

Operating manual

Manometer - Thermometer HD2304.0



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INDEX

GENERAL CHARACTERISTICS	3
DESCRIPTION OF THE FUNCTIONS	6
THE PROGRAMMING MENU	10
PROBES AND MEASUREMENTS.....	11
PP471 MODULE FOR PRESSURE MEASUREMENT	11
Pt100 TEMPERATURE PROBES	12
TEMPERATURE MEASUREMENT.....	12
CONNECTING THE TP47 CONNECTOR.....	12
DIRECT CONNECTION OF 4-WIRE Pt100 SENSOR	14
INSTRUMENT SIGNALS AND FAULTS	15
WARNINGS	16
INSTRUMENT STORAGE.....	17
LOW BATTERY WARNING AND BATTERY REPLACEMENT	18
WARNING ABOUT BATTERY USE	18
NOTES ABOUT WORKING AND OPERATIVE SAFETY.....	19
TECHNICAL CHARACTERISTICS.....	20
TECHNICAL CHARACTERISTICS OF THE MANOMETER-THERMOMETER.....	20
TECHNICAL DATA OF PROBES AND MODULES IN LINE WITH THE INSTRUMENT.....	21
PRESSURE MEASUREMENT BY PP471 MODULE	21
SONDE DI TEMPERATURA SENSORE Pt100 CON MODULO SICRAM.....	22
Pt100 4-WIRE PROBES	22
ORDERING CODES.....	23

GENERAL CHARACTERISTICS

The **HD2304.0** Manometer - Thermometer is a portable instrument that allows measurement of **absolute, relative** and **differential pressure**, and **temperature**.

- The **PP471** electronic module is used to measure the pressure. The module works as an interface between the instrument and the TP704 and TP705 series Delta Ohm probes.
- The **temperature** is detected using immersion, penetration, contact or air Pt100 probes with SICRAM module, or direct 4 wire Pt100 probes.

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

The units of measurement for the measurable quantities are:

- Pa (Pascal)
- hPa (hectopascal)
- kPa (kilopascal)
- mbar (millibar)
- bar (bar)
- atm (atmosphere)
- mmHg (millimeter of mercury)
- mmH₂O (millimeter of water)
- kgf/cm² (kilogram-force/square centimeter)
- PSI
- inchHg (inch of mercury)
- inchH₂O (inch of water)
- °C/°F

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 'Description of the functions' at page 6.

Manometer - Thermometer HD2304.0



HD2304.0

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 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. **ZERO**: performs the zero of the pressure probes.
10. **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.
11. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the HOLD key, disables the *AutoPowerOff* function.
12. **MAX** (maximum value), **MIN** (minimum value) and **AVG** (average value) symbols.
13. Main display line.
14. Line for symbols and comments.

DESCRIPTION OF THE FUNCTIONS

The keyboard of the **HD2304.0** Manometer – Thermometer 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.

Once the Settings Menu has been opened, by pressing simultaneously the **DATA+UNIT** keys, 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.

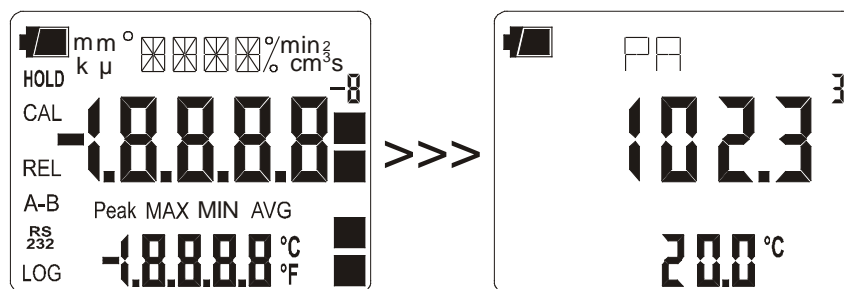


ON/OFF and AUTO/OFF key

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, while the "**ERR**" message is shown in the central part of the display. When the probe is inserted into a functioning instrument, the "**NEW_PROB_DET**" (New probe detected) message appears, while the "**ERR**" message is shown in the central part of the display, and a sequence of "beeps" is simultaneously issued. 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.



