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English

Operating manual

Multiparameter portable instrument

HD98569

www.deltaohm.com

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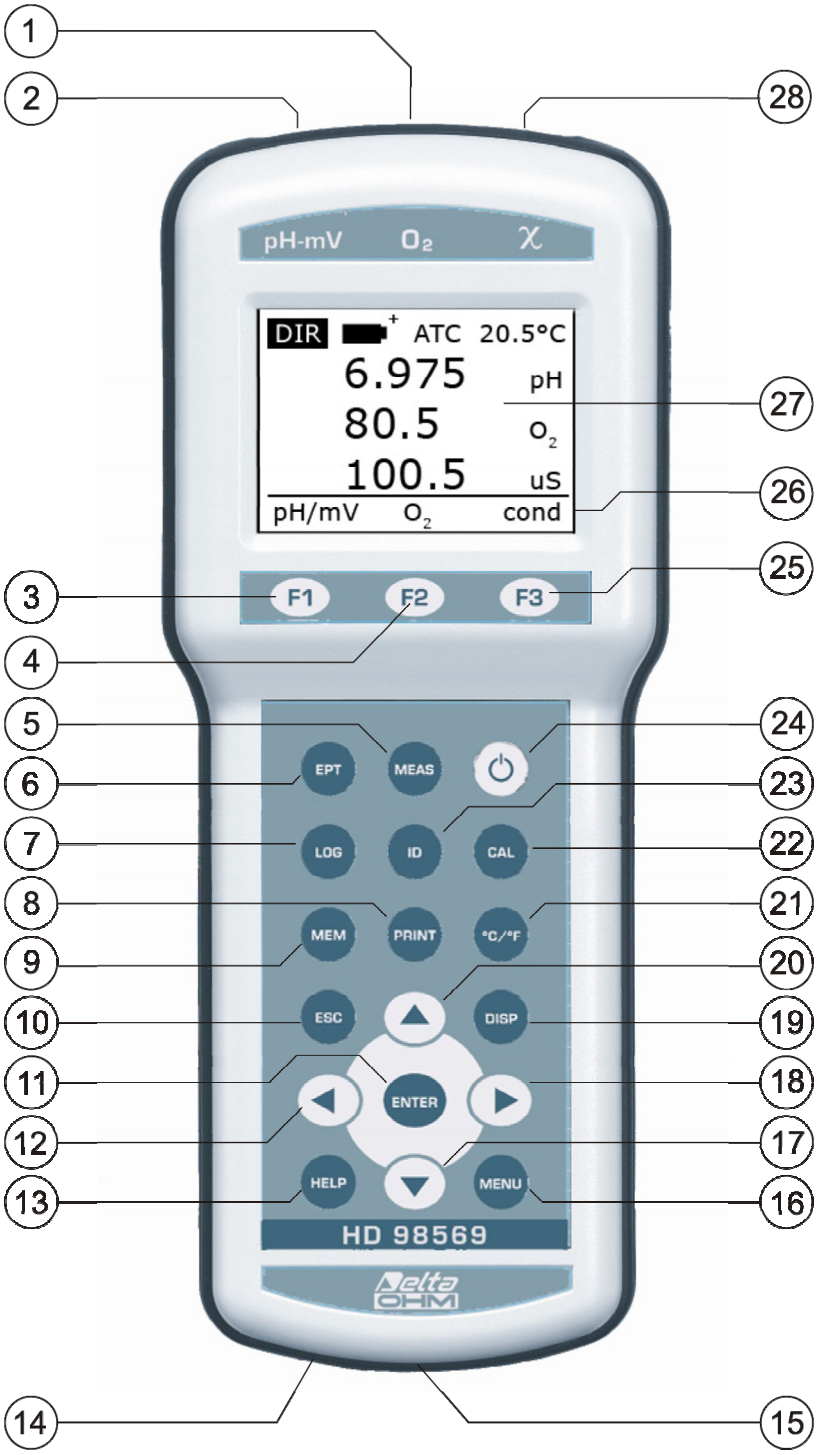
HD 98569

pH – Conductivity – Dissolved Oxygen – Temperature



1. 8-pole DIN45326 connector, input for dissolved Oxygen and temperature combined probes with SICRAM module, or temperature only Pt100 probes with SICRAM module.
2. 8-pole DIN45326 connector, for combined pH/mV/temperature electrodes with SICRAM module, or temperature only Pt100 probes with SICRAM module.
3. Function key **F1**: The key's function is described in the bottom line of the display. In standard measurement mode, if you press it repeatedly, it toggles the unit of measurement of the SICRAM pH probe connected to the left input, between pH, mV, or no indication.
4. Function key **F2**: The key's function is described in the bottom line of the display. In standard measurement mode, if you press it repeatedly, it toggles the unit of measurement of the dissolved Oxygen probe connected to the central input, between Oxygen concentration in liquids (mg/l), saturation index (%), or no indication in absence of the connected probe.
5. **MEAS** (measurement) key: It allows to repeat the measurement, when the EPT = AUTO, MAN or TIME modes are selected (see the EPT function description on page 7). It also returns to the standard display.
6. **EPT** (End PoinT) key: It selects the unit of measurement. The EPT, MAN, TIME, and AUTO modes are available (see the EPT function description on page 7).
7. **LOG** key: It starts and ends the saving of data in the internal memory.
8. **PRINT** key: It prints the data on the current screen. It uses the serial communication port RS232C or the USB 2.0 port.
9. **MEM** key: It stores the currently displayed screen.
10. **ESC** key: In the menu, it cancels the operation in progress without making changes.
11. **ENTER** key: In the menu, it confirms the current selection.
12. ◂ key: In the menu, it moves the cursor leftwards. During measurement, it decreases the display contrast.
13. **HELP** key: It shows a description of the instrument main functions on the display.
14. Power supply input 12Vdc for the ∅5.5mm - ∅2.1mm connector. Positive at centre. ⊕—●—⊖
15. 8-pole female MiniDin, serial RS232C and USB1.1-2.0 multiport connector.
16. **MENU** key: It allows access to the menu.
17. ▾ key: In the menu, it decreases the current value.
18. ▸ key: In the menu, it moves the cursor rightwards. During measurement, it increases the display contrast.
19. **DISP** key: It gives the main parameters of the probes connected to the instrument, the barometric pressure measured by the internal pressure sensor, the next memory positions MEM and ID, current date and time.
20. ▴ key: In the menu, it increases the current value.
21. **°C/°F** key: If the temperature sensor is present, the key toggles the unit of measurement between °C and °F. If no temperature or combined temperature probes are present, the key allows manual input of the temperature value used for temperature compensation and selection of the unit of measurement (°C or °F). See also the description of the ATC/MTC feature.
22. **CAL** key: It starts the pH electrode, conductivity probe or dissolved Oxygen probe calibration procedure.
23. **ID** key: It allows to set the sample identifier number.
24. **ON-OFF** key: It turns the instrument on and off.
25. Function key **F3**: The key's function is described in the bottom line of the display. In standard measurement mode, if you press it repeatedly, it toggles the unit of measurement of the conductivity probe connected to the right input, between conductivity, resistivity, TDS, NaCl concentration, or no indication.
26. Description of the F1, F2, F3 function keys:
27. Instrument display. The display is backlit: To enable or disable the backlight, select the menu item Menu >> System Parameters >> Backlight. Use the ◂ ▸ arrows to modify the display contrast.
28. 8-pole DIN45326 connector, input for combined 4-ring or 2-ring conductivity/temperature probes complete with SICRAM module (the conductivity input is not compatible with the temperature probes with SICRAM module).

Introduction

The **HD 98569** is a multiparameter portable instrument and datalogger for electrochemical measurements: **pH**, **conductivity**, **dissolved Oxygen** and **temperature**. It is fitted with a large backlit LCD display.

The instrument measures:

- **pH**, **mV**, **redox potential** (ORP) using pH, redox electrodes or combined pH/temperature probes complete with SICRAM module;
- **conductivity**, **liquid resistivity**, **total dissolved solids** (TDS) and **salinity** using combined 4-ring and 2-ring conductivity/temperature probes with SICRAM module;
- **concentration of dissolved Oxygen** in liquids (in mg/l), **saturation index** (in %) and temperature using SICRAM combined probes of **polarographic**, with two or three electrodes, and **galvanic** type with integrated temperature sensor.

The immersion, penetration, or contact Pt100 **temperature** probes with SICRAM module can be connected to the instrument.

- The pH electrode calibration can be carried out on a minimum of one to a maximum of five points, and the calibration sequence can be chosen from a list of 8 buffers. The temperature compensation can be automatic or manual.
- The calibration of the conductivity probe can be automatic, by recognition of standard solutions: 147μS/cm, 1413μS/cm, 12880μS/cm, 111800μS/cm or manual with different solutions.
- The dissolved Oxygen probe's quick calibration function guarantees timely accuracy of the performed measurements.
- The pH, conductivity, dissolved Oxygen and temperature probes are fitted with a SICRAM module, with the factory calibration settings already being memorized inside.

The HD 98569 is a **datalogger**. It stores up to 2000 single screens (labels) and up to 9000 samples in continuous recording of: pH or mV, conductivity or resistivity or TDS or salinity, dissolved Oxygen concentration, saturation index, and temperature.

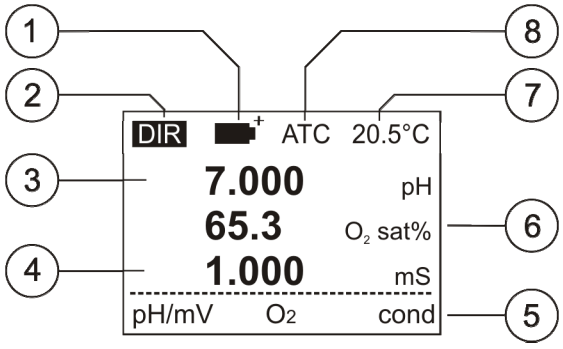
The data can be transferred from the instrument connected to a PC via the multistandard RS232C serial port or the USB 2.0-1.1 port.

The RS232C serial connection can be used for direct printing of the labels using a 24 column printer (HD40.1).

The **DeltaLog11** dedicated software (vers. 2.0 and later) allows management and configuration of the instrument, and data processing on the PC.

Display Description

When you turn the instrument on the display appears as in the figure.



The display is backlit: To enable or disable the backlight, select the menu item Menu >> System Parameters >> Backlight.

You can adjust the contrast level: Use the ◂ ▸ arrows to modify it.

The display is laid out as described below:

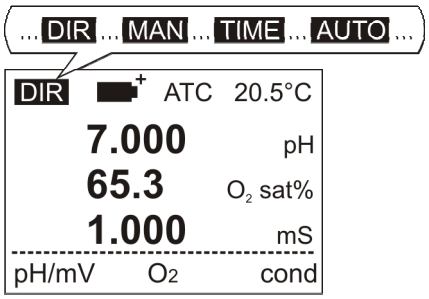
1. **Battery symbol**: It indicates the battery level.
2. **EPT symbol**: The **EPT** (End PoinT) symbol indicates the display mode. The mode selection is done using the **EPT** key. Until the EPT is blinking, the measurement is updated on the display; when it is fixed, the measurement is "frozen". For a new measurement, press MEAS.

   EPT = **DIR**: The instrument operates in **continuous view mode**. In this mode the displayed measurement is updated every second (standard mode).

   EPT = **MAN**: The displayed measurement is continuously updated until MEAS is pressed. During the measurement update, the MAN symbol is blinking. For a new measurement, press MEAS.

   EPT = **TIME**: The measurement is frozen after a set time of 8 seconds. For a new measurement, press MEAS.

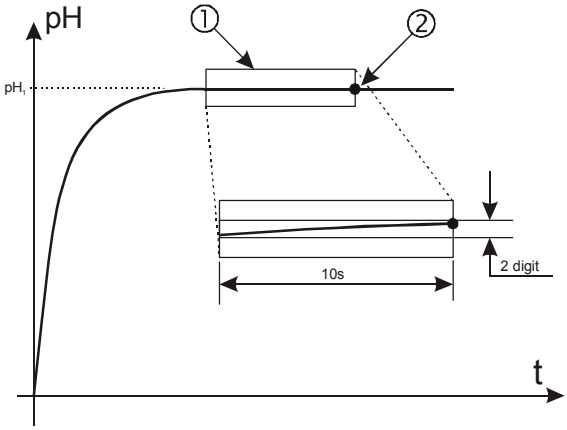
   EPT = **AUTO**: The instrument performs the measurement, and when it stabilizes the AUTO symbol stops blinking. For a new measurement, press MEAS.



In the following figure you can see an example of the measurement process with the **EPT AUTO** function enabled. After setting the EPT = AUTO function using the EPT key, the electrode is immersed into a liquid. To perform the measurement, press MEAS. the AUTO

symbol blinks to indicate that the measurement is in the stabilization phase. In the position indicated by point 1, the measurement remains within a predefined stability range for 8 seconds. At the end of this interval (point 2), the instrument freezes the measurement, and shows a stable value. The AUTO symbol stops blinking.

For a new measurement, press MEAS.



The reference stability range has a span of 2 digits.
When recording is started (Logging), the EPT function switches automatically to DIR.

3. **pH/mV**: It reports the pH or mV value measured by the SICRAM pH probe connected to the left input. The measurement indication blinks if the pH/mV probe is not calibrated or if the calibration was unsuccessful (please see the DISP key description on page 11).
4. **Conductivity**: It reports the conductivity, resistivity, TDS, NaCl concentration value measured by the conductivity probe with SICRAM module connected to the right input. The measurement indication blinks if the conductivity probe is not calibrated or if the calibration was unsuccessful (please see the DISP key description on page 11).
5. **Function keys line**: The bottom line is associated to the F1, F2, F3 function keys. Please see the details in the keyboard's description on page 8.
6. **Dissolved Oxygen**: It reports the dissolved Oxygen concentration value (mg/l) or saturation index (%) measured by the dissolved Oxygen probe with SICRAM module connected to the central input. The measurement indication blinks if the dissolved Oxygen probe is not calibrated or if the calibration was unsuccessful (please see the DISP key description on page 11).
7. **Temperature** used to compensate the pH, conductivity and dissolved Oxygen measurements. For the details see the paragraph dedicated to temperature on page 33.
8. **ATC** or **MTC** indicate the temperature compensation type being used.

   ATC means automatic compensation: If the temperature probe is present, compensation is carried out according to this probe, or according to the temperature detected by a combined probe, if present. **In this case, you cannot modify the manually input temperature value**. For the details see the paragraph dedicated to temperature on page 33.

   MTC means manual compensation: There are no temperature sensors; the temperature used for compensation is typed using the keyboard. Press the **°C/°F** key once to modify its value: The temperature indication blinks. Use the ▼ and ▲ arrows to set the desired value and confirm with ENTER. The display stops blinking, and the temperature displayed is used for compensation.

   If the temperature probe is not present, in order to change the unit of measurement between °C and °F, it is necessary to press the °C/°F key **twice**.

Keyboard description

Each key specific function is described in detail below.

ON-OFF key

The instrument is turned on using the ON/OFF key. **Press this key for at least two seconds**. When pressing ON-OFF again the instrument is turned off.
The turning on starts a self test including the detection of the probes connected to the inputs. **As the probes' identification and calibration data are captured upon turning the instrument on, it is necessary to connect the probes when the instrument is off. If a probe is connected and the instrument is on, nothing is shown on the display: it is necessary to turn the instrument off and on.**
Finally, the instrument is set for normal measurement.
Once turned off, wait few seconds before turning it on to allow completion of the shut down routine.

MEAS key

The key allows to perform or repeat a new measurement, when the EPT = AUTO, MAN or TIME modes are selected (see the EPT function description on page 7).
It returns the instrument display to the standard measurement mode, after pressing the MEM and DISP keys.

EPT key

The key selects the measurement performance mode. By pressing the **EPT** key, you can select the DIR, MAN, TIME or AUTO modes in this order (see the EPT function description on page 7).

CAL key

It starts the pH, conductivity or dissolved Oxygen probes calibration procedure (see the chapter dedicated to calibration on page 22).

ID key

This key allows to input the value of the first sample ID associated with the PRINT and MEM function. Use the ◂ and ▸ arrows to select the value to be modified, and set the desired value using the ◂ and ▸ arrows. Modify the other values in the same way. At the end, confirm with ENTER.
The ID is an automatically increased progressive number. The identifier is indicated in the printout and in the recorded samples together with the date, time and measured values. This parameter can be modified only by the administrator (see page 18).
If the EPT option is set to DIR (see the EPT key in this chapter), each time the PRINT or MEM key is pressed, the **ID** is increased by 1.

If the EPT option is set to Auto, Man or Time, pressing PRINT only causes the print to occur when the measurement has stabilized (EPT symbol still); until the measurement is frozen, it is possible to repeat the print at will, but the sample identifier number is not increased. This is useful when more labels concerning a single measurement must be printed with the same identification code, without increasing the code each time.

LOG key

It starts and stops the logging of a data block to be saved in the instrument's internal memory. The data logging frequency is set in the “System Parameters >> Memory and Logging >> Log Interval” menu parameter. The data logged between a start and subsequent stop represent a data block.
When the logging function is on, the “NOW LOGGING!” indication and the time elapsed since the recording beginning are displayed.
To end the logging, press LOG.
For the details see the chapter dedicated to recording on page 49.

°C/°F key

If a temperature sensor is present (temperature probe or combined probe with integrated temperature sensor), the key changes the unit of measurement between °C and °F. If no temperature or combined temperature probes are present, the key allows manual input of the temperature value used for temperature compensation and selection of the unit of measurement (°C or °F). See also the description of the EPT key.

PRINT key

It sends the displayed data to the serial RS232C or USB output as a label formatted across 24 columns.
If EPT = DIR, the **ID** is increased by 1 (see page 9).
Before starting the communication via the RS232C serial port, set the baud rate according to the connected device.

- For the connection to a PC’s RS232 port, select the “System Parameters >> RS232 Baud Rate” menu item, and select the maximum value equal to 38400 baud by using the arrows ▲ and ▼. Confirm by pressing ENTER.
  The DeltaLog11 software (vers. 2.0 and later) for PC will automatically set the baud rate value during connection by reading it on the instrument. **If you are using a different program than DeltaLog11, be sure the baud rate is the same for both the instrument and the PC: the communication will only work in this way.**
- For the connection to a PC’s USB port, please see page 46.
- For the direct connection to a serial printer (e.g. HD40.1), set the recommended baud rate for the printer. See the details on page 50.

Note: The PRINT key can also print the data contained in the instrument's memory: Select the data to be printed using the MEM key and press PRINT to print it.

MEM key

It manages the single data storage. For continuous recording use the LOG key.
By pressing MEM you will enable the F1= STOR, F2=CLR and F3=VIEW commands.

F1=STOR stores the current screen. Before enabling the MEM function, you can select (using the F1=pH/mV, F2=O_2 and F3=cond function keys) the variable to be stored: pH or mV, conductivity, resistivity, TDS or NaCl, dissolved Oxygen concentration, or saturation index; using the °C/°F key, the temperature in °C or °F. The units of measurements of the logged samples are the same as those used on the display during recording.

