# NIEUWKOOP

USER MANUAL

RV1100

RH/°C-METER

IP67

TO MEASURE = TO KNOW

NIEUWKOOP
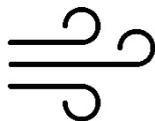
1. Input for probes, 8-pole DIN45326 connector.
2. Battery symbol: displays the battery charge level.
3. Function indicators.
4. Secondary display line.
5. **DATA/ENTER** key: during normal operation displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements; in the menu, confirms the current selection.
6. **CLR/ESC** key: during normal operation resets the maximum, the minimum and the average of current measurements; in the menu, it resets the value set with the arrows.
7. **HOLD/▨** key: freezes the measurement display during normal operation; in the menu, increases the current value.
8. **UNIT/MENU** key: it allows selection of the unit of measurement; when pressed together with the DATA key, it allows to open the menu.
9. **REL/▨** key: during normal operation 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.
10. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the HOLD key, disables the *AutoPowerOff* function.
11. **MAX** (maximum value), **MIN** (minimum value) and **AVG** (average value) symbols.
12. Main display line.
13. Line for symbols and comments.

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TABLE OF CONTENTS

NIEUWKOOP

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1. GENERAL CHARACTERISTICS

The Thermohygrometer Model **HD2301.0** is a portable instrument that measures an environment's temperature and relative humidity.

It is fitted with a large LCD display for excellent visualization of the measured data. The Thermohygrometer Model **HD2301.0** measures temperature and relative humidity in two modes:
- using combined probes, fitted with a Pt100 sensor or thermocouple, for temperature and relative humidity measurement;
- while temperature only is measured by immersion, penetration, or contact probes. The sensor can be a Pt100 or Pt1000.

When the combined humidity/temperature probe is connected, the instrument calculates and displays the following data:
- absolute humidity,
- dew point,
- partial vapour pressure.

The probes are fitted with the *automatic detection* module, with the factory calibration settings already being memorized inside.

The units of measurement are the following:
1. %RH % of relative humidity
2. g/m3 Grams of vapour in a cubic meter of dry air
3. hPa Partial vapour pressure (hPa)
4. Td Dew point (ºC or ºF)
5. ºC/ºF Temperature in Celsius (ºC) or Fahrenheit (ºF) degrees.

Using the Max, Min and Avg function of this instrument respectively obtains the maximum, minimum or average values.
Other available functions are:
- the relative measurement REL;
- the HOLD function;
- the automatic turning off which can also be disabled.

For further details see chapter 2.

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2. DESCRIPTION OF THE FUNCTIONS

The keyboard of the Thermohygrometer Model HD2301.0 is composed of *double-function* keys.
The function on the key is the "main function", while the one above the key 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; press the **DATA+UNIT** keys together to open the menu.
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 and AUTO-OFF key

This key has two functions:
• **ON/OFF:** to turn the instrument on press **ON**, to turn it off press **OFF**.
The turning on enables all display segments for a few seconds, starts an **Auto-test** including the detection of the probe connected to the input, and sets the instrument ready for normal measurement. The following is displayed:
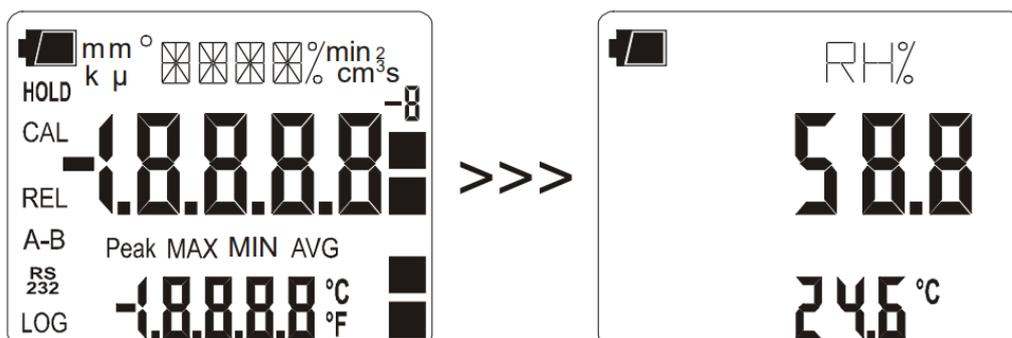
• **AUTO/OFF:** the *AutoPowerOff* function can be disabled by simultaneously pressing this key and the "HOLD" key when turning the instrument on.