+



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 and 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 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. During electrode calibration, it allows to decrease the nominal buffer value.



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.
- **▲**: once the MENU has been opened with the **DATA+MENU** key, 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 UNIT/MENU key

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

- **UNIT:** by pressing this key the unit of measurement of the input probe 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:
 - *Pressure measurement unit:*
 - Pa (Pascal)
 - hPa (hectoPascal)
 - kPa (kiloPascal)
 - mbar (millibar)
 - bar (bar)
 - atm (atmosphere)
 - mmHg (millimeter of mercury)
 - mmH₂O (millimeter of water)
 - kgf/cm² (kilogram-force/square centimeter)
 - PSI
 - inchHg (inch of mercury)
 - inchH₂O (inch of water)
 - *Temperature measurement unit:*
 - °C (Celsius degrees)
 - °F (Fahrenheit degrees)
- **MENU:** the menu includes the **Probe Type** item. This item displays the type of probe connected to the instrument's input (see chapter xx):
 - 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.

ZERO Tasto ZERO

By pressing this key, the ZERO of the pressure probes is performed.

- In the differential pressure probes leave the two inputs open, so that they detect the same pressure.
- In the relative pressure (compared to the atmosphere) probes, leave the input open, so that it detects the atmospheric pressure.
- In the absolute pressure probes, apply the vacuum by using a suitable pressure calibrator.



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. 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 **UNIT+MENU** key, the ▼ key will allow to decrease the value of the selected parameter.

THE PROGRAMMING MENU

To access to the menu press simultaneously the following keys:



Menu:

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:

- TP704 and TP705 pressure probes combined with the PP471 module: the type of probe (i.e. if the PP471 module and the TP704-2BAI probe (2 bar absolute) are connected) is shown in the central part of the display. In the main line "2" is displayed, which indicates the sensor's bottom scale. The unit of measurement "**bAr**" and the sensor characteristic "**Abs**" (absolute) are displayed alternately in the secondary line;
- temperature probes "Pt100" complete with SICRAM module: the "**Auto**" message is displayed in the central part of the display;
- direct 4 wire "Pt100" temperature probes: in this case, the "**100Pt_4u**" message is displayed.

NOTE: Upon turning on the instrument automatically detects the probes fitted with SICRAM module: the type of probe is configured by the instrument and cannot be modified by the user.

If direct 4 wire "Pt100" probes that are not manufactured by "Delta OHM" are connected to the instrument, the **NO_PRBE_SER_NUM** message is displayed .

- 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.

PROBES AND MEASUREMENTS

The instrument measures absolute, relative and differential pressure using the PP471 SICRAM module and the TP704 and TP705 series probes. It also measures the temperature with a Pt100 sensor with SICRAM module or with direct 4 wire Pt100 probes.

The SICRAM module 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 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.

The probes fitted with SICRAM module are calibrated in the factory; no calibration is required by the user.

PP471 MODULE FOR PRESSURE MEASUREMENT

The PP471 module acts as an interface between the TP704 and TP705 series Delta OHM probes and the instrument. The **TP704** series pressure probes have a 1/4" BSP threaded male connection, and must be screwed into the system using the necessary sealing gaskets. The **TP705** series have two Ø5 connections where the suitable tubes are inserted in order to perform the desired measurement.

Caution! Please pay careful attention to the joint pressure sealing; use suitable gaskets and joints. The threaded connection is protected by a plastic cap. Put it back after use as it protects the pressure cell from foreign bodies.

IMPORTANT! Ensure the probe's bottom scale is higher than the pressure that will be measured. In case this value is unknown, start by using higher-capacity probes.

For every pressure probe a range of overload pressure and a burst pressure are declared: pressures in the range of overload pressure don't cause the break of the sensor but the declared accuracy can be overcome. Pressure over the stated burst pressure may break the sensor. The application of higher pressures than the overload pressure limit, although lower than the burst pressure, may produce permanent damage to the probe (e.g. offset shift). Never exceed the stated burst pressure (see Technical Characteristics of the probes at page xx)

Upon turning on the instrument automatically detects the PP471 module. The probe's type (absolute, relative or differential) and bottom scale value are detected even when the instrument is on (see chapter 3).

