REV. 2.0
15/10/2012

HD2109.1
HD2109.2

ENGLISH

Our instruments' quality level is the results of the product continuous development. This can bring about differences between the information written in this manual and the instrument that you have purchased. We cannot entirely exclude errors in the manual, for which we apologize.
The data, figures and descriptions contained in this manual cannot be legally asserted. We reserve the right to make changes and correction without prior notice.

CONTENTS

INTRODUCTION

The **HD2109.1** and **HD2109.2** are portable instruments with a large LCD display. They measure the **concentration of dissolved oxygen in liquids** (in mg/l), the **saturation index** (in %) and the **temperature** using SICRAM combined probes of **polarographic**, with two or three electrodes, and **galvanic** type with integrated temperature sensor. Temperature only is measured by Pt100 - SICRAM or direct 4 wires - immersion, penetration or contact probes.
Thanks to an internal pressure sensor, the instruments automatically compensate for barometric pressure. The instrument anticipates automatic compensation of the oxygen probe membrane permeability and of the salinity of the liquid being examined.

The dissolved oxygen probe's quick calibration function guarantees timely correctness of the performed measurements.
The dissolved oxygen and temperature probes are fitted with an automatic detection module, with the factory calibration settings already being memorized inside.

The HD2109.2 is a **datalogger**. It memorizes up to 18,000 dissolved oxygen concentration, saturation index measurements, barometric pressure and temperature samples which can be transferred from the instrument connected to a PC via the RS232C serial port or USB 2.0 port. The storing interval, printing, and baud rate can be configured using the menu.

The HD2109.1 and HD2109.2 models are fitted with an RS232C serial port and can transfer the acquired measurements to a PC or to a portable printer in real time.

Printing and, for the model HD2109.2, logging always include the temperature, in °C or °F, the concentration of dissolved oxygen in liquids (in mg/l), the saturation index (in %) and the barometric pressure (in mbar).

The *Max*, *Min* and *Avg* function calculates the maximum, minimum or average values.
Other functions include: the relative measurement REL, the Auto-HOLD function, and the automatic turning off which can also be disabled.
The instruments have IP67 protection degree.

This manual describes the HD2109.1 and HD2109.2 models: if not otherwise specified, the description is intended to be applicable to both models.

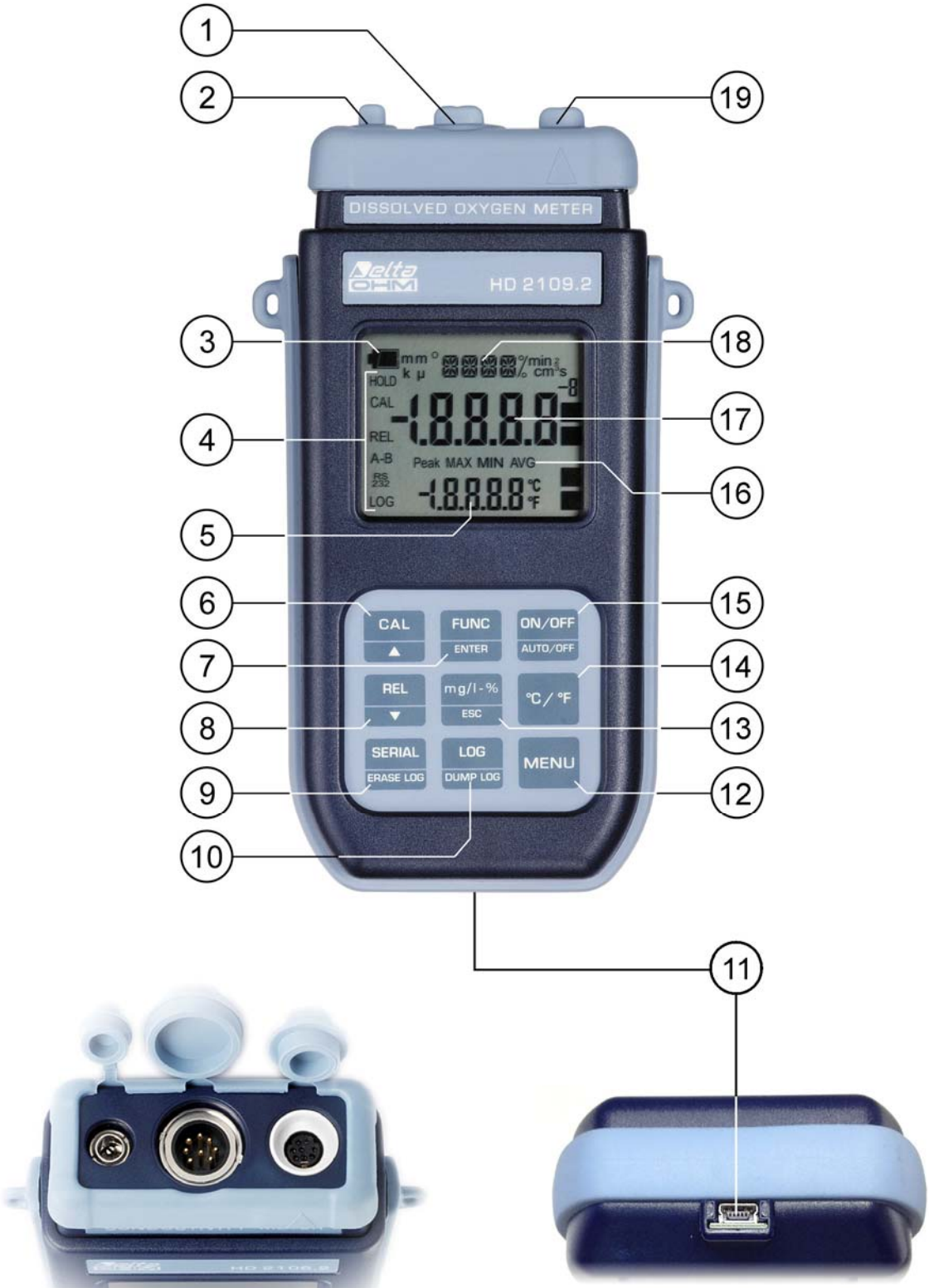
Dissolved Oxygen – Temperature
HD2109.1

HD2109.1

1. 8-pole DIN45326 connector, input for dissolved oxygen and temperature combined probes, for Pt100 SICRAM temperature probes and direct 4-wire Pt100 probes complete with TP47 module.
2. External auxiliary power supply connector input (positive at centre).
3. Battery symbol: displays the battery charge level.
4. Function indicators.
5. Secondary display line.
6. **CAL/▲** key: during normal operation starts the dissolved oxygen probe calibration; in the menu, increases the current value.
7. **FUNC/ENTER** key: during normal operation displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements; in the menu, confirms the current selection. This updates the display measurement when the *Auto-Hold* function is enabled.
8. **REL/▼** key: enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed); in the menu, decreases the current value.
9. **SERIAL** key: starts and ends the data transfer to the serial communication port.
10. **MENU** key: allows access to and exit from the menu.
11. **mg/l-%-ESC** key: cyclically changes the main variable measurement between:
    - dissolved oxygen concentration (in mg/l),
    - saturation index (in %),
    - barometric pressure (in mbar).

    In the menu, cancels the operation in progress without making changes.
12. **°C/°F** key: when the probe is not connected, allows manual modification of the temperature. When a probe with temperature sensor is connected, pressing this key twice changes the unit of measurement from degrees Celsius to Fahrenheit.
13. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the CAL key, disables the automatic turn off.
14. MAX, MIN and AVG symbols.
15. Main display line.
16. Line for symbols and comments.
17. 8-pole MiniDin connector for RS232C. For the connection to PC (with cable HD2110CSNM or C206) or printer (with cable HD2110CSNM).

Dissolved Oxygen – Temperature
HD2109.2



HD2109.2

1. 8-pole DIN45326 connector, input for dissolved oxygen and temperature combined probes, for Pt100 SICRAM temperature probes and direct 4-wire Pt100 probes complete with TP47 module.
2. External auxiliary power supply connector input (positive at centre).
3. Battery symbol: displays the battery charge level.
4. Function indicators.
5. Secondary display line.
6. **CAL/▲** key: during normal operation starts the dissolved oxygen probe calibration; in the menu, increases the current value.
7. **FUNC/ENTER** key: during normal operation displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements; in the menu, confirms the current selection. This updates the display measurement when the *Auto-Hold* function is enabled.
8. **REL/▼** key: enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed); in the menu, decreases the current value.
9. **SERIAL/ERASE LOG** key: starts and ends the data transfer to the serial communication port. In the menu, clears the data contained in the instrument's memory.
10. **LOG/DUMP LOG** key: during normal operation, starts and ends the saving of the data in the internal memory; in the menu, starts the data transfer from the instrument's memory to the PC.
11. Mini-USB type B connector for USB 2.0. For the connection to PC (with cable CP23).
12. **MENU** key: allows access to and exit from the menu.
13. **mg/l-%-ESC** key: cyclically changes the main variable measurement between:
    - dissolved oxygen concentration (in mg/l),
    - saturation index (in %),
    - barometric pressure (in mbar).