During turning on, should no probes be connected, the **"NO_PRBE_SER_NUM"** message is displayed in the line for symbols for a few seconds, and in the main line a series of dashes appears while the **"ERR"** message replaces the temperature.
When the probe is inserted into a functioning instrument, the **"NEW_PROB_DET"** (New probe detected) message appears: as the data are captured upon turning the instrument on, it is necessary to turn it off and on again.

Caution! Replace the probes when the instrument is off.

NIEUWKOOP

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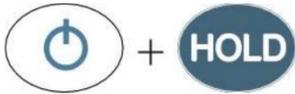
 DISABLING OF THE AUTOMATIC TURNING OFF

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.
Press simultaneously the **ON/OFF** key and the **HOLD** key to disable this function.

In this case, remember to turn the instrument off using the **ON/OFF** key: disabling of the automatic turning off is shown by the blinking battery symbol.

 CLR/ESC key

The "CLR" key has two functions:
- **CLEAR (CLR):** allows to reset the maximum (MAX), minimum (MIN) and average (AVG) value of the captured measurements;
- **ESC:** once the MENU has been opened with the DATA+UNIT keys, the CLR key will allow to cancel the parameters set using the ▲ and ▼ arrows.

 DATA/ENTER key

The "DATA" key is used for the following functions:
- **DATA:** during normal measurement, by pressing this key once the maximum (MAX) value of the measurements captured by the probe connected to the instrument is displayed, updating it with the acquisition of new samples;
  - by pressing this key again the minimum (MIN) value is displayed;
  - by pressing this key a third time the average (AVG) value is displayed.

  The acquisition frequency is once a second.

  The MAX, MIN and AVG values remain in the memory until the instrument is on, even after exiting the DATA calculation function. When the instrument is off, the previously memorized data are cleared. Upon turning on, the instrument automatically starts memorizing the MAX, MIN and AVG values.

  To reset the previous values and start with a new measurement session, press CLR until the **FUNC_CLRD** message appears.
- **ENTER:** once the MENU has been opened with the DATA+UNIT keys, the DATA key will perform the ENTER function and the MENU can be browsed and the displayed parameter confirmed.

 HOLD/▲ key

The "HOLD" key is used for the following functions:
- **HOLD:** by pressing this key the current measurement is frozen and the "HOLD" message will appear in the upper left-hand corner of the display. To return to the current measurement, press the key again.

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- ▲ : once the MENU has been opened with the DATA+UNIT keys, the ▲ key will allow to increase the value of the selected parameter.

Pressed together with the ON/OFF key, during turn on, the *AutoPowerOff* function is disabled (see the description of the ON/OFF key).

UNIT/MENU key

The "UNIT" key is used for the following functions:

• **UNIT:** by pressing this key the unit of measurement of the main input quantity is selected: the unit of measurement will appear in the upper part of the display; the measured value will be displayed in the central line. By repeatedly pressing the UNIT key, the desired unit of measurement can be selected between the following:

1. %RH   % of relative humidity
2. g/m3   Grams of vapour in a cubic meter of dry air
3. hPa   Partial vapour pressure (hPa)
4. Td   Dew point (ºC or ºF)

By now pressing UNIT, the %RH unit of measurement is displayed again in the comment line and, simultaneously, the unit of temperature measurement blinks. Use the ▲ and ▼ arrows, if you wish to change the temperature display from degrees Celsius (ºC) to degrees Fahrenheit (ºF), or vice-versa. Confirm by pressing the UNIT key or wait for the unit of measurement to stop blinking (about 15 seconds timeout)

• **MENU:** in the menu two items can be set (see chapter 3):
     1. Probe type
     2. Probe calibration
- the menu is opened by pressing simultaneously DATA+UNIT: the first item of the instrument programming menu will appear;
- use the ▲ and ▼ arrows (respectively located above the HOLD and REL keys) to **modify** the displayed value;
- press **DATA/ENTER** to **confirm** the modification and go onto the next item;
- press **CLR/ESC** to **cancel** the modification;
- to **exit** the menu, press the **UNIT/MENU** key again.

REL/▼ key

The "REL" key is used for the following functions:
• **REL:** it displays the difference between the current value and that measured on pressing the key for both measurements: main and secondary. The "REL" message is displayed on the left. To return to the normal measurement, press the key again.

• ▼ : once the MENU has been opened with the **DATA+UNIT** keys, the ▼ key will allow to decrease the value of the selected parameter.