F2=CLR allows clearing of the memory part dedicated to the single records stored using the MEM >> F1 = STOR key. The message “CLEAR ALL?” is displayed: Press F3=YES to clear, F1=NO to cancel the operation.

F3=VIEW displays the logged data: F1=PREV goes to the previous sample, F3=NEXT to the next one. The displayed sample is indicated as “M:####”, where #### is the current sample progressive number. To print the current data, press the PRINT key.

To return to the standard view, press MEAS.

For the details see the chapter dedicated to recording on page 49.

DISP key

The feature reports useful information on the instrument and connected probes functioning.
From top to bottom there are:

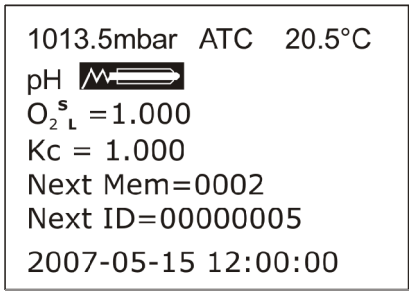
- Barometric pressure, measured by an internal pressure sensor,
- Temperature compensation type (ATC or MTC),
- Temperature compensation,
- Calibration information on the connected probes.

For the pH probe the symbol shows an electrode that gets “empty” as its efficiency decreases. If the pH probe is not calibrated, the CAL blinking message appears.

For the dissolved Oxygen probe, the calibration coefficient (SLOPE) is reported: this value must be between 0.500 and 1.500. A value close to 1.500 indicates an exhausted probe.

For the conductivity probe, the cell constant nominal value is shown. It has up to 4 different calibration points and nominal cell constant corrections. **The displayed value is referred to the calibration point at 1413µS/cm**.

The memory position MEM progressive number and the identification code will follow (please see the ID key description).
In the bottom line we have the current date and time.



If a pH, conductivity or dissolved Oxygen probe has not been calibrated by the user or if the calibration was unsuccessful, the measurement indication in the main page will blink to notify the problem: By pressing DISP, you can check the type of problem occurred.

Up Arrow

in the menu, it increases the current value.

ESC key

In the menu, the key clears or cancels the active function.

Right Arrow

In the menu, it moves the cursor rightwards. During measurement, it increases the display contrast.

ENTER key

In the menu, the ENTER key confirms the current parameter.

Left Arrow

In the menu, it moves the cursor leftwards. During measurement, it decreases the display contrast.

MENU key

Using this button the instrument's menu can be accessed. See a detailed description on page 13.

Down Arrow

In the menu, it decreases the current value.

HELP key

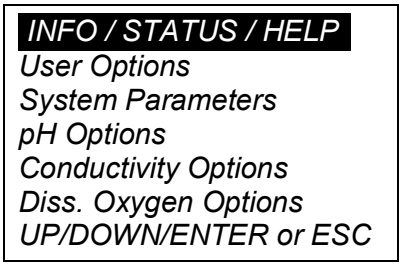
It displays a short help on the instrument's main functions. Press ESC to go back to standard measurement. Use the ▲ and ▼arrows, to browse the HELP items. To display an item, press ENTER.

Function keys F1 … F3

The function of the F1, F2, F3 keys is described by the message near each key in the bottom line of the display.

Menu description

The MENU key is used to access the menu main screen. To select one item, use the arrow keys (▲ and ▼). The selected item has a white text on a black background.



Press ENTER to access the selected item. Use the ▲ and ▼ arrows to browse the submenus and modify the single parameters. Press ENTER to confirm the value of the selected parameter, press ESC to cancel the operation: In both cases, you return to the initial menu.
Press ESC to return to the main menu from a submenu, and to exit the main menu and return to measurement mode.
Note: Some menu parameters can be changed only by an user registered as “Administrator” (see the details on page 18).

Language selection

The menu items are in 4 languages: Italian, English, French and Spanish. To select the language, press MENU, use the ▲ and ▼ arrows to select User Options >> User Registration and select the language using the MENU key. Press ESC to confirm and return to measurement mode.

The menu items are listed in this order:

1. **“INFO / STATUS / HELP”**
    - 1.1. “*Instrument Info*” shows some information on the instrument: model, types of measurement, firmware version, serial number and calibration date.
    - 1.2. “*Instrument Status*” reports the last enabled user, the current type and status of communication interface, the temperature compensation mode and the temperature sensor used for compensation.
    - 1.3. “*Short Manual*”. It is a short help showing the instrument main functions.

2. **“USER OPTIONS”**
    - 2.1. “*Logged=Admin*” displays the currently registered user (see the next point)
    - 2.2. “*User Log-in*” selects the language among Italian, English, French or Spanish and/or the current user type. See the details on page *18*.
    - 2.3. “*User Password*” allows to create and/or edit the password associated to each registered user: Administrator, User_1, User_2 and User_3. See the details on page *18*.
    - 2.4. “*User Logoff option*”: When you turn the instrument on you can get:
      A) The user of the previous session without requiring a password (“Recall User”),
      B) Require a user (“Request New User”): in this case, you have to select the user and, if not “Anonymous”, enter the password. This parameter can be modified only by the administrator (see page *18*).

3. "**SYSTEM PARAMETERS**"

3.1. "*Date and Time*" manages the instrument date and time setting. Use the ◄ and ► arrows to move the cursor, and the ▲ and ▼ arrows to edit the selected value. The MENU key clears the seconds to synchronize them to the minute: Use the ▲ and ▼arrows to set the current minute plus one, and as soon as that minute is reached press MENU. This synchronizes the time to the second. Press ENTER to confirm, ESC to exit without making changes.

3.2. "*Memory and Logging*" is composed of five sub-functions:

3.2.1. "*Log Interval*": It sets the interval in seconds between two loggings. The interval can be set from 0 to 999 seconds. **If the value 0 is set, the logging is disabled.** Press LOG to start the logging, press LOG again to end.

3.2.2. "*Single Memory Mode*": It selects the instrument memory management mode. It applies only to the single record (MEM key): The continuous recording (LOG key) stops when the available memory space is full.

- By setting it to "**0**" you select the standard mode (normal): When the memory is full, the logging stops; to carry out further recordings, you should download the data, if necessary, and clear them.
- By setting it to "**1**" you select the circular mode ("endless loop"): When the memory is full, it starts to overwrite the oldest data. Recording is not interrupted. The logging mode can be selected or modified only by the administrator (see page *18*).

3.2.3. "*Memory on Print opt.*":

- If you select "**0**", when using PRINT the current data is sent to the printer but is not saved in the memory.
- If you select "**1**", when using PRINT the current data is sent to the printer and also saved in the memory.

This parameter can be selected only by the administrator (see page *18*).

3.2.4. "*Clear Log*" allows to permanently clear all the data stored in the memory using the LOG key. Press ENTER to confirm, ESC to exit without clearing the memory.

3.2.5. "*Print Log*" sends all the data contained in the continuous memory to the device connected to the serial port. The continuous recording data (using the LOG key) are formatted across 80 columns: **They cannot be printed on the HD40.1 portable printer**. This command allows, for example, to send the data to the HyperTerminal software. The DeltaLog11 software (vers. 2.0 and later) manages the data transfer and the printing from the PC, and does not require the use of this command.

3.3. "*RS232 Baud Rate*". This function allows selection of the frequency used for the serial RS232 communication with the PC. Values from 1200 to 38400 baud. Use the ▲ and ▼ arrows to select the parameter and confirm with ENTER. **The communication between instrument and PC (or serial port printer) only works if the instrument and PC or printer baud rates are the same**. If the USB connection is used this parameter value is automatically set (please see the details on page *49*).

3.4. "*Electrode Serial Numbers*". It identifies the serial numbers of the SICRAM probes connected to the instrument inputs. These serial numbers are reported in the printouts and stored data.
The SICRAM pH, conductivity and dissolved Oxygen probes report the "service hours", that is, the number of hours that the probe has been connected to the functioning instrument. This parameter is saved in the SICRAM memory and cannot be modified.

3.5. "*System Reset*": It is formed by two sub-functions:

3.5.1. "*Partial Reset*": The partial reset restores the instrument functioning without modifying the menu settings such as, Baud Rate, log interval, date and time…

The data in the memory are not cleared. This operation can be carried out only by the administrator (see page *18*).

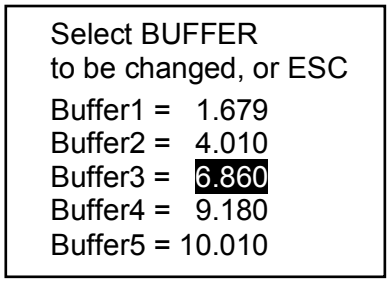
3.5.2. "*Complete Reset*": The complete system reset restores the instrument to the original factory conditions, restoring all menu parameters. After a complete reset, the date, time, baud rate, log interval... must be set again. The data in the memory are not cleared. This operation can be carried out only by the administrator (see page *18*).

3.6. "*Backlight*". It enables or disables the display backlight. Use the arrows ▲ e ▼, press ESC to exit.

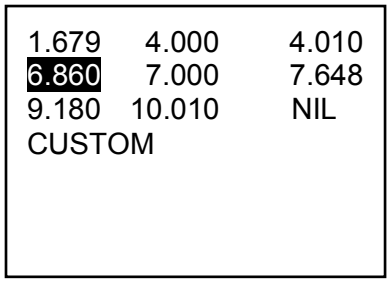
4. "**pH OPTIONS**"

4.1. "*pH Resolution*" selects the number of leading digits for the pH measurement: using the ▲ and ▼ arrows select 7.12 to obtain the pH hundredths or 7.123 to obtain the thousandths. The chosen resolution is applied to the new logged measurements, while the previous choice still applies for the already memorized ones.

4.2. "*pH Buffer Solutions*": The instruments allows selecting up to 5 buffers for the pH electrode calibration. Select the buffer BUFFER1, …, BUFFER5 to be modified using the ▲ and ▼ arrows, and confirm with ENTER.



In the next table, select the value to be assigned to the chosen buffer.



You can select one of the 8 buffers in the memory, enter a user defined CUSTOM buffer, or exclude one from the list by selecting NIL. The 8 buffers in the memory are compensated for temperature, but the buffer defined by the user is not compensated for temperature: So the buffer value must be set at the actual solution temperature. As an alternative, the correct value according to temperature can be set in the calibration phase. Please see the chapter dedicated to calibration on page *22*.

4.3. "*pH Electrode History*": The last eight calibrations can be stored in the instrument memory. The data are associated to the SICRAM probe serial number: The "Show on Display" submenu displays the following items: date, time, operator that carried out the calibration, calibration points (pH, mV and temperature detected). The last 8 calibration information are shown: offset, slope and the symbol indicating the pH electrode efficiency after calibration. Use the ▲ and ▲ arrows to browse the last 8 calibrations. Use the "Print" function to print these information.

4.4. "*pH Calibration Expiration*": It is possible to set the pH electrode calibration validity number of days. When the validity period has expired, the measurement is blinking on the display and by pressing the DISP key the "CAL" blinking message appears; the

calibration data can still be used. The “Expired calibration” message is indicated in the printout. Enter “Number of days” = 0 to disable this feature.

Note: The day is counted at midnight: By entering 1, at midnight of the same day, the calibration is considered expired.

This operation can be carried out only by the administrator (see page *18*).

4.5. “*Reset pH History*”: This function clears the pH electrode calibration information in the memory (see “pH Electrode History” above). Press ENTER to erase, ESC to exit without erasing.
This operation can be carried out only by the administrator (see page *18*).

4.6. “*Advanced Settings*” groups some advanced functions concerning the pH measurement.

4.6.1. “*Set Antimony Electrode*”: This function allows using an antimony electrode for pH measurement and to perform its calibration with the standard calibration solutions. To enable it, select **YES** and confirm with **ENTER**. Select **NO** and confirm with **ENTER**, to exit without making changes. To modify the “Iso pH” parameters and offsets, please see the following.

4.6.2. “*Isotherm pH Point*” is expressed in pH units: Use the arrows to set its value between 0pH and 14pH, and confirm with ENTER. If the parameter is expressed in mV instead of pH, use the following formula to obtain the corresponding value in pH:

$$\mathrm{pH\_ISO} = 7 - \frac{\mathrm{mV}}{59.16}$$

4.6.3. “*Initial Offset*” is the electrode zero point expressed in mV: Use the arrows to set the corresponding value between -500mV and +500mV, and confirm with ENTER.

4.6.4. “*Reset Std. glass electrode*”: It restores the standard pH measurement functioning and disables the special electrode measurement correction.

Note: The “*Set Antimony Electrode*” function activation or the modification of the submenu items, will erase the current calibration. *W*hen exiting the menu, **you should perform a new calibration**.

5. **“CONDUCTIVITY OPTIONS”**

5.1. “*Cond*. *ALFA Coefficient*” (α_T): The temperature coefficient α_T is the percentage measurement of the conductivity variation according to temperature and is expressed in %/°C (or %/°F). The coefficient may vary from 0.00 to 4.00%/°C. Use the arrows (▲ and ▼) to set the desired coefficient, and confirm with ENTER.

5.2. “*Reference Temperature*”: It indicates the temperature to which the displayed conductivity value is standardized. The values vary from 0 to 50°C. **Usually the values of 20°C or 25°C are used**. Use the arrows (▲ and ▼) to set the desired value, and confirm with ENTER.

5.3. “*Conductivity TDS*”: It represents the χ/TDS conversion factor, that is, **the ratio between the measured conductivity value and the total quantity of dissolved solids in the solution**, expressed in mg/l (ppm) or g/l (ppt). This conversion factor depends on the nature of the salts present in the solution. In the field of water quality treatment and control, the main component is $CaCO_3$ (Calcium Carbonate). For this solution, a value of 0.5 is usually used. In agriculture, for fertilizer water preparation, and in hydroponics, a factor of about 0.7 is used. Using the arrows (▲ and ▼), set the desired value, selecting it in the 0.4…0.8 range, and confirm with ENTER.

6. "**DISSOLVED OXYGEN OPTIONS**"

6.1. "*View Oxy History*": The dissolved Oxygen probe SICRAM module stores the last eight calibrations in the memory. This menu item displays each calibration date and slope. The "*Print Oxygen History*" function, gives the date, slope and temperature per each calibration.

6.2. "*Oxy Calibration validity*": It is possible to set the dissolved Oxygen probe calibration validity number of days. When the validity period has expired, the measurement is blinking on the display and by pressing the DISP key the "CAL" blinking message appears; the calibration data can still be used. The "Expired calibration" message is indicated in the printout. Enter "Number of days" = 0 to disable this feature.
Note: The day is counted at midnight: By entering 1, at midnight of the same day, the calibration is considered expired.
This operation can be carried out only by the administrator (see page *18*).

6.3. "*Reset Calibration History*": This function clears the dissolved Oxygen probe calibration information (see "Dissolved Oxygen Probe Calibration History" above). Press ENTER to erase, ESC to exit without erasing.
This operation can be carried out only by the administrator (see page *18*).

6.4. "*Salinity Correction*": Enter the measured liquid salinity. Use the ▲ and ▼ arrows to set the value expressed in g/l, and confirm with ENTER. To disable the salinity compensation, set the value to zero.

Note: The dissolved Oxygen concentration depends on the measured liquid salinity. In contrast, salinity has no effect on the saturation index.

6.5. "*Automatic Salinity Correction*": The salinity value is measured directly by the instrument, if a conductivity probe is connected and immersed in the measured liquid. Select "0" to manually set the correction using the "Manual Setting of the Salinity" menu item, select "1" to enable automatic correction.

Instrument Identifier Code

The instrument can be identified using a code appearing in the printouts and in the stored data. This code is managed (creation, editing, erasing...) using the DeltaLog11 software (vers. 2.0 and later) and this can be performed only by the administrator (see page *18*).

User Management

The user must identify himself or herself by entering a user name and password: The registered user name is shown in all performed operations: Printing, logging, calibration...
The available users are: *Administrator, user_1, user_2, user_3* and *anonymous user*. The different users have different usage levels: The *Administrator* is enabled to use all of the instrument functions and assigns the password to the other users. The three users and the anonymous can access only part of the functions.

Settings

The user management options are stored in the "**USER OPTIONS**" menu item.
When the instrument comes out of the factory, the only user stored is the administrator. The password is "00000000": The "*Menu >> User Options >> User Password*" function allows modification of the administrator password.
To enable the user_1, user_2 and user_3, you must assign a different password (not "00000000"), using the "User Password" function.
In order to do that:

1. Select the menu item "Menu >> User Options >> User Password".
2. Select the desired user (e.g. User_1) using the ▲ ▼ arrows, and confirm with ENTER.
3. Type the old password ("00000000" in a new instrument), and confirm with ENTER.
4. Type the new password (not "00000000"), and confirm with ENTER.
5. Select "Menu >> User Options >> User Registration" using the ▲ ▼ ◀ ▶ arrows, and select the new user to which you have just assigned a password.
6. Type the password, and confirm with ENTER.

Now the User_1 is enabled and can use the instrument: The printed and stored information will show "Operator = User_1".

Note: The passwords beginning with 27 (27000000 to 27999999) are reserved and you cannot use them.

Access modes

If you wish the instrument to request the user selection and relevant password upon turning on, set "Menu >> User Options >> User Exit Mode = Request New User". When you turn the instrument on you get all the users: Select the user using the ▲ ▼ ◀ ▶ arrows, and type its password. Confirm by pressing ENTER. The anonymous user does not need a password.

If you select "Recall User", the instrument uses the previous user without requiring a password. In this case, use the "User Registration" menu item to change the user (see points 5 and 6 above).

Note: The access mode can be modified only by the administrator.

Functions reserved to the administrator

Some functions are reserved to the user registered as "Administrator" (see the details on page *13*). Only the Administrator can:

- Modify the instrument identifier with the DeltaLog11 software (vers. 2.0 and later),
- Perform the instrument partial and total reset,
- Set the user access mode with or without password prompting (“User Exit Mode”),
- Selects the instrument memory management mode (“Single Memory Mode”),
- Set the storage mode when using the PRINT key (“Print Memory Mode”),
- Clear the calibration history (“Clear Calibration History”),
- Set the pH and dissolved Oxygen calibration interval (“pH Calibration Expiration” and “Dissolved Oxygen Calibration Expiration”),
- Modify the ID sample value (ID key),
- Clear the memory content.

pH measurement

The HD 98569 instrument works with combined pH/temperature probes complete with SICRAM module, pH measurement electrodes, redox potential measurement electrodes (ORP), and specific ion electrodes combined with the SICRAM KP471 module. To switch from pH to mV and vice versa, press the F1= pH/mV function key.

The pH measurement is generally accompanied by the temperature measurement for the automatic compensation of the pH electrode Nernst coefficient. The SICRAM combined pH/temperature probes are fitted with Pt100 temperature sensor.

The SICRAM KP471 module is provided for the connection of a pH electrode. For a pH measurement compensated for according to temperature, the instrument requires a temperature probe to be connected to the O_2 input. As an alternative, the compensation temperature value for the solution being measured can be entered manually.

