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Instruction Manual

Industrial Charge Amplifier for Multi-purpose with Ethernet

Type 5073B…

Forword

Thank you for choosing a Kistler quality product characterized by technical innovation, precision, and long life. This instruction manual applies to the Industrial Charge Amplifier for Multi-purpose with Ethernet Type 5073B… .

Keep this instruction manual for future reference. It should be available at the point of use.

Information in this instruction manual is subject to change any time without notice. Kistler reserves the right to improve and modify its products in the course of technical advancement, without any obligation to inform any persons or organizations of such changes.

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Content

1. Introduction

The industrial charge amplifier for multi-purpose (ICAM-B) can be used wherever mechanical quantities are measured with piezoelectric sensors.

Most important performance features at a glance:

- Variants with 1, 2, 3 or 4 channels with individual configuration and control (Reset/Measure)
- Wide measuring ranges from 20pC up to 1‘000‘000 pC
- Analog voltage output +/-10 V or current output 4… 20 mA
- Fast analog signal throughput with 20 kHz bandwidth
- 6 analog outputs with fully flexible scaling and internal routing
- Digital control interface for stand-alone operation
- Selectable low-pass filter and switchable high-pass filter
- Web-UI for configuration and control via Ethernet
- Network and channel status indicators via individual LEDs
- Digital data streaming up to 1 kSps
- Virtual channels for real-time calculations using one or more sensor channels
- REST-API for configuration from other systems
- IIoT connectivity with OPC UA and MQTT
- Industrial variants with degrees of protection IP50, IP65 and IP67
- Reverse compatibility to 5073A… with optional RS232 interface

Please take the time to thoroughly read this instruction manual. It will help you with the installation, maintenance, and use of this product.

To the extent permitted by law Kistler does not accept any liability if this instruction manual is not followed.

Kistler offers a wide range of products for use in measuring technology.

- Piezoelectric sensors for measuring force, torque, strain, pressure, acceleration, shock, vibration and acoustic emission
- Strain gage sensor systems for measuring force and torque
- Piezoresistive pressure sensors and transmitters
- Signal conditioners, indicators and calibrators
- Electronic control and monitoring systems as well as software for specific measurement applications
- Data transmission modules (telemetry)

Introduction

Kistler also develops and produces measuring solutions for the application fields engines, vehicles, manufacturing, plastics and biomechanics sectors.

Our product and application brochures will provide you with an overview of our product range. Detailed data sheets are available for almost all products.

If you need additional help beyond what can be found either online or in this manual, please contact Kistler's extensive support organization.

2. Safety and Liability

As an environmentally aware company, Kistler does not send out operating instructions in paper form. For this reason, please refer to the following information regarding the installation and operation of Kistler products:

1. The safety and warning information set out below
2. The specifically applicable instruction manual for the purchased product

Instruction manuals for each product are available on the Kistler website and can be accessed via the type number at www.kistler.com.

Paper instruction manuals can also be requested from Kistler's customer service or the responsible Kistler sales department.

Instruction manuals are subject to change at any time without advance notification, in particular regarding equipment modifications (conversions, retrofits etc.). Instruction manuals must be accessed regularly on the internet for this reason.

2.1 General

At the time of purchase, each Kistler product is compliant with the necessary and applicable safety regulations and all other relevant requirements. Every product is in perfect condition with respect to safety requirements when it leaves Kistler's factory.

2.2 Setting up and using your Product

Only qualified individuals with the necessary technical know-how are allowed to install and operate Kistler products. These qualified individuals must adhere to all requirements contained in this safety and warning information and in the applicable instruction manual for the respective product. They must also comply with the applicable national safety provisions for installation and operation in each case.

If a product is not installed, used or maintained in the proper manner, this could result in serious injuries or fatal accidents and damage to the product and its surroundings.

Please check for any damage to the packaging before unpacking the product. Any damage found must be reported to the shipping company and the Kistler Sales Center or its distributor.

The delivery scope must be checked before starting to set up the product. If a part is missing, the responsible Kistler Sales Center or its distributor must be notified.

If the product has visible signs of damage, no longer works, is stored for lengthy periods in unfavorable conditions and/or was exposed to major stresses during shipping, safe operation is no longer guaranteed and the product must immediately be returned for repair to Kistler or the responsible distributor.

The product may not be disassembled, opened, repaired or otherwise modified because this may impair its operation and, in particular, can result in electric shocks. Any attempt to open or modify the product or to damage or remove labels will automatically result in the voiding of all warranty claims.

The product must not be used in potentially explosive environments unless it is specifically designated for such use.

2.3 Electromagnetic Compatibility (EMC)

To ensure that electromagnetic compatibility (EMC) is maintained for the entire measuring chain, particular attention must be paid to connection of the inputs and outputs of the cable screen and to the cable installation:

- Cables must not be run parallel to wiring that causes interference.
- Only the supplied or optionally available cables must be used.
- Please ensure a reliable connection between shielding, connector boxes and device enclosures.
- Machinery and hardware must also comply with the EMC standards.

This product meets the standards for industrial use. For this reason, this product is not allowed to be used in a residential environment.

2.4 Warnings and their Relevance

Disregard of the following precautions can lead to malfunctions or damage to system components, environment or people (see table below).

Disregard may have consequence

Mechanical defects or with unpredictable consequence (might endanger material or people)

Indicates a caution or warning notice

Indicates a tip or important information

2.5 Transportation and Storage

All the following safety precautions must be taken if the product is to be shipped or stored for a lengthy period:

- All connectors must be covered with the dust caps that are supplied.
- The plug connections must be kept dry and dust-free.
- It must be ensured that no dirt can penetrate the product.
- The storage environment must be dry and must provide protection against vibrations.
- Compliance with the storage temperature is required according to the specifications on the relevant data sheet or in the relevant operating instructions.
- The product must be stored in the original packaging.

2.6 Product use

During storage and operation, the specifications on ambient temperature stated in the technical data must also be observed. The product may be permanently damaged if the permissible ambient temperature is exceeded to a significant extent.

The product may only be used under the specified operating conditions; in particular, high relative air humidity and temperature fluctuations that might result in condensation should be avoided.

Do not perform tuning, maintenance or repair work on live, open devices.

2.7 Software Upgrades and Updates

The software and firmware available on the Kistler website must always be used.

Kistler declines any liability whatsoever for any direct or consequential damage caused by products running on software and firmware, which has not been upgraded or updated with the latest software supplied.

2.8 Disposal Information for Electrical Equipment

Do not discard old electronic instruments in municipal trash. For disposal at end of life, please return this product to an authorized local electronic waste disposal service or contact the nearest Kistler Instrument sales office for return instructions.
Please contact your Kistler Sales Center if you have any questions about disposal.

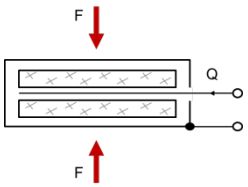
Contact addresses and further information can be found at **www.kistler.com**

3. Fundamentals

The typical measuring chain consists of a piezoelectric sensor with charge output, a charge amplifier and a system for cycle command, data acquisition and data evaluation.
In industrial applications, cycle command functionality is usually implemented with a programmable logic controller (PLC).

3.1 Piezoelectric Measurement

Sensors
Piezoelectric sensors directly convert mechanical quantities, such as force, pressure and acceleration, into an electric charge. This charge is proportional to the force acting on the quartz crystal in the sensor. The sensitivity of the sensors is given in pC/M.U.



Notes on piezoelectric measurement
When working with piezoelectric instruments, please note that these differ from other familiar electrical measuring instruments. The applicable criteria are different from those for conventional current or voltage measurement, for example. When unpacking the sensors and the special cables ensure that their connectors remain clean and dry, in order to maintain their high insulation resistance. In particular, the Teflon insulator of all connector pairs in the input circuit must be kept absolutely clean and must not be touched with your fingers. Only use unadulterated cleaning agents, for example 1003 cleaning spray from Kistler or white spirits, on a clean, lint-free paper towel.

High insulation sensor cables
Only high insulation, low noise sensor cables, as per Kistler data sheets 1631C_000-346 and 1601B_000-352, may be used for connecting the sensors. Normal commercial coaxial cables generate triboelectricity as a result of movement, which would falsify the measurement result.

Connecting piezoelectric sensors in parallel
When several sensors are connected in parallel, the charge amplifier measures the sum of all charges. For example, the four quartz force links of a measuring platform can be connected in parallel in order to measure the total force.

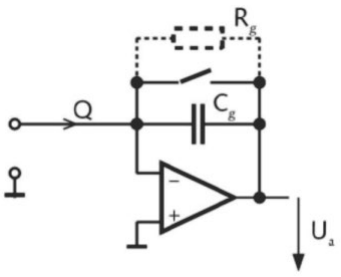
Polarity
Kistler defines polarity in such a way that an increase in compressive force in a force sensor produces a negative charge. The charge amplifier inverts the sensor signal and, in this case, generates a positive output voltage.

Measuring range
We recommend setting the widest measuring range at the start of measurement or for very intermittent operation. Normal overdriving by overly large charge signals do not damage the charge amplifier. If the amplifier is overdriven by a factor of more than 10, the charge can produce an unacceptably high voltage. The amplitude of the voltage depends on the input charge, the total input capacitance (sensor and cable) and the range capacitor.

Measure mode
The major advantage of the charge amplifier principle is that even quasistatic measurement can be carried out perfectly. Static measurement is limited by the finite time constant in the negative feedback circuit, as well as by drift effects (for example, input current) in the charge amplifier.

3.2 The Industrial Charge Amplifier

In this context it should be noted that the term "charge amplifier" does not mean a device that amplifies a charge Q1 to a value Q2. We use it in the sense of a device for converting the charge Q into a voltage U_a. A charge amplifier is therefore a charge-to-voltage converter. It employs the circuit principle of the integrator. Its key components are an operational amplifier with very high internal gain and extremely high input insulation (R_g) as well as a high-precision, low-loss negative feedback capacitor (C_g).



The following approximate formula is adequate for calculating the voltage signal in most cases:

$U_a = -Q / C_g$

At the end of each measuring cycle the negative feedback capacitor is discharged by means of the Reset command and the output signal is set to zero in order to prevent zero drift during measurement. The insulation resistance of the negative feedback capacitor C_g determines the lower cut-off frequency of the charge amplifier according to the formula.

$f_u = 1/(2\tau \cdot R_g \cdot C_g)$

The negative feedback capacitor can also be discharged according to a time constant. This option is available in the device with a preconfigured resistor but can also be configured with a different time constant on request.

Very stringent requirements are imposed on the stability, low input current and high input insulation of such an integrator, as the charges to be measured are often just a few pC. As a result of the high charge sensitivity and high input resistance, the sensitivity to noise is also relatively high.

In industrial applications, the sensitivity to interference can be reduced if the charge amplifier is mounted as close as possible to the sensor. The signal can then be processed further away, as the output circuit of the charge amplifier is low resistance and hence insensitive to interference.