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3. THE PROGRAMMING MENU

To access to the menu press simultaneously the following keys:

The items to be set are listed in this order:

1. Probe type: the **">>>_PRBE_TYPE"** message is displayed in the comment line. The main line in the center of the display shows the type of probe connected to the instrument. The following probes can be connected to the input:

- humidity/temperature combined probes with "Pt100" sensor complete with SICRAM module
- temperature probes "Pt100" complete with SICRAM module
- direct 4 wire "Pt100" probes complete with TP47 module
- 2 wire or 4 wire "Pt1000" probes complete with TP47 module

NOTE: The probes fitted with SICRAM module, and Delta Ohm "Pt1000" probes, are automatically detected by the instrument upon turning on. The type of probe is configured by the instrument and cannot be modified by the user.

If the direct 4 wire "Pt100" probes and the "Pt1000" probes that are not manufactured by Delta Ohm are connected to the instrument, the **NO_PRBE_SER_NUM** message is displayed. In this case the probe type must be entered manually by the user:

- use the ▲ and ▼ arrows (respectively located above the HOLD and REL keys) to **modify** the type of probe;
- press **DATA/ENTER** to **confirm** the modification and go onto the next item;
- press **CLR/ESC** to **cancel** the modification;
- to **exit** the menu, press the **MENU** key again.

2. User calibration procedure of the combined humidity/temperature probe:
the probes are calibrated in our laboratory at 23ºC at the relative humidity points of 75%RH, 33%RH and 11.4%RH. On request, the probes can be checked at different isotherms.

For the Calibration sequence, see chapter 4.1.2, paragraph "Calibration of the combined humidity/temperature probe".

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4. PROBES AND MEASUREMENTS

The instrument works by using combined humidity/temperature probes (temperature with a Pt100 sensor) and with temperature only probes with 4 wire Pt100, or 2 or 4 wire Pt1000.

The combined humidity/temperature probes are fitted with **SICRAM** module that acts as an interface between the sensor on the probe and the instrument. There is a microprocessor circuit with a permanent memory inside the module that enables the instrument to recognize the type of probe connected and to read its calibration information.

The Nieuwkoop Pt1000 probes 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 menu description on chapter 3).

> **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**.

4.1 MEASUREMENT OF RELATIVE HUMIDITY

The humidity probes are "humidity and temperature" combined probes:
• the humidity sensor is a capacitative type sensor;
• while according to the model the temperature sensor is either a Pt100 or a thermocouple K.

The instrument measures relative humidity %RH and temperature, and starting from the fixed barometric pressure value of 1013.25mbar it calculates the following resulting quantities:

1. g/m3   Grams of vapour in a cubic meter of dry air
2. hPa   Partial vapour pressure (hPa)
3. Td   Dew point (ºC or ºF)

4.1.1 Performing the measurement

To perform the measurement, proceed as follows:
- introduce the probe in the area of whose parameters you wish to measure,

Caution! Keep the probe far from elements that might interfere with measurement such as: heat or sources of cooling, walls, air-streams, etc.
Avoid temperature drops that might cause condensation.

- a reading taken when no heat drop occurs is practically immediate;

NOTE: in conditions involving **heat drops**, it is necessary to wait until the probes and their housing have reached a thermal equilibrium in order to prevent heat irradiation or absorption on the relative humidity sensor which would cause a **faulty measurement**.

- since temperature affects relative humidity; move the probe like a fan in order to speed the response time in the presence of heat drops.

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4.1.2 Calibration of the combined humidity/temperature probe

Caution! To calibrate the probes correctly, a knowledge of and abiding by the physical phenomena on which the measurement is based is fundamental: this is the reason why it is recommended to abide by what is reported below carefully and only to perform new calibrations if technically proficient.

The probes are calibrated in our laboratory at 23°C at the points of 75%RH, 33%RH and 11.4%RH.
On request, the probes can be checked at different isotherms.

The calibration of the temperature sensor by the user is not required: the sensor is calibrated in the factory and the Callendar Van Dusen parameters are recorded in the SICRAM module.

In order to calibrate the instrument correctly, it is very important for the probe and the saturated solutions to maintain the same temperature and that this is as stable as possible during the entire calibration operation.

