OPERATING MANUAL

PRO 521

PRO 525

Conductivity

meters / loggers

P-000109-10-EN 02/2026

senseca

Contents

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 Product identification

Exact product name can be found on device rear plate. The firmware version is displayed at startup. The info in this manual applies to devices with **firmware version 1.4.1.0 or later**.

1.2 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 portable meter for measuring conductivity in liquids.

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).

Danger!

Measure in samples when measuring food and discard the sample after measurement.

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!

Measuring cell must never come into contact with water-repellent materials such as oil or silicone!

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 521 and **PRO 525** are professional handheld conductivity meters. They have a fixed probe with cable. **PRO 525** also has data logging capabilities.

The probe has a built-in temperature sensor for automatic compensation of the conductivity measurement.

For each displayed variable, minimum, average and maximum values can be detected. 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 measurements 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 525 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 instrument 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 521 is supplied with:

- Quick start guide
- Sheet with Master PIN
- 4 alkaline batteries, AA size
- Test report

PRO 525 is additionally supplied with a USB cable.

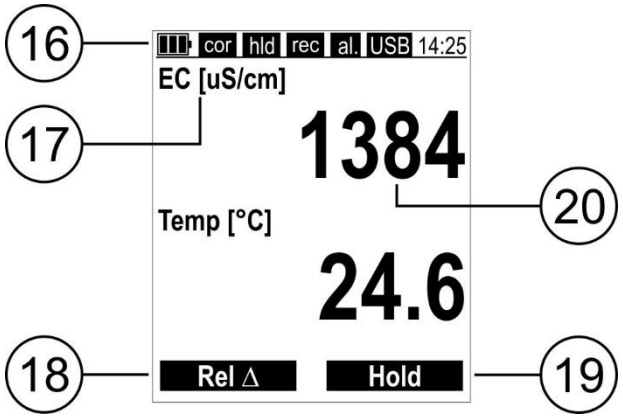
The **ProXware** application software is downloadable from Senseca website.

3 Description

1. Probe fixed connection.
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: favorite functions (menu shortcuts).
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



Symbols in the status bar:

	Battery charge level
	External power supply connected
cor	Measurement correction applied
lck	Protected mode active (*)
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.

(*) lck *and* cor *symbols share the same position;* cor *has priority over* lck*, which is not displayed if* cor *is on.*

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

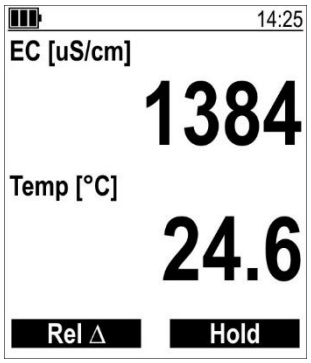
The combined conductivity and temperature probe is already connected to the instrument via a fixed connection at the top of the instrument.

5 Measurement mode

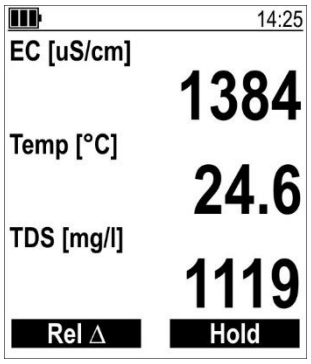
To switch on the instrument, press the ON/OFF key. After a few seconds, the instrument displays the measured values.

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.13].

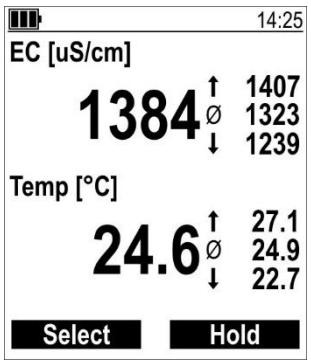
Use the **down/up arrow** keys to scroll through the measured parameters. By repeatedly pressing the ← key, measurements can be displayed in different formats:



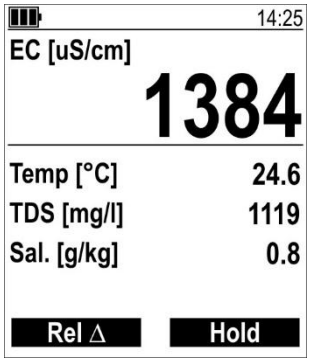
Parameters displayed in large format.