To change the instantaneous or peak value unit of measurement, press UNIT. The following units of measurement are available:

Pa, hPa, kPa, mbar, bar, atm, mmHg, mmH₂O, kgf/cm², PSI, inchHg, inchH₂O.

Some units of measurement require a degree of multiplication:

- the "-3" symbol indicates the displayed value must be divided by 1,000;
- the "3" and "6" symbols indicate the displayed value must be multiplied respectively by 1,000 or by 1,000,000.

The instrument does not automatically detect the probes which are not fitted with SICRAM module.

Pt100 TEMPERATURE PROBES

The instrument accepts the input of platinum temperature probes with resistances of 100Ω (Pt100).

The Pt100 sensors are connected to 4 wires; the excitation current was chosen in order to minimize the sensor self-heating effects.

All probes with module are calibrated in the factory; no calibration is usually required by the user.

The °C or °F unit of measurement can be chosen using the **UNIT** key.

TEMPERATURE MEASUREMENT

The response time for the measurement of the temperature in **air** is greatly reduced if the air is moving. If the air is still, stir the probe. Please remember that the response times in any case are longer than those for liquid measurements.

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.

CONNECTING THE TP47 CONNECTOR

All probes produced by Delta Ohm are provided with a connector.

The **HD2304** also work with direct 4 wire Pt100 probes manufactured by other producers: for the instrument connection is prescribed the **TP47** connector to which the probe's wires should be welded.

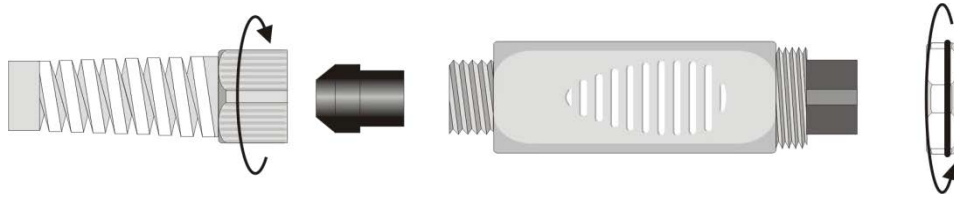


The instructions to connect the Platinum probe to the TP47 module are provided below.

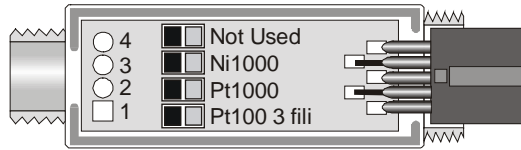
The **TP47** module is supplied complete with fairlead and gasket for 5 mm maximum diameter cables. Do the following to open the module and connect a probe:

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:



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:



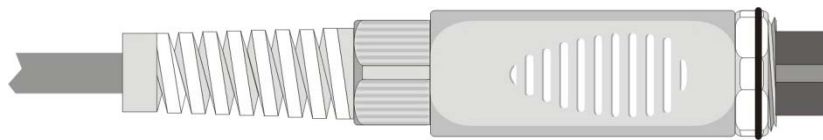
Caution! Before welding, pass the probe cable through the fairlead and gasket.

6. Weld the wires as shown in the table:

Sensor	Board connection	Jumper to close
Pt100 4 wires		None

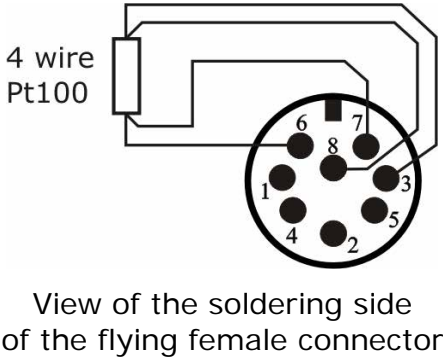
Ensure the welds are clean and perfect.