If a temperature only probe is connected to the instrument, it has priority on the temperature supplied by any combined probe: Please see the chapter dedicated to temperature measurement on page *33*.

pH SICRAM probes

The SICRAM pH probe is formed by a pH electrode, a Pt100 temperature sensor located inside the probe, and an electronic module. The module has a memory circuit that enables the instrument to recognize the type of probe connected. It stores also the serial number, the factory calibration of the Pt100 sensor, the manufacturing date and the parameters of the last two pH calibration performed by the user.

The instrument stores the last eight pH calibrations performed by the user: The last two calibration are stored in the probe's SICRAM memory. Upon power on, the instrument reads the two calibrations in the probe and, if the probe was calibrated on the same instrument, they are added to the ones already stored in the instrument in order to make up the history calibration of the SICRAM pH probe. If the SICRAM pH probe is connected to a different instrument, only the parameters in the probe memory will make up the calibration history.

Module pH SICRAM KP471

The KP471 module is a SICRAM type interface for pH electrodes with S7 connector.
Three different cable lengths are available: 1m (code KP471.1), 2m (code KP471.2) and 5m (code KP471.5).
By using this module you can add all of the advantages of a SICRAM probe to a pH electrode: For example, you can move the module with the electrode from an instrument to another instrument, without performing a new calibration.

The module is automatically recognized by the instrument when you turn it on, and the serial number and parameters described above are read.

You just need to connect the electrode to the KP471 module S7 connector, connect the module to the pH input, and turn the instrument on. Perform a first calibration on two or more points. One must be in the neutral band (e.g. 6.86pH). The module is now ready for use.

Of course, **once the calibration is performed, the electrode linked to the module should not be changed**: As the electrode calibration information are saved in the module, this will generate measurement errors. **When you replace the electrode you should do a new calibration**.

The electrode for pH measurement

The electrode for pH measurement, generally in glass, generates an electrical signal proportional to the pH according to Nernst law. Of this signal the following aspects are considered:

Zero point: The pH where the electrode generates a potential of 0 mV. In most electrodes, this value is found at about 7 pH.

Offset or Asymmetry Potential: mV generated by an electrode when immersed in a buffer solution at 7pH. Generally oscillates between ± 20 mV.

Slope: Response of the electrode expressed in mV per pH units. The theoretical electrode slope at 25°C is 59.16 mV/pH. When the electrode is new the slope is close to the theoretical value.

Sensitivity: It is the electrode's slope expression in relative terms. It is obtained by dividing the actual value of the slope by the theoretical value, and is expressed as a %. The asymmetry potential and the slope vary in time with the use of the electrode, which necessitates regular calibration.

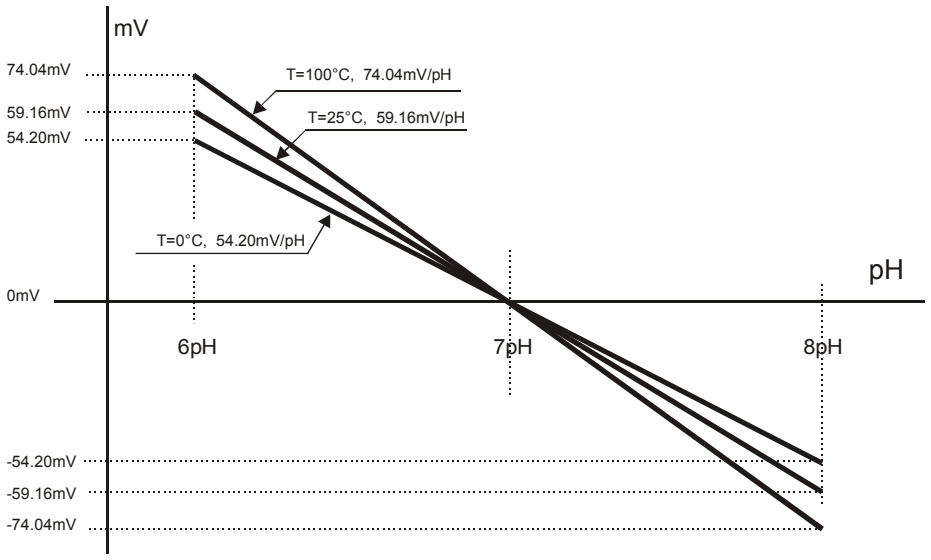
The pH electrodes must be calibrated using the standard solutions (see the calibration chapter below). The ORP and specific ion electrodes do not need calibration. **The standard redox solutions are only used to check the quality of a redox electrode**.
User calibration of the temperature sensor is not required: The sensor is calibrated in the factory and the Callendar Van Dusen parameters are recorded in the SICRAM module.

The probes are detected during turn on, and this cannot be performed when the instrument is already on, therefore if a probe is connected and the instrument is on, it is necessary to turn it off and on.

Automatic or manual temperature compensation for pH measurement

The pH measurement is influenced by the measured solution temperature.

The electrode slope varies according to the temperature in a known mode according to Nernst law: e.g., a 1pH variation, that at 25°C means 59.16mV, at 100°C means 74.04mV.



When a temperature probe is present (temperature only probe, combined pH/temperature probe, conductivity/temperature probe, or dissolved Oxygen/temperature probe), the instrument automatically applies the **ATC** (Automatic Temperature Compensation) function.
In absence of the temperature probe or sensor, the lower display shows the **MTC** (Manual Compensation Temperature).
If the correct value is not entered manually, the extent of the error committed in pH measurement is proportional to temperature and measured liquid pH value itself. This occurs, for example with

the KP471 module, if no temperature probe or combined probe with temperature sensor is also connected.

In **MTC** mode, in order to manually change the compensation temperature press °C/°F once: The indicated temperature value starts blinking. Select the desired temperature value by using the ▲ and ▼ arrows, and confirm with ENTER. The display stops blinking, and the temperature displayed is used for compensation.
During manual compensation, in order to change the unit of measurement between °C and °F, it is necessary to press the °C/°F key twice.

pH electrode calibration

The electrode calibration is used to compensate the asymmetry potential and slope departures to which the electrode is subject with time.
The calibration frequency depends on the accuracy desired by the user and on the effects that the measured samples have on the electrode. Generally, we recommend daily calibration, but it is the user's responsibility from personal experience, to establish the most appropriate frequency.
The calibration may be carried out using one or more points (up to 5): when using 1 point, the electrode offset is corrected, with 2 points the offset and the gain is corrected.

The instrument has a memory of 8 buffers with relevant temperature compensation tables (ATC) plus a "CUSTOM" buffer, not compensated for temperature. The five buffers can be selected by using the **BUFFER_1, …, BUFFER_5** menu items. Usually two for the acid, one for the neutral, and two for the alkaline band will be selected:

@25°C

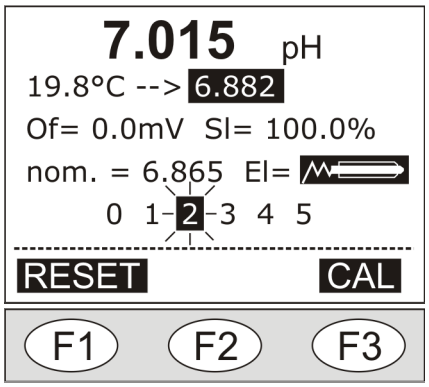
BUFR_1 (NEUTRAL)	**6.860**	7.000	7.648
BUFR_2 (ACID)	1.679	4.000	**4.010**
BUFR_3 (ALKALINE)	**9.180**	10.010	

If no electrode calibration was carried out on the instrument, or the last calibration failed, or the calibration validity period has expired, the measurement is blinking on the display and by pressing the DISP key the **CAL** blinking message appears.

Calibration procedure

1. Select the buffer to be calibrated in the "pH Options" >> "pH Buffer Solutions" menu item (please see the menu description on page *13*). This operation must be performed only the first time or when the normal calibration buffers are changed.
2. Dip the SICRAM pH/temperature probe or the electrode linked to the KP471 module to be calibrated and the temperature probe in the buffer selected for calibration. If no temperature probe is available, use a thermometer and enter the value manually as indicated in the paragraph "Automatic or Manual pH Compensation".
3. The electrode calibration mode is started by pressing **CAL** followed by **F1=pH**.
4. The page shown in the figure will appear: From top to bottom there are:
   - The pH measurement value with the current calibration (7.015pH in the example)
   - The temperature compensated buffer value (in the figure 19.8°C → 6.882): To modify this last value use the arrow keys (▼ and ▲).
   - Offset and slope values after calibration: When you enter the calibration procedure, these values are set to the factory values. When pressing F3=CAL, the actual conditions are shown.

- The buffer solution nominal value at 25°C as detected by the instrument (in the figure Nom.=6.865) and the symbol indicating the electrode quality.
- The numbers 0, 1, 2, 3, 4 and 5 refer to the buffer solutions of the Buffer1, ..., Buffer5 menu. Among the selected buffers, the instrument automatically detects the closest to the pH value being read, and shows it blinking at the bottom ("2" in the example).



5. To proceed with the calibration press **F3 = CAL**. The offset and gain calibration and the electrode efficiency are displayed.
   The blinking number identifying the detected buffer changes to ☑, to indicate that the current value has been accepted. The blinking of the new symbol means the instrument is still in calibration mode. By pressing F3 = CAL again, it is possible to repeat the calibration from the last point to obtain a finer calibration.
6. Extract the electrode from the buffer, wash it, clean it carefully, and insert it in the next buffer.
7. The instrument shows the new buffer value. This value is blinking. **The previous calibration point is captured permanently**: The blinking ☑, becomes still.
8. To continue with other calibration points, repeat the steps from point 5.
9. To end the electrode calibration, press **ESC**.

NOTES:

- **By accessing the pH calibration, the previous calibration information are transferred in the "pH Electrode Calibration History". The current offset and slope values are set to nominal values: The offset = 0mV, the gain (slope) varies according to the measured temperature (59.16mV/pH at 25°C).**
  You should perform a new calibration.
  If an error is made during calibration, you can press F1 = RESET to restart with a new calibration.
- The instrument is provided with a measurement stability control system: Until the reading is not sufficiently stable, the F3 = CAL key is disabled. Instead, the **WAIT** message is displayed.
- When choosing the standard buffer (see the MENU), you can disable one by selecting **NIL**. In this case, the buffer is excluded from the sequence, and won't be proposed during calibration.
- If the buffer value is rejected because it is considered to be excessively corrupted, the "Buffer out of limits!" message will appear. The instrument waits for a valid buffer. If it is not available, press F1=RESET to restore the initial calibration and exit using F3=EXIT. Repeat the calibration as soon as possible.
- During calibration, the instrument evaluates the electrode efficiency: If the correction is excessive, the electrode symbol is replaced by "ERROR". If you confirm the calibration anyway, the measurement on the display and the electrode symbol, which appears by pressing **DISP**, are blinking to remind you that you should replace it as soon as possible.

Temperature characteristics of Delta OHM standard solutions

The 8 standard buffers reported in the table on page *22* are memorized in the instrument with relevant variations according to temperature: The characteristics of the three Delta Ohm standard buffers at 6.86pH, 4.01pH and 9.18pH (@25°C) are reported below.

6.86 pH @ 25°C

°C	pH	°C	pH
0	6.98	50	6.83
5	6.95	55	6.83
10	6.92	60	6.84
15	6.90	65	6.85
20	6.88	70	6.85
25	**6.86**	75	6.86
30	6.85	80	6.86
35	6.84	85	6.87
40	6.84	90	6.88
45	6.83	95	6.89

4.01 pH @ 25°C

°C	pH	°C	pH
0	4.01	50	4.06
5	4.00	55	4.07
10	4.00	60	4.09
15	4.00	65	4.10
20	4.00	70	4.13
25	**4.01**	75	4.14
30	4.01	80	4.16
35	4.02	85	4.18
40	4.03	90	4.20
45	4.05	95	4.23

9.18 pH @ 25°C

°C	pH	°C	pH
0	9.46	50	9.01
5	9.39	55	8.99
10	9.33	60	8.97
15	9.28	65	8.94
20	9.22	70	8.92
25	**9.18**	75	8.90
30	9.14	80	8.88
35	9.10	85	8.86
40	9.07	90	8.85
45	9.04	95	8.83

Conductivity measurement

The HD 98569 works with combined conductivity/temperature probes with SICRAM (right input). The 4 wire Pt100 temperature sensor is used for automatic compensation of conductivity.

If a temperature only probe is connected (to the pH/mV or O_2 inputs), the measured temperature value becomes the reference value, and has priority on the one supplied by the combined conductivity probe.

SICRAM conductivity probes

The combined conductivity/temperature probe with SICRAM is fitted with a Pt100 temperature sensor and an electronic module. The module has a memory circuit that enables the instrument to recognize the type of probe connected. It stores also the serial number, the factory calibration of the Pt100 sensor, the manufacturing date and the last calibration performed by the user.

The SICRAM conductivity probes use the cell constant saved in the probe's memory: a new calibration updates its value.

The instrument obtains the following from the measurement of conductivity:

- the liquid resistivity measurement (Ω·cm, kΩ·cm, MΩ·cm),
- the concentration of total dissolved solids (TDS) according to the χ/TDS conversion factor, which can be modified using the menu,
- the salinity (NaCl quantity in the solution, expressed in g/l).

By repeatedly pressing "**F3 = cond.**" you can select the quantity.

The conductivity probes must be periodically calibrated. To facilitate this operation, four standard calibration solutions are automatically recognized by the instrument:

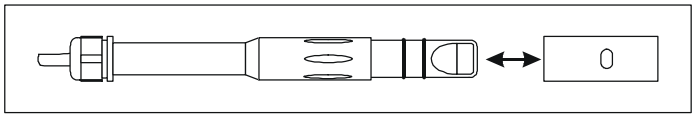
- 0.001 Molar KCl solution (147µS/cm @25°C),
- 0.01 Molar KCl solution (1413µS/cm @25°C),
- 0.1 Molar KCl solution (12880µS/cm @25°C),
- 1 Molar KCl solution (111800µS/cm @25°C),

User calibration of the temperature sensors is not required.

The probes are detected during turn on, and this cannot be performed when the instrument is already on, therefore if a probe is connected and the instrument is on, it is necessary to turn it off and on.

Standard SP06TS probe

The 4-electrode conductivity/temperature combined probe, code SP06TS, is formed by a cell delimited by a bell in Pocan.
A positioning key, present in the probe's end part, orients the bell correctly when the probe is introduced. For cleaning, simply pull the bell along the probe's axis **without rotating it**. **It is not possible to perform measurements without this bell.**



The probe is recommended for non-heavy general use. The temperature measuring range is 0°C…+90°C.

4-electrode or 2-electrode probes

The HD 98569 uses 4-electrode or 2-electrode probes for conductivity measurement. The selection of the type of probe is managed automatically by the SICRAM module.
The 4-electrode probes are preferred to measure high conductivity solutions, either over an extended range or in presence of pollutants. The 2-electrode probes operate in a shorter measurement range but with an accuracy comparable with the 4-electrode probes.
The probes can be in glass or plastic: The first can work in presence of aggressive pollutants, the latter are more resistant to collisions, and so more suitable for industrial use.

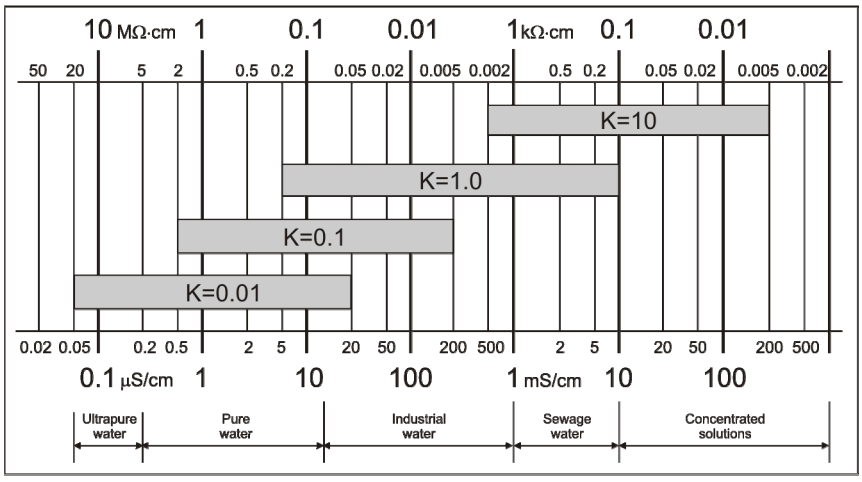
Probes with temperature sensor

The combined conductivity probes for the HD 98569 are fitted with a built-in Pt100 temperature sensor, and measure conductivity and temperature at the same time: This allows automatic correction of the conductivity (**ATC**) according to the measured temperature. Alternatively, you can measure the temperature using a Pt100 probe connected to the pH/mV or O_2 inputs: If this probe is present, the temperature of the combined probe is not used.

Choosing the cell constant

The cell constant K is a piece of information which characterizes the cell. It depends on its geometry and is expressed in cm^{-1}. There is no cell capable of measuring the entire conductivity scale accurately enough. Consequently, cells with different constants are used allowing good accuracy on different scales. The cell with constant K = 1 cm^{-1} allows measurements from low conductivity up to relatively high conductivity.

The theoretical measurement cell is made of two 1 cm^2 metallic plates separated one from the other by 1 cm. This type of cell has a cell constant Kcell of 1 cm^{-1}. In essence, the number, form, material and dimensions of the plates in the cell are different from model to model, from manufacturer to manufacturer.
The low constant K probes are preferably used for low conductivity values, the high constant ones for high values.
The indicative measurement range is reported in the following diagram:



Automatic or manual temperature compensation for conductivity measurement

The conductivity measurement generally refers to a standard temperature, called **reference temperature**, that is, the instrument proposes the conductivity you would get at the reference temperature. This temperature can be chosen within the range 0…50°C in the “Conductivity Reference Temperature” menu item (**usually the values of 20°C or 25°C are used**).

The conductivity variation per each grade of temperature variation is a characteristic of the solution and is indicated by the term "**temperature coefficient α_T**": admissible values from 0.00 to 4.00%/°C, **default value 2.00%/°C**.
When a temperature sensor is present, the instrument automatically applies the temperature compensation function, and proposes the measurement using the reference temperature according to the coefficient α_T on the display.

Resistivity, TDS and salinity measurements

The HD 98569 instrument measures electric conductivity and temperature of a solution, and then calculates resistivity, salinity and TDS. By repeatedly pressing "F3 = cond." you can select the measurement.

The resistivity is defined as the reciprocal of conductivity. The measurement is expressed in Ωcm or one of the derived units (kΩcm, MΩcm or GΩcm). It is generally used to measure pure and ultra pure water.

The salinity is calculated using a more complex calculation: It is based on the assumption that the measured conductivity is entirely and only due to the sodium chloride (NaCl) dissolved in the water. It is expressed in g/l or mg/l.

The TDS (Total Dissolved Solids) is the measurement of the total concentration of ion species in the solution. It is calculated by multiplying the conductivity measurement by a factor called "TDS Coefficient", set in the menu from 0.4 to 0.8 (MENU >> "Conductivity Options" **>>** "TDS Coefficient"). The measurement of total dissolved solids is expressed in g/l or mg/l.

Calibration of conductivity

The probe calibration can be carried out on one to four points, using the standard solutions automatically detected by the instrument (automatic calibration) or other solutions with known temperature characteristics (manual calibration).

