

Supercal 5 U

Compact thermal ultrasonic energy meter



Instruction for use



Further information can be found at
www.sontex.ch

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1. Product Description

The *Supercal 5 U* is a thermal energy meter with ultrasonic flow sensor for heating and/or cooling systems for nominal sizes: qp 3.5 to 6.0 m³/h. Consumption values can be read over the display, or over the Software *Superprog* Windows or Android. Communication interface like optical probe, NFC, M-Bus, Bacnet, Modbus, bidirectional Sontex radio, wM-Bus or LoRaWAN[®] are also available.

The *Supercal 5 U* complies with the requirements of the European Directive MID 2014/32/EU modules B and D and of the standard EN 1434 class 2.

2. Symbols

Symbol	Significance
	DANGER! Failure to observe these warnings leads to fatal or serious injury.
	WARNING! Failure to observe these warnings may lead to death or serious injury.
	CAUTION! Failure to observe these warnings may lead to moderate injury.
	NOTICE! Failure to observe these warnings may result in damage to property.
	Information Information that is important for a specific topic or goal, but not relevant to security.
	Disposal This symbol indicates that electrical and electronic equipment must be disposed separately. Do not dispose of the calculator with household waste.

3. Scope of delivery

One box contains 1 flow sensor linked to the calculator body of *Supercal 5 U*, 1 calculator cover of *Supercal 5 U*, 1 mounting plate for the fixation of the calculator on the flow sensor, 1 pair of temperature sensor (Optional), 1 pair of seals and their wire, 1 pair of gasket, 1 installation guide.

4. Target user and personnel qualification

This documentation is intended for the system operator and the installer.

The thermal energy meter may only be installed or replaced by authorised specialists in sanitary, heating and air-conditioning technology.

5. Intended use

The thermal energy meters is an instrument intended for measuring the energy which in a heat-exchange circuit is absorbed (cooling) or given up (heating) by the heat-conveying liquid.

The thermal energy meters is intended exclusively for the specified purpose. Any other use beyond this or any modification of the energy meters is considered improper and is not permitted.

6. Safety Information and General Recommendations

The product has left the factory in perfect technical condition. To ensure safe operation, follow the instructions in this document. Installation and maintenance must only be carried out by a trained and authorized specialist.

DANGER

The entire electrical system if connected to the main 230 VAC must be voltage-free before opening the calculator cover.

WARNING

- Improper installation, pressure test, non observance of the informations stated on the device, modifications or incorrect operation can cause personal injury and property damage.
- The calculator cover contains an A batterie, therefore:
 - Do not damage or open the battery, do not charge, replace or short-circuit it.
 - Do not expose to temperatures above 70°C or throw into fire.
 - If the device is damaged and leaks electrolyte, avoid contact with skin/eyes and do not inhale fumes. Move to fresh air and seek medical advice if needed.
- Before installation, check the energy meter for any damage that might have happened during transport.

NOTICE

- If the seal is damaged or removed, the thermal energy meter is no longer approved for legal measurement.
- The thermal energy meter should be installed only in leak-tested, rinsed and purged pipelines before commissioning.
- Operating conditions: temperatures +5°C to +55°C, relative humidity <95% (non condensing).
- The pipeline must be free of air pockets to ensure accurate measurements.
- Devices with activated radio are not permitted in air freight.
- In case of doubt, the text of the English Instructions For Use applies.

7. Technical data

Technical data of the *Supercal 5 U* are available on the datasheet at the following link:



8. Precautions of use

NOTICE

Safe operation of the equipment can only be guaranteed if the instruction for use have been read and the safety instructions contained therein have been observed.



- In the event of non compliancy to these instructions, the device may be destroy and Sontex declines all liability, warranty and guarantee for correct metrology. Sontex will not be liable in the event of any modification of the metrological data or of the measurement parameters if any of manufacturer's seals is damaged. The seals can only be applied by authorised people in conformity to national legislation related to legal metrology.
- To protect the system against all unauthorised manipulations, the thermal energy meter, the connection screws, the temperature sensors and the sensor pockets must all be sealed. It is important for the wire seal to be as short as possible so that it is slightly taut. This is the only way of preventing malicious interference.
- Outside installation and flooding are not allowed.
- The cable between the flow sensor and the calculator **cannot** be shortened or extended and must be handle with care (don't pull the cable on calculator or flow sensor side).
- All cable must be installed with a minimum distance of 300 mm from heavy voltage and high frequency cables.
- Make sure that the thermal energy meter and the labels can be read easily.
- Generally, avoid an installation situation with an accumulation of heat above average. An above-average heat build-up affects substantially the lifetime of the electronic components

- In case of use of sensor pockets we recommend to use Sontex one.

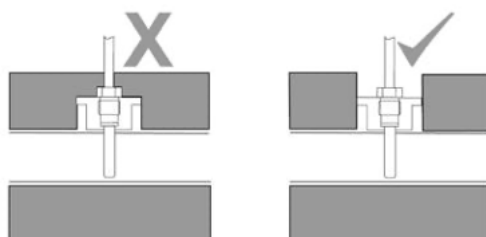
9. System requirements

Temperatures sensor requirements:

- Only matched pairs are supplied and may not be separated, extended or shortened, since this affects the measuring accuracy.
- Only platinum temperature sensors with type approval in the Pt500 version must be used.
- Temperature sensors must be paired and used as below:

Cable length	Number of wires	Shielded
≤ 3 m	2	No
> 3 m and ≤ 15 m	2	Yes
> 15 m and ≤ 50 m	4	Yes

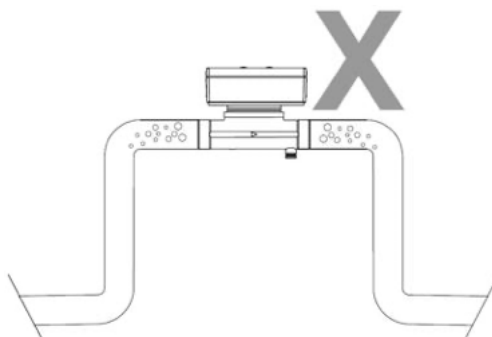
- The two wires connection cable must have a cross-section of at least 0.22mm^2 until a cable length of 12.5m and 0.5 with cable length longer than 12.5m and until 15m as EN1434-2 2004 recommendations
- The four wires connection cable must have a cross-section of at least 0.5mm^2 .
- For shielded temperature sensor, the cable must be fixed in the calculator using the strain reliefs with shield in contact with the earth.
- Temperature sensors with protection pockets must be inserted up to the stall and fixed afterwards.
- The Sontex temperature sensor with blue color label is fitted close to the flow sensor. The Sontex temperature sensor with red color label is mounted in the "opposite" pipe (in the other side of the heat exchanging circuit).
- The temperature sensors can be installed alternatively in protection pockets or directly in the heating and/or cooling agent however always both in the same way. **Asymmetrical mounting isn't permitted.**
- For cooling applications, insulation must not cover the temperature sensor fixing screw. This also applies if the sensor is directly fixed in the flow sensor:



- The insulation of the temperature sensor cables can be PVC or silicone. Sontex recommends the use of silicone insulation.

Flow sensor requirements:

- Install the flow sensor **BEFORE** any control valve to prevent interference.
- To avoid pressure surges (water hammer) which could damage the flow sensor, a stable pressure must be ensured.
- Install the flow sensor between two shut-off valves.
- Install the flow sensor so that no air can be collected and stay inside:



Calculator requirements:

- Install the calculator away from refrigerating fluid pipes to avoid thermal influence.
- Ensure no condensation water can enter the calculator.
- If vibrations are present or if the medium temperature regularly reaches 90°C, mount the calculator on the wall.
- Overcurrent protection ($\leq 10A$) must be installed in the mains cable.

Radio transmission requirements (Sontex Radio, wM-Bus or LoRaWAN®):

The radio quality must be checked on site. Interference may be caused by heat sources, electromagnetic fields, mobile radio or neighbouring transmitters.

10. Communication interfaces and options

The communication interface is native for powered remote M-Bus, and in the calculator cover on request for Radio Sontex and wM-Bus. Other communication modules are available either delivered mounted on the *Supercal 5U* calculator, either delivered separately.

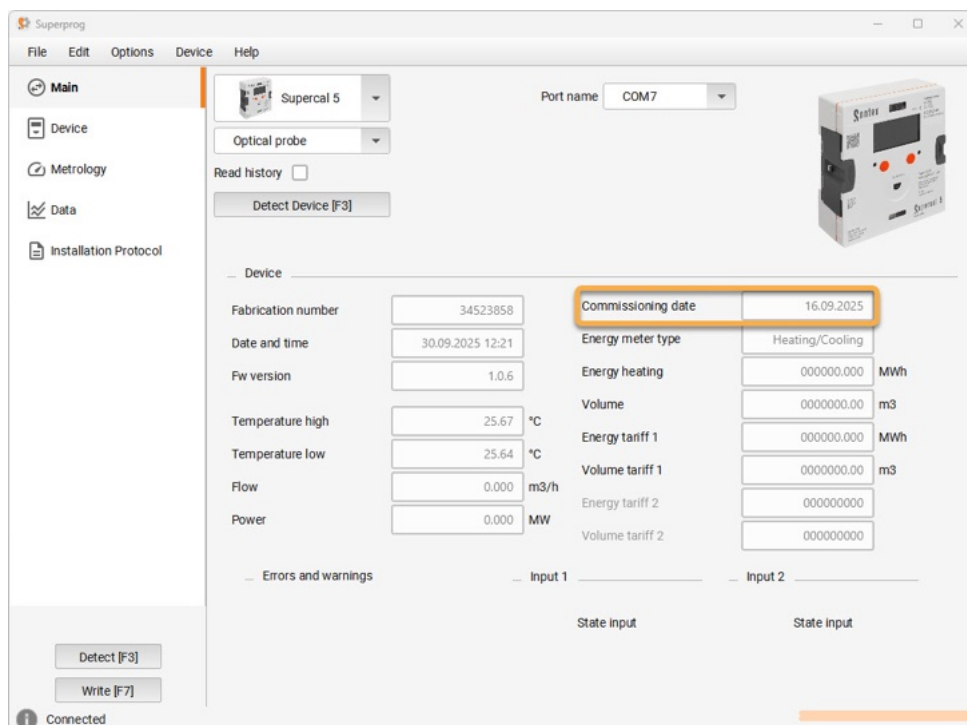
The parameters can be set using the *Superprog Windows* or *Superprog Android* using the installer licence.

10.1 Connection with *Superprog Windows*

Open the *Superprog* software.



- Select Supercal 5
- Select your communication option
- Select the communication port
- Click on “detect device” or “Detect” to make a device read out



If the "Commissioning date" is 01.01.2000, the *Supercal 5 U* is in storage mode and the radio interfaces (as well as LoRaWAN®) are switched off. By sealing the device, the radio interfaces are activated and the "commissioning date" is adjusted.

10.2 Connection with *Superprog Android*

Activate the NFC connection on your smartphone and open the *Superprog Android* app.



Place your smartphone on the NFC logo of the *Supercal 5 U* calculator. Click on Install SC5 / Configure SC5



Remove and place again your smartphone on the NFC logo, the *Superprog Android* application will read the *Supercal 5 U* parameters.



10.3 LoRaWAN[®] settings



Supercal 5 U delivered with a LoRaWAN[®] modul already insert, will have the parameters set in the product configurator when ordered.

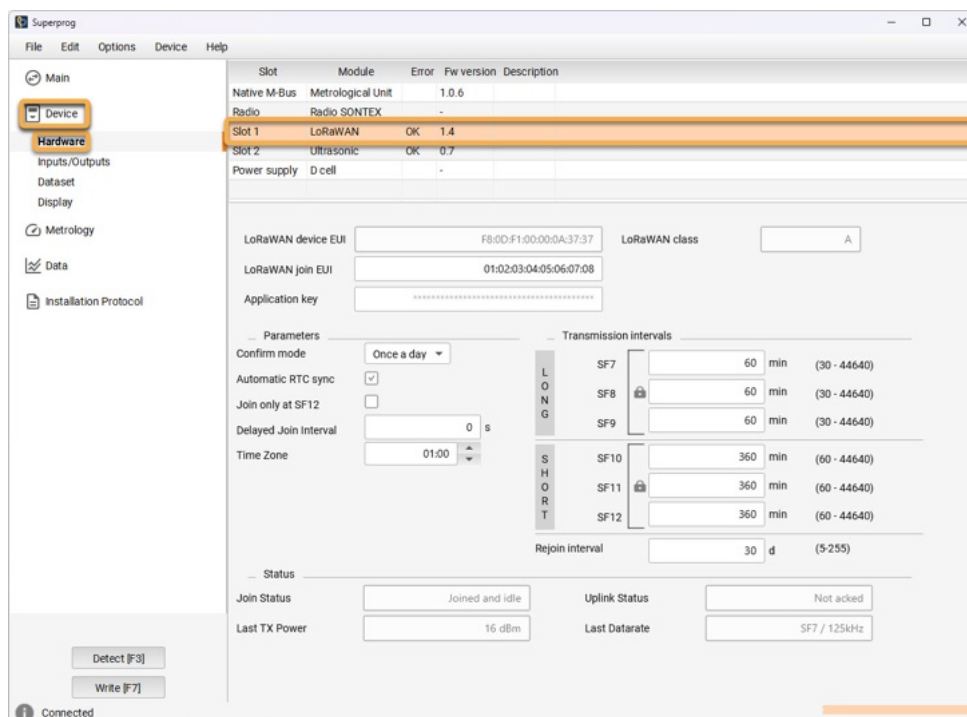
When inserting a LoRaWAN[®] modul which previously had another module (e.g. Input, Output, BacNet, ModBus etc) installed in the modul Slot 1, the default parameter of the LoRaWAN[®] Modul will be written to the *Supercal 5 U*, overwriting the parameters of a previously installed module.