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.

DIRECT CONNECTION OF 4-WIRE Pt100 SENSOR

Sensor	Direct soldering to the connector
Pt100 4 wires	 <p data-bbox="403 443 496 510">4 wire Pt100</p> <p data-bbox="403 689 847 757">View of the soldering side of the flying female connector</p>

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 10.



The P100 probe is recognized upon turning on the instrument: connect the probe when the instrument is switched off and then turn it on.

INSTRUMENT SIGNALS AND FAULTS

The following table lists all of the indications displayed by the instrument in different operating and error situations.

Display indications	Explanation
PROB COMM LOST	This appears if the SICRAM module connected to the channel has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
OVER	Measurement overflow: this appears if the pressure sensor exceeds the limit of 120% of the full scale nominal value. Over 125%, the display indicates ERR. Measurement overflow: this appears if the external temperature probe is measuring a value exceeding the set measuring range.
ERR	This appears in the menu if a module has already been detected by the instrument, but is disconnected.
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.
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.
### BAR ABS	Probe ###bar absolute.
### BAR DIFF	Probe ###bar differential.
### BAR GAUG	Probe ###bar relative.
### BAR SG	Probe ###bar relative compared to 1 bar.
### mBAR ABS	Probe ###mbar absolute.
### mBAR DIFF	Probe ###mbar differential.
### mBAR GAUG	Probe ###mbar relative.
PROB_SER #####	Serial number ##### of the probe connected to the input.
ERR	Error.
FUNC CLRD	Max, min and average values cleared.
NEW PROBE DET	New probe detected at the input
PLS_EXIT >>> FUNC RES_FOR_FACT ONLY	Please exit using ESC >>> function reserved to factory calibration.
PRES_REL_TO_ZERO ENTR_TO_MENU	Press REL to reset probe or ENTER to access menu.
prob ERR	Error – unexpected probe.
SYS ERR #	Program error number #.

WARNINGS

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. Some pressure probe models are suitable for measurement of non-corrosive gases or air and dry and not liquid only: check the membrane compatibility with the plant fluid.
2. Do not bend the probe connectors or force them upward or downward. Do not bend or force the contacts when inserting the probe connector into the instrument.
3. Do not bend, deform or drop the probes, as this could cause irreparable damage.
4. Always select the most suitable probe for your application.
5. 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.
6. Above 400°C and below -40°C, avoid violent blows or thermal shocks to Platinum temperature probes as this could cause irreparable damage.
7. To obtain reliable measurements, temperature variations that are too rapid must be avoided.
8. 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.
9. Temperature measurements on non-metal surfaces usually require a great deal of time due to the low heat conductivity of non-metal materials.
10. **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.

11. Avoid taking measurements in presence of high frequency sources, microwave ovens or large magnetic fields; results may not be very reliable.
12. Clean the probe carefully after use. Clean the probe pressure chamber carefully. Avoid deposits or incrustations left by the fluid coming into contact with the membrane, as with time this could cause measurement errors.
13. Avoid inserting nails or spikes into the pressure chamber as the membrane could be unintentionally torn.
14. In order to fix the probes, use a suitable fixed wrench, and possibly sealing gaskets.
15. **Great attention must be paid while installing the probes in containers and tubes under pressure. Also pay attention to the probes' bottom scale. In addition to the irreparable damage, it can even cause serious physical damage to both the operator and things. Before the probe a stop valve should always be present. Ensure that the plant is not subject to abnormal or unexpected depressed fluid fluctuations.**

16. 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.


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: do not use any incompatible solvent for cleaning.

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.

If you continue to use it, the instrument can no longer ensure correct measurement. However, the memory data are maintained.

If the battery charge level is insufficient, the following message appears when you turn the instrument on:

**BATT TOO LOW
CHNG NOW**

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

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.

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.

