

OPERATING MANUAL

PRO 111

PRO 115

Pt100 thermometers



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1 General information

Read this document carefully and familiarize yourself with the operation of the device before using it. Keep this document ready to hand and in the immediate vicinity of the device so that it is always available to the personnel/user in case of doubt.

Only technically qualified persons are permitted to carry out commissioning, operation, maintenance and decommissioning. The personnel must have carefully read and understood the operating manual before starting any activity.

Legal notices

- For your safety, use only the manufacturer's original spare parts and accessories. We assume no responsibility for the use of other products and any resulting damage.
- The user must have adequate knowledge of the measuring process and use of the measurements. The user is liable in case of damage/danger due to misinterpretation of the measurements as a result of inadequate knowledge.
- The liability and warranty of the manufacturer for product damages and consequential damages are voided in the event of misuse, failure to comply with these operating instructions, failure to observe safety warnings, assignment to inadequately qualified technical personnel and arbitrary modifications of the device.
- No part of this document may be reproduced, modified or translated without prior written permission of the product manufacturer. In case of ambiguity between different language versions of this document, the English version applies.
- This document does not create any legally binding obligations for the product manufacturer. All legally binding obligations are included only in the General Terms and Conditions of Sale.

Correctness of content

- This document was checked for corrected contents and is subject to a continuous updating process. This does not rule out potential errors. In the event that errors are discovered or in case of suggestions to make this document more user-friendly, please inform us via the contact information given in this document.
- We reserve the right to change the product specifications and the contents of this document without prior notice.

Explanation of symbols used

Danger!

Warning of danger that could result in death, serious bodily injury, or serious property damage if not observed.

Caution!

Warning of potential danger or harmful situation that may cause damage to the device or the environment if not observed.

Attention!

Action that may have a direct effect on operation or may cause an unexpected behavior.

[▶ p.4] Reference to the indicated page number.

1.1 Safety information

Fault-free operation and operational safety of the device can only be guaranteed if the general safety requirements and the specific safety requirements in this document are observed.

Do not use the device in climatic conditions other than those specified in this document.

Do not use the device in places with:

- Rapid ambient temperature variations that may cause condensation.
- Direct vibrations / shocks to the device.
- High-intensity electromagnetic fields or static electricity.

Intended use

The device is a thermometer for interchangeable Pt100 probes, designed for temperature measurements with the appropriate probe, in liquid, gases, soft plastic materials and bulk materials.

Foreseeable misuse

If the following notices are disregarded, personal injury or death, as well as property damage can occur.



Danger!

- Do not use in safety / emergency stop devices!
- Not suitable for use in hazardous areas (Ex-environments)!
- Not suitable for diagnostic or other medical purposes on patients!
- Not suitable for SIL (Safety Integrity Level)!
- The device is not suitable for contact with food (use only appropriate probes)!
- Not suitable for children!
- Do not use as PPE (Personal Protection Equipment).



Caution!

Do not use if:

- There is visible damage to the device.
- The device is not working as expected.
- The device has been stored under unsuitable conditions for an extended period.

On suspicion that the device can no longer be operated without danger, it must be decommissioned and prevented from recommissioning with appropriate labelling.

In case of doubt, send the device to the manufacturer for repair or maintenance.



Caution!

Penetration probes entail the risk of **stab injuries** due to the pointed probe. Handle penetration probes with care and fit a protective cap on the probe tip when not in use!



Caution!

Risk of burns when measuring high or very low temperatures: use gloves if necessary!



Attention!

Remove batteries to prevent leakage if the device is stored at a temperature above 50 °C or not used for an extended period of time.

2 Overview

PRO 111 and **PRO 115** are professional handheld temperature meters for 4-wire Pt100 temperature probes. **PRO 115** also has data logging capabilities.

High-precision temperature-compensated analog front-end and polynomial sensor linearization.

Detection of minimum, average and maximum values. The user can reset the statistical info to start a new statistical calculation.

Alarm thresholds can be set, to warn the user when the set values are exceeded.

The HOLD feature allows freezing the measurement on display, while the REL feature allows showing the measurement against a value determined by the user.

The meter can be connected to a PC via the USB-C port, for data acquisition in COM interface mode. The logger version PRO 115 can operate in mass storage mode, for viewing or downloading the files stored in the internal memory or connecting to the **ProXware** application software.

Powered by 4 standard AA size alkaline batteries. For permanent operation, the instruments can also be powered via the USB-C port by a 5 Vdc standard power adapter or suitable power bank.

The configurable auto-off feature and LCD backlight level allows for more energy saving options.