Technical note on the instrument functioning
The instrument uses four different automatically selected measurement scales: When the cell constant is equal to 1, the four standard calibration solutions are associated to a different measurement scale. The calibration solution at 147µS/cm refers to the measurement scale 0, the solution at 1413µS/cm to the measurement scale 1, and so on. When the calibration point is confirmed using the CAL key (see the details in the next paragraph), the display indicates the calibrated scale (range) with the ☑ symbol.
If the calibration was performed on multiple solutions, make sure that the ☑ symbol is displayed near a non yet calibrated range: It is useless to calibrate the same range twice.
This warning is valid only if the cell constant is different from 1, and/or the solutions are not standard.

Automatic calibration of conductivity using memorized standard solutions

The instrument can recognize four standard calibration solutions:

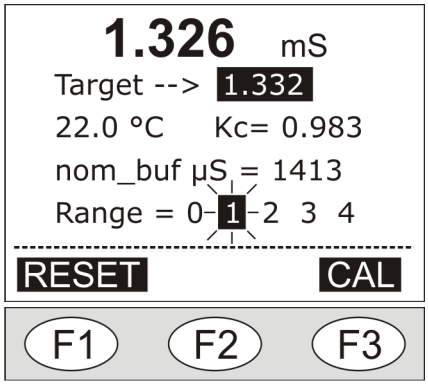
- 0.001 Molar KCl solution (147µS/cm @25°C),
- 0.01 Molar KCl solution (1413µS/cm @25°C),
- 0.1 Molar KCl solution (12880µS/cm @25°C),
- 1 Molar KCl solution (111800µS/cm @25°C),

By using one of these solutions, the calibration is automatic; the calibration can be carried out on

multiple points to increase accuracy.
The manual calibration is possible with a different conductivity solution from that used in the automatic calibration.

The solution temperature for the calibration must be between 15°C and 35°C: If the solution is under 15°C, or over 35°C, the instrument rejects the calibration and displays "NON ADMISSIBLE TEMP.".

1. Turn the instrument on with the **ON/OFF** key.
2. Set the α_T temperature coefficient in the menu (point *5* on page *16*): For Delta OHM calibration solutions, enter 2.00%/°C.
3. Set the reference temperature in the menu (20°C or 25°C) (point *5.1* on page *16*).
4. Dip the conductivity meter cell in the calibration solution until the electrodes are covered with liquid.
5. Stir the probe lightly to remove any possible air inside the measurement cell.
6. If a temperature probe is also present, immerse it together with the conductivity probe.
7. Press **CAL**, followed by **F3 = cond.**
8. The page shown in the figure will appear: From top to bottom there are:
   - The conductivity measurement value with the current calibration (1.326mS in the example)
   - The recognized standard calibration solution value (Target → 1.332). Both values refer to the solution actual temperature, that is, not compensated;
   - The solution temperature and the current cell constant Kcell (when accessing calibration, the cell constant Kcell is read in the memory of the SICRAM probe);
   - The standard calibration solution nominal value at 25°C, which is closest to the conductivity value being read;
   - 4 measurement ranges (Range = 0 1 2 3). The working range is blinking ("1" in the example).



   If the measurement was TDS, resistivity or salinity, by pressing CAL the instrument goes automatically into conductivity calibration mode.
9. The detected buffer value (Target), can be modified using the arrows ▲ and ▼.
10. To proceed with the calibration press **F3 = CAL**. The cell constant value is updated.
    The ☑ symbol is displayed over the number identifying the calibrated range. The instrument is still in calibration mode: By pressing **F3 = CAL** again, it is possible to repeat the current calibration point to obtain a finer calibration.
11. To end the calibration and return to measurement, press **ESC** (go to step *15*), or continue the calibration for the next point.

12. Extract the probe from the calibration solution, wash it, clean it carefully, and insert it in the following solution.
13. The instrument proposes the detected value of the new solution and the corresponding range is blinking. **The previous point is captured permanently.**
14. Continue the calibration by repeating the steps from point 8.
15. To end the calibration press **ESC**.
16. Rinse the probe with water. If you are going to perform low conductivity measurements, we recommend rinsing the probe using distilled or bi-distilled water.

The instrument is calibrated and ready for use.

The calibration updates the cell constant by saving it in the probe's memory.
Note: When calibrating multiple points, it is recommended to start from lower values toward higher values, not vice versa.

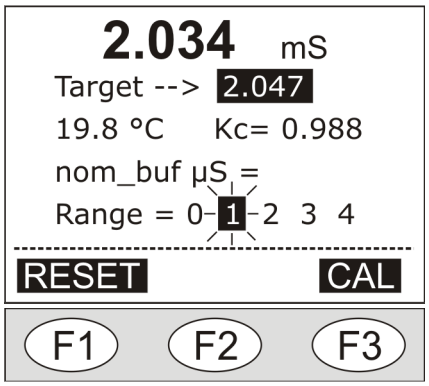
Manual calibration of conductivity using not-memorized standard solutions

Manual calibration is possible at any calibration solution and temperature if it is within the instrument measurement limits and provided that you know the solution's conductivity at the calibration temperature.

The solution temperature must be between 15°C and 35°C: If the solution is under 15°C, or over 35°C, the instrument rejects the calibration and displays "NON ADMISSIBLE TEMP".

Proceed as follows:

1. Turn the instrument on with the ON/OFF key.
2. Set the α_T temperature coefficient to 0.0 (point *5* on page *16*).
3. Dip the conductivity meter cell into a known conductivity solution. The electrodes must be immersed in the liquid.
4. Stir the probe lightly to remove any possible air inside the measurement cell.
5. If a temperature probe is also present, immerse it together with the conductivity probe.
6. According to the temperature detected, determine the calibration solution conductivity using the table specifying the conductivity according to temperature.
7. Press **CAL**, followed by **F3 = cond.**
8. The page shown in the figure will appear: From top to bottom there are:
   - The conductivity measurement value with the current calibration (2.034mS in the example)
   - The recognized standard calibration solution value (Target → 2.047). Both values refer to the solution actual temperature, that is, not compensated;
   - The solution temperature and the current cell constant Kcell (when accessing calibration, the cell constant Kcell is read in the memory of the SICRAM probe);
   - The standard calibration solution nominal value is not present;
   - 4 measurement ranges (Range = 0 1 2 3). The working range is blinking ("1" in the example).



9. The instrument measures the conductivity according to the cell constant saved in the probe's SICRAM memory:
   If the read value is sufficiently close to the theoretical one, the "Target" indication reports the actual value, at the measured temperature, of one of the four standard solutions: The detected standard solution is displayed in the "nom_buf" item. Continue the calibration from point 8 of the previous chapter "Automatic calibration of conductivity using memorized standard solutions".
   If the calibration solution value is too far from one of the four standard solutions (147µS/cm, 1413µS/cm,…), "nom_buf" is not defined. Continue the calibration according to the following point:
10. Using the arrows (▲ and ▼) set the conductivity value determined in point 6, and confirm with **F3 = CAL**. The cell constant correction is displayed.
    The ☑ symbol is displayed over the number identifying the calibrated range. The instrument is still in calibration mode: By pressing **F3 = CAL** again, it is possible to repeat the current calibration point to obtain a finer calibration.
11. To end the calibration and return to measurement, press **ESC** (go to step 17), or continue the calibration for the next point.
12. **If the next calibration solution is one of the standard solutions automatically detected by the instrument**, open the menu and re-enter the temperature coefficient as it was before the calibration. Extract the probe from the calibration solution, wash it, clean it carefully, and insert it in the following solution. Continue the calibration from point 12 of the previous chapter "Automatic calibration of conductivity using memorized standard solutions".
13. **If the next calibration solution is NOT one of the standard solutions automatically detected by the instrument**, extract the probe from the calibration solution, wash it, clean it carefully, and insert it in the following solution.
14. The instrument proposes the value of the new solution: **The previous point is captured permanently**.
15. Continue by repeating the steps from point *9*.
16. To end the calibration press **ESC**.
17. Open again the menu, and re-enter the temperature coefficient as it was before the calibration.
18. Rinse the probe with water. If you are going to perform low conductivity measurements, we recommend rinsing the probe using distilled or bi-distilled water.

The instrument is now calibrated and ready for use.

The calibration updates the cell constant by saving it in the SICRAM probe's memory.

NOTES:

- **When accessing the calibration, the cell constant Kcell is set to the value read in the memory of the probe with SICRAM.**

- Upon confirming the calibration by using "**F3 = CAL**", the instrument checks that the correction to the cell constant does not exceed the ±10% limits. If the calibration is rejected because it exceeds the ±10% limit, the "**NON ADMISSIBLE VAR%**" message will appear, followed by a long beep. **The instrument remains in calibration mode and maintains the cell constant nominal value of the SICRAM memory**: If you leave the calibration by pressing ESC, the instrument will preserve the cell constant K nominal value.
- The most frequent causes of error are due to the probe malfunctioning caused by deposits, dirt, pollution, bad preservation conditions of the standard conductivity solutions. Please see the chapter dedicated to trouble shooting on page *41*.
- The SPT401.001S probe with cell constant K=0.01 is supplied with a 2m *cable*. The cable has a connector to be screwed on the probe's body, on one end, and the SICRAM module to be connected to the instrument, on the other end. The SICRAM module contains the probe's information (serial number, calibration parameters, etc.) **The probe, together with its cable, should be used only with that cable. You cannot use other probes' cables: The measured value will be wrong.**
  The SPT401.001S measurement is performed in closed chamber.

Table of standard solutions at 147µS/cm, 1413µS/cm, 12880µS/cm and 111800µS/cm

The table reports the standard solutions automatically detected by the instrument according to temperature.

°C	µS/cm	µS/cm	mS/cm	mS/cm
15.0	121	1147	10.48	92.5
16.0	124	1173	10.72	94.4
17.0	126	1199	10.95	96.3
18.0	128	1225	11.19	98.2
19.0	130	1251	11.43	100.1
20.0	**133**	**1278**	**11.67**	**102.1**
21.0	136	1305	11.91	104.0
22.0	138	1332	12.15	105.9
23.0	141	1359	12.39	107.9
24.0	144	1386	12.64	109.8
25.0	**147**	**1413**	**12.88**	**111.8**

°C	µS/cm	µS/cm	mS/cm	mS/cm
25.0	**147**	**1413**	**12.88**	**111.8**
26.0	150	1440	13.13	113.8
27.0	153	1467	13.37	115.7
28.0	157	1494	13.62	117.7
29.0	161	1521	13.87	119.8
30.0	164	1548	14.12	121.9
31.0	168	1581	14.37	124.0
32.0	172	1609	14.62	126.1
33.0	177	1638	14.88	128.3
34.0	181	1667	15.13	130.5
35.0	186	1696	15.39	132.8

Measurement of the dissolved Oxygen

The *HD 98569* measures dissolved Oxygen using combined probes of polarographic, with two or three electrodes, and galvanic type with integrated temperature sensor. The dissolved Oxygen probe is fitted with a SICRAM interface module that stores the last 8 calibrations and the serial number.

The instrument connected to the probe detects the dissolved Oxygen partial pressure in the measured liquid, as well as the temperature and the barometric pressure: Using these values, it calculates the dissolved Oxygen concentration (mg/l), and the saturation index (%).

If a temperature only probe is connected (pH/mV connector), the temperature measured by this probe becomes the reference value for the measurement chain, and has priority on the one supplied by the combined dissolved Oxygen probe.
The probe is detected during turn on, and this cannot be performed when the instrument is already on, therefore if a probe is connected and the instrument is on, it is necessary to turn it off and on.

How to measure

Some instructions on the instrument's operation and measurement mode are reported below.
By pressing the **F2 = O_2** function key, you can select the type of measurement: the **dissolved Oxygen concentration** (mg/l), or the **saturation index** (%).

To measure the dissolved oxygen, immerse in the liquid the polarographic probe to a depth of at least 80 mm or the galvanic probe to a depth of at least 50 mm.

> It is essential that the liquid in contact with the membrane is continually changed so as to avoid incorrect measurements caused by Oxygen exhaustion in the liquid sample. Check that the liquid stirring is such that it avoids production of measurement variations.

While immersing the probe, check that no air bubbles remain trapped in contact with the membrane.

When connecting the probe to the instrument and turning it on, wait a few minutes (~ 15) until the reading is stable and reliable. This time span serves to eliminate the dissolved Oxygen in the cell's internal electrolyte. Leave the probe connected to the instrument even if the instrument is off to avoid this waiting time. Disconnect the probe only at the end of the work.

The probe connected to the instrument is always aligned even if the instrument is off: in this condition the measurement can occur immediately after turning on, once the probe response's stabilized.

If the measurements are taken in a container, if possible, fit the container with a stirrer and adjust the stirring speed in order to obtain a stable reading, avoiding trapping air in the liquid.

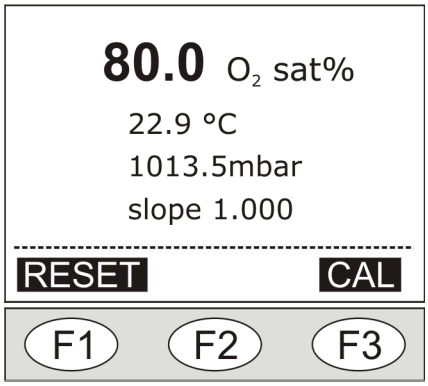
Calibration of the dissolved Oxygen probe

The probe must be calibrated periodically using the DO9709/20 (for polarographic probes DO9709SS, DO9709SM and galvanic probe DO9709SG) or DO9709/21 (for galvanic probe DO9709SS.1) calibrator.
The instrument checks the dissolved Oxygen probe efficiency. The "OFS_ERROR" message indicates that the probe is exhausted.
The same message is displayed during calibration, when calibration is not possible or the reading is unstable. Clean the measurement cell with replacement of the electrolyte and/or the membrane covering the measurement electrodes: If the error indication persists, replace the probe.

Proceed as follows:

1. Connect the dissolved Oxygen probe to the instrument.
2. Disconnect the temperature only probe, if connected to the instrument, so that the indicated temperature is that measured by the dissolved Oxygen probe built-in temperature sensor.

3. Turn the instrument on with the ON/OFF key.
4. Wet the sponge contained in the calibrator using 2ml of distilled water.
5. Insert the probe into the calibrator.
6. Wait at least 15 minutes until the system stabilizes thermally, saturation is reached inside the calibrator and the reading is stable. If the membrane and/or electrolyte solution have been replaced, wait at least 30 minutes.
7. Press **CAL**, then "**F2 = oxy**" (when accessing the calibration, the slope is set automatically to 1.000 and the previous calibration information is transferred to the "Dissolved Oxygen Probe Calibration History" contained in the SICRAM module). The saturation index value, temperature, barometric pressure and slope of the probe are displayed from top to bottom.



8. To proceed with the calibration press **F3 = CAL**. The calibration value 101.7% and the new slope value, corrected according to the new calibration, are displayed.
9. If the measurement did not stabilize, press F3 = CAL again to repeat the calibration.
10. To end the calibration and return to measurement, press **ESC**.

The instrument is calibrated and ready for use.

If an error is made during calibration, you can press F1 = RESET to reset the slope value to 1.000. *Y*ou must repeat the calibration.

On pressing F3 = CAL during calibration, the instrument checks that the correction to be made does not exceed the expected limits for correct functioning. If the calibration is rejected, the display shows "**OFS_ERROR",** the calibration is ended and the slope value is set to 1.000.

In case of "**OFS_ERROR**", replace the electrolyte and the membrane. If the error persists, you can try to clean the electrodes using very fine abrasive cloth (better if *impregnated with ammonia)* before replacing the probe.

Electrolyte solution and/or membrane replacement

The electrolyte contained in the dissolved oxygen probe will be exhausted because of the chemical reaction generated by the current in proportion to the partial pressure of the oxygen present in the water. Subsequently, the current generated by the probe is so low that the calibration operation is impossible. It is necessary to replace the electrolyte contained in the probe to restore its functionality.

Incorrect use of the probe can cause the rupture or obstruction of the oxygen-permeable membrane containing the electrolyte solution. In this case it is necessary to replace the membrane and the electrolyte solution.

After replacement of the electrolyte solution and/or membrane, insert the probe's connector in the instrument and wait 2 hours before performing the dissolved oxygen measurement (this is the necessary time to exhaust the oxygen trapped in the electrolyte solution during the replacement).

DO9709SM POLAROGRAPHIC PROBE

1. Remove the protective container from the head of the probe.

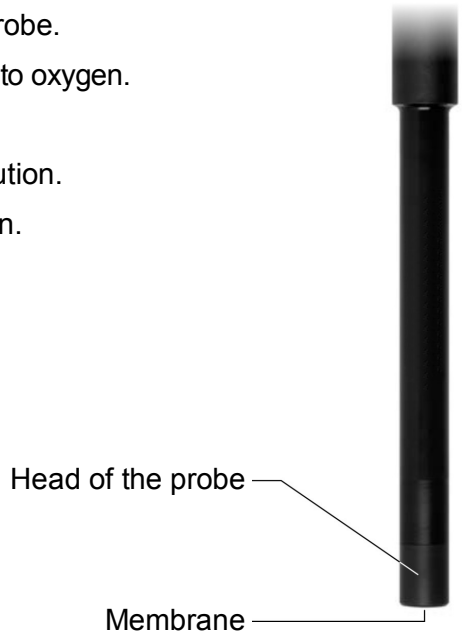
2. Unscrew the probe's head with the membrane permeable to oxygen.

3. If necessary, replace the membrane.

4. Fill the head of the probe with the supplied electrolyte solution.

5. Eliminate any possible air bubble in the electrolyte solution.

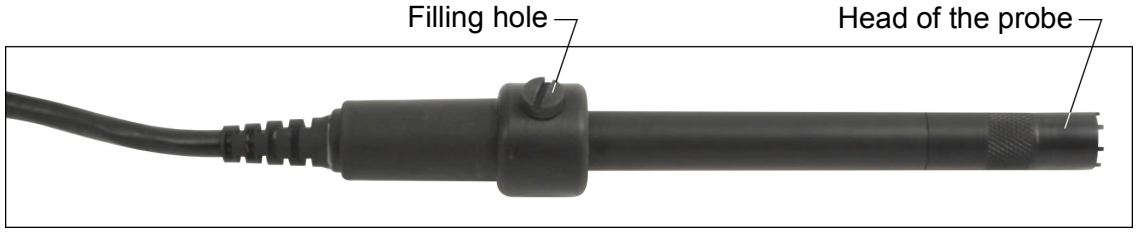
6. Screw the probe's head back on carefully.



DO9709SG GALVANIC PROBE

1. Remove the protective container from the head of the probe.

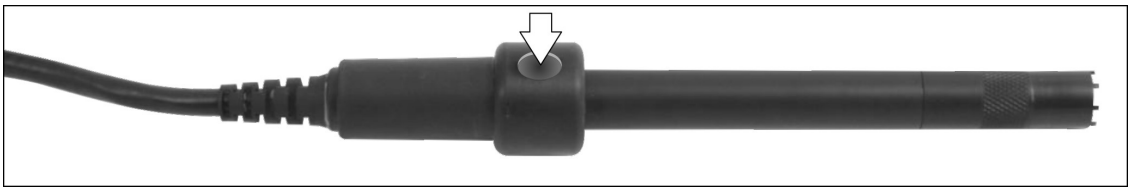
2. Unscrew the cap of the filling hole and the head of the probe with the membrane permeable to oxygen (check that the membrane is in good condition).



