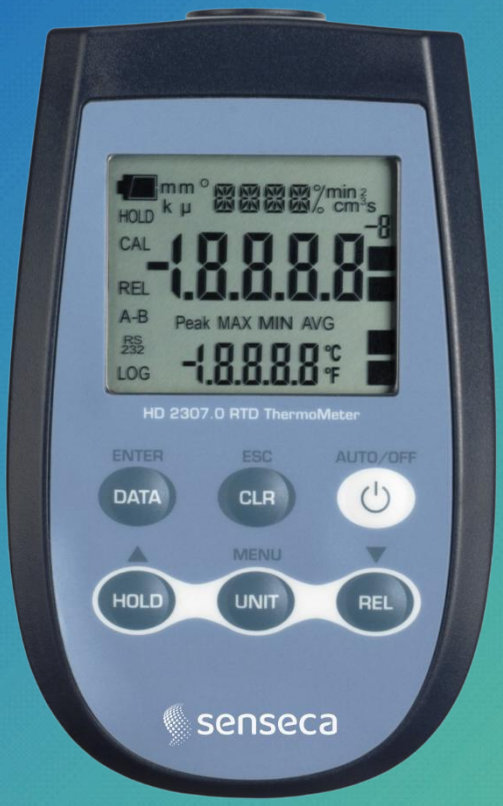
# OPERATING MANUAL

## HD2307.0

RTD Thermometer




EN

V2.0

senseca

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# 1 Introduction

**HD2307.0** is a handheld thermometer for Pt100/Pt1000 temperature probes.

Pt100 probes with SICRAM module, direct 3- or 4-wire Pt100 probes or direct 2- or 4-wire Pt1000 probes can be connected.

The probes with SICRAM module keep memory of the probe calibration data and are automatically recognized when the instrument is turned on.

Main features:

- Relative measurement (REL).
- HOLD function.
- Display of maximum, minimum and average statistical parameters.
- Configurable temperature unit of measurement: °C, °F.
- Auto-off (can be disabled).

# 2 Description




1. Input for Pt100/Pt1000 temperature probes.
2. Battery charge level.
3. Function indicators.
4. **CLR/ESC** key: in measurement mode resets the statistical values; inside the menu exits discarding any unconfirmed changes.
5. **DATA/ENTER** key: in measurement mode displays the statistical values of the detected measurements (pressing the key repeatedly, MAX, MIN and average AVG appear in sequence); inside the menu confirms the current selection.
6. **HOLD/▲** key: in measurement mode freezes the displayed value; inside the menu scrolls through the options for the selected parameter or increases its value.
7. **UNIT/MENU** key: selects the unit of measurement; when pressed together with the DATA key, enters the menu.
8. **REL/▼** key: in measurement mode enables the relative measurement; inside the menu scrolls through the options for the selected parameter or decreases its value.
9. **ON-OFF/AUTO-OFF** key: switches the instrument on and off; when pressed together with the HOLD key, disables the Auto-off.
10. Secondary display row.
11. Main display row.
12. Units of measurement and other information.

# 3 Operation

**Before switching the instrument on, connect the probe. The SICRAM probes must be connected when the instrument is off; if the probe is connected when the instrument is already on, it is not recognized.**

To switch the instrument on and off, press the **ON-OFF** key.

When the instrument is switched on, all display segments will be displayed for some seconds; next, the instrument model and the type of calibration in use appear: factory (FACt) or user (USEr), then the measurement is displayed.




If a non-SICRAM probe is connected, set the type of probe via the **RTD_PRBE_TYPE** menu item.

If no probe is connected when the instrument is switched on, the message **NO_PRBE_SER_NUM** scrolls across the top line for a few seconds, dashes appear on the main row and **ERR** appears on the secondary row.

If the probe is inserted while the instrument is on, the message **NEW_PROB_DET** will appear. For the new probe to be recognized, the instrument must be turned off and then back on.

If a SICRAM probe is disconnected while the instrument is on, the **PROB COMM LOST** indication appears.