When inserting a LoRaWAN[®] Modul which already has LoRa-Parameters configured for modul Slot 1, the LoRa-Parameters preconfigured on the *Supercal 5 U* will overwrite the default parameters of the LoRaWAN[®] Module.

10.3.1 Superprog Windows

10.3.1.1 LoRaWAN® communication parameters

Click on Device / Hardware / Slot 1



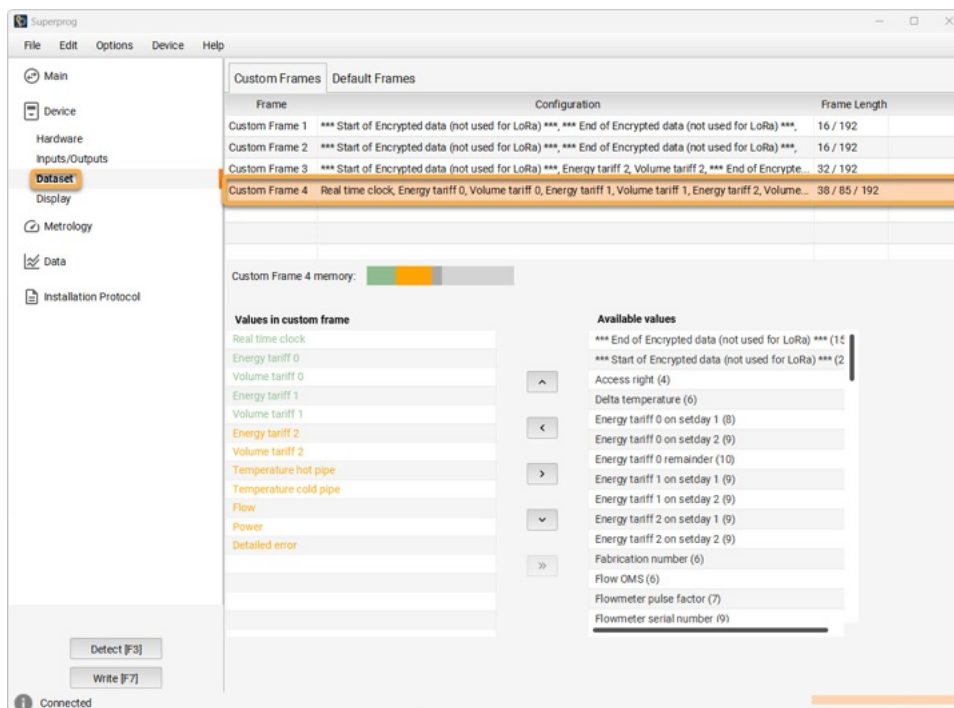
Parameter	Description	Read/Write	Default Value
LoRaWAN Device EUI	Device identification which is read from the LoRaWAN® module	read	-
LoRaWAN Join EUI*	Network identification, which ensures the connection to the network	read/write	01 02 03 04 05 06 07 08
Application Key	Encryption	write	-
Confirm mode*	The confirmation of telegrams (acknowledge) by the network server can be activated or deactivated. - Once per day (midnight) - Twice per day (midnight & midday)	read/write	Once per day
Automatic RTC sync*	The device clock is adjusted by the network	read/write	enabled
Join only at SF12*	The first join is set to the strongest transmission power	read/write	disabled
Delayed Join Interval*	After sealing, "Sealed" appears on the <i>Supercal 5 U</i> LCD and the join process starts after the time set	read/write	0s
Time Zone	Relevant for devices with programmed calendar and specific times for readout. With the Time Zone the <i>Supercal 5 U</i> can be aligned with the time zone of the used region	read/write	UTC+1
Transmission Intervals*	Transmission intervals for the telegrams long / short	read/write	60 min (SF7-9) 360 min (SF10-12)
Rejoin Interval*	To increase the security of the communication, a rejoin is performed at regular intervals. New session keys are generated each time a new connection is made	read/write	30 days
Join status	Indicate if LoRaWAN® network has been joined	read	N/A

* Can be ordered with customer-specific configuration with LoRaWAN® module already integrated in *Supercal 5 U*.

Click on “Write” to implement the setting you have done in the *Supercal 5 U*.

10.3.1.2 LoRaWAN® telegrams content (Payload)

Click on Dataset / Custom Frame 4



The content of the short and long telegram can be configured freely according to need. The maximum telegram lengths are:

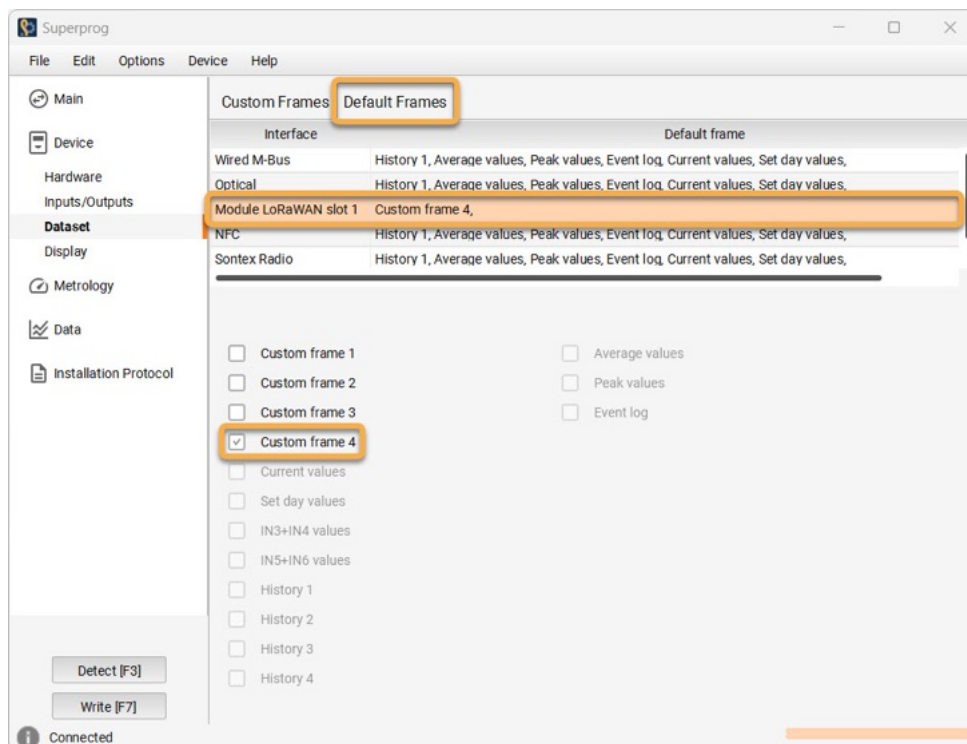
- Short telegram: 39 bytes (for SF10-SF12) (green)
- Long telegram: 103 bytes (for SF7-SF9) (orange)

Custom Frame 4 memory: Shows the short telegram size in green, long telegram in orange, serial number which is always include in dark grey and remaining available memory in light grey.

Values in custom frame: Show the values of the short telegram in green + the value of long telegram in orange. The values can be modified by using arrows in the middle.

- ⬆ Select a value in “values in custom frame” and click on this icon to bring this value up in the telegram.
- ⬅ Select a value in “available values” and click on this icon to include this value in the telegram.
- ➡ Select a value in “values in custom frame” and click on this icon to remove the value from the telegram.
- ⬇ Select a value in “values in custom frame” and click on this icon to bring this value down in the telegram.
- ⬮ Select a value in “values in custom frame” and click on this icon to remove all values from the telegram.

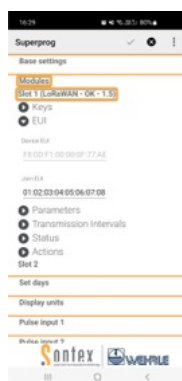
Click on “Default Frames”



Select “Module LoRaWAN slot 1” and check that custom frame 4 is selected. If not select it.

10.3.2 Superprog Android

Click on modules / Slot 1:



EUI menu:

Device EUI: Device identification which is read from the LoRa module. Set in the factory and can't be modified.

Join EUI: Network identification, which ensures the connection to the network.



Parameters menu:

Confirm mode: The confirmation of telegrams (acknowledge) by the network server can be activated or deactivated:

- Disabled
- Enabled (not recommended)
- Once a day (midnight)
- Twice a day (twelve and midnight)

RTC synchronisation: No or Automatic. If automatic, the *Supercal 5 U* time will synchronize with the LoRaWAN[®] network.

Delayed Join Interval (s): In case the thermal energy meter is installed inside a close box, this timing let you close the door/cover before the LoRaWAN[®] join the network. Target is to check that communication is working properly with the door closed.

Timezone: Set the timezone where the *Supercal 5 U* is used.



Transmission interval menu:

RF transmission interval when SF10-SF12 (min): set the transmission interval in minutes with spreading fact 10 to 12 (Minimum 60 minutes, maximum 44640 minutes).

RF transmission interval when SF7-SF9 (min): set the transmission interval in minutes with spreading fact 7 to 9 (Minimum 30 minutes, maximum 44640 minutes).

Rejoin interval (days): To increase the security of the communication, a rejoin is performed at regular intervals (Minimum 5 days, maximum 255 days). New session keys are generated each time a new connection is made.



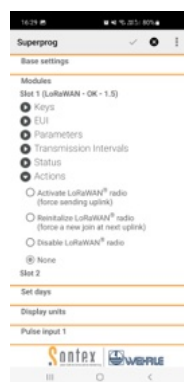
Status menu:

Join status: Give the information if the join to LoRaWAN[®] network has been done or not.

Uplink status: Give the information if the uplink has been sent or not.

Last datarate status: Give the information about LoRaWAN[®] network communication quality (SF7 highest quality, SF12 lowest).

Last Tx Power: Give the last transmission power.



Activate LoRaWAN[®] radio (force sending uplink): Force an immediate join to LoRaWAN[®] network.

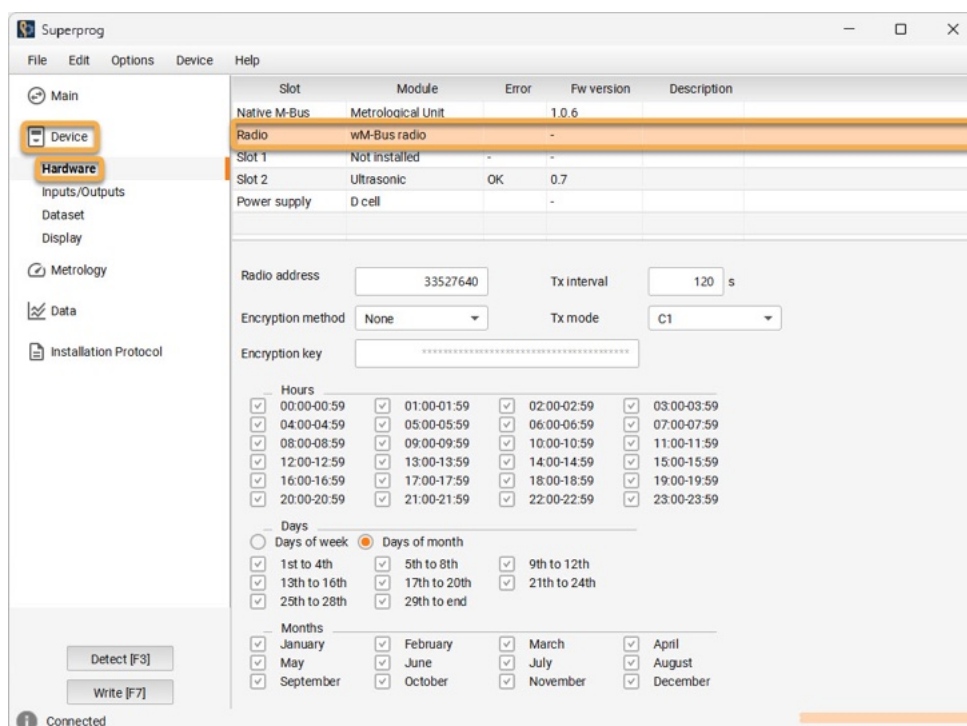
Reinitialize LoRAWAN[®] radio (force a new join at next uplink): Force a join to LoRaWAN[®] network at next uplink.

Disable LoRAWAN[®] radio: Disconnect the *Supercal 5 U* from the LoRaWAN[®] network.

10.4 wM-Bus settings

10.4.1 Superprog Windows

Click on Device / Hardware / Radio



Radio address: wM-Bus device own address, can't be modified

Tx interval: transmission interval. The reduction of this time reduce the battery lifetime

Encryption mode: Can be set to None, mode 5 or mode 7

Tx mode: Can be set to C1 or T1

Encryption key: Encryption key can be modified

You can set the hours, days of the week or of the month, months on which telegram will be sent by checking/unchecking the boxes.

Content of the telegram can't be modify, see M-Bus frame document on Sontex extranet.