3. Fill the head of the probe up to ¾ with KOH electrolyte solution.

4. Screw the head of the probe with the electrolyte solution to the probe. Rinse any excess electrolyte solution with water.

5. Pour the electrolyte solution in the filling hole (the probe filling requires about 5 ml of solution). From time to time, gently tap the probe stem to remove any air bubbles.



6. When the filling hole is full, screw the cap back on. Rinse any excess electrolyte solution with water.

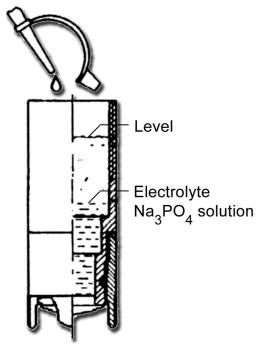
7. Place the probe with the membrane upwards and check that there are no air bubbles under the membrane. If you notice air bubbles, further fill the probe with electrolyte solution.

8. Wait approximately 2 hours before using the probe, then calibrate.

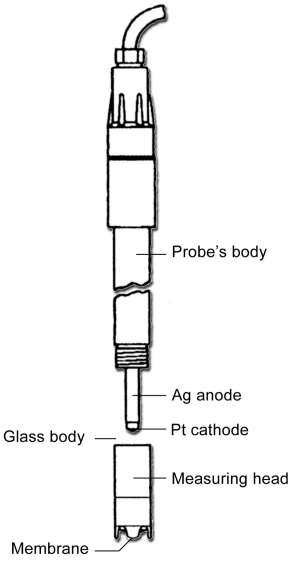
ATTENTION:
The electrolyte solution contains Potassium Hydroxide (KOH) and is caustic! Avoid contact with skin, use suitable gloves and protect the eyes. In case of contact, rinse immediately and thouroughly with water.

Note: some residues (lead oxide and carbonate) due to the reaction of the electrolyte solution with oxygen can be visible inside the membrane; such residues do not compromise the probe operability and can be removed by unscrewing the head of the probe and rinsing the membrane during the regular periodic maintenance. The accumulation of many residues in a short time (few days) may indicate the presence of air bubbles inside the probe due to an incorrect filling, to the cap not sufficiently closed or to leakage in the membrane.

DO9709SS POLAROGRAPHIC PROBE

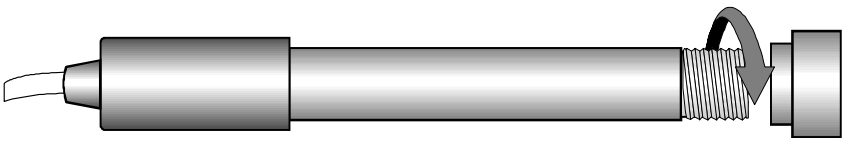


1. Unscrew the probe's head with the membrane permeable to oxygen.
2. If necessary, replace the membrane.
3. Fill the probe's head with the DO 9701 electrolyte solution until the level indicated in the figure (filling level).
4. Eliminate any possible air bubble in the electrolyte solution.
5. Screw the probe's head back on carefully.

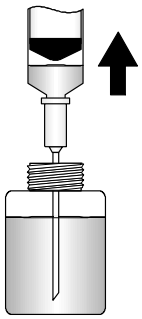


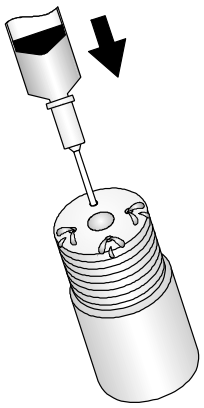
DO9709SS.1 GALVANIC PROBE

1. Unscrew the probe's head and the membrane permeable to oxygen. If necessary, replace the membrane.



2. Attach the needle to a 10 ml syringe.
3. Using the syringe, withdraw the DO 9701.1 electrolyte solution.
4. Remove the air bubbles inside the syringe. Insert the needle into one of the four holes surrounding the cathode of the probe and inject the solution until it leaks out. The fill volume is approximately 5 ml.





5. Screw the probe's head back on carefully.

Check the probe's status

The glass body covering the cathode of the polarographic probe and the membrane on the probe's head should not be damaged.
If there are cracks in the glass body, the probe must be replaced. If the oxygen-permeable membrane is damaged, dirty or obstructed it must be replaced. When the probe's head is unscrewed the probe is not protected. Handle it with care to avoid collisions that could damage it irreparably.

Control the zero of the probe

Compensation of the zero (offset) of the probe is already done in the factory.
The user can control the offset by immersing the probe in the 0.0% dissolved oxygen solution (DO 9700):

- pour a small quantity of 0.0% dissolved oxygen solution into a container, after suitably cleaning the container with distilled water,
- insert the probe in the zero solution and wait at least 5 minutes,
- the instrument should indicate a saturation index < 0.6%.

Dissolved oxygen probe storage

When the dissolved oxygen probe is not used it should be disconnected from the instrument to avoid useless consumption of the electrolyte solution and the discharge of the batteries.
When no measurement is taken for long periods, withdraw the internal electrolyte of the galvanic probe, to avoid useless consumption of the measurement electrodes.
Always keep the electrode wet using the special cap provided with the probe and filled with distilled water.

Polarographic probe and galvanic probe: differences

To help choosing between the use of a polarographic or galvanic probe, the following table summarizes the main differences between the two probes.

	Polarographic probe DO9709SM	**Galvanic probe DO9709SG**
Polarization time	After connecting the probe to the instrument it is necessary to wait at least 5 minutes before taking the measurement.	Polarization is not needed. After connecting the probe to the instrument it is possible to take the measurement immediately.
Flow rate	Requires a lower flow rate (> 9 cm/s), because it consumes less oxygen.	Requires a higher flow rate (> 20 cm/s), because it consumes more oxygen.
Electrodes life	Longer, because the electrodes are not consumed when the probe is disconnected from the instrument.	Shorter, because the electrodes are consumed even when the probe is disconnected from the instrument (if the electrolyte is not removed).
Maintenance	Requires little maintenance.	The electrolyte solution must be replaced more frequently.
Accuracy	Higher accuracy (± 1% f.s.).	Standard accuracy (± 2% f.s.).

Firmware update for DO9709SM and DO9709SG probes

The DO9709SM and DO9709SG probes are compatible with the instrument HD98569 starting from firmware version **1.20.007**. The instruments with previous firmware versions must be updated.

Temperature measurement

The instrument accepts platinum temperature probes with resistances of 100Ω and SICRAM module on the pH/mV and O_2 inputs. The instrument can also measure the temperature using the combined pH/temperature, conductivity/temperature and dissolved Oxygen/temperature probes.
The temperature sensor excitation current was chosen in order to minimize the sensor self-heating effects.
All temperature probes with SICRAM module are calibrated in the factory.
The probes are detected during turn on: When you insert a probe into a functioning instrument, the instrument does not show any new message: You should turn the instrument off and then back on again.

The °C or °F unit of measurement can be chosen for display, printing, and logging using the °C/°F key.

The displayed temperature is used for pH, conductivity or dissolved Oxygen compensation. If no temperature or combined temperature probes are present, the manual temperature is displayed: The **MTC** message is displayed. If at least one temperature probe is connected (temperature only probe or combined probe), the message becomes **ATC**. The measured temperature is used to compensate the pH, conductivity and dissolved Oxygen measurements.

In case of multiple temperature sensors connected to the instrument (e.g. Pt100 probe, pH/temperature probe with SICRAM, combined conductivity or dissolved Oxygen probe), the **reference** temperature to compensate **all** measurements, is chosen according to the following principle: **The temperature only probe has priority on the temperature supplied by combined probes. If the temperature only probe is not present, the following order is valid:** The temperature of the dissolved Oxygen probe has priority on the pH/mV probe that has priority on the conductivity probe.

If you disconnect the reference temperature probe (temperature only probe or combined probe), the instrument switches from ATC to MTC mode. The temperature used for compensation is the one manually set using the °C/°F key (see the description on page *10*).

How to measure

The temperature measurement by **immersion** is carried out by inserting the probe in the liquid for at least 60mm; the sensor is housed in the end part of the probe.

In the temperature measurement by **penetration** the probe tip must be inserted to a depth of at least 60mm, the sensor is housed in the end part of the probe. When measuring the temperature on frozen blocks it is convenient to use a tool to bore a cavity in which to insert the tip probe.

In order to perform a correct **contact** measurement, the measurement surface must be even and smooth, and the probe must be perpendicular to the measurement plane.
So as to obtain the correct measurement, the insertion of a drop of oil or heat-conductive paste is useful (do not use water or solvents). This method also improves the response time.

Warnings and operating instructions on the temperature sensors

1. Do not expose the probes to gases or liquids that could corrode the material of the sensor or the probe itself. Clean the probe carefully after each measurement.
2. Do not bend the probe connectors or force them upward or downward.
3. If the connector is fitted with a seal rubber ring (o-ring): Make sure it is inserted all the way.
4. Do not bend, deform or drop the probes, as this could cause irreparable damage.
5. Always select the most suitable probe for your application.
6. Do not use the temperature probes in presence of corrosive gases or liquids. The sensor container is made of AISI 316 stainless steel, while the contact probe container is made from AISI 316 stainless steel plus silver. Avoid contact between the probe surface and any sticky surface or substance that could corrode or damage it.
7. Avoid blows or thermal shocks to Platinum temperature probes as this could cause irreparable damage.
8. To obtain reliable measurements, temperature variations that are too rapid must be avoided.
9. Temperature probes for surface measurements (contact probes) must be held perpendicular against the surface. Apply oil or heat-conductive paste between the surface and the probe in order to improve contact and reduce reading time. Whatever you do, do not use water or solvent for this purpose. A contact measurement is always very hard to perform. It has high levels of uncertainty and depends on the ability of the operator.
10. Temperature measurements on non-metal surfaces usually require a great deal of time due to the low heat conductivity of non-metal materials.
11. If probes are not insulated from their external casing; be very careful not to come into contact with live parts (above 48V): This could be extremely dangerous for the instrument as well as for the operator, who could be electrocuted.
12. Avoid taking measurements in presence of high frequency sources, microwave ovens or large magnetic fields; results may not be very reliable.
13. Clean the probe carefully after use.
14. The instrument is water resistant and IP66, but should not be immersed in water. Close the free connectors using caps. The probe connectors must be fitted with sealing gaskets.

Instrument storage

Instrument storage conditions:

- Temperature: -25…+65°C.
- Humidity: less than 90% RH without condensation.
- During storage avoid locations where:
  humidity is high,
  the instrument may be exposed to direct sunlight,
  the instrument may be exposed to a source of high temperature;
  the instrument may be exposed to strong vibrations;
  the instrument may be exposed to steam, salt or any corrosive gas.

The instrument case is made of ABS plastic and rubber: do not use any incompatible solvent for cleaning.

pH, conductivity and dissolved Oxygen measurements - Most frequent problems, possible causes and handling

Instrument functioning

- *When selecting some functions the "Operation reserved to the administrator" message is displayed on the screen*.

Some instrument functions are reserved to the user registered as "Administrator". The other users cannot execute them (see the details on page *18*).

- *Clicking on the LOG key the "Logging disabled!" message is displayed on the screen*.

The logging interval was set to 0. To enable it, open the menu "System Parameters >> Memory and Logging Options >> Log Interval", and select a log interval different from zero.

pH measurement

The average life of a pH electrode is about one year according to the use and maintenance performed.

The electrodes used at high temperatures or in highly alkaline environments have a shorter life.

It is recommended to condition the new electrodes for half day by immersing them, before use, into a buffer at 6.86pH or 4pH.

Calibrate the electrode with solutions closer to the values being measured. A new electrode must always be calibrated at neutral pH (6.86pH) as first point, and at least on an acid or alkaline second point.

Generally, the pH electrodes have a body in glass: handle them with care to avoid breakage. In particular, the membrane (the sensitive element housed in the end part of the electrode) is made of very thin glass.

Some of the most frequent problems and their possible solutions are reported below.

Wrong pH measurement. Carry out the following checks:

- Check that the diaphragm is not obstructed and possibly clean it using the HD62PT solution.
- Check that the reference system is not contaminated. In case of a filling type electrode, replace the electrolyte with the suitable solution.
- Check that no air bubbles are present in the electrode tip and that it is sufficiently immersed.

Dirt residuals deposited on the membrane can alter the measurement: use the **HD62PP** solution for protein cleaning.

Slow response or wrong measurements. Possible causes are aging, or erosion of the membrane, or a short circuit in the connector.

Storage. Keep the electrode immersed in the HD62SC solution.

Conductivity measurement

The service life of a cell can be unlimited, provided that the necessary maintenance is performed and that it does not break. Some of the most frequent problems and their possible solutions are reported below.

Measurement of conductivity different from the expected value.

Check that the probe is connected to the correct input: Input χ.

Check that the cell used is suitable for the measurement range. Check that the cell is not dirty, that there are no air bubbles inside it. Repeat the calibration using the proper not contaminated standard.

Slow response or instability.
Check that the cell is not dirty, that there are no traces of oil or air bubbles inside it. If you work with a Platinum cell, new platinum-coating of the electrode could be necessary.

Calibration not accepted.
Check that the standard solutions are in good condition, and that the calibration solution temperature is within the range 15…35°C.

Measurement of the dissolved Oxygen

The body of the DO9709SS probe is in POM. The body of the DO9709SS.1 probe is in Epoxy. The body of the DO9709SM and DO9709SG probes is in ABS. The membrane is in PTFE.

During use, control the compatibility of these materials with the liquid that you want to measure.
The probe must be kept wet by using its protection.
Regularly check that no obstructions are present on the membrane.
Do not let hands touch the membrane.
During measurement, make sure the membrane is not coming into contact with objects that could tear it off.

Instrument Signals and Faults

The following table lists all error indications and information displayed by the instrument and supplied to the user in different operating situations:

Display indication	Explanation
pH ERROR	This message appears if the pH measurement exceeds the -2.000pH…19.999pH limits, if the mV measurement exceeds the ±2.4V limits.
mV ERROR	The measurement appears in mV, and exceeds the ±2.4V limits.
LOGGING DISABLED	Logging disabled. The logging interval is set to 0.
LOG MEM FULL	The memory is full, the instrument cannot store further data. The memory space reserved to continuous recording is full.
MEM MEMORY FULL	The memory is full, the instrument cannot store further data. The memory space reserved to single recording is full.
ERROR IN LOG MEMORY	Instrument management program error. Contact the instrument's supplier and communicate the error message.
PROBE ERROR	A probe with SICRAM module has been inserted when not admissible for that specific instrument.
SYS ERR #	Instrument management program error. Contact the instrument's supplier and communicate the numeric code # reported by the display.
CAL LOST	Program error: it appears after turning on for a few seconds. Contact the instrument's supplier.
CAL blinking	Calibration not completed correctly.
T_ERROR	The measurement limit of the temperature probe has been exceeded
OFS ERROR	The dissolved Oxygen probe is exhausted. See the paragraph “Calibration of the dissolved Oxygen probe”

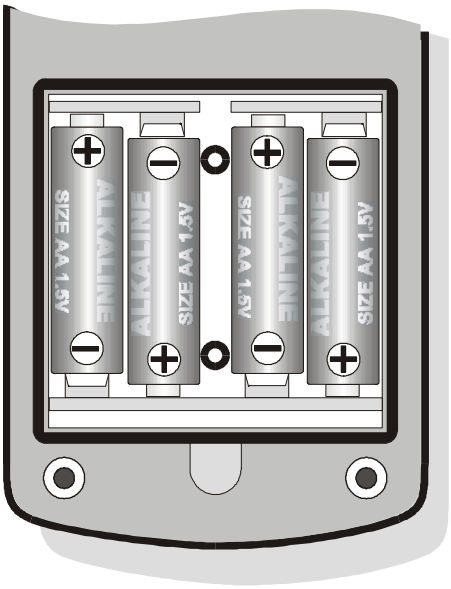
Battery symbol and battery replacement

The battery symbol 
on the display constantly shows the battery charge status. To the extent that batteries have discharged, the symbol "empties". When the charge decreases still further it starts blinking…

In this case, batteries should be replaced as soon as possible.
If you continue to use it, the instrument can no longer ensure correct measurement. Data stored on memory will remain.
The instrument does not turn on, if the battery charge level is insufficient.

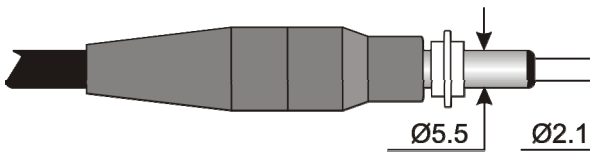
In order to avoid data loss, the logging session is ended, if the HD 98569 is logging and battery voltage falls below the minimum operating level.

To replace the batteries, switch the instrument off and unscrew the two screws on the battery cover counter clockwise. After replacing the batteries (4 1.5V alkaline batteries - type AA) fasten the cover's screws clockwise.



After replacing the batteries, the date and time must be checked.

The instrument can be powered by the mains using, for example, the stabilized power supply SWD10 input 100÷240 Vac output 12 Vdc – 1A.
The power supply positive (pole) must be connected to the central pin.



The external power supply connector has an external diameter of 5.5mm and an internal diameter of 2.1mm.
Warning: The power supply cannot be used as battery charger.
The battery symbol becomes [~] when the external power supply is connected.

MALFUNCTIONING UPON TURNING ON AFTER BATTERY REPLACEMENT

After replacing the batteries, the instrument may not restart correctly; in this case, repeat the operation. After disconnecting the batteries, wait a few minutes in order to allow circuit condensers to discharge completely; then reinsert the batteries.

WARNING ABOUT THE USE OF BATTERIES

- Batteries should be removed when the instrument is not used for an extended time.
- Flat batteries must be replaced immediately.
- Avoid loss of liquid from batteries.
- Use waterproof and good-quality batteries, if possible alkaline. Sometimes on the market, it is possible to find new batteries with an insufficient charge capacity.

Serial interface and USB

The instrument is provided with a multistandard serial port, electrically isolated, RS-232C and USB 2.0.
The connection to the RS232C serial port of the PC uses the cable **HD2110CSNM** with subD 9-pole female connector on one end and 8-pole MiniDin connector on the other end.
The connection to the USB port uses the cable **HD2101/USB** with USB type A connector on one end and 8-pole MiniDin connector on the other end. The USB connection requires the previous installation of a driver included in the DeltaLog11 software package. **Install the driver before connecting the USB cable to the PC** (follow the instructions included in the software package).

