. available. 3. Define a physical range and the unit with the scaling calculator – if required.

Sensor, initial excitation



Filter, averaging

General Format S	Scaling Display Excitation Filter Adjustment	
Hardware filter		
Hardware filter:	500 Hz -	
Averaging		
Averaging: [
	 Filter Activate the hardware filter for avoiding aliasing effects. This is always recommended for measuring with periodic signals. Activate the block averaging (floating average) for smoothing disturbing signal interrupts or noise components. The average value is online calculated from the samples of the CAN data rate. (Example: CAN output rate = device sample rate: 100 Hz, internal sample rate: 2 kHz > cyclic average calculation from 2000 / 100 = 20 samples) Activate the software filter for additionally filtering the signal. Select the filter type (Bessel, Butterworth, Tschebychev) and the cut-off frequency (0.1 Hz495.0 Hz, depending on the sampling rate). 	

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Offset adjust	None Manually	
General Format Scaling Display Excitation Filter Adjustment Mode: None	Group 1 Group 2 Group 3 Group 4	
Reference value: 0 V Offset value: 0 V Run channel adjustment		



The offset adjustment is supported by the respective device from the following firmware version: M-SENS, M-SENS 8 >= V3.12.07 M-SENS 8plus >= V3.12.08

The calibration function with a broadcast command (IPEhotkey) also allows the offset adjustment during a running acquisition to a user defined target value (reference value). The following actions are permitted:

- **None** no offset calibration
- Manually only channels with this status are calibrated with the Manual calibration command
- Group X channels, which are assigned to a specific group (1...4), are calibrated with the desktop icon IPEhotkey and the Calibration Group command. The channel assignation to one group can also be effected for all devices (e.g. SENS type, STG, CAN*pressure* mixed in one group). A signal-based calibration is therefore possible.
- 5.4.9 M-CNT2

Format (M-CNT2) M-CNT2 provides extended input settings in the Format tab (data type).	16-Bit integer signed 16-Bit integer unsigned 8-Bit integer signed 8-Bit integer unsigned 32-Bit integer signed
General Format Scaling Display Input signal Mode Excitation Filter	32-Bit integer unsigned
Data type Type: 16-Bit integer unsigned Task: Default NoValue NoValue	
Value:	t Value
Channel type	
Input: 🖾 Output:	

In addition to data types 8 Bit and 16 Bit integer signed/unsigned type 32 Bit integer signed/unsigned is selectable in order to transfer numerical values > 65535 to the DAQ software (requestet for measurement frequency > 65.5 kHz resp. counter reading > 65.5 k).



Scaling, measuring ranges

ſ	General	Scaling	Display Input signal Excitation Filter					
	Sensor mode							
	Mode: Frequency 🗸							
			Frequency					
	Sensor r	range	Duty cycle					
		Mi	Period duration Pulse duration					
			Pause duration	-				
	Physical	range						
		Mi	1 Max:	200000				

General Scaling D	isplay Input signal Excitation Filter
Sensor mode	
Mode:	Frequency •
	Frequency
Sensor range	Duty cycle
Min:	Period duration Pulse duration
	Pause duration
Physical range	Event counter
Min:	1 Max: 200000

Scaling M-FRQ

Scaling M-CNT2

Scaling

- 1.
- Select the mode for frequency or period acquisition. Select a sensor range. Depending on the device/channel, 2. different ranges are available.
- Define a physical range and the unit with the scaling calculator if required. 3.



Mode	Ranges			Remarks
	Min.	Max.	Unit	
Frequency	0 200	0 200	kHz	Maximum > Minimum minimum signal frequency 0.03 Hz maximum signal frequency 200 kHz
Duty cycle Range 0.01 % to 99.99 %	0 100	0 100	%	Maximum > Minimum minimum signal frequency 0.03 Hz maximum signal frequency: 10 kHz at 1 % duty cycle 250 kHz at 25 % duty cycle 500 kHz at 50 % duty cycle 250 kHz at 75 % duty cycle 10 kHz at 99 % duty cycle
Periodic duration	0 200	0 200	S	Maximum > Minimum maximum interval duration 200 s minimum interval duration 1 µs
Pulse duration	0 200	0 200	S	Maximum > Minimum maximum pulse duration 200 s minimum pulse duration 1 µs
Pause duration	0 200	0 200	S	Maximum > Minimum maximum pause duration 200 s minimum pause duration 1 μs
Event counter	0	127 4.295 * 10 ⁹	S	Depends on configured data type



Select values >=1 Hz for the frequency with **Sensor range Min**! This avoids an unnecessary long response time until the value 0 Hz or -FS is sent if a signal is missing or has the value approx. 0 Hz. The maximum response time at 0 Hz is 40 s.