    In the menu, cancels the operation in progress without making changes.
14. **°C/°F** key: when the probe is not connected, allows manual modification of the temperature. When a probe with temperature sensor is connected, pressing this key twice changes the unit of measurement from degrees Celsius to Fahrenheit.
15. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the CAL key, disables the automatic turn off.
16. MAX, MIN and AVG symbols.
17. Main display line.
18. Line for symbols and comments.
19. 8-pole MiniDin connector for RS232C. For the connection to PC (with cable HD2110CSNM or C206) or printer (with cable HD2110CSNM).

KEYBOARD AND MENU DESCRIPTION

Foreword

The instrument keyboard is composed of single-function keys, like the MENU key, and double-function keys such as the ON-OFF/Auto-OFF key.

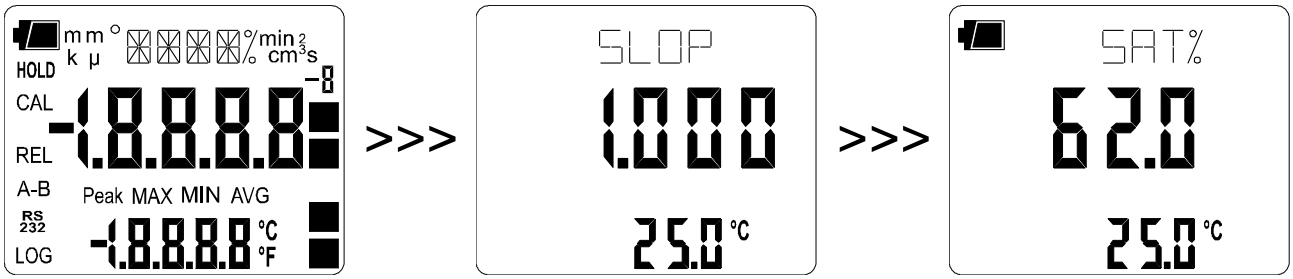
In the double-keys, the function in the upper part is the "main function", while the one in the bottom part is the "secondary function". When the instrument is in standard measurement mode, the main function is active. In the menu or in conjunction with the FUNC key, the secondary function is enabled.

The pressing of a key is accompanied by a short confirmation beep: a longer beep sounds if the wrong key is pressed.

Each key specific function is described in detail below.

ON-OFF/Auto-OFF key

The instrument is turned on and off using the ON/OFF key. The turning on enables all display segments for a few seconds. An auto-test follows which analyses the type of probe connected, and reads its calibration information. In cases of a dissolved oxygen probe, the electrode calibration coefficient (SLOPE) is also displayed: this value must be between 0.500 and 1.500. A value close to 1.500 indicates an exhausted probe (see page 14 for how to proceed). Finally, the instrument is set for normal measurement.



If a temperature probe is connected, the main line displays a dotted line (- - - -).
The connected probe's data are captured upon turning the instrument on: when the probe is inserted into a functioning instrument, the "NEW_PROB_DET" message appears: turn the instrument off and then back on again.
Replace the probes when the instrument is off.

Automatic turning off

The instrument has an *AutoPowerOff* function that automatically turns the instrument off after about 8 minutes if no key is pressed during the intervening time. The *AutoPowerOff* function can be disabled by holding the CAL/▲ key pressed down when turning the instrument on: the battery symbol will blink to remind the user that the instrument can only be turned off by pressing the <ON/OFF> key.

The automatic turning off function is disabled when external power is used. On the other hand, it cannot be disabled when the batteries are discharged.

FUNC/ENTER key

During normal measurement this enables the display and logging of the maximum (MAX), minimum (MIN) and average (AVG) value of dissolved oxygen concentration, saturation index, barometric pressure and temperature measurements, updating them with the acquisition of new samples. The acquisition frequency is once a second. To switch from dissolved oxygen to barometric pressure and to saturation index use the "mg/l-%-ESC" key.

In the menu, the ENTER key confirms the current parameter and then goes to the next one.
The MAX, MIN and AVG measurements remain in the memory until the instrument is on, even after exiting the calculation function. To reset the previous values and restart with a new measurement session, press FUNC until the message "FUNC CLR" appears, then use the arrows to select YES and confirm using ENTER.
The dissolved oxygen concentration (or barometric pressure or saturation index) and temperature values are displayed at the same time. According to settings in the "RCD Mode" menu item, the maximum, minimum and average indications have different meanings: please see the description of this MENU key below.

Attention: the data captured using the Record function cannot be transferred to the PC.

CAL /▲ key

It increases the current parameter when used in the menu; when used in measurement mode, it starts the dissolved oxygen probe calibration (please see the chapter dedicated to calibration on page 15).

°C/°F key

The temperature value measured by the sensor present in the dissolved oxygen probe is used to calculate the saturation index and the dissolved oxygen concentration in the liquid being measured. The key changes the unit of measurement between Centigrade or Fahrenheit.

mg/l -% / ESC key

It changes the main variable measurement between dissolved oxygen concentration (in mg/l), barometric pressure (in mbar), and saturation index (in %).

The instrument has an Auto-Hold function, which can be set in the MENU, that "freezes" the measurement automatically when it has been stable (**within 1 digit**) for over 10 seconds: the message HOLD is displayed.
To perform a new measurement, it is necessary to press the FUNC/ENTER key.
The HOLD message starts blinking, while the display follows the actual measurement trend, until it stabilizes again and the HOLD message remains still.

In the menu, the key clears or cancels the active function (ESC).

REL/▼ key

In measurement mode, it displays the difference between the current value and that measured on pressing the key. The **REL** message appears on the display; press the key again to return to the current measurement.

When used in the menu, it decreases the current variable value.

MENU Key

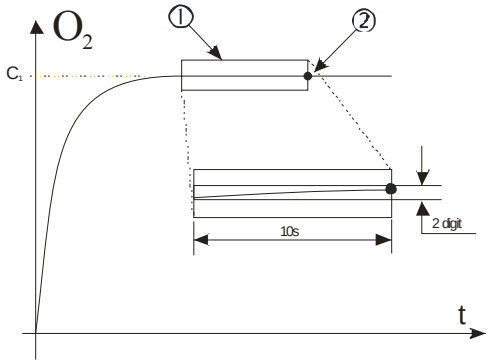
The first menu item is accessed by initially pressing on the MENU key; press ENTER to go to the following items. To modify the item displayed, use the arrow keys (▲ and ▼). The current value is confirmed by pressing the ENTER key and the display moves on to the next parameter. If pressing ESC the setting is cancelled.
To exit the menu, press the MENU key at any time.

The menu items are listed in this order:

1) **Sample ID (Identifier of the sample being measured)**: it is an automatically increased progressive number associated with the single PRINT function (**print interval set to 0**) for the printing of labels. The index appears in the single sample printing together with date, time, dissolved oxygen and temperature measured values. This menu item allows the value of the first sample to be set: each time the PRINT key is pressed, the identification ID in the printing is increased by 1 allowing progressive measurement of all measured samples. If the Auto-Hold function, described below in this chapter, is enabled, the print time interval is forced to zero. Pressing SERIAL only causes the print to occur when the measurement has stabilized (HOLD symbol still). Later, it is possible to repeat the print at will, but while the HOLD mode is on, the sample identifier number is not increased. This is useful when more labels must be printed with the same identification code without increasing the code each time.
   The message "SMPL ID UNT=RSET SER=PRNT" is scrolled in the comment line: using the arrows (▲ and ▼) the currently measured sample identifier value can be changed.
   By holding the °C/°F key down the proposed number is set to zero.
   The instrument's heading information will be printed using the SERIAL key.