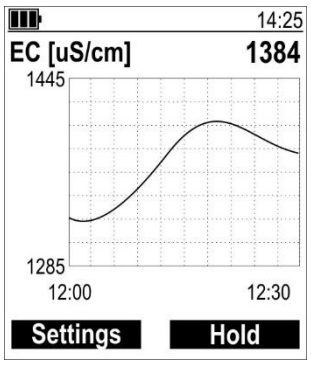
Parameters displayed in medium format.



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



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



One parameter displayed numerically and graphically.

Up to 3 parameters can be displayed graphically, 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.13].

5.1 Hold function

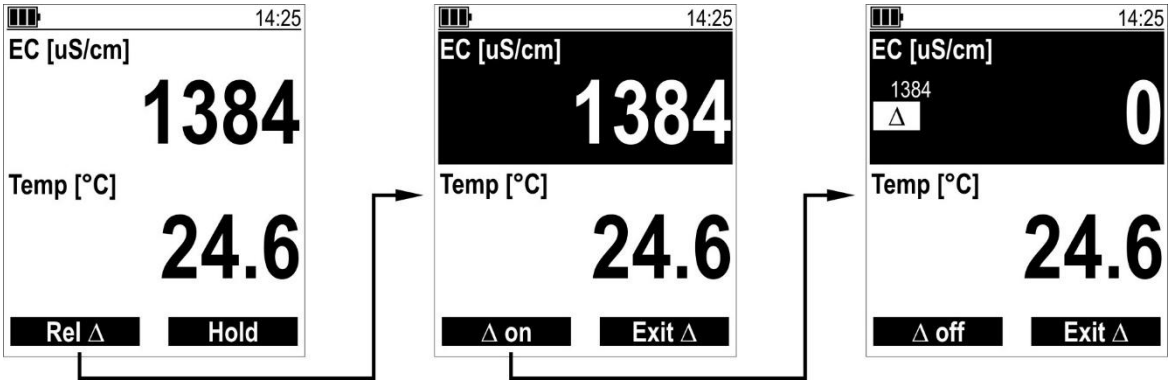
The **Hold** function, which can be activated/deactivated by pressing the right function key, freezes the current measurement values on the display.

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.

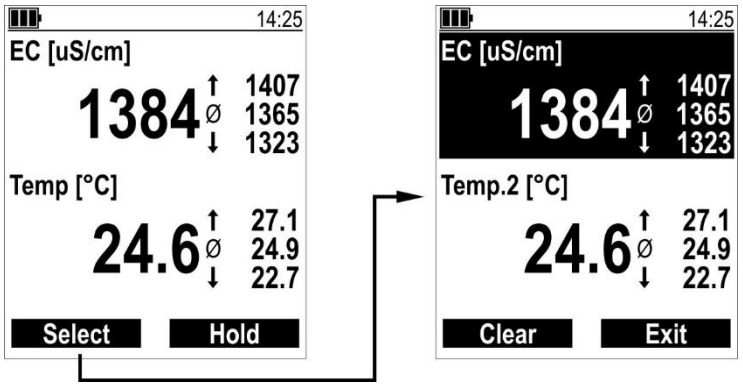
The **Rel Δ** command is not available:

- 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**).