Indicating rotation direction

(General	Format	Sc	aling	Display	Input signal	Mode	Excitation	Filte	er	
1	Sensor r	node									
		Mod	e:	Event (counter wit	th direction				Ŧ	
1			_	Freque	ency with d	lirection			-	•	F
	Sensor r	ange		Duty c	yde					_	ŀ
		Mi	in:	Period Pulse o	duration luration						
				Pause	duration						
	Physical	range		Event	counter						
		M		Event	counter wi	th direction			1	•	
		M		0			PISA	000000		-	1

The Scaling tab offers special sensor modes Frequency with direction and Event counter with direction for channel 1/2 and channel 3/4.

Both settings support incremental sensors that provide a second phase-shifted output signal used for detection of the rotation direction. This can be used for positive / negative frequency / rpm indication or as up & down counter.

Input signal

General Scaling Display Input signal Excitation	n Filter
Signal parameters	
Threshold on: 3 V	Input signal
Threshold off: 1 V	1. Select the upper threshold with <i>Threshold on</i> in a range of +/-40 V.
Edge: Positive edge	 Select the lower threshold with <i>Threshold off</i> in a range of +/-40 V. The lower threshold must always smaller than the upper one.
DC compensation: 💌	 Select an edge for defining the positive or negative signal edge. If the negative edge is selected, the input signal will be inverted. The DC compensation disables the direct current component in the signal with a passive high-pass (1-pole, 0.8 Hz cut-off frequency).

An oscilloscope is recommended for displaying the signal behavior for configuring the switching thresholds on and off. If the sensor signal does not exceed the threshold on or fall below the threshold off, no exact acquisition is possible. In this case, the value does not change although the revolutions per minute increase and the sensor is connected correctly. Correct the threshold values in the configuration and run a test acquisition.



Please note that a lot of speed sensors send an almost ideal square wave signal in the lower frequency range, but the graph changes with increasing frequency (> saw tooth). This can also be caused by external capacities e.g. a (long) connection cable to the sensor.

Mode (M-CNT2)

Mode Frequency with/without direction

General	Format	Scaling	Display	Inpu	ut signal	Mode	
Frequenc	y time out n	node:			Frequer	ncy time out mode	e Fixed gate time setting to 42 s
Stat	tic direction	input			Static d	irection input	2nd signal used with input 2 resp. input 4 to
Ignore	frequency	drop:				·	define the direction of rotation. (for example: level high means right hand
							rotation, level low means left hand rotation)

If the **Frequency time out mode** is activated, the maximum gate time of 42 s is set in the **Input signal** tab. This enables frequency measurement down to 0.0238 Hz, while lower frequencies will be output as 0 Hz. In order to indicate a rotation stop immediately, a short gate time is recommended, but this means, the minimum frequency that can be measured increases.

Example Input signal tab > **Zero detection threshold**: Gate time: 0.5 s > minimum frequency that can be measured: 2 Hz (correlating to 120 rpm)

Mode Event counter with/without direction

General Format Scaling Display Input s	ignal Mode Excitation	Filter
Operating mode		
Mode: Event counter with	over flow	•
Challes discation installs		
Stauc direction input:		Event counter with resetting at clock
Physical position reset		Event counter without resetting
Physical position reset		
Reset value: 10	Operating mode	
	Mode Resetting at clock	Counter reading is reset every sample period (= the module's sample rate).
	Mode Without resetting	Counter reading stops and remains un-changed as soon as the counter value reaches its upper range (zero reset with a measurement restart)
	Mode Over flow	The counter reading starts from zero again, as soon as the counter value reaches its upper range.
	Statisc direction input	2nd signal used with input 2 resp. input 4 to define the direction of rotation.
	Physical position reset	
	Reset value	Predefining the reset value.
	Reset position	Reset current value to 0.



For detecting the rotation direction the frequency identical but phase shifted signal (provided by the sensor) can be used at input 2 resp. input 4. Alternatively a static voltage signal can be used at input 2 / 4. Activate the checkbox "Static direction input" in this case.