10.4.2 Superprog Android

Click on Base setting and scroll down



wM-Bus frame format: Can be set to C1 or T1

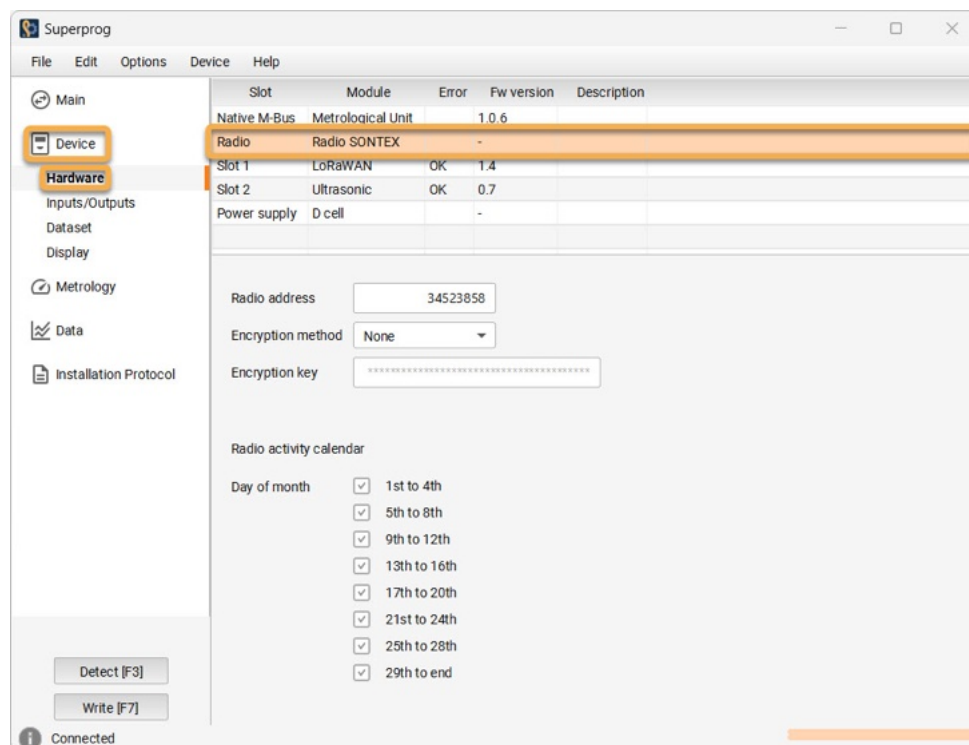
Encryption enable: Encryption can be enabled, Mode 5 or Mode 7

10.5 Sontex Radio settings

10.5.1 Superprog Windows

10.5.1.1 Sontex Radio communication parameters

Click on Device / Hardware / Radio



Radio address: Radio address of the *Supercal 5 U* is the same as the serial number and can't be modified.

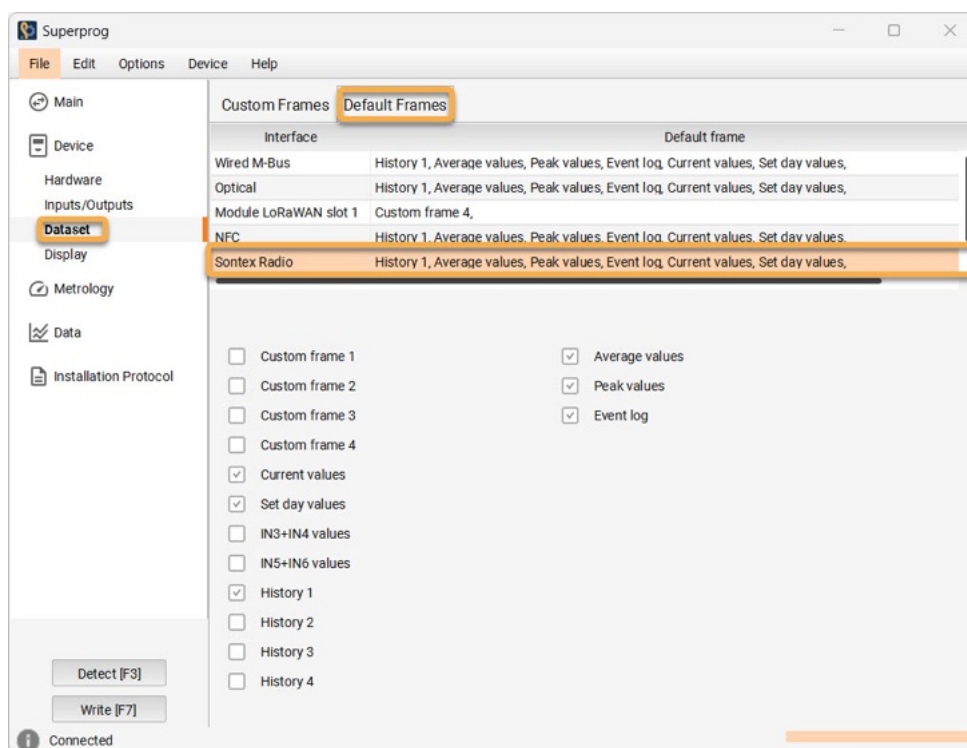
Encryption method: Can be set as None or Mode 5.

Encryption key: Encryption key can be modified

Radio activity calendar: Check or uncheck the box to select the month period on which the radio will be active.

10.5.1.2 Sontex Radio telegrams content

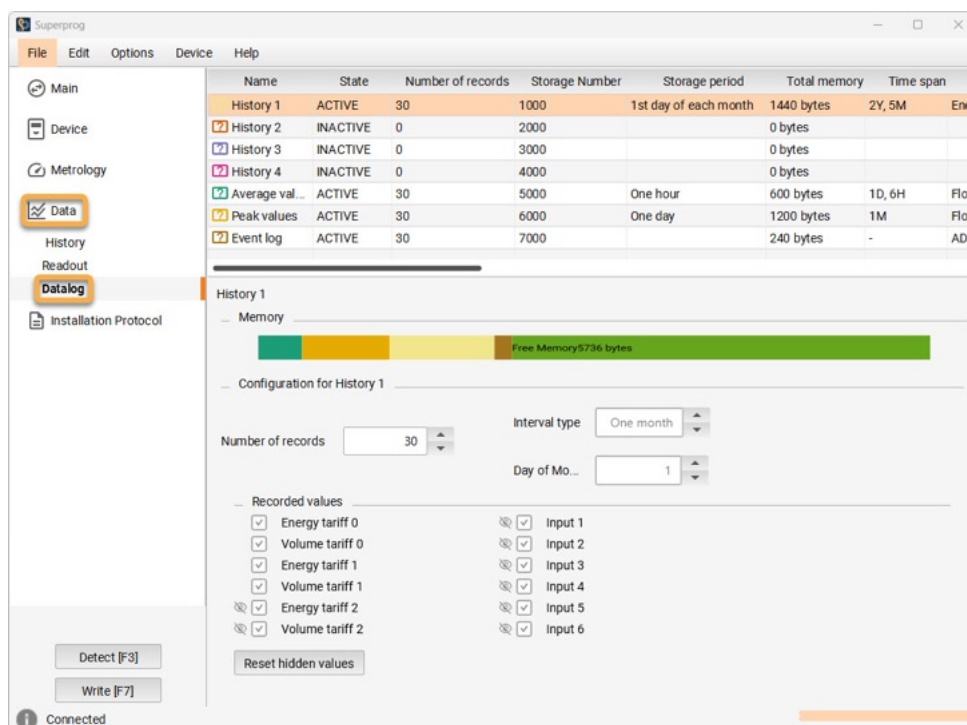
Click on Dataset / Default Frames / Sontex Radio.



This area display the values that are include in the telegram and in which position.

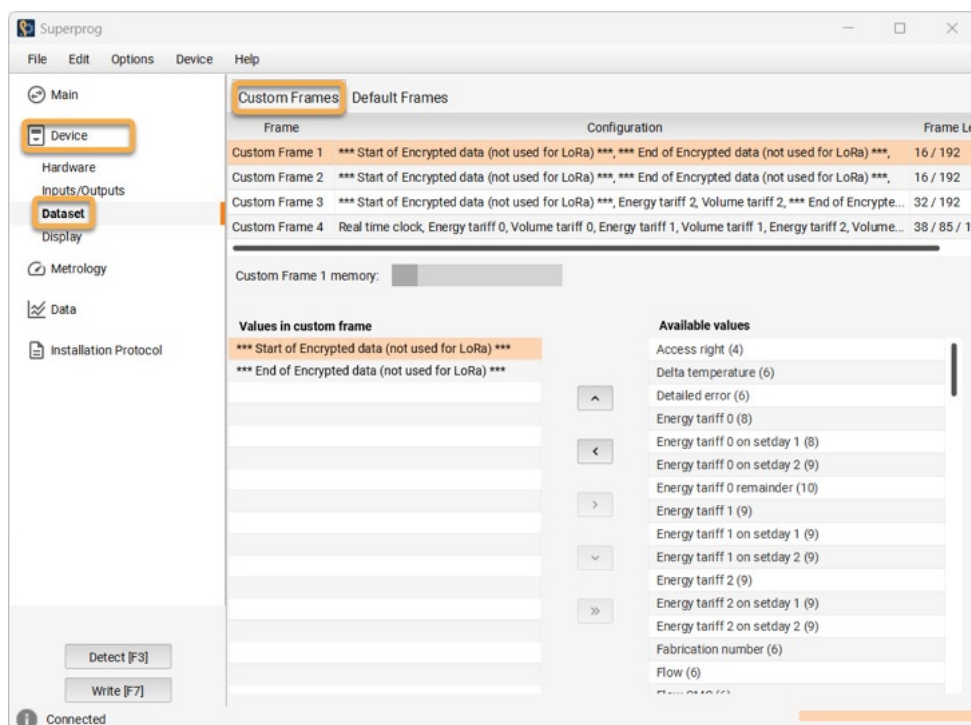
Those parameters can be changed by check or uncheck the box of the desired value.

History 1 to 4, Average values, Peak values and event log can be set by going on Data / Datalog



Click on the parameter you want to set and depending on your setting the bar in the Memory field will show you the remaining memory available.

Custom frame 1 to 4 can be selected in default frame menu. To see custom frames values click on Device / Dataset / Custom Frames, select the custom frames that you want to set and see its content.

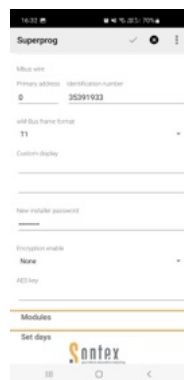


The values can be modified by using arrows in the middle.

- ⬆ Select a value in “values in custom frame” and click on this icon to bring this value up in the telegram.
- ⬅ Select a value in “available values” and click on this icon to include this value in the telegram.
- ➡ Select a value in “values in custom frame” and click on this icon to remove the value from the telegram.
- ⬇ Select a value in “values in custom frame” and click on this icon to bring this value down in the telegram.
- ➡➡ Select a value in “values in custom frame” and click on this icon to remove all values from the telegram.

10.5.2 Superprog Android

Click on Base setting and scroll down



Encryption enable: Can be set as None or Mode 5.

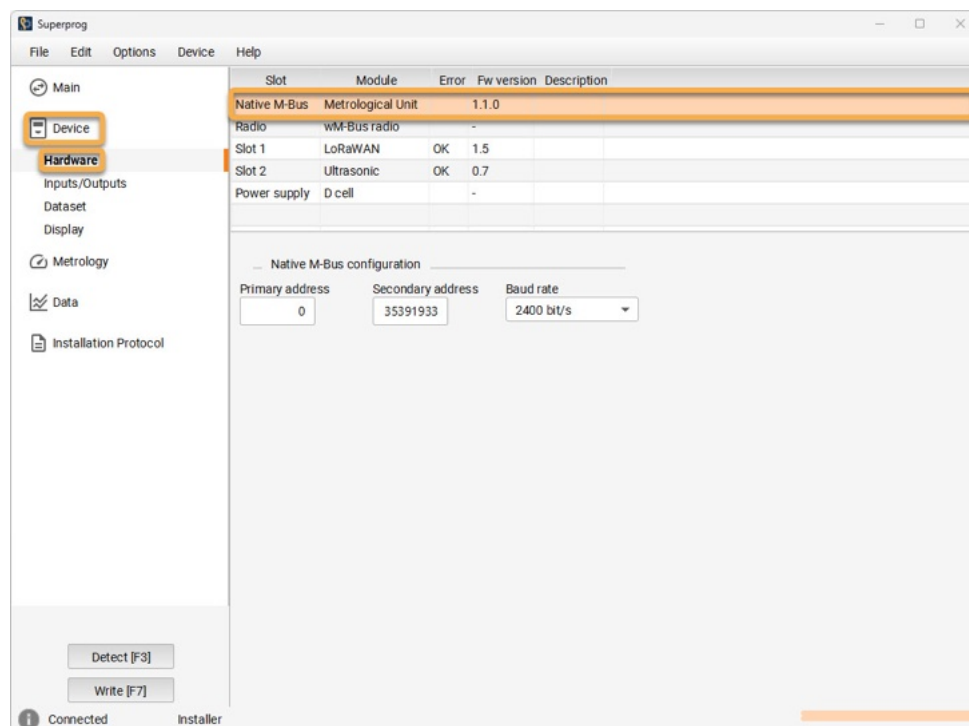
AES key: Encryption key can be modified.

