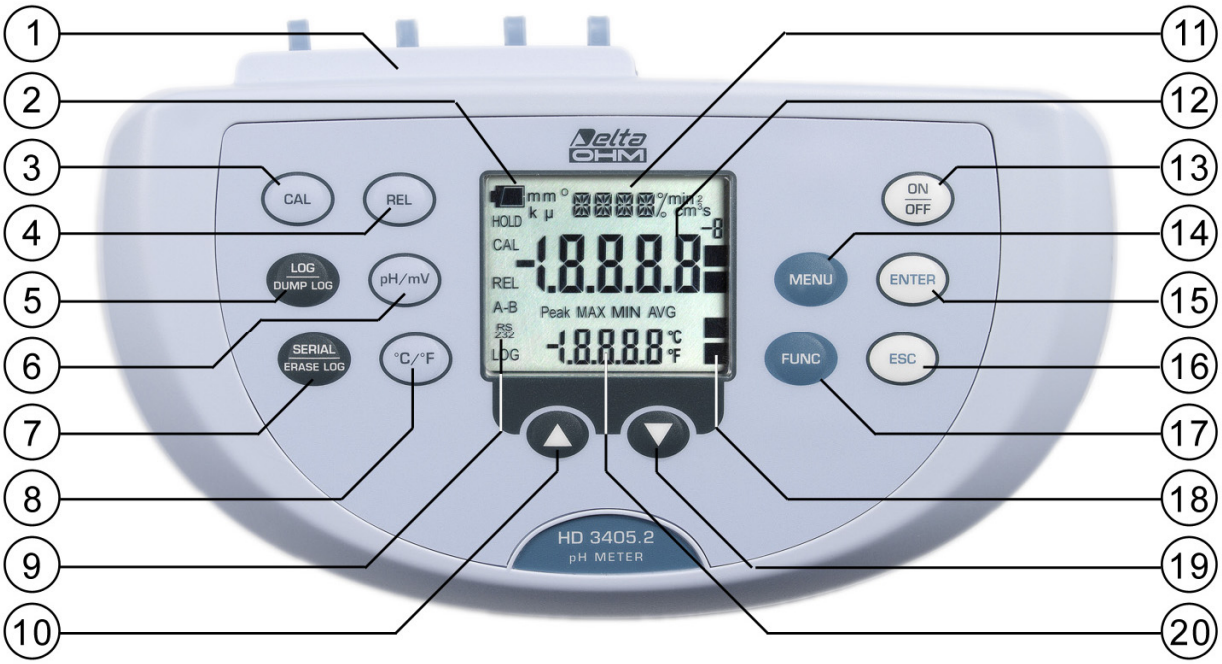
REV. 1.0
31 Jan. 2006

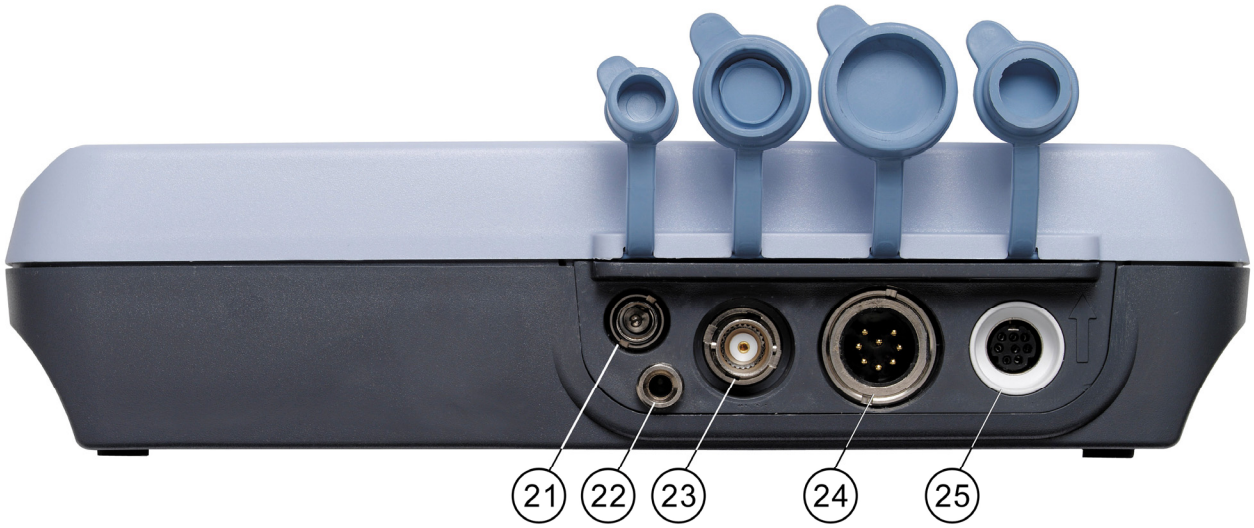
HD3405.2

GB

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.

Temperature-pH meter
HD3405.2





HD3405.2

1. Connectors.
2. Battery symbol: displays the battery charge level. The symbol does not appear when the external power supply is connected.
3. **CAL** key: it starts the probe the pH electrode calibration.
4. **REL** key: enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed). It is applied to the in mV and temperature measurement.
5. **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.
6. **pH/mV** key: when pressed for at least one second, changes the main variable measurement between pH and mV. When the Auto-HOLD function is enabled, slight pressure updates the measurement.
7. **SERIAL/ERASE LOG** key: starts and ends data transfer to the serial/USB communication port. In the menu, clears the data contained in the instrument's memory.
8. **°C/°F** key: when the probe is not connected, allows manual modification of the temperature. When double pressed, changes the unit of measurement for the temperature from degrees Celsius to Fahrenheit.
9. Function indicators.
10. Key ▲: in the menu, increases the current value.
11. Line for symbols and comments.
12. Main display line.
13. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the ENTER key, disables the automatic turn off.
14. **MENU** key: allows access to and exit from the menu.
15. **ENTER** in the menu, confirms the current selection; when pressed together with the ON/OFF key, disables the automatic turn off.
16. **ESC** key: In the menu, cancels the operation in progress without making changes.
17. **FUNC** key: during normal operation displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements.
18. pH electrode efficiency indicators.
19. Key ▼: in the menu, decreases the current value.
20. Secondary display line.
21. External mains power supply connector input 12Vdc for ∅ 5.5mm - 2.1mm connector.
22. Socket for ∅ 4 mm standard plug for the reference electrode pH/ISE.
23. BNC connector for the pH/mV electrode.
24. 8-pole DIN45326 connector, input for Pt100 temperature probes with SICRAM module, 4 wire direct Pt100 probes, 2 wire Pt1000 probes.
25. 8-pole MiniDin connector for RS232C connection using cable HD2110CSNM, for USB 2.0 connection using cable HD2101/USB and for *S-print-BT* printer connection using cable HD2110CSP.

INTRODUCTION

The instrument series HD34… is made up of 4 bench top instruments for electrochemical measures: **pH**, **conductivity**, **dissolved oxygen, and temperature**.

The **HD3405.2** measures **pH** and the **redox potential** (ORP) in mV. It measures the **temperature** using Pt100 or Pt1000 immersion, penetration or air contact probes.
The pH electrode calibration, as well as manual, can be carried out on one, two or three points and the calibration sequence can be chosen from a list of 13 buffers.

The displayed data can be stored **(datalogger)** and can be transferred to PC or serial printer thanks to the multi-standard serial ports RS232C and USB2.0 and software DeltaLog9 (Vers.2.0 and subsequent ones). The storing and printing parameters can be set from menu.

Display, printing and logging always show temperatures in °C °F, and pH or mV.

Other common function of this instrument series include: Max, Min and Avg function, the Auto-HOLD function, the automatic turning off which can also be disabled.

The instruments have IP66 protection degree.

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 LOG/DUMP LOG key.