4. Device Description

4.1 Purpose of the 5073B charge amplifier

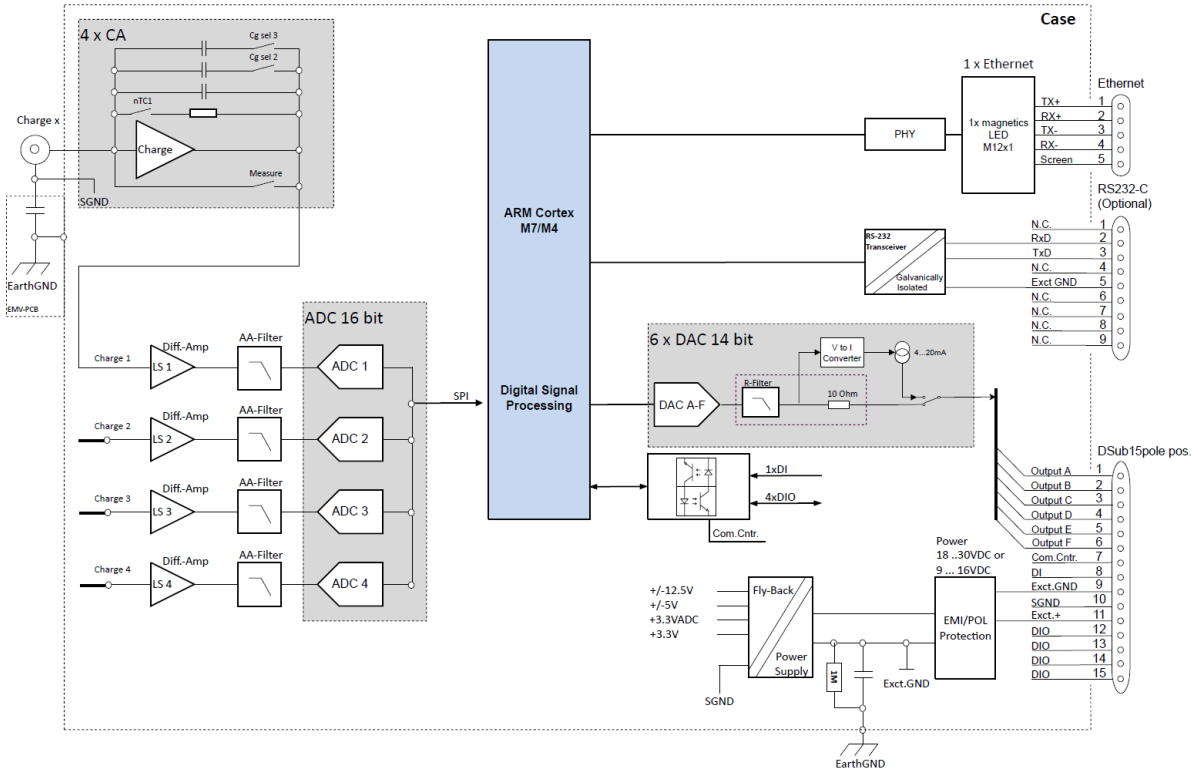
The industrial charge amplifier for multi-purpose (ICAM-B) can be used wherever mechanical quantities are measured with piezoelectric sensors. Piezoelectric sensors produce an electric charge which varies in direct proportion to the load acting on the sensor. The charge amplifier Type 5073B… converts a charge signal into a low-impedance voltage signal. It covers slow, quasi-static signals as well as dynamic processes. Depending on variant, up to four sensors can be connected at the same time.

The 5073B… combines proven analog signal routing with parallel IIoT connection and remote data processing, providing solid performance on both paths.

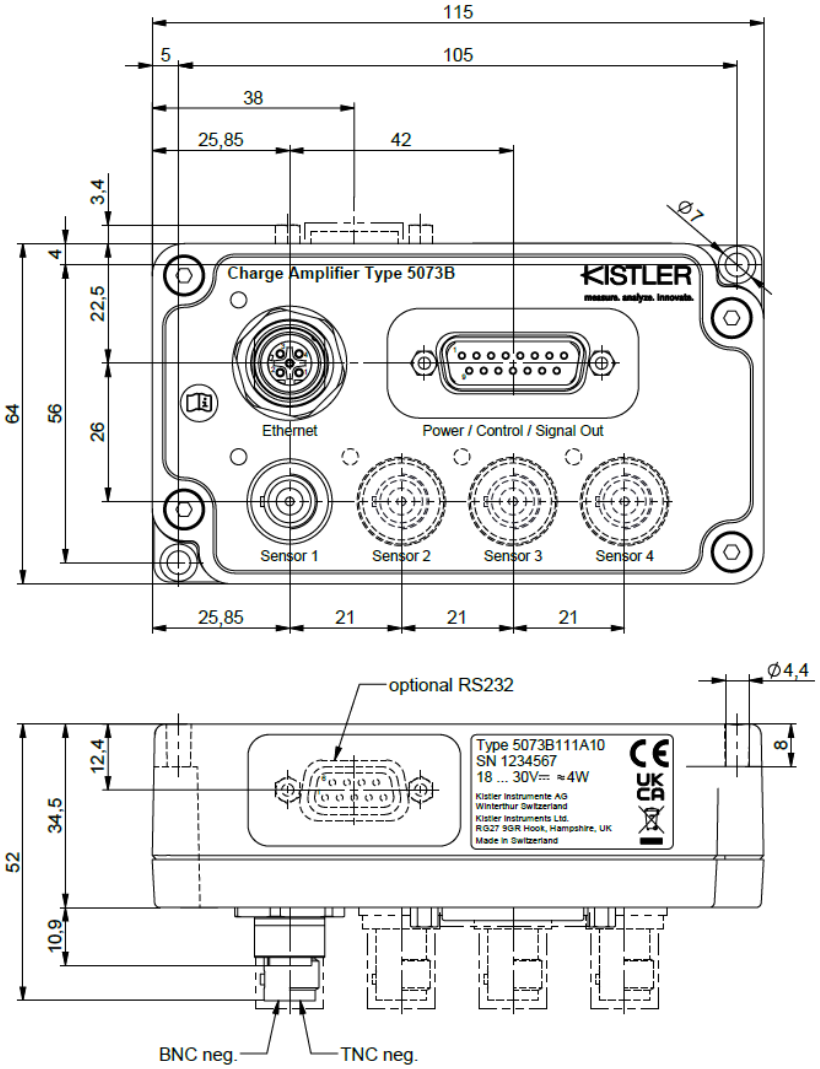
The charge amplifier Type 5073B... with its sealed metal case is designed for harsh industrial environments. Depending on the variant, up to four measuring channels can be accommodated in a single case. The amplifier features a wide measuring range and a rich set of signal processing features. The 5073B… is configured via an intuitive web user interface. The web user interface is not only to configure the device but also to display various measurement values (e.g., live value, min and max value, RMS value) as well as the measurement curve in a y/t graph.

With its adjustable measurement range, acquisition of peak values, programmable offset, excellent technical data and galvanic isolation the ICAM-B is extremely versatile. The low-pass filter can be selected from a wide range of available filters. The switchable high-pass filter allows monitoring of fast processes without interrupting the measurement – even during continuous operation.
The input signals can be flexibly routed to six analog outputs, where the output signal mode can be chosen among the many available options such as instant value, RMS, integral, min, max and peak to peak values.
The virtual channel functionality allows real-time calculations (sum, weighted sum and subtraction) of different input signals.

4.2 Block diagram



4.3 Dimensions

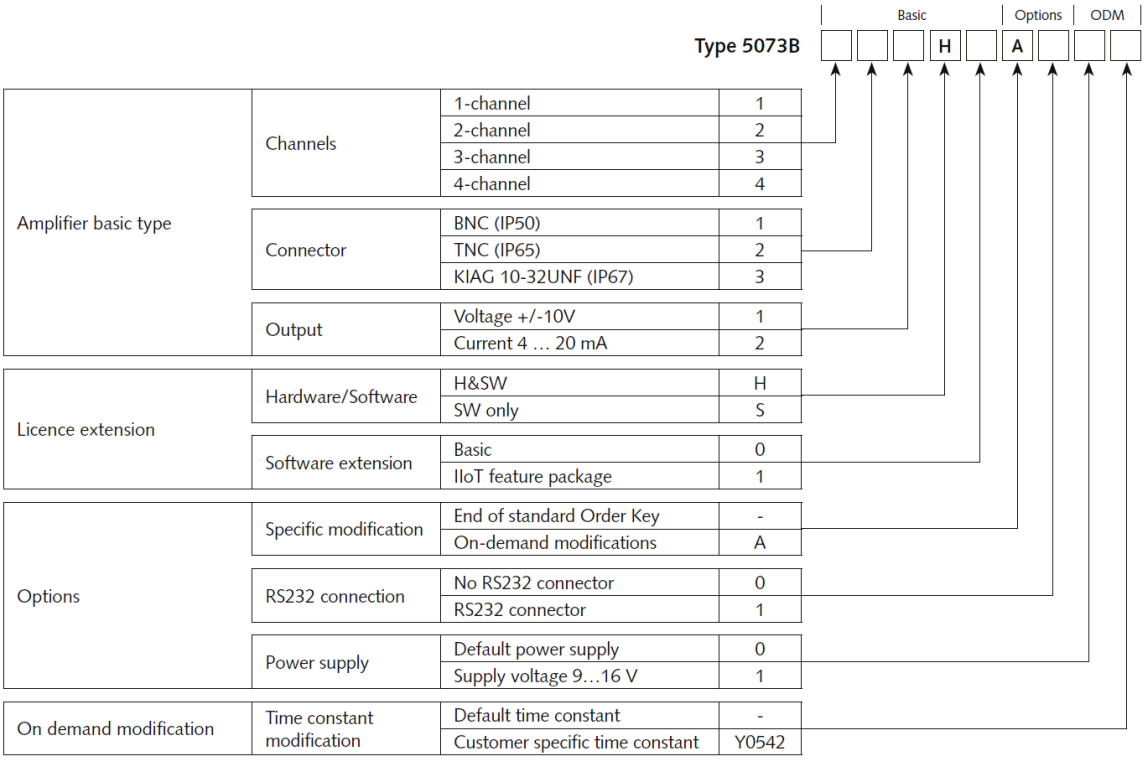


4.4 LED status indicator

Sensor LED per channel		
Initialization		yellow 1Hz blinking
Operate / Measure		blue
Reset, waiting for trigger		blue 1Hz blinking
Overload		red
Device LED		
Device boot/ initialization		yellow 1Hz blinking
Network connected, but initializing / waiting for IP-address assignment		yellow 1Hz blinking
MQTT Configured broker not available / no response		yellow 1Hz blinking

Waiting for internal/external action/ factory reset button pressed		blue 3Hz blinking
Device state "ok"		blue
Device state "error" • Overload on one or more channels • Operating temperature out of specification • Hardware error (device broken / not responding)		red
Device state "error " Reset/Measure timing violation (55ms) • Range switch during measure		red 3Hz blinking
Device state "connection lost" • Network connection lost (unplugged ethernet cable)		yellow

4.5 Ordering information



Type 5073B				Basic				Options	ODM	
					H			A		

Amplifier basic type	Channels	1-channel	1
		2-channel	2
		3-channel	3
		4-channel	4
	Connector	BNC (IP50)	1
		TNC (IP65)	2
		KIAG 10-32UNF (IP67)	3
	Output	Voltage +/-10V	1
		Current 4 … 20 mA	2
Licence extension	Hardware/Software	H&SW	H
		SW only	S
	Software extension	Basic	0
		IIoT feature package	1
Options	Specific modification	End of standard Order Key	-
		On-demand modifications	A
	RS232 connection	No RS232 connector	0
		RS232 connector	1
	Power supply	Default power supply	0
		Supply voltage 9…16 V	1
On demand modification	Time constant modification	Default time constant	-
		Customer specific time constant	Y0542

4.6 Included accessories

Quick start guide	55274765
Protective cap IP54 for sensor input BNC neg.	18000844
Protective cap IP54 for sensor input TNC neg.	18000850
Protective cap IP54 for sensor input KIAG 10-32 neg.	18000855
Protective cap for M12 socket (IP67)	55160137
Protective cap for D-Sub 15-pole	55273284
RS232 option only :	
Null modem mini adapter, D-Sub 9-pole pos. – D-Sub 9-pole neg.	1489
Protective cap for D-Sub 9-pole	55066918

4.7 Accessories (optional)

Sensor cable PFA, IP65 plug KIAG 10–32 UNF pos. plug KIAG 10–32 UNF pos.	1635Cxx
Sensor extension cable PFA, IP65 socket KIAG 10–32 UNF neg. plug KIAG 10–32 UNF pos.	1637Cxx
Network connection cable plug RJ45 – plug, plug M12 male 4-Pole D-coded, length 2m	1200A195A2
Connector D-Sub 15-pole neg., IP40, with metallized cover and lifting screws	65016033
Connector D-Sub 15-pole neg., IP67, with lifting screws M20x1,5 for cable diameter 6 … 12 mm	65016052
Cable D-Sub 15-pole neg. – open ends, Length according to order (Lmin = 1 m / Lmax = 10 m)	500A41Asp
RS-232C cable, D-Sub 9-pole pos. – D-Sub 9-pole neg.	1200A27
Cover IP67 for D-Sub 9-pole	65008385
Cover IP67 for D-Sub 15-pole	55273284
Null modem mini adapter, D-Sub 9-pole pos. – D-Sub 9-pole neg.	1489

It is only allowed to use Kistler approved Accessories. Please note that product approval, certifications and warranty apply only to the device in combination with explicit Kistler approved accessories.