2.1 Scope of delivery

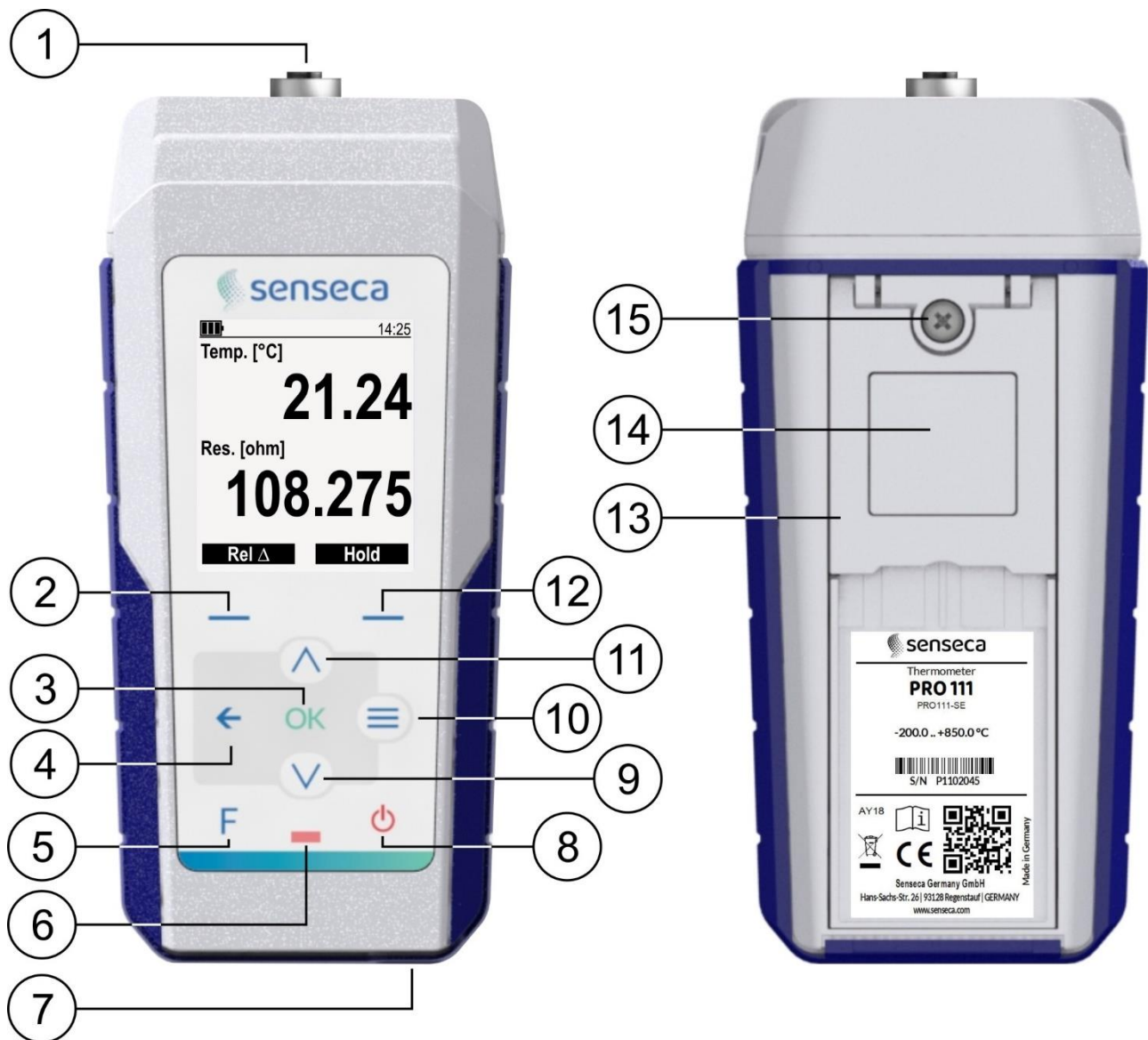
PRO 111 is supplied with:

- Quick start guide
- 4 alkaline batteries, AA size
- Test report

PRO 115 is additionally supplied with a USB cable.

The **ProXware** application software is downloadable from Senseca website.

3 Description



1. Input with M12 connector.
2. Left function key: runs the command shown at the bottom left on display.
3. **OK** key: confirms the selection.
4. **←** key: in measurement display cycles through the various available visualization modes; in the menu goes up one level, cancelling any unconfirmed changes.
5. **F** key: reserved.
6. Status LED.
7. USB-C port for connecting the PC or the external power supply.
8. **ON/OFF** key: turns the instrument on/off.
9. **Down arrow** key: scrolls down in a list or decreases the value of a parameter.
10. **MENU** key: enters the configuration menu.
11. **Up arrow** key: scrolls up in a list or increases the value of a parameter.