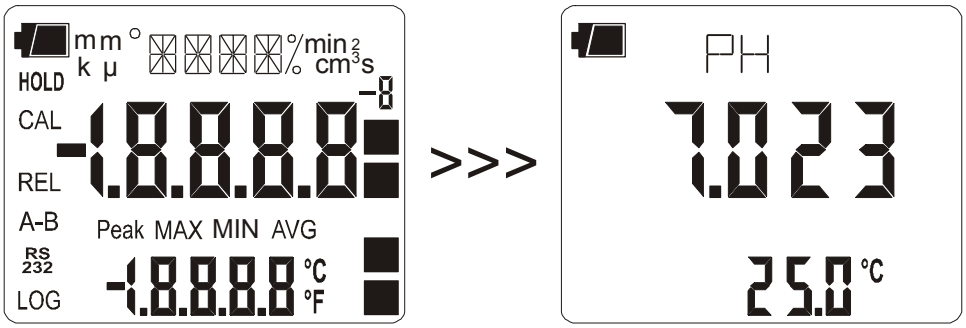
In the double-keys, the function in the upper part is the "main function", while the one in the bottom part is the "secondary function". When the instrument is in standard measurement mode, the main function is active. In the menu, the secondary function is enabled.

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 key

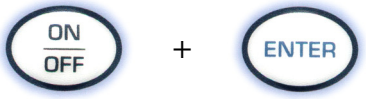
The instrument is turned on and off using the ON/OFF key. Turning on enables all display segments for a few seconds, starts an auto-test, including the detection of the temperature probe connected to the input, and sets the instrument ready for normal measurement.



During turning on, should no probes be connected, the message "NO_PRBE_SER_NUM" is displayed in the line for symbols for a few seconds, and in the secondary line the last manually-set temperature appears. The unit of measurement symbol (°C or °F) starts blinking, and a letter "m" meaning "manual" appears next to the battery symbol.

When the probe fitted with SICRAM module is inserted into a functioning instrument, the "NEW_PROB_DET" (New probe detected) message appears: as the probe's data are captured upon turning the instrument on, it is necessary to turn the instrument off and 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.

ENTER key

In the menu, the ENTER key confirms the current parameter and then goes to the next one. Pressed together with the ON/OFF, disables the automatic turn off.

MENU key

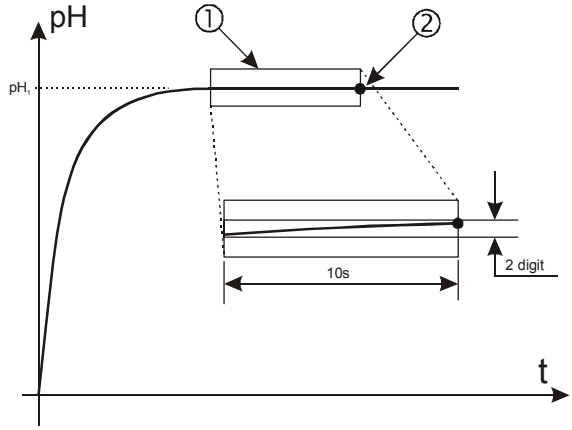
The first menu item is accessed by initially pressing on the MENU key, press ENTER to go the following. To modify the item displayed , use the arrows key (▲ and ▼). The current value is confirmed by pressing the ENTER key and the display moves on to next parameter. If pressing ESC the setting is cancelled.

To exit the menu, press the MENU key at any time.

The menu items are listed in this order:

1) **Management of memorized data**: 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 29).
2) **Identifier of the sample being measured**: it is an automatically increased progressive number associated with the single PRINT function (print interval set to 0). The index appears in the single sample printing together with date, time, pH or mV 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 REL/ ▼ key down the proposed number is rapidly set to zero.
   The instrument's heading information will be printed using the SERIAL key.
3) **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 "pH/mV" (please see the description of the pH/mV key for further explanation).
In the following figure you can see an example of the measurement process with the Auto-Hold function enabled. A electrode is immersed into a liquid and, to perform the measurement, the "pH/mV key is pressed": The pH measurement raises progressively reaching the final value. The HOLD symbol blinks. In the sketch 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.



Press the "pH/mV" key again to carry out a new measurement.

4) **Print and log interval** sets the interval in seconds between two loggings or data transfers to the serial port. The interval can be set from 0s, 1s, 5s, 10s, 15s, 30s, 60s (1min), 120s (2min), 300s (5min), 600s (10min), 900s (15min), 1200s (20min), 1800s (30min) e 3600s (1 hour). **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 second 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.

5) **Sleep_Mode_LOG** 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) **LAST CAL m/d h/m (Last pH calibration)**: the display shows the month and day (m/d) in the main line, and the hour and minutes (h/m) in the secondary line of the last pH electrode calibration. This menu item cannot be modified. The calibration year is not displayed.

7) **pH RES**: selects the number of leading digits for the pH measurement: using the arrows select 1.23 to obtain the pH hundredths or 1.234 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

8) **BUFR_1 (First buffer)**: selects the value of the first buffer for the pH electrode calibration. The preset buffers are compensated for temperature. The ATC indication is displayed in the lower line. The USER buffer, defined by the user, is **not** compensated for temperature: to change its value, go to the "SET USER BUFR" step.

   Please see the paragraph dedicated calibration on page.14.

9) **BUFR_2 (Second buffer)**: selects the value of the second buffer for the pH electrode calibration. No standard solution values close (less than 2pH) to the first buffer are proposed. This is also true for the USER buffer, defined by the user at the "SET USER BUFR" step: if, for example BUFR_1=6.860 and USER=5.000, the BUFR_2 USER does not appear among the values because it is too close to BUFR_1. The selection NIL (=no buffer) disables the current buffer. The USER buffer, defined by the user, is not compensated for temperature.

   Please see the paragraph dedicated calibration on page14.

10) **BUFR_3 (Third buffer)**: selects the value of the third buffer for the pH electrode calibration. No standard solution values close (less than 2pH) to the first buffer are proposed. This is also true for the USER buffer, defined by the user at the "SET USER BUFR" step: The selection NIL (=no buffer) disables the current buffer. The USER buffer is not compensated for temperature.

    Please see the paragraph dedicated calibration on page 14.

11) **SET USER BUFR (Set user pH buffer)**: this is a buffer whose value can be defined by the user using the arrows; all values from 0 to 14pH are available. This buffer 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.

12) **RCD MODE (Record mode)**: the instrument captures a pH/mV and a temperature value every second. If the RCD MODE parameter is set to "**pH**" (factory default), the maximum and minimum values displayed using FUNC/ENTER refer to pH: the indicated temperature is that measured at the maximum and minimum pH and is not the maximum and minimum temperature.
    If the RCD MODE parameter is set to "**tp**" (=temperature), the maximum and minimum values displayed using FUNC/ENTER refer to temperature: the indicated pH is that measured at the maximum and minimum temperature and is not the maximum and minimum pH.
    Finally, if the RCD MODE parameter is set to "**Indep**" (=independent), the maximum and minimum values displayed using FUNC/ENTER are independent: the indicated pH and temperature are the maximum and minimum measured values but are not necessarily referred to the same measurement moment.

13) **Probe type**: the message "PRBE_TYPE" is scrolled in the comment line. The main line in the center of the display shows the type of temperature probe connected to the instrument. following probes can be connected to the input:

    - temperature probes Pt100 complete with SICRAM module
    - 4 wire Pt100 probes through module TP47
    - 2 wire Pt100 probes through module TP47
    - 2 wire Ni1000 probes through module TP47

    Upon turning on the instrument automatically detects the probes fitted with SICRAM module, the Delta Ohm Pt1000 and Ni1000: the *Probe Type* menu item is configured by the instrument and cannot be modified by the user.

    The temperature probes direct 4 wire Pt100, the Pt1000 and the Ni1000 are manufactured by Delta OHM. When turned on they display the message "NO_PRBE_SER_NUM". In this

case the probe type must be entered manually. Select **Probe type** using the MENU key and then select the type of probe used with the arrow keys; confirm using ENTER

14) **YEAR**: to set the current year. Use the arrows to modify this parameter and confirm using ENTER.
15) **MNTH (month)**: to set the current month. Use the arrows to modify this parameter and confirm using ENTER.
16) **DAY**: to set the current day. Use the arrows to modify this parameter and confirm using ENTER.
17) **HOUR** : to set the current hour. Use the arrows to modify this parameter and confirm using ENTER.
18) **MIN (minutes)**: 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.
19) **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.29).