5. Commissioning

Do not open the device.

Moisture and particles would be able to enter the device and may cause errors and drift.

5.1 Installation

To mount the amplifier, use the flange marked on the graphic and M4 Cylinder Head Screws.

See section 5.1.5 for details on EMC and ground loop.

5.1.1 Connecting sensors

Depending on the version, one, two, three or four sensors can be connected to the 5073B... charge amplifier.

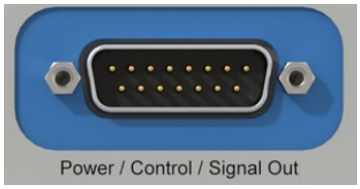
- The extremely high input insulation of the charge amplifier (>1E13 Ohm) means the signal or charge input has to be protected against dirt and moisture. Clean the connector contacts with a clean, lint-free paper towel and Type 1003 cleaning spray or white spirit.
- Connect the cable to the sensor. We recommend using high-insulation, low-noise cables from Kistler. These are tested specifically for high insulation resistance, low noise and low unwanted (triboelectric) charge produced by friction. If the cable is moved during operation, it should not be suspended over spans exceeding 30 ... 50 cm.
- Connect the sensor cable to the BNC neg./ TNC neg./ KIAG 10-32UNF neg. (depending on the variant) jack of the industrial charge amplifier.

5.1.2 Network connection

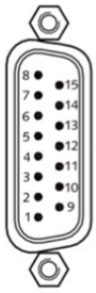
The Ethernet interface enables remote access, remote configuration and monitoring, firmware update, integration with control systems, data streaming and a web-based user interface.

Connector	Pin	Function
M12 4-pole neg. D-coded 	1	TX+
	2	RX+
	3	TX-
	4	RX-
	5	Shield

5.1.3 Power/Control/Signal out

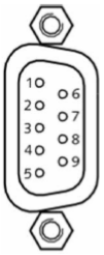


The D-Sub 15-pole connector is used to connect the supply voltage. Six pins on the D-sub connector are designated for analog outputs with fully flexible scaling and internal routing. The connector also accommodates pins for digital inputs and outputs for controlling industrial measurement processes.

Connector	Pin	Function
D-Sub 15-pol. pos 	1	Analog output 1
	2	Analog output 2
	3	Analog output 3
	4	Analog output 4
	5	Analog output 5
	6	Analog output 6
	7	Common Control
	8	DI (08)
	9	Exct. GND
	10	Signal GND
	11	Exct.+
	12	DIO (12)
	13	DIO (13)
	14	DIO (14)
	15	DIO (15)

5.1.4 Optional RS232

The optional RS-232C interface was kept for reverse compatibility to 5073A. This interface can be used to integrate the 5073B… into control systems, or to configure the device via ManuWare software in 5073A compatibility mode.

Connector	Pin	Function
D-Sub 9 pole neg. (optional) 	1	Not connected
	2	RxD
	3	TxD
	4	Not connected
	5	Exct. GND
	6	Not connected
	7	Not connected
	8	Not connected
	9	Not connected

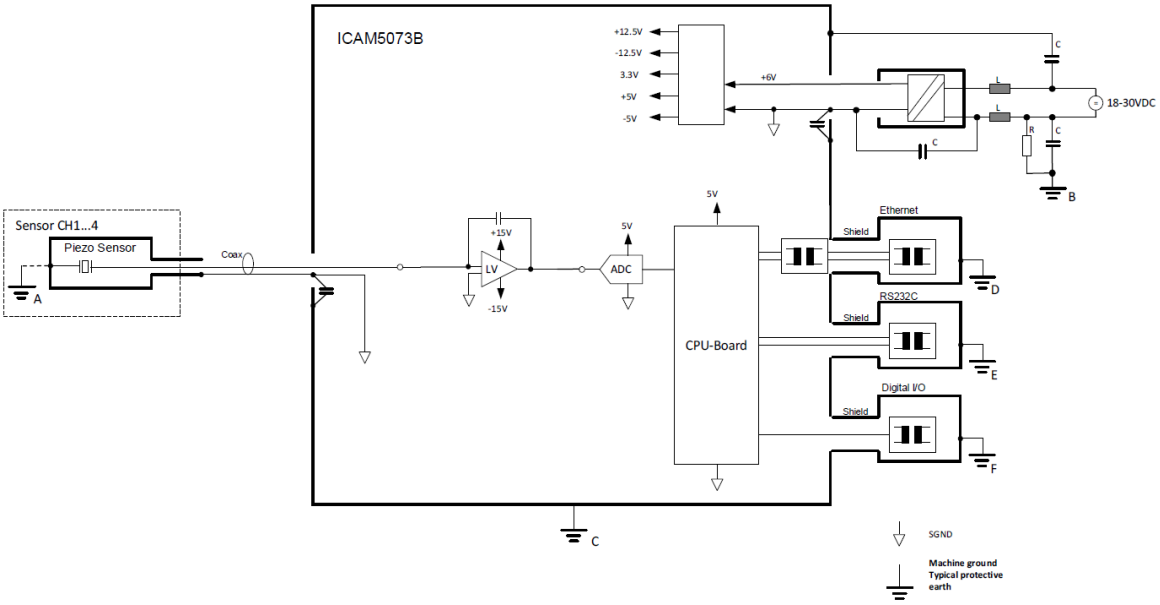
5.1.5 EMC and ground loops

Piezoelectric sensors are usually designed so that one of the electrodes is connected on the sensor case, allowing the use of coaxial cables. Thus, when the sensor is installed, it is usually grounded by the metal structure (safety). If the sensor is not insulated when it is installed, a resultant ground loop could cause interference.

There are different counter measures if EMC or ground loops occur:

A low-impedance and at the same time low-inductance connection between instrument case and sensor (large-area copper braiding, ribbon cable) usually provides good results.

On the other side, the sensor may also be installed using insulation elements to eliminate current flow based on potential differences or induction.



For the connections that are galvanically insulated, there shall be a defined connection of the measuring chain to a ground level.

Potential differences from Sensor to Amplifier Mounting Area

On single channel 5073B1… device, either sensor or amplifier shall be connected to ground, in order to not have a floating measurement system.

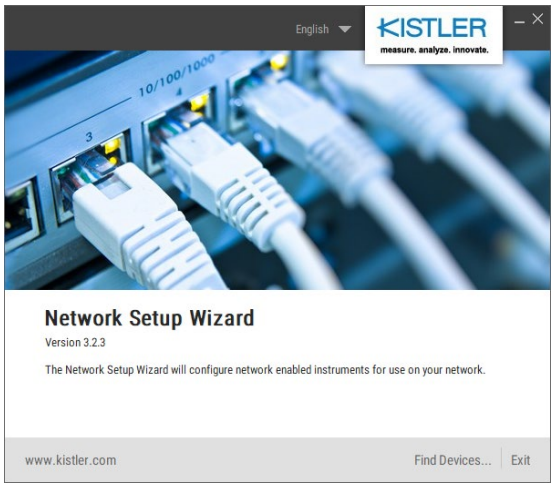
Potential differences between Sensor Inputs

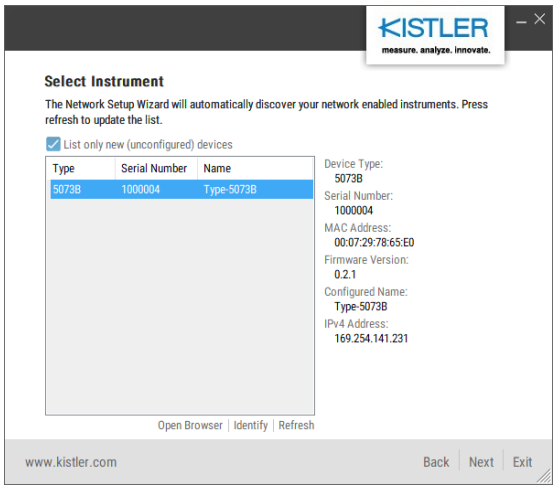
On multi-channel 5073B2.., 5073B3.. and 5073B4.. it is important to consider, that sensor connector grounds are internally connected and capacitive coupled to the housing.

It is therefore recommended to electrically insulate the sensors in order to prevent electrical current flow due to potential differences between sensor locations, or to take adequate counter measures.

6. Device configuration and operation

6.1 Access to the web user interface





To access web UI of the device, connect the amplifier with a network cable directly to a PC or a network (e.g. network switch). The user can use the «Network Setup Wizard», which can be downloaded from Kistler website www.kistler.com.
Start the «Network Setup Wizard» tool that finds all Kistler network devices. Then, click on «Find Devices…» and wait until Kistler network devices are displayed. It may take up to 30 seconds until the devices are displayed.

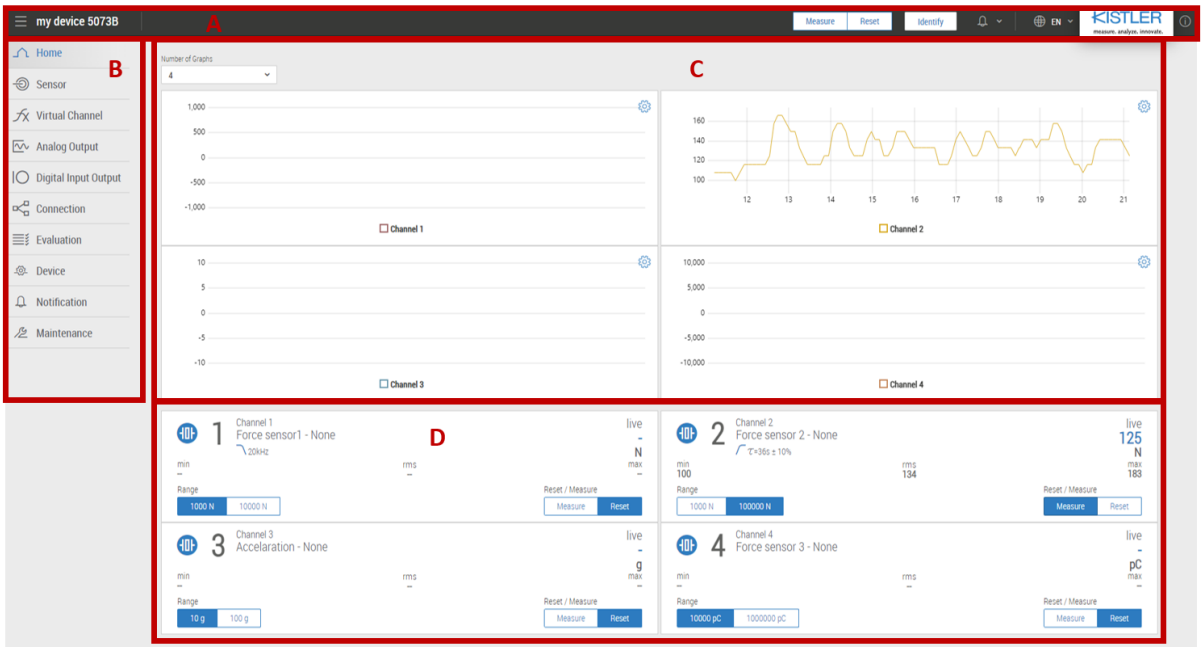
To see all devices, including the already configured ones, deselect the «List only new (unconfigured) devices» checkbox.

Bottom right of the list field you see different options:

a) Open Browser:
   Opens the web interface of the selected device in your web browser.
b) Identify:
   Permits an identification of the selected device.
c) Refresh:
   Repeats the search and refreshes the list of devices found in the network.