10.6 Powered remote M-Bus settings

10.6.1 Superprog Windows

10.6.1.1 Powered remote M-Bus communication parameters

Click on Device / Hardware / Native M-Bus

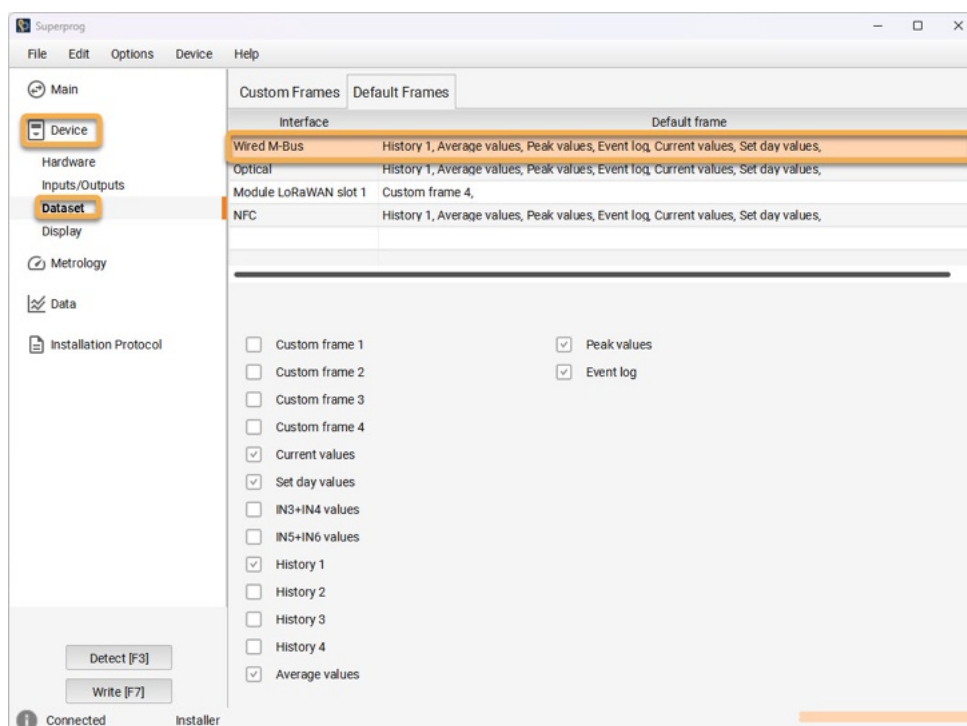


By default, the primary address will be configured with the address 0 and the secondary address will correspond to the serial number of the device.

Default communication speed is 2400 Bauds and can be set to 300; 600; 1200 or 4800.

10.6.1.2 Powered remote M-Bus telegrams content

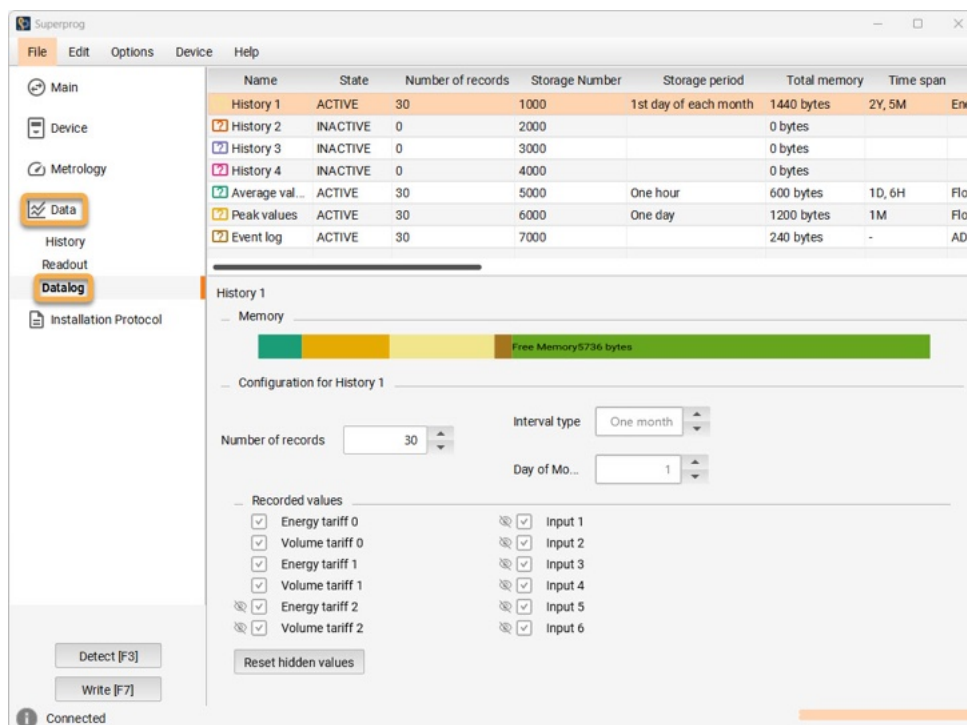
Click on Device / Dataset / Wired M-Bus



This area display the values that are include in the telegram and in which position.

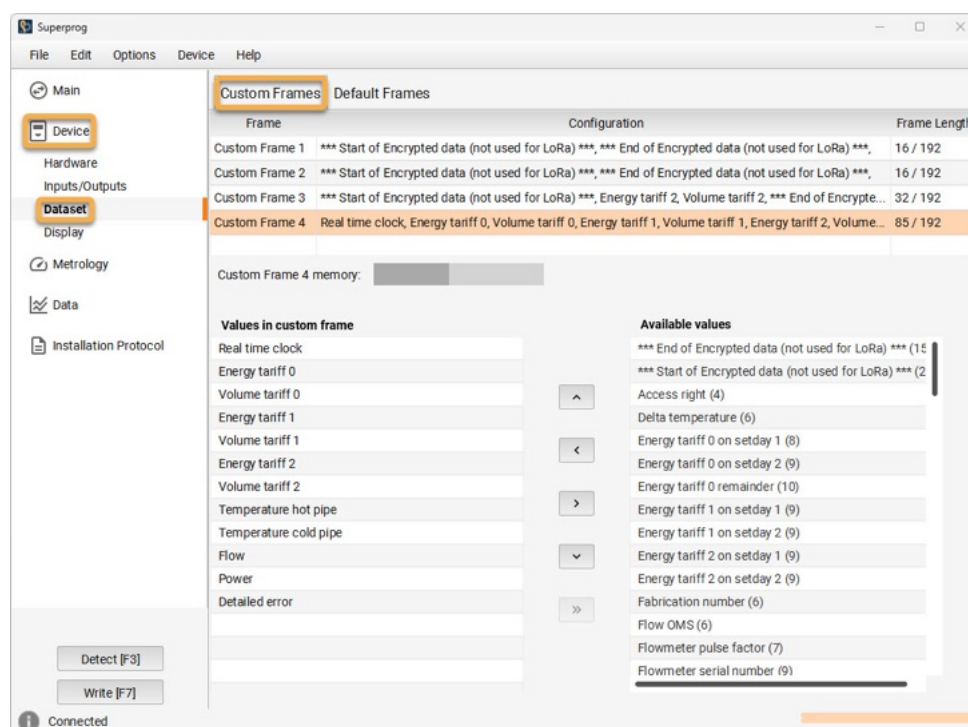
Those parameters can be changed by check or uncheck the box of the desired value.

History 1 to 4, Average values, Peak values and event log can be set by going on Data / Datalog



Click on the parameter you want to set and depending on your setting the bar in the Memory field will show you the remaining memory available.

Custom frame 1 to 4 can be selected in default frame menu. to see custom frames values click on Device / Dataset / Custom Frames, select the custom frames that you want to set and see its content.



The values can be modified by using arrows in the middle.

- ^ Select a value in "values in custom frame" and click on this icon to bring this value up in the telegram.
- < Select a value in "available values" and click on this icon to include this value in the telegram.
- > Select a value in "values in custom frame" and click on this icon to remove the value from the telegram.
- ▼ Select a value in "values in custom frame" and click on this icon to bring this value down in the telegram.
- >> Select a value in "values in custom frame" and click on this icon to remove all values from the telegram.

10.6.2 Superprog Android

Click on Base setting and scroll down

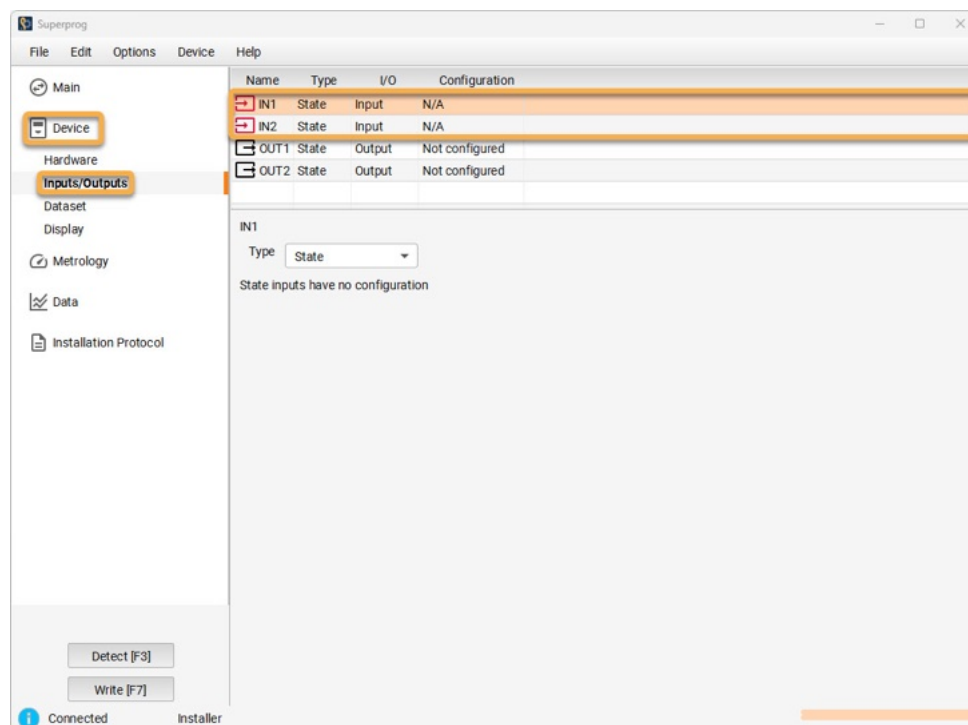


By default, the primary address will be configured with the address 0 and the secondary address will correspond to the serial number of the device.

10.7 Pulse inputs settings

10.7.1 Superprog Windows

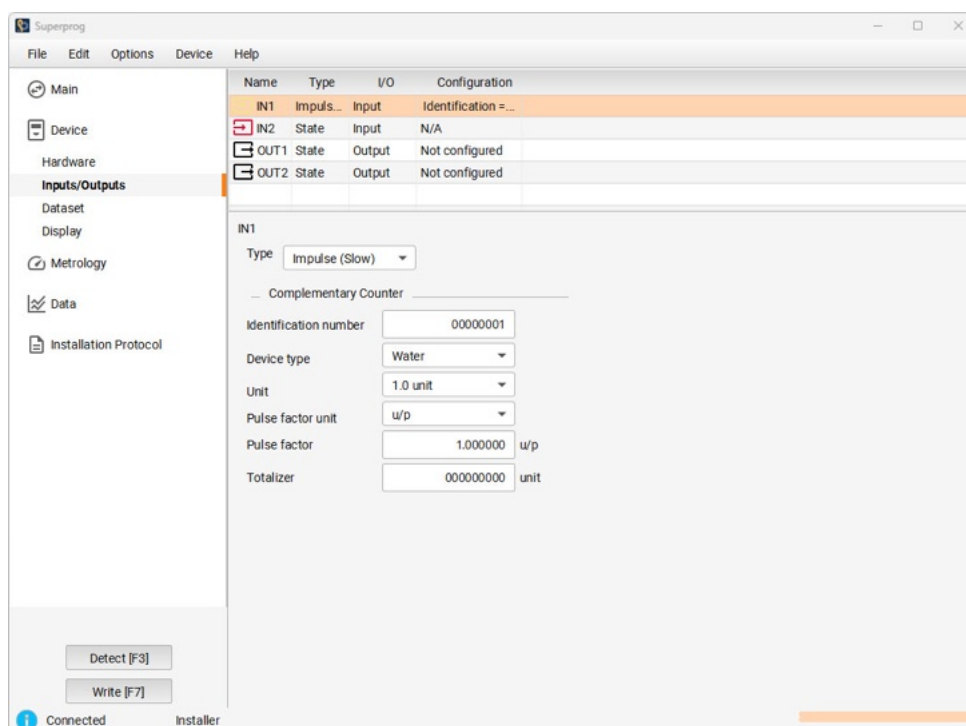
Click on Device / Inputs/Outputs / IN 1 or IN 2



The thermal energy meter offers the possibility of integrating up to two further pulse input from other meters, for instance a hot water and a cold water meter.

Each pulse input can be set to State, Impulse (Slow) or Impulse (Fast).

Impulse (Slow) Impulse (Fast) parameters can be set on below page:



Identification number: Serial number of the device connected to INPUT.

Device type: Type of the device connected to INPUT (Water, electricity, gaz...).

Unit: Unit of the device connected to INPUT (0.001 kWh; 1 MJ...).

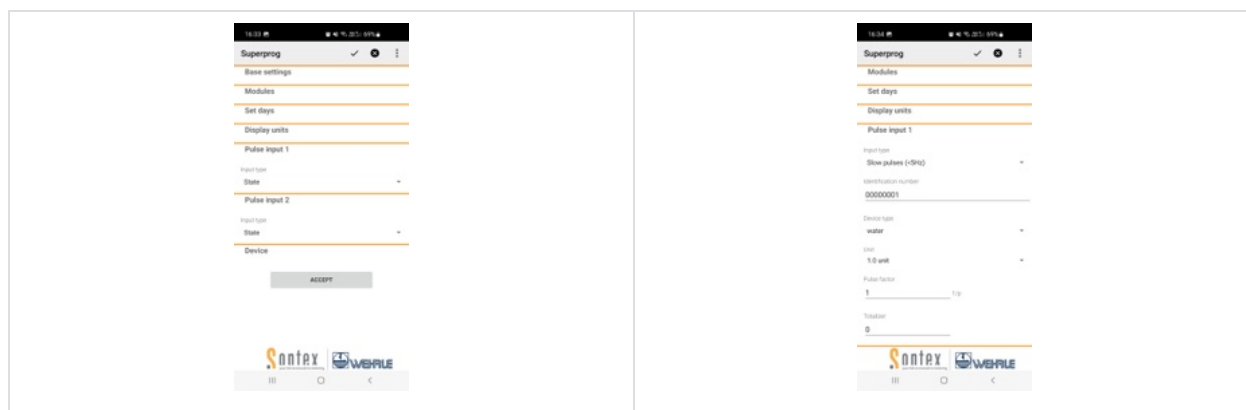
Pulse factor unit: Can be set to unit per pulse or pulse per unit.