**Caution:** replace the probe when the instrument is off.

## 3.1 Unit of measurement

To change the unit of measurement from °C to °F or vice versa, press the **UNIT** key.

## 3.2 Statistical values

The maximum, minimum or average value of the detected measurements can be displayed.

Press the **DATA** key repeatedly until the desired statistical value appears on the display.

To reset the statistical values, press and hold the **CLR** key until the message **FUNC_CLRD** appears.

The statistical values are updated once per second.

If the device is switched off, the statistical data are deleted.

## 3.3 Relative measurement (REL)

This function clears the measurement and displays the difference between the current value and the value measured when the function was activated.

To activate the relative measurement, press the **REL** key. The label REL will appear on the display on the left. To deactivate the relative measurement, press the **REL** key again.

## 3.4 HOLD function

When the HOLD function is active, the displayed measurement is not updated but remains fixed at the value it had when the function was activated.

Press **HOLD** to activate the function. The label HOLD will appear on the display in the upper-left part. To deactivate the function, press the **HOLD** key again.

## 3.5 Auto-off

The auto-off feature automatically turns off the instrument 8 minutes after the last key press.

The auto-off feature can be disabled by pressing the **ON-OFF** and **HOLD** keys simultaneously when turning on the instrument. When the auto-off feature is disabled, the battery symbol on the display blinks.

# 4 Menu

To enter the menu, press the **DATA** (ENTER) and **UNIT** (MENU) keys simultaneously:

The menu consists of two items:

1. **RTD_PRBE_TYPE**: probe type setting
2. **CAL_MODE**: selection of calibration type and start of user calibration

The item label scrolls across the top line of the display.

The **DATA** (ENTER) key confirms the selected option and moves to the next menu item.

The **CLR** (ESC) key allows cancelling any unconfirmed changes.

To exit the menu, press the **UNIT** (MENU) key.

## 4.1 Probe type setting (RTD_PRBE_TYPE)

SICRAM probes are automatically recognized by the instrument when it is turned on. If a SICRAM probe is connected, it is not necessary to set this item, as it is configured as **AUTO** and cannot be changed.

If a non-SICRAM probe is connected, use the ▲▼ arrow keys (HOLD and REL) to select the type of probe connected: 4-wire Pt100, 3-wire Pt100, or 2- or 4-wire Pt1000. Press the **DATA** (ENTER) key to confirm.

**Note**: if an unconfigured non-SICRAM probe is connected, the message NO_PRBE_SER_NUM (probe serial number missing) appears when the instrument is turned on.

## 4.2 Calibration type (CAL_MODE)

When this item is selected, the text >>>_CAL_MODE scrolls across the top line of the display.

The main row of the display shows the type of calibration currently in use, which is the factory calibration (**FACt**) by default.

A user calibration can be performed by selecting **USEr** using the arrow keys ▲▼ (HOLD and REL) and pressing the **DATA** (ENTER) key. After confirming the USEr option, the text SEL_MEAS_1/2 scrolls across the top line of the display; selecting 1 or 2 on the main row starts the calibration procedure (see the "User probe calibration" paragraph for details); to exit without starting the calibration, select 0 in the main row and press the **DATA** (ENTER) key.

# 5 Use and maintenance of the probes

The probes with SICRAM module are already factory calibrated. The calibration data are stored in the SICRAM module memory.

For probes without SICRAM module, the probe tolerance class must be considered.

The sensor is located at the end of the probe.

**Immersion or penetration measurement**: immerse the probe stem for at least 60 mm; when measuring in liquids, stir the liquid if possible.

**Attention!**

The measurement may be inaccurate if the probe stem is not sufficiently immersed, due to heat loss from the metal stem.

**Measurement in air/gases**: immerse the stem as much as possible in the fluid to be measured. The response time is shorter in the presence of flow; in the absence of flow, you can speed up the measurement by moving the probe, if possible.

**Attention!**

The probe stem must be dry, otherwise a temperature lower than the actual temperature will be detected.