Once the device is found and appeared in the list, the web UI can be accessed by clicking on «Open Browser» or entering the IP address in the web browser directly.
The Kistler charge amplifier 5073B… can be configured and operated via the web user interface.

6.2 Home screen in the web UI



Upon accessing the web UI of the 5073B…, you will be directed to the Home screen of the user interface.

The Home screen contains the following elements:

A) Status bar
B) Navigation pane
C) Y-t graphs
D) Sensor portlets

Each of the elements are explained in detail in the following sections.

6.2.1 Status bar

Minimizes and re-opens the navigation pane

my device 5073B

User defined device name

Measure Reset

Switch to change the amplifier's operation mode from Reset to Measure and vice versa. Blue shows the active status. If this switch is used, the Measure or Reset status will be applied to all channels.

Identify

Makes your device blink yellow with device LED. This allows identifying the device the user is currently working with. This is especially helpful when more than one device is in use.

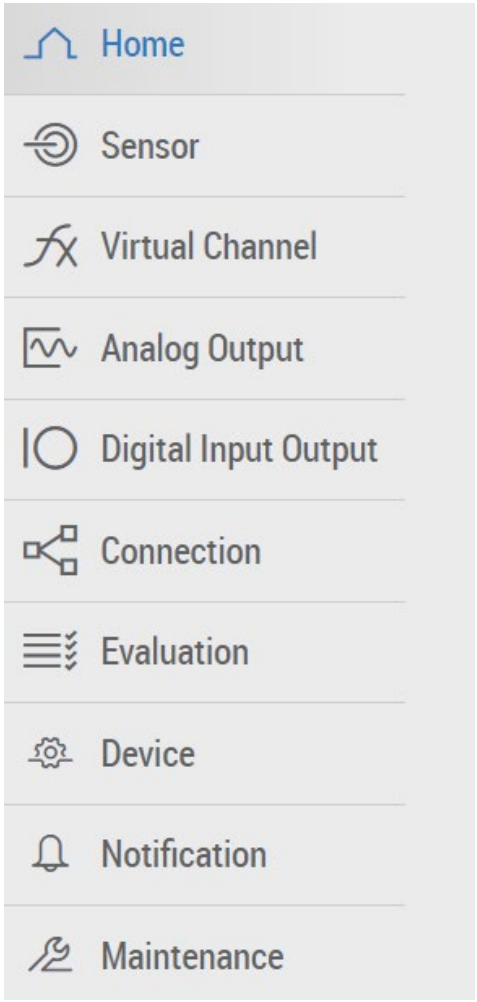
Notification and warning messages

EN

The globe symbol opens the list to select the display language of the web user interface.

Opens the guide to the REST-API

6.2.2 Navigation pane



Home

Navigates to the «home screen», an overview page. Shows important channel and device configurations and some measurement values.

Sensor

Navigates to the sensor configuration page.

Virtual Channel

Navigates to the configuration page of the virtual channels which allow calculations with the sensor signals in real time.

Analog Output

Navigates to the analog output configuration page.

Digital Input Output

Navigates to the digital input output configuration page.

Connections

Navigates to the connection page where the user can access MQTT and OPC UA configuration. This page will only appear if the IIoT features license is purchased.

Evaluations

Navigates to the evaluation page where the user can enable and configure 1-point, 2 point and window mode evaluations.

Device

Navigates to the device configuration page where e.g. network settings, clock setting can be configured.

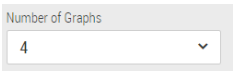
Notifications

Navigates to the notifications page where the notifications and error messages can be managed.

Maintenance

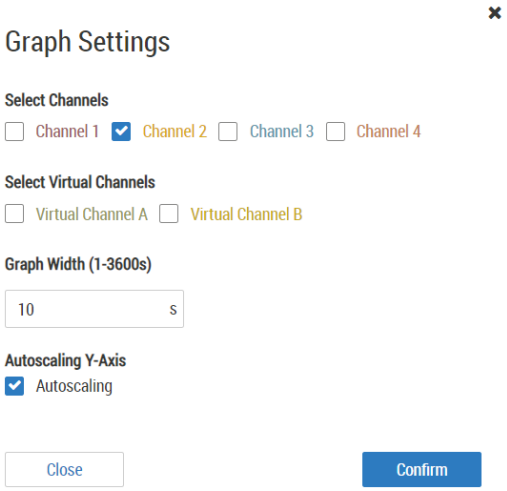
Navigates to the maintenance page where e.g. firmware updates, factory reset and user management, license and certification management can be performed.

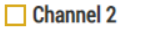
6.2.3 Graphs



The number of graphs to be displayed on the Home screen can be selected from the drop down.

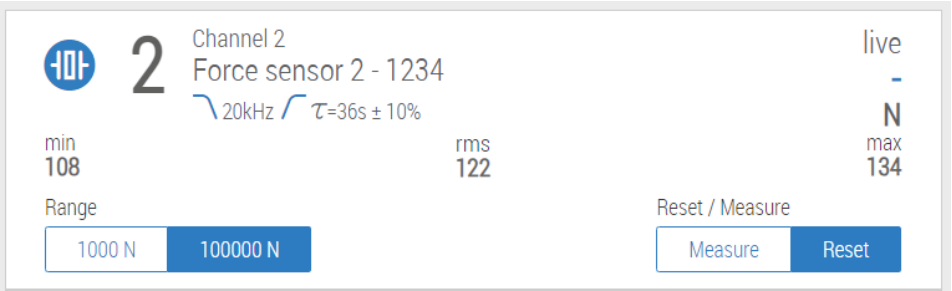
Graphs settings such as channels to be displayed on the graph and scale of the axes can be adjusted by clicking on this icon.



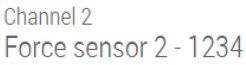


The channel number under every graph shows which channels are being displayed in the graph.

6.2.4 Sensor portlets



The sensor portlets show the most important status information, settings, and measurement values of the input channels of the 5073B. Clicking on a portlet navigates to the sensor configuration page for the respective channel.



The channel number, the entered channel name and serial number are shown.

This section shows an overview of what is activated on the sensor channel.

A low-pass filter with cut off frequency of 20kHz is configured on this channel.

A high-pass filter with time constant of 36s is configured on this channel.

This section shows the two user-defined ranges and units. The blue color shows the active range.

This shows the channel status. The blue color shows the current active status.

min
108

This shows the minimum signal value before Reset.

max
134

This shows the maximum signal value before Reset.

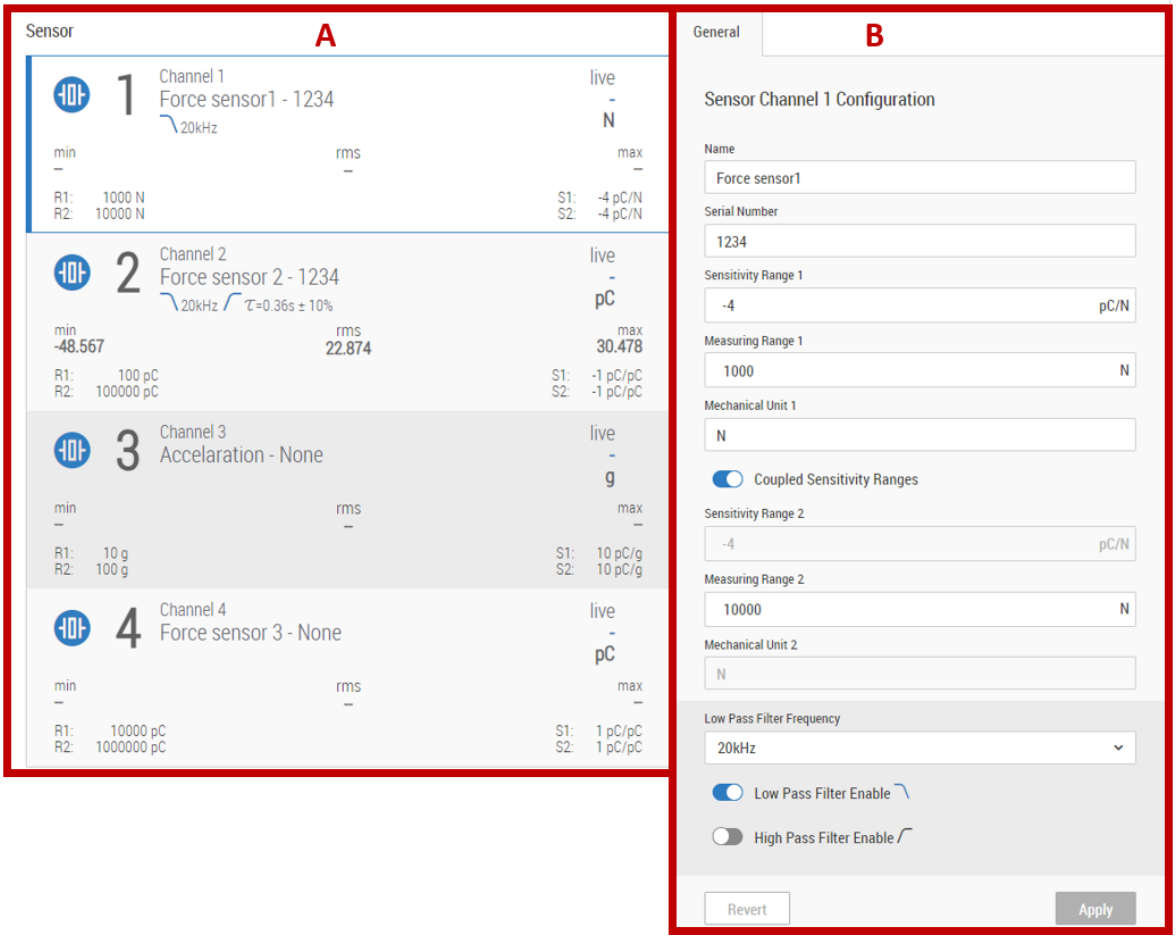
rms
122

This shows the rms (root mean square) of the signal value before Reset.

live
-21.494

This shows the live value of the signal.

6.3 Sensor configuration page



A) Channel selection

The sensor portlets in the channel selection section have two functions:

- Show the most important information of the channel (configuration & values). The portlets are identical to the sensor portlets on the home screen.
- Selection of the channel(s) which shall be configured in the configuration section B).
  A selected channel gets a blue bar on the left and a thin blue frame.

B) Configuration section

Here are the parameters that can be set by the user.

Name: enter a sensor name of your choice.

Serial number: if desired, enter the serial number of the sensor or an internal equipment number or similar to make your measurements better traceable.

Sensitivity Range 1/2: enter the sensitivity value of your connected sensor for measuring range 1 and range 2.

Measuring Range 1/2: enter the range you expect from your measuring signal.
If the signal exceeds the specified range by more than 5%, an «Input Over Range» will be signalized by the red LED channel.

Measurement Unit 1/2: unit can be entered by typing the desired unit in the field.

Coupled sensitivity Ranges: if coupled sensitivity is enabled, the same sensitivity value and unit will be taken for both ranges.

Low pass filter: a low pass filter can be enabled by switching the low pass filter. Blue color represents filter activated.