Calibration sequence:
1. Unscrew the sensor protection on the top of the probe.
2.   In its place screw the bored cap with the threaded ring very well at the base (there are two types of thread: M24x1.5 and M12x1, so use the appropriate one).
3. Open the cap for the 75%RH saturated solution.
4. Should there be any drops of solution inside the measuring chamber, dry them with some blotting paper.
5. Insert the probe in the container, making sure the cap at the base is screwed well. **The measuring chamber must be closed perfectly, otherwise it will not get saturated**: it is essential that no air passes through it.
6. **Wait at least 30 minutes**.
7. Press simultaneously the **DATA** and **UNIT keys** to open the menu;
8. Press **DATA/ENTER** to reach the second menu item: the message "PROB_CAL_EXIT_OR_75_OR_33_OR_11" is shown in the upper part of the display.
9. To proceed with the calibration:
    *   using the ▼ and ▼ arrows, select **75%** (placed respectively upper the HOLD and REL keys;
    *   confirm by pressing **DATA/ENTER**.
    NOTE: to exit without calibrating the probe, use the ▲ and ▼ arrows until the message "nonE" appears in the central display and press **UNIT**.
    *   the relative humidity read by the probe is shown;
    *   if necessary, correct the value of the saturated solution against the 75.0% proposed by the instrument using the arrows ▲ and ▼ .
    The *temperature* is that measured by the Pt100 or TC sensor.
    To confirm the calibration point
    *   press **DATA/ENTER.** The instrument returns to the calibration main page and displays "nonE". To proceed with another point, select it using the arrows and confirm with UNIT.
10. To return to measurement mode, use the ⊠ and ⊠ arrows until the message "nonE" appears in the central display and press **UNIT**.
11. Remove the probe from the 75%RH container and close it immediately using its cap.

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Calibrating the points at 33%RH and 11%RH

Repeat the points from 3) to 9) using the saturated salts at 33%RH and 11%RH

When completed, unscrew the ring with the cap, and screw the protection grid back on the sensors.

The calibration is now complete.

Important notes:

1) Do not let hands touch the RH sensor

2) The sensor base is in alumina so it could easily break

3) During the entire calibration cycle keep the temperature as constant as possible; plastic materials are poor thermal conductors, therefore some time is needed for them to reach a thermal equilibrium

4) In case no satisfactory results are obtained, check that:
    - the sensor is not faulty, corroded or dirty
    - the measuring chamber is perfectly closed during calibration
    - the saturated solutions are not exhausted. A saturated solution at 11%RH or 33%RH is exhausted when there is no more salt inside between the two walls but only a thick liquid: in this case the chamber cannot reach its saturation anymore. For the saturated solutions at 75%RH, check that the salt is not dry (crystallized): in order to reach the saturation, it needs to be wet.

5) Storage of the saturated solutions: the saturated solutions must be stored in a dark environment at a constant temperature of about 20°C with the container well closed inside a dry room.

Temp °C	Lithium Chloride	Magnesium Chloride	Sodium Chloride
0	11.23 ± 0.54	33.66 ± 0.33	75.51 ± 0.34
5	11.26 ± 0.47	33.60 ± 0.28	75.65 ± 0.27
10	11.29 ± 0.41	33.47 ± 0.24	75.67 ± 0.22
15	11.30 ± 0.35	33.30 ± 0.21	75.61 ± 0.18
20	11.31 ± 0.31	33.07 ± 0.18	75.47 ± 0.14
25	11.30 ± 0.27	32.78 ± 0.16	75.29 ± 0.12
30	11.28 ± 0.24	32.44 ± 0.14	75.09 ± 0.11
35	11.25 ± 0.22	32.05 ± 0.13	74.87 ± 0.12
40	11.21 ± 0.21	31.60 ± 0.13	74.68 ± 0.13
45	11.16 ± 0.21	31.10 ± 0.13	74.52 ± 0.16
50	11.10 ± 0.22	30.54 ± 0.14	74.43 ± 0.19
55	11.03 ± 0.23	29.93 ± 0.16	74.41 ± 0.24
60	10.95 ± 0.26	29.26 ± 0.18	74.50 ± 0.30
65	10.86 ± 0.29	28.54 ± 0.21	74.71 ± 0.37
70	10.75 ± 0.33	27.77 ± 0.25	75.06 ± 0.45
75	10.64 ± 0.38	26.94 ± 0.29	75.58 ± 0.55
80	10.51 ± 0.44	26.05 ± 0.34	76.29 ± 0.65
85	10.38 ± 0.51	25.11 ± 0.39	
90	10.23 ± 0.59	24.12 ± 0.46	
95	10.07 ± 0.67	23.07 ± 0.52	
100	9.90 ± 0.77	21.97 ± 0.60	

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4.2 DIRECT INPUT INTO Pt100 AND Pt1000 TEMPERATURE PROBES

The instrument accepts the input of Platinum temperature probes with resistances of 100Ω (Pt100) and 1000Ω (Pt1000).