**Measurement of solid materials by contact**: the measuring surface should be flat and smooth; the probe should be perpendicular to the measuring plane. Probes with tip specially designed for contact measurements must be used. The ambient temperature and heat dissipation of the probe metal stem can affect the accuracy of the measurement.

**Attention!**

For a more accurate and faster contact measurement, interpose thermally conductive paste between the measuring surface and the probe tip.
Measurement on non-metallic surfaces takes longer because of the poor thermal conductivity.

## 5.1 Warnings on the usage of probes

**Danger!**

Some sensors are not isolated from the outer sheath; take great care not to come into contact with live parts (above 48 V): it could be dangerous for the instrument and for the operator who could be electrocute.

**Caution**!

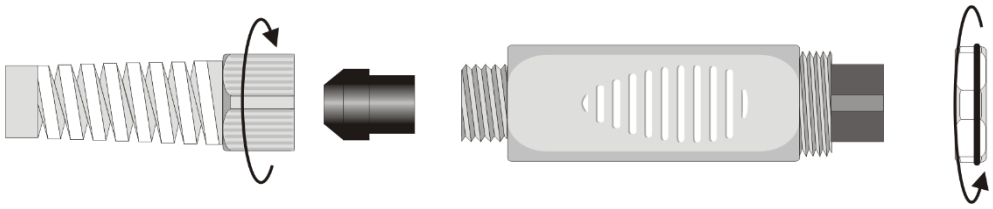
- Do not expose the probes to gas or liquids that could corrode the probe material. After the measurement, clean accurately the probes.
- Respect the correct probes polarity.
- When inserting the probes connector into the instrument, do not fold or force the contacts.
- Do not bend, deform or drop the probes: they can be irreparably damaged.
- Do not take measurements in the presence of high-frequency sources, microwaves, or strong magnetic fields.

## 5.2 Connecting third-party probes

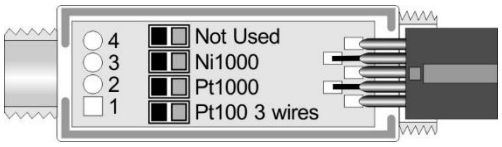
Third-party probes with open wires can be connected to the instrument using the optional **TP47** connector, suitable for cables with a maximum diameter of 5 mm.

To connect the probe to the TP47 connector:

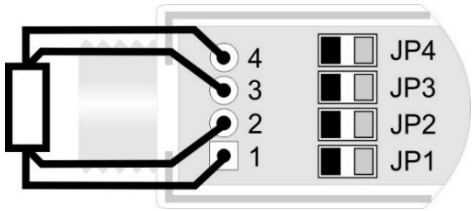
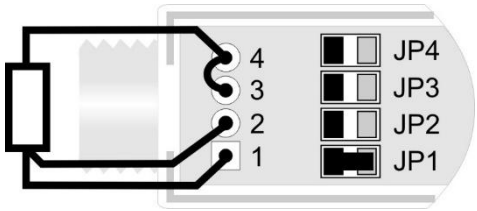
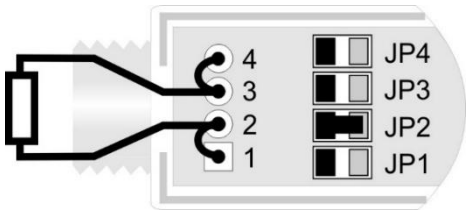
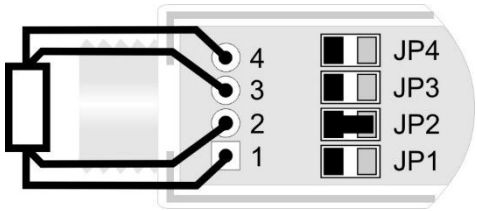
1. Unscrew the cable gland and remove the rubber grommet; unscrew the ring nut with the O-ring on the other side.