Sensor, initial excitation

General Format Scaling	g Display Input	signal Excitation Filter
Sensor excitation:	0 V	•
	0 V	
	2,5 V	Sensor
	5 V	
	7,5 V	If the sensor rquires a sensor excitation, select the initial excitation from the
	10 V	list. Depending on the device/channel, different voltages are available.
	12,5 V	as to the device supply
	15 V	

Filter / Averaging

General Format	Scaling	Display	Input sign	al
Hardware filter				
Hardware filter:	10 kHz			
Averaging				
Averaging:	V			

Filter Select

Select the hardware filter for avoiding aliasing effects. This is always recommended for measuring with periodic signals.

Averaging is calculated from the values acquired within the respective sample period. An internal sample rate of 5 kHz. (M-CNT2) is used. Example Module sample rate (means output rate to CAN bus) = 100 Hz

5.5 Acquire measurement data

5.5.1 Visualization

- Move to the Signals tab.
- Select **Display** from the main menu.
- IPEmotion displays measurement values of all active channels continuously in the channel grid. ▶

Change to the View tab to create and arrange alphanumerical and graphical display components (numeric display, tachometer, bargraph, y-t-diagram, ...) or use the oscilloscope feature to display periodic signals at higher frequencies.

Click Stop from the main menu to stop data visualization.

5.5.2 Storage

- Move to the **Acquisition** tab. ►
- Right click to **Saving** from the left-hand **Setup** structure,

select Storage group from the context menu.

- Create one or more storage groups for your measurement task.
- Assign active channels (measurement signals) to your storage groups which you created previously.
- If required, change the storing rate to lower data rates or use the average function (MEAN).
- Define individual trigger events as required to control data storage. ▶
- Click Store from the main menu to start data storage.
- ▶ Click Stop from the main menu to stop data storage.

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File Project Signals Acquisit	on View Data manager	Analysis Reporting	Scriptin	ig Info		⇔ ?
Calculation Number Storage group	Limit FFT Signal	Store Details Control View				
Setup	Available channels			Included channels		
	Selection	All		X Selection	X	All
Calculations f(x) Formulas	1 Name	Active Description		Name	Storing rate	Sampling rate
Number	0 91100842_4		_	<pre>> 91100842_1</pre>	10 Hz	10 Hz
Text	91100842_5 91100842_6			91100842_2	10 Hz 10 Hz	10 Hz 10 Hz
Storage group-1	3 91100842_7 2 € 1100842_8 4 III 0		-	•	III	•
Analysis	0 2 General Saving Stor	age				
Classifications	0 Pre-trigger:	1s]		
Function gener	0 Post-trigger:	10s				<i>f</i> (x)
Sequence control	0 Stop-trigger:					f(x)
						. 2



IPETRONIK





6 Firmware update

The firmware of the IPETRONIK X- and CAN devices is subject to continuous developments. Both product lines can get a firmware update over the X-PlugIn.

- Move to the **Signals** tab.
- Highlight the X-System.
- Select Functions > Update devices from the tool bar.
- Select Update to download new firmware to the connected modules, or first
- import the latest firmware files using Check for updates under Library.
- CAN and X-Modules can be updated over X-Update



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6.1 Resetting modules

The system plug X-LINK DEF (X-LINK Module DEFAULT plug) is used for resetting X-devices to its default settings.

Resetting effects on

- configuration settings
- serialized device specific settings (e.g. shunt check, offset compensation)
- the IP address range (default range)

How to use

- Switch off the power supply
- > Plug in X-LINK DEF at the respective system connector of the device
- Switlch on the power supply
- Wait 10 seconds
- Switch off the power supply
- Pull off X-LINK DEF



7 Appendix

7.1 Filter in the measurement engineering

7.1.1 Why is it necessary to use filters?



Filters of analog measuring amplifiers are used for avoiding interrupting frequencies (frequency spectra, which do not contribute to the signal and/or which cannot be processed by the system). A low pass filter, which reduces the amplitudes of the frequencies above a specific cut-off frequency, is usually used for avoiding negative effects to the useful signal. The threshold in the range of the cut-off frequency (the barrier between the useful and the unrequested signal) is continuous.

Depending on the measuring task, the following filter properties are to be respected:

• Useful signals below the cut-off frequency are also damped. (A damping of 3 dB at the cut-off frequency means a reduction of the initial signal of 30 %.)