FUNC key

It enables the display and logging of the maximum (MAX), minimum (MIN) and average (AVG) value of the pH, mV, and temperature measurements, updating them with the acquisition of new samples. The acquisition frequency is once a second.

> 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 pH and temperature value 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.

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

ESC key

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

CAL key

It starts the pH electrode calibration ((please see the paragraph dedicated to calibration page.14).

REL key

In measurement mode, displays for both measurements - **mV** and **temperature** - 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.

LOG/DumpLOG key

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 single session.

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 HD3405.2 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)

When the LOG key is pressed after the MENU key, the transfer of the logged data on the serial port is started.

Please see the paragraph dedicated to data transfer on page 29.

pH/mV-key

Changes the main variable measurement between pH and mV. The selected parameter is used for display, printing, and logging.

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 mV) for over 10 seconds: the message HOLD is displayed.

To perform a new measurement, it is necessary to press the pH/mV key.
The HOLD message starts blinking, while the display follows the actual measurement trend, until it stabilizes again and the HOLD message remains still.

NOTE: when the Auto-Hold function is enabled, the pH/mV key allows the pH measurement to be relaunched, **and the measurement in mV is disabled. To restore the display in mV, disable the Auto-Hold function in the menu.**

SERIAL/EraseLOG key

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

When pressed after the MENU key, the SERIAL key **permanently** erases all the data contained in the instrument's memory.

°C/°F Key

When the temperature probe is connected, the measured value is used to compensate the pH measurement; the key changes the unit of measurement for the temperature from degrees Celsius to Fahrenheit.
If the probe is not present, the compensation temperature must be entered manually: to manually change the value shown in the display lower line, press °C/°F once. The temperature indicated starts blinking. While the display is blinking, it is possible to change the compensation temperature using the arrows (▲ and ▼). Confirm using ENTER. The display stops blinking, and that temperature is used for compensation.
If the temperature probe is not present, to change the unit of measurement between °C and °F, it is necessary to press **twice** the °C/°F key.

Up Arrow

When used in the menu, it increases the current variable value. During measurement, if the temperature probe is not present, it increases the temperature value for pH compensation.

Down Arrow

When used in the menu, it decreases the current variable value. During measurement, if the temperature probe is not present, it decreases the temperature value for pH compensation.

pH MEASUREMENT

The instrument works with pH measurement electrodes, redox potential measurement electrodes (ORP), and specific ion electrodes. The probes with 4 wire Pt100, 2 wire Pt1000 or Ni1000 sensors may be used for measuring temperature or for the automatic compensation of the Nernst coefficient with the pH electrode.

Some probes are fitted with SICRAM module that acts as an interface between the sensor on the probe and the instrument. There is a electronic circuit with a permanent memory inside the module that enables the datalogger to recognize the type of probe connected and to read its calibration information.

The Delta Ohm Pt1000 and Ni1000 probes complete with TP47 module , are automatically detected while the direct 4 wire Pt100 temperature probe is not automatically detected by the instrument and must be set up in the **Probe type** menu item (please see the description of the menu on page 8).

The pH or mV indication is displayed in the main line; the secondary line shows the temperature.

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. The following aspects of this signal are considered:

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

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.

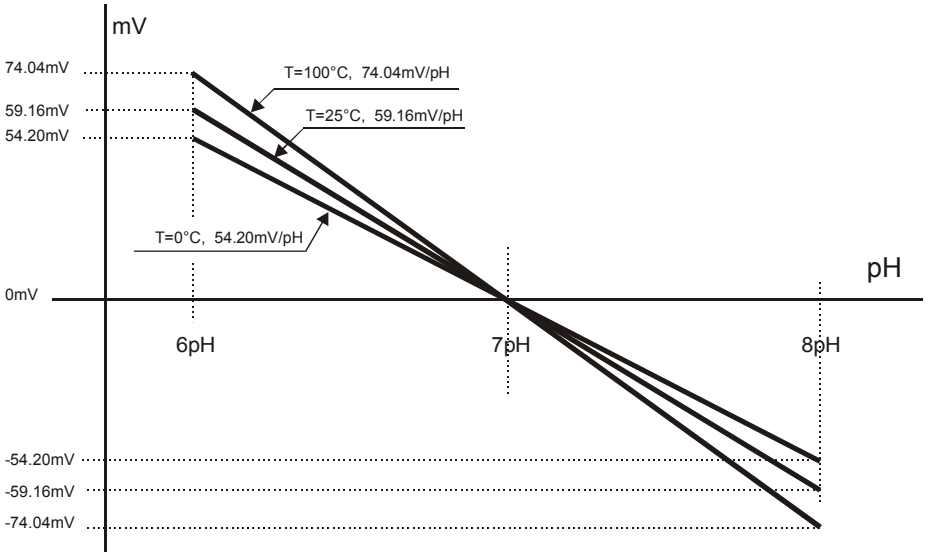
Sensitivity: it is the electrode's slope expression in relative terms. It is obtained by dividing the actual value of the slope by the theoretical value, and is expressed as a %. The asymmetry potential and the slope vary in time with the use of the electrode, which necessitates regular calibration.

The pH electrodes must be calibrated using the standard solutions (see the pH calibration chapter below). The ORP and specific ion electrodes do not need calibration as their absolute voltage is measured. **The redox standard solutions are only used to check the quality of a redox electrode**.
No calibration of the temperature sensor is required by the user: 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.

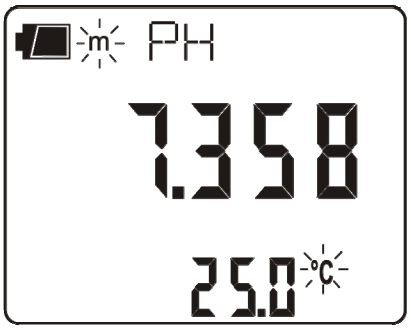
Automatic or manual pH compensation

In a correct measurement of pH, the results need to be expressed together with the temperature value at which the reading is performed.
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, the instrument automatically applies the ATC automatic temperature compensation function. To disable it, the temperature probe must be disconnected.
If the temperature probe is not present, and the correct value is not entered manually, the extent of the error committed in pH measurement is proportional to temperature and pH value itself.

In absence of the temperature probe, the lower display shows the manually set compensation temperature (default=25°C).
To point this condition out, the °C or °F symbol blinks intermittently near the temperature value. Moreover, on the main display an "m" (**m**anual) is turned on near the battery symbol (if present). On the print-outs, the **MT** indication is printed. Instead, if the probe is present, the **AT** symbol is printed.



To manually change the compensation temperature press °C/°F once: the indicated temperature value starts blinking. Select the desired temperature value by using the arrows and confirm with ENTER. The display stops blinking, and the temperature displayed is used for compensation.
To change the unit of measurement between °C and °F, it is necessary to press twice the °C/°F key.

pH electrode calibration

The electrode calibration is used to compensate the zero potential and slope deviations to which the electrode is subject with time.
The calibration frequency depends on the accuracy desired by the user and by the effects that the measured sample 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 1, 2 or 3 points. When using 1 point, the electrode offset is corrected, with 2 points the offset and the gain is corrected; finally, in case a three points calibration is carried out two offsets and two slopes are calculated, **the second point is the one in which the zero is performed**.

The instrument has a memory of 13 buffers with relevant temperature compensation tables (ATC) plus an "User" buffer, not compensated. The three buffers can be selected by using the **BUFR_1_pH, BUFR_2_pH, BUFR_3_pH** menu items. Usually one for the acid, one for the neutral, and one for the alkaline band will be selected:

@25°C

BUFR_1 (NEUTRAL)	**6.860**	6.865	7.000	7.413	7.648
BUFR_2 (ACID)	1.679	2.000	4.000	4.008	**4.010**
BUFR_3 (ALKALINE)	**9.180**	9.210	10.010		

The buffers in bold are predefined in the factory, these are the "Delta OHM" ones.

If electrode calibration was not carried out on the instrument, or the batteries have been changed or the last calibration failed, the display blinks the **CAL** message.

Calibration procedure

1) Insert the temperature probe and the electrode in the solution of a calibration buffer. If no temperature probe is available, use another thermometer and enter the value manually as indicated in the paragraph "*Automatic or manual pH compensation*".

2) The electrode calibration mode is started by pressing CAL.