The Pt100 are connected to 4 wires, the Pt1000 to 2 wires; the excitation current was chosen in order to minimize 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 and the Delta Ohm Pt1000 probes are detected by the instrument; the model configuration is required for the other probes (please see the description of the Probe Type menu item on chapter 3).

4.2.1 Temperature measurement

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.

NOTE: 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 between the surface and the probe is useful (do not use water or solvents). This method also improves the response time.

4.2.2 Connecting the TP47 connector for the 4 wire Pt100 and 2 wire Pt1000 probes

All probes are provided with a connector.

The Thermohygrometer Model **HD2301.0** also works with direct 4 wire Pt100, and Pt1000 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 **TP47** module is supplied complete with fairlead and gasket for 5 mm maximum diameter cables.

Do the following to open the module and connect a probe:

1. unscrew the fairlead;
2. extract the gasket;
3. remove the label using a cutter;
4. unscrew the ring on the opposite side as illustrated in the figure:

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5. 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 closed with a tin bead for some type of sensors:
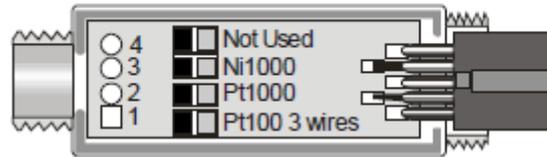
Caution! Before welding, pass the probe cable through the fairlead and gasket.

6. Weld the wires as shown in the table:

Sensor	TP47 Board connection	Jumper to close
Pt100 4 wires		None
Pt1000 2 wires		JP2
Pt1000 4 wires		JP2

Ensure the welds are clean and perfect.

7. Once the welding operation is complete, close the two shells;
8. insert the gasket in the module;
9. screw the fairlead and the ring.
10. at the other end of the module, enter the ring with the O-ring as indicated in the picture.
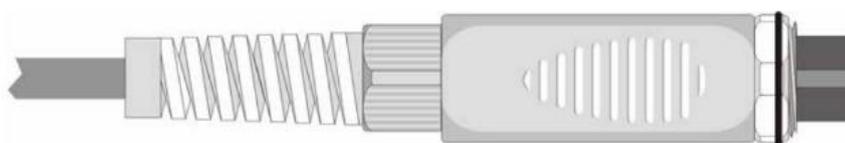
11. Make sure the cable is not twisted while you are screwing the fairlead. Now the probe is ready.

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4.2.3 Direct connection of 4 wire Pt100 sensors

Sensor	Direct soldering to the connector
Pt100 4 wires	 4 wire Pt100 View of the soldering side of the flying female connector
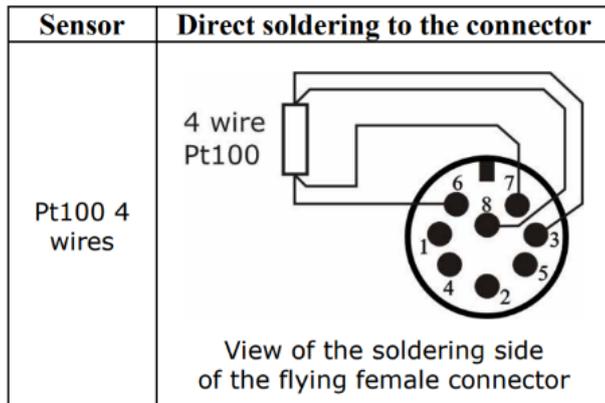
4 wire Pt100 sensors can be soldered directly to the pins of the flying female connector without making use of the TP47 board. The 4 wires of the Pt100 sensors have to be soldered as indicated in the figure on the left. In order to use this type of probe it is necessary to set up the menu item "Probe Type" as described at page 9. The P100 probe is recognized upon turning on the instrument: connect the probe when the instrument is switched off and then turn it on.

5. WARNINGS

1. 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.

2. 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.

3. Do not bend the probe connectors or force them upward or downward.

4. Do not bend or force the contacts when inserting the probe connector into the instrument.

5. Do not bend, deform or drop the probes, as this could cause irreparable damage.

6. Always select the most suitable probe for your application.

7. Do not use the temperature probes in presence of corrosive gases or liquids. The sensor container is made of AISI 316 stainless steel, while the contact probe container is made from AISI 316 stainless steel plus silver. Avoid contact between the probe surface and any sticky surface or product that could corrode or damage it.

8. Above 400°C and below −40°C, avoid violent blows or thermal shocks to Platinum temperature probes as this could cause irreparable damage.

9. To obtain reliable measurements, temperature variations that are too rapid must be avoided.

10. 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.