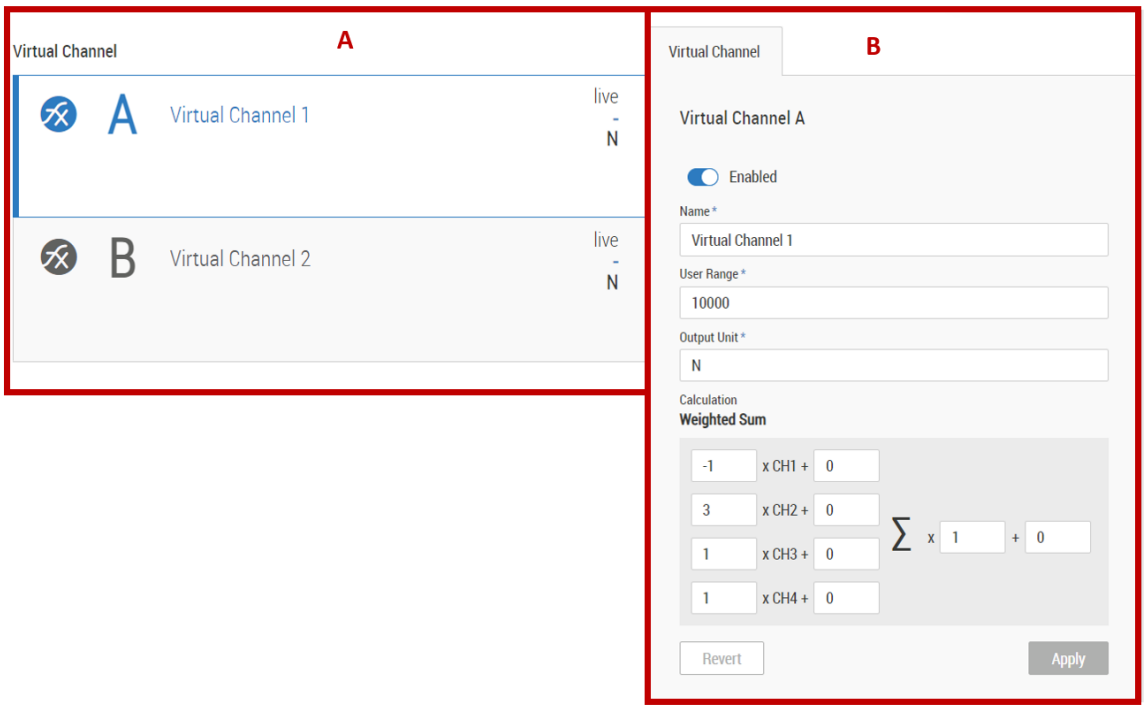
Low pass filter frequency: the cut off frequency of low pass filter can be selected from the drop-down list.

High pass filter: a high pass filter can be enabled by switching the high pass filter. Blue color represents filter activated.

Apply: when a parameter is changed, apply button will be enabled. If the user clicks on the Apply button, all the changes will be applied.

Revert: after changing a parameter, if it is desired to go back to the previous value, Revert button can be clicked.

6.4 Virtual Channel configuration page



Virtual channels can be used for real-time calculations using one or more sensor channels. In general, the measuring values coming from the sensor channels are taken as “pure numbers” only without any unit. After the calculation stage, the values are receiving again a physical unit and the respective range has to be specified like on a sensor channel.
There are only 2 virtual channels available on 5073B….

A) Channel selection

The virtual channel portlets have two functions:

- Show the live value of the virtual channel
- Selection of the channel(s) which shall be configured in the configuration section B).

B) Configuration section

Here are the parameters that can be set by the user.

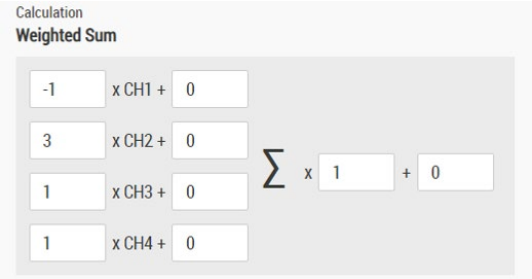
Enabled: activates the virtual channel

Name: enter a virtual channel name of your choice.

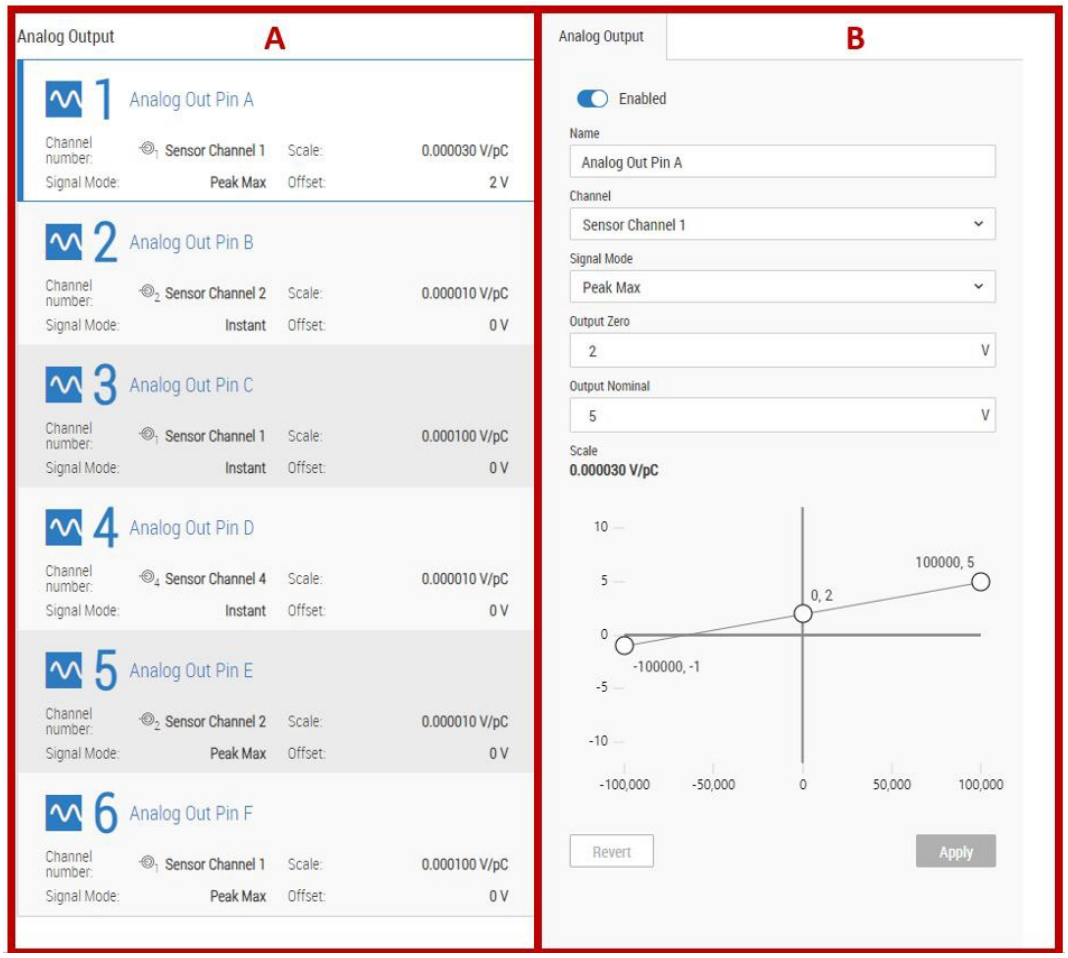
User Range: enter the range you expect from your virtual channel signal.

Output Unit: unit can be entered by typing the desired unit in the field.

Calculation:
Desired numbers can be added to or subtracted from each sensor channel signal. Sensor channel signals can also be multiplied by a number.



6.5 Analog output configuration page



A) Analog output selection

The analog output portlets have two functions:

- Show the most important information of the analog output
- Selection of the analog output(s) which shall be configured in the configuration section B)

B) Analog output configuration section

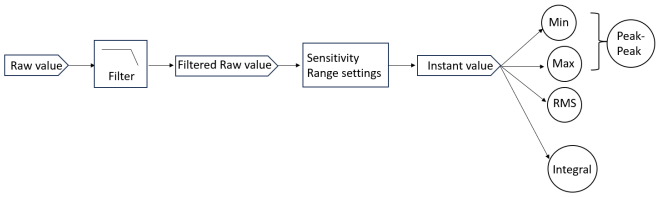
Here are the parameters that can be set by the user.

Enabled: activates the analog output

Channel: the channel that is intended to be routed to the analog output can be selected from the drop-down list. All sensor input channels and virtual channels can be routed to the analog outputs.

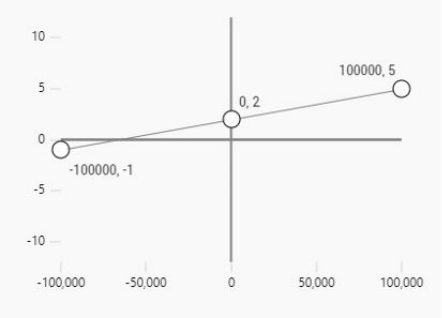
Signal mode: output signal can be selected from the list of available signal modes. The available signal modes are Raw, Filtered Raw, Instant, Peak Min, Peak Max, Peak-Peak, RMS and Integral.

- **Raw** value is the raw signal without any filtering and application of sensitivity.
- **Filtered Raw** value is the raw value after filtering.
- **Instant value** is the value where filter is applied and also sensitivity and range settings are applied.
- **Peak Max** is the max value of the instant signal.
- **Peak Min** is the minimum value of the instant signal.
- **Peak-Peak** is the peak-to-peak value of the instant signal or the difference between the max and min value.
- **RMS** is the root mean square value that is calculated from the instant signal.
- **Integral** is the integral of the instant signal.



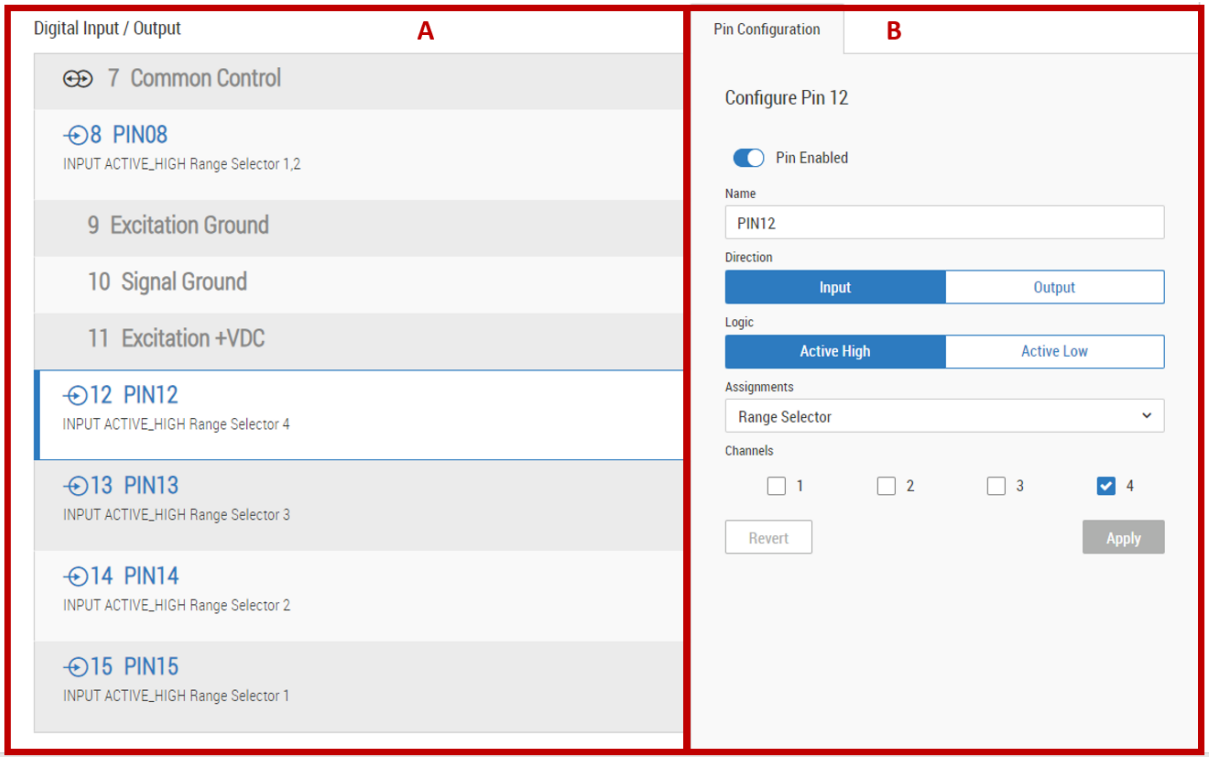
Output zero: this value defines the offset value of signal or deviation from 0 output when input is 0.