2) **AUTO-HOLD function**: the instrument normally operates in **continuous view** mode (default setting). In this mode the displayed measurement is updated every second. If the Auto-

Hold function is enabled, the instrument performs the measurement and when it stabilizes it goes in HOLD mode. To update the display indication, press FUNC/ENTER.
In the following figure you can see an example of the measurement process with the Auto-Hold function enabled. A probe is immersed into a liquid at concentration C_1 and, to perform the measurement, the FUNC/ENTER key is pressed: The concentration measurement raises progressively reaching the final value. The HOLD symbol blinks. In the stretch indicated by 1, the measurement remains stable for 10 seconds, within two digits: at the end of this interval (point 2), the instrument goes into HOLD mode, presenting the final stable value.



3) **SAL mg/l (Setting the salinity):** the message "**SAL mg/l – UNT=RSET**" is scrolled in the comment line. The display central line shows the current salinity value, and the secondary line the corresponding dissolved oxygen concentration value. Use the arrows to enter this value, and confirm using ENTER. To disable the salinity compensation, set the value to zero: pressing the °C/°F key rapidly sets the value to zero without the need to use of the arrows.
Note: the dissolved oxygen concentration depends on the measured liquid salinity. In contrast, salinity has no effect on the saturation index.

4) **Management of memorized data (only HD2109.2)**: the message "**LOG_DUMP_or_ERAS" (Transfer data or erase)** is scrolled in the comment line. The center figure reports the number of free memory pages (FREE). All memory data are permanently erased by pressing SERIAL/EraseLOG. By pressing LOG/DumpLOG, the data transfer of the logged data on the serial port is started: the "BAUD-RATE" must have previously been set to the maximum value (please see the menu items described below and the paragraph "STORING AND TRANSFERRING DATA TO A PERSONAL COMPUTER" on page 27).

5) **Sleep_Mode_LOG (Automatic turning off during recording) (only HD2109.2):** this function controls the instrument's automatic turning off during logging, occurring between the capture of a sample and the next one. When the interval is lower than 60 seconds, the instrument will always remain on. With intervals greater than or equal to 60 seconds, it is possible to turn off the instrument between loggings: it will turn on at the moment of sampling and will turn off immediately afterwards, thus increasing the battery life. Using the arrows select **YES** and confirm using **ENTER** in order to enable the automatic turning off, select **NO** and confirm to disable it and keep the instrument on continuously.

   Note: even if **Sleep_Mode_LOG=YES** is selected, the instrument does not turn off for less than one minute intervals.

6) **Print and log interval**: sets the interval in seconds between two loggings or data transfers to the serial port. The interval can be set at 0, 1s, 5s, 10s, 15s, 30s, 60s (1min), 120s (2min), 300s (5min), 600s (10min), 900s (15min), 1200s (20min), 1800s (30min) and 3600s (1hour). **If the value 0 is set, SERIAL works on command: the sending of data to the serial port is performed each time the key is pressed**. Recording (LOG) is performed with one sec-

ond intervals even if the interval is set to 0. With an interval from 1 to 3600s, continuous data transfer is started when the SERIAL key is pressed. To end the recording (LOG) and **continuous** data transfer operations (SERIAL with an interval greater than 0), press the same key again.

7) **RCD MODE (Record mode)**: the instrument captures the dissolved oxygen concentration, saturation index, barometric pressure and temperature values every second. The relationship existing between these parameters is such that the maximum or minimum value of one generally does not correspond to the maximum or minimum value of the others. If the RCD MODE parameter is set to "**I Sat**", the maximum (MAX) and minimum (MIN) values displayed using FUNC/ENTER refer to saturation: the remaining indicated parameters are those measured at the maximum and minimum saturation index and not their maximum and minimum values.
   The same is true for the other items: "**Conc**" refers to dissolved oxygen concentration, "**tp**" to temperature, "**Press**" to barometric pressure.
   If the RCD MODE parameter is set to "**tp**", the maximum and minimum values displayed using FUNC/ENTER refer to temperature: the other indicated parameters are those measured at the maximum and minimum temperature and are not the maximum and minimum of the other variables.
   If "**Indep**" (=independent) is selected, the maximum and minimum values displayed using FUNC/ENTER are independent: the indicated values are the maximum and minimum of each variable but are not necessarily referred to the same measurement **moment**.
8) **YEAR**: to set the current year. Use the arrows to modify this parameter and confirm using ENTER.
9) **MNTH (month)**: to set the current month. Use the arrows to modify this parameter and confirm using ENTER.
10) **DAY**: to set the current day. Use the arrows to modify this parameter and confirm using ENTER.
11) **HOUR**: to set the current hour. Use the arrows to modify this parameter and confirm using ENTER.
12) **MIN**: to set the current minutes. In order to correctly synchronize the minute, it is possible to reset the seconds by pressing the °C/°F key. Use the arrows to set the current minute plus one, and as soon as that minute is reached press °C/°F: this synchronizes the time to the second. Press ENTER to go onto the next item.
13) **BAUD_RATE:** indicates the frequency used for the serial communication with the PC. Values from 1200 to 38400 baud. Use the arrows to modify this parameter and confirm using ENTER. **The communication between instrument and PC (or serial port printer) only works if the instrument and PC baud rates are the same**. If the USB connection is used this parameter value is automatically set (please see the details on page 27).

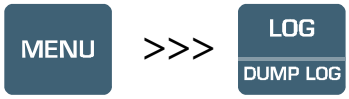
LOG/DumpLOG key - only HD2109.2

In measurement mode, this function 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 **"Print and log interval"** menu parameter. The data logged between a start and subsequent stop represent a block.

When the logging function is on, the LOG indication is displayed, the battery symbol blinks and a beep is issued each time a logging occurs; **the battery symbol does not appear when using an external power supply**.
To end the logging, press LOG.

If the Auto-HOLD function is enabled (please see the menu), the data logging is disabled.

The HD2109.2 can turn off during logging between one capture and the next: the function is controlled by the **Sleep_Mode_LOG** parameter. When the logging interval is less than one minute, the logging instrument remains on; with an interval of at least one minute, it turns off between one capture and the next if the parameter **Sleep_Mode_LOG**=YES.



DUMP LOG - only HD2109.2

To start the transfer of the data contained in the instrument internal memory via the serial port, press the MENU key. Using FUNC/ENTER select the "LOG_DUMP_or_ERAS" item, and then press on the LOG/DumpLOG key.
Please see the paragraph dedicated to data transfer on page 27.

SERIAL key - only HD2109.1

SERIAL/EraseLOG key - only HD2109.2

In measurement mode, this function starts and stops the data transfer to the RS232C serial output.
According to the settings entered in the **Print and log interval** menu item, a single sample can be printed if **Print and log interval**=0 or a continuous indefinite printing of the measured data can be set up if **Print and log interval**=1…3600.
The printing operation is accompanied by the display of the RS232 symbol and the blinking of the battery symbol; **when using an external power supply the battery symbol does not appear**.
Press SERIAL to end the continuous printing.

Before starting the printing with SERIAL, set the baud rate. To do so, select the **Baud Rate** menu item and select the maximum value equal to 38400 baud by using the arrows. Confirm by pressing ENTER.
The DeltaLog9 software for PC will automatically set the baud rate value during connection. **If you are using a different program than DeltaLog9, be sure the baud rate is the same for both the instrument and the PC: the communication will only work in this way.**

Erase memory - only HD2109.2

Press the MENU key to **permanently** clear all the data contained in the instrument's memory. Using FUNC/ENTER select the "LOG_DUMP_or_ERAS" item, and then press on the SERIAL key.

MEASUREMENT OF THE DISSOLVED OXYGEN

The instruments work with combined probes of polarographic, with two or three electrodes, and galvanic type with integrated temperature sensor, or with temperature probes with Pt100 sensor. The dissolved oxygen probe is fitted with SICRAM module; the temperature probe can be a SICRAM type or direct 4 wires.

The probe measures 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 in mg/l, and the saturation index (in %).

The temperature indication is displayed in the secondary line; the main line shows all the other quantities.

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 procedures are reported below.

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 front of the membrane is continually changed so as to avoid incorrect measurements caused by oxygen exhaustion in the liquid in contact with the membrane. 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, wait a few minutes until the reading is stable and reliable. This time span serves to eliminate the dissolved oxygen in the probe's internal electrolyte.
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 stabilized.
Attention: when no measurement is taken for long periods, it is recommended that the probe be disconnected from the instrument to avoid useless consumption of the probe's internal electrolyte.

If the measurements are taken in a container, perform them with the container filled until running over. Fit the container with a stirrer and adjust the stirring speed in order to obtain a stable reading until an equilibrium is reached, avoiding trapping air in the liquid.