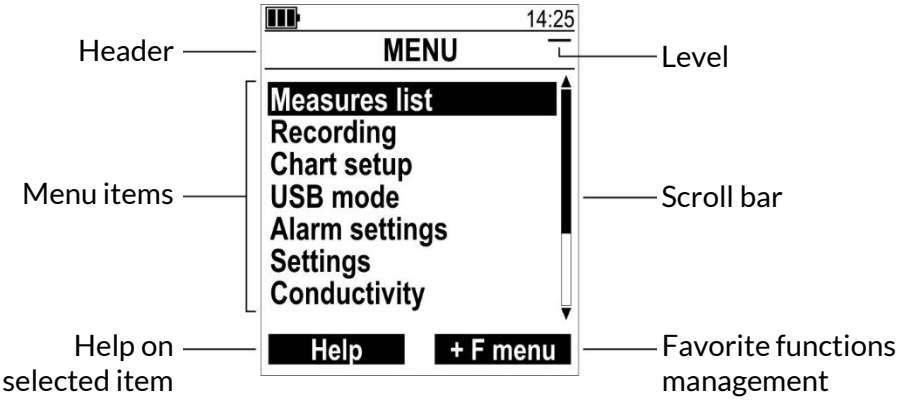
To exit the statistical values reset mode, press the right function key (**Exit**).



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.

The right function key (**+ F menu** or **– F menu**) adds or remove the selected item to or from the list of favorite functions [▶ p.17].

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	*Only **PRO 525***
= Start recording	Automatic logging start
= Set interval	Setting of logging interval: 1/2/5/10/15/30 s, 1/2/5/10/15/30 min, 1 h
= Mode	Setting of single recording mode
= Single recording	Manual storing of the current measurements (single sample)
– Chart setup	Setting of the measurement graphical display
= Channel select	Selection of parameters to be displayed graphically (up to 3 parameters, 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

MENU	DESCRIPTION
– USB mode	Configurable only in **PRO 525** between COM interface (for logging and serial communication) or Mass storage (for viewing logging files from PC). In **PRO 521** the mode is always COM interface.
– 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
= PIN configuration	Protected mode configuration
≡ Activate PIN code	Protected mode enabling/disabling
≡ Set PIN	Setting of access code
= Dark mode	Black background enabling/disabling
= Factory reset	Reset to factory settings
– Conductivity	Measurement settings
= Probe info	Information on the probe
= Alerting	Selection of the measure/channel with which to associate the alarm
= Alarm settings (*)	Setting of the alarm thresholds
≡ Min. alarm	Lower alarm threshold (alarm if measure < threshold)
≡ Max. alarm	Upper alarm threshold (alarm if measure > threshold)
≡ Hysteresis	Thresholds hysteresis
= Conductivity	Conductivity measurement settings
≡ Range	Selection of the measurement full scale
≡ T. compensation	Selection of the temperature compensation method for conductivity measurement: Off (no compensation), nLF, Lin, NaCl
≡ Comp. Coefficient	Temperature coefficient used in linear temperature compensation: 0.300…3.000 %/K *The item appears only if "T. compensation" is set to "Lin"*
≡ Reference temp.	Selection of the reference temperature for conductivity measurement: 20 or 25 °C *The item appears only if "T. compensation" is not set to "Off"*
≡ TDS	Setting the conversion factor for calculating the concentration of total dissolved solids: 0.40…1.00
≡ Correction factor	Cell constant correction factor: 0.8000…1.2000
≡ Adjustment	Correction of conductivity measurement. It is possible to: o manually set the calibration point (“Manual” option); o use one of the standard solutions available (84 / 1413 / 2765 µS/cm, 50 / 12.88 / 111.8 mS/cm); o restore the factory calibration (“Factory defaults” option).

MENU	DESCRIPTION
≡ Calibration History	List of the last 10 calibrations performed, identified by date and time. Selecting a date displays the calibration information (correction factor, uncompensated reference conductivity, calibration temperature).
= Temperature	Temperature measurement settings
≡ Temp. units	Setting of the temperature unit of measurement: °C, °F, K
≡ Zero point	Temperature measurement offset adjustment
≡ Gradient	Temperature measurement slope adjustment

(*) The item does not appear if "Alerting" is set to "Off"; to display the item, first select a measure/channel to associate the alarm with.