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

TECHNICAL CHARACTERISTICS

TECHNICAL CHARACTERISTICS OF THE MANOMETER-THERMOMETER

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...+50 °C
Warehouse temperature	-25...+65 °C
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 1800 mAh alkaline batteries
Power absorbed with instrument off	< 20 µA

Connections

Input for probes	8-pole male DIN45326 connector
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Unit of measurement

Pa, hPa, KPa, mbar, bar, atm, mmHg, mmH₂O, kgf/cm², PSI, inchHg, °C, °F

Measurement of temperature by Instrument

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

TECHNICAL DATA OF PROBES AND MODULES IN LINE WITH THE INSTRUMENT

PRESSURE MEASUREMENT BY PP471 MODULE

All TP704 and TP705 series Delta OHM probes can be connected to the PP471 module. See the table below for the technical specifications of the individual probes.

PP471 SICRAM module for the measurement of absolute, relative and differential pressures. It operates with TP704 and TP705 series pressure probes. The module is equipped with cable (L=1.5 m) and 8-pole DIN 45326 female connector.

TP704 and TP705 series pressure probes to associate to PP471 module

Full scale pressure	Maximum over-pressure	Burst pressure	ORDERING CODES			Accuracy From 20 to 25°C	Operating temperature	Connection
			Differential pressure	Relative pressure (compared to atmosphere)	Absolute pressure			
			NON insulated membrane	Insulated membrane	Insulated membrane			
10 mbar	20 mbar	0.01 mbar	TP705-10MBD			0.50 % FSO	0...60 °C	Tube Ø 5 mm
20 mbar	40 mbar	0.01 mbar	TP705-20MBD			0.50 % FSO	0...60 °C	Tube Ø 5 mm
50 mbar	100 mbar	0.01 mbar	TP705-50MBD			0.50 % FSO	0...60 °C	Tube Ø 5 mm
100 mbar	200 mbar	0.1 mbar	TP705-100MBD			0.25 % FSO	0...60 °C	Tube Ø 5 mm
				TP704-100MBGI		0.25 % FSO	-30...80 °C	¼ BSP
200 mbar	400 mbar	0.1 mbar	TP705-200MBD			0.25 % FSO	0...60 °C	Tube Ø 5 mm
				TP704-200MBGI		0.25 % FSO	-30...80 °C	¼ BSP
400 mbar	1000 mbar	0.1 mbar		TP704-400MBGI		0.25 % FSO	-40...125 °C	¼ BSP
500 mbar	1000 mbar	0.1 mbar	TP705-500MBD			0.25 % FSO	0...60 °C	Tube Ø 5 mm
600 mbar	1000 mbar	0.1 mbar		TP704-600MBGI		0.25 % FSO	-40...125 °C	¼ BSP
1 bar	2 bar	1 mbar	TP705-1BD			0.25 % FSO	0...60 °C	Tube Ø 5 mm
					TP705BARO	0.25 % FSO	0...60 °C	Tube Ø 5 mm
				TP704-1BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-1BAI	0.25 % FSO	-40...125 °C	¼ BSP
2 bar	4 bar	1 mbar	TP705-2BD			0.25 % FSO	0...60 °C	Tube Ø 5 mm
				TP704-2BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-2BAI	0.25 % FSO	-25...85 °C	¼ BSP
5 bar	10 bar	1 mbar		TP704-5BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-5BAI	0.25 % FSO	-25...85 °C	¼ BSP
10 bar	20 bar	0.01 bar		TP704-10BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-10BAI	0.25 % FSO	-25...85 °C	¼ BSP
20 bar	40 bar	0.01 bar		TP704-20BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-20BAI	0.25 % FSO	-25...85 °C	¼ BSP
50 bar	100 bar	0.01 bar		TP704-50BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-50BAI	0.25 % FSO	-25...85 °C	¼ BSP
100 bar	200 bar	0.1 bar		TP704-100BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-100BAI	0.25 % FSO	-25...85 °C	¼ BSP
200 bar	400 bar	0.1 bar		TP704-200BGI		0.25 % FSO	-40...125 °C	¼ BSP
					TP704-200BAI	0.25 % FSO	-25...85 °C	¼ BSP
500 bar	1000 bar	0.1 mbar		TP704-500BGI		0.25 % FSO	-40...125 °C	¼ BSP
	700 bar	0.1 mbar			TP704-500BAI	0.25 % FSO	-25...85 °C	¼ BSP