While measuring running water, for example, water streams, check that the flow speed is sufficient, otherwise remove the probe, pick up a sample and proceed as described above.

The temperature measuring range with the oxygen probe is **0°C…+45°C**.

Measurement of the concentration of dissolved oxygen

The probe must be calibrated periodically using the DO9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe) calibrator.
The instrument checks the dissolved oxygen probe efficiency; the "CHNG MEMBRANE AND ELECTROLYTE" message indicates that the probe is exhausted.
The same message is displayed during calibration: either when calibration is not possible or the reading is unstable. It is thus necessary to replace the probe or clean the measurement cell with replacement of the electrolyte and/or the membrane covering the measurement electrodes.

Proceed as follows:

1. Connect the probe to the instrument.
2. Turn the instrument on with the ON/OFF key.
3. Wet the sponge contained in the calibrator using 2ml of distilled water.
4. Insert the probe into the calibrator.
5. Wait a few minutes until the system stabilizes thermally and 100% RH is reached inside the calibrator.
6. Using "mg/l-%-ESC", select the measurement of dissolved oxygen concentration (SAT%).
7. Press CAL to start the calibration: press ENTER to confirm and exit the procedure, or ESC to quit the calibration without making changes.
8. On pressing ENTER, the display shows the new gain value (SLOP) for a few seconds and then will progressively reach 101.7%.

The instrument is calibrated and ready for use.

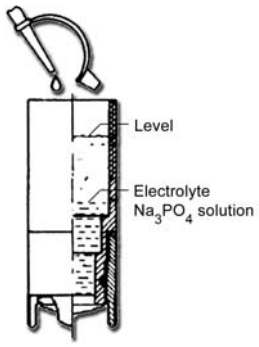
On pressing ENTER during calibration, the instrument checks that the correction to be made does not exceed the expected limits for correct functioning. Slope between 0.500 and 1.500. If the calibration is rejected because it is outside the admitted corrections, the **CAL ERR** message will appear, followed by the "CHNG MEMBRANE AND ELECTROLYTE" message. The instrument maintains the previous calibration values until the probe's efficiency is restored.

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.

POLAROGRAPHIC PROBE



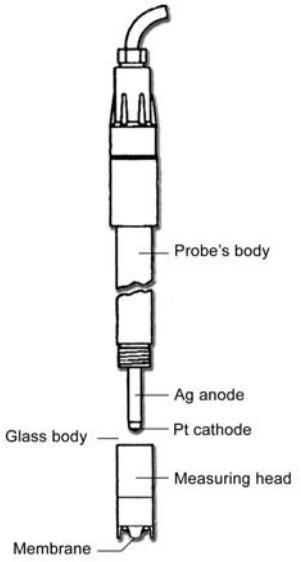
Unscrew the probe's head and the membrane permeable to oxygen.

If necessary, replace the membrane.

Fill the probe's head with the DO 9701 electrolyte solution until the level indicated in the figure (filling level).

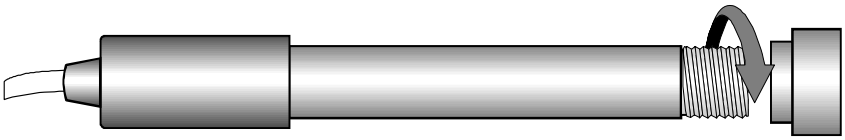
Eliminate any possible air bubble in the electrolyte solution.

Screw the probe's head back on carefully.



GALVANIC PROBE

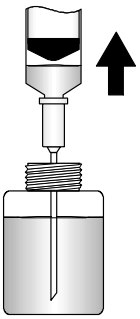
1. Unscrew the probe's head and the membrane permeable to oxygen. If necessary, replace the membrane.

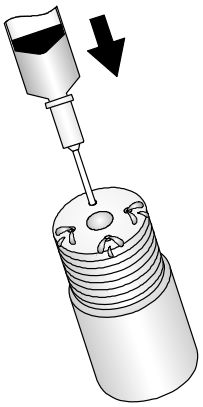


2. Attach the needle to a 10 ml syringe.

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.

After replacement of the electrolyte solution and/or membrane, insert the probe's connector in the instrument and wait 15 minutes before performing the dissolved oxygen measurement (this is the necessary time to exhaust the oxygen trapped in the electrolyte solution during the replacement).

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 < 0.3%.

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.
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 polarographic or galvanic probe, the following table summarizes the main differences between the two probes.

	Polarographic probe	**Galvanic probe**
Polarization time	After connecting the probe to the instrument it is necessary to wait at least 5-10 minutes before taking the measurement.	Polarization is not needed. After connecting the probe to the instrument it is possible to take the measurement immediately.
Power consumption	If connected to the instrument, the probe is also powered when the instrument is off, decreasing the life of the batteries.	Power is not needed. Longer life of the batteries, feature important in field measurements.
Cleaning	Requires frequent cleaning of the anode.	Maintenance of the electrodes is not needed.
Electrolyte replacement	Requires frequent replacement of the electrolyte solution.	It can also work months without replacing the electrolyte solution.
Drift	The measurement of the zero has the tendency to drift.	The measurement of the zero is stable. Higher accuracy when measuring low oxygen concentrations.

Pt100 TEMPERATURE PROBE

The instrument accepts the input of Platinum temperature probes with resistances of 100Ω with SICRAM module or direct 4 wires.
The excitation current was chosen in order to minimize the sensor self-heating effects.
The probes with direct 4-wire input are checked for conformity with class A tolerance according to norm IEC751 - BS1904 - DIN43760.

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

How to measure

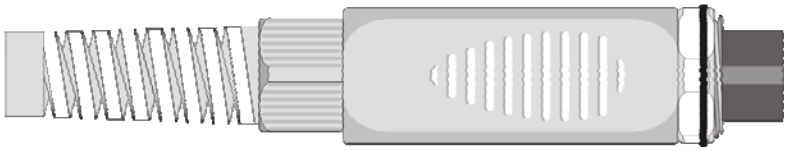
The temperature measurement by **immersion** is carried out by inserting the probe in the liquid for at least 60 mm; the sensor is housed in the end part of the probe.

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

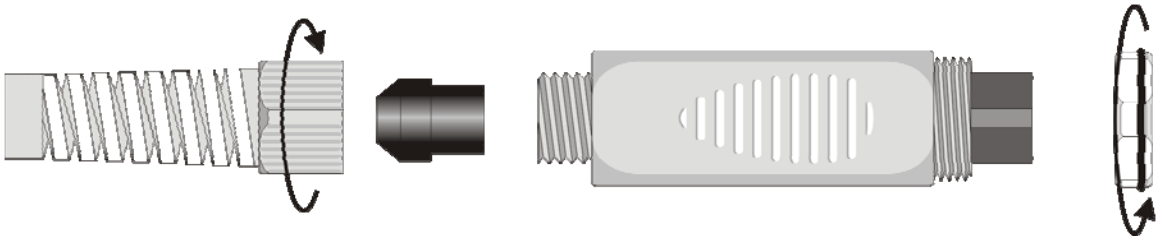
Instructions to connect the TP47 module for 4-wire Pt100 probes

All Delta Ohm probes are provided with a connector. The HD2109.1 and HD2109.2 instruments also work with direct 4-wire Pt100 probes manufactured by other producers: for the instrument connection is prescribed the TP47 connector to which the probe's wires should be welded.

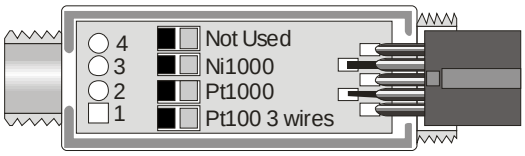


The instructions to connect the Platinum probe to the TP47 module are provided below.
The module is supplied complete with fairlead and gasket for 5mm maximum diameter cables.