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.

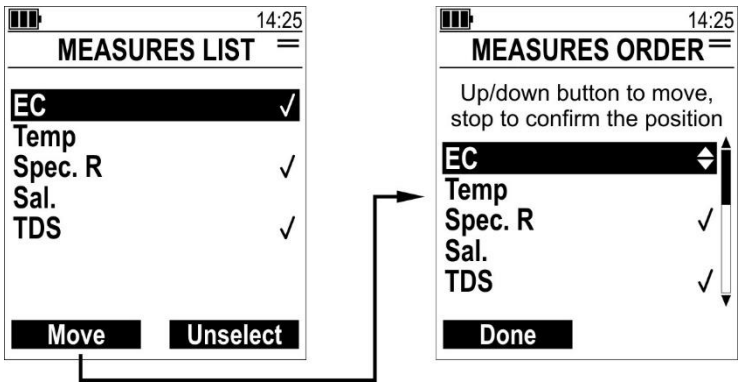
Configuring a parameter by setting a numerical value:

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 (**Done**).

The symbols used for the variables are listed below:

EC	Conductivity measurement
Temp	Temperature measurement
Spec. R	Specific resistance (resistivity, kohm*cm)
Sal.	Salinity (g/kg)
TDS	Concentration of total dissolved solids (mg/l)

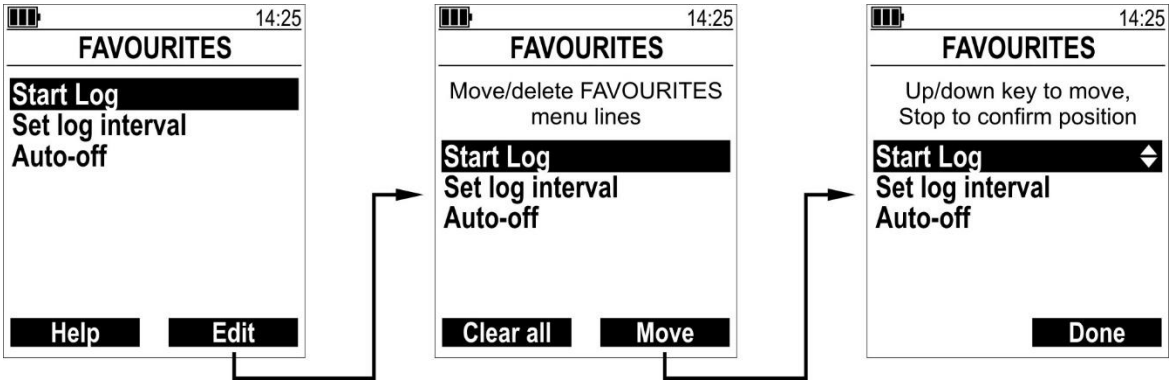
6.4 Favorite functions (menu shortcuts)

Frequently used menu items can be added to a list of favorite functions so that they are easily accessible without the need to navigate the menu structure.

To add a menu item to the list of favorite functions, select it in the menu and press the right function key (**+ F menu**). Items added to the list of favorite functions are marked with the symbol ★.

The favorite functions can be accessed from the measurement screens by pressing the **F** key. To execute a favorite function, select it with the **down/up arrow** keys, then press **OK** to confirm.

The list of the favorite functions can be edited by pressing the right function key (**Edit**).



The left function key (**Clear all**) deletes the entire list.

To change the position of a function, select it with the **down/up arrow** keys, press the right function key (**Move**), move the quantity with the **down/up arrow** keys, and press the right function key (**Done**).

Press the ← key to exit from the function list editing mode.

To delete a single menu item from the list of favorite functions, select it in the menu and press the right function key (**- F menu**): the symbol ★ disappears.

Attention!