Standard parameters of the instrument serial transmission are:

- Baud rate 38400 baud
- Parity None
- N. bit 8
- Stop bit 1
- Protocol Xon/Xoff

It is possible to change the RS232C serial port baud rate by setting the "Baud Rate" parameter in the menu (please see page *14*). The possible values are: 38400, 19200, 9600, 4800, 1200. The other transmission parameters are fixed.
The USB 2.0 connection does not require the setting of parameters (Baud rate = 460800 fixed): **the selection of the port is carried out directly by the instrument.**

All the commands transferred to the instrument must have the following structure:
XXCR where: **XX** is the command code and **CR** is the Carriage Return (ASCII 0D)
The XX command characters are exclusively upper case characters. Once a correct command is entered, the instrument responds with "&"; when any wrong combination of characters is entered, the instrument responds with "?".
The instrument response strings end with the sending of the CR (Carriage Return) and LF (Line Feed) command, preceded by the "|" vertical bar character, that is, the combination "|CRLF".
Before sending commands to the instrument via the serial port, locking the keyboard to avoid functioning conflicts is recommended: Use the P0 command. When complete, restore the keyboard with the P1 command.

Reading the instrument parameters

COMMAND	*ACTION*	*RESPONSE*	*NOTES*
AA	Model request	HD 98569 pH/Chi/Oxy/temperature	
AG	Firmware version	Firmware 1.00.100	
AH	Firmware date	2006_01_31	
AS	Serial number	Ser. Number=00000000	
AU	User identification	User=FACTORY User=Administrator User=User_1 User=User_2 User=User_3 User=Anonymous	
AZ	Full heading	HD 98569 Vers. 1.00.100 2007/04/24 Ser. number=00000000 Calibrated 2007-01-01 00:01:00 Operator=Admin Communication interface=USB Temp. comp. mode=AUTO T Probe = Pt100	

COMMAND	*ACTION*	*RESPONSE*	*NOTES*
FA	Clock date request	060414092400	Current date “yy/mm/dd hh/mm/ss”, HEX format
FB	Clock date request	06-12-31 00:33:27	yy-mm-dd hh:mm:ss
FD	Instrument calibration date request	060414092400	Calibration date “yy/mm/dd hh/mm/ss”, HEX format
FE	Instrument calibration date request	06-12-31 00:33:27	yy-mm-dd hh:mm:ss
K1	Print current measurements	Same as manual print	It increases the ID
K2	pH calibration status	Same as manual print	
K4	pH calibration history	Same as manual print	
K6	Last conductivity calibration	Same as manual print	
K7	O_2 calibration history	Same as manual print	
LN	No. of next memory location request	Next avail. memory=0001	
RA	Read log interval	Print Interval= 000	
RE	Read current endpoint status	Endpoint mode = 0	
RF	Read parameter αT	Chi alfa = 2.00	
RH	Read pH electrode calibration expiration	pH cal exp.days = 0	
RI	Read parameter ID	Sample ID = 00000001	
RK	Read cell constant Kcell	Chi nominal Kcell = 0.700	
RL	Read parameter “Print and Storage Mode”	Print&mem = 0	0 = only print, 1 = print and record
RM	Read parameter “Storage Mode”	Memory mode = 0	0 = standard 1 = cyclic
RO	Read parameter “O_2 probe calibration expiration”	Oxy cal exp.days = 0	
RP	Read pH resolution	pH resolution = 1/1000	pH resolution: 1/100
RQ	Read salinity	Salinity = 11.1	g/l
RR	Read conductivity reference temperature	Chi ref temp= 25.00	
RS	Read conductivity TDS factor	Chi TDS factor= 0.500	
RT	Read temperature mode (ATC or MTC)	Temp_MODE = 0	0 = MTC 1 = ATC
RU	Read set units of measurement.	&0;0;1;0;	0 = pH , 1= mV 0 = micros, 1 = ohm, 2 = TDS, 3 = NaCl 0 = °C, 1 = °F 0 = sat% 1 = mg/l
SH	Read pH calibration status	pH calibration status = valid pH calibration status = expired!	
SO	Read O_2 calibration status	oxy calibration status = valid oxy calibration status = expired!	

Setting the instrument parameters

COMMAND	*ACTION*	*RESPONSE*	*NOTES*
DA	Input date-time	&/?	DA 2005/12/12 12:34:56 It rejects any incorrect date
LR	Setting of the displayed memory index	&/?	lr3 ---> shows memory no. 4

COMMAND	*ACTION*	*RESPONSE*	*NOTES*

Uxy	Setting of the displayed unit of measurement	x = 0...3 // pH, cond, temp, oxy
		y = see the RU codes	

WA	Setting log interval	&/?	0...999
WE	Setting Endpoint mode	&/?	0 = endpoint “dir” 1 = endpoint “man” 2 = endpoint “time” 3 = endpoint “auto”
WF	Setting temperature coefficient α_T	&/?	0...400 = 0.00 ... 4.00 %
WH	Setting pH calibration validity number of days.	&/?	0 ... 999
WI	Setting sample identification number	&/?	00000000 ... 99999999
WL	Setting print and storage mode	&/?	0 = only print, 1 = print and record
WM	Setting storage mode	&/?	0 = linear logging mode 1= cyclic logging mode (endless loop)
WO	Setting O_2 calibration validity number of days.	&/?	0 ... 999
WP	Setting pH Resolution	&/?	0 = 2 decimal positions 1 = 3 decimal positions
WQ	Setting salinity for O_2 measurement	&/?	0..700 = 0.0 70.0 g/l
WR	Setting conductivity reference temperature	&/?	0 ... 5000 = 0.00 50.00 °C
WS	Setting conductivity TDS factor	&/?	400 ... 800 = 0.400 ... 0.800
WT	Setting MTC temperature	&/?	-500 ... +1500 = -50...+150 °C

Activation of the instrument functions

COMMAND	*ACTION*	*RESPONSE*	*NOTES*
KE	Exit from memory mode	&	
KL	Activate log	&	
KM	Activate memory display mode	&	Not accepted if no data present in the memory
KQ	Stop log + save operating parameters	&	Use it also to only save the operating parameters
KS	Single line continuous printing	&	
KT	Stop single line printing	&	
LDxxxx	Memory dump no. xxxx+1	Dump or ?	
P0	Ping & lock keys	&	
P1	Ping & unlock keys	&	

Storing and Transferring Data to a PC

The HD 98569 instrument can be connected to a personal computer via an RS232C serial port or an USB port, and exchange data and information through the DeltaLog11 software (vers. 2.0 and later) running in a Windows operating environment (see the details on the previous chapter).
It is possible to print the measured values according to the label format (PRINT key) on a 24 column printer (e.g. HD40.1) or store them in the internal memory using the Logging function (MEM key): The label is as shown in the example on page *51*. The stored data can be recalled to be viewed directly on the instrument display, printed or transferred to the PC.
Using the LOG key, you can record continuously the acquired measurements by selecting a logging interval from one second to one hour.

THE RECORD FUNCTIONS

The instrument allows the recording of up to 9200 data pages in its internal memory. Each data is made of the measurements detected by the probes connected to the inputs in a given instant. The stored parameters are those shown on the display and selected using the **F1**, **F2** and **F3** keys.

Two different recording modes are available: one upon command and the other continuous.

Logging upon command

This function allows recording of the current screen and is managed by the **MEM** key. This mode has 200 memory pages for a total of 200 single records. By pressing MEM, the function keys perform the following:

- MEM >> **F1** = **STOR**: It stores the current screen.
- MEM >> **F2** = **CLR**: It clears the memory section reserved to the 200 single samples. It does not touch the continuous recording section (please see later, in this chapter). When pressing “F2 = CLR” you are prompted to confirm the erasure: Press “F3=YES” to erase, “F1=NO” to exit without erasing.
- MEM >> **F3** = **VIEW**: It displays the single screens in the memory. When you have selected a screen, you can print the label using the PRINT key. By pressing “F3 = VIEW”, the instrument shows the last recorded label. Move back and forward on the recorded screens using F1=PREV and F3=NEXT.

To return to standard measurement, press MEAS.

Continuous recording

This function memorizes the screens continuously according to an interval that can be set in the menu. The logging starts by pressing the **LOG** key and ends by pressing the same key again: the data memorized form a continuous block of data.

This mode has 1800 memory pages, 5 samples per page, for a total of 9000 samples.

The logging interval can be set from 0 to 999 seconds. To set it, open the menu “System Parameters >> Memory and Logging >> Log Interval”, (see the description of the menu items on page *13*). If the value 0 is set, the logging is disabled. The display will show “LOGGING DISABLED”.
The data stored in the memory can be transferred to a PC using the DeltaLog11 software (vers. 2.0 an later): please see the software HELP for the details.

To clear the memory (not the section reserved to single recording), use the Erase Log function (MENU >> System Parameters >> Memory and Logging >> Erase Log).
The window to confirm the operation will appear: “ERASE LOG ???”. Press ESC to cancel the operation, ENTER to confirm.
The instrument starts clearing the internal memory; at the end of the operation, it goes back to normal display.

NOTES:

- The data transfer carried out using the DeltaLog11 software does not cause the memory to be erased; the operation can be repeated as many times as required.
- The recorded data remain in the memory even if the instrument is turned off, if the recording was complete.
- **Memory clearing can be performed only by the administrator** (see page *18*).

THE PRINT FUNCTION

The PRINT key sends the data present on the display when the key is pressed directly to the RS232 and USB ports. The print data units of measurements are the same as those used on the display, as selected using the F1, F2 and F3 function keys.

To print a data contained in the memory section reserved to single records (logged using the MEM key), select the screen to be printed using MEM >> F3 = VIEW. Print the label using the PRINT key. For the details see the previous paragraph “Logging upon command”.

A 24 column printer with serial input can be connected to the MiniDin connector (e.g. the Delta Ohm 24 column printer HD40.1) using the HD2110CSNM cable.

NOTES:

- The print out performed using the PRINT key is formatted across 24 columns. The print out performed using the LOG key is formatted across 80 columns, therefore a standard printer is required.
- In order to print the data to a parallel interface printer, you must use a parallel-serial adaptor (not supplied).
- **The direct connection between instrument and printer via a USB port does not work.**

Example of a printout obtained using the ***HD40.1*** printer

	NOTES
HD 98569	*Instrument model*
pH / chi / Oxy / temperature	
Ser num=12345678	*Instrument serial number*
2007 – 01 - 31 12:00:00	*Current date and time in the format year-month-day hours:minutes:seconds*
LAB POSITION #1	*Denomination used for the instrument*
Operator = Administrator	*Operator (Administrator or User_1, User_2, User_3 or Anonymous)*
SAMPLE ID = 00000001	*Number of the sample*
pH EL sernum = 01234567	*Serial number of the pH electrode*
pH = 7.010	*pH measurement*
pH out of calibration !	*The calibration validity period has expired (otherwise the calibration date is shown)*
O_2 EL sernum = 76543210	*Serial number of the dissolved Oxygen probe*
mg/l O_2 = 5.59	*Measurement of the concentration of dissolved Oxygen*
chi EL sernum = 98756410	*Conductivity probe serial number*
mS = 2.177	*Conductivity measurement*
Temp = 25.0°C ATC	*Temperature measurement* *ATC = automatic compensation* *MTC = manual compensation*

Functioning Notes and Operating Safety

Authorized use

The instrument has been designed exclusively for laboratory measurements.
Comply with the technical specifications outlined in the chapter TECHNICAL DATA on page 55. Its use is authorized only in conformity with the instructions written in this manual. Any different use is considered improper.

General instructions on security

This instrument has been manufactured and tested according to safety regulation EN 61010-1:2010 concerning electronic measurement instruments and was delivered ex factory in perfect security conditions.
Its regular functioning and operating security can be ensured only if all the normal safety measures as well as the specifications described in this manual are complied with.
Its regular functioning and operating security is ensured only within the climatic conditions specified in the chapter TECHNICAL DATA on page 55.

If the instrument is moved from a cold to a hot environment, or vice versa, the condensation can disturb its functioning. You need to wait for the instrument to reach the environment temperature before using it.

User obligations

The user of the instrument must ensure that the following regulations and directives concerning the handling of hazardous materials are complied with:

- CEE directives on job safety
- National laws on job safety
- Accident prevention regulations
- Security data from the manufacturers of chemical substances.

HD22.2 Laboratory electrode holder with magnetic stirrer
HD22.3 Laboratory electrode holder

HD22.2

The HD22.2 is a laboratory electrode holder with an ultra slim magnetic stirrer. The height adjustable electrode holder supports two standard ∅ 12 mm electrodes. The stirring is performed by a small magnetic bar (not supplied) immersed in the liquid: The motion is generated by a rotary magnetic field controlled by microprocessor. There are no mechanically moving parts, therefore no maintenance is required.
The rotational speed can constantly be adjusted from 15 to 1500 rpm.
The HD22.2 has a modern and functional design. It is made of materials that resist to most chemical products: during use, control its compatibility.

Operation

- Insert the magnetic bar in the liquid container to be stirred.
- Power the stirrer by directly connecting the SWD10 power supply 12Vdc output (optional).
- Turn the instrument on with the key.
- Set the rotational speed to the minimum by holding the key, until the LED located between the and keys stops blinking.
- Now put the liquid container, at the center of the base.
- Set the desired rotational speed by pressing the and keys; during adjustment the LED located between the two keys is blinking.
- The key allows to invert the magnetic bar rotation. The lit LED between the and keys, indicates that the inversion function is on; the rotation direction is automatically inverted **every 30 seconds**.

The set speed and rotation direction remain in the memory also when the instrument is off. Upon power on, the rotation will progressively go back to the previously set speed.

Note: If a non circular rotational motion begins, due to irregularities in the bottom of the container or the magnetic bar, use the and keys to restore a circular motion.
The electrode holder height can be adjusted. To set the desired height, press the button and slide the electrode holder along the staff.

HD22.3

The HD22.3 is a laboratory staff and electrode holder. Its height and depth can be adjusted. It can hold up to 5 standard ∅ 12 mm electrodes. The solid, fire-coated metal base, ensures stability even with 5 electrodes. The staff is fitted with hooks for cables and electrodes.

Technical Information

	HD22.2	***HD22.3***
Power	*12Vdc, 200mA*	*---*
Stirring speed	*15…1500 rpm*	*---*
Stirring capacity	*Max. 1000 ml*	*---*
Stirring magnetic bar	*L = 30…40 mm, depending on the application*	*---*
Material	*Body ABS; staff AISI 304*	*Body ABS; base Fe 360*
Painting	*---*	*Nickel plated and powder-coated*
Weight	*1150g*	*1900g*
Bearing surface	*∅ 100 mm*	*---*
Dimensions	*Base: 215x145x25 mm Staff: height 380 mm*	*Height max. 450 mm.*
Environment temperature, % RH	*0…50 °C, max. 85% RH without condensation*	
No. of housings for the electrodes	*Up to four ∅ 12 mm electrodes and one ∅ 4.5 mm breakable to ∅ 12 mm*	
Protection degree	*IP65*	

HD22.2

HD22.3

HD 98569 Technical characteristics

Measured quantities	pH - mV χ - Ω - TDS - NaCl mg/l O_2 - $\%O_2$ °C - °F
Instrument	
Dimensions (Length x Width x Height)	250x100x50mm
Weight	640g (batteries included)
Materials	ABS, rubber
Display	Graphic, backlit display, 56x38 mm. 128x64 points.
Operating conditions	
Operating temperature	-5 … 50°C
Warehouse temperature	-25 … 65°C
Working relative humidity	0 … 90% RH without condensation
Protection degree	**IP66**
Power	
Batteries	4 1.5V type AA batteries
Autonomy (when the probes are connected)	25 hours with 1800mAh alkaline batteries
Mains adapter (code SWD10)	12Vdc/1A (positive at centre)
Security of stored data	Unlimited
Time	
Date and time	Real time
Accuracy	1min/month max drift
Continuous recording (LOG key)	
Quantity	9000 samples from the three inputs
Type	In 1800 pages containing 5 samples each
Storage interval	1s … 999s
Logging upon command (MEM key)	
Quantity	200 samples from the three inputs
Type	In 200 pages containing 1 sample each
Storage of calibrations	
pH and dissolved Oxygen	Last 8 pH and dissolved Oxygen calibrations. The last 2 calibrations are stored in the probe's SICRAM memory.
Conductivity	The last calibration is stored in the probe's SICRAM memory.
RS232C serial interface	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1

Flow Control	Xon/Xoff
Serial cable length	Max. 15 m
USB interface	
Type	1.1 - 2.0 electrically isolated
Connections	
Enabled inputs for temperature probes with SICRAM module	pH/mV and O_2 inputs.
pH/temperature input with SICRAM module	8-pole male DIN45326 connector
Conductivity/temperature input with SICRAM module	8-pole male DIN45326 connector
Dissolved Oxygen/temperature input with SICRAM module	8-pole male DIN45326 connector
Serial interface RS232C/USB	8-pole female MiniDIN connector
Mains power supply	2-pole connector (Ø5.5mm - Ø2.1mm). Positive at centre (e.g. SWD10).

- *Measurement of pH by Instrument*

Measurement range	-9,999…+19.999pH
Resolution	0.01 or 0.001pH selectable from menu
Instrument accuracy	±0.001pH ±1digit
Input impedance	$>10^{12}\Omega$
Calibration error @25°C	|Offset| > 20mV Slope > 63mV/pH or slope < 50mV/pH Sensitivity > 106.5% or sensitivity < 85%
Calibration points	Up to 5 points selected among 8 automatically detected buffer solutions
Temperature compensation	-50...150°C
Standard solutions detected automatically @25°C	1.679pH - 4.000pH - 4.010pH 6.860pH - 7.000pH - 7.648pH 9.180pH - 10.010pH

Measurement of mV by Instrument

Measurement range	-1999.9 … +1999.9mV
Resolution	0.1mV
Instrument accuracy	±0.1mV ±1digit
Drift after 1 year	0.5mV/year

- *Measurement of conductivity by Instrument*

		Resolution
Measurement range (Kcell=0.01)	0.000…1.999µS/cm	0.001µS/cm
Measurement range (Kcell=0.1)	0.00…19.99µS/cm	0.01µS/cm
Measurement range (Kcell=1)	0.0…199.9µS/cm	0.1µS/cm
	200…1999µS/cm	1µS/cm
	2.00…19.99mS/cm	0.01mS/cm
	20.0…199.9mS/cm	0.1mS/cm
Measurement range (Kcell=10)	200…1999mS/cm	1mS/cm
Instrument accuracy (conductivity)	±0.5% ±1digit	

Measurement of resistivity by Instrument		*Resolution*
Measurement range (Kcell=0.01)	Up to 1GΩ·cm	(∗)
Measurement range (Kcell=0.1)	Up to 100MΩ cm	(*****)
Measurement range (Kcell=1)	5.0…199.9Ω·cm	0.1Ω·cm
	200…999Ω·cm	1Ω·cm
	1.00k…19.99kΩ·cm	0.01kΩ·cm
	20.0k…99.9kΩ·cm	0.1kΩ·cm
	100k…999kΩ·cm	1kΩ·cm
	1…10MΩ·cm	1MΩ·cm
Measurement range (Kcell=10)	0.5…5.0Ω·cm	0.1Ω·cm
Instrument accuracy (resistivity)	±0.5% ±1digit	

Measurement of total dissolved solids (with coefficient χ/TDS=0.5)		*Resolution*
Measurement range (Kcell=0.01)	0.00…1.999mg/l	0.005mg/l
Measurement range (Kcell=0.1)	0.00…19.99mg/l	0.05mg/l
Measurement range (Kcell=1)	0.0…199.9 mg/l	0.5 mg/l
	200…1999 mg/l	1 mg/l
	2.00…19.99 g/l	0.01 g/l
	20.0…199.9 g/l	0.1 g/l
Measurement range (Kcell=10)	100…999 g/l	1 g/l
Instrument accuracy (total dissolved solids)	±0.5% ±1digit	

Measurement of salinity		*Resolution*
Measurement range	0.000…1.999g/l	1mg/l
	2.00…19.99g/l	10mg/l
	20.0…199.9 g/l	0.1 g/l
Instrument accuracy (salinity)	±0.5% ±1digit	

(∗) The resistivity measurement is defined as the reciprocal of conductivity: the resistivity indication, near bottom scale, will appear as in the following table.