3) Among the three prepared buffers, the instrument automatically detects the closest to the pH value being read and flags it up on the lower display.
If the buffer is not detected the first buffer BUFR_1_pH is proposed.

4) At this point the CAL symbol is not blinking on the display and the following is shown from the upper side downward:
   a) the chosen buffer nominal value at 25°C (scrolling indication)
   b) the pH measurement value with the current calibration
   c) the temperature compensated buffer value

   The detected and temperature compensated buffer value, shown in the lower line, can be modified using the arrows.

5) To proceed with the calibration press ENTER. The electrode offset mV value (OFFS) is shown on the display for few seconds).
After a few seconds the instrument shows the measurement again, corrected according to the new calibration, **but remains in calibration mode**. Pressed repeatedly the ENTER key allows the calibration on the point to be repeated, for example, in order to obtain a more stable value.

6) To end the electrode calibration, press "ESC" to exit calibration, or continue the calibration for the second point.

7) Extract the electrode from the buffer, clean it carefully, and insert it in the following buffer.

8) Press the MENU key .

The instrument displays the value detected on the new buffer: continue by repeating the steps from point 3).

NOTES:

- After calibration, the instrument displays **an electrode quality indication**:
  - No signal: electrode functioning.
  - 1 small square blinking on the lower right: electrode almost exhausted.
  - 2 small squares blinking on the lower right: electrode exhausted to be replaced.
- **The 3 point calibration must always be carried out according to the fixed sequence: NEUTRAL>>ACID>>BASIC**. The basic buffer must be the last in the sequence.
- **Without having pressed ENTER at all, the calibration is interrupted by pressing ESC;** the previous values will continue to be used.
- The buffers are always presented in the sequence set in the menu with the BUFR_1-BUFR_2-BUFR_3 parameters. The 2 point calibration is possible using the sequence BUFR_1-BUFR_2 or BUFR_2-BUFR_3 or even BUFR_1-BUFR_3. **The 3 point calibration is only possible using the exactly described sequence BUFR_1-BUFR_2-BUFR_3**.

		Allowed pH calibration sequences		
Number of calibration points	1	BUFR_1	BUFR_2	BUFR_3
	2	BUFR_1 - BUFR_2	BUFR_2 - BUFR_3	BUFR_1 - BUFR_3
	3	BUFR_1 - BUFR_2 - BUFR_3		

- A buffer can be disabled in the option selection phase (MENU mode) by choosing the **NIL** value. In this case, the disabled buffer is excluded from the sequence and will not be proposed.
- **In any case where no operation is performed, the calibration mode automatically stops after 60 seconds.**
- If the calibration is rejected by the instrument because it is considered to be excessively corrupted, the **CAL ERR** message will appear, followed by a long beep. The instrument remains in calibration mode and maintains the previous calibration values: at this point, if the calibration is interrupted using ESC, the instrument signals the anomaly through the CAL message blinking.

Temperature characteristics of Delta OHM buffer solutions

The 13 standard buffers reported in the table on page 14 are memorized in the instruments 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, 4.01pH e 9.18pH (@25°C)

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

DIRECT INPUT INTO Pt100, Pt1000 AND Ni1000 TEMPERATURE PROBES WITH TP47 MODULE

The instrument accepts the input of Platinum temperature probes with resistances of 100Ω and 1000Ω as well as Nickel temperature probes with a 1000Ω resistance.
The Pt100 are connected to 4 wires, the Pt1000 and Ni1000 to 2 wires, with the excitation current chosen minimizing the sensor self-heating effects.
All probes with module are calibrated in the factory, the 2 or 4 wire probes with direct input are **checked for conformity with class A tolerance** according to norm IEC751 - BS1904 - DIN43760.
The probes with SICRAM module, Pt1000 and Ni1000 TP47 module are detected by the instrument; the model configuration is required for the other probes (please see the description of the Probe Type menu on page 8).

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

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.

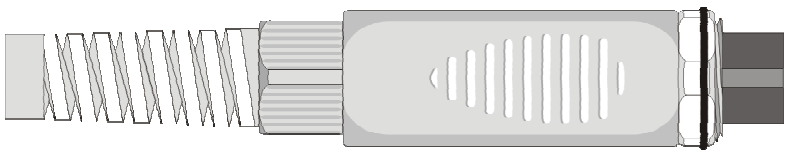
In the temperature measurement by **penetration** the probe tip must be inserted to a depth of at least 60mm, the sensor is housed in the end part of the probe. When measuring the temperature on frozen blocks it is convenient to use a mechanical tool to bore a cavity in which to insert the tip probe.

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.

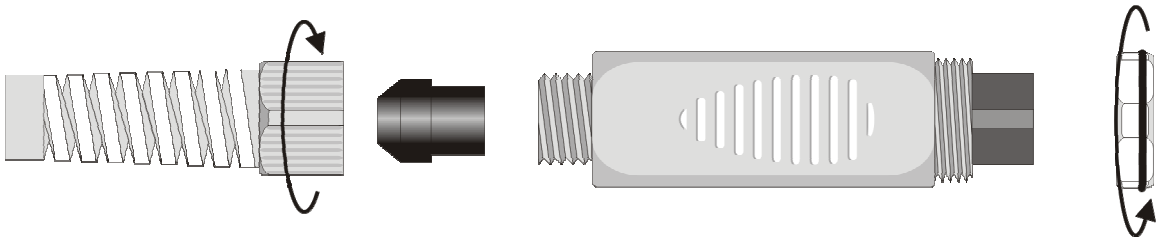
Instructions to connect the TP47 module for 4 wire Pt100 probes, Pt1000 and Ni1000

All Delta Ohm probes are provided with a module TP47. The HD3405.2 also work with direct 4 wire Pt100 probes, Pt1000 and Ni1000 probes manufactured by other producers: for the instrument connection is prescribed the TP47 connector to which the probe's wires should be welded.

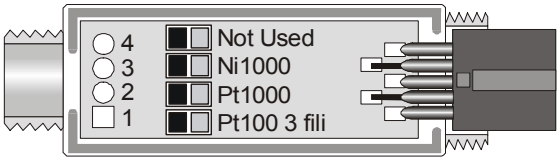


The instructions to connect the Platinum or Nickel probe to the TP47 module are provided below.
The module is supplied complete with fairlead and gasket for 5mm maximum diameter cables.

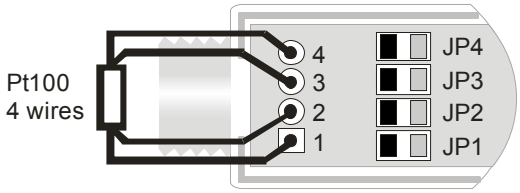
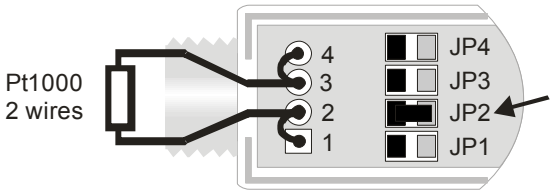
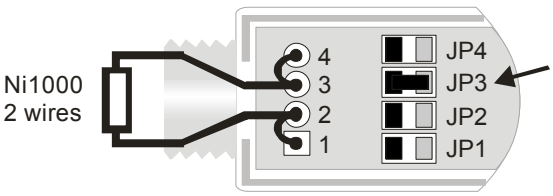
Do the following to open the module and connect a probe:
Unscrew the fairlead and extract the gasket, remove the label using a cutter, unscrew the ring on the opposite side as illustrated in the figure:



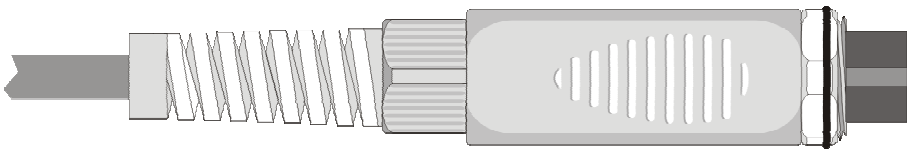
Open the two module shells: the printed circuit to which the temperature probe must be connected is housed inside. On the left there are the 1…4 points on which the sensor wires must be welded. The JP1…JP4 jumpers are in the center of the card. These must be closed with a tin bead for some type of sensors:



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

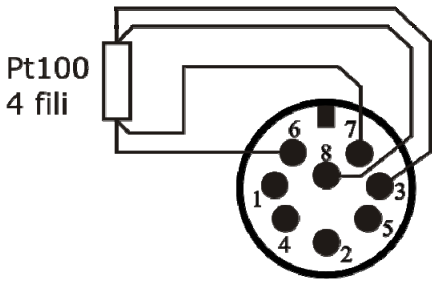
Sensor	TP47 card connection	Jumper
Pt100 4 wires		None
Pt1000 2 wires		JP2
Ni1000		JP3

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 the 4-sensor to a DIN45326 connector

Sensor	Direct connection to the connector
Pt100 4 wires	 Female Connector on the welding

Sensor 4 wire Pt100 can be welded directly to the DIN45326 female connector's pins without having to resort to the TP47 board. The 4 wires of Pt100 must be soldered as shown in the diagram to the left.
To use this type of probe, set the "Probe Type" item in the menu as stated in page 8.
Probe Pt100 is acknowledged by the device upon start-up: insert the probe when the device is on and only start up after insertion.