For security reasons, It is not possible to add the menu items “Activate PIN code”, “Set PIN”, and “Factory reset” to the list of favorite functions.

6.5 Protected mode

The configuration of the instrument can be protected with a numeric code (PIN) that is required to access the menu or send serial commands.

By default, the protected mode is disabled. To enable the protected mode, select **Settings → PIN configuration → Activate PIN code → Yes** and press **OK**. You are prompted to enter the PIN, which is **0** by default. Set the PIN, if different from the default, using the **down/up arrow** keys and function keys (**< >**), then press **OK**, the instrument returns to the setting screen with protected mode enabled.

The protected mode activation is highlighted by the lck symbol in the status bar of the display.

Attention!

lck is not displayed if cor is on, because the two symbols share the same position and cor has priority over lck.

Upon exiting the menu after activating the protected mode, the mode is immediately active. If the menu is entered when the mode is already active (thus entering the access PIN), upon exiting the menu the PIN request to re-enter the menu is reactivated 2 minutes after the last key press (in the meantime, it is possible to re-enter the menu without entering the PIN), unless the 2 minutes without pressing keys have already elapsed within the menu, in which case the PIN request to re-enter the menu is reactivated immediately upon exiting the menu.

In protected mode, accessing the menu by entering the PIN does not automatically unlock serial communication, and sending the PIN via the appropriate serial command [▶ p.25] does not automatically unlock menu access.

Attention!

Menu items added to the list of favorite functions are not protected if accessed via the **F** key.

Changing the PIN:

The code can be set from 0 to 9999 (default = 0).

To change PIN, select **Settings → PIN configuration → Set PIN**, set PIN using **down/up arrow** keys and function keys (**< >**), then press **OK**, a message appears to remind you to activate protected mode, press **Help Off** to close the screen.

Attention!

Changing the PIN automatically disables the protected mode if it is active. After changing the PIN, it is necessary to reactivate the protected mode again.

Attention!

In the package of the instrument there is a sheet with a Master PIN, different for each instrument, which allows access to the protected features in case the user forgets the PIN after changing it.
If you lose your Master PIN sheet, you can request a copy by indicating the serial number of your device.

7 Measurement basics

7.1 Conductivity measurement

Conductivity is the capability of a material to conduct electrical current. Conductivity is the inverse of the specific resistance (resistivity, Ω*m).

$$EC = L / (R * A)$$

Where:

- EC = electrical conductivity (in S/m)
- L = length of the material (in m)
- A = cross section of the material (in m^2)
- R = resistance of the material (in Ω)

In the measurement of conductivity in liquids, the parameters L and A are characteristic of the measuring cell of the probe used, and define the so-called "cell constant" of the probe. The units of measurement used for the conductivity of liquids are generally µS/cm or mS/cm.

The measuring cell can have 2 or 4 electrodes. The 4-electrode technology allows for better compensation of negative effects on the measurement due to polarization or contamination of the electrodes.

When measuring liquids with a conductivity probe, the probe tip must be dipped at least 30 mm, so that the measuring cell is completely submerged.

If low conductivity values are measured, it is advisable to stir the liquid gently with the probe.

The probe can be stored with the cell dry or wet. If stored dry, the response time after immersion in liquid may be slightly longer.

Attention!

- Unless the probe is completely watertight, do not immerse the probe above the shaft.
- After immersing the probe, ensure that no air bubbles are trapped in the measuring cell.
- If the same probe is used to measure multiple liquids with very different conductivities, it is recommended to rinse and dry the probe before immersing it in a new liquid.
- Measuring cell must never come into contact with water-repellent materials such as oil or silicone.
- If the measured conductivity is significantly different from the expected value, the measuring cell may be dirty or contaminated; in this case, clean the measuring cell with soap and water.
- Calibrate the probe frequently.

Temperature compensation

The conductivity of aqueous solutions depends on temperature. To compare solutions regardless of temperature, temperature compensation can be applied using the temperature sensor integrated in the probe, so that the measurement always refers to the same reference temperature (as if the solution were at the reference temperature).