Output nominal: the output range can be adjusted to a value other than ±10 V between -10V and +10V.
The graph here illustrates the scaling when offset is 2V and nominal output is 5V.



Scale: The scale is then calculated using the offset and nominal output values defined by the user.

6.6 Digital input/output configuration page



The 15-pole D-sub connector features 5 pins that can function as digital input/output. Pin 8 is exclusively designated for digital input, whereas pins 12 to 15 offer the flexibility to be configured as either input or output.

A) Digital IO selection

The digital input/output portlets have two functions:
- Show the most important information of the digital IO
- Selection of the pin which shall be configured in the configuration section B)

Please note that the pins appearing in grey are not configurable.

B) Digital IO configuration

Here are the parameters that can be set by the user.

Pin Enabled: activates the digital IO pin

Name: enter a name of your choice for the digital IO pin.

Direction: select whether the pin is going to function as an input or output. Only pin 12-15 can be configured as input or output.

It is imperative to connect the common control (pin 7) to 0 V to prevent potential damage to the device when configuring any of the digital I/O pins as output.

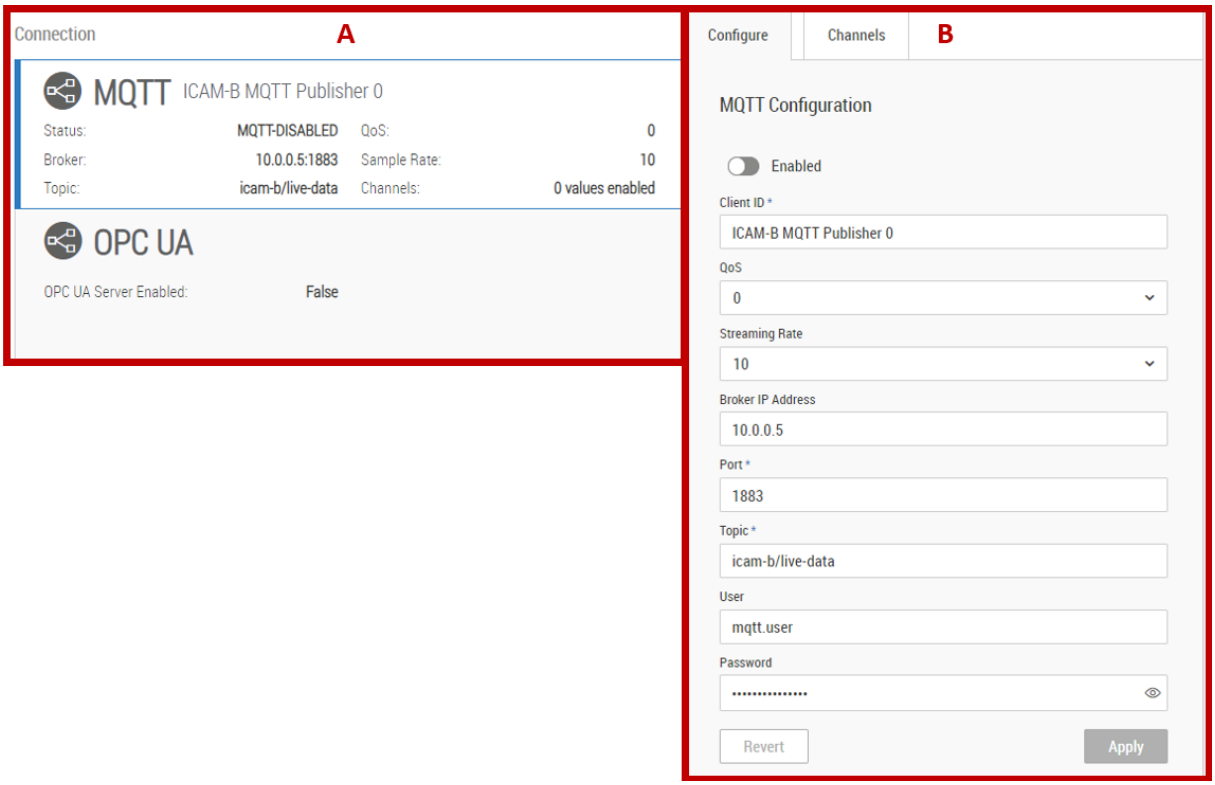
Logic: the logic of each pin can be selected as active high or active low.

Assignments: for digital inputs, there are two assignment options available. One assignment is to control Reset/Measure with the digital input. The other assignment Range selector is to switch the range.
For digital output there are more assignments that are measure state, range state, overload, evaluations, system error and error. The digital output sends a signal to an external system when the state is changed for example from reset to measure, or when an overload occurs.

Logic Level for digital Inputs:
Low: 0 … 0.8 V and High: 2.4 ... 30 V
Logic Level for digital Outputs
Low 0 and High: 18 …30V (supply-voltage dependent)

Channels: after choosing the assignment, the corresponding channels for the digital IO have to be selected.

6.7 Connections configuration page



The connections configuration page is only available if licensed IIoT feature package is purchased. This package includes MQTT for data streaming and OPC UA for parametrization.

A) Protocol selection

The connection portlets have two functions:

- Show the most important information of each connection
- Selection of the connection to be configured

B) MQTT configuration

Here are the parameters that can be set by the user.

Enabled: activates the selected connection.

Client ID: Connecting client has a specified client ID

QoS: There are three levels to note in MQTT QoS: 0, 1, 2.
QoS 0: Publisher will send a message only once. Subscriber Might receive or might not receive the message.
QoS 1: Publisher will send a message at least once as long as an acknowledgement is received or the command to end the transmission is received. It is likely that the subscriber receives the message at least once (it is possible that the message can be received more than once).
QoS 2: Publisher will only send a message once. Subscriber will only receive the message once.

Streaming Rate: streaming rate of up to 1 kSps can be chosen from the drop-down menu.

Broker IP Address: here the user enters the IP address of the broker.

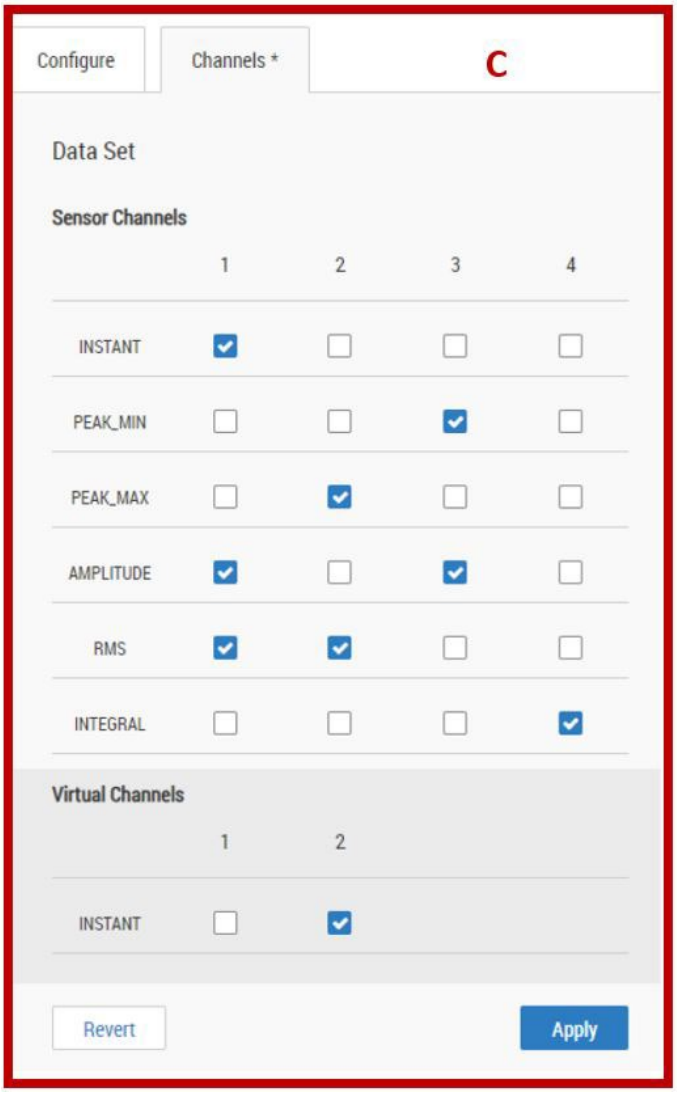
Port: The default unencrypted MQTT port is 1883.

Topic: MQTT topic is a filter the broker uses in MQTT message deliveries.

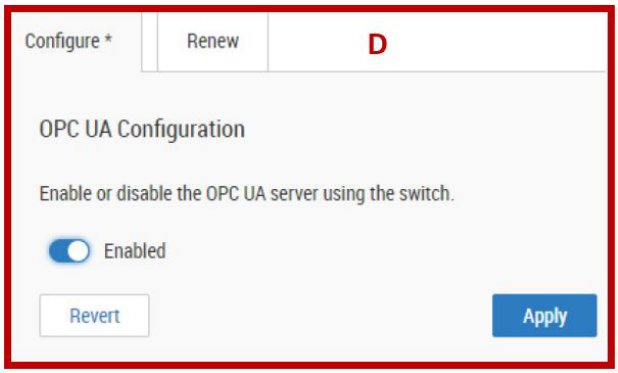
User and Password: when an MQTT client connects to the broker, it sends its username and password in the CONNECT packet.

C) MQTT Data Set selection

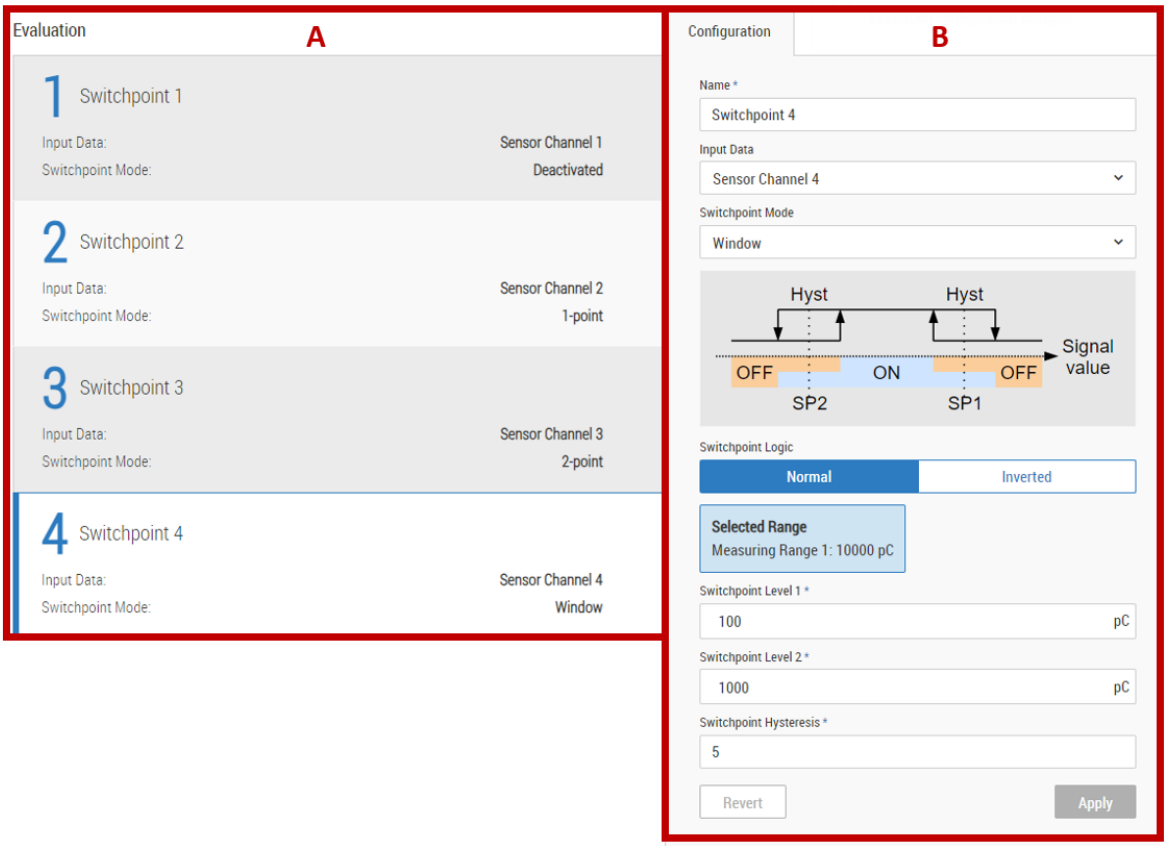
The data to be streamed can be defined by selecting the channel number and the signal mode for the corresponding channel.