WARNINGS AND OPERATING INSTRUCTIONS

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. Do not bend or force the contacts when inserting the probe connector into the instrument.
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 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. Above 400°C and below –40°C, avoid violent 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. 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 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.

Notes on pH electrodes use

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.

The new electrodes must be conditioned for half a day by immersing them 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) first point and at least a second point.

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 and, in case of a filling type electrode, replace the electrolyte with the **KCL3M** solution (electrodes KP63, KP64 e KP90) or the **PROTELYTE** solution (electrodes KP61, KP71 e KP80).

Check that no air bubbles are present in the electrode tip and that it is sufficiently immersed.

Even 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 connector short circuiting.

Storage. Keep the electrode immersed in the **HD62SC** solution.

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	This message appears if the pH measurement exceeds the -2.000pH…19.999pH limits, if the mV measurement exceeds the ±2.4V limits, if the temperature probe, already detected by the instrument, is disconnected. At the same time an intermittent beep is issued.
PROB COMM LOST	This appears if the probe, has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
OVER	Measurement overflow: this appears when the probe measures a value exceeding the measurement range or the mV measurement is included in the +2.0…+2.4V range.
UNDR	Measurement overflow: this appears when the mV measurement is included in the -2.4…-2.0V range.
LOG **MEM** **FULL**	Memory full; the instrument cannot store further data, the memory space is full.
NEW PROBE DET	This message appears when a probe is inserted into a functioning instrument. Turn the instrument off and then back on again.
PROB **ERR**	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.
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 indications	Explanation
>>> LOG_DUMP_or_ERAS	transfer or erase data
>>> PRBE_TYPE	type of probe connected
AUTO HOLD	automatic function holding the displayed measurement
BATT TOO LOW - CHNG NOW	battery discharged - replace it immediately
BAUDRATE >>>	baud rate value
BUFR_1	first standard value
BUFR_2	second standard value
BUFR_3	third standard value
CAL ERR	calibration error
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
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_STOP	logging complete
LOG_STRT	logging started
MIN >>> USE_UNIT_TO_ZERO SEC	minutes >>> use the °C/°F key to reset the seconds
MNTH	month
NEW_PROB_DET	new probe detected
NIL	disable current buffer
OFFS	offset
OVER	maximum limit exceeded
pH RES	pH measurement resolution
PLS_EXIT >>> FUNC RES_FOR_FACT ONLY	please exit using ESC >>> function reserved to factory calibration
PRBE_SER #### ####	serial number #### #### of the connected probe
PRNT AND LOG INTV	printing and logging intervals
PRNT INTV >>>	printing interval
PROB COMM LOST	lost communication with probe
PROB ERR	error - unexpected probe
RCD MODE	record function operating mode (max, min, avg)
SET USER BUFR	user define buffer value
SLP_MODE_LOG	turning off during recording mode
SLPE%	gain %
SMPL ID REL=RSET SER=PRINT	identifier of the sample - REL=reset - SERIAL=print heading
SYS ERR #	program error number #
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…

If you wish to continue using the instrument, remove the flat batteries and supply it using the external power supply. Data stored on memory are maintained even without power supply.
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 or use the external power supply, in order to turn the instrument back on.

In order to avoid data loss, the logging session is ended, if the HD3405.2 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 screw the cover on clockwise.

After replacing the batteries, the menu parameters **must be set again**. To go to the next item press ENTER; to return to measurement mode, press MENU.
In order to avoid losing the menu settings, before removing the batteries, connect the external power supply.

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 leak proof 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.

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

SERIAL INTERFACE AND USB

The HD3405.2 is fitted with an electrically isolated RS-232C and USB2.0 serial interface.
The USB connection requires the previous installation of a driver in the instrument software. Install the driver **before connecting the USB cable to the PC** (please see the details on page 31).

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 9). 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.

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	AT 21.3 6.778	Captured measurements (24 characters) AT = automatic temperature compensation, temperature, pH or mV.
G0	Model HD3405 -2	Instrument model
G1	M=pH / Thermometer	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=SICRAM Pt100	Type of probe connected to input
G7	Probe SN=11119999	Probe serial number
G8	Probe cal.=2004/01/12	Probe calibration date
GB	User ID=0000000000000000	User code (set with T2xxxxxxxxxxxxxxx)
GC		Print instrument's heading
K1	PRINTOUT IMMEDIATE MODE	Immediate printing of data
K0		Stop printing data
K4	&	Start logging data
K5	&	Stop logging data
K7	&	Enable REL function
K6	&	Disable REL function
KP	&	Auto-power-off function=ENABLE
KQ	&	Auto-power-off function=DISABLE
LN	&1999	Number of free pages in the flash memory
LD	PRINTOUT OF LOG	Print data logged in flash

Command	Response	Description
LE	&	Erase data in 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 pH. n=0 > pH n=1 > mV
RA	& #	Reading of LOG/PRINT interval set
RP	& 600	Battery level (Resolut. 0.01V)
RUA	U= °C	Channel A unit of measurement
RUB	U= pH	Channel B unit of measurement
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 PC

The HD3405.2 instrument can be connected to a personal computer via an RS232C serial port, and exchange data and information through the DeltaLog9 software (Version 2.0 or later versions) running in a Windows operating environment. The measured values can be sent directly to the PC, through the *SERIAL* function in real time or store them in the internal memory using *Logging* function (LOG key) in their internal memory. If necessary, the data stored in the memory can be transferred to a PC later.

THE *LOGGING* FUNCTION

The *Logging* function allows the recording up to 40000 data pair [T-pH] registered by the probes connected to the inputs. Logging always includes **two** parameters. Each data pair is composed of: [temperature in °C or °F], [pH or mV].

The logged parameters are selected using the "°C/°F" end "pH/mV".
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 data.

See the description of the menu items on page.6.

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

To clear the memory use the Erase Log function (MENU >> SERIAL/Erase Log).
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.
- 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 inputs directly to a PC or printer S'Print-BT. Print data units of measurements are the same as those used on the display. Printing always includes **two** parameters. Each pairs data is composed of: temperature in °C or °F, pH or mV. The printed parameters are selected using the "°C/°F", and "pH/mV".

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.6). 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.