Pulse factor: By default, the pulse factor will be 1 Pulse/Unit or Unit/Pulse for each pulse input depending of the Pulse factor unit set before.

Totalizer: If the external device has already counted, the value can be entered in this cell.

10.7.2 Superprog Windows

Click on Pulse input 1 or 2.



Each pulse input can be set to state, impulse (Slow) or impulse (Fast), IN pulse transfer (Input transferred directly to output)

If set to impulse (Slow) or impulse (Fast) below parameters can be set:

Identification number: Serial number of the device connected to INPUT.

Device type: Type of the device connected to INPUT (Water, electricity, gaz...).

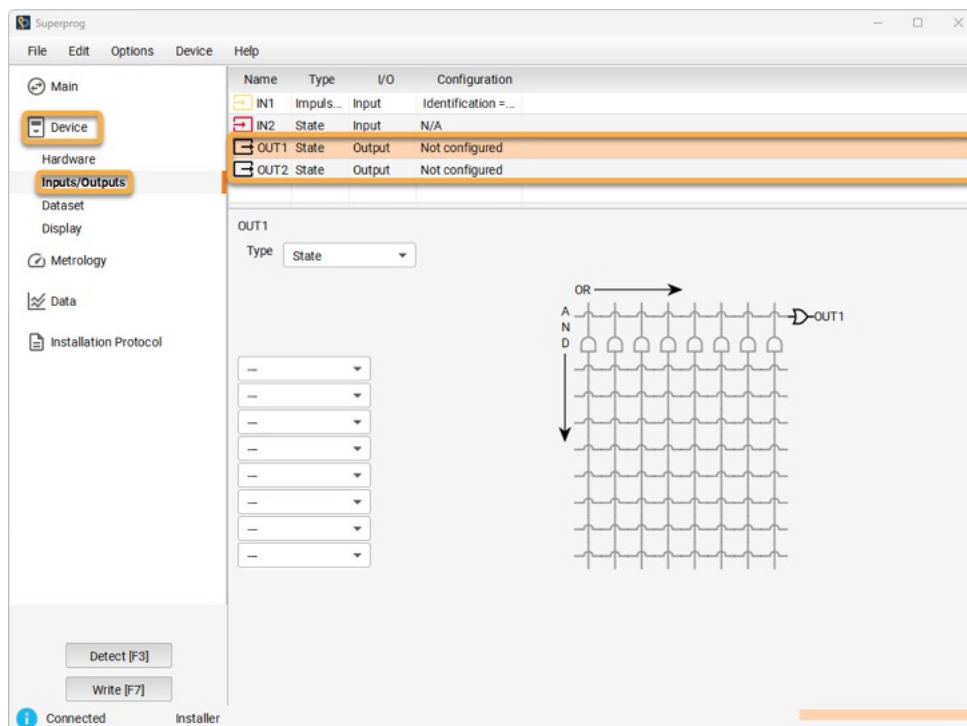
Unit: Unit of the device connected to INPUT (0.001 kWh; 1 MJ...).

Pulse factor: Number of unit per pulse.

Totalizer: If the external device has already counted, the value can be entered in this cell.

10.8 Pulse outputs settings

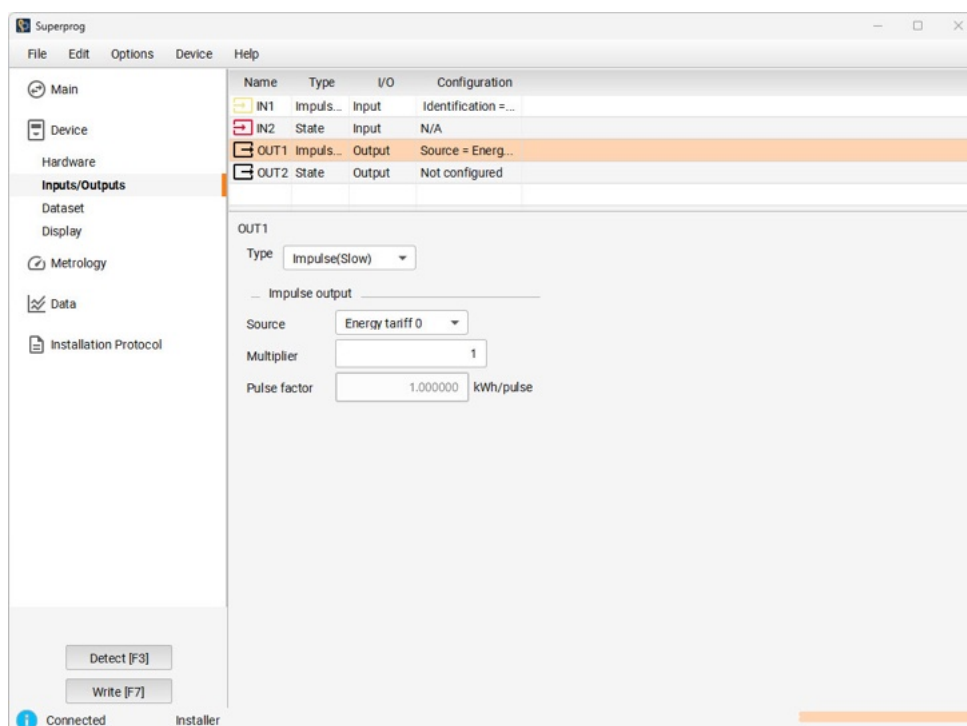
Click on Device / Inputs/Outputs / OUT 1 or OUT 2



Each pulse output can be set to state, impulse (Slow) or impulse (Fast).

State output can be set using the PLA concept.

Impulse (Slow) or impulse (Fast) parameters can be set on below screen after selecting in Type:



Source: Values that will be send to the output (Energy Tariff 0, Volume Tariff 0, Energy Tariff 1, Volume Tariff 1, Energy Tariff 2 or Volume Tariff 2)

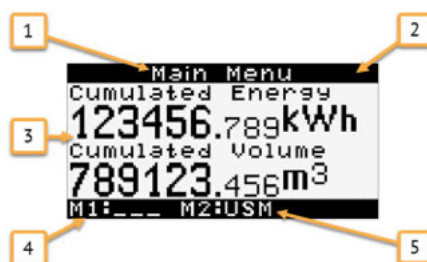
Multiplier: Multiply the values of selected source by the values set

Pulse factor: Cannot be set.

Pulse output can't be set with *Superprog Android*.

11. Functions overview

11.1 Display explanation



1	Menu title
2	Power supply module (B for 3.6V battery, ⚡ for the other power supply module)
3	Menu informations
4	Module slot 1 (left): ___ (___ for no module, 3 letters for module as listed below) D/A: Analog output module MOD: Modbus module BUS: M-Bus module REL: Relay output module IN: Digital input module

	BAC: BACnet Module LOD : LoRaWAN [®] module with radio disabled LOJ: LoRaWAN [®] module which started its join process LOR: LoRaWAN [®] module connected to LoRaWAN [®] network LOF: LoRaWAN [®] module with join process fail or disconnected from the LoRaWAN [®] network
5	Ultrasonic module (right): USM

11.2 Display structure

To display general data on the calculator, several windows have been created in the form of menu/sub-menu functions.

Depending on the chosen version of the thermal energy meter, some menus may be added.

The “Energy and volume” window of the main menu is the basic display.

The navigation buttons enables the user to change from one menu to another and to access the different positions within a menu.

Short pressure on the left or right navigation button permits transition from one menu to another or continuation to the next display while remaining in the same menu.

Long pressure (> 2 seconds) on the navigation button gives access to sub-menu within a menu or enables the “Energy” window to be displayed from within a menu.

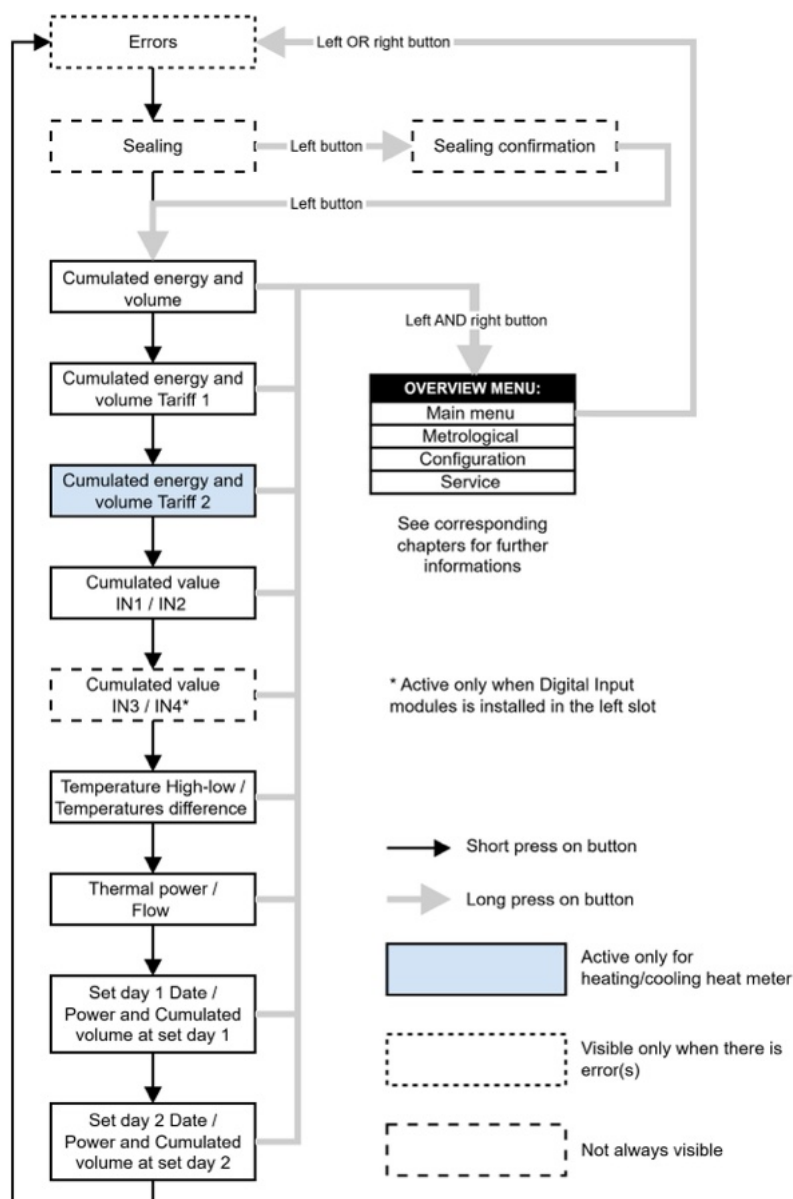
After 3 minutes, the display automatically reverts to the basic “Energy” window.

Long pressure (>2 seconds) on both navigation button when in sub-menu bring back to overview menu.

The LCD is blinking as long as the *Supercal 5 U* is not sealed.

11.3 Detailed display structure

11.3.1 Main menu



During normal operation mode, the LCD display is off. A short press on one of the two buttons automatically turns on the LCD display and switches to Main Menu.

If an error is active, it will appear as the first menu page in the menu structure. A short press on one of the two buttons switches from ERROR to Main Menu.

After 3 minutes, the calculator display automatically switches back to the main menu.

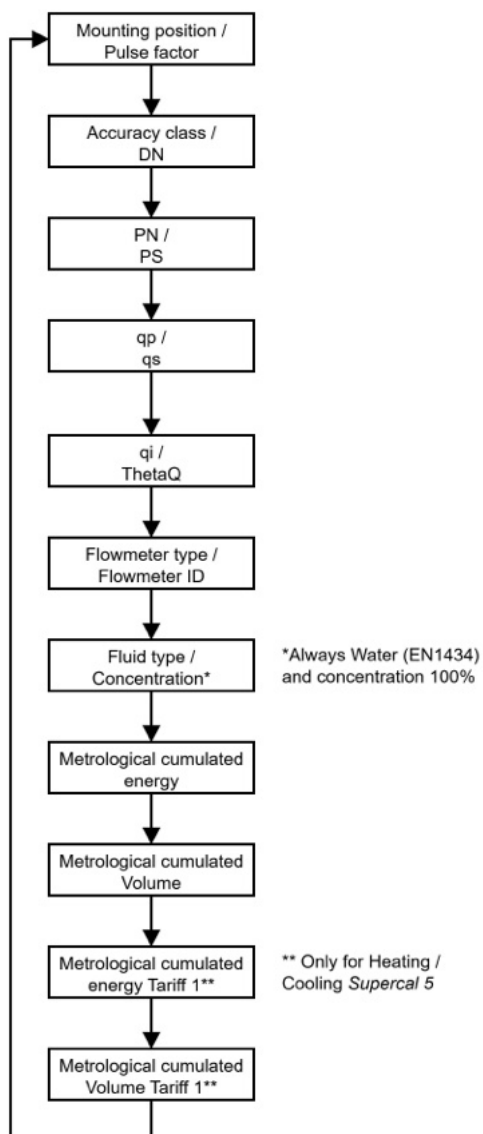
Cumulated Energy and Volume menu: If the calculator is Heating only, then the Cumulated Energy and Cumulated Volume displays are dedicated to heating tariff. Tariff 1 is customizable.

If the calculator is Cooling only, then the Cumulated Energy and Cumulated Volume displays are dedicated to cooling tariff. Tariff 1 is customizable.