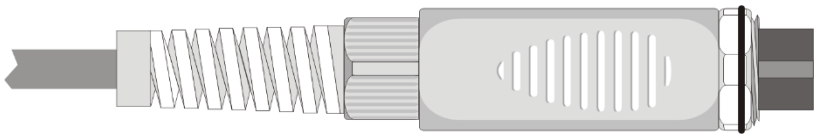
2. Remove the label using a cutter and open the two halves of the connector to access the printed circuit board.



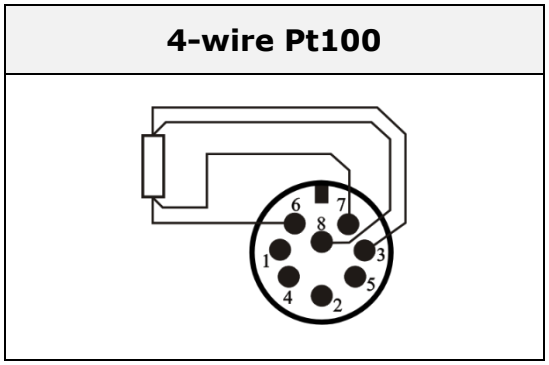

3. Pass the probe cable through the cable gland and the rubber grommet.
4. Solder the probe wires and configure the JP short jumpers as shown in the table.

| Probe type | Connection to TP47 | Jumper to close |
|---|---|---|
| 4-wire Pt100 |  | None |
| 3-wire Pt100 |  | JP1 |
| 2-wire Pt1000 |  | JP2 |
| 4-wire Pt1000 |  | JP2 |

5. Close the two halves, insert the rubber grommet, screw the cable gland and the ring nut with the O-ring. Be careful not to let the cable get twisted when tightening the cable gland.



The 4-wire Pt100 probe can also be soldered directly to the pins of a female free connector without using the TP47 module, following the pinout shown in the diagram below, which show the solder side of the female free connector.




## 5.3 User probe calibration

To ensure proper calibration of the probe, it is essential to understand and consider the physical phenomena underlying the measurement: it is recommended that calibration be performed only if you have the appropriate technical knowledge and that you strictly follow the procedure described in this manual.

Calibration can be performed at one or two points, within the probe operating range, **that differ from each other by at least 10 °C**.

To start calibration, enter the menu (**DATA + UNIT** key pressed simultaneously), press **DATA** (ENTER) to select the CAL_DATA menu item, select **USEr** with the arrow keys ▲▼ (HOLD and REL) and press **DATA** (ENTER). The text SEL_MEAS_1/2 scrolls across the top line of the display, proceed as follows:

1. Use the arrow keys ▲▼ (HOLD and REL) to select **1** in the main row and press **DATA** (ENTER) to confirm: the text UP DOWN 1st MEAS scrolls across the top line of the display, and the main row displays the temperature measurement.
2. Place the probe in a thermostatic bath at a known temperature (use a reference thermometer) and wait for the measurement to stabilize.
3. Use the arrow keys ▲▼ (HOLD and REL) to adjust the measurement value displayed by the instrument until it matches the value measured by the reference thermometer, then press **DATA** (ENTER) to confirm.
4. To exit the procedure without calibrating the second point, select **0** in the main row and press **DATA** (ENTER) to confirm.

   To continue the calibration with the second point, select **2** in the main row and press **DATA** (ENTER) to confirm: the text UP DOWN 2nd MEAS scrolls across the top line of the display.

5. Place the probe in the second thermostatic bath and wait for the measurement to stabilize.
6. Use the arrow keys ▲▼ (HOLD and REL) to adjust the measurement value displayed by the instrument until it matches the value measured by the reference thermometer, then press **DATA** (ENTER) to confirm.
7. To exit the procedure, select **0** in the main row and press **DATA** (ENTER) to confirm.

**Warning**: the calibration data are saved in the instrument memory and not in the probe. The same correction is applied to any probe connected. Therefore, the user calibration should only be used with the probe used for calibration and not with other probes.