12. Right function key: runs the command shown at the bottom right on display.
13. Foldable stand: pull to open the stand.
14. Magnet, for attachment to metal surfaces.
15. Battery compartment fixing screw.

DISPLAY

The diagram shows a digital display with the following elements:

- 16:** Status bar at the top containing icons for battery, correction, hold, logging, alarm, and USB, along with the time 14:25.
- 17:** The measured parameter and unit: "Temp. [°C]".
- 20:** The measured value: "21.24".
- 18:** The function corresponding to the left function key: "Rel Δ".
- 19:** The function corresponding to the right function key: "Hold".

Symbols in the status bar:

- Battery charge level
- External power supply connected
- cor** Measurement correction applied
- hld** Hold function active
- rec** Logging in progress
- al.** Measurement in alarm
- USB** USB port connected to PC
- 14:25 Current time

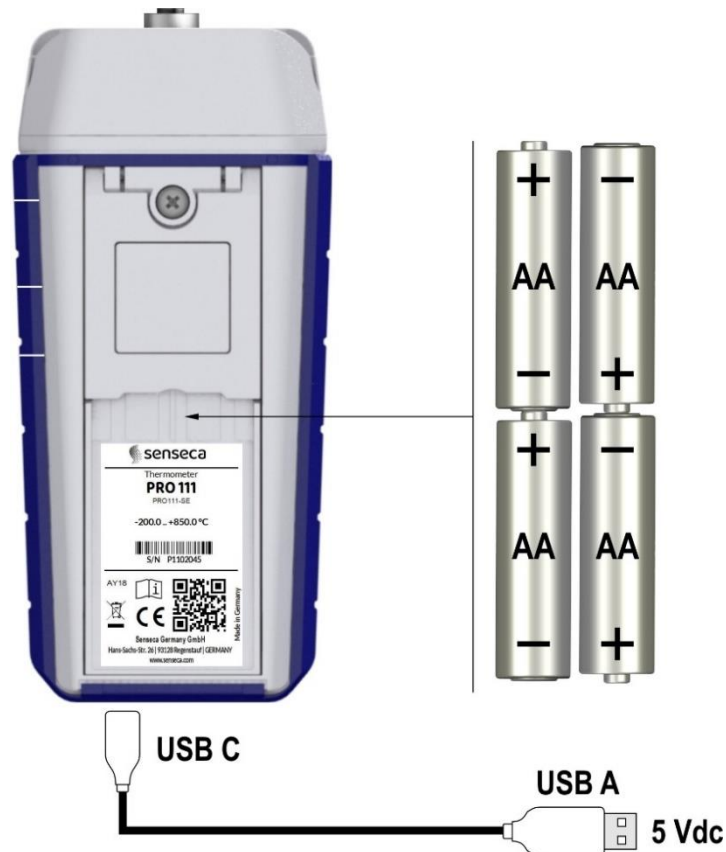
16. Status bar.
17. Measured parameter and unit of measurement.
18. Function corresponding to the left function key.
19. Function corresponding to the right function key.
20. Measured value.

4 Preparing the instrument

Power supply

The instrument is powered by 4 AA size alkaline batteries, already assembled in the device as standard.

If for some reason (e.g., shipping rules) the batteries are not already assembled, unscrew the battery cover fixing screw and remove the cover, then insert the batteries as shown below.



The instrument can also be powered via the USB-C port by a 5 Vdc standard power adapter or power bank. If a power bank is used, make sure it is of appropriate capacity and does not have the auto-shutdown function when the current draw is very low (for example, suitable power banks are those in the Varta Power Bank Energy series).

Probe connection

Connect the probe to the input at the top of the instrument by screwing the shell of the probe M12 connector to the instrument M12 connector.

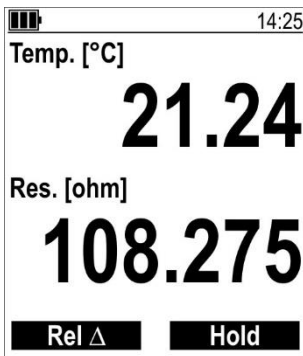


5 Measurement mode

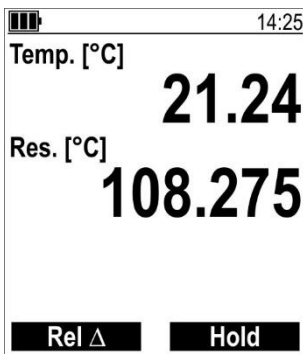
To switch on the instrument, press the ON/OFF key. After a few seconds, the instrument displays the measured value.