K cell = 0.01 cm^{-1}	
Conductivity (µS/cm)	Resistivity (MΩ·cm)
0.001 µS/cm	1000 MΩ·cm
0.002 µS/cm	500 MΩ·cm
0.003 µS/cm	333 MΩ·cm
0.004 µS/cm	250 MΩ·cm
…	…

K cell = 0.1 cm^{-1}	
Conductivity (µS/cm)	Resistivity (MΩ·cm)
0.01 µS/cm	100 MΩ·cm
0.02 µS/cm	50 MΩ·cm
0.03 µS/cm	33 MΩ·cm
0.04 µS/cm	25 MΩ·cm
…	…

Automatic/manual temperature compensation	0...100°C with α_T = 0.00…4.00%/°C
Reference temperature	0…50°C (**default 20°C or 25°C**)
χ/TDS conversion factor	0.4…0.8
Allowed cell constant K (cm^{-1})	0.01…20.00
Standard solutions automatically detected (@25°C)	
	147μS/cm
	1413μS/cm
	12880μS/cm
	111800μS/cm

- *Measurement of the concentration of dissolved Oxygen*

Measurement range	0.00…90.00mg/l
Resolution	0.01mg/l
Instrument accuracy	±0.03mg/l ±1digit (60...110%, 1013mbar, 20...25°C)

Measurement of the saturation index of dissolved Oxygen

Measurement range	0.0…600.0%
Resolution	0.1%
Instrument accuracy	±0.3% ±1digit (in the range 0.0…199.9%)
	±1% ±1digit (in the range 200.0…600.0%)

Setting the salinity

Setting	Direct in the menu, or automatic by conductivity measurement
Measurement range	0.0…70.0g/l
Resolution	0.1g/l

Temperature measurement with the sensor inside the O_2 probe

Measurement range	0.0…45.0°C
Resolution	0.1°C
Instrument accuracy	±0.1°C
Drift after 1 year	0.1°C/year
Automatic temperature compensation	0…50°C

- *Measurement of temperature by Instrument*

Pt100 measurement range	-50…+150°C
Resolution	0.1°C
Instrument accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year

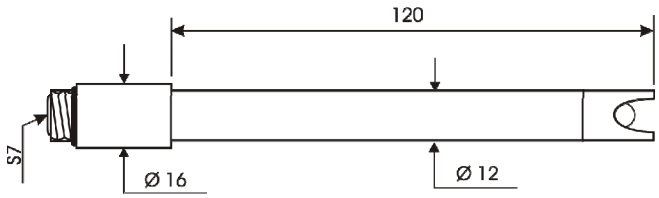
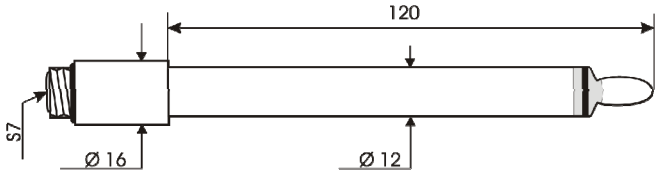
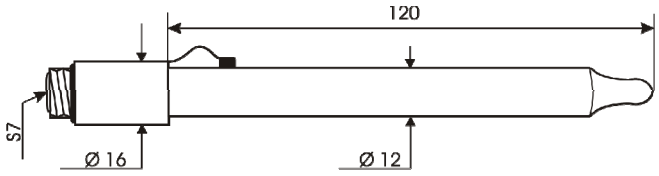
Technical data in line probes for the HD 98569 instrument

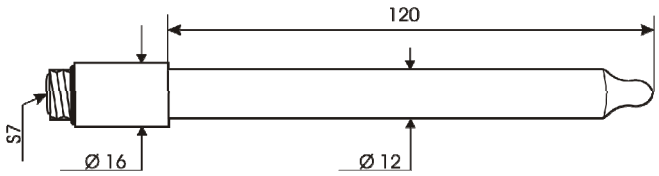
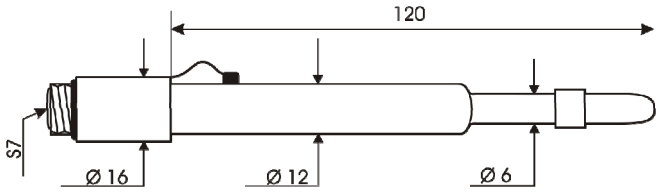
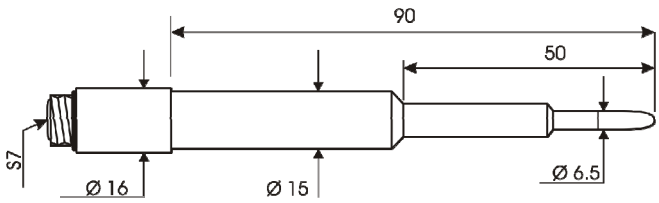
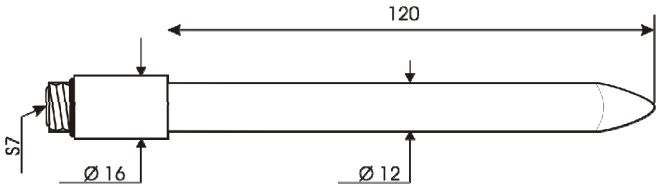
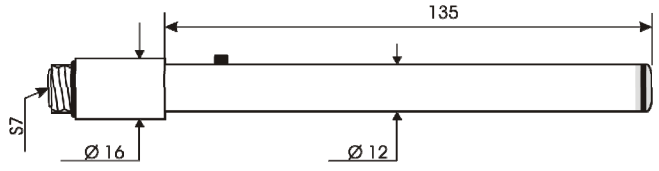
pH / mV

SICRAM KP471 module to connect the pH electrodes and the S7 connector

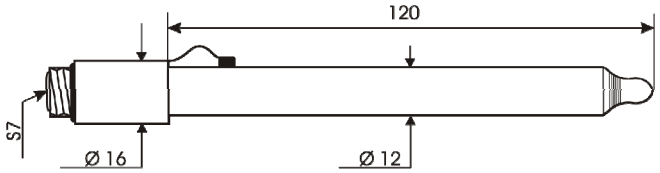
KP471...	Please see the technical characteristics of the electrode connected to the module. Cable length: KP471.1 1m KP471.2 2m KP471.5 5m	

pH electrodes to be connected to the KP471 SICRAM module

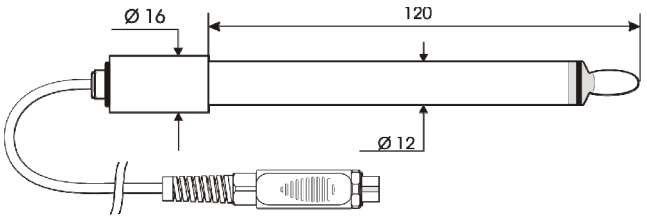
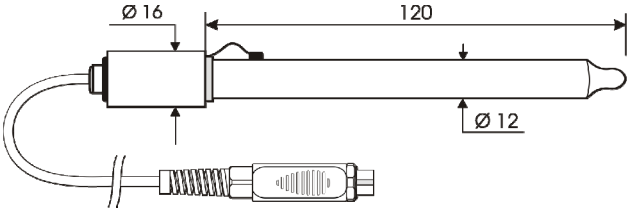
ORDER CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
KP20	0…14pH / 0…80°C / 3bar Body in glass - GEL 1 diaphragm in ceramic Waste water, drinking water, colours, aqueous emulsions, electroplating waters, fruit-juices, stock waters, titration, varnishes.	
KP50	0…14pH / 0…80°C / 3bar Body in glass - GEL 1 Teflon ring diaphragm Varnishes, cosmetics, aqueous emulsions, electroplating waters, creams, deionised water, TRIS buffer, drinking water, stock waters, fruit-juices, low ionic content solutions, mayonnaise, preserved foods, colours, titration, titration in non water solutions, stock waters, soaps, waste water, viscous samples.	
KP61	2…14pH / 0…80°C / 3bar Body in glass Liquid reference 3 diaphragms in ceramic Waste water, dough, bread, fruit-juices, varnishes, cosmetics, creams, deionised water, drinking water, aqueous emulsions, electroplating waters, soaps, yogurt, milk, titration, titration in non water solutions, stock waters, mayonnaise, wine, low ionic content solutions, butter, protein samples, colours, viscous samples.	

ORDER CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
KP62	0…14pH / 0…80°C / 3bar Body in glass - GEL 1 diaphragm in ceramic Colours, varnishes, drinking water, aqueous emulsions, fruit-juices, electroplating waters, stock waters, titration, waste water.	
KP64	0…14pH / 0…80°C / 0.1bar Body in glass Liquid reference KCl 3M Teflon ring diaphragm Colours, varnishes, cosmetics, creams, deionised water, drinking water, aqueous emulsions, fruit-juices, soaps, low ionic content solutions, preserved foods, stock waters, titration, titration in non water solutions, TRIS buffer, waste water, viscous samples, wine.	
KP70	2…14pH / 0…50°C / 0.1bar Body in epoxy - GEL 1 open hole Dough, bread, colours, varnishes, cosmetics, creams, drinking water, aqueous emulsions, fruit-juices, electroplating waters, soaps, mayonnaise, preserved foods, cheese, milk, stock waters, viscous samples, waste water, butter, yogurt.	
KP80	2…14pH / 0…60°C / 1bar Body in glass - GEL 1 open hole Dough, bread, colours, varnishes, cosmetics, creams, drinking water, aqueous emulsions, fruit-juices, electroplating waters, soaps, mayonnaise, preserved foods, stock waters, titration, titration in non water solutions, viscous samples, waste water, yogurt, milk, butter.	
KP100	0…14pH / 0…80°C / 1bar Body in glass - Liquid reference KCl 3M 1 Teflon ring diaphragm For leather, paper.	

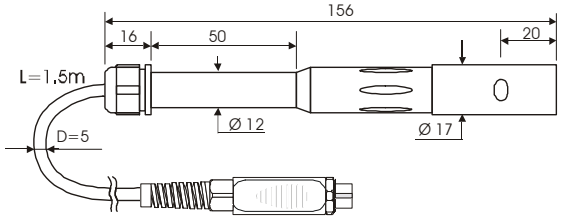
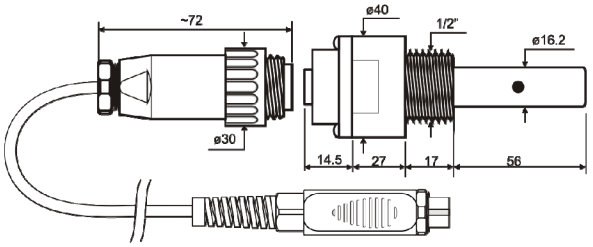
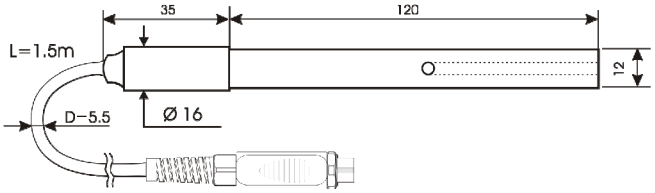
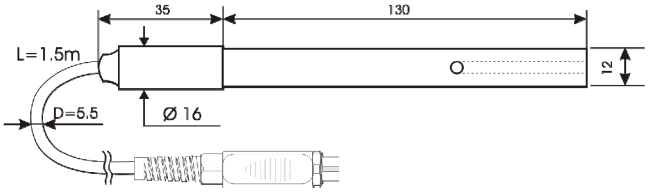
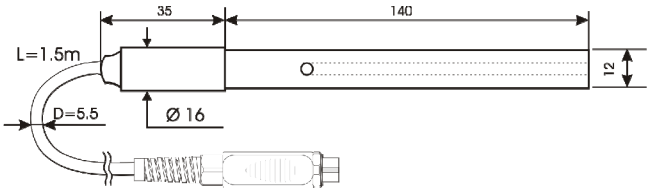
Redox electrode to be connected to the KP471 SICRAM module

ORDER CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
KP90	±2000mV 0…80°C 5bar Body in glass Liquid reference KCl 3M General use.	

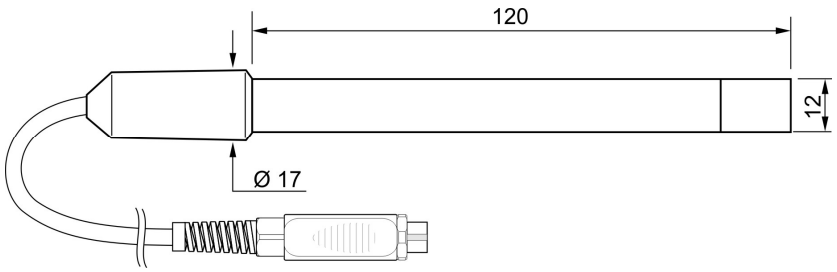
pH electrodes complete with SICRAM module

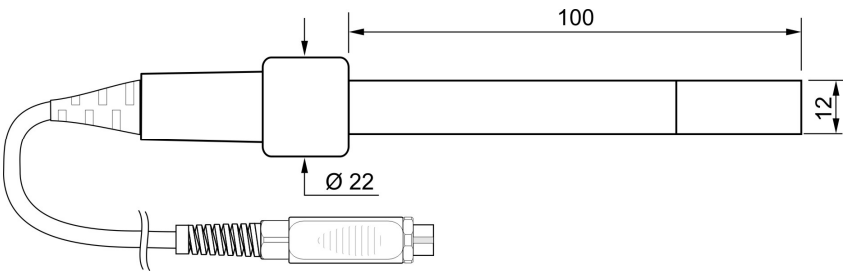
CODICE DI ORDINAZIONE	CAMPO DI MISURA ED IMPIEGO	DIMENSIONI
KP50TS	0…14pH / 0…80°C / 3bar Body in glass - GEL 1 Teflon ring diaphragm Cable L = 1m Varnishes, cosmetics, aqueous emulsions, electroplating waters, creams, deionised water, TRIS buffer, drinking water, fruit-juices, low ionic content solutions, mayonnaise, preserved foods, colours, titration, titration in non water solutions, stock waters, soaps, waste water, viscous samples.	
KP63TS	0…14pH / 0…80°C / 1bar Body in glass. Pt100 sensor Liquid reference KCl 3M 1 diaphragm in ceramic Cable L = 1m Colours, varnishes, drinking water, aqueous emulsions, fruit-juices, electroplating waters, stock waters, titration, waste water.	

Conductivity probes with SICRAM module

ORDER CODE	MEASUREMENT RANGE AND USE	DIMENSIONS
SP06TS	K=0.7 5µS/cm …20mS/cm 0…90°C 4-electrode cell in Platinum Pocan probe material General use Not heavy duty Pt100 sensor	
SPT401.001S	K=0.01 0.04µS/cm …20µS/cm 0…120°C 2-electrode cell AISI 316 Ultra pure water **Closed-cell measurement** Pt100 sensor Cable length 2m.	
SPT01GS	K=0.1 0.1µS/cm …500µS/cm 0…80°C 2-electrode cell in Platinum wire Glass probe material Pure water Pt100 sensor	
SPT1GS	K=1 10µS/cm …10mS/cm 0…80°C 2-electrode cell in Platinum wire Glass probe material General heavy duty use, medium conductivity Pt100 sensor	
SPT10GS	K=10 500µS/cm …200mS/cm 0…80°C 2-electrode cell in Platinum wire Glass probe material General heavy duty use, high conductivity Pt100 sensor	

DISSOLVED OXYGEN PROBES FOR HD 98569

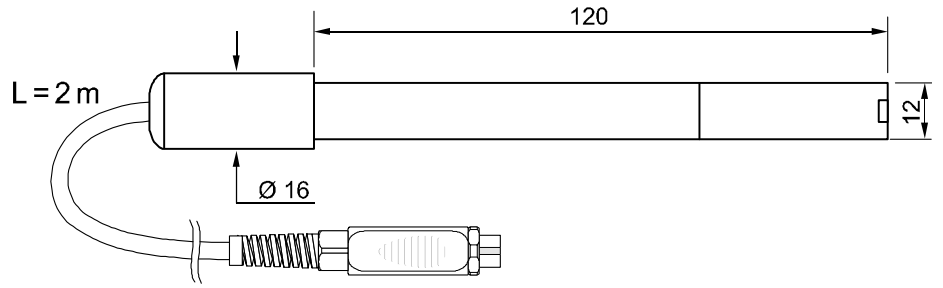
Model	**DO9709 SM**	**DO9709 SM.5**
Type	Polarographic probe: Ag/AgCl anode, Platinum cathode	
O_2 measuring range	0…40 mg/l; 0…400% air saturation	
Temperature measuring range	-5…45 °C	
Temperature sensor	Pt1000	
Accuracy	± 1% f.s.	
Response time in N_2	t_{90} < 30 s	
Flow rate	> 9 cm/s	
Minimum immersion depth	30 mm	
Membrane	Replaceable	
Cable length	2 m	5 m
Dimensions		

Model	**DO9709 SG**	**DO9709 SG.4**
Type	Galvanic probe: Lead anode, Platinum cathode	
O_2 measuring range	0…60 mg/l; 0…600% air saturation	
Temperature measuring range	-5…50 °C	
Temperature sensor	NTC	
Accuracy	± 2% f.s.	
Response time	90% in 10 s (changes with temperature)	
Flow rate	> 20 cm/s	
Life time	≥ 3 years (depending on application and maintenance)	
Maximum pressure	3 bar	
Operating temperature	0…+40 °C	
Storage temperature	0…+60 °C	
Membrane	Replaceable	
Cable length	2 m	4 m
Dimensions		

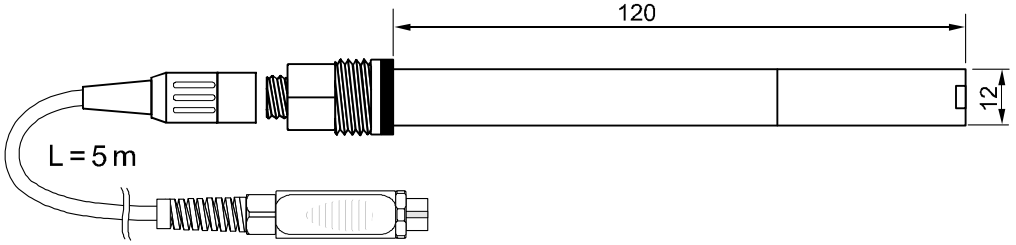
Model	**DO9709 SS**	**DO9709 SS.5**	**DO9709 SS.1**	**DO9709 SS.5.1**
Type	Polarographic probe, Silver anode, Platinum cathode		Galvanic probe, Zinc anode, Silver cathode	
Range O_2	0.00…60.00mg/l		0.00…20.00mg/l	
Operating temperature	0…45°C		0…50°C	
Accuracy	±1% f.s.		±2% f.s.	
Membrane	Replaceable		Replaceable	
Cable length	2 m	5 m (*)	1.6 m	5 m (*)