# 6 Error indications

| Displayed indication | Description |
|---|---|
| **BATT TOO LOW CHNG NOW** | Insufficient battery charge.<br>It appears when the instrument is turned on. A long beep sounds, and the instrument turns off. Replace the batteries. |
| **CAL LOST** | Program error.<br>It appears when the instrument is turned on. Contact the technical support. |
| **ERR** | Probe disconnected.<br>An intermittent beep sounds. |
| **NEW_PROBE_DET** | New probe connected while instrument is on.<br>Turn the instrument off and then back on. |
| **NO_PRBE_SER_NUM** | The serial number of the connected probe is missing. |
| **OVER** | Overflow, the detected measurement value is greater than the upper limit of the measuring range. |
| **UNDR** | Underflow, the detected measurement value is less than the lower limit of the measuring range. |
| **PLS_EXIT >>> FUNC RES_FOR_FACT ONLY** | Reserved function.<br>Exit with ESC key. |
| **PROB ERR** | Unexpected SICRAM probe. |
| **PROB COMM LOST** | SICRAM probe disconnected while the instrument is on.<br>An intermittent beep sounds. |
| **SYS ERR #** | Program error.<br>Contact the technical support and provide the numeric code # shown in the message. |

# 7 Power supply

The meter is supplied with 3 x 1.5 V AA size **alkaline** batteries.

The battery symbol on display constantly shows the battery charge status. As the batteries discharge, the symbol "empties". When the charge decreases still further, it starts blinking.



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

**When the battery charge is too low to ensure accurate measurements, the instrument turns off.**

If the battery charge is too low when the device is turned on, the message **BATT TOO LOW CHNG NOW** appears; the device emits a long beep and turns off.

To replace the batteries, proceed as follows:

1) Switch the instrument off.
2) Unscrew the battery compartment cover screw counterclockwise.
3) Replace the batteries (3 x 1,5 V AA alkaline) making sure to observe the correct polarity.



4) Replace the cover by tightening the screw clockwise.

**Note**: the instrument may not restart properly after replacing the batteries. If this happens, remove the batteries and wait a few minutes to allow the circuit capacitors to discharge completely, then reinsert the batteries.

**Warnings on battery usage:**

- If the instrument is not used for a long period of time, remove the batteries.
- If the batteries are low, replace them as soon as possible.
- If the batteries leak, replace them immediately.
- Use high-quality, sealed alkaline batteries with sufficient capacity.

**Batteries disposal:**

- Dispose of dead batteries in the dedicated bins or deliver them to authorized collection centers. Follow the relevant regulation.
- Do not dispose of batteries in household waste.
- Do not throw batteries into fire.

# 8 Maintenance

Do not use aggressive cleaning agents or incompatible with the materials indicated in the technical specifications. For cleaning, use a soft dry cloth or slightly dampened with clean water.

# 9 Safety instructions

The instrument proper operation and operating safety can be ensured only in the climatic conditions specified in this manual and if all standard safety measures as well as the specific measures described in this manual are followed.
Do not use the instruments in places where there are:

- Corrosive or flammable gases.
- Direct vibrations or shocks to the instrument.
- High-intensity electromagnetic fields, static electricity.

**User obligations**

The instrument operator shall follow the directives and regulations below that refer to the treatment of dangerous materials:

- EU directives on workplace safety.
- National law regulations on workplace safety.
- Accident prevention regulations.

# 10 Technical specifications

| | |
|---|---|
| Power supply | 3 x 1.5 V AA size alkaline batteries |
| Battery life | 200 hours of continuous operation with 1800 mAh batteries<br>Current consumption when the instrument is off <20 μA |
| Inputs | 1 input with 8-pole DIN45326 connector for Pt100 probes with SICRAM module, direct 3- or 4-wire Pt100 and 2- or 4-wire Pt1000 probes |
| Display | 2-line, 4½-digit LCD<br>Visible area 52x42 mm |
| Operating conditions | -5…50 °C, 0…90 %RH no condensation |
| Storage Temperature | -25…65 °C |
| Material | ABS |
| Dimensions | 140x88x38 mm |
| Weight | 160 g (with batteries) |
| Degree of protection | IP 67 |