11. Temperature measurements on non-metal surfaces usually require a great deal of time due to the low heat conductivity of non-metal materials.

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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 IP67, but should not be immersed in water. 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.

6. INSTRUMENT SIGNALS AND FAULTS

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

DISPLAY INDICATION	EXPLANATION
- - -	This appears in the display central line when a temperature only probe is connected. In the lower line the temperature is shown correctly.
PRBE_TYPE	Type of probe connected.
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.
CAL LOST	Program error: it appears after turning on for a few seconds. Contact the instrument's supplier.
CAL__11_ UP DOWN	Calibration at 11% RH, use the arrows to correct the value proposed.
CAL__33_ UP DOWN	Calibration at 33% RH, use the arrows to correct the value proposed.
CAL__75_ UP DOWN	Calibration at 75% RH, use the arrows to correct the value proposed.
ERR	This appears if the probe has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
FUNC CLRD	Max, min and average values cleared
NEW PROBE DET	This message appears when a probe is inserted into a functioning instrument. Turn the instrument off and then back on again.
NO_PRBE_ SER_NUM	The connected probe's serial number is absent.
nonE	No selection.
OVER	Measurement overflow: indicates that the probe is measuring a value exceeding the measuring range.
PLS_EXIT >>> FUNC RES_FOR_FACT ONLY	Please exit using ESC >>> function reserved to factory calibration.
PRBE_SER #### ####	Serial number #### #### of the connected probe.
PROB ERR	A probe with SICRAM module has been inserted when not admissible for that specific instrument.
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.
PROB_CAL_EXIT_OR_7 5_OR_33_OR_11	Probe calibration - exit or select 75, 33 or 11% RH.
SYS ERR #	Instrument management program error. Contact the instrument's supplier and communicate the numeric code # reported by the display.

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7. 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:

<div align="center">

BATT TOO LOW
CHNG NOW

</div>

The instrument issues a long beep and turns off. In this case, replace the batteries in order to turn the instrument back on.
To replace the batteries, proceed as follows:
1. switch the instrument off;
2. unscrew the battery cover counter clockwise;
3. replace the batteries (3 1.5V alkaline batteries - type AA);
4. screw the cover on clockwise.

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.

7.1 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.

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8. INSTRUMENT STORAGE

Instrument storage conditions:
- Temperature: -25...+65ºC.
- 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: do not use any incompatible solvent for cleaning.

9. 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

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10. TECHNICAL CHARACTERISTICS

10. 1 TECHNICAL INFORMATION ON THE THERMOHYGROMETER

Instrument

Dimensions (Length x Width x Height) ....140 x 88 x 38 mm
Weight ....160 g (complete with batteries)
Material ....ABS
Display ....2x4½ digits plus symbols
                                                                                                                Visible area: 52 x 42 mm

Operating conditions

Operating temperature ....−5 ÷ 50ºC
Warehouse temperature ....−25 ÷ 65ºC
Working relative humidity ....0 ÷ 90%RH without condensation
Protection degree of the case IP67

Power

Batteries ....3 1.5V type AA batteries
Autonomy ....200 hours with 1800mAh alkaline
                                                                                                                batteries
Power absorbed with instrument off ....< 20 µA

Connections

Input for probes ....8-pole male DIN45326 connector

Unit of Measurement ....%RH – g/m3 – hPa – Td – ºC – ºF

Measurement of relative humidity by Instrument

Measurement range ....0 ÷ 100%RH
Resolution 0.1%RH
Accuracy ....±0.1%RH
Drift after 1 year 0.1%RH/year

Measurement of temperature by Instrument

Pt100 measurement range ....−200 ÷ +650 ºC
Pt1000 measurement range ....−200 ÷ +650ºC
Resolution ....0.1 ºC
Accuracy ....±0.1 ºC
Drift after 1 year ....0.1 ºC/year

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10.2 TECHNICAL DATA OF PROBES AND MODULES IN LINE WITH THE INSTRUMENT

10.2.1 TEMPERATURE PROBES Pt100 SENSOR USING SICRAM MODULE

Model	Type	Application range	Accuracy
TP472I	Immersion	196 °C...+500 °C	
TP472I.O	Immersion	-50 °C...+300 °C	
TP473P.I	Penetration	-50 °C...+400 °C	
TP473P.O	Penetration	-50 °C...+300 °C	
TP474C.O	Contact	-50 °C...+300 °C	
TP475A.O	Air	-50 °C...+250 °C	
TP472I.5	Immersion	-50 °C...+400 °C	±0.1°C (@ 0 °C)
TP472I.10	Immersion	-50 °C...+400 °C	±0.2°C (-50 °C ≤ t ≤ 250 °C)
TP49A.I	Immersion	-70 °C...+250 °C	±0.3°C (t < -50 °C; t > 250 °C)
TP49AC.I	Contact	-70 °C...+250 °C	
TP49AP.I	Penetration	-70 °C...+250 °C	
TP875.I	Globe-thermometer Ø 150 mm	-30 °C...+120 °C	
TP876.I	Globe-thermometer Ø 50 mm	-30 °C...+120 °C	
TP87.O	Immersion	-50 °C...+200 °C	

Common characteristics

Resolution   0.01 °C in the range ± 199.99 °C,

                                    0.1 °C in the remaining field

Temperature drift @20°C   0.003%/°C

10.2.2 Pt100/Pt1000 PROBES WITH TP47 CONNECTOR WITHOUT SICRAM MODULE

Model	Type	Application range	Accuracy
TP47.100.O	Pt100 4 wires	-50...+250 °C	Class A
TP47.1000.O	Pt1000 4 wires	-50...+250 °C	Class A
TP87.100.O	Pt100 4 wires	-50...+200 °C	Class A
TP87.1000.O	Pt1000 4 wires	-50...+200 °C	Class A

Common characteristics

Resolution   0.01 °C in the range ± 199.99 °C,

                                    0.1 °C in the remaining field

Temperature drift @20°C   Pt100   0.003%/°C

                                    Pt1000   0.005%/°C

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10.2.3 RELATIVE HUMIDITY AND TEMPERATURE PROBES USING SICRAM MODULE

Model	Temp sensor	Application range		Accuracy	
		%RH	Temperature	%RH	Temp.
HP472ACR	Pt100	0...100% RH	-20 °C...+80 °C	±1.5% (0...85%RH) ±2.5% (85...100%RH) @ T=15...35 °C (2 + 1.5% measure)% @ T= remaining range	±0,3 °C
HP473ACR	Pt100	0...100% RH	-20 °C...+80 °C		±0,3 °C
HP474ACR	Pt100	0...100% RH	-40 °C...+150 °C		±0,3 °C
HP475ACR	Pt100	0...100% RH	-40 °C...+150 °C		±0,3 °C
HP475AC1R	Pt100	0...100% RH	-40 °C...+180 °C		±0,3 °C
HP477DCR	Pt100	0...100% RH	-40 °C...+100 °C		±0,3 °C
HP478ACR	Pt100	0...100% RH	-40 °C...+150 °C		±0,3 °C
HP480	Pt100	0...100% RH	-40 °C...+60 °C		±0,25 °C
HP481	Pt100	0...100% RH	-40 °C...+60 °C		±0,25 °C

Common characteristics

Relative humidity

Sensor ....Capacitive

Resolution 0.1%RH

Temperature drift @20°C ....0.02%RH/°C

Response time %RH at constant temperature ....10sec (10 -> 80%RH; air speed = 2 m/s)

Temperature with sensor Pt100

Resolution ....0.1°C

Temperature drift @20°C ....0.003%/°C

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11. ORDER CODES

HD2301.0   The kit is composed of the instrument HD2301.0, 3 pieces 1.5V alkaline batteries, operating manual and case. **The probes must be ordered separately.**

11.1 PROBES COMPLETE WITH SICRAM MODULE

COMBINED RELATIVE HUMIDITY AND TEMPERATURE PROBES:

HP472ACR Combined probe %RH and temperature, dimensions Ø26 x 170 mm. Connection cable length 2 m.

HP473ACR Combined probe %RH and temperature. Dimensions handle Ø26 x 130 mm, probe Ø14 x 120 mm. Connection cable length 2 m.

HP474ACR Combined probe %RH and temperature. Dimensions handle Ø26 x 130 mm, probe Ø14 x 215 mm. Connection cable length 2 m.

HP475ACR Combined probe %RH and temperature. Connection cable length 2 m. Handle Ø26 x 110 mm. Stainless steel stem Ø12 x 560 mm. Point Ø14 x 75 mm.

HP475AC1R Combined probe %RH and temperature. Connection cable length 2 m. Handle 80 mm. Stainless steel stem Ø14 x 480 mm.

HP477DCR Combined sword probe %RH and temperature. Connection cable length 2 m. Handle Ø26 x 110 mm. Probe's stem 18 x 4 mm, length 520 mm.

HP478ACR Combined probe %RH and temperature. Connection cable length 5 m. Stainless steel stem Ø14 x 130 mm.

HP480   %RH and Temperature probe for compressed air systems. Supplied complete with SICRAM module. 2 m connection cable. Supplied with 15 µm AISI 316 sintered stainless steel filter, measurement chamber, airflow control valve and 3 quick connect couplings 1/4" (Italian, German and American standard).

HP481   %RH and Temperature probe for compressed air systems. Supplied complete with SICRAM module. 2 m connection cable. Supplied with 15 µm AISI 316 sintered stainless steel filter.

P1   Technopolymer and 34 µm stainless steel grid protection for probes Ø26, thread M24x1.5. Operating temperature: -40...80 °C.

P2   Technopolymer and 20 µm sintered PE protection for probes Ø26, thread M24x1.5. Operating temperature: -40...80 °C.

P3   20 µm sintered bronze protection for probes Ø26, thread M24x1.5. Operating temperature: -40...150 °C.

P4   20 µm sintered PE protection for probes Ø26, thread M24x1.5. Operating temperature: -40...80 °C.

P6   10 µm sintered stainless steel protection for probes Ø14, thread M12x1. Operating temperature: -40...180 °C.

P7   20 µm PTFE protection for probes Ø14, thread M12x1. Operating temperature: -40...150 °C.

P8   PBT and 10 µm stainless steel grid protection for probes Ø14, thread M12x1. Operating temperature: -40...120 °C.

HD75   Saturated solution for checking the Relative Humidity sensor at 75% RH, with screw adaptor for Ø14 probes, thread M12×1.

HD33   Saturated solution for checking the Relative Humidity sensor at 33% RH, with screw adaptor for Ø14 probes, thread M12×1.

HD11   Saturated solution for checking the Relative Humidity sensor at 11% RH, with screw adaptor for Ø 14 probes, thread M12×1.

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TEMPERATURE MEASUREMENT PROBES:

TP472I   Immersion probe, sensor Pt100. Stem Ø3 mm, length 300 mm. Cable length 2 metres.

TP472I.O   Immersion probe, sensor Pt100. Stem Ø3 mm, length 230 mm. Cable length 2 metres.

TP473P.I   Penetration probe, sensor Pt100. Stem Ø4 mm, length 150 mm. Cable length 2 metres.

TP473P.O   Penetration probe, sensor Pt100. Stem Ø4 mm, length 150 mm. Cable length 2 metres.

TP474C.O   Contact probe, sensor Pt100. Stem Ø4 mm, length 230 mm, contact surface Ø 5 mm. Cable length 2 metres.

TP475A.O   Air probe, sensor Pt100. Stem Ø4 mm, length 230 mm. Cable length 2 metres.

TP472I.5   Immersion probe, sensor Pt100. Stem Ø6 mm, length 500 mm. Cable length 2 metres.

TP472I.10 Immersion probe, sensor Pt100. Stem Ø6 mm, length 1000 mm. Cable length 2 metres.

TP49A.I   Immersion probe, sensor Pt100. Stem Ø2.7 mm, length 150 mm. Cable length 1.5 metres. Aluminium handle.

TP49AC.I   Contact probe, sensor Pt100. Stem Ø4 mm, length 150 mm. Cable length 1.5 metres. Aluminium handle.

TP49AP.I   Penetration probe, sensor Pt100. Stem Ø2.7 mm, length 150 mm. Cable length 1.5 metres. Aluminium handle.

TP875.I   Globe-thermometer Ø150 mm with handle. Cable length 2 metres.

TP876.I   Globe-thermometer Ø50 mm with handle. Cable length 2 metres.

TP87.O   Immersion probe, sensor Pt100. Stem Ø3 mm, length 70 mm. Cable length 2 metres.

11.2 TEMPERATURE PROBES WITHOUT SICRAM MODULE

TP47.100.O Immersion probe, sensor Pt100 direct 4 wires. Probe's stem Ø3 mm, length 230 mm. 4-wire connection cable with connector, length 2 metres.

TP47.1000.O Immersion probe, sensor Pt1000. Probe's stem Ø3 mm, length 230 mm. 4-wire connection cable with connector, length 2 metres.

TP87.100.O Immersion probe, sensor Pt100 direct 4 wires. Probe's stem Ø3 mm, length 70 mm. 4-wire connection cable with connector, length 2 metres.

TP87.1000.O Immersion probe, sensor Pt1000. Probe's stem Ø3 mm, length 70 mm. 4-wire connection cable with connector, length 2 metres.

TP47   Only connector for probe connection: Pt100 direct 3 and 4 wires, Pt1000 and Ni1000 2 wires.

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