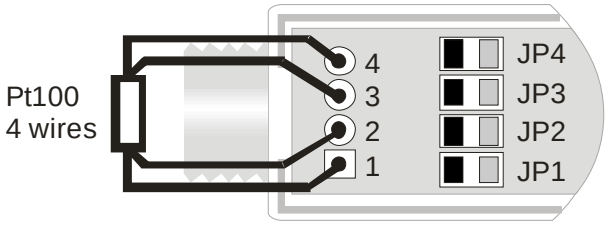
Do the following to open the module and connect a probe.
Unscrew the fairlead and extract the gasket, remove the label using a cutter, unscrew the ring on the opposite side as illustrated in the figure:



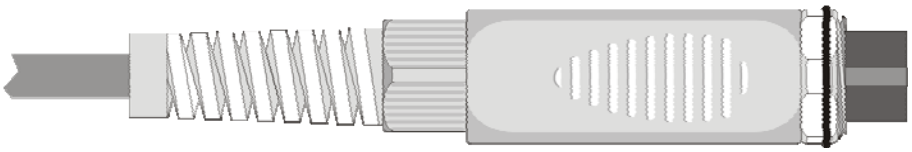
Open the two module shells: the printed circuit to which the probe must be connected is housed inside. On the left there are the 1…4 points on which the sensor wires must be welded. The JP1…JP4 jumpers are in the center of the board. These must be left open:



Before welding, pass the probe cable through the fairlead and gasket.
Weld the wires as shown in the table:

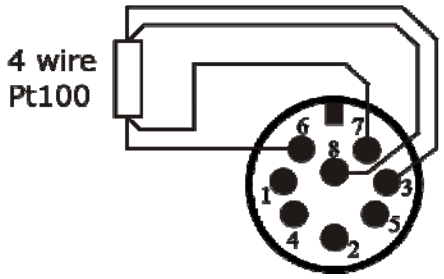
Sensor	TP47 board connection	Jumper to close
Pt100 4 wires		None

Ensure the welds are clean and perfect. Once the welding operation is complete, close the two shells, insert the gasket in the module, screw the fairlead. At the other end of the module, enter the ring with the O-Ring as indicated in the picture.



Make sure the cable is not twisted while you are screwing the fairlead. Now the probe is ready.

Direct connection of 4-wire Pt100 sensor to a DIN45326 connector

Sensor	Direct soldering to the connector
4-wire Pt100	 View of the soldering side of the free female connector

The **4-wire Pt100 sensor** can be soldered directly to the DIN45326 female connector's pins without having the need to use the TP47 board. The 4 wires of the Pt100 sensors have to be soldered as indicated in the figure on the left.
The P100 probe is recognized upon turning on the instrument: connect the probe when the instrument is switched off and then turn it on.
The use of this probe type doesn't require any other settings. This connector does not guarantee the IP67 protection degree.

WARNINGS AND OPERATING INSTRUCTIONS

1. The dissolved oxygen probes can be influenced by the presence of gases and vapours, such as chlorine, sulphur dioxide, hydrogen sulphide, amines, ammonia, carbon dioxide, bromine and iodine. Such substances can get through the membrane and interfere with the measurement. Other substances such as solvents, oils, sulphurs, carbonates and algae can obstruct or degrade the membrane or corrode the electrodes.
2. Never touch the active membrane surface of the dissolved oxygen probe.
3. 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.
4. Do not bend the probe connectors or force them upward or downward.
5. Do not bend or force the contacts when inserting the probe connector into the instrument.
6. Do not bend, deform or drop the probes, as this could cause irreparable damage.
7. Always select the most suitable probe for your application.
8. Do not use 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.
9. Above 400°C and below –40°C, avoid violent blows or thermal shocks to Platinum temperature probes as this could cause irreparable damage.
10. To obtain reliable measurements, temperature variations that are too rapid must be avoided.
11. 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.
12. Temperature measurements on non-metal surfaces usually require a great deal of time due to the low heat conductivity of non-metal materials.
13. 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.
14. Avoid taking measurements in presence of high frequency sources, microwave ovens or large magnetic fields; results may not be very reliable.
15. Clean the probe carefully after use.
16. The instrument is water resistant and IP67, but is not watertight and therefore should not be immersed in water without closing the free connectors using caps. **The probe connectors must be fitted with sealing gaskets.** Should the instrument fall into the water, check for any water infiltration. Gently handle the instrument in such a way as to prevent any water infiltration from the connectors' side.

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 indications	Explanation
ERR	It appears when the dissolved oxygen or temperature measurements exceed the expected ranges.
CAL **ERR**	This appears during calibration when the gain correction exceeds the limits of 0.500 or 1.500. If this occurs, the calibration is rejected and the previous values are maintained.
LOG **MEM** **FULL**	Memory full; the instrument cannot store further data, the memory space is full.
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.
BATT TOO LOW **CHNG NOW**	Indication of insufficient battery charge appearing on turning on. The instrument issues a long beep and turns off. Replace the batteries.

The following table reports the indications provided by the instrument as they appear on the display, together with their description.

Display indication	Explanation
AUTO-HOLD	automatic function holding the displayed measurement
BATT TOO LOW - CHNG NOW	battery discharged - replace it immediately
BAUDRATE	baud rate value
CHNG MEMBRANE AND ELECTROLYTE	replace the electrolyte solution and/or membrane
COMM STOP	printing complete
COMM STRT	printing started
DAY_	day
DUMP_END	data transfer complete
DUMP_In_PROG	data transfer in progress
FUNC CLR	max, min and average values clearing
FUNC CLRD	max, min and average values cleared
HOUR	hour
KCEL	cell constant K
LAST CAL m/d h/m	last calibration date month/day hour/minutes
LOG IN PROG	logging in progress
LOG MEM FULL	memory full
LOG_CLRD	memory data cleared
LOG_DUMP_OR_ERAS	transfer or erase data
LOG_STOP	logging complete
LOG_STRT	logging started
mg/l	concentration of dissolved oxygen unit of measurement
MIN >>> USE_UNIT_TO_ZERO SEC	minutes >>> use the UNIT key to reset the seconds
MNTH	month
NaCl	measurement of salinity in g/l
PLS_EXIT >>> FUNC RES_FOR_FACT ONLY	please exit using ESC >>> function reserved to factory calibration
PRBE_TYPE	type of probe connected
PRNT AND LOG INTV	printing and logging intervals
PRNT INTV	printing interval!!
PROB COMM LOST	lost communication with probe
RCD MODE	record function operating mode (max, min, avg)
REF_TEMP	reference temperature
SAL mg/l UNT=RSET	setting the salinity (°C/°F key to reset)
SAT %	the display is showing the saturation index
SLOP	slope or gain of the dissolved oxygen probe
SLP_MODE_LOG	turning off during recording mode
SMPL ID UNT=RSET SER=PRINT	identifier of the sample - °C/°F=reset - SERIAL=print heading
SYS ERR #	program error number #
TDS	total dissolved solids
UNDR	minimum limit exceeded
YEAR	year

LOW BATTERY WARNING 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. The memory data are maintained.
If the battery charge level is insufficient, the following message appears when you turn the instrument on:

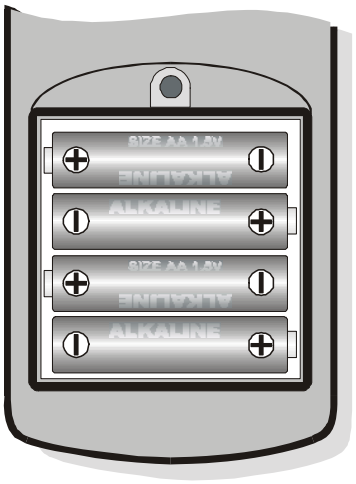
BATT TOO LOW
CHNG NOW

The instrument issues a long beep and turns off. In this case, replace the batteries in order to turn the instrument back on.

In order to avoid data loss, the logging session is ended, if the HD2109.2 is logging and battery voltage falls below the minimum operating level.

The battery symbol turns off when the external power supply is connected.

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



After replacing the batteries, the date, time, baud rate, type of probe, printing interval, logging parameters **must be set again**: **in order to simplify the operation, on insertion of the new batteries the instrument turns on automatically and requests these parameters in sequence**. To go to the next item press ENTER; to return to measurement mode, press MENU.

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 BATTERY USE

- Batteries should be removed when the instrument is not used for an extended time.
- Flat batteries must be replaced immediately.
- Avoid batteries leaking.
- Always use good quality leakproof alkaline batteries. Sometimes on the market, it is possible to find new batteries with an insufficient charge capacity.

INSTRUMENT STORAGE

Instrument storage conditions:

- Temperature: -25…+65°C.
- Humidity: less than 90%RH without condensation.
- Do not store the instrument in places 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.

MAINTENANCE

The instrument case is made of ABS plastic and the protections are rubber: do not use any incompatible solvent for cleaning.
The body of the polarographic probe is in POM, the body of the galvanic probe is in Epoxy, the membrane is in 25µ PTFE.

During the use control the compatibility of these materials with the liquid that you want to measure. The probe must be kept wet by using its cap. Regularly check that no obstructions are present on the membrane.
Do not let hands touch the membrane.
Do not use any abrasive product for cleaning.