D) OPC UA configuration
OPC UA can be enabled using the switch in the configuration section.
The OPC UA certificate can be renewed in the Renew section.



6.8 Evaluation configuration page



Evaluation might be used to define process limits. This may help customers using different sensor assemblies, or assemblies in various processes, to control specific process levels according to assembly limits or process limits.

A) Evaluation selection

The evaluations portlets have two functions:

- Show the most important information of the evaluation
- Selection of the evaluation which shall be configured in the configuration section B.

B) Evaluations configuration

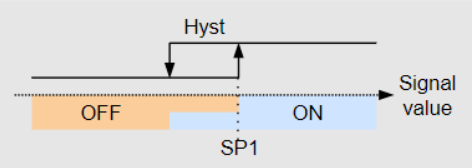
Here are the parameters that can be set by the user.

Name: enter a name of your choice for the evaluation.

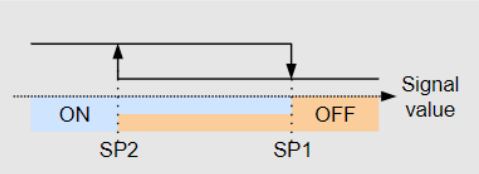
Input Data: select the sensor channel or virtual channel that is going to be used for evaluation.

Switchpoint mode: the evaluation mode can be selected from the available options 1-point, 2-point and window mode.

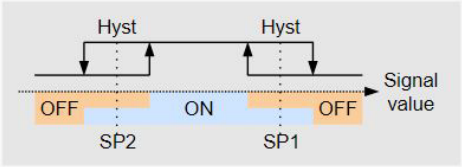
1- Point
The switching state changes when the current measurement value passes the switchpoint level1 (SP1). This change occurs with rising or falling measurement values. If a hysteresis is defined for SP1, the switching behavior shall observe the hysteresis as shown.



2- Point
The switching state changes when the current measurement value passes the Setpoint SP1. This change occurs only with rising measurement values. The switching state also changes, when the current measurement value passes the Setpoint SP2. This change occurs only with falling measurement values. Hysteresis shall be ignored in this case.



Window
The switching state changes when the current measurement value passes the Setpoint SP1 and Setpoint SP2. This change occurs with rising or falling measurement values. If hysteresis is defined for SP1 and SP2, the switching behavior shall observe the hysteresis as shown. This behavior shows symmetrical hysteresis in respect to SP1 and SP2.

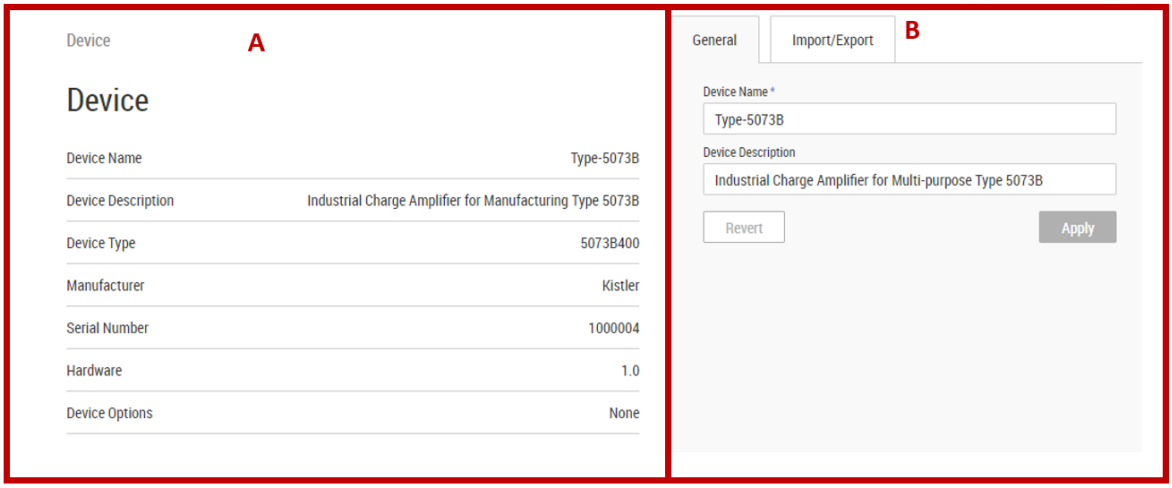


Logic: the logic of each evaluation can be selected as normal as shown in the schematic or inverted.

Switchpoint Level 1: this corresponds to SP1 shown in the schematic.

Switchpoint Level 2: this corresponds to SP2 shown in the schematic.

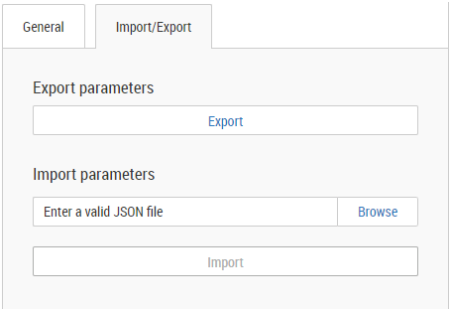
6.9 Device configuration page



In this section, device related information such as device type, serial number, device name, network settings, connector guide and date/time settings are shown and can be adjusted.

A) Device

In this section, device name and device description can be changed. The user can see the serial number, device type and device options.
All the parameters of a device can be exported in a JSON format, or a JSON file can be imported to a device.

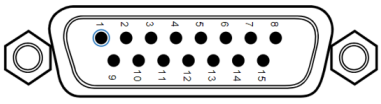


B) Network

IP settings and DNS configuration can be seen and changed in this section are shown and can be adjusted.

C) System connector

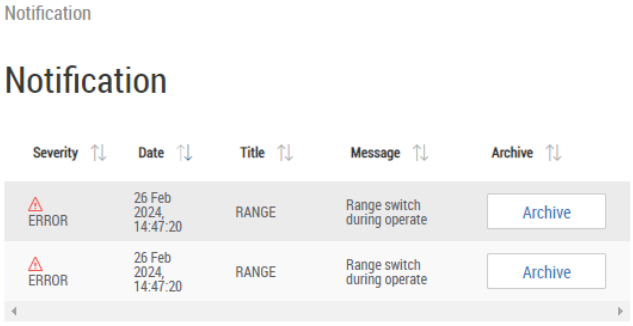
The 15-pole D-sub connector has been described in this section. Each pin can be selected by clicking on the pin in the picture and configured by clicking on configure button.

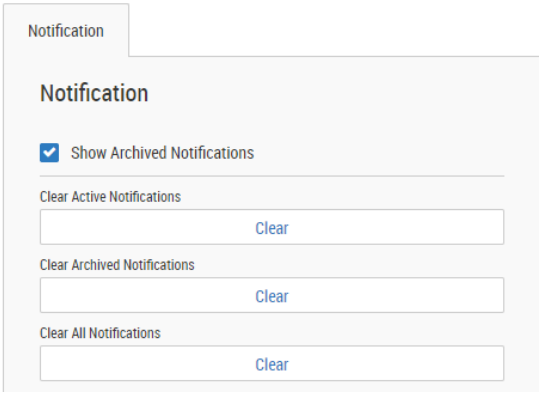


D) Date/Time

Date and time related settings can be adjusted in this section.

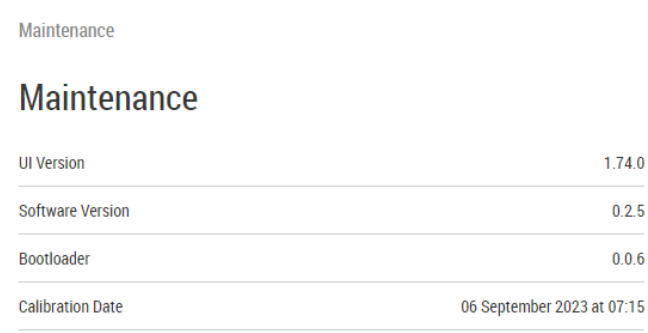
6.10 Notification page

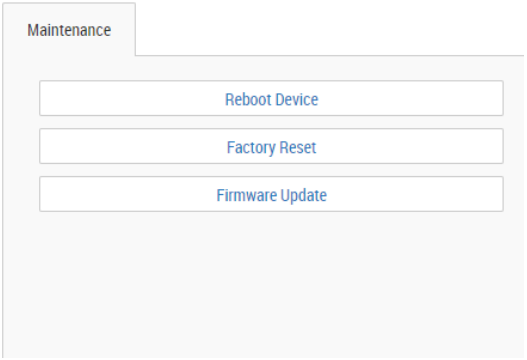




All the error messages and notifications are store in this section. The notifications then can be cleared or archived by the user.

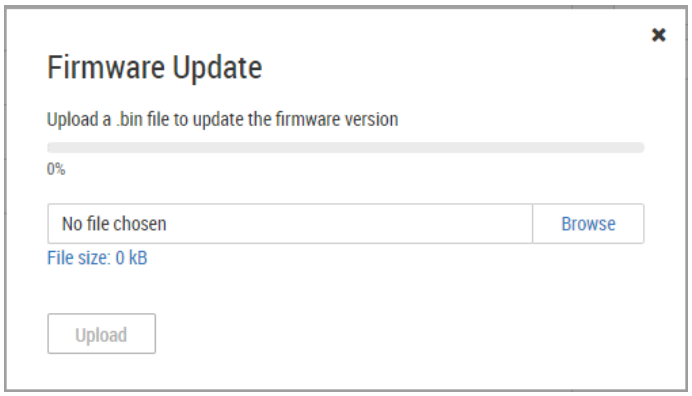
6.11 Maintenance page



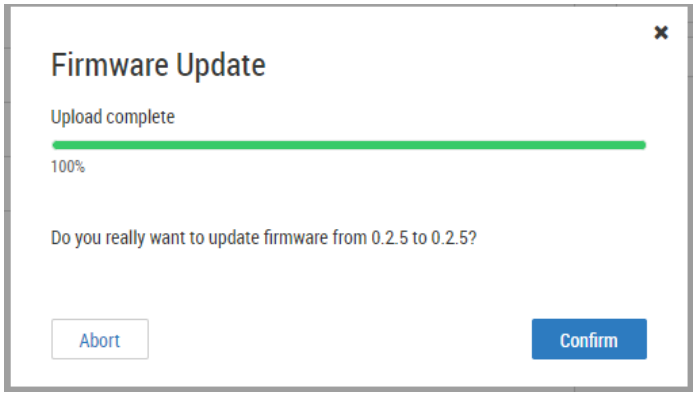


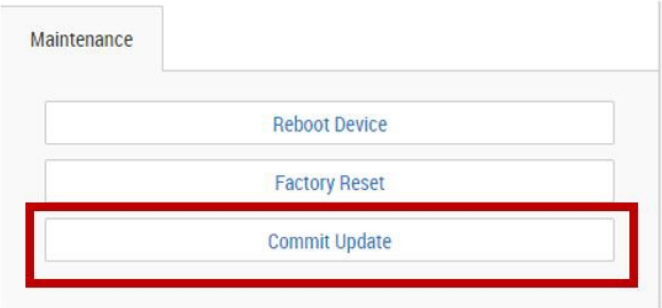
The firmware version, UI version and calibration dates can be seen in maintenance section. Moreover, the user can do factory reset, device reboot and firmware update in this section.