Note: when the instrument is turned on for the first time, it automatically enters the menu displaying some factory settings (language, date/time, etc.); press repeatedly OK to accept the proposed settings or change them as indicated in the Configuration chapter ► p.12].

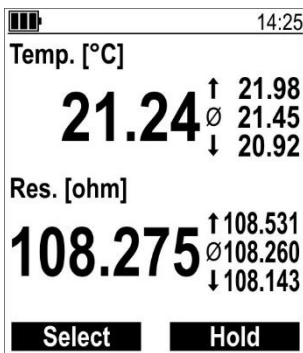
By repeatedly pressing the ← key, measurements can be displayed in different formats:



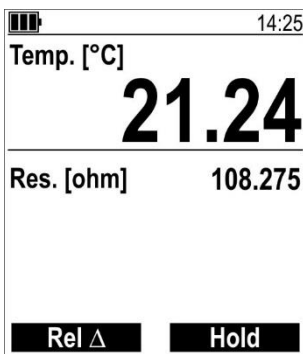
Parameters displayed in large format.



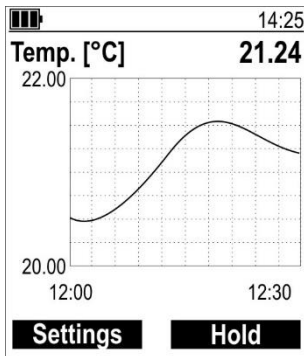
Parameters displayed in medium format.



Parameters displayed in medium format with indication of maximum (↑), average (∅) and minimum (↓) values.



One parameter displayed in large format and the remaining in small format.



One parameter displayed numerically and graphically.

The parameters that can be displayed graphically are selectable in the **Chart setup** → **Channel select** menu. The left function key **Settings** is a shortcut to the **Chart setup** menu.

A graph for each of the chosen parameters is displayed. Use the **down/up arrow** keys to scroll through the various graphs.

To enable/disable the display of a parameter, change the units of measurement or the order in which parameters are displayed, see the Configuration chapter [▶ p.12].

5.1 Hold function

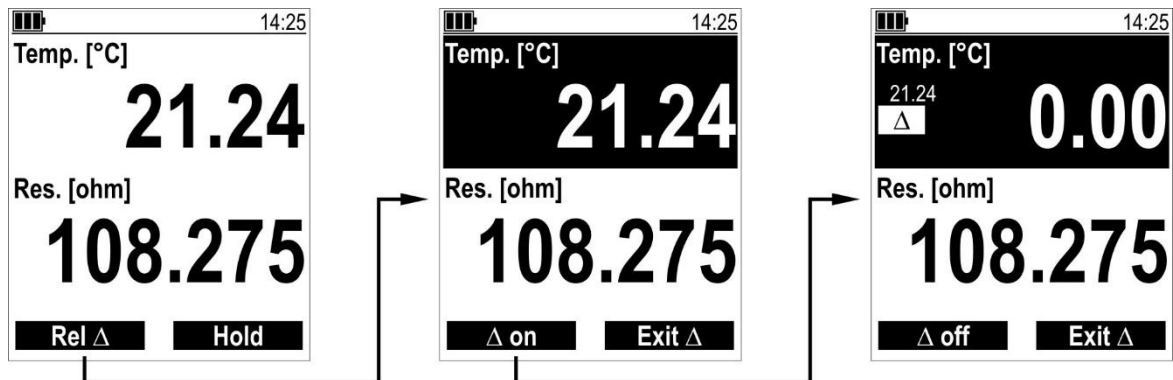
The **Hold** function, which can be activated/deactivated by pressing the right function key, freezes the current measurement value on the display.

The function activation is highlighted by the **hld** symbol in the status bar of the display.

5.2 Rel function

The **Rel** function displays the relative measurement against a reference value, consisting of the measurement value at the time the function is activated.

To activate the relative measurement, press the left function key (**Rel Δ**), select with the **down/up arrow** keys the measurement for which the function should be activated (the selected measurement is highlighted in negative), then press the left function key (**Δ on**). The symbol **Δ** and the reference value appear on display.



To disable the relative measurement, press the left function key (**Δ off**) again.

By pressing the right function key (**Exit Δ**), the instrument exits the relative measurement enable/disable (**Δ on/off**) mode.