25 °C (default) or 20 °C can be set as reference temperature (**Conductivity → Conductivity → Reference temp.** menu).

Since the temperature dependence of a solution varies greatly depending on the type of solution, different compensation methods can be set (**Conductivity → Conductivity → T. compensation** menu):

- **nLF**
  It is a non-linear compensation method, in accordance with standard **EN 27888**. It applies to surface water, drinking water, and fish farms with conductivity between 60 and 1000 µS/cm. The reference temperature is 25 °C.
- **NaCl**
  It is a non-linear compensation method, in accordance with standard **EN 60746-3**. It applies to weak NaCl solutions in pure and ultrapure water.
- **Lin**
  It is a linear compensation method. The conductivity at the reference temperature Tref is calculated from the conductivity measured at temperature T according to the following formula:

  $$EC(T_{ref}) = EC(T) / [1 + (\alpha/100)*(T-T_{ref})]$$

  Where α is the temperature coefficient set in **Conductivity → Conductivity → Comp. coefficient** menu.

  A typical temperature coefficient for aqueous solutions is 2 %/K. A more accurate value can be determined by measuring the uncompensated conductivity of the solution at two different temperatures, T_1 and T_2, and applying the following formula:

  $$\alpha = (EC(T_1) - EC(T_2)) * 100 / [EC(T_1) * (T_1 - T_2)]$$

The compensation method set is displayed in measurement mode in brackets after the conductivity unit of measurement. If no compensation method appears after the unit of measurement, it means that temperature compensation is disabled.

7.2 TDS measurement

The measurement of total dissolved solids (TDS) is calculated by multiplying the conductivity measurement by a coefficient:

$$TDS = C_{TDS} * EC$$

Where C_{TDS} is the TDS conversion factor set in the **Conductivity → Conductivity → TDS** menu.

The conversion factor depends on the type of solution. For surface water, natural water, drinking water, and NaCl, KCl, or similar saline solutions, it can be considered to be 0.5. For fertilizer solutions, it is approximately 0.65…0.7. The values indicated are a guideline; the precise value of the conversion factor for a solution can be determined experimentally by measuring its conductivity and then evaporating a known volume and weighing the residue.

The instrument displays the TDS measurement in mg/l.

7.3 Salinity measurement

Salinity is the concentration of salts in seawater. Standard seawater has a salinity of 35‰, or 35 g of salt per 1 kg of water, but the value may differ for different seas and depending on environmental conditions. The reference is the UNESCO international oceanographic tables.

The salinity measurement is compensated for temperature regardless of the compensation method set in the instrument.

The instrument displays the salinity measurement in g/kg.

7.4 Temperature measurement

The integrated sensor is located near the measuring cell.

Stir the liquid if possible.

Attention!

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

7.5 General warnings on probes usage

For temperature or other measurements that are automatically temperature compensated, 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.
- Do not deform or drop the probe!

7.6 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

It is possible to manually apply a correction to the conductivity and temperature measurements, or calibrate the slope of the conductivity probe at one point using a reference solution.

If a measurement correction is applied, the cor symbol appears on the display.

8.1 Conductivity

To manually apply a correction to the conductivity measurement, set the correction factor CF_{EC} in the **Conductivity → Conductivity → Correction factor** menu. The value 1.0000 indicates no correction.

$$\text{Displayed value} = \text{Measured value} * CF_{EC}$$

To calibrate the slope of the conductivity probe with a reference solution, select **Conductivity → Conductivity → Adjustment**. Calibration can be performed by manually setting the solution value, or with automatic recognition of a standard solution.

Attention!