Firmware update can be done by uploading the FW package available at the Kistler website (www.kistler.com).



Once the file is selected, upload button has to be clicked. Once uploading the file is completed, confirm button has to be pressed. Then, the device will be rebooted, and the new firmware update will be confirmed.
After the firmware update, the IP of the device might be changed if dynamic IP (DHCP) is used. Thus, it is necessary to go to setup Wizard and access the device by searching for the device again and commit the new firmware. Without committing the new firmware, the new firmware will not be written on the device.



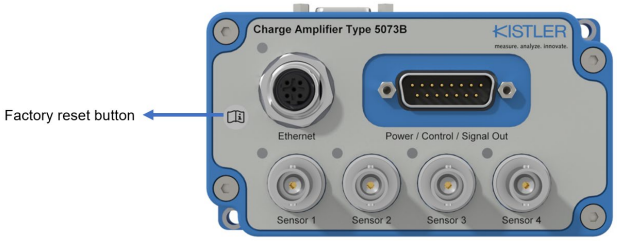


If a username and password is defined, the browser will request the user to login with the username and password.

Factory reset can be initiated through either the web user interface or by utilizing the factory reset button on the device. When opting for the web user interface, users can navigate to the factory reset option within the maintenance menu on the navigation pane. Alternatively, if the factory reset button is preferred, the following steps should be followed:

- Power off the device.
- Press and hold the factory reset button.
- Power on the device while holding the factory reset button.
- Hold the factory reset button for 10 s after powering on.

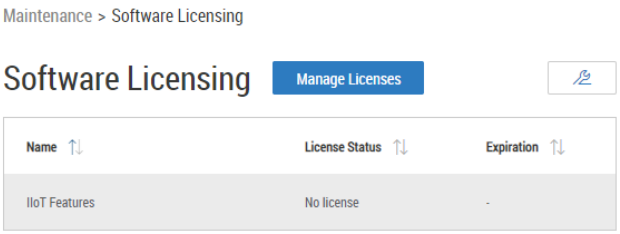
In order to use 5073B… as a replacement for 5073A… in compatibility mode, a factory reset is required. Otherwise, the device might not be identified in ManuWare.
Please note that after a factory reset the IP settings might be lost. Therefore, the user needs to find the device with the new IP address via Setup Wizard.



If a username and password is set, after the factory reset, the user needs to enter a username and password again.

Software licensing

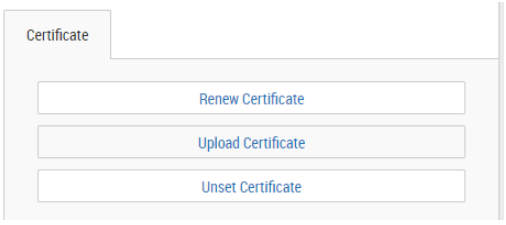
The charge amplifier supports two standardized IIoT protocols which can be enabled by purchasing the licensed IIoT feature package. The licensed IIoT package features configurability and parametrization capabilities through the implementation of OPC-UA. OPC-UA is a widely adopted industrial communication protocol that facilitates secure data exchange between devices in the industrial automation. An additional feature that comes in the IIoT licensed package is MQTT for data streaming, which makes the amplifier suitable for a variety of applications across industries by providing efficient communication. The license can be purchased either from the Kistler web shop or from the sales representatives in your country.
To enable the license, the software licensing in the Maintenance section can be opened.



By clicking on Manage Licenses, a window will be opened, where the new license can be activated.

Certificate

The device 5073B… creates a self-signed certificate upon booting up the device. A self-signed certificate is a type of digital certificate that is signed by its own creator rather than a trusted certificate authority (CA). While self-signed certificates can provide encryption and authentication, they are not trusted by default by web browsers and other client software because they have not been signed by a recognized CA. Therefore, when using a self-signed certificate, users may encounter security warnings or errors indicating that the certificate is not trusted. If a secure connection is required, HTTPS could be used instead of HTTP. The certificates can be renewed or unset if necessary. Please note that the UI might react slower while using HTTPS than HTTP. Thus, it is recommended to use HTTP if controlling the device through web UI is desired.
The 5073B… allows uploading certificates other than the certificate created by the device itself.



License agreement and some links to customer services and support are available in the maintenance section as well.

User Management
Upon initial setup or following a factory reset, a prompt will appear to establish a username and password. Users have the option to either create a username and password or proceed without setting up a user account.

Through the User Management feature located in the Maintenance section, users can add or remove individuals from the user list. Once a user account is created, it is mandatory to input the correct username and password after system reboot, firmware updates, or when accessing the web UI.

In the event of a forgotten password, users must perform a factory reset using the designated button on the device.

7. Service and Maintenance

7.1 Cleaning and storage

Keep the device clean and protect the measuring chain against excessive dirt and moisture.

In the event that the device is not being used, we recommend storing it in a dry, clean and well-ventilated place.

In case the device housing has become dirty, clean it. Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water. Do not use other liquids as they may attack the housing.

For cleaning of the connectors use the Kistler cleaning spray Type 1003.

7.2 Services

Support on Commissioning
On request, Kistler offers support on commissioning to help customers with a faster integration of the measuring equipment. Please contact your preferred Kistler Sales Responsible or the Kistler Office near you.

Recalibration
Even though there is no physical wear that leads to bad signal quality, regulations in customer's field of application may dictate a periodic calibration of measuring components.

Kistler offers Recalibration Service for amplifiers. Please contact your preferred Kistler Sales Responsible or the Kistler Office near you.

If you need additional help beyond what can be found either online or in this manual, please contact Kistler's extensive support organization.

7.3 Inspection for visible Damage

Please observe the following instructions for the servicing of your charge amplifier device:

- Check the device for visible damage before each use. Do not put a damaged device into operation!
- Leave all repairs to the manufacturer's plant.

7.4 Repair

If your charge amplifier device is defective, please observe the following instructions:

- Contact the responsible Kistler representative and give notice that the defective device is to be sent in for repair.
- Send the defective device in the original packaging to the Kistler representative.
- Enclose a detailed description of the defect and the accompanying circumstances with the device
- Describe the measurement process during which the defect occurred
- If a major repair is necessary, you will receive a cost estimate
- Kistler will endeavor to repair your device in a short time and at minimal cost and send it to you in as-new condition

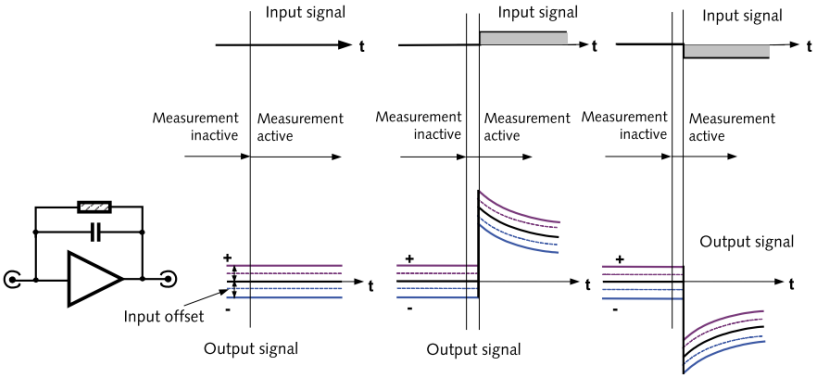
7.5 Drift

It is recommended to have the charge amplifier powered on for at least 1 hour before performing measurements, as the amplifier will need to heat up to a stable working temperature to ensure the specified drift rates. After storage on extreme temperatures, this startup time may be longer.

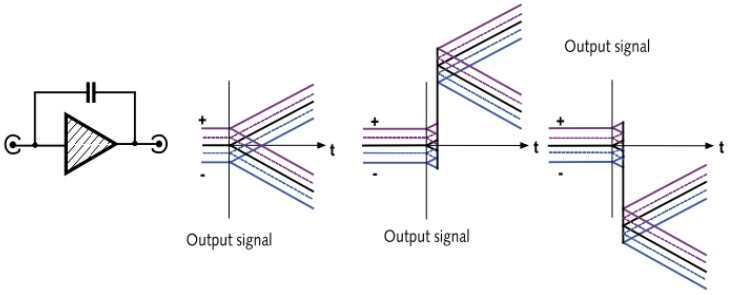
The gradual zero point shifting of the output signal during a measuring cycle is called drift. The maximum drift is specified as ±0.05 pC/s at 25°C (see section technical data). Any values significantly higher than specified can be due to one of the following causes:

Cause 1
The output signal drops exponentially towards zero. It is caused by the insulation resistance in the charge amplifier

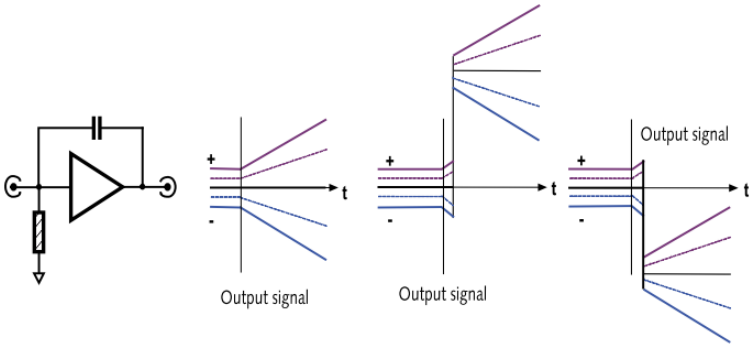
feedback being too low. In turn this is due to poor feedback capacitor insulation resistance. Please make sure, that the internal time constant functionality is not activated, since this would result in such behavior. To rectify the defect, return the charge amplifier to the responsible Kistler sales center/distributor for repair.



Cause 2
The signal at the output drifts linearly in the positive or negative direction. This may be caused by a faulty input operational amplifier. To rectify the defect, return the charge amplifier to the responsible Kistler sales center/distributor for repair.



Cause 3
Depending on the polarity of the offset voltage on the amplifier input, the drift can be in the positive or negative direction. It is caused by the insulation resistance at the input of the charge amplifier being too low. It may, however, also be due to insufficient sensor insulation resistance. The insulation of the sensor cable and the sensor (but not the input resistance of the charge amplifier) can be measured with a Type 5493 insulation tester. Dirty amplifier input, sensor and cable connectors and sockets must be cleaned or replaced. The zero of the charge amplifier input stage can be recalibrated if the problem persists. Send the amplifier to the responsible Kistler sales center/distributor to have this carried out.



Note
Cause 3 is readily diagnosed by removing the sensor and sensor cable and connecting a charge calibrator for testing.

8. Technical Data

This chapter only contains safety-relevant technical data. For all other technical data, please refer to the data sheet on our website www.kistler.com.

8.1 General

Environment		Indoor/outdoor
Altitude	m	<2000
Operating temperature range	°C	-20 … 65
Storage temperature	°C	-40 … 85
Degree of protection as per EN60529 (only with cables fitted and/or covered connectors)	IP	BNC (IP50) TNC (IP65) KIAG 10-32 (IP67)
Housing material		Die-cast aluminium
Weight	g	≈325
Dimensions (Width x Height x Length)	mm	64 x 34.5 x 115
Vibration resistance IEC60068 Part 2–6 (58 Hz … 150 Hz)	g	10
shock resistance IEC60068 Part 2–27 (6 ms)	g	100

9. Certification Information

9.1 CE (Europe)

Hereby, Kistler Instrumente AG declares that the charge amplifier Type 5073B is in compliance with Directive 2014/30/EU.

9.2 UKCA (UK)

Hereby, Kistler Instrumente AG declares that the charge amplifier Type 5073B is in compliance with Directive UK SI 2017 No. 1091.

9.3 FCC (USA)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by Kistler Instrumente AG for compliance could void the user's authority to operate the equipment.

9.4 IC (Canada)

Canada Compliance Statement: This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Canada Déclaration de Conformité: L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage.
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

9.5 Others

The conformity for countries with other national regulations has to be approved prior to use and operation.

Turn To The Industry Experts

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