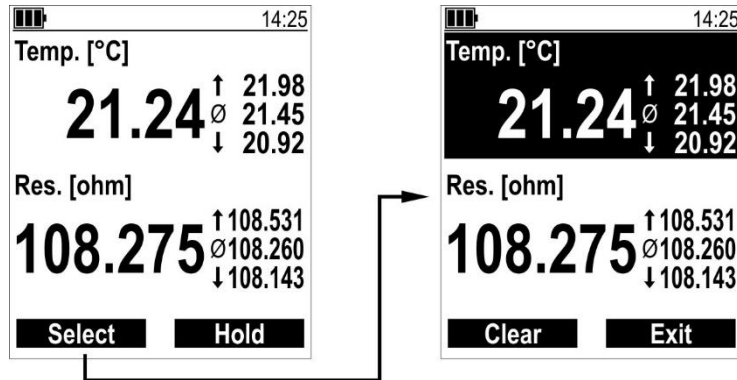
The **Rel Δ** command is not available:

- in the screen with the statistical values;
- in the screen with the graph;
- while logging.

5.3 Reset of the statistical values

To reset the statistical values, press the left function key (**Select**) in the measurement screen with the maximum/medium/minimum values, select with the **down/up arrow** keys the measurement whose statistical values should be reset (the selected measurement is highlighted in negative), then press the left function key (**Clear**).

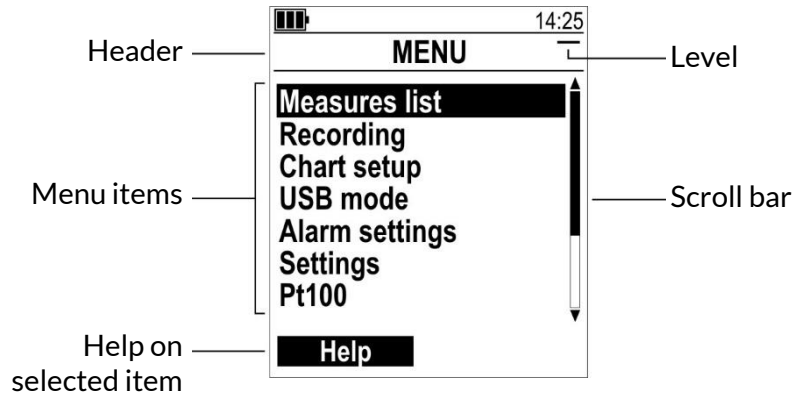
To exit the statistical values reset mode, press the right function key (**Exit**).



6 Configuration

Press the **MENU** key to enter the configuration menu.

The menu is structured in levels. The current level is indicated by the number of overlapping bars in the menu header:



Use the **down/up arrow** keys to select an item, press **OK** to confirm.

The presence of the scroll bar indicates that there are additional items available beyond those displayed.

The left function key (**Help**) provides a description of the selected item. If the help function is entered, press the left function key (**Help off**) again to exit.

! Attention!

It is not possible to access the menu if the instrument is logging.

6.1 Menu structure

The menu structure is shown below; each item is preceded by the level according to the bar symbology shown on the display.

MENU	DESCRIPTION
– Measures list	Selection of the quantities to display and log
– Recording	<i>Available only in PRO 115. Item visible only if USB mode=COM interface.</i>
= Start recording	Logging start
= Set interval	Setting of logging interval: 1/2/5/10/15/30 s, 1/2/5/10/15/30 min, 1 h
– Chart setup	Setting of the measurement graphical display
= Channel select	Selection of parameters to be displayed graphically (selectable from those enabled in the "Measures list" menu)
= Chart interval	Chart measurement interval: 1/2/5/10/15/30 s, 1/2/5/10 min
– USB mode	USB setting: COM interface (for logging and serial communication) or Mass storage (for viewing logging files from PC)
– Alarm settings	Type of alarm signaling: Off, acoustical (buzzer) and/or optical (flashing backlight and red flashing status LED)
– Settings	
= Device info	Displaying of instrument info (model, S/N, FW revision, ...)
= Backlight	Backlight configuration
≡ BL activation	Backlight duration: Off, 5 s, 30 s, 1 min, always On
≡ BL intensity	Backlight intensity: Low, Medium, High
= Auto-off	Auto-off setting: Off, 30 min, 1/2/4/6/12 h
= Date & time	Setting of date and time (yyyy-mm-dd hh:mm:ss)
= Time zone	UTC or CET time zone setting
= Language	Selection of the menu language
= Dark mode	Black background enabling/disabling
= Factory reset	Reset to factory settings
– Pt100	Measurement settings
= Measures units	Setting of the unit of measurement: °C, °F, K
= Alerting	Alarm thresholds enabling/disabling
= Min. alarm (*)	Lower alarm threshold (alarm if measure < threshold)
= Max. alarm (*)	Upper alarm threshold (alarm if measure > threshold)
= Hysteresis (*)	Thresholds hysteresis
= Calibration	Setting of the Callendar-Van Dusen (CVD) equation parameters
≡ R ₀	Parameter R ₀
≡ exponent for A	Exponent of the CVD equation term related to coefficient A
≡ A	Coefficient A
≡ exponent for B	Exponent of the CVD equation term related to coefficient B
≡ B	Coefficient B
≡ exponent for C	Exponent of the CVD equation term related to coefficient C
≡ C	Coefficient C
= Correction	Measurement adjustment
≡ Zero point	Offset adjustment
≡ Gradient	Slope adjustment
= Probe info	Information on the probe