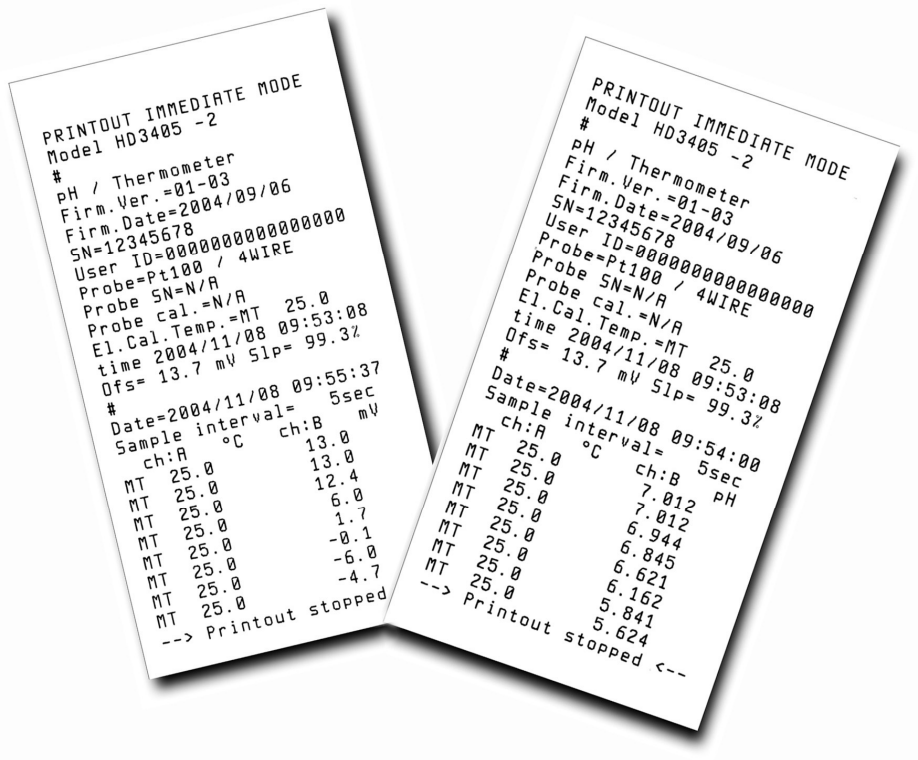
See the description of the menu items on page.6.

Connect the *S-print-BT* printer using cable HD2110CSP.

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.
- It is possible to activate both the logging (LOG) and direct transfer (PRINT) functions at the same time.

*Example of a printout obtained using the **S'print-BT** printer*



CONNECTION TO A PC

The connection to the RS232C del PC serial port of the PC uses the cable with code HD2110CSNM: sub D 9-pole female connector on one end – 8-pole MiniDin on the other end. The connection to the USB port uses the cable with code HD2101/USB: USB type A connector on one end – 8-pole MiniDin on the other end.

The instrument is supplied with the DeltaLog9 software (version from 2.0) 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.

The HD3405.2 instrument is compatible with the HyperTerminal communication program supplied with the Windows operating systems (from Windows 98 to Windows XP).

CONNECTION TO THE RS232C SERIAL PORT

1. The measurement instrument must be switched off.
2. Using the Delta Ohm HD2110CSNM cable, connect the measurement instrument to the first free serial port (COM) 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. Launch 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 RS232C SERIAL PORT

The USB connection requires the installation of the drivers. They are contained in the DeltaLog9 CD-Rom (Version 2.0 or later versions)

Proceed as follows:

1. **Do not connect the instrument to the USB port until you are expressly requested to do it.**
2. Insert the DeltaLog9 CD-Rom, and select the “Install/Remove USB driver" item”.
3. The application checks the presence of the drivers on the PC: the installation starts if they are not present; if they are already installed, the drivers are removed by pressing the key.
4. The installation wizard prompts the software user license: to proceed, the software usage terms must be accepted - click on YES.
5. On the next page the folder where the drivers will be installed is indicated: confirm without modifying.
6. Complete the installation by clicking on Finish. Wait few seconds until the DeltaLog9 page appears.
7. Close DeltaLog.

8. Connect the instrument to the PC USB port. When Windows detects the new device, the "*New software installation wizard*" is started.
9. If you are asked for the authorization to search an updated driver, answer *NO* and continue.
10. In the installation window, select "*Install from a list or specific location*".
11. In the next window select "*Search for the best driver in these locations*" and "*Include this location in the search*".
12. Using *Browse*, indicate the installation folder provided at point 5:

    C:\Program Files\Texas Instruments\USB-Serial Adapter

    Confirm with *OK*.
13. If you get the message that the software did not pass the Windows Logo testing, select "*Continue*".
14. The USB driver are installed: at the end, click on "*Finish*".
15. **The installation wizard requests the files location once more**: repeat the just described steps and provide the location of the same folder (see point 12).
16. **Wait**: the operation could take a few minutes.
17. The installation procedure is now complete: the device will be detected on each new connection automatically.

In order to check if the entire operation was successful, in CONTROL PANEL double click on SYSTEM. Select "Device Manager" and connect the instrument to the USB port.
The following items should appear:

- "*UMP Devices >> UMP3410 Unitary driver*" and "*Porte (COM e LPT) >> UMP3410 Serial Port (COM#)*" for Windows 98 and Windows Me,
- "*Multiport serial boards >> TUSB3410 Device*" and "*Porte (COM e LPT) >> USB-Serial Port (COM#)*" for Windows 2000, NT and XP.

When the USB cable is disconnected, these two items disappear and come back when it is connected again.

Notes.

1. If the instrument is connected to the USB port **before** installing the drivers, Windows signals the presence of an unknown device: in this case, cancel the operation and repeat the procedure illustrated at the beginning of this section.

2. In the documentation supplied with the DeltaLog9 CD-Rom, is included a detailed version of this chapter with pictures. Moreover, the necessary steps to remove the USB drivers are reported.

FUNCTIONING NOTES AND OPERATING SECURITY

Authorized use

Comply with the technical specifications outlined in the chapter “TECHNICAL CHARACTERISTICS” 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 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 can be ensured only within the climatic conditions specified in the chapter “TECHNICAL CHARACTERISTICS”.

Do not use or store the instrument in ways and/or places in which there are:

- Quick environment temperature changes that could cause condensation.
- Corrosive or inflammable gases.
- Direct vibrations or shocks against the instrument.
- High intensity electromagnetic fields, static electricity.

If the instrument is moved from a cold to a hot environment, the condensation can disturb its functioning. In this case, 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

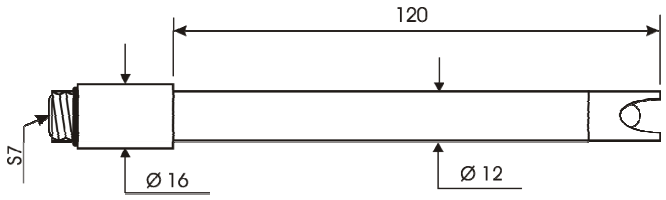
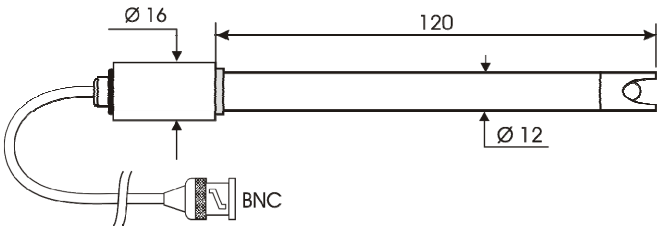
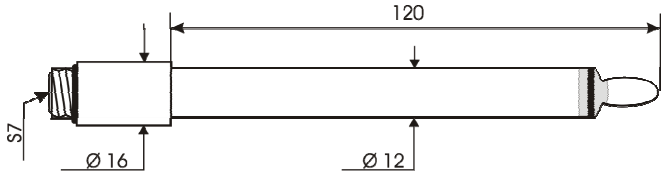
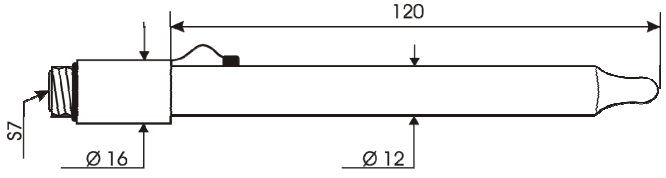
INSTRUMENT TECHNICAL CHARACTERISTICS