SERIAL INTERFACE AND USB

The HD2109.1 and HD2109.2 instruments are fitted with an electrically isolated RS-232C serial interface; the HD2109.2 also has an USB 2.0 interface.
The following serial cables can be used:

- **HD2110CSNM**: serial connection cable with 8-pole MiniDin connector on one end and 9-pole Sub D connector on the other end;
- **C.206**: serial connection cable with 8-pole MiniDin connector on one end and USB type A connector on the other end. With integrated RS232/USB converter;
- **CP23**: connection cable with Mini-USB type B connector on one end and USB type A connector on the other end (only for HD2109.2).

The connection via the C.206 cable requires the previous installation of the cable USB drivers. Install the drivers **before connecting the C.206 cable to the PC**.
The connection via the CP23 cable does not require the installation of USB drivers: when connecting the instrument to the PC, the Windows® operating system automatically recognizes the device as an HID device (Human Interface Device) and uses the drivers already included in the operating system.

Cable	Instrument port	PC port	Installation of USB drivers
HD2110CSNM	RS232 (MiniDin)	RS232 (9-pole SubD)	No
C.206	RS232 (MiniDin)	USB	Yes
CP23	USB (Mini-USB)	USB	No

The instrument standard serial transmission parameters 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 "*Baudrate*" parameter in the menu (please see page 12). The possible values are: 38400, 19200, 9600, 4800, 2400, 1200. The other transmission parameters are fixed.
The USB 2.0 connection does not require the setting of parameters.

The instruments are provided with a complete set of commands and data queries to be sent via the PC. The serial commands work with a standard serial communication program (e.g. Hyperterminal) only through the RS232 serial port of the instrument, using the cable HD2110CSNM or the cable C.206.

All the commands transferred to the instrument must have the following structure:
XYcr where: **XY** is the command code and **cr** is the Carriage Return (ASCII 0D)

Command	Response	Description
P0	&	Ping (locks the instrument keyboard for 70 seconds)
P1	&	Unlocks the instrument keyboard
S0	22.2 8.66 98.4 1023.3	Captured measurements of temperature, dissolved oxygen concentration, saturation index, and barometric pressure.
G0	Model HD2109 -2	Instrument model

Command	Response	Description
G1	M=Dissolved oxygen meter	Model description
G2	SN=12345678	Instrument serial number
G3	Firm.Ver.=01-01	Firmware version
G4	Firm.Date=2004/06/15	Firmware date
G5	cal 0000/00/00 00:00:00	Calibration date and time
G6	Probe=Oxygen Schott	Type of probe connected to input
GB	User ID=0000000000000000	User code (set with T2xxxxxxxxxxxxxxx)
GC		Print instrument's heading
K0		Stop printing data
K1	PRINTOUT IMMEDIATE MODE	Immediate printing of data
K4	&	Start logging data
K5	&	Stop logging data
K6	&	Disable REL function
K7	&	Enable REL function
KP	&	Auto-power-off function=ENABLE
KQ	&	Auto-power-off function=DISABLE
LD	PRINTOUT OF LOG	Print data logged in flash
LE	&	Erase data in flash memory
LN	&2000	Number of free pages in the flash memory
LUAn	&	Sets the unit of measurement for the temperature. n=0 > °C n=1 > °F
LUBn	&	Sets the unit of measurement for the O_2 n=0 > mg/l O_2 n=1 > %O_2 n=2 > mbar
RA	& #	Reading of LOG/PRINT interval set
RP	& 600	Battery level (Resolut. 0.01V)
RUA	U= °C	Temperature measurement unit
RUB	U= % Sat	Dissolved oxygen measurement unit
WA#	&	Setting LOG/PRINT interval. # is a hexadecimal number 0…D that represents the position of the interval in the list 0, 1, 5, 10, …, 3600 seconds.
WC0	&	Setting SELF off
WC1	&	Setting SELF on

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 command (Carriage Return). The instrument does not send the LF command (Line Feed).
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.

STORING AND TRANSFERRING DATA TO A PERSONAL COMPUTER

The HD2109.1 and HD2109.2 instruments can be connected to a personal computer via an RS232C serial port or USB 2.0 port, and exchange data and information through the DeltaLog9 software running in a Windows operating environment. Both models can send in real time input measured values directly to a PC, through the PRINT function; the HD2109.2 can also store the values measured by using the *Logging* function (LOG key) in its internal memory. If necessary, the data stored in the memory can be transferred to a PC later.

THE *LOGGING* FUNCTION - ONLY FOR HD2109.2

The *Logging* function allows the recording up to 18,000 sets of data registered by the probes connected to the inputs. Logging always includes **four** parameters. Each set of data includes: temperature in °C or °F, dissolved oxygen concentration (in mg/l), saturation index (in %) and barometric pressure (in mbar).

The time interval between two consecutive measurements can be set from 1 second to 1 hour. The logging starts by pressing the LOG key and ends by pressing the same key again: the data memorized in this way form a continuous block of samples.

See the description of the menu items on page 10.

If the automatic turning off option between two recordings (MENU >> **Sleep_Mode_LOG**) is enabled, upon pressing the LOG key the instrument logs the first data and turns off. 15 seconds before the next logging instant, it turns on again to capture the new sample, and then turns off.

The data stored in the memory can be transferred to a PC using the DUMP LOG command: MENU >> LOG. During data transfer the display shows the message DUMP; to stop the data transfer press ESC on the instrument or on the PC.

CLEARING THE MEMORY - ONLY FOR HD2109.2

To clear the memory use the Erase Log function (MENU key >> using ENTER select the "LOG_DUMP_or_ERAS" item >> SERIAL key).
The instrument starts clearing the internal memory; at the end of the operation, it goes back to normal display.

NOTES:

- Data transfer does not cause the memory to be erased; the operation can be repeated as many times as required.
- The stored data remain in the memory independently of battery charge conditions.
- 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 connector does not work.**
- Some keys are disabled during logging. The following keys work: ON/OFF, FUNC (Max-Min-Avg) and SERIAL.
- The recording started with the display in Max-Min-Avg mode proceeds normally with the actual measured values. Only the display shows respectively the Max, Min or Avg values.
- **The logging is disabled, if the Auto-HOLD function is enabled.**
- If the logging is started when the display is in REL mode, the relative values are logged.
- It is possible to activate both the logging (LOG) and direct transfer (PRINT) functions at the same time.

THE *PRINT* FUNCTION

The PRINT function sends the measurements taken in real time by the instrument input directly to a PC or a printer. Printing always includes **four** parameters. Each set of data includes: temperature in °C or °F, dissolved oxygen concentration (in mg/l), saturation index (in %) and barometric pressure (in mbar).

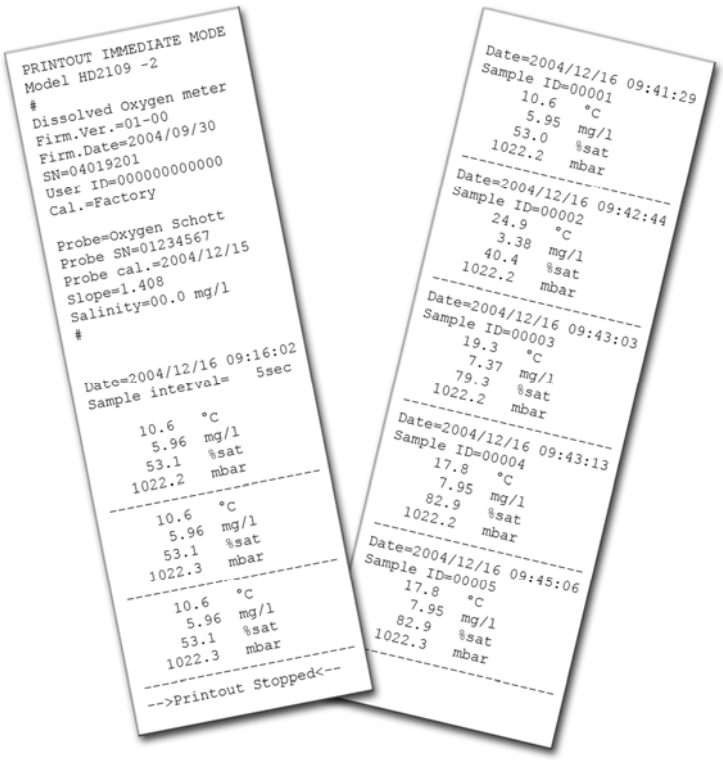
The function is started by pressing SERIAL. The time interval between two consecutive prints can be set from 1 second to 1 hour (please see the **Print and log interval** menu item on page 10). If the print interval is equal to 0, by pressing SERIAL the single data is sent to the connected device. If the print interval is higher than 0, the data transfer continues until the operator stops it by pressing SERIAL again.