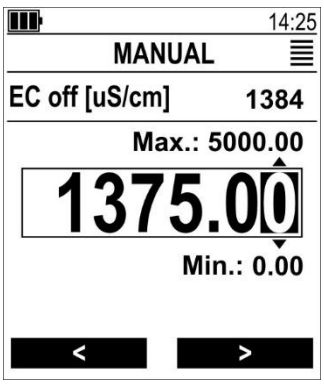
- Rinse the probe with distilled or deionized water before immersing it in a reference solution.
- After immersing the probe in a reference solution, wait for thermal equilibrium between the probe and the solution, and for the measurement to stabilize before calibrating the point.
- It is advisable to perform calibration at a temperature close to that of the solution to be measured.
- Use fresh standard solutions.

In case of erroneous calibration, it is always possible to reset the user calibration parameters to the factory values by selecting **Conductivity → Conductivity → Adjustment → Factory defaults → Yes**.

- **Conductivity calibration with manual setting of solution value:**

Select **Conductivity → Conductivity → Adjustment → Manual**.

In the upper part of the display, the current conductivity measurement with no temperature compensation is shown. In the center of the display, the conductivity value of the solution at the current temperature should be set.

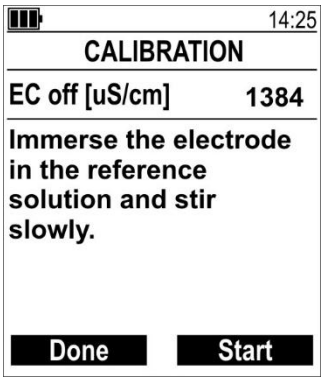


Select the various digits using the function keys (< >). To change a digit, use the **down/up arrow** keys. When finished, press **OK** to confirm the value.

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

- **Conductivity calibration with automatic recognition of standard solution:**

Select **Conductivity → Conductivity → Adjustment**, then select one of the available standard solutions (84 / 1413 / 2765 µS/cm, 50 / 12.88 / 111.8 mS/cm).



Dip the probe into the standard solution and press the right function key (**Start**). Wait for the instrument to complete the calibration process; when finished, the message "Correction done" will appear.

To exit calibration, press the left function key (**Done**).

8.2 Temperature

The measurement can be adjusted by setting the following parameters, available in the **Conductivity → Temperature** 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_T}%) to the measurement. Zero indicates no correction.

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

9 Logging (PRO 525 only)

The logging function stores in the memory of the instrument the detected measurements, along with the date and time of each sample. Data recording can be automatic, according to the set interval, or single (manual).

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.

9.1 Automatic logging

The automatic logging data are stored in **CSV** format.

To start automatic logging, select the **Start recording** item from the **Recording** menu.

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.

9.2 Single recording

The single recordings data are stored in a single file in **JSON** format (history.json). The new recordings are added to existing recordings, which are not deleted.

Three modes are available for single recording, which can be selected in the **Recording → Mode** menu:

- **Standard**
- **Multiselect**
- **On hold**

Standard mode:

To make a single recording, select the **Single recording** item of the **Recording** menu, then select with the **down/up arrow** keys one of the available labels (Location xx) and press **OK** to confirm and save the measurement data.

During data saving, the rec symbol lights up in the status bar of the display.

The selected label is marked with the check mark. The label associated with the recording is useful for distinguishing the various recordings in the data file, which is unique for all single recordings. The label may, for example, represent the location where the recording takes place; recordings made in different locations may be associated with different labels. There are 20 distinct labels available (Location 1...20).

Multiselect mode:

Operation is similar to standard mode, except that the check mark always remains visible next to all labels that are selected (in standard mode only the last label selected is marked with the check mark).

The left function key **Clear**, which appears on the label list screen, removes all checkmarks from the list (but does not clear the data). The function key appears only if there is at least one check mark.

On hold mode:

Operation is similar to the standard mode, with the added option of directly accessing the label list when the Hold function key, which becomes **Hold/rec**, is pressed.

If, after pressing the **Hold/rec** function key, a label is selected and **OK** is pressed, the data is saved and the instrument returns to measurement mode, exiting the Hold function. If instead OK is not pressed to save the data, but the menu is exited to return to measurement mode, the instrument remains in Hold.

