

HD2304.0
MANOMETER – THERMOMETER
ENGLISH

Our instruments' quality level is the results of the product continuous development. This can bring about differences between the information written in this manual and the instrument that you have purchased. We cannot entirely exclude errors in the manual, for which we apologize.

The data, figures and descriptions contained in this manual cannot be legally asserted. We reserve the right to make changes and corrections without prior notice.

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.

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1. GENERAL CHARACTERISTICS

The Manometer - Thermometer Model HD2304.0 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 2.

2. DESCRIPTION OF THE FUNCTIONS

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

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.

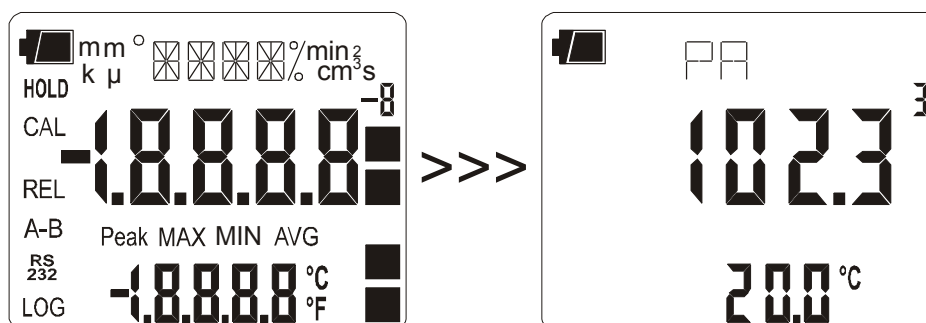


ON/OFF and AUTO/OFF key

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, remind to turn the instrument off with the **ON/OFF** key: the automatic turning off disabling is shown by the battery symbol blinking.

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

HOLD**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 3):
 - 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**ZERO key**

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**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.

3. 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.

4. 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 fitted 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.

4.1 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.

Please see the technical characteristics of the probes on paragraph "Technical characteristics".

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.

4.2 Pt100 TEMPERATURE PROBE

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.

4.2.1 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.

4.2.2 Connecting the TP47 connector

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

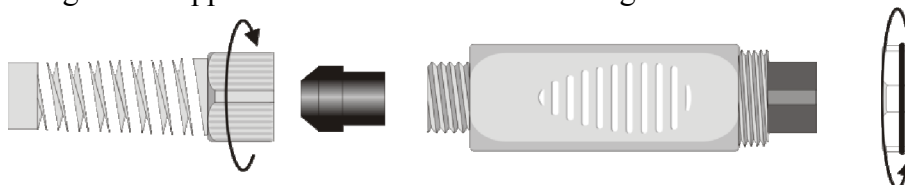
The **HD2304** also work with direct 4 wire Pt100 probes manufactured by other producers: for the instrument connection is prescribed the **TP47** connector to which the probe's wires should be welded.



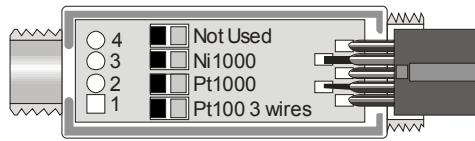
The instructions to connect the Platinum probe to the TP47 module are provided below.

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:



- 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:



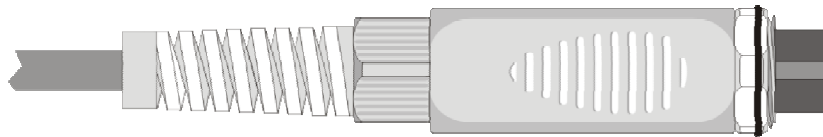
Caution! Before welding, pass the probe cable through the fairlead and gasket.

- Weld the wires as shown in the table:

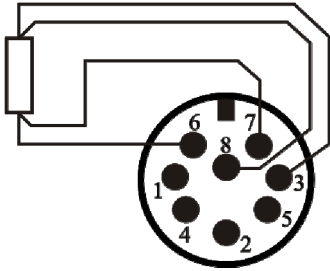
Sensor	Board connection	Jumper to close
Pt100 4 wires	<p>The diagram shows a Pt100 4-wire sensor cable with four wires connected to the four connection points (1, 2, 3, 4) on the board. The wires are connected as follows: the top two wires to points 3 and 4, and the bottom two wires to points 2 and 1. The jumper locations JP1, JP2, JP3, and JP4 are shown to the right of the connection points, with JP1, JP2, and JP3 having black bars indicating they should be closed.</p>	None

Ensure the welds are clean and perfect.