The PRINT function works with a standard serial communication program (e.g. Hyperterminal) only through the RS232 serial port of the instrument, using the cable HD2110CSNM or the cable C.206.

Connect the HD40.1 printer using cable HD2110CSNM.

NOTES:

- The print out is formatted across 24 columns.
- Some keys are disabled during serial transmission. The following keys work: ON/OFF, FUNC (Max-Min-Avg) and LOG.
- The FUNC key has no effect on the print-outs, only on the display.
- **If the Auto-Hold function is enabled, the print time interval is forced to zero**: pressing SERIAL only causes the print to occur when the measurement has stabilized (HOLD symbol still). Later, it is possible to repeat the print at will, but while the HOLD mode is on, the sample identifier number is not increased. This is useful when more labels must be printed with the same identification code without increasing the code each time.
- If the serial transfer is started when the display is in REL mode, the relative values are transferred.
- It is possible to activate both the logging (LOG) and direct transfer (PRINT) functions at the same time.



CONNECTION TO A PC

HD2109.1

Connection to the PC with the cable:

- **HD2110CSNM**: 8-pole MiniDin connector on one end and 9-pole Sub D connector on the other end;
- **C.206**: 8-pole MiniDin connector on one end and USB type A connector on the other end. With integrated RS232/USB converter (requires the installation of the USB drivers).

HD2109.2

Connection to the PC with the cable:

- **CP23**: Mini-USB type B connector on one end and USB type A connector on the other end;
- **HD2110CSNM**: 8-pole MiniDin connector on one end and 9-pole Sub D connector on the other end;
- **C.206**: 8-pole MiniDin connector on one end and USB type A connector on the other end. With integrated RS232/USB converter (requires the installation of the USB drivers).

The instruments are supplied with the DeltaLog9 software that manages the connection, data transfer, graphic presentation, and printing operations of the captured or logged measurements.
The DeltaLog9 software is complete with "On-line Help" (also in PDF format) describing its characteristics and functions.

CONNECTION TO THE RS232C SERIAL PORT OF THE INSTRUMENT

1. The measurement instrument must be switched off.
2. Using the Delta Ohm HD2110CSNM or C.206 cable, connect the measurement instrument to the first free RS232C (COM) or USB serial port of the PC.
3. Turn on the instrument and set the baud rate to 38400 (MENU >> ENTER until the Baud Rate parameter >> select 38400 using the arrows >> confirm with ENTER). The parameter remains in the memory until replacement of the batteries.
4. Start the DeltaLog9 application and press CONNECT. Wait for the connection to occur and follow the indications on the screen. For a description of the DeltaLog9 application, please refer to its on-line Help.

CONNECTION TO THE USB 2.0 PORT OF THE INSTRUMENT - ONLY FOR HD2109.2

The connection via the CP23 cable does not require the installation of USB drivers: when connecting the instrument to the PC, the Windows® operating system automatically recognizes the device as an HID device (Human Interface Device) and uses the drivers already included in the operating system.

To check if the connection has been successfully completed, double-click on "*Device Manager*" from the Control Panel. The following items should appear:

"*Human Interface Device*" >> "*HID-compliant device*"

"*Human Interface Device*" >> "*USB Human Interface Device*"

When the USB cable is disconnected, the items disappear and reappear when it is connected again.

NOTES ABOUT WORKING AND OPERATIVE SAFETY

Authorized use

The technical specifications as given in chapter "TECHNICAL CHARACTERISTICS" must be observed. Only the operation and running of the measuring instrument according to the instructions given in this operating manual is authorized. Any other use is considered unauthorized.

General safety instructions

This measuring system is constructed and tested in compliance with the EN 61010-1 safety regulations for electronic measuring instruments. It left the factory in a safe and secure technical condition.
The smooth functioning and operational safety of the measuring system can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed during operation.
The smooth functioning and operational safety of the instrument can only be guaranteed under the environmental and electrical operating conditions that are in specified in chapter "TECHNICAL CHARACTERISTICS".

Do not use or store the product in places such as listed below:

- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the instrument.
- Excessive induction noise, static electricity, magnetic fields or noise.

If the measuring system was transported from a cold environment to a warm environment, the formation of condensate can impair the functioning of the measuring system. In this event, wait until the temperature of the measuring system reaches room temperature before putting the measuring system back into operation.

Obligations of the purchaser

The purchaser of this measuring system must ensure that the following laws and guidelines are observed when using dangerous substances:

- EEC directives for protective labour legislation
- National protective labour legislation
- Safety regulations

INSTRUMENT TECHNICAL CHARACTERISTICS

Instrument	
Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm
Operating conditions	
Working temperature	-5…50°C
Storing temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP67**
Power Supply	
Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	
Without probes or with temperature probe	20µA
With dissolved oxygen probe	40µA
Mains (cod. **SWD10**)	Output mains adapter 100-240Vac/12Vdc-1A
Units of measurement	mg/l O_2, %O_2, mbar, °C, °F
Security of memorized data	Unlimited, independent of battery charge conditions
Time	
Date and time	Schedule in real time
Accuracy	1min/month max drift
*Measured values storage - model **HD2109.2***	
Type	2000 pages containing 9 samples each
Quantity	18.000 measurements composed of four parameters: mg/l O_2 - %O_2 - mbar - [°C or °F]
Selectable storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min e 1hour
Serial interface RS232C	
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 15m
Selectable print interval	Immediate or 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour

*USB interface - model **HD2109.2***

Type	1.1 - 2.0 electrically isolated

Connections

Input for dissolved oxygen and temperature probes	8-pole male DIN45326 connector
RS232 serial interface	8-pole MiniDin connector
USB interface (only **HD2109.2**)	Mini-USB type B connector
Mains adapter (cod. **SWD10**)	2-pole connector (positive at centre)

Measurement of the concentration of dissolved oxygen

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

Measurement of the saturation index of dissolved oxygen

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

Measurement of barometric pressure

Measurement range	0.0…1100.0mbar
Resolution	0.1mbar
Accuracy	±2mbar±1digit between 18 and 25°C ±(2mbar+0.1mbar/°C) in the remaining range

Setting the salinity

Measurement range	0.0…70.0g/l
Resolution	0.1g/l

Temperature measurement with the sensor inside the dissolved oxygen probe

Measurement range	0.0…+45.0°C
Resolution	0.1°C
Accuracy	±0.1°C
Drift after 1 year	0.1°C/year

Temperature measurement by Instrument with Pt100 probe

Pt100 measurement range	-200…+650°C
Resolution	0.1°C
Accuracy	±0.1°C
Drift after 1 year	0.1°C/year