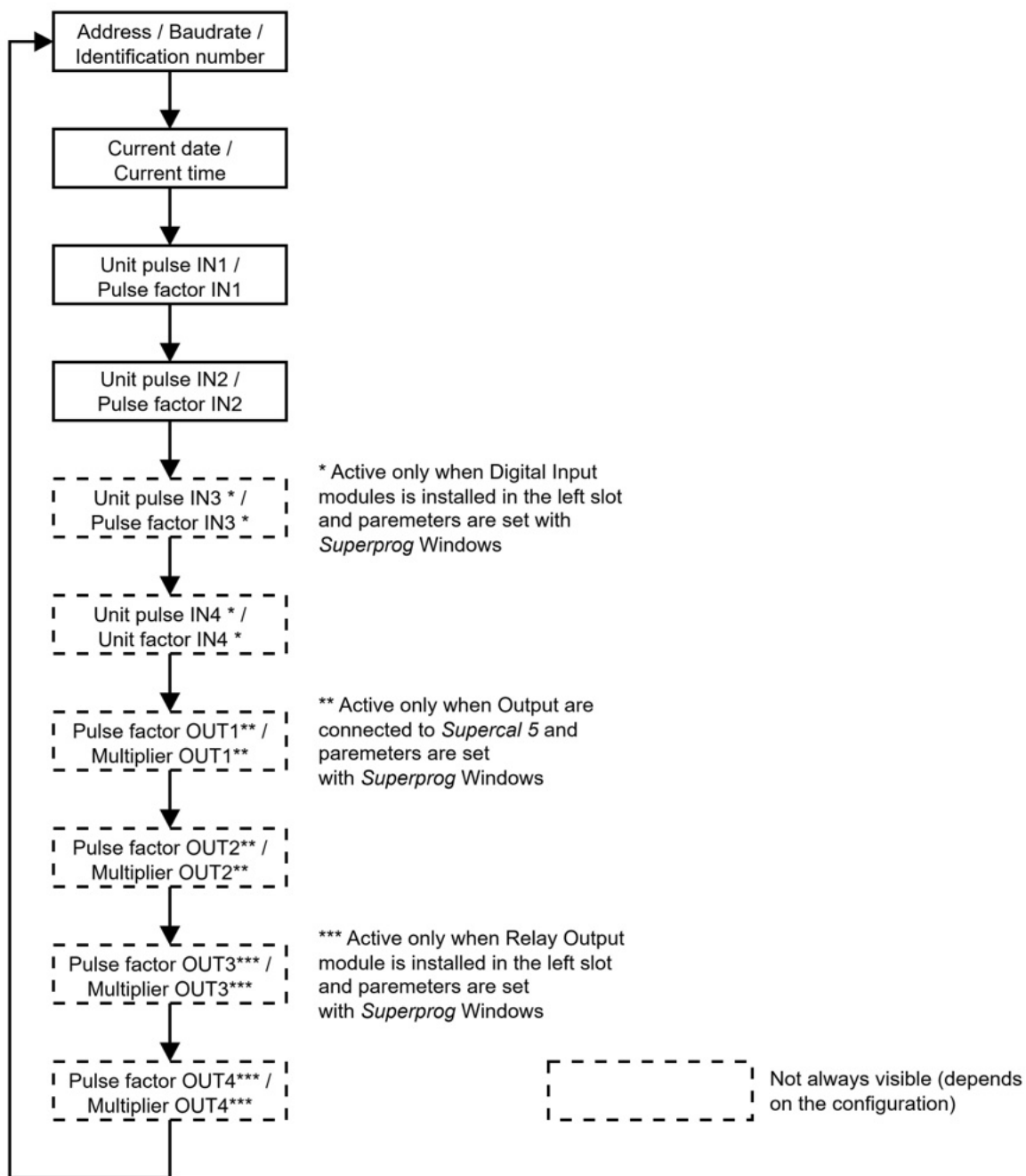
If the calculator is Heating-Cooling, the Cumulated Energy display shows the heating energy, but the total volume will be

shown: Heating and Cooling. Tariff 1 shows the cooling energy and cooling volume. Tariff 2 is customizable.

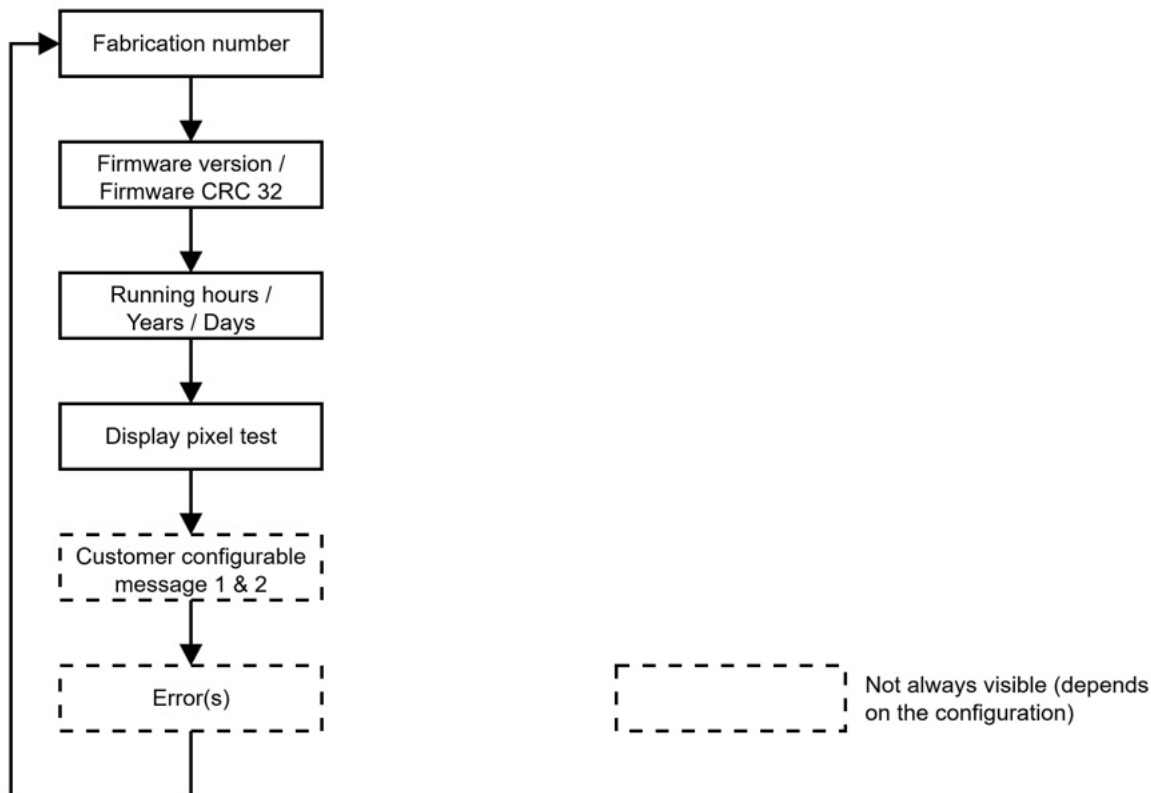
11.3.2 Metrological menu



11.3.3 Configuration menu



11.3.4 Service menu



11.4 Auxiliary inputs

The *Supercal 5 U* has two additional pulse inputs (IN1 and IN2) for connecting additional counters for cumulative electrical pulse counting. These two auxiliary inputs are automatically integrated into the M-Bus, radio or optical telegram, and transmitted.

They enable the connection of various hot water, cold water, electricity, gas or oil meters.

Their individual parameterisation (normal and/or fast mode) can be set-up in the software.

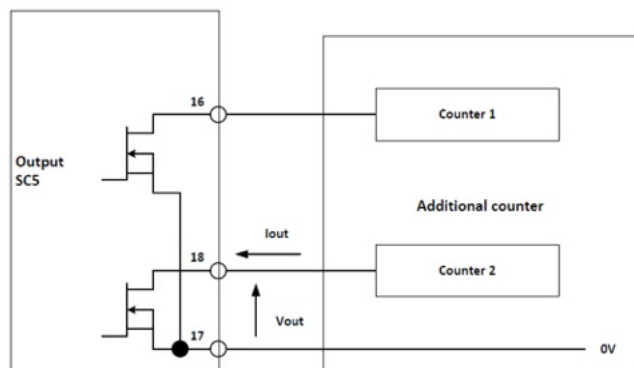
Technical Characteristics of the Auxiliary Inputs

Designation	Description
Input frequency normal mode	Max. 5 Hz
Input frequency fast mode	Battery or main operation max. 200 Hz
Input voltage	0...30V
Slow volume pulses	0,0001–99,999,999 l/Imp or Imp/l
Fast volume pulses	0,0001–99,999,999 l/Imp or Imp/l

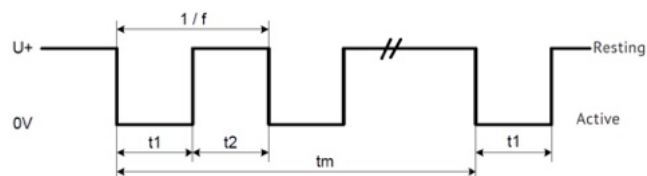
11.5 Open-collector outputs control

Designation	Description	Value
Normal mode	Voltage	max. 30VDC
	Current	max. 100mA
	Voltage drop	approx. 1.3V at 20mA
	Duty cycle	1:1
	Electrical pulse duration	100ms conductive
	Maximum electrical pulse frequency	5 HZ (+/-20%)
Fast mode	Voltage	max. 30VDC
	Current	max. 100mA
	Voltage drop	approx. 1.3V at 20mA
	Pulse type	linear or scaled pulses
	Maximum electrical pulse frequency	200 Hz (+/- 20 %)

Circuit diagram:



Pulse control:



Designation	Description
Normal mode	t1 = t2 min. 100 ms (at duty cycle = 50 %)
Fast mode (D battery or main operated)	t1 = t2 min. 2,5 ms (at duty cycle = 50 %)
Vout max.	< 30 V inactive, 0,3 V active
Vout min.	2,0 V inactive, 0 V active
Iout max.	< 5 µA inactive at 30 V, < 100 µA active
Iout min.	0 µA inactive, 1,65 µA active at 3,6 V

11.5 Technical Characteristics of embedded M-Bus

Designation	Description
Interface definition	According to EN 1434-3
Interface	Potential-free, reverse polarity protected
Transmission speed	300...4800 bauds selectable with <i>Superprog Android</i> & <i>Superprog Windows</i> .
Data structure	Variable

Designation	Description
Supply Voltage	
UMU,M (MARK)	36 V
UMU,S (SPACE)	24 V
UM,M (SPACE)	12 V
UM,S (MARK)	11.3 V
Supply current	
IM	1.5 mA
IS	20 mA

11.6 Stored data

All the following data is stored in the internal memory of the *Supercal 5 U* and it can be read from the *Superprog Windows* software:

- Totalizer values in a period of time
- Average values in a period of time
- Maximum values in a period of time
- Event log

11.7 Data backup

The *Supercal 5 U* has a non-volatile FRAM for data storage.

The data is thus retained even in the event of a power failure. All values are automatically updated and saved.

The historical data is organized in:

- Four totalizers
- One average value
- One maximum value
- One historical event

For each set of historical data, some customization is available:

- Maximum number of records
- Recording frequency

Historical events can be customized as follows:

- Maximum number of records
- Which event

The historical values can be downloaded from the *Supercal 5 U* by M-Bus.

Totalizer history					Average value history	Peak value history	Event history
Period	Monthly	Biannually	Biannually	Biannually	Monthly	Monthly	
Register number	60	30	2	2	60	60	60
	Energy	Energy	Energy	Energy	Flow	Flow	Date
	Volume	Volume	Volume	Volume	Power	Power	Hour
	Energy 1	Energy 2	Energy 3	Energy 4	High temperature	High temperature	Event
	Volume 1	Volume 2	Volume 3	Volume 4	Low temperature	Low temperature	
	Energy 2	Energy 3	Energy 4	Energy 5	Delta temperature	Delta temperature	
	Volume 2	Volume 3	Volume 4	Volume 5			
	A1	A1	A1	A1			
	A2	A2	A2	A2			

The storage frequency can be set to:

- Hourly (hh:00)
- Daily (00:00)
- Monthly (on any day)
- Every six month (starting on the 1st of any month and ending on the 28th of any month)

Each of the three historical totalizers can store one of the following values:

- Energy
- Volume

Average values can be stored periodically every:

- Fifteen minutes (hh:00, hh:15, hh:30, hh:45)
- Thirty minutes (hh:00, hh:30)
- Hourly (hh:00)
- Daily (00:00)

The following average values are stored:

- Flow
- Thermal Power
- High temperature
- Low temperature
- Delta Temperature

Peak values can be stored periodically:

- Daily (00:00)
- Monthly (on any day)

The frequency for recording peak values must be a multiple of the average recording frequency.

The following average and peak values can be stored:

- Flow
- Thermal Power
- High temperature
- Low temperature
- Delta Temperature

The date and time is recorded with each stored value.

Superprog Windows or *Superprog Android* can be used to set which events can trigger the recording of the event together with the time, date, value and event number.

11.8 Nowa

“NOWA” means “Normalized heat meter adapter”.

The NOWA interface is a standardized interface that establishes the connection to the control of the custody transfer test bench via a modern calculator interface.

The relevant data of the calculators are recorded employing test benches operated by the custody transfer office and the necessary adjustment, calibration, and parametrization are carried out in the course of the custody transfer test.