• Filters always cause a time shifting (phase shifting) between the initial signal and the filtered one. The value of the phase shifting depends on the type of filter and the filter order (pole number).



The image above shows the result of two inputs with the same input signal of 4 V amplitude and 12.5 Hz frequency.

Channel 2 black without filter

Channel 3

red with 30 Hz hardware filter (Bessel type)

Channel 3 clearly shows the damping, the phase shifting, as well as, the start oscillation of the filter.

7.1.2 How to use filters?

Modern systems offer qualified hardware filters and, if applicable, additional software filters.

Although today's microprocessors provide a high processing power, the use of hardware filters is still essential. Especially when users cannot exclude that (periodic) signals can pass the AD converter and software filter, which cannot process the signals. Every sampling system follows Shannon's sampling theorem whereby one must at least sample with twice the signal frequency. Otherwise, aliasing effects can occur, whereas the acquired frequency is considerably lower than the actual signal (see image below).

Why do we additionally filter with DSP?

The hardware filter at the input excludes a distortion by frequency spectra above the system limit with the maximum sampling rate. Depending on the application, it can be required to lower the cut-off frequency.

Example:

M-SENS devices provide a switchable hardware filter with 150 Hz cut-off frequency. If the cut-off frequency is e.g. 50 Hz, interrupting frequency spectra (of devices with additional software filter) in the range between 50 Hz and the hardware filter frequency can be filtered with DSP. The filter frequency can be configured in defined steps up to the hardware filter frequency.

Aliasing effects in spite of hardware and software filter?



Despite sophisticated measurement engineering, errors can occur due to wrong settings. If, for example, a 100 Hz signal is acquired with a sampling rate of 100 Hz (also the output rate to the data bus). The system can independently acquire the correct signal, but the result is wrong because the sampling rate was set too low. If the signal is sent to the bus with a lower sampling / output rate, the result does not reflect the initial signal.



7.2 Alias free measurement - automatically

The X-PlugIn is supporting the PlugIn Options a default setting for alias free measurement.

Frequently used	Active		Title	Version	1	Description		P
Basic settings		5	CAETEC dataLog	15.10.	00	CAETEC Data logger (A	ARCOS and µCROS)	-
Appearance			IPETRONIK FlexRay-Exten	01.00.	00.59433 RC	IPETRONIK FlexRay-E	xtender	
/iew			IPETRONIK CAN	01.16.	00	Connection of IPETRO	NIK CAN acquisitio	
Data manager		*	IPETRONIK X	02.07.	00.25207 RC	IPETRONIK CAN and E	themet devices 🔞	
Data service		1013	IPETRONIK LOG	03.60.	01	IPETRONIK Data logge	er (M-LOG, S-LOG,	
import		A	Advantech APAX	01.00.	04	Advantech APAX		
Export		1	BECKHOFF	01.06.	00.63196 RC	BECKHOFF Bus Couple	r	
Analysis		S	GPS	01.05.	00	Serial interface for GPS	S mouse	
Maps		1	SIEMENS PLC	01.05.	00	Access to process data	a of Siemens PLCs	
Directories		le:	Status	01.00.	00	Monitoring system para	ameters	
Jnits		<u>a</u>	IPEsensors	01.	PErmotion	settings - IPETRON	IIK X	
Hotkey		2	Video	01.		secondo a critor		1
Jser administration	4				Ethernet int	erfaces CAN inter	faces Options	Componen
PEdoud					Aliasing-fre	e filter settings		
PlugIns				_	Alizaina fiz	a filtar aattiaaat		
Jser displays	Plugin s Specify t	ettings he plugi	s ns to be used.	a lat	Allasing-fre	e niter settings:		
oper oper of doors	no autom	atic upo	late is run at installing later plugi	in ver	CSV import	mode		
					-	CV import modes	of suit	

This checkbox has an impact on the DSP and hardware software filter settings. The function is only supported for modules which have adjustable DSP and / or hardware filter.

If aliasing-free filtering is active, the software filter frequency is automatically adjusted when the sampling rate changes. The frequency is changed such that the new value is always the maximum possible frequency, where aliasing free measurement is guaranteed. If the filter frequency previously had been changed to a lower value intentionally, the filter frequency has to be changed manually by the user after the sample rate has been changed. This also applies, if the sample rate is decreased. The automatic adaptation of the software filter frequency is not applied, in case that the aliasing free measurement is disabled.