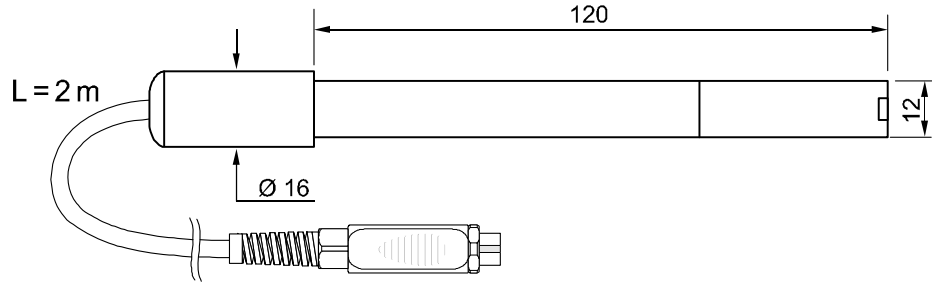
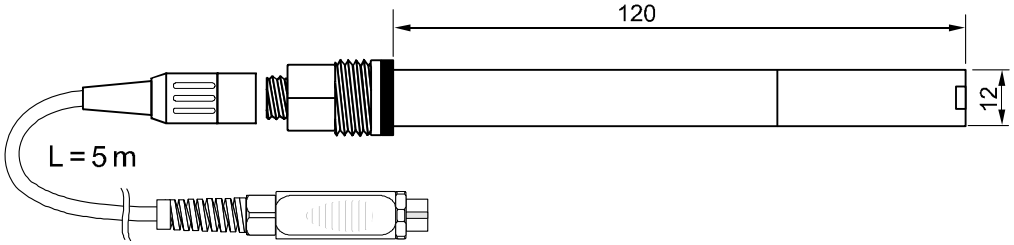
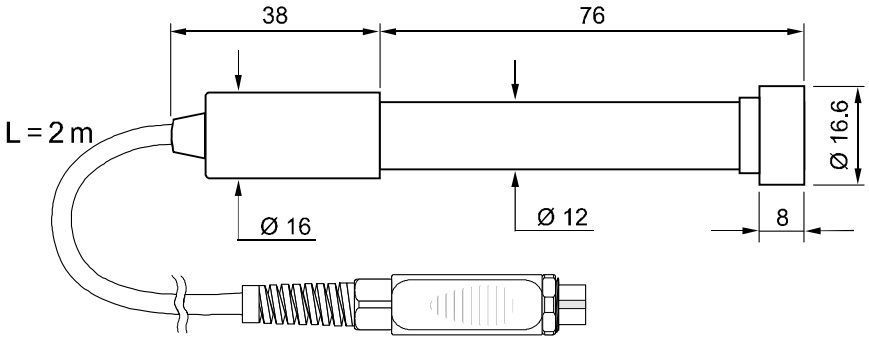
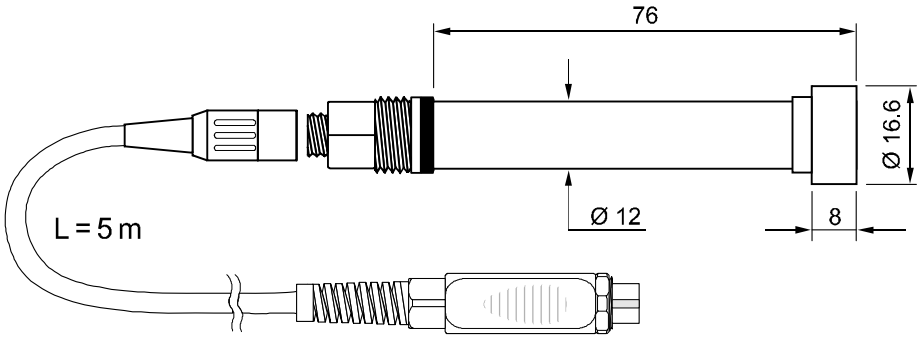
Automatic temperature compensation	0…50°C

TECHNICAL DATA OF PROBES

DISSOLVED OXYGEN PROBES

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	2m	5m (*)	2m	5m (*)

(*) Cable with connector

DO9709SS	
DO9709SS.5	
DO9709SS.1	
DO9709SS.5.1	

TEMPERATURE PROBES Pt100 SENSOR 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.I	Contact	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.5°C (+300°C…+400°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.O Class A - Thin Film	Immersion	-70°C…+250°C	±0.25°C
TP49AC.O Class A - Thin Film	Contact	-70°C…+250°C	±0.25°C
TP49AP.O Class A - Thin Film	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

4-WIRE Pt100 PROBES WITH TP47 MODULE

Model	Type	Application range	Accuracy
TP47.100.O 1/3 DIN – Thin Film	Pt100 4 wires	-50…+250°C	1/3 DIN
TP87.100.O 1/3 DIN – Thin Film	Pt100 4 wires	-50…+200°C	1/3 DIN

Temperature drift @ 20°C 0.003%/°C

ORDER CODES

HD2109.1 Kit including: instrument HD2109.1, calibrator DO9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), 4 x 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.

HD2109.2 Kit including: instrument HD2109.2 **datalogger**, calibrator DO9709/20 (for polarographic probe) or DO9709/21 (for galvanic probe), 4 x 1.5V alkaline batteries, operating manual, case and DeltaLog9 software.

The dissolved oxygen probes, the temperature probes, the cables for the connection to PC or printer must be ordered separately.

HD2110CSNM Connection cable 8-pole MiniDin – Sub D 9-pole female for RS232C.

C.206 Connection cable 8-pole MiniDin – USB type A. With integrated RS232/USB converter.

CP23 Connection cable Mini-USB type B – USB type A.

DeltaLog9 Software for transfer and management of the data on PC using 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 basis plate. Flexible electrode holder for free positioning. For Ø 12mm probes.

COMBINED DISSOLVED OXYGEN / TEMPERATURE PROBES

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

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

DO9709 SS.1 **Galvanic** combined probe for measurement of O_2 and temperature with replaceable membrane. The kit includes: three membranes, zero solution, electrolyte solution. Cable length 2m. Dimensions Ø 12mm x 76mm. Membrane holder Ø 16mm.

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

ACCESSORIES

DO9709 SSK	Accessories kit for the DO9709 SS and DO9709 SS.5 probes consisting of two membranes, zero solution, electrolyte solution.
DO9709/20	Calibrator for DO9709 SS and DO9709 SS.5 polarographic probes.
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 probes consisting of two membranes, zero solution, electrolyte solution.
DO9709/21	Calibrator for DO9709 SS.1 and DO9709 SS.5.1 galvanic probes.
DO9701.1	Electrolyte solution for DO9709 SS.1 and DO9709 SS.5.1 galvanic probes.
DO9700	Zero oxygen solution.

Pt100 TEMPERATURE PROBES 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.I	Contact probe, sensor Pt100. Stem Ø 4 mm, length 230 mm, contact surface Ø 5mm. 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.O	Immersion probe, sensor Pt100. Stem Ø 2.7 mm, length 150 mm. Cable length 2 metres. Aluminium handle.
TP49AC.O	Contact probe, sensor Pt100. Stem Ø 4 mm, length 150 mm. Cable length 2 metres. Aluminium handle.
TP49AP.O	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.

Pt100 TEMPERATURE PROBES COMPLETE WITH TP47 MODULE

TP47.100.O Immersion probe, sensor Pt100 direct 4 wires. Probe's stem Ø 3mm, length 230mm. 4-wire connection cable with connector, length 2 metres.

TP87.100.O Immersion probe, sensor Pt100 direct 4 wires. Probe's stem Ø 3mm, length 70mm. 4-wire connection cable with connector, length 2 metres.

TP47 Only connector for direct 4-wire Pt100 probes connection.

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

NOTES

CERTIFICATO DI CONFORMITÀ DEL COSTRUTTORE

MANUFACTURER'S CERTIFICATE OF CONFORMITY

rilasciato da

issued by

DELTA OHM SRL STRUMENTI DI MISURA

DATA
DATE 2008/05/28

Si certifica che gli strumenti sotto riportati hanno superato positivamente tutti i test di produzione e sono conformi alle specifiche, valide alla data del test, riportate nella documentazione tecnica.

We certify that below mentioned instruments have been tested and passed all production tests, confirming compliance with the manufacturer's published specification at the date of the test.

La riferibilità delle misure ai campioni internazionali e nazionali è garantita da una catena di riferibilità che ha origine dalla taratura dei campioni di prima linea dei laboratori accreditati di Delta OHM presso l'Istituto Primario Nazionale di Ricerca Metrologica.

The traceability of measures assigned to international and national reference samples is guaranteed by a reference chain which source is the calibration of Delta OHM accredited laboratories reference samples at the Primary National Metrological Research Institute.

Tipo Prodotto: **Misuratore di ossigeno disciolto e temperatura**
Product Type: ***Dissolved oxygen and temperature meter***

Nome Prodotto: **HD2109.1 – HD2109.2**
Product Name:

Responsabile Qualità
Head of Quality

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Cod. Fisc./P.Iva IT03363960281 - N.Mecc. PD044279
R.E.A. 306030 - ISC. Reg. Soc. 68037/1998

WARRANTY

TERMS OF WARRANTY

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 UE Directive 2002/96/EC, 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 ❑ **HD2109.1** ❑ **HD2109.2**

Serial Number _____

RENEWALS

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

CE CONFORMITY

The product complies with 2004/108/CE (EMC) and 2006/95/CE (low voltage) directives, and meets the requirements of the following technical standards:

Safety	EN61010-1
Electrostatic discharge immunity test	EN61000-4-2 Level 3
Radiated, radio-frequency, electromagnetic field immunity	EN61000-4-3 Level 3
Electrical fast transient/burst immunity	EN61000-4-4 Level 3
Immunity to conducted disturbances, induced by RF fields	EN61000-4-6
Voltage dips, short interruptions and voltage variations immunity	EN61000-4-11
Radio disturbance characteristics (conducted and radiated emissions)	EN55022:2007 class B