(*) The item does not appear if "Alerting" is set to "Off"; to display the item, set "Alerting" to "On".

To go back up one level within the menu, press the **←** key. The **MENU** key allows exiting the menu directly and return to measurement mode from any level (except from parameter setting screens, from which you can exit only with **←**).

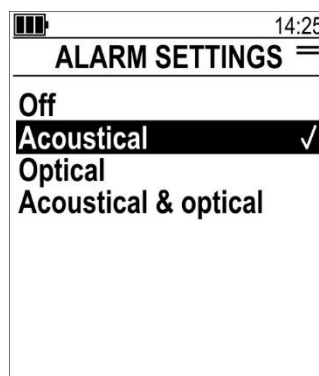
6.2 Configuring a parameter

Configuring a parameter may require choosing an option from those proposed, or setting a numerical value.

Configuring a parameter by choosing an option from those proposed:

The current setting is marked by the check mark. To change it, choose an option with the **down/up arrow** keys, then press **OK** to confirm.

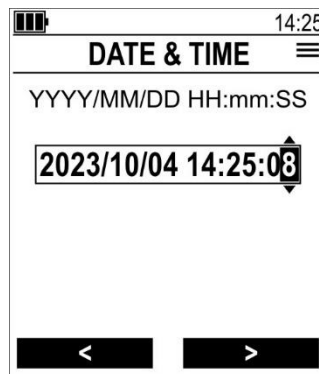
Pressing the **←** key it is possible to exit by canceling changes not yet confirmed.



Configuring a parameter by setting a numerical value:

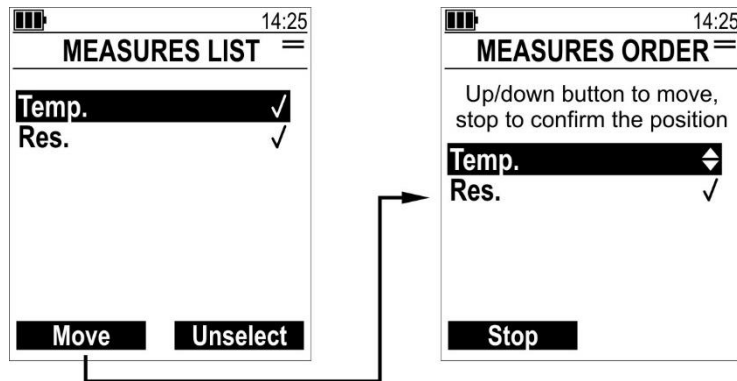
Select the various digits using the function keys (**<** **>**). To change a digit, use the **down/up arrow** keys. When finished, press **OK** to confirm the value.

Pressing the **←** key it is possible to exit by canceling changes not yet confirmed.



6.3 Selecting and sorting the quantities to be displayed

The **Measures list** menu item allows choosing which quantities to display and in which order.



Enabled quantities are marked by the check mark. To enable or disable a quantity, select it with the **down/up arrow** keys, then press the right function key (**Select** or **Unselect** depending on whether the quantity is disabled or enabled).

The quantities are displayed in the measurement screens in the order in which they appear in this menu. To change the position of a quantity, select it with the **down/up arrow** keys, press the left function key (**Move**), move the quantity with the **down/up arrow** keys, and press the left function key (**Stop**).

“Res.” indicates the resistance value of the Pt100 sensor.

7 Measurement basics

The sensor is located at the end of the probe.

Immersion or penetration measurement: immerse the probe stem for at least 60 mm; when measuring in liquids, stir the liquid if possible.

Attention!

The measurement may be inaccurate if the probe stem is not sufficiently immersed, due to heat loss from the metal stem.

Measurement in air/gases: immerse the stem as much as possible in the fluid to be measured. The response time is shorter in the presence of flow; in the absence of flow, you can speed up the measurement by moving the probe, if possible.

Attention!