12. Installation

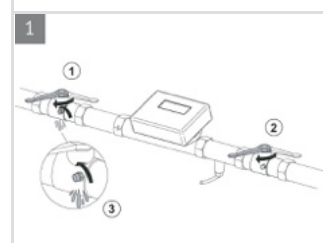
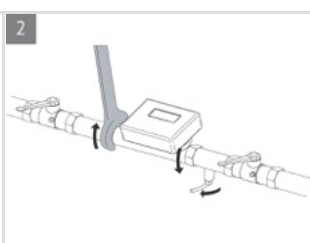
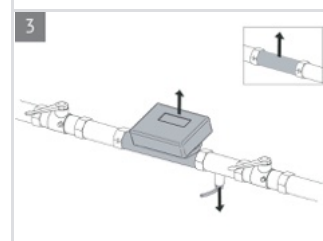
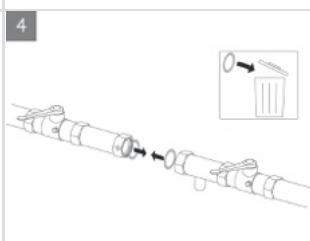
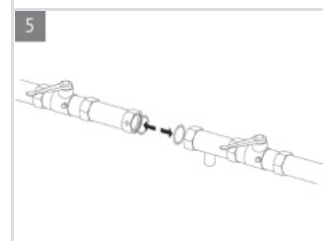
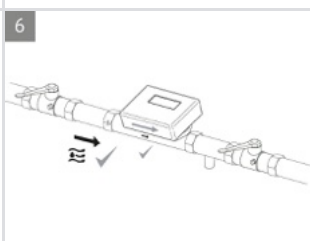


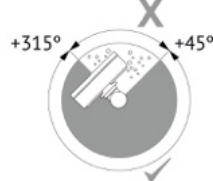
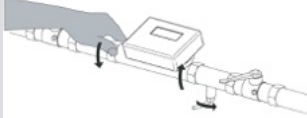
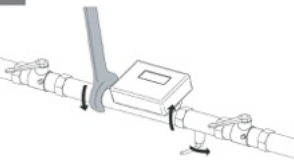
The prescriptions related in the standard EN1434-6 must be respected when the *Supercal 5 U* is installed.

12.1 Flow sensor installation

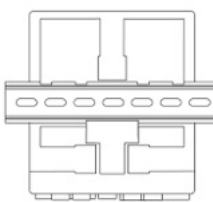
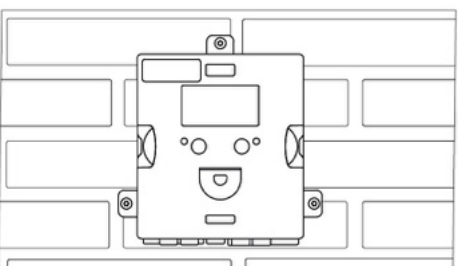
Depending on version and use (heat and/or cooling meter), the energy meter must be fitted on the “cold” or “hot” pipe side of the installation in compliance with the calculator. Mounting position set in the *Supercal 5 U* can be seen in the metrological menu or using the *Superprog Android* or *Superprog Windows*.

Flush out the installation pipes carefully in compliance with the DIN/EN standard specification before dismantling the thermal energy meter.

	1 Close the shutoff valves before and behind the meter. Open the drainage valve to reduce the pressure and discharge the water contained in the pipe between the two shutoff valves.		2 Unscrew the pipes and temperature sensors nuts
	3 Remove the thermal energy meter / tube and the temperature sensors.		4 Remove the old gaskets and discard it.
	5 Place a gasket on each side of the pipe. Only use appropriate new gaskets.		6 Install the new flow sensor on the pipe and ensure that the flow direction corresponds to the arrow on the flow sensor. Insert the calculator on the flow sensor by sliding it to the left.

7 	Install the flow sensor so that no air can be collected and stay inside.	8 	Installation can be carried out on both horizontal and vertical pipe sections. In case of horizontal mounting with a small quantity of air in the medium, the flow sensor must be mounted with the measuring head between +45° and +315°. Mounted between +315° and +45° can bring air collection in the flow sensor which may lead to no counting or wrong counting.
9 	Tighten the fixing nuts firmly by hand.	10 	Tighten the fixing nuts up to the mechanical end stop using a mounting tool

12.2 Installation of the calculator on the wall

	Slide the calculator to the left to remove it from the flow sensor if already mounted.		Fix the calculator on the DIN rail by sliding the plastic part on the back of the calculator or...
			... fix it on the wall by extending the 3 plastic parts on the back of the calculator.

12.3 Connection of the temperature sensors on the calculator

All shielded cables must be grounded and provided with strain relief!

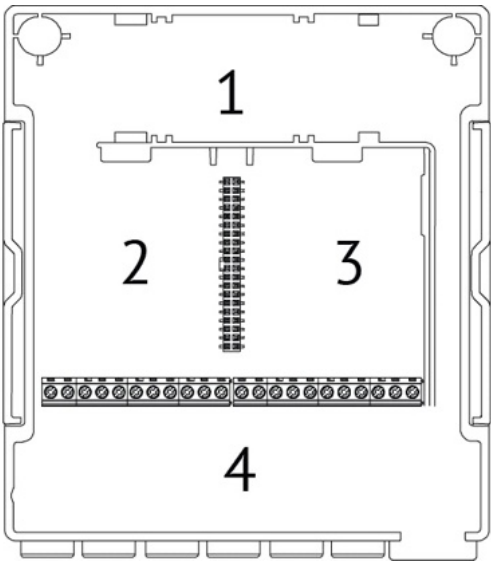
5-7: Red 6-8: White	5-7: Red 6-8: White	1-5-3-7: Red 6-2-8-4: White
2 wire sensor: 5: Red wire temperature sensor high 6: White wire temperature sensor high 7: Red wire temperature sensor low 8: White wire temperature sensor low	4-wires sensor with 2-wires integrator (Aluminium or plastic sensor head): 5: Red wire temperature sensor high 6: White wire temperature sensor high 7: Red wire temperature sensor low 8: White wire temperature sensor low	4-wires sensor with 4-wires integrator (Aluminium or plastic sensor head): 1/5: Red wires temperature sensor high 6/2: White wires temperature sensor high 3/7: Red wire temperature sensor low 4/8: white wires temperature sensor low

12.4 Installation of the temperature sensors

	For cooling applications, insulation must not cover the temperature sensor fixing screw. This also applies if the sensor is directly fixed in the flow sensor.		Install the temperature sensor according to EN1434 by having the measuring tip positioned in the center or above of the cross section of the pipe.
	For a heating thermal energy meter, install the temperature probes 1 with red label on the supply/hot side and the temperature probes with blue label on the return/cold side.		For a cooling thermal energy meter, install the temperature probes 2 with blue label on the supply/cold side and the temperature probes with red label on the return/hot side.
	For a heating thermal energy meter, install the temperature probes 1 with red label on the supply/hot side and the temperature probes with blue label on the return/cold side.		

12.5 Power supply, communication module and calculator wiring

All cables must be fixed with the strain relief provided with the *Supercal 5 U* and its modules.

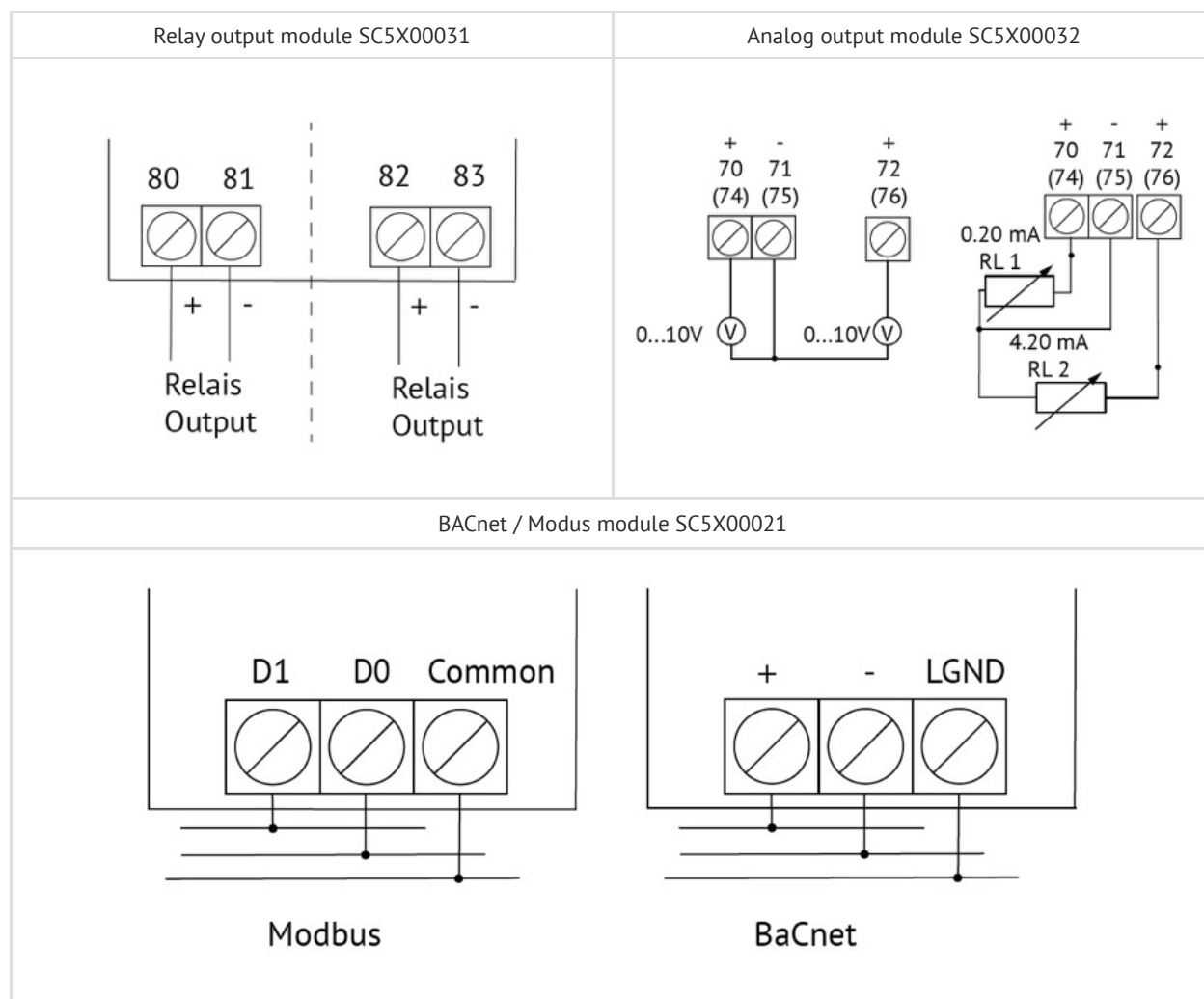


12.5.1 Power supply wiring (Zone 1)

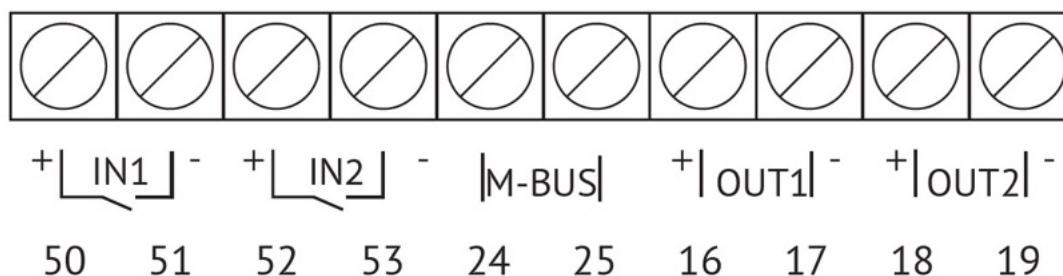
110.230 VAC 50/60 Hz power supply module	24 VAC / 24 VDC power supply module
Diagram showing three terminals labeled L, 26, and N. Terminal L is connected to a power source (indicated by a circle with a diagonal line). Terminal 26 is connected to a power source (indicated by a circle with a diagonal line). Terminal N is connected to a power source (indicated by a circle with a diagonal line). The terminals are numbered 28, 26, and 27 below them.	Diagram showing three terminals labeled with symbols for AC, DC, and a common ground. The terminals are numbered 28, 26, and 27 below them.

12.5.2 Communication module wiring (Zone 2 and/or 3)

M-Bus module SC5X00020	Digital input module SC5X00030
Diagram showing two terminals labeled 124 and 125. Terminal 124 is connected to a power source (indicated by a circle with a diagonal line). Terminal 125 is connected to a power source (indicated by a circle with a diagonal line). The terminals are numbered 124, 125, 124, and 125 above them.	Diagram showing two sets of terminals. The first set is labeled 90 and 91, with 90 connected to a power source (indicated by a circle with a diagonal line) and 91 connected to a power source (indicated by a circle with a diagonal line). The second set is labeled 92 and 93, with 92 connected to a power source (indicated by a circle with a diagonal line) and 93 connected to a power source (indicated by a circle with a diagonal line). The terminals are numbered 90, 91, 92, and 93 above them. Below the terminals are labels for IN 3/5 Input and IN 4/6 Input.



12.5.3 Calculator wiring (Area 4)

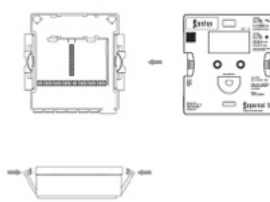
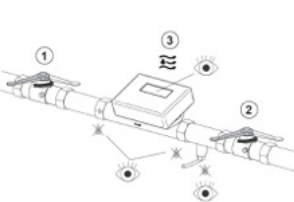
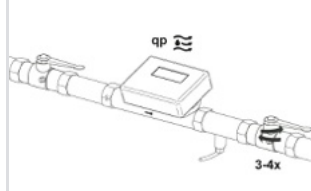


Input 1 (IN1 50-51) and Input 2 (IN2 52-53): Additional pulse inputs for connecting additional counters for cumulative electrical pulse counting. These two auxiliary inputs are automatically integrated into the M-Bus, radio or optical telegram, and transmitted. They enable the connection of various hot water, cold water, electricity, gas or oil meters. Their individual parameterisation (normal and/or fast mode) can be set-up in the *Superprog* software.

M-Bus (24-25): M-Bus connection

Output 1 (OUT1 16-17) and Output 2 (OUT2 18-19): Open-collector outputs can be used to display energy, volume, tariff 1, tariff 2, alarm and threshold values. These outputs are not galvanically isolated. For the connection to control systems we recommend the use of relay outputs.

12.6 Calculator closing, installation purging and testing

	Put the calculator cover of the <i>Supercal 5 U</i> on the calculator body and close it.	 Open the upstream valve. Open the downstream valve. Check on the LCD that there is flow. Check the waterproofness of the thermal energy meter connection and temperatures probes placed under pressure.
	Purge the pipe system to be sure that no air remains in the flow sensor by running the flow close to qp and then relatively rapidly closing and opening a downstream valve not so far away from the thermal energy meter three to four times. This gentle behaviour (producing no water hammer!) ensure that the most persisting enclosed air bubble decide to leave.	

13. Commissioning

13.1 Testing the installation

To check the purge-result, a zero check (see below) should be performed. This test should show the stability of the zero measurement (no counting). When possible, perform the following procedure (the order is important):

- After purging, still under some static pressure close the downstream valve.
- Close the upstream valve.
- The thermal energy meter is now blocked and under pressure.

A stable zero indication, undistracted from any possibility present vibrational influences should be the result. Should there still be any doubt about air inclusions, repeat the sequence.

On a long term, static circulation will help the purge, but won't do it completely.

Once the flow is on, you can check by repeatedly pressing the user button, various operating parameters such as flow rate, power, flow and return temperature on the LCD display of the calculator. If modules are installed, this is also shown on the LCD display (M1;M2:).

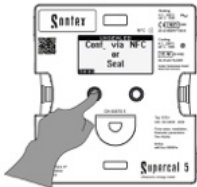
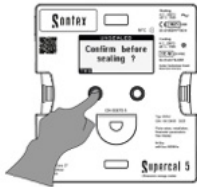
With the *Superprog Windows* or *Superprog Android*, you can read additional information from the unit.

All parameters displays are used to check the thermal energy meter or to adjust the system. It must be checked that the regulated flow of the system does not exceed the maximum permitted flow of the thermal energy meter.

13.2 Configuration and sealing

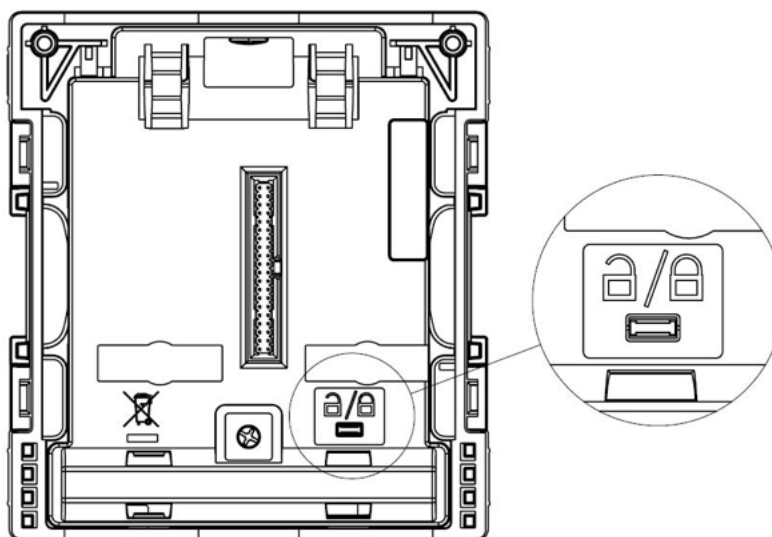
The sealing can be performed manually, via NFC with the *Superprog Android* application, via optical head with the *Superprog Windows* software or a M-Bus communication software.

13.2.1 Sealing manually the *Supercal 5 U*

	Do one long press on the left button.		Do one long press on the left button, the <i>Supercal 5 U</i> is sealed
---	--	--	--

Other non-metrological settings can always be changed using a smartphone with *Superprog Android* via NFC or by using the *Superprog Windows* and an optical interface.

Once the unit is sealed, in order to return to commissioning mode or to the un-sealed state, the seal must be broken as pictured below:



13.2.2 Configuration and sealing with *Superprog Android*

Needed SW Tools and equipment:

- *Superprog Android* V1.5.0 and upper.
- Android smartphone with NFC.

Configuration of the *Supercal 5 U* using *Superprog Android*:

- Activate the NFC on your smartphone and position it on the NFC logo of the *Supercal 5 U* calculator.
- Once your smartphone has detected the *Supercal 5 U*, press on "Install SC5 / Configure SC5" icon.
- Remove your smartphone and position it again on the NFC logo.
- Navigate in the different menu to set the needed parameters and click on accept icon.
- Check the box "Seal the supercal 5" and press Ok button.

13.2.3 Configuration and sealing with *Superprog Windows*

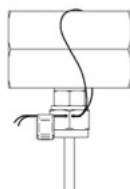
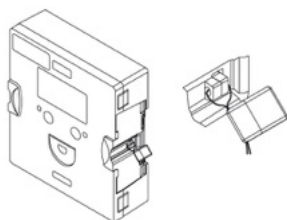
Needed SW Tools and equipment:

- *Superprog Windows* V1.7.0 and upper.
- Optical head compatible IEC62056-21b:2002.

Configuration of the *Supercal 5 U* using *Superprog Windows*:

- Make a device read out with *Superprog Windows* by using the optical head. Make sure that the LED of the optical head is well positioned on the optical interface.
- Navigate in the different menu to set the needed parameters and press the "Write" button to confirm the changes. When you are requested to confirm the changes, you can check the checkbox to Seal the *Supercal 5 U*.

13.2.4 Seals installation



Install the seals on the calculator and the temperature sensors

14. Error codes and troubleshooting

If several errors are present at the same time, the individual error messages are added together and displayed.

If an error occurs for more than one hour, it is stored in the error memory with date and time (start of error) and duration (in minutes). If an error is present for less than 60 minutes, it is deleted automatically without being saved.

Text - Error code displayed	Error name in <i>Super prog</i>	Error code in M-Bus telegram	Status / Warning in <i>Tools Supercom and Sonexa</i>	Description	Troubleshooting procedure
N/A	N/A	N/A	N/A	The thermal energy meter is not counting.	Repeat the purge procedure described in Mechanical installation.
A/D Reference 1/2 - 1*	! AD reference 1	01 00 00 (detailed errors er er)	! AD ref1 error	Reference resistance 1 in the calculator cover (MET) is damaged.	Replace the calculator cover (MET)
A/D Reference 2/2 - 2*	! AD reference 2	02 00 00 (detailed errors er er)	! AD ref2 error	Reference resistance 2 in the calculator cover (MET) is damaged.	
A/D sensor 1 - 4*	! AD sensor 1	04 00 00 (detailed errors er er)	! AD sensor 1 error	Temperature sensor 1 is defective	Check that the temperature sensor is properly connected to input 5-6 (if 2-wires) or 1-5-6-2 (if 4-wires). If temperature sensor is properly connected and only "A/D sensor 1" error appears on the screen: - swap the temperature sensor connection on the calculator. - if the error is replaced by "A/D sensor 2", the temperature sensor previously connected is defective, replace it.
A/D sensor 2 - 8*	! AD sensor 2	08 00 00 (detailed errors er er)	! AD sensor 2 error	Temperature sensor 2 is defective	Check that the temperature sensor is properly connected to input 7-8 (if 2-wires) or 3-7-8-4 (if 4-wires). If temperature sensor is properly connected and only "A/D sensor 2" error appears on the screen: - swap the temperature sensor connection on the calculator. - if the error is replaced by "A/D sensor 1", the temperature sensor previously connected is defective, replace it.

Range Sensor 1 - 16*	 Temperature 1 min	10 00 00 (detailed errors er er)	 Temperature 1 below min	Temperature sensor 1 $\leq$ min. Range error.	Check that temperature sensor used it Pt500, Check that the installation temperature is the same as measured by the calculator, if not replace the temperature sensor.
Range Sensor 1 - 32*	 Temperature 1 max	20 00 00 (detailed errors er er)	 Temperature 1 above max	Temperature sensor 1 $\geq$ max. Range error.	
Range Sensor 2 - 64*	 Temperature 2 min	40 00 00 (detailed errors er er)	 Temperature 2 below min	Temperature sensor 2 $\leq$ min. Range error.	
Range Sensor 2 - 128*	 Temperature 2 max	80 00 00 (detailed errors er er)	 Temperature 2 above max	Temperature sensor 2 $\geq$ max. Range error.	
Flow Saturation - 512	 Overflow	00 02 00 (detailed errors er er)	 Overflow	The flow rate is higher than 1.2qs.	Reduce the flow rate.
Open case - 1024	 Case open	00 04 00 (detailed errors er er)	 Case open	The calculator is open.	Close the calculator cover.
Main power cut - 2048	 Main power cut	00 08 00 (detailed errors er er)	 Main power cut	Power outage.	Check the main power supply connection.
Slot error M1 - 4096	 Module 1 error	00 10 00 (detailed errors er er)	 Module 1 error	Error in module 1.	Details must be found into specific module error.
Slot error M2 - 8192	 Module 2 error	00 20 00 (detailed errors er er)	 Module 2 error	Error in module 2.	Check below module errors
M2: US0	 Overflow	10 (Module 2 parameters 8D C0 80 40,FF 53,F5, xx)	 Overflow	The flow rate is higher than 1,2 qs.	Reduce the flow rate.
M2: USR	 Reverse flow	08 (Module 2 parameters 8D C0 80 40,FF 53,F5, xx)	 Reverse flow	Reverse flow.	Check that the flow sensor arrow is on the same direction than the flow. If not dismount the flow sensor and mount it in the proper direction.

M2: USA	 Low amplitude	02 (Module 2 parameters 8D C0 80 40,FF 53,F5, xx)	 Low amplitude	Low amplitude.	Air bubbles are on the flow sensor, repeat the purge procedure described in Chapter 12.6 . If the error is still displayed, replace the thermal energy meter.
M2: USN	 No water	01 (Module 2 parameters 8D C0 80 40,FF 53,F5, xx)	 No water	No water in the flow sensor.	No water in the flow sensor or air bubble are on the flow sensor, repeat the purge procedure described in Chapter 12.6 . If the error is still displayed, replace the thermal energy meter.
M2: UST	 Temperature error	04 (Module 2 parameters 8D C0 80 40,FF 53,F5, xx)	 Temperature error	Temperature <0°C or >130°C.	Check that the medium temperature is the same as measured by the calculator, if not replace the temperature sensor. If yes, reduce the installation temperature.

* This code won't appear on the top right of the screen. The code is always a sum of 256 + one or more of this code. To help you doing the correct calculation the screen will display the text which is between quotation marks. For example, code 268 is 256 + 4 + 8, screen will display „A/D sensor 1“ and „A/D sensor 2“.

14.1 Troubleshooting M-Bus

If there is no communication via the M-Bus with the *Supercal 5 U*, please check:

- Does the device address in the device match the master?
- Do device and master have the same baud rate?
- Are there other devices with the same device address on the M-Bus?
- Is the M-Bus correctly connected to the device?

14.2 Troubleshooting MODBUS

- Do device and master have the same baud rate and parity?
- Is the wiring of the interface OK?
- Do all slaves on the MODBUS have different device addresses?

15. Maintenance and Cleaning Instructions

No specific maintenance is required for the electronic device.

The only parts that can be replaced during the thermal energy meter lifetime, are the optional communication and power supply modules.

The front of the calculator housing can be cleaned with a dry, soft cloth.

16. Legal and Compliance Information

Hereby, Sontex declares that the product is in compliance with Directive 2014/53/EU, 2014/32/EU and 2011/65/EU.

The full text of the CE Declaration of Conformity can be found on our website.

17. Support & Warranty Information

- For technical support, please contact your local agent.
- Warranty and guarantee claims are only valid if the device has been used in accordance with their intended use and if the technical requirements and any applicable technical regulations have been observed.
- Links to online documentation, declaration of conformity, manuals, or support forums:



18. Disposal



For the purposes of disposal, the device is considered a used electronics device in the sense of the European Guideline 2012/19/EU (WEEE). It must not be disposed of with household waste. Dispose only at authorized collection points.

19. Accessories

19.1 Optical probe

The optical interface is available on every *Supercal 5 U*.

Communication between the *Superprog* software and *Supercal 5 U* can be done by means of an optical coupler.

The *Superprog* software is mainly used to configure the non-metrological parameters and for readout.

The transmission speed is set at 2400 bauds and cannot be changed.

We recommend the use of optical couplers supplied by: 

Should communication problems occur, please refer to the document User Guide *Superprog* (integrated as PDF in the software).

For the optical probe listed below, we have noted the filters needed to permit correct communication with *Superprog* software:

Optical probe	Filter
P+E Technik : "K1-98" or "K1-06"	No filter
P+E Technik : "K01-USB"	No filter

19.2 Sensor pocket

Sensor pockets for Sontex temperature sensors Pt500			
Temperature sensor diameter	Pocket	Part number	Material
Ø 6.0	34 x G3/8"	0460A202	Brass
Ø 6.0	34 x G1/2"	0460A206	Brass
Ø 6.0	84 x G1/2"	0460A207	Brass