- Once the welding operation is complete, close the two shells;
- insert the gasket in the module;
- screw the fairlead and the ring. Make sure the cable is not twisted while you are screwing the fairlead. Now the probe is ready.





4.2.3 Direct connection of 4 wire Pt100 sensors

Sensor	Direct soldering to the connector
Pt100 4 wires	<p data-bbox="336 383 427 450">4 wire Pt100</p>  <p data-bbox="392 629 722 685">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 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. 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 model 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.

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 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 bottom 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
PRBE_SER #####	serial number ##### of the probe connected to the input
ERR	error
FUNC CLR D	max, min and average values cleared
NEW PROB DET	new probe detected at the input
OVER	maximum limit exceeded
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 #


7. 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.

8. LOW BATTERY WARNING AND BATTERY REPLACEMENT

The battery symbol 

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



In this case, batteries should be replaced as soon as possible.

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

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

**BATT TOO LOW
CHNG NOW**

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

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.

8.1 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 leak proof alkaline batteries. Sometimes on the market, it is possible to find new batteries with an insufficient charge capacity.

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

10. TECHNICAL CHARACTERISTICS

10.1 TECHNICAL INFORMATION ON 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: 52x42mm

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 1800mAh 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

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

10.2 ON LINE INSTRUMENT PROBES AND MODULES TECHNICAL DATA

10.2.1 Pressure measurement by module PP471

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.

Technical characteristics

Accuracy

±0.05% of full scale

Full scale pressure	Maximum over-pressure	Burst pressure	Resolution	ORDER 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			
10.0 mbar	350 mbar	400 mbar	0.01 mbar	TP705-10MBD			0.50 % FSO	0...60°C	Tube Ø 5mm
20.0 mbar	350 mbar	400 mbar	0.01 mbar	TP705-20MBD			0.50 % FSO	0...60°C	Tube Ø 5mm
50.0 mbar	350 mbar	400 mbar	0.01 mbar	TP705-50MBD			0.50 % FSO	0...60°C	Tube Ø 5mm
100 mbar	350 mbar	400 mbar	0.1 mbar	TP705-100MBD			0.25 % FSO	0...60°C	Tube Ø 5mm
	200 mbar	250 mbar		TP704-100MBGI			0.25 % FSO	-10...+80°C	¼ BSP
200 mbar	600 mbar	700 mbar	0.1 mbar	TP705-200MBD			0.25 % FSO	0...60°C	Tube Ø 5mm
	400 mbar	450 mbar		TP704-200MBGI			0.25 % FSO	-10...80°C	¼ BSP
400 mbar	800 mbar	900 mbar	0.1 mbar		TP704-400MBGI		0.25 % FSO	-10...80°C	¼ BSP
500 mbar	1500 mbar	1800 mbar	0.1 mbar	TP705-500MBD			0.25 % FSO	0...60°C	Tube Ø 5mm
600 mbar	1200 mbar	1500 mbar	0.1 mbar		TP704-600MBGI		0.25 % FSO	-40...125°C	¼ BSP
1.00 bar	3 bar	3.3 bar	1 mbar	TP705-1BD			0.25 % FSO	0...60°C	Tube Ø 5mm
	2 bar	2.2 bar				TP705BARO	0.25 % FSO	0...60°C	Tube Ø 5mm
	2 bar			TP704-1BGI	0.25 % FSO	-40...125°C	¼ BSP		
	2 bar			TP704-1BAI	0.25 % FSO	-40...120°C	¼ BSP		
2.00 bar	6 bar	7 bar	1 mbar	TP705-2BD			0.25 % FSO	0...60°C	Tube Ø 5mm
	4 bar	4.5 bar		TP704-2BGI	0.25 % FSO	-40...125°C	¼ BSP		
	4 bar			TP704-2BAI	0.25 % FSO	-25...85°C	¼ BSP		
5.00 bar	10 bar	12 bar	1 mbar	TP704-5BGI	0.25 % FSO	-40...125°C	¼ BSP		
				TP704-5BAI	0.25 % FSO	-25...85°C	¼ BSP		
10.0 bar	20 bar	25 bar	0.01 bar	TP704-10BGI	0.25 % FSO	-40...125°C	¼ BSP		
				TP704-10BAI	0.25 % FSO	-25...85°C	¼ BSP		
20.0 bar	40 bar	45 bar	0.01 bar	TP704-20BGI	0.25 % FSO	-40...125°C	¼ BSP		
				TP704-20BAI	0.25 % FSO	-25...85°C	¼ BSP		
50.0 bar	100 bar	120 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	240 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	450 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	700 bar	1000 bar	0.1 bar	TP704-500BGI	0.25 % FSO	-40...125°C	¼ BSP		
				TP704-500BAI	0.25 % FSO	-25...85°C	¼ BSP		

10.2.2 Temperature probes Pt100 using SICRAM module

Model	Type	Application range	Accuracy
TP472I	Immersion	-196°C...+500°C	±0.25°C (-196°C...+350°C) ±0.4°C (+350°C...+500°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)

Common characteristics

Resolution	0.1°C
Temperature drift @20°C	0.003%/°C

10.2.3 - 4 wire Pt100 Probes

Model	Type	Application range	Accuracy
TP47.100	4 wire Pt100	-50...+400°C	Class A

Common characteristics

Resolution	0.1°C
Temperature drift @20°C	0.003%/°C

11. ORDER CODES

HD2304.0 The kit is composed of the HD2304.0, 3 1.5V alkaline batteries, operating manual, and case. **The SICRAM interface module PP471 and probes must be ordered separately.**

11.1 PROBES COMPLETE WITH SICRAM MODULE

PRESSURE MEASUREMENT PROBES

PP471 SICRAM interface module between instrument and TP704 and TP705 series Delta Ohm probes. Cable length 2 metres.

The list of pressure probes is outlined in the technical data table, paragraph 10.2.

TEMPERATURE MEASUREMENT PROBES

TP472I Pt100 sensor immersion probe. Stem Ø 3 mm, length 300 mm. Cable length 2 metres.

TP472L.0 Pt100 sensor immersion probe. Stem Ø 3 mm, length 230 mm. Cable length 2 metres.

TP473P.0 Pt100 sensor penetration probe. Stem Ø 4 mm, length 150 mm. Cable length 2 metres.

TP474C.0 Pt100 sensor contact probe. Stem Ø 4 mm, length 230 mm, contact surface Ø 5 mm. Cable length 2 metres.

TP475A.0 Pt100 sensor air probe. Stem Ø 4 mm, length 230 mm. Cable length 2 metres.

TP472L.5 Pt100 sensor immersion probe. Stem Ø 6 mm, length 500 mm. Cable length 2 metres.

TP472L.10 Pt100 sensor immersion probe. Stem Ø 6 mm, length 1000 mm. Cable length 2 metres.

11.2 TEMPERATURE PROBES WITHOUT SICRAM MODULE

TP47.100 Direct 4 wire Pt100 sensor immersion probe. Probe's stem Ø 3 mm, length 230 mm. 4 wire connection cable with connector, length 2 metres.

TP47 Only connector for probe connection: direct 4 wire Pt100.

CERTIFICATO DI CONFORMITÀ DEL COSTRUTTORE

MANUFACTURER'S CERTIFICATE OF CONFORMITY

rilasciato da
issued by

DELTA OHM SRL STRUMENTI DI MISURA

DATA 2014/07/02
DATE

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

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

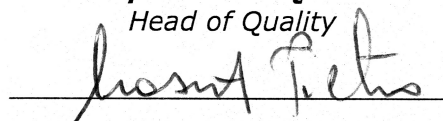
La riferibilità delle misure ai campioni internazionali e nazionali delle unità del SIT è garantita da una catena di riferibilità ininterrotta che ha origine dalla taratura dei campioni di laboratorio presso l'Istituto Primario Nazionale di Ricerca Metrologica.

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

Tipo Prodotto: Manometro Termometro
Product Type: **Manometer Thermometer**

Nome Prodotto: HD2304.0
Product Name:

Responsabile Qualità
Head of Quality



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Via Marconi, 5
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Cod. Fisc./P.Iva IT03363960281 - N.Mecc. PD044279
R.E.A. 306030 - ISC. Reg. Soc. 68037/1998

WARRANTY



TERMS OF WARRANTY

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



The electrical and electronic equipment marked with this symbol cannot be disposed of in public landfills. According to the UE Directive 2002/96/EC, the European users of electrical and electronic equipment can return it to the dealer or manufacturer upon purchase of a new one. The illegal disposal of electrical and electronic equipment is punished with an administrative fine.

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

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

Instrument code **HD2304.0**

Serial Number _____

RENEWALS

Date _____

Date _____

Inspector _____

Inspector _____

Date _____

Date _____

Inspector _____

Inspector _____

Date _____

Date _____

Inspector _____

Inspector _____



CE CONFORMITY

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

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