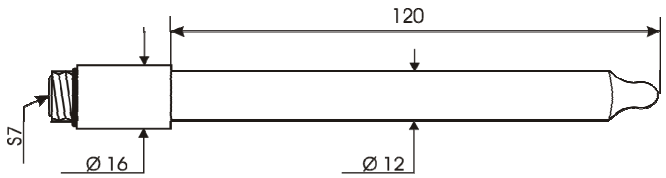
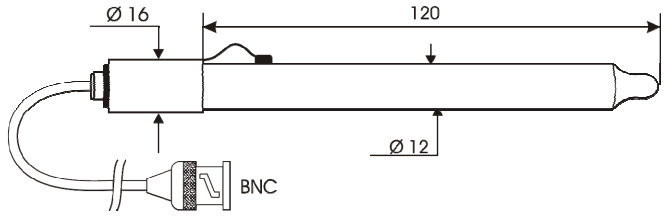
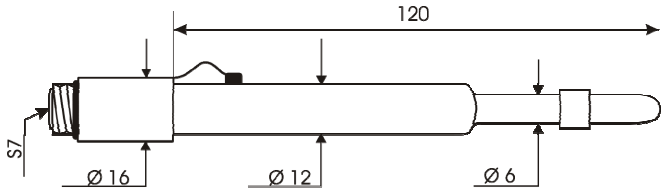
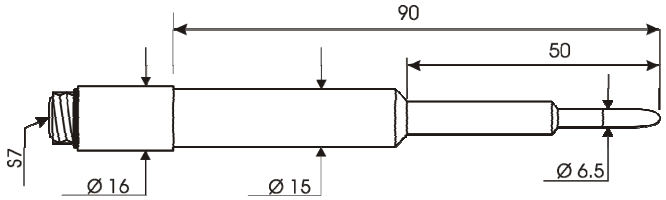
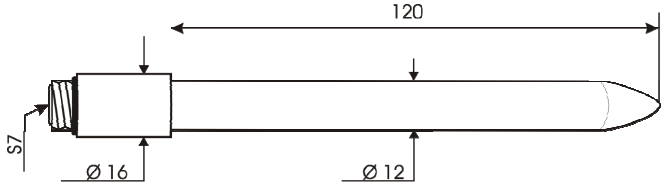
Measured quantities	pH, mV, °C, °F
Instrument	
Dimensions (Length x Width x Height)	220x120x55mm
Weight	460g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm
Operating conditions	
Operating temperature	-5…50°C
Warehouse temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**
Power	
Batteries	3 type AA batteries
Autonomy (only batteries)	100 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains (cod. **SWD10**)	Output mains adapter 100-240Vac/12Vdc-1A
Unit of measurement	pH, mV, °C, °F
Security of memorized data	Unlimited
Time	
Date and time	Schedule in real time
Accuracy	1min/month max departure
Measured values storing	
Type	2000 pages containing 17 samples each
Quantity	34000 pairs of measurements composed of [pH or mV] and [°C o °F].
Selectable storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 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	1.1 - 2.0 electrically isolated
Connections	
Temperature probe input with SICRAM module or TP47 module	8-pole male DIN45326 connector
pH/mV input	Female BNC
Serial interface and USB	pole MiniDin connector
Mains adapter (cod. SWD10)	2-pole connector (positive at centre) 12Vdc/1A
Measurement of pH by Instrument	
Measurement range	-2.000…+19.999pH
Resolution	0.01 or 0.001pH selectable from menu
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%
Automatic/manual temperature compensation	-50…+150°C
Standard solutions automatically detected (@25°C)	
	1.679pH - 2.000pH - 4.000pH - 4.008pH - 4.010pH - 6.860pH - 6.865pH - 7.000pH - 7.413pH - 7.648pH - 9.180pH - 9.210pH - 10.010pH
Measurement of mV by Instrument	
Measurement range	-1999.9…+1999.9mV
Resolution	0.1mV
Accuracy	±0.1mV ±1digit
Drift after 1 year	0.5mV/year
Measurement of temperature by Instrument	
Pt100 measurement range	-200…+650°C
Pt1000 measurement range	-200…+650°C
Ni1000 measurement range	-50…+250°C
Resolution	0.1°C
Accuracy	±0.1°C ±1digit
Drift after 1 year	0.1°C/year
EMC standard regulations	
Security	EN61000-4-2, EN61010-1 level 3
Electrostatic discharge	EN61000-4-2 level 3
Electric fast transients	EN61000-4-4 level 3,
	EN61000-4-5 level 3
Voltage variations	EN61000-4-11
Electromagnetic interference susceptibility	IEC1000-4-3
Electromagnetic interference emission	EN55020 class B

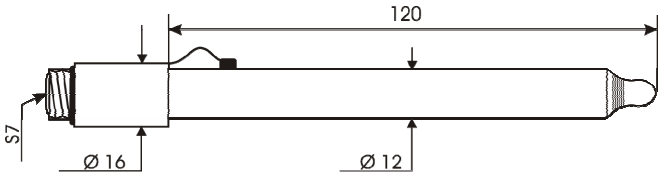
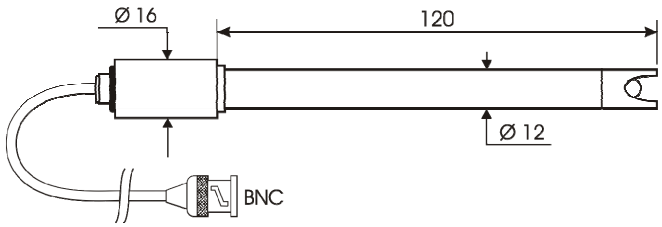
TECHNICAL DATA OF PROBES AND MODULES EQUIPPED WITH INSTRUMENT

pH ELECTRODES

ORDER CODE	MEASURING RANGE AND USE	DIMENSIONS
KP20	0…14pH / 0…80°C / 3bar Glass body - GEL filled 1 ceramic diaphragm Waste water , Drinking water, Water emulsions, Galvanic, Fruit-juices , Water suspensions, Paints, Titration, Varnish.	
KP30	0…14pH / 0…80°C / 3bar Glass body - GEL filled 1 ceramic diaphragm Cable L=1m with BNC Waste water , Drinking water, Water emulsions, Galvanic, Paints, Varnish, Water suspensions, Fruit-juices Titration.	
KP50	0…14pH / -5…100°C / 3bar Glass body - GEL filled 1 Teflon ring diaphragm Varnish, Cosmetics, Water emulsions, Galvanic, Creams, Deionised water, TRIS buffer, Drinking water, Fruit-juices , Solutions of low ionic content, Mayonnaise, Preserved foods, Paints, Titration, Titration in water solutions, Water suspensions, Soap, Waste water, Viscous samples.	
KP61	2…14pH / 0…80°C / 3bar Glass body Liquid reference 3 ceramic diaphragms Waste water, Mixtures, Bread, Fruit-juices , Varnish, Cosmetics, Creams, Deionised water, Drinking water, Water emulsions, Galvanic, Soap, Yoghurt, Milk, Titration, Preserved foods, Titration in water solutions, Water suspensions, Mayonnaise, Wine, Solutions of low ionic content, Butter, Proteic substances, Paints, Viscous samples.	

ORDER CODE	MEASURING RANGE AND USE	DIMENSIONS
KP62	0…14pH / 0…80°C / 3bar Glass body– GEL filled 1 ceramic diaphragm Paints, Varnish, Drinking water, Water emulsions, Fruit-juices , Galvanic, Water suspensions, Titration, Waste water .	
KP63	0…14pH / 0…80°C / 1bar Glass body Liquid reference KCl 3M 1 ceramic diaphragm Cable L=1m with BNC Paints, Varnish, Drinking water, Water emulsions, Fruit-juices , Galvanic, Water suspensions, Titration, Waste water.	
KP64	0…14pH / 0…80°C / 0.1bar Glass body Liquid reference KCl 3M Teflon ring diaphragm Paints, Varnish, Cosmetics, Creams, Deionised water, Drinking water, Water emulsions, Fruit-juices, Soap, Solutions of low ionic content, Preserved foods, Water suspensions, Titration, Titration in water solutions, TRIS buffer, Waste water, Viscous samples, Wine.	
KP70	2…14pH / 0…50°C / 0.1bar Body epoxy – GEL filled 1 open hole Mixtures, Bread, Paints, Varnish, Cosmetics, Creams, Drinking water, Water emulsions, Fruit-juices, Galvanic, Soap, Mayonnaise, Preserved foods, Cheese, Milk, Water suspensions, Viscous samples, Waste water, Butter, Yoghurt.	
KP80	2…14pH / 0…60°C / 1bar Glass body– GEL filled 1 open hole Mixtures, Bread, Butter, Paints, Varnish, Cosmetics, Water emulsions, Creams, Drinking water, Galvanic, Fruit-juices, Soap, Mayonnaise, Preserved foods, Water suspensions, Titration in water solutions, Viscous samples, Milk, Titration, Waste water , Yoghurt.	