### Instrument measurement specifications

| | |
|---|---|
| Measuring range | -200…+650 °C |
| Resolution | 0.1 °C |
| Accuracy<br>(*Instrument only, excluding probe error*) | ±0.1 °C |
| Long term stability | 0.1 °C/year |

**Specifications of Pt100 SICRAM probes in line with the instrument**

| Model | Type | Range of use | Accuracy |
|---|---|---|---|
| **TP472I** | Immersion | -196 °C…+500 °C | ±0.1°C (@ 0 °C)<br>±0.2°C (-50 °C ≤ t ≤ 250 °C)<br>±0.3°C (t < -50 °C; t > 250 °C) |
| **TP472I.O** | Immersion | -50 °C…+300 °C | |
| **TP473P.I** | Penetration | -50 °C…+400 °C | |
| **TP473P.O** | Penetration | -50 °C…+300 °C | |
| **TP474C.O** | Contact | -50 °C…+300 °C | |
| **TP475A.O** | Air | -50 °C…+250 °C | |
| **TP472I.5** | Penetration | -50 °C…+400 °C | |
| **TP472I.10** | Penetration | -50 °C…+400 °C | |
| **TP49A.I** | Immersion | -70 °C…+250 °C | |
| **TP49AC.I** | Contact | -70 °C…+250 °C | |
| **TP49AP.I** | Penetration | -70 °C…+250 °C | |
| **TP875.I** | Globe thermometer Ø150 mm | -30 °C…+120 °C | |
| **TP876.I** | Globe thermometer Ø50 mm | -30 °C…+120 °C | |
| **TP87.O** | Immersion | -50 °C…+200 °C | |

# 11 Probes and accessories ordering codes

The instrument is supplied with carrying case and 3 x 1.5 V AA size alkaline batteries.

**Probes must be ordered separately.**

### Pt100 temperature probes with SICRAM module

| | |
|---|---|
| **TP472I** | Immersion probe. Stem Ø3 mm, L=300 mm. 2 m cable. |
| **TP472I.O** | Immersion probe. Stem Ø3 mm, L=230 mm. 2 m cable. |
| **TP473P.I** | Penetration probe. Stem Ø4 mm, L=150 mm. 2 m cable. |
| **TP473P.O** | Penetration probe. Stem Ø4 mm, L=150 mm. 2 m cable. |
| **TP474C.O** | Contact probe. Stem Ø4 mm, L=230 mm, contact surface Ø 5 mm. 2 m cable. |
| **TP475A.O** | Air probe. Stem Ø4 mm, L=230 mm. 2 m cable. |
| **TP472I.5** | Penetration probe. Stem Ø6 mm, L=500 mm. 2 m cable. |
| **TP472I.10** | Penetration probe. Stem Ø6 mm, L=1000 mm. 2 m cable. |
| **TP49A.I** | Immersion probe. Stem Ø2.7 mm, L=150 mm. 1.5 m cable. Aluminum handle. |
| **TP49AC.I** | Contact probe. Stem Ø4 mm, L=150 mm. 1.5 m cable. Aluminum handle. |
| **TP49AP.I** | Penetration probe. Stem Ø2.7 mm, L=150 mm. 1.5 m cable. Aluminum handle. |
| **TP875.I** | Globe thermometer Ø150 mm with handle. 2 m cable. |
| **TP876.I** | Globe thermometer Ø50 mm with handle. 2 m cable. |
| **TP87.O** | Immersion probe. Stem Ø3 mm, L=70 mm. 1 m cable. |

### Temperature probes without SICRAM module

| | |
|---|---|
| **TP47.100.O** | Pt100 immersion probe. Class A. Temperature range -50…+250 °C. Stem Ø3 mm, L=230 mm. 2 m cable with 8-pole connector. |
| **TP47.1000.O** | Pt1000 immersion probe. Class A. Temperature range -50…+250 °C. Stem Ø3 mm, L=230 mm. 2 m cable with 8-pole connector. |
| **TP87.100.O** | Pt100 immersion probe. