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English

Operating manual

RTD / thermocouple thermometers

HD2178.1 – HD2178.2

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CONTENTS

INTRODUCTION

The **HD2178.1** and **HD2178.2** are portable instruments with a large LCD display. They measure the temperature using immersion, penetration or air contact probes. Input A accepts K, J, T, N or E thermocouple type probes. Input B accepts probes with SICRAM module and Pt100 sensor probes or probes which sensor can be a Pt100 4 wires, Pt1000 or Ni1000 2 wires.

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

The HD2178.2 instrument is a **datalogger**. It memorizes up to 80,000 samples which can be transferred from the instrument connected to a PC via the RS232C serial port or USB 2.0 port. The logging interval, printing, and baud rate can be configured using the menu.
The HD2178.1 and HD2178.2 models are fitted with an RS232C serial port and can transfer the acquired measurements in real time to a PC or to a portable printer.
The *Max, Min* and *Avg* function calculate the maximum, minimum or average values.
Other functions include: the relative measurement REL, the HOLD function, and the automatic turning off that can also be disabled.
The instruments have IP66 protection degree.

This manual describes the HD2178.1 and HD2178.2 models: if not otherwise specified, the description is intended to be applicable to both models.

RTD - Thermocouple Thermometer
HD2178.1

HD2178.1

1. Input for thermocouple, standard miniature connector.
2. Input for probes, 8-pole DIN45326 connector.
3. Input for external power supply connector.
4. Battery symbol: displays the battery charge level.
5. Function indicators.
6. Secondary display line.
7. **HOLD/▲** key: freezes the measurement during normal operation; in the menu, increases the current value.
8. **FUNC** key: displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements. When pressed together with the UNIT/UserCal key, starts the calibration procedure for the probe connected to the instrument.
9. **REL/▼** key: enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed); in the menu, decreases the current value.
10. **SERIAL** key: starts and ends data transfer to the serial communication port.
11. **MENU** key: allows access to and exit from the menu.
12. **ENTER** key: in the menu, confirms the current selection.
13. **UNIT/USER CAL** key: during normal operation, selects the unit of measurement for the temperature between °C or °F; when pressed together with the FUNC key, starts the calibration procedure for the probe connected to the instrument.
14. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the HOLD key, disables the automatic turn off.
15. MAX, MIN and AVG symbols.
16. Main display line.
17. Line for symbols and comments.
18. 8-pole MiniDin connector for RS232C. For the connection to PC (with cable HD2110CSNM or C206) or printer (with cable HD2110CSNM).

RTD – Thermocouple Thermometer
HD2178.2

HD2178.2

1. Input for thermocouple, standard miniature connector.
2. Input for probes, 8-pole DIN45326 connector.
3. External auxiliary power supply connector input.
4. Battery symbol: displays the battery charge level.
5. Function indicators.
6. Secondary display line.
7. **HOLD/▲** key: freezes the measurement during normal operation; in the menu, increases the current value.
8. **FUNC** key: displays the maximum (MAX), the minimum (MIN) and the average (AVG) of current measurements. When pressed together with the UNIT/UserCal key, starts the calibration procedure for the probe connected to the instrument.
9. **REL/▼** key: enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed); in the menu, decreases the current value.
10. **SERIAL/ERASE LOG** key: starts and ends data transfer to the serial communication port. In the menu, clears the data contained in the instrument's memory.
11. **LOG/DUMP LOG** key: during normal operation, starts and ends the saving of the data in the internal memory; in the menu, starts the data transfer from the instrument's memory to the PC.
12. Mini-USB type B connector for USB 2.0. For the connection to PC (with cable CP23).
13. **MENU** key: allows access to and exit from the menu.
14. **ENTER** key: in the menu, confirms the current selection.
15. **UNIT/USER CAL** key: during normal operation, selects the unit of measurement for the temperature between °C, °F or °K; when pressed together with the FUNC key, starts the calibration procedure for the probe connected to the instrument.
16. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the HOLD key, disables the automatic turn off.
17. MAX, MIN and AVG symbols.
18. Main display line.
19. Line for symbols and comments.
20. 8-pole MiniDin connector for RS232C. For the connection to PC (with cable HD2110CSNM or C206) or printer (with cable HD2110CSNM).

KEYBOARD AND MENU DESCRIPTION

Foreword

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

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

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

Each key specific function is described in detail below.

ON-OFF/Auto-OFF key

The instrument is turned on and off using the ON/OFF key. The turning on enables all display segments for a few seconds, and then the type of calibration enabled (CAL FACT = factory calibration; CAL USER = user calibration). Then an auto-test follows, including detection of the probe connected to the input, and setting the instrument ready for normal measurement.

During turning on, should no probes with SICRAM module be connected to the input B, the message "CH_B_ NO_SER_NUM" is scrolled in the line for symbols for a few seconds. When the probe is inserted into the B input of a functioning instrument, the "NEW_CH_B_PROB_DET" (New probe detected) message appears: as the probe's data are captured upon turning the instrument on, it is necessary to turn the instrument off and on again.
Replace the probes when the instrument is off.

Automatic turning off

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

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

FUNC key

It enables the display and logging of the maximum (MAX), minimum (MIN) and average (AVG) value of the measurements captured by the probe connected to the instrument, updating them with the acquisition of new samples. The acquisition frequency is once a second.

The MAX, MIN and AVG measurements remain in the memory until the instrument is on, even after exiting the calculation function. To reset the previous values and restart with a new measurement session, press FUNC until the message "FUNC CLR" appears, then use the arrows to select YES and confirm using ENTER.
Attention: the data captured using the Record function cannot be transferred to the PC.

HOLD/▲ key

It increases the current parameter when used in the menu; when used in measurement mode, it freezes the measurement in progress, and upon application of pressure on the key, the message **HOLD** appears in the upper side of the display. To return to the current measurement, press the key again.

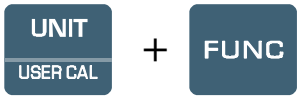
Upon turning on the instrument, the *AutoPowerOff* function can be disabled by holding the HOLD key down (please see the ON-OFF key description).

UNIT/UserCAL key

During measurement allows selection of the unit of measurement for the input temperature. By repeatedly pressing the function key, the different units of measurement are displayed in sequence:

1. °C Celsius degrees
2. °F Fahrenheit degrees

This setting changes the information displayed and the immediate print of data (SERIAL key). **The data recorded using the LOG function (*HD2178.2*) and sent to the printer or PC through the serial port using the SERIAL function (*HD2178.1 and HD2178.2*), keep the chosen unit of measurement and display it.**



Calibration of the probe and selection of the type of calibration

Simultaneous pressure on the UNIT/UserCal and FUNC keys starts the calibration procedure of the temperature probe connected to the instrument. Please see the paragraph dedicated to calibration on page 14.

To select the type of calibration (USER=user or FACT= factory) press the UNIT/UserCal and FUNC keys together, then use the arrows to select the desired item, and confirm using ENTER.

ENTER key

In the menu, the ENTER key confirms the displayed parameter and then goes to the next one.

REL/▼ key

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

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

MENU Key

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

The menu items are listed in this order:

1) **Management of memorized data (only HD2178.2)**: the message **“>>>_LOG_DUMP_or_ERAS**” (Transfer data or erase) is scrolled in the comment line. The center figure reports the number of free memory pages (FREE). All memory data are erased by pressing SERIAL/EraseLOG. By pressing LOG/DumpLOG, the data transfer of the logged data on the serial port is started: the “BAUD-RATE” must have previously been set to the maximum value (please see the menu items described below and the paragraph "STORING AND TRANSFERRING DATA TO A PERSONAL COMPUTER" on page 25).
2) **SEL Tc (select thermocouple type)**: the currently used thermocouple type appears in the comment line in inverted commas, while the message “SEL tc" appears in the other two lines. Use the arrow keys (▲ and ▼) to modify the type of thermocouple. The message in the comment line changes by pressing the arrow keys.
3) **CH B:** the message “CH_B" appears 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:
    - temperature probes Pt100 complete with SICRAM module
    - direct 4-wire Pt100 probes through module TP47
    - 2-wire Pt1000 probes through module TP47
    - 2-wire Ni1000 probes through module TP47

    Upon turning on the instrument automatically detects the probes fitted with SICRAM module: the *“CH_B”* menu item is configured as *“Pt100 Sicr”* and cannot be modified by the user.

When turned on, the temperature probes direct 4-wire Pt100, the Pt1000 and the Ni1000 display the message **"CH_B_NO_SER_NUM" (no probe serial number); in this case the probe type must be entered manually**. Select **Probe type** using the MENU key, **CH_B** and then the type of probe used with the arrow keys; confirm using ENTER.

4) **Print and log interval**: sets the interval in seconds between two loggings or data transfers to the serial port. The interval can be set at 0, 1s, 5s, 10s, 15s, 30s, 60s (1min), 120s (2min), 300s (5min), 600s (10min), 900s (15min), 1200s (20min), 1800s (30min) and 3600s (1hour). **If the value 0 is set, SERIAL works on command: the sending of data to the serial port is performed each time the key is pressed**. Recording (LOG) is performed with one second intervals even if the interval is set to 0. With an interval from 1 to 3600s, continuous data transfer is started when the SERIAL key is pressed. To end the logging (LOG) and **continuous** data transfer operations (SERIAL with an interval greater than 0), press the same key again.

5) **Sleep_Mode_LOG (Automatic turning off during logging) (only HD2178.2):** this function controls the instrument's automatic turning off during logging, occurring between the capture of a sample and the next one. When the interval is lower than 60 seconds, the instrument will always remain on. With intervals greater than or equal to 60 seconds, it is possible to turn off the instrument between loggings: it will turn on at the moment of sampling and will turn off immediately afterwards, thus increasing the battery life. Using the arrows select **YES** and confirm using **ENTER** in order to enable the automatic turning off, select **NO** and confirm to disable it and keep the instrument on continuously.
Note: even if **Sleep_Mode_LOG=YES** is selected, the instrument does not turn off for less than one minute intervals.

6) **YEAR**: to set the current year. Use the arrows to modify this parameter and confirm using ENTER.

7) **MNTH (month)**: to set the current month. Use the arrows to modify this parameter and confirm using ENTER.

8) **DAY**: to set the current day. Use the arrows to modify this parameter and confirm using ENTER.

9) **HOUR**: to set the current hour. Use the arrows to modify this parameter and confirm using ENTER.

10) **MIN (minutes)**: to set the current minutes. In order to correctly synchronize the minute, it is possible to reset the seconds by pressing the UNIT key. Use the arrows to set the current minute plus one, and as soon as that minute is reached press UNIT: this synchronizes the time to the second. Press ENTER to go onto the next item.

11) **BAUD_RATE:** indicates the frequency used for the serial communication with the PC. Values from 1200 to 38400 baud. Use the arrows to modify this parameter and confirm using ENTER. **The communication between instrument and PC (or serial port printer) only works if the instrument and PC baud rates are the same**. If the USB connection is used this parameter value is automatically set (please see the details on page 25).

LOG/DumpLOG key - only HD2178.2

In measurement mode, this function starts and stops the logging of a data block to be saved in the instrument's internal memory. The data logging frequency is set in the "**Print and log interval**" menu parameter. The data logged between a start and subsequent stop represent a block.

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

The HD2178.2 can turn off during logging between one capture and the next: the function is controlled by the **Sleep_Mode_LOG** parameter. When the logging interval is less than one minute, the logging instrument remains on; with an interval of at least one minute, it turns off between one capture and the next if the parameter **Sleep_Mode_LOG**=YES.

Dump LOG - only HD2178.2

When the LOG key is pressed after the MENU key, the transfer of the logged data on the serial port is started.
Please see the paragraph dedicated to data transfer on page 25.

SERIAL key - only HD2178.1

SERIAL/EraseLOG key - only HD2178.2

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

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

Erase memory - only HD2107.2

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

THE PROBES

Input A accepts K, J, T, N or E thermocouple temperature probes. The thermocouple type is set up by menu.
The connector contacts of thermocouple probe are polarized, they have to be put into the miniature connector placed in the instrument on the right way. Usually the probes are marked with the symbol + and -: these symbols have to correspond to the relevant symbols placed on the rubber protection of the instrument.

Input B accepts temperature probes fitted with the SICRAM module (with a Platinum Pt100 sensor with 100Ω resistance) or with direct 4-wire Pt100, 2-wire Pt1000 and Ni1000 sensors. The excitation current was chosen in order to minimize the sensor self-heating effects. The SICRAM module acts as an interface between the sensor on the probe and the instrument: there is a microprocessor circuit with memory that enables the instrument to recognize the type of probe connected and to read its functioning information. The probes with SICRAM module are automatically detected by the instrument, while the direct probes must be set up in the **CH_B** menu item (please see the description on page 10).

The SICRAM probes connected to the B input 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.

TEMPERATURE MEASUREMENT

In all versions the temperature sensor is housed at the end of the probe.

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. The response times 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 60mm; the sensor is housed in the end part of the probe.

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

In order to perform a correct **contact** measurement, the measurement surface must be even and smooth, and the probe must be perpendicular to the measurement plane. A contact measurement is hard to perform due to various factors: the operator must be experienced in handling the probe and consider all the factors influencing it.
So as to obtain the correct measurement, the insertion of a drop of oil or heat-conductive paste is useful (do not use water or solvents). This method also improves the response time.

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

Calibration of the RTD and thermocouple temperature probe in line with the instrument

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 and using the suitable equipment.

The probes fitted with SICRAM module are calibrated in the factory and the calibration parameters are recorded in the module. All RTD probes with direct input are **checked for conformity with class A tolerance** according to norm IEC751 - BS1904 - DIN43760.
The instrument is provided with the FACT (factory) calibration. The user is also able to perform a USER calibration of instrument+probe. The calibration information is saved in the instrument memory and not in the probe. The same correction is applied to any probe connected to the input: it is therefore implied that the USER calibration should only be used with a precise probe: the one used during calibration and no other probe.

To pass from the user to the factory calibration and back, press the UNIT/UserCal and FUNC keys together, then use the arrows to select the type of calibration, and confirm using ENTER.

Calibration sequence:
The calibration can be carried out on one or two points **that should differ by at least 10°C** and be included in the probe functioning range.
Insert the probe into a thermostatic bath, the temperature of which is precisely known from a reading taken on a sample reference thermometer. Wait for the measurement to stabilize.
Press simultaneously the UNIT/UserCal and FUNC keys, using the arrows select the USER calibration, and confirm with UNIT/UserCal.
Use the arrows to select the input to which the probe to calibrate is connected and choose input A (to calibrate one thermocouple probe) or input B (to calibrate one RTD probe): confirm by pressing ENTER key.

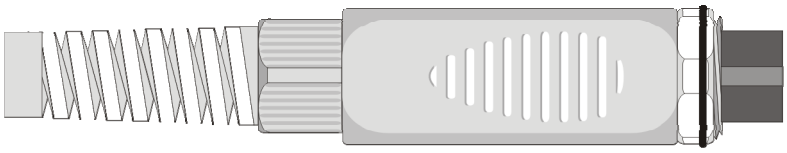
Use the arrows to select 1 (first calibration point) and confirm with ENTER. The "UP DOWN 1st MEAS" (correct the first point using the arrows ▲/▼) message is scrolled in the comment line. The instrument display shows the measured temperature: use the arrows to correct the indicated value until it coincides with the value measured by the sample reference thermometer.
Confirm by pressing ENTER.

To exit the procedure without performing the second point, select 0 and press ENTER.
To perform the second point, select the point 2 with the arrows and press ENTER.
The "UP DOWN 2nd MEAS" (correct the second point using the arrows ▲/▼) message is scrolled in the comment line.
Move the probe to the second thermostatic bath and wait for the measurement to stabilize. The instrument display shows the measured temperature: use the arrows to correct the indicated value until it coincides with the value measured by the sample reference thermometer.
Confirm by pressing ENTER.

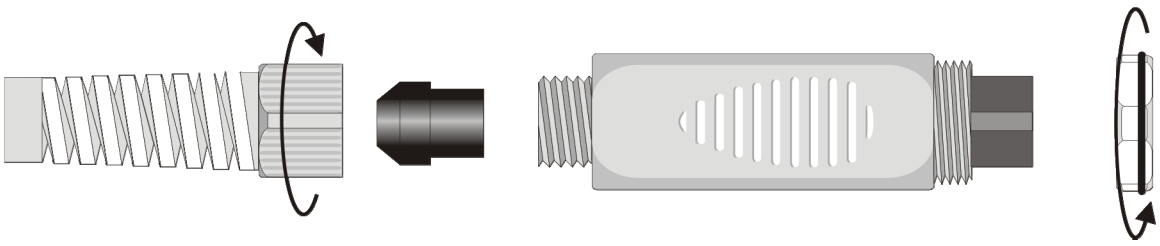
The procedure is now complete.

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

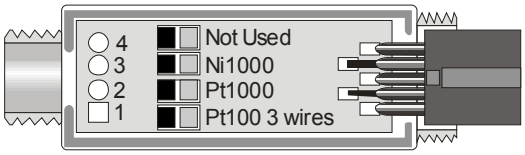
All Delta Ohm probes are provided with a connector. The HD2178.1 and HD2178.2 instruments also work with 4-wire direct Pt100, 2-wire Pt1000 and Ni1000 probes manufactured by other producers: for the instrument connection is prescribed the TP47 connector to which the probe's wires should be welded.
Note: the 3 wire Pt100 direct connection is not allowed.



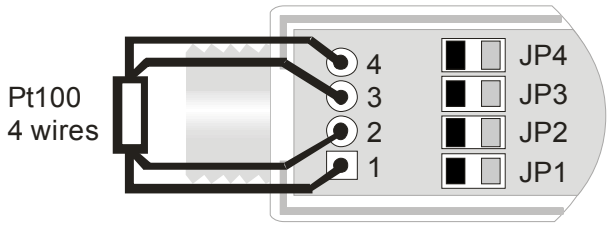
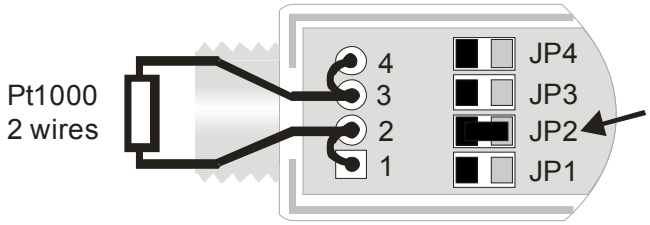
The instructions to connect the Platinum or Nickel probe to the module are provided below.
The module is supplied complete with fairlead and gasket for 5mm maximum diameter cables.
Do the following to open the module and connect a probe:
Unscrew the fairlead and extract the gasket, remove the label using a cutter, unscrew the ring on the opposite side as illustrated in the figure:

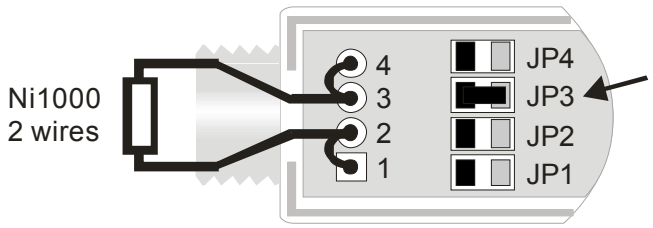


Open the two module shells: the printed circuit to which the probe must be connected is housed inside. On the left there are the 1…4 points on which the sensor wires must be welded. The JP1…JP4 jumpers are in the center of the board. These must be closed with a tin bead for some type of sensors:

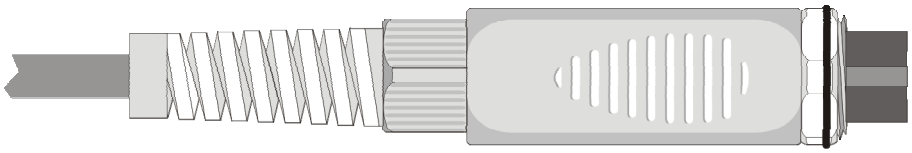


Before welding, pass the probe cable through the fairlead and gasket.
Weld the wires as shown in the table:

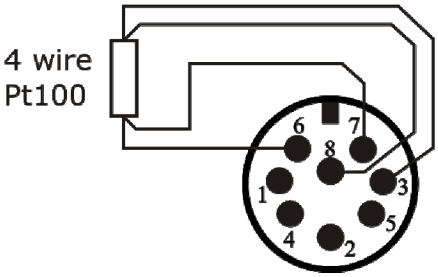
Sensor	TP47 card connection	Jumper to close
Pt100 4 wires		None
Pt1000 2 wires		JP2

Sensor	TP47 card connection	Jumper to close
Ni1000		JP3

Ensure the welds are clean and perfect. Once the welding operation is complete, close the two shells, insert the gasket in the module, and screw the fairlead and the ring. At the other end of the module, enter the ring with the O-Ring. Make sure the cable is not twisted while you are screwing the fairlead. Now the probe is ready.



Direct connection of 4 wire Pt100 sensors

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

4 wire Pt100 sensors can be soldered directly to the pins of the free 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.

WARNINGS AND OPERATING INSTRUCTIONS

1. Do not expose the probes to gases or liquids that could corrode the material of the sensor or the probe itself. Clean the probe carefully after each measurement.
2. Do not bend the probe connectors or force them upward or downward.
3. Do not bend or force the contacts when inserting the probe connector into the instrument.
4. Do not bend, deform or drop the probes, as this could cause irreparable damage.
5. Always select the most suitable probe for your application.
6. Do not use probes in presence of corrosive gases or liquids. The sensor container is made of AISI 316 stainless steel, while the contact probe container is made from AISI 316 stainless steel plus silver. Avoid contact between the probe surface and any sticky surface or substance that could corrode or damage it.
7. Above 400°C and below –40°C, avoid violent blows or thermal shocks to Platinum temperature probes as this could cause irreparable damage.
8. To obtain reliable temperature measurements, temperature variations that are too rapid must be avoided.
9. Temperature probes for surface measurements (contact probes) must be held perpendicular against the surface. Apply oil or heat-conductive paste between the surface and the probe in order to improve contact and reduce reading time. Whatever you do, do not use water or solvent for this purpose. A contact measurement is always very hard to perform. It has high levels of uncertainty and depends on the ability of the operator.
10. Temperature measurements on non-metal surfaces usually require a great deal of time due to the low heat conductivity of non-metal materials.
11. The sensor is not insulated from its external casing; be very careful not to come into contact with live parts (above 48V). This could be extremely dangerous for the instrument as well as for the operator, who could be electrocuted.
12. Avoid taking measurements in presence of high frequency sources, microwave ovens or large magnetic fields; results may not be very reliable.
13. Clean the probe carefully after use.
14. The instrument is water resistant and IP66, but should not be immersed in water. Protect the connectors from water by closing them well using their caps. The probe connectors must be fitted with sealing gaskets. Should the instrument fall into the water, check for any water infiltration. Gently handle the instrument in such a way as to prevent any water infiltration from the connectors' side.

INSTRUMENT SIGNALS AND FAULTS

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

Display indications	Explanation
ERR	This appears if the probe has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
CH_B COMM LOST	This appears if the probe has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
OVER **or** **UNDR**	Measurement overflow: indicates that the probe is measuring a value exceeding the measuring range.
LOG **MEM** **FULL**	Memory full; the instrument cannot store further data, the memory space is exhausted.
NEW CH_B PROBE DET	This message appears when a probe is inserted into a functioning instrument. Turn the instrument off and then back on again.
PROB **ERR**	A probe with SICRAM module has been inserted when not admissible for that specific instrument.
SYS **ERR** **#**	Instrument management program error. Contact the instrument's supplier and communicate the numeric code # reported by the display.
CAL **LOST**	Program error: it appears after turning on for a few seconds. Contact the instrument's supplier.
BATT TOO LOW **CHNG NOW**	Indication of insufficient battery charge appearing on turning on. The instrument issues a long beep and turns off. Replace the batteries.

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

Display indications	Explanation
>>> CAL_MODE >>> KEY_UNIT FOR_NEW_USER CAL_	calibration mode >>> press UNIT to start a new user calibration
>>>_LOG_DUMP_or_ERAS	transfer or erase data
>>>_PRBE_TYPE	type of probe connected
1ST_MEAS UP DOWN	correct the first point using the arrows ▲/▼
2ND_MEAS UP DOWN	correct the second point using the arrows ▲/▼
BATT TOO LOW - CHNG NOW	battery discharged - replace it immediately
BAUDRATE >>>	baud rate value
CAL FACT	factory calibration
CAL USER	user calibration
CH_B	description of probe connected to input B
CH_B COMM LOST	communication loss with SICRAM probe of input B
CH_B_NO_SER_NUM	serial number of probe connected with input B is absent
CH_B_SER #### ####	serial number #### #### of probe connected to input B
COMM STOP	printing complete
COMM STRT	printing started
DAY_	day
DUMP_END	data transfer complete
DUMP_In_PROG >>>	data transfer in progress
ERR	error
FUNC CLR	max, min and average values clearing
FUNC CLRD	max, min and average values cleared
HOUR	hour
LOG In PROG	logging in progress
LOG MEM FULL	memory full
LOG_CLRD	memory data cleared
LOG_STOP	logging complete
LOG_STRT	logging started
MIN >>> USE_UNIT_TO_ZERO SEC	minutes >>> use the UNIT key to reset the seconds
MNTH	month
NEW_CH_B_PROB_DET	new probe detected connected to input B
OVER	maximum limit exceeded
PLS_EXIT >>> FUNC RES_FOR_FACT ONLY	please exit using FUNC >>> function reserved to factory calibration
PRBE_SER #### ####	serial number #### #### of the connected probe
PRNT AND LOG INTV	printing and logging intervals
PRNT INTV >>>	printing interval
PROB ERR	probe error
SEL CHAN	selection of input for user calibration
SEL MEAS 1/2	select measurement 1 or 2
SLP_MODE_LOG	turning off during recording mode
SYS ERR #	program error number #
UNDR	minimum limit exceeded
YEAR	year

LOW BATTERY WARNING AND BATTERY REPLACEMENT

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

In this case, batteries should be replaced as soon as possible.
If you continue to use it, the instrument can no longer ensure correct measurement. The memory data are maintained.
If the battery charge level is insufficient, the following message appears when you turn the instrument on:

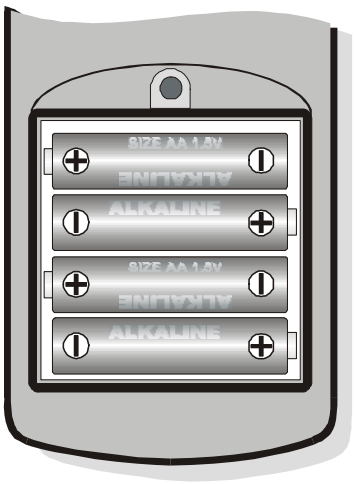
BATT TOO LOW
CHNG NOW

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

In order to avoid data loss, the logging session is ended, if the HD2178.2 is logging and battery voltage falls below the minimum operating level.

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

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



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

MALFUNCTIONING UPON TURNING ON AFTER BATTERY REPLACEMENT

After replacing the batteries, the instrument may not restart correctly; in this case, repeat the operation. After disconnecting the batteries, wait a few minutes in order to allow circuit condensers to discharge completely; then reinsert the batteries.

WARNING ABOUT BATTERY USE

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

INSTRUMENT STORAGE

Instrument storage conditions:

- Temperature: -25…+65°C.
- Humidity: less than 90%RH without condensation.
- Do not store the instrument in places where:
  Humidity is high.
  The instrument may be exposed to direct sunlight.
  The instrument may be exposed to a source of high temperature.
  The instrument may be exposed to strong vibrations.
  The instrument may be exposed to steam, salt or any corrosive gas.

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

SERIAL INTERFACE AND USB

The HD2178.1 and HD2178.2 instruments are fitted with an electrically isolated RS-232C serial interface; the HD2178.2 also has an USB 2.0 interface.
The following serial cables can be used:

- **HD2110CSNM**: serial connection cable with 8-pole MiniDin connector on one end and 9-pole Sub D connector on the other end;
- **C.206**: serial connection cable with 8-pole MiniDin connector on one end and USB type A connector on the other end. With integrated RS232/USB converter;
- **CP23**: connection cable with Mini-USB type B connector on one end and USB type A connector on the other end (only for HD2178.2).

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

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

The instrument standard serial transmission parameters are:

- Baud rate 38400 baud
- Parity None
- N. bit 8
- Stop bit 1
- Protocol Xon/Xoff

It is possible to change the RS232C serial port baud rate by setting the "*Baudrate*" parameter in the menu (please see page 11). The possible values are: 38400, 19200, 9600, 4800, 2400, 1200. The other transmission parameters are fixed.
The USB 2.0 connection does not require the setting of parameters.

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

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

Command	Response	Description
P0	&	Ping (locks the instrument keyboard for 70 seconds)
P1	&	Unlocks the instrument keyboard
S0	35.2 23.8	Captured measurements (24 characters)
G0	Model HD2178 -2	Instrument model

Command	Response	Description
G1	M=RTD + Thermocouple K	Model description
G2	SN=12345678	Instrument serial number
G3	Firm.Ver.=01-00	Firmware version
G4	Firm.Date=2004/06/15	Firmware date
G5	cal 0000/00/00 00:00:00	Calibration date and time
G6	Probe=Tc K	Type of thermocouple probe connected to input A
GD	Probe=Sicram Pt100	Type of probe connected to input B
GE	Probe SN=11119999	Serial number of probe connected to input B
GF	Probe cal.=2004/01/12	Calibration date of probe connected to input B
GB	User ID=0000000000000000	User code (set with T2xxxxxxxxxxxxxxxx)
GC		Print instrument's heading
LN	&1999	Number of free pages in the flash memory
LD	PRINTOUT OF LOG	Print data logged in flash
LE	&	Erase data in flash memory
K1	PRINTOUT IMMEDIATE MODE	Immediate printing of data
K0		Stop printing data
K4	&	Start logging data
K5	&	Stop logging data
K7	&	Enable REL function
K6	&	Disable REL function
KP	&	Auto-power-off function=ENABLE
KQ	&	Auto-power-off function=DISABLE
RA	Sample interval= 1 sec.	Reading of LOG/PRINT interval set
RP	& 600	Battery level (Resolut. 0.01V)
RUA	U= °C	Measuring quantity
WA#	&	Setting LOG/PRINT interval. # is a hexadecimal number 0…D that represents the position of the interval in the list 0, 1, 5, 10, …, 3600 seconds.
WC0	&	Setting SELF off
WC1	&	Setting SELF on

Command characters are exclusively upper case characters. Once a correct command is entered, the instrument responds with "&"; when any wrong combination of characters is entered, the instrument responds with "?". The instrument response strings end with the sending of the CR command (Carriage Return). The instrument does not send the LF command (Line Feed).
Before sending commands to the instrument via the serial port, locking the keyboard to avoid functioning conflicts is recommended: use the P0 command. When complete, restore the keyboard with the P1 command.

STORING AND TRANSFERRING DATA TO A PERSONAL COMPUTER

The HD2178.1 and HD2178.2 instruments can be connected to a personal computer via an RS232C serial port or USB 2.0 port, and exchange data and information through the DeltaLog9 software running in a Windows operating environment. Both models can send in real time input measured values directly to a PC, through the PRINT function; the HD2178.2 can also store the values measured by using the *Logging* function (LOG key) in its internal memory. If necessary, the data stored in the memory can be transferred to a PC later.

THE *LOGGING* FUNCTION - ONLY FOR HD2178.2

The *Logging* function allows the recording up to 80,000 measurements registered by the probe connected to the input. The time interval between two consecutive measurements can be set from 1 second to 1 hour. The logging starts by pressing the LOG key and ends by pressing the same key again: the data memorized in this way form a continuous block of data.

See the description of the menu items on page 10.

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

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

CLEARING THE MEMORY - ONLY FOR HD2178.2

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

NOTES:

- Data transfer does not cause the memory to be erased; the operation can be repeated as many times as required.
- The logged data remain in memory apart from the battery charge conditions.
- In order to print the data to a parallel interface printer, you must use a parallel-serial adaptor (not supplied).
- **The direct connection between instrument and printer via a USB connector does not work.**
- Some keys are disabled during logging. The following keys work: ON/OFF, HOLD, FUNC (Max-Min-Avg) and SERIAL.
- Pressing the HOLD, REL and FUNC keys has no effect on the logged data if these keys are pressed **after** starting the recording, otherwise the following is valid.
- The recording started with the display in HOLD mode proceeds normally with the actual measured values (that is, not in “HOLD” mode). Only the display is frozen to the values present when the HOLD key was pressed.
- The same is true for the Max-Min-Avg function.
- If the logging is started when the display is in REL mode, the relative values are logged.
- It is possible to activate both the logging (LOG) and direct transfer (PRINT) functions at the same time.

THE *PRINT* FUNCTION

The PRINT function sends the measurements taken in real time by the instrument inputs directly to a PC or a printer. Print data units of measurements are the same as those used on the display. The function is started by pressing SERIAL. The time interval between two consecutive prints can be set from 1 second to 1 hour (please see the **Print and log interval** menu item on page 10). If the print interval is equal to 0, by pressing SERIAL the single data is sent to the connected device. If the print interval is higher than 0, the data transfer continues until the operator stops it by pressing SERIAL again.

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

Connect the HD40.1 printer using cable HD2110CSNM.

NOTES:

- The print out is formatted across 24 columns.
- Some keys are disabled during serial transmission. The following keys work: ON/OFF, HOLD, FUNC (Max-Min-Avg) and LOG.
- Pressing the HOLD, REL and FUNC keys has no effect on the printed data if these keys are pressed **after** starting the printing, otherwise the following is valid.
- The transfer started with the display in HOLD mode proceeds normally with the actual measured values (that is, not in “HOLD” mode). Only the display is frozen to the values present when the HOLD key was pressed.
- The same is true for the Max-Min-Avg function.
- If the serial transfer is started when the display is in REL mode, the relative values are transferred.
- It is possible to activate both the logging (LOG) and direct transfer (PRINT) functions at the same time.

CONNECTION TO A PC

HD2178.1

Connection to the PC with the cable:

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

HD2178.2

Connection to the PC with the cable:

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

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

CONNECTION TO THE RS232C SERIAL PORT OF THE INSTRUMENT

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

CONNECTION TO THE USB 2.0 PORT OF THE INSTRUMENT - ONLY FOR HD2178.2

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

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

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

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

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

NOTES ABOUT WORKING AND OPERATIVE SAFETY

Authorized use

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

General safety instructions

This measuring system is constructed and tested in compliance with the EN 61010-1:2010 safety regulations for electronic measuring instruments. It left the factory in a safe and secure technical condition.
The smooth functioning and operational safety of the measuring system can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed during operation.
The smooth functioning and operational safety of the instrument can only be guaranteed under the environmental and electrical operating conditions that are in specified in chapter "TECHNICAL CHARACTERISTICS".

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

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

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

Obligations of the purchaser

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

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

INSTRUMENT TECHNICAL CHARACTERISTICS

Instrument	
Dimensions (Length x Width x Height)	185x90x40mm
Weight	470g (complete with batteries)
Materials	ABS, rubber
Display	2x4½ digits plus symbols Visible area: 52x42mm
Operating conditions	
Working temperature	-5…50°C
Storing temperature	-25…65°C
Working relative humidity	0…90%RH without condensation
Protection degree	**IP66**
Power Supply	
Batteries	4 1.5V type AA batteries
Autonomy	200 hours with 1800mAh alkaline batteries
Power absorbed with instrument off	20µA
Mains (cod. **SWD10**)	Output mains adapter 100-240Vac/12Vdc-1A
Measuring units	°C - °F
Security of memorized data	Unlimited, independently of battery charge conditions
Time	
Date and time	Schedule in real time
Precision	1min/month max drift
*Measured values memorization - model **HD2178.2***	
Type	2000 pages of 40 samples each
Quantity	Total of 80000 samples
Selectable storage interval	1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
Serial interface RS232C	
Type	RS232C electrically isolated
Baud rate	Can be set from 1200 to 38400 baud
Data bit	8
Parity	None
Stop bit	1
Flow Control	Xon/Xoff
Serial cable length	Max 15m
Selectable print interval	immediate or 1s, 5s, 10s, 15s, 30s, 1min, 2min, 5min, 10min, 15min, 20min, 30min and 1hour
*USB interface - model **HD2178.2***	
Type	1.1 - 2.0 electrically isolated

Connections

Input module for the probes	8-pole male DIN45326 connector
RS232 serial interface	8-pole MiniDin connector
USB interface (only **HD2178.2**)	Mini-USB type B connector
Mains adapter (cod. **SWD10**)	2-pole connector (positive at centre)

Measurement of temperature by Instrument – RTD sensors

Pt100 measurement range	-200…+650°C
Pt1000 measurement range	-200…+650°C
Resolution	0.1°C
Accuracy	±0.05°C
Drift after 1 year	0.1°C/year

Measurement of temperature by Instrument - Tc

TC measurement range: K	-200 … +1370°C
TC measurement range: J	-100 … +750°C
TC measurement range: T	-200 … +400°C
TC measurement range: N	-200 … +1300°C
TC measurement range: E	-200 … +750°C
Resolution	0.1°C
Instrument accuracy	
Thermocouple K	±0.1°C up to 600°C ±0.2°C over 600°C
Thermocouple J	±0.1°C up to 400°C ±0.2°C over 400°C
Thermocouple T	±0.1°C
Thermocouple N	±0.1°C up to 600°C ±0.2°C over 600°C
Thermocouple E	±0.1°C up to 300°C ±0.2°C over 300°C

The accuracy only refers to the instrument. Error due to the thermocouple or to the cold junction reference sensor is not included.

Temperature drift @ 20°C	0.02%/°C
Drift after 1 year	0.1°C/year

Tolerance of the thermocouple probes:

The tolerance of a type of thermocouple corresponds to the maximum acceptable deviation from the e.m.f. of any thermocouple of that type, with reference junction at 0°C. The tolerance is expressed in degrees Celsius, preceded by the sign.

The tolerances refer to the operating temperature expected for the thermocouple, in agreement with the diameter of the thermoelements.

TOLERANCE CLASSES OF THERMOCOUPLES

Tolerances according to **IEC 60584-2** standard.
The values refer to thermocouples with **reference junction at 0 °C**.

	Tolerance class 1		Tolerance class 2		Tolerance class 3	
Type of thermocouple	**Temperature range (°C)**	**Tolerance (°C)**	**Temperature range (°C)**	**Tolerance (°C)**	**Temperature range (°C)**	**Tolerance (°C)**
B	---	---	+600…+1700	± 0.0025 · t	+600…+800	± 4
	---	---	---	---	+800…+1700	± 0.005 · t
E	-40…+375	± 1.5	-40…+333	± 2.5	-167…+40	± 2.5
	+375…+800	± 0.004 · t	+333…+900	± 0.0075 · t	-200…-167	± 0.015 · t
J	-40…+375	± 1.5	-40…+333	± 2.5	---	---
	+375…+750	± 0.004 · t	+333…+750	± 0.0075 · t	---	---
K , N	-40…+375	± 1.5	-40…+333	± 2.5	-167…+40	± 2.5
	+375…+1000	± 0.004 · t	+333…+1200	± 0.0075 · t	-200…-167	± 0.015 · t
R , S	0…+1100	± 1	0…+600	± 1.5	---	---
	+1100…+1600	± [1+0.003 · (t-1100)]	+600…+1600	± 0.0025 · t	---	---
T	-40…+125	± 0.5	-40…+133	± 1	-67…+40	± 1
	+125…+350	± 0.004 · t	+133…+350	± 0.0075 · t	-200…-67	± 0.015 · t

Note: t = temperature of measurement junction in °C.

TECHNICAL DATA OF PROBES AND MODULES IN LINE WITH THE INSTRUMENT

PROBES Pt100 4 WIRES AND Pt1000 2 WIRES

Model	Type	Application range	Accuracy
TP47.100.O 1/3 DIN – Thin Film	Pt100 4 wires	-50…+250°C	1/3 DIN
TP47.1000.O 1/3 DIN – Thin Film	Pt1000 2 wires	-50…+250°C	1/3 DIN
TP87.100.O 1/3 DIN – Thin Film	Pt100 4 wires	-50…+200°C	1/3 DIN
TP87.1000.O 1/3 DIN – Thin Film	Pt1000 2 wires	-50…+200°C	1/3 DIN

Common characteristics

Resolution 0.1°C

Temperature drift @ 20°C

Pt100 0.003%/°C

Pt1000 0.005%/°C

TEMPERATURE PROBES Pt100 SENSOR USING SICRAM MODULE

Model	Type	Application range	Accuracy
TP472I	Immersion	-196°C…+500°C	±0.25°C (-196°C…+300°C) ±0.5°C (+300°C…+500°C)
TP472I.0 1/3 DIN – Thin Film	Immersion	-50°C…+300°C	±0.25°C
TP473P.I	Penetration	-50°C…+400°C	±0.25°C (-50°C…+300°C) ±0.5°C (+300°C…+400°C)
TP473P.0 1/3 DIN - Thin Film	Penetration	-50°C…+300°C	±0.25°C
TP474C.0 1/3 DIN - Thin Film	Contact	-50°C…+300°C	±0.3°C
TP475A.0 1/3 DIN - Thin Film	Air	-50°C…+250°C	±0.3°C
TP472I.5	Immersion	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP472I.10	Immersion	-50°C…+400°C	±0.3°C (-50°C…+300°C) ±0.6°C (+300°C…+400°C)
TP49A.I Class A	Immersion	-70°C…+250°C	±0.25°C
TP49AC.I Class A	Contact	-70°C…+250°C	±0.25°C
TP49AP.I Class A	Penetration	-70°C…+250°C	±0.25°C
TP875.I	Globe-thermometer Ø 150 mm	-30°C…+120°C	±0.25°C
TP876.I	Globe-thermometer Ø 50 mm	-30°C…+120°C	±0.25°C
TP87.O 1/3 DIN - Thin Film	Immersion	-50°C…+200°C	±0.25°C
TP878.O 1/3 DIN - Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP878.1.O 1/3 DIN - Thin Film	Photovoltaic	+4°C…+85°C	±0.25°C
TP879.O 1/3 DIN - Thin Film	Compost	-20°C…+120°C	±0.25°C

Common characteristics

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

ORDER CODES

HD2178.1	Kit including the instrument HD2178.1, 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software. **The probes and the cables must be ordered separately.**
HD2178.2	Kit including the HD2178.2 **datalogger,** 4 1.5V alkaline batteries, operating manual, case and DeltaLog9 software. **The probes and the cables must be ordered separately.**
HD2110CSNM	Connection cable 8-pole MiniDin – Sub D 9-pole female for RS232C.
C.206	Connection cable 8-pole MiniDin – USB type A. With integrated RS232/USB converter.
CP23	Connection cable Mini-USB type B – USB type A.
DeltaLog9	Software for transfer and management of the data on PC using Windows (from 98) operating systems.
SWD10	Stabilized power supply at 100-240Vac/12Vdc-1A mains voltage.
HD40.1	The kit includes: 24-column portable thermal printer, serial interface, 57mm paper width, four NiMH 1.2V rechargeable batteries, SWD10 power supply, instruction manual, 5 thermal paper rolls.
BAT.40	Spare battery pack for HD40.1 printer with in-built temperature sensor.
RCT	The kit includes 4 thermal paper rolls 57mm wide and 32mm in diameter.

PROBES COMPLETE WITH SICRAM MODULE

TP472I	Immersion probe, sensor Pt100. Stem Ø 3 mm, length 300 mm. Cable length 2 metres.
TP472I.0	Immersion probe, sensor Pt100. Stem Ø 3 mm, length 230 mm. Cable length 2 metres.
TP473P.I	Penetration probe, sensor Pt100. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
TP473P.0	Penetration probe, sensor Pt100. Stem Ø 4mm, length 150 mm. Cable length 2 metres.
TP474C.0	Contact probe, sensor Pt100. Stem Ø 4 mm, length 230 mm, contact surface Ø 5 mm. Cable length 2 metres.
TP475A.0	Air probe, sensor Pt100. Stem Ø 4 mm, length 230 mm. Cable length 2 metres.
TP472I.5	Immersion probe, sensor Pt100. Stem Ø 6 mm, length 500 mm. Cable length 2 metres.
TP472I.10	Immersion probe, sensor Pt100. Stem Ø 6 mm, length 1000 mm. Cable length 2 metres.
TP49A.I	Immersion probe, sensor Pt100. Stem Ø 2.7 mm, length 150 mm. Cable length 2 metres. Aluminium handle.

TP49AC.I Contact probe, sensor Pt100. Stem Ø 4 mm, length 150 mm. Cable length 2 metres. Aluminium handle.

TP49AP.I Penetration probe, sensor Pt100. Stem Ø 2.7 mm, length 150 mm. Cable length 2 metres. Aluminium handle.

TP875.I Globe-thermometer Ø 150 mm with handle. Cable length 2 metres.

TP876.I Globe-thermometer Ø 50 mm with handle. Cable length 2 metres.

TP87.O Immersion probe, sensor Pt100. Stem Ø 3 mm, length 70 mm. Cable length 2 metres.

TP878.O Contact probe for solar panels. Cable length 2 metres.

TP878.1.O Contact probe for solar panels. Cable length 5 metres.

TP879.O Penetration probe for compost. Stem Ø 8 mm, length 1 metre. Cable length 2 metres.

TEMPERATURE PROBES WITHOUT SICRAM MODULE

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

TP47.1000.O Immersion probe, sensor Pt1000. Probe's stem Ø 3mm, length 230mm. 2-wire connection cable with connector, length 2 metres.

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

TP87.1000.O Immersion probe, sensor Pt1000. Probe's stem Ø 3mm, length 70mm. 2-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.

THERMOCOUPLE PROBES

Any kind of thermocouple probes with standard miniature connector described in the price-list can be connected to these instruments.

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

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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:
Document-No. / Month.Year : **5019 / 08.2017**

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 : **HD2178.1 – HD2178.2**

Descrizione prodotto:
Product description : **Termometro RTD – Termocoppia**
RTD – Thermocouple Thermometer

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

Direttive / *Directives*	
2014/30/EU	Direttiva EMC / *EMC Directive*
2014/35/EU	Direttiva bassa tensione / *Low Voltage Directive*
2011/65/EU	RoHS / *RoHS*

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

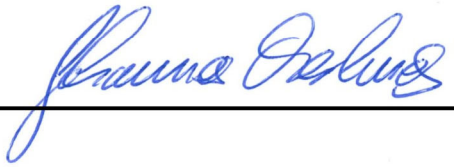
Norme armonizzate / *Harmonized standards*	
EN 61010-1:2010	Requisiti di sicurezza elettrica / *Electrical safety requirements*
EN 61326-1:2013	Requisiti EMC / *EMC requirements*
EN 50581:2012	RoHS / *RoHS*

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, 03/08/2017



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.

GUARANTEE

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TERMS OF GUARANTEE

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 Directive 2011/65/EU, 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: ❑ **HD2178.1** ❑ **HD2178.2**

Serial Number _____

RENEWALS

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

CE

RoHS 2011/65/EU

GHM GROUP – Delta OHM | Delta Ohm S.r.l. a socio unico
Via Marconi 5 | 35030 Caselle di Selvazzano | Padova | ITALY
Phone +39 049 8977150 | Fax +39 049 635596
www.deltaohm.com | info@deltaohm.com

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The quality level of our instruments is the result of the constant development of the product. This may produce some differences between the information written in this manual and the instrument you have purchased. We cannot completely exclude the possibility of errors in the manual, for which we apologize.

The data, images and descriptions included in this manual cannot be legally asserted. We reserve the right to make changes and corrections with no prior notice.

GHM GROUP – Delta OHM | Delta Ohm S.r.l. a socio unico
Via Marconi 5 | 35030 Caselle di Selvazzano | Padova | ITALY
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www.deltaohm.com | info@deltaohm.com

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