REDOX ELECTRODES

ORDER CODE	MEASURING RANGE AND USE	DIMENSIONS
KP90	±2000mV 0…80°C 5bar Glass body Liquid reference KCl 3M General use	
KP91	±1000mV 0…60°C 1bar Epoxy body – GEL filled Cable L=1m with BNC General use Not heavy duty	

TEMPERATURE PROBES

TEMPERATURE PROBES Pt100 SENSOR USING SICRAM MODULE

Model	Type	Application range	Accuracy
TP87	**Immersion**	-50°C…+200°C	±0.25°C (-50°C…+200°C)
TP472I.0	**Immersion**	-50°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP473P.0	**Penetration**	-50°C…+400°C	±0.25°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP474C.0	**Contact**	-50°C…+400°C	±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP475A.0	**Air**	-50°C…+250°C	±0.3°C (-50°C…+250°C)
TP472I.5	**Immersion**	-50°C…+400°C	±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)
TP472I.10	**Immersion**	-50°C…+400°C	±0.3°C (-50°C…+350°C) ±0.4°C (+350°C…+400°C)

Temperature drift @20°C 0.003%/°C

Pt100 4 –WIRE PROBES AND Pt1000 2-WIRE PROBES COMPLETE WITH TP47 MODULE

Model	Type	Application range	Accuracy
TP87.100	Pt100 4 wires	-50…+200°C	Class A
TP87.1000	Pt1000 2 wires	-50…+200°C	Class A

Temperature drift @20°C 0.005%/°C

TP47 Module for the connection of Pt100 4-wire and Pt1000 2-wire probes to instrument series HD34…, without amplifying electronics and linearization.

ORDER CODES

HD3405.2K The kit is composed of: instrument HD3405.2 **datalogger**, for the measurement of pH - redox - conductivity - resistivity - TDS - salinity - temperature, 3 1.5V alkaline batteries, operating manual, software **DeltaLog9 version 2.0**.

pH/mV electrodes, temperature probes, standard reference solutions for different measurement types, connection cables for pH electrodes with S7 connector, cables for data download to PC or printer have to be ordered separately.

HD2110CSNM 8-pole connection cable Mini Din - Sub D 9-pole female for RS232C, for connection to PC without USB input.

HD2101/USB Connection cable USB 2.0 connector type A - 8-pole Mini Din for connection to PC with USB input.

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

S'print-BT Portable, serial input, 24 column thermal printer, 58mm paper width.

HD2110CSP Connection cable for instruments series HD34…to printer **S'print-BT.**

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.

TP47 Module for the connection of Pt100 4-wire and Pt1000 2-wire probes to instrument series HD34…, without amplifying electronics and linearization.

pH ELECTRODES

KP 20 Combined pH electrode for common use, GEL filled with screw connector S7 Epoxy body.

KP 30 Combined pH electrode for common use, GEL filled, cable 1m with BNC, Epoxy body

KP 50 Combined pH electrode for common use, varnish, emulsions GEL filled, with screw connector S7, glass body.

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

KP 62 Combined pH electrode, 1 diaphragm for pure water, Paint, varnish, GEL filled, with screw connector S7, glass body.

KP 63 Combined pH electrode for common use, varnish, cable 1 m with BNC, electrolyte KCl 3M glass body.

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

KP 70 Combined pH electrode, micro diam.6.5mm, GEL filled, bread, mixtures, cheese, etc., with screw connector S7, glass body.

KP 80	Combined pointed pH electrode, electrolyte, with screw connector S7, glass body.
CP	Extension cable 1.5m with BNC connectors on one side and S7 on the other side for electrode with S7 connector.
CP5	Extension cable 5m with BNC connectors on one side and S7 on the other side for electrode with S7 connector.
CE	S7 screw connector for pH electrode.
BNC	Female BNC for electrode extension..

ORP ELECTRODES

KP90	REDOX PLATINUM electrode, with screw connector S7, electrolyte KCl 3M, glass body.
KP91	REDOX PLATINUM electrode general use not heavy duty GEL filled, cable 1m with BNC, glass body.

pH STANDARD SOLUTIONS

HD8642	Standard solution 4.01pH - 200cc.
HD8672	Standard solution 6.86pH - 200cc.
HD8692	Standard solution 9.18pH - 200cc.

REDOX STANDARD SOLUTIONS

HDR220	Redox standard solution 220mV 0,5 l.
HDR468	Redox standard solution 468mV 0,5 l

ELECTROLYTE SOLUTIONS

KCL 3M	100ml ready for use solution for refilling of the electrodes KP63, KP64, and KP90..
PROTELYTE	100ml ready for use solution for refilling of the electrodes KP61, KP71, and KP80.

CLEANING AND MAINTENANCE

HD62PT	Diaphragm cleaning (tiourea in HCl) – 500ml.
HD62PP	Protein cleaning (pepsin in HCl) – 500ml.
HD62RF	Regeneration (fluorhydric acid) – 500ml.
HD62SC	Solution for electrode preservation – 500ml.

Temperature probes complete with SICRAM module

TP87	Immersion probe, sensor Pt100. Probe's stem Ø 3mm, length 70mm. Cable length 1 metre.
TP472I.0	Immersion probe, sensor Pt100. Stem Ø 3 mm, length 230 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 4mm, length 230mm, contact surface Ø 5mm. Cable length 2 metres.
TP475A.0	Air probe, sensor Pt100. Stem Ø 4mm, length 230mm. Cable length 2 metres.
TP472I.5	Immersion probe, sensor Pt100. Stem Ø 6mm, length 500 mm. Cable length 2 metres.
TP472I.10	Immersion probe, sensor Pt100. Stem Ø 6mm, length 1,000mm. Cable length 2 metres.

Temperature probe complete with TP47 module

TP87.100	Immersion probe, sensor Pt100. Probe's stem Ø 3mm, length 70mm. Connection cable 4 wires with connector, length 1 metre.
TP87.1000	Immersion probe, sensor Pt1000. Probe's stem Ø 3mm, length 70mm. Connection cable 2 wires with connector, length 1 metre.
TP47	Only connector for probe connection: Pt100 direct 4 wires, Pt1000 and Ni1000 2 wires (the connection instructions are outlined on page 18).

CONTENTS

The electric and electronic devices with the following symbol

cannot be disposed in the public dumps.
According to the Directive UE 2002/96/EC, the European users of electric and electronic devices are allowed to give back to the Distributor or Manufacturer the used device at the time of purchasing a new one.
The illegal disposing of electric and electronic devices is punished by a pecuniary administrative penalty.

GARANZIA

GARANTIE

GUARANTEE

GARANTIA

Questo certificato deve accompagnare l'apparecchio spedito al centro assistenza.
IMPORTANTE: La garanzia è operante solo se il presente tagliando sarà compilato in tutte le sue parti.

This guarantee must be sent together with the instrument to our service centre.
N.B.: Guarantee is valid only if coupon has been correctly filled in all details.

Le certificat doit porter le cachet du revendeur et la date d'achat. A défaut, la garantie sera comptée à partir de la date de la sortie d'usine.
ATTENTION: Pour bénéficier de la garantie, le présent certificat doit obligatoirement accompagner l'appareil présumé défectueux.

Dieser Garantieschein muss der Spedition beigelegt werden, wenn das Gerät an das Kundendienstzentrum gesandt wird.
WICHTIG: Die Garantie ist nur gültig, wenn dieser Abschnitt bis ins Einzelne ausgefüllt ist.

Este certificado debe acompañar al aparato enviado al centro de asistencia.
IMPORTANTE: La garantía es válida solo si el presente cupón ha sido completado en su totalidad.

Instrument type ❑ **HD3405.2**

Serial number _____

RENEWALS

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

CE CONFORMITY	
Safety	EN61000-4-2, EN61010-1 LEVEL 3
Electrostatic discharge	EN61000-4-2 LEVEL 3
Electric fast transients	EN61000-4-4 LEVEL 3
Voltage variations	EN61000-4-11
Electromagnetic interference susceptibility	IEC1000-4-3
Electromagnetic interference emission	EN55020 class B