The probe stem must be dry, otherwise a temperature lower than the actual temperature will be detected.

Measurement of solid materials by contact: the measuring surface should be flat and smooth; the probe should be perpendicular to the measuring plane. Probes with tip specially designed for contact measurements must be used. The ambient temperature and heat dissipation of the probe metal stem can affect the accuracy of the measurement.

Attention!

For a more accurate and faster contact measurement, interpose thermally conductive paste between the measuring surface and the probe tip.

Measurement on non-metallic surfaces takes longer because of the poor thermal conductivity.

7.1 General warnings on probes usage

Wait for thermal equilibrium between the sensitive part of the probe and the area to be measured before taking the measurement.

Thoroughly clean the probe after use.

Danger!

If the probe has a metal stem or other metal parts, be careful not to come into contact with live parts.

Caution!

- Do not expose the probe to corrosive gases or liquids!
- Do not expose the probe to temperatures exceeding the operating limit specified for the probe, the measuring sensor may be damaged.
- Avoid performing measurements in the presence of high-frequency sources, microwaves or strong magnetic fields.
- Connect the probe to the instrument without forcing or bending the connectors or contacts!
- Do not deform or drop the probe!
- Bending within moderate radius is only allowed for mineral insulated probes.

7.2 Warning on USB port isolation

The instrument USB port is not galvanically isolated, and its connection, either to the PC or to an external power supply that is not isolated from ground, may affect the measurement when using a probe that is in contact with the measured medium. Under such conditions, always check the measurement with and without USB connected: if a difference in the detected value is noticed, disconnect USB, or use an external suitable USB isolator (for example, DFRobot FIT0860) to detect reliable measurements.

8 Measurement adjustment

The Pt100 sensor can be characterized by entering the parameter R_0 (resistance at 0 °C) and the coefficients A, B and C with the related exponents of the Callendar-Van Dusen equation through the **Pt100 → Calibration** menu.

The measurement can be adjusted by setting the following parameters, available in the **Pt100 → Correction** menu:

- **Zero point:** adds an offset (t_{offs}) to the measurement.

$$\text{Displayed value} = \text{Measured value} + t_{offs}$$

- **Gradient:** applies a percentage correction ($C_{slope}\%$) to the measurement. Zero indicates no correction.

$$\text{Displayed value} = (\text{Measured value} + t_{offs}) * (1 + C_{slope}\% / 100)$$

If a measurement correction is applied by setting a value other than zero for the “Zero point” and/or “Gradient” parameters, the **cor** symbol appears on the display.

9 Logging (PRO 115 only)

The logging function stores in the memory of the instrument the detected measurement, along with the date and time of each sample. The data are stored in **CSV** format.

Logging is automatic according to the set interval. To start logging, select the **Start recording** item from the **Recording** menu.

Attention!

- To use the logging function, the **USB mode** menu item must be set to **COM interface**.
- The Logging function records only the quantities enabled in the measurement screens. Before starting logging, make sure that all quantities of interest are enabled.

By selecting "Start recording," the instrument automatically exits the menu. It is not possible to access the menu during logging.

The logging activation is highlighted by the **rec** symbol in the status bar of the display. During logging, the status LED briefly flashes green every 5 seconds.

With logging active, in the measurement screens the left function key assumes the function of **Stop** logging.

During logging, the instrument auto-off is disabled.

9.1 Viewing the logged data

The instrument can be connected to the PC via a standard USB-C cable. The instrument is viewed by the PC as a mass storage device containing the various log files in CSV format.

Attention!

- For viewing files from PC, logging must be off and the **USB mode** menu item must be set to **Mass storage**.

The files can be opened with any standard software capable of reading CSV files, or, the **ProXware** application software can be used.

9.2 Deleting the logged data

The log files can be erased from the PC using a file manager.

10 Serial communication

Serial commands can be sent to the instrument, to read the instrument information and the measurements.

To send serial commands to the instrument, the **USB mode** menu item must be set to **COM interface**.

In the serial communication software used, the PC COM port number to which the instrument is connected and the following parameters should be set:

- Baud rate = 115200
- Data bits = 8
- Stop bits = 1
- Parity = None

The full list of commands supported by the model, with their description, is obtained by sending the following command:

GetCommandList: 0<CR><LF>

<CR> = Carriage Return

<LF> = Line Feed

Between the characters ":" and "0" of the command there is a space.

All command strings sent to the instrument must be terminated by the <CR><LF> control characters.

11 Battery management

If the external power supply is not connected, the battery symbol on the display indicates the battery charge level.

If the battery charge is insufficient to ensure a correct measurement, the instrument turns off. The data remains stored even with low batteries.

In case of discharged batteries it is necessary to replace the batteries: unscrew the battery cover fixing screw and remove the cover, take out the exhausted batteries and insert 4 new AA size alkaline batteries [► p.8], then screw the cover back on.

Attention!

If you plan to use the instrument on battery power alone, make sure the charge is sufficient to complete the measurements.

Tips:

To increase the battery autonomy, it is possible to reduce the brightness of the backlight and/or enable the instrument auto-off (see Configuration chapter [► p.12]).

Danger!

- Do not short-circuit the batteries, they may explode with serious risk to people!
- Do not expose the batteries to high temperature!
- Do not throw the batteries into fire!

Caution!

Disposal: Dispose the exhausted batteries in the appropriate bins or deliver them to authorized collection centers. Comply with current regulations.

12 Maintenance

It is recommended to perform a calibration check of the instrument and connected probes annually at accredited laboratories.

12.1 Cleaning

Do not use aggressive cleaning agents or incompatible with the materials indicated in the technical specifications. For cleaning, use a soft dry cloth or slightly dampened with clean water.

12.2 Storage

It is advisable to remove the batteries if the product is stored for a long time.



Caution!

Do not store the product where:

- Humidity is high.
- The product is exposed to direct sunlight.
- The product is exposed to a source of high temperature.
- There are strong vibrations.
- There is vapor, salt and/or corrosive gas.

12.3 Disposal



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.

13 Technical specifications

Measurement specifications

Measuring range	-200.00...+850.00 °C / -328.00...+1562.00 °F
Resolution	0.01 °C/°F
Accuracy	±0.05 °C or ±0.06% of measured value (whichever is higher) ± 1 digit
Linearization	According to IEC 60751
Measurement rate	2 meas./s
Long-term drift	±0.02 °C/year
Probe cable length	≤ 10 m

General specifications

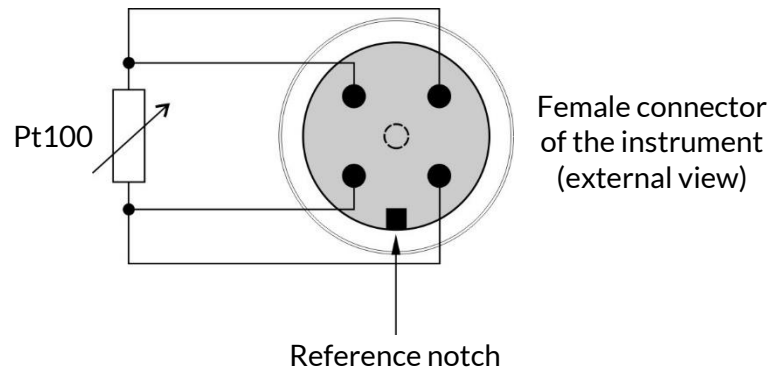
Input channels	1 for 4-wire Pt100 probes M12 connector
Storage capacity (only PRO 115)	Up to 1 million data sets, file system based (CVS files). Each data set includes measurement and date/time stamp.
Logging type (only PRO 115)	Automatic with manual start/stop
Logging interval (only PRO 115)	1, 2, 5, 10, 15, 30 s / 1, 2, 5, 10, 15, 30 min / 1 h
Clock	User settable RTC Max. drift 1 min/month @ 25 °C
Display	140 x 160 dot matrix backlit LCD Visible area 42 x 50 mm
User interface	Multilingual
PC connection	USB-C, Mass Storage Device (only PRO 115)
Power supply	4 x AA alkaline batteries External 5 Vdc via USB C
Power consumption	20 mA typ.
Battery autonomy	> 150 h typ. continuous operation (backlight off)
Auto power off	Yes, user configurable
Operating conditions	-5...50 °C / 0...85 %RH non-condensing
Storage temperature	-25...65 °C (without batteries)
Protection degree	IP 67 (except probe connection) IK 06
Dimensions	170 x 78 x 38 mm
Weight	340 g approx.
Housing material	ABS, TPE (side protection), Polyester (front panel)

14 Attachable probes and accessories

Pt100 probes of the **AX 11x** series can be connected to the instrument.

For the available probes, please visit Senseca website.

The figure below shows the 4-wire connection of the Pt100 sensor to the instrument.



! Attention!

The Pt100 probes of the DX 11x digital series are not suitable for PRO 11x.

Accessories:

CASE PRO-400



Case for PRO Line.
Recess for one instrument, space for accessories, carrying handle, zipper.
Dimensions: 415 x 245 x 70 mm (W x H x D).
Art. No. 486900

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