Changing the labels name:

The label names can be customized with the following serial command:

updateLocation: n, name

where n is the label index (1...20). The name has a maximum length of 16 characters.

9.3 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 data files.

Attention!

With the instrument turned on, to view the device disk drive, logging must be off and the **USB mode** menu item must be set to **Mass storage**.

Regardless of the USB mode setting, the instrument disk drive is always visible when the instrument is turned off, if it is connected to a PC and protected mode is not enabled [▶ p.19].

The **ProXware** application software can be used to read the CSV files.

JSON files can be imported into Microsoft Excel® (Data → Get data → From file → From JSON menu). See the Microsoft Excel® help for details on the data import procedure.

9.4 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 [1], the PC COM port number to which the instrument is connected has to be set.

Recommended communication parameters:

- 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.

Serial communication in protected mode:

If the protected mode is active [▶ p.19], the following command must be sent to activate serial communication:

setPINCode: nnnn

where nnnn is the PIN.

The default PIN is **0000**. The PIN must always be written with 4 digits (e.g., 0023 for 23).

After the PIN is sent, the serial communication is locked again if the instrument does not receive serial commands for 2 minutes.

Attention!

In the package of the instrument there is a sheet with a Master PIN, different for each instrument, which allows access to the protected features in case the user forgets the PIN after changing it.
If you lose your Master PIN sheet, you can request a copy by indicating the serial number of your device.

[1] *Any standard serial communication software, e.g., "HTerm", can be used.*

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.9], 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.13]).

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 Conductivity PRO 52x-425 Temperature	 0.0…500.0 µS/cm, 0…1000 mS/cm -5.0…+105.0 °C
Resolution Conductivity PRO 52x-425 Temperature	 Min. 0.1 µS/cm 0.1 °C / 0.1 °F
Accuracy (@ 25 °C) Conductivity PRO 52x-425 Temperature	 <u>0…250 mS/cm</u>: ±0.5% of measure ±(0.2% FS or 2 µS/cm) ±1 digit <u>> 250 mS/cm</u>: Typ. ±1.5% of measure ± 0.2% FS ±1 digit ±0.2% of measure ±0.3 K ±1 digit
Calculated quantities PRO 52x-425	 Resistivity: 0.001…100.0 kΩ*cm Salinity: 0.0…70.0 g/kg TDS: 0…2000 mg/l
EC temperature compensation	Automatic (it can be disabled) using the temperature sensor integrated in the probe. Compensation methods: • Non-linear according to EN 27888 • Non-linear according to EN 60746-3 • Linear with selectable coefficient (0.3…3.0 %/K) 20 or 25 °C selectable reference temperature
Probe type PRO 52x-425	 4-pole graphite/epoxy/PVC-U
Application PRO 52x-425	 Ultra-wide range, from well to waste water, chemicals
Measurement rate	1 meas./s

General specifications

Input channels	1 fixed connection for conductivity and temperature combined probe
Storage capacity (only PRO 525)	Up to 1 million data sets, file system based. Each data set includes measurements of all channels and date/time stamp.
Logging type (only PRO 525)	Automatic with manual start/stop or manual single recording

Logging interval (only PRO 525)	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 (en, de, it, fr, es)
PC connection	USB-C, Mass Storage Device (only PRO 525)
Power supply	4 x AA alkaline batteries External 5 Vdc via USB C
Power consumption	18 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 80 x 38 mm
Weight	435 g approx. (PRO 52x-425, including probe)
Housing material	ABS, TPE (side protection), Polyester (front panel)

14 Accessories

Solutions:

GKL 100	1413 µS/cm standard solution, 100 ml. **Art. No. 601396**
GKL 101	84 µS/cm standard solution, 250 ml **Art. No. 601398**
GKL 102	50 mS/cm standard solution (sea water ref.), 100 ml. **Art. No. 601400**

Other 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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