(*) Cable with connector

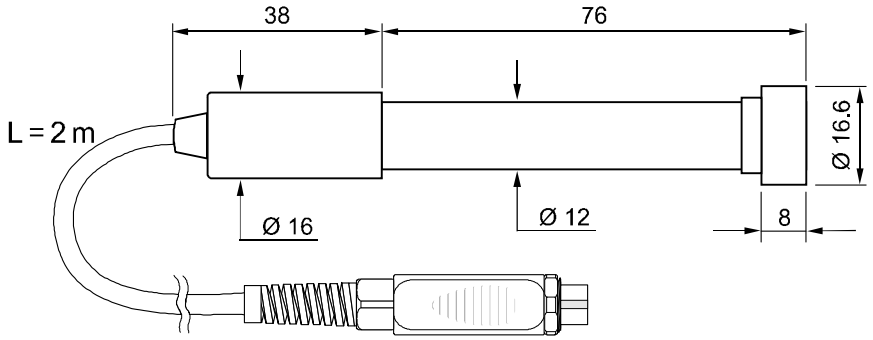
DO9709SS



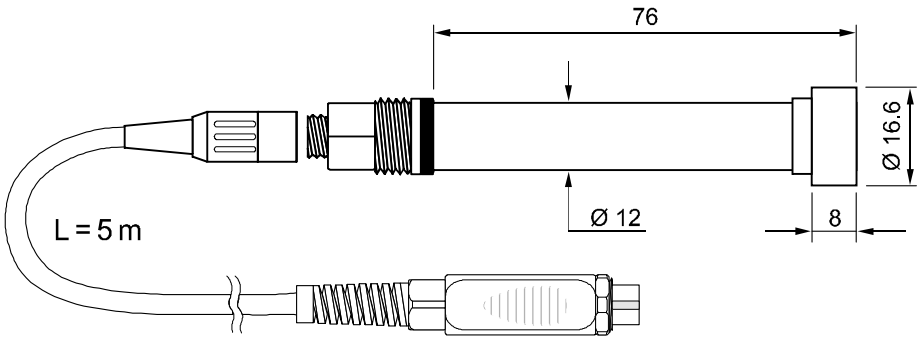
DO9709SS.5



DO9709SS.1



DO9709SS.5.1



TEMPERATURE PROBES Pt100 USING SICRAM MODULE

Model	Type	Application range	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 1/3 DIN – Thin Film	Immersion	-50°C…+300°C	±0.25°C
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP473P.0 1/3 DIN - Thin Film	Penetration	-50°C…+300°C	±0.25°C
TP474C.0 1/3 DIN - Thin Film	Contact	-50°C…+300°C	±0.3°C
TP475A.0 1/3 DIN - Thin Film	Air	-50°C…+250°C	±0.3°C
TP472I.5	Immersion	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Immersion	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.I Class A	Immersion	-70°C…+250°C	±0.25°C
TP49AC.I Class A	Contact	-70°C…+250°C	±0.25°C
TP49AP.I Class A	Penetration	-70°C…+250°C	±0.25°C
TP875.I	Globe-thermometer Ø 150 mm	-30°C…+120°C	±0.25°C
TP876.I	Globe-thermometer Ø 50 mm	-30°C…+120°C	±0.25°C
TP87.O 1/3 DIN - Thin Film	Immersion	-50°C…+200°C	±0.25°C
TP878.O 1/3 DIN - Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP878.1.O 1/3 DIN - Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP879.O 1/3 DIN - Thin Film	Compost	-20°C…+120°C	±0.25°C

Temperature drift @ 20°C 0.003%/°C

Order codes

HD 98569 The kit is composed of the HD 98569 datalogger instrument for pH - redox - conductivity - resistivity - TDS - salinity - dissolved Oxygen concentration - saturation index - temperature measurements, 4 1.5V type AA batteries, operating manual, case and DeltaLog11 software (downloadable from Delta OHM website), case and SICRAM pH471.1 module (cable 1 meter).

The pH/mV electrodes, conductivity probes, dissolved oxygen probes, temperature probes, standard reference solutions for different measurement types, serial and USB connection cables for data download to PC or printer have to be ordered separately.

HD2110CSNM 8-pole MiniDin - Sub D 9-pole female connection cable for PC and printer with RS232C input.

HD2101/USB Connection cable USB 2.0 connector type A - 8-pole MiniDin, for PC with USB input.

DeltaLog11 CD-ROM of DeltaLog11 software for download and management of the data on PC. For Windows (from 98) operating systems.

SWD10 Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.

HD40.1 The kit includes: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls.

BAT.40 Spare battery pack for HD40.1 printer with in-built temperature sensor.

RCT The kit includes 4 thermal paper rolls 57mm wide and 32mm in diameter.

HD22.2 Laboratory electrode holder composed of basis plate with incorporated magnetic stirrer, staff and replaceable electrode holder. Height max. 380mm. For ∅12mm electrodes.

HD22.3 Laboratory electrode holder with metal base. Electrode holder with flexible arm for free positioning. For ∅12mm electrodes.

SICRAM module with S7 input for pH electrodes

KP471.1 SICRAM module for pH electrode with standard S7 connection, cable L=1m.

KP471.2 SICRAM module for pH electrode with standard S7 connection, cable L=2m.

KP471.5 SICRAM module for pH electrode with standard S7 connection, cable L=5m.

pH electrodes to be connected to the KP471 SICRAM module

KP20 Combined general use pH electrode, gel-filled, with screw connector S7, body in Epoxy.

KP 50 Combined pH electrode for general use, varnishes, emulsions, gel-filled, with screw connector S7, body in glass.

KP 61 Combined pH electrode, 3 diaphragms for milk, cream, etc. with screw connector S7, body in glass.

KP62 Combined pH electrode, 1 diaphragm for pure water, paints, etc. gel-filled, with screw connector S7, body in glass.

KP 64 Combined pH electrode for water, varnishes, emulsions, etc. with screw connector S7, KCl 3M electrolyte, body in glass.

KP70 Combined pH electrode, micro Ø 6.5mm, gel-filled, for milk, bread, cheese, etc. with screw connector S7, body in glass.

KP80 Combined pointed pH electrode, gel-filled, with screw connector S7, body in glass.

KP 100 Combined pointed pH electrode, flat membrane, liquid reference, with screw connector S7, body in glass, for leather, paper.

ORP ELECTRODES TO BE CONNECTED TO THE KP471 SICRAM MODULE

KP90 REDOX PLATINUM electrode for general use, with screw connector S7, KCl 3M electrolyte, body in glass.

pH ELECTRODE WITH SICRAM MODULE

KP 50TS Combined pH/temperature electrode, gel-filled, with SICRAM module, body in glass, for general use, Pt100 sensor, for varnishes, emulsions. Cable length 1m.

KP63TS Combined pH/temperature electrode, Pt100 sensor, with SICRAM module, body in glass, Ag/AgCl sat KCl.

pH STANDARD SOLUTIONS

HD8642 Buffer solution 4.01pH - 200cc.

HD8672 Buffer solution 6.86pH - 200cc.

HD8692 Buffer solution 9.18pH - 200cc.

REDOX STANDARD SOLUTIONS

HDR220 Redox buffer solution 220mV 0.5 l.

HDR468 Redox buffer solution 468mV 0.5 l.

ELECTROLYTE SOLUTIONS

KCL 3M 50ml ready solution for electrode refilling.

MAINTENANCE AND CLEANING

HD62PT Diaphragm cleaning solution (Tiourea in HCl) – 200ml.

HD62PP Diaphragm cleaning solution (Pepsina in HCl) – 200ml.

HD62RF Electrode regeneration solution (Fluorhydric Acid) – 100ml.

HD62SC Electrode preservation solution – 200ml.

COMBINED CONDUCTIVITY AND TEMPERATURE PROBES USING SICRAM MODULE

SP06TS Conductivity/temperature combined probe, 4-electrode cell in Platinum, body in Pocan. Cell constant K=0.7. Measuring range 5μS/cm …20mS/cm, 0…90°C.

SPT401.001S Conductivity/temperature combined probe, 2-electrode cell in AISI 316 steel. Cell constant K=0.01. Cable length 2m.
Measuring range 0.04μS/cm …20μS/cm, 0…120°C. Closed-cell measurement.

SPT01GS Conductivity/temperature combined probe 2-electrode cell in Platinum wire, body in glass. Cell constant K=0.1. Measuring range 0.1µS/cm …500µS/cm, 0…80°C.

SPT1GS Conductivity/temperature combined probe 2-electrode cell in Platinum wire, body in glass. Cell constant K=1. Measuring range 10µS/cm …10mS/cm, 0…80°C.

SPT10GS Conductivity/temperature combined probe 2-electrode cell in Platinum wire, body in glass. Cell constant K=10. Measuring range 500µS/cm …200mS/cm, 0…80°C.

STANDARD CONDUCTIVITY CALIBRATION SOLUTIONS

HD8747 Standard calibration solution 0.001 mol/l equal to 147µS/cm @25°C - 200cc.

HD8714 Standard calibration solution 0.01 mol/l equal to 1413µS/cm @25°C - 200cc.

HD8712 Standard calibration solution 0.1 mol/l equal to 12880µS/cm @25°C - 200cc.

HD87111 Standard calibration solution 1 mol/l equal to 111800µS/cm @25°C - 200cc.

COMBINED DISSOLVED OXYGEN/TEMPERATURE PROBES

DO9709 SM **Polarographic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: probe, one spare membrane, zero solution, electrolyte solution and DO9709/20 calibrator. Cable length 2 m. Dimensions Ø 12 mm x 120 mm.

DO9709 SM.5 **Polarographic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: probe, one spare membrane, zero solution, electrolyte solution and DO9709/20 calibrator. Cable length 5 m. Dimensions Ø 12 mm x 120 mm.

DO9709 SG **Galvanic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: probe, one spare membrane, zero solution, electrolyte solution and DO9709/20 calibrator. Cable length 2 m. Dimensions Ø 12 mm x 100 mm.

DO9709 SG.4 **Galvanic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: probe, one spare membrane, zero solution, electrolyte solution and DO9709/20 calibrator. Cable length 4 m. Dimensions Ø 12 mm x 100 mm.

DO9709 SS **Polarographic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: probe, two membranes, zero solution, electrolyte solution and DO9709/20 calibrator. Cable length 2 m. Dimensions Ø 12 mm x 120 mm.

DO9709 SS.5 **Polarographic** combined probe for measurement of O_2 and temperature with connector, replaceable membrane. The kit includes: probe, two membranes, zero solution, electrolyte solution and DO9709/20 calibrator. Cable length 5 m. Dimensions Ø 12 mm x 120 mm.

DO9709 SS.1 **Galvanic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: probe, two membranes in total, zero solution, electrolyte solution and DO9709/21 calibrator. Cable length 1.6 m. Dimensions Ø 12 mm x 76 mm. Membrane holder Ø 16 mm.

DO9709 SS.5.1 **Galvanic** combined probe for measurement of O_2 and temperature with connector, replaceable membrane. The kit includes: probe, two membranes in total, zero solution, electrolyte solution and DO9709/21 calibrator. Cable length 5 m. Dimensions Ø 12 mm x 76 mm. Membrane holder Ø 16 mm.

ACCESSORIES FOR THE COMBINED DISSOLVED OXYGEN PROBES

DO9709 SMK	Accessories kit for the DO9709 SM and DO9709 SM.5 probes consisting of one membrane, zero solution, 50 ml electrolyte solution.
DO9701M	50 ml electrolyte solution for DO9709 SM and DO9709 SM.5 polarographic probes.
DO9709 SGK	Accessories kit for the DO9709 SG and DO9709 SG.4 probes consisting of one membrane, zero solution, 100 ml electrolyte solution.
DO9701G	100 ml electrolyte solution for DO9709 SG and DO9709 SG.4 galvanic probes.
DO9709 SSK	Accessories kit for the DO9709 SS and DO9709 SS.5 probes consisting of three membranes, zero solution, electrolyte solution.
DO9701	Electrolyte solution for DO9709 SS and DO9709 SS.5 polarographic probes.
DO9709/21K	Accessories kit for the DO9709 SS.1 and DO9709 SS.5.1 galvanic probes consisting of three membranes, zero solution, electrolyte solution.
DO9701.1	Electrolyte solution for DO9709 SS.1 and DO9709 SS.5.1 galvanic probes.
DO9709/20	Calibrator for DO9709 SS, DO9709 SS.5, DO9709 SM, DO9709 SM.5 polarographic probes and DO9709 SG, DO9709 SG.4 galvanic probes.
DO9709/21	Calibrator for DO9709 SS.1 and DO9709 SS.5.1 galvanic probes.
DO9700	Zero oxygen solution.

TEMPERATURE PROBES COMPLETE WITH SICRAM MODULE

TP472I	Immersion probe, sensor Pt100. Stem Ø 3 mm, length 300 mm. Cable length 2 metres.
TP472I.0	Immersion probe, sensor Pt100. Stem Ø 3 mm, length 230 mm. Cable length 2 metres.
TP473P.I	Penetration probe, sensor Pt100. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
TP473P.0	Penetration probe, sensor Pt100. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
TP474C.0	Contact probe, sensor Pt100. Stem Ø 4 mm, length 230 mm, contact surface Ø 5 mm. Cable length 2 metres.
TP475A.0	Air probe, sensor Pt100. Stem Ø 4 mm, length 230 mm. Cable length 2 metres.
TP472I.5	Immersion probe, sensor Pt100. Stem Ø 6 mm, length 500 mm. Cable length 2 metres.
TP472I.10	Immersion probe, sensor Pt100. Stem Ø 6 mm, length 1000 mm. Cable length 2 metres.
TP49A.I	Immersion probe, sensor Pt100. Stem Ø 2.7 mm, length 150 mm. Cable length 2 metres. Aluminium handle.
TP49AC.I	Contact probe, sensor Pt100. Stem Ø 4 mm, length 150 mm. Cable length 2 metres. Aluminium handle.
TP49AP.I	Penetration probe, sensor Pt100. Stem Ø 2.7 mm, length 150 mm. Cable length 2 metres. Aluminium handle.
TP875.I	Globe-thermometer Ø 150 mm with handle. Cable length 2 metres.

TP876.I	Globe-thermometer Ø 50 mm with handle. Cable length 2 metres.
TP87.O	Immersion probe, sensor Pt100. Stem Ø 3 mm, length 70 mm. Cable length 2 metres.
TP878.O	Contact probe for solar panels. Cable length 2 metres.
TP878.1.O	Contact probe for solar panels. Cable length 5 metres.
TP879.O	Penetration probe for compost. Stem Ø 8 mm, length 1 metre. Cable length 2 metres.

DELTA OHM metrology laboratories LAT N° 124 are ISO/IEC 17025 accredited by ACCREDIA for Temperature, Humidity, Pressure, Photometry / Radiometry, Acoustics and Air Velocity. They can supply calibration certificates for the accredited quantities.

Member of GHM GROUP

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EU DECLARATION OF CONFORMITY

Delta Ohm S.r.L. a socio unico – Via Marconi 5 – 35030 Caselle di Selvazzano – Padova – ITALY

Documento Nr. / Mese.Anno:
Document-No. / Month.Year : **5104 / 04.2018**

Si dichiara con la presente, in qualità di produttore e sotto la propria responsabilità esclusiva, che i seguenti prodotti sono conformi ai requisiti di protezione definiti nelle direttive del Consiglio Europeo:
We declare as manufacturer herewith under our sole responsibility that the following products are in compliance with the protection requirements defined in the European Council directives:

Codice prodotto:
Product identifier : **HD98569**

Descrizione prodotto:
Product description : **Strumento multiparametro portatile – datalogger**
Portable multiparameter instrument – data logger

I prodotti sono conformi alle seguenti Direttive Europee:
The products conform to following European Directives:

Direttive / *Directives*	
2014/30/EU	Direttiva EMC / *EMC Directive*
2014/35/EU	Direttiva bassa tensione / *Low Voltage Directive*
2011/65/EU	RoHS / *RoHS*

Norme armonizzate applicate o riferimento a specifiche tecniche:
Applied harmonized standards or mentioned technical specifications:

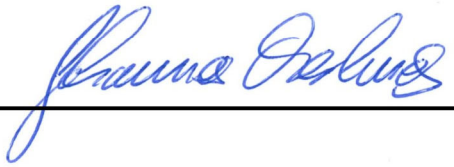
Norme armonizzate / *Harmonized standards*	
EN 61010-1:2010	Requisiti di sicurezza elettrica / *Electrical safety requirements*
EN 61326-1:2013	Requisiti EMC / *EMC requirements*
EN 50581:2012	RoHS / *RoHS*

Il produttore è responsabile per la dichiarazione rilasciata da:
The manufacturer is responsible for the declaration released by:

Johannes Overhues

Amministratore delegato
Chief Executive Officer

Caselle di Selvazzano, 20/04/2018



Questa dichiarazione certifica l'accordo con la legislazione armonizzata menzionata, non costituisce tuttavia garanzia delle caratteristiche.
This declaration certifies the agreement with the harmonization legislation mentioned, contained however no warranty of characteristics.

GUARANTEE

Member of GHM GROUP

TERMS OF GUARANTEE

All DELTA OHM instruments are subject to accurate testing, and are guaranteed for 24 months from the date of purchase. DELTA OHM will repair or replace free of charge the parts that, within the warranty period, shall be deemed non efficient according to its own judgement. Complete replacement is excluded and no damage claims are accepted. The DELTA OHM guarantee only covers instrument repair. The guarantee is void in case of incidental breakage during transport, negligence, misuse, connection to a different voltage than that required for the appliance by the operator. Finally, a product repaired or tampered by unauthorized third parties is excluded from the guarantee. The instrument shall be returned FREE OF SHIPMENT CHARGES to your dealer. The jurisdiction of Padua applies in any dispute.

The electrical and electronic equipment marked with this symbol cannot be disposed of in public landfills. According to the Directive 2011/65/EU, the european users of electrical and electronic equipment can return it to the dealer or manufacturer upon purchase of a new one. The illegal disposal of electrical and electronic equipment is punished with an administrative fine.

This guarantee must be sent together with the instrument to our service centre.

IMPORTANT: Guarantee is valid only if coupon has been correctly filled in all details.

Instrument Code: **HD98569**

Serial Number _____

RENEWALS

Date _____	Date _____
Inspector _____	Inspector _____
Date _____	Date _____
Inspector _____	Inspector _____
Date _____	Date _____
Inspector _____	Inspector _____

CE

RoHS 2011/65/EU

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The quality level of our instruments is the result of the constant development of the product. This may produce some differences between the information written in this manual and the instrument you have purchased. We cannot completely exclude the possibility of errors in the manual, for which we apologize.

The data, images and descriptions included in this manual cannot be legally asserted. We reserve the right to make changes and corrections with no prior notice.

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