SONDE DI TEMPERATURA SENSORE Pt100 CON MODULO SICRAM

Model	Type	Range of use	Accuracy
TP472I	Immersion	-196 °C...+500 °C	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C \leq t \leq 250 °C) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °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	
TP472I.10	Immersion	-50 °C...+400 °C	
TP49A.I	Immersion	-70 °C...+250 °C	
TP49AC.I	Contact	-70 °C...+250 °C	
TP49AP.I	Penetration	-70 °C...+250 °C	
TP875.I	Globe thermometer Ø150 mm	-30 °C...+120 °C	
TP876.I	Globe thermometer Ø50 mm	-30 °C...+120 °C	
TP87.O	Immersion	-50 °C...+200 °C	

Common features

Resolution	0,1°C
Temperature drift @ 20°C	0,003%/°C

Pt100 4-WIRE PROBES

Model	Type	Range of use	Accuracy
TP47.100.O	4-wire Pt100	-50...+250 °C	Classe A
TP87.100.O	4-wire Pt100	-50...+200 °C	Classe A

Common features

Resolution	0.1°C
Temperature drift @ 20°C	0,003%/°C

ORDERING CODES

HD2304.0 The kit is composed of the instrument HD2304.0, 3 1.5V alkaline batteries, operating manual, and case. **The probes must be ordered separately.**

PROBES COMPLETE WITH SICRAM MODULE

PRESSURE MEASUREMENT PROBES

PP471 SICRAM interface module between instrument and TP704 and TP705 series Delta OHM probes. Cable length 1.5 m.

The list of pressure probes TP704 and TP705 is outlined in the technical data table at page 21.

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.

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

Delta OHM metrological laboratories LAT N° 124 have been ISO/IEC 17025 accredited by ACCREDIA in Temperature, Humidity, Pressure, Photometry/Radiometry, Acoustics and Air Speed. They can provide calibration certificates for the accredited quantities.

NOTES

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DICHIARAZIONE DI CONFORMITÀ UE
EU DECLARATION OF CONFORMITY

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

Documento Nr. / Mese.Anno: **5141 / 09.2019**
Document-No. / Month.Year :

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

Codice prodotto:
Product identifier : **HD2304.0**

Descrizione prodotto:
Product description : **Manometro – Termometro RTD**
Manometer – RTD Thermometer

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

Direttive / Directives	
2014/30/EU	Direttiva EMC / <i>EMC Directive</i>
2014/35/EU	Direttiva bassa tensione / <i>Low Voltage Directive</i>
2011/65/EU - 2015/863/EU	RoHS / <i>RoHS</i>

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

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

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

Johannes Overhues

Amministratore delegato
Chief Executive Officer

Caselle di Selvazzano, 09/09/2019

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

WARRANTY

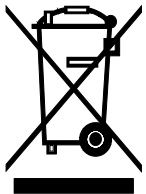
Delta OHM is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.

Delta OHM repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

TECHNICAL INFORMATION

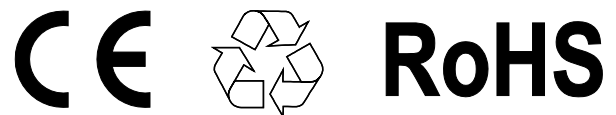
The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased. In case of discrepancies and/or inconsistencies, please write to sales@deltaohm.com. Delta OHM reserves the right to change technical specifications and dimensions to fit the product requirements without prior notice.

DISPOSAL INFORMATION



Electrical and electronic equipment marked with specific symbol in compliance with 2012/19/EU Directive must be disposed of separately from household waste. European users can hand them over to the dealer or to the manufacturer when purchasing a new electrical and electronic equipment, or to a WEEE collection point designated by local authorities. Illegal disposal is punished by law.

Disposing of electrical and electronic equipment separately from normal waste helps to preserve natural resources and allows materials to be recycled in an environmentally friendly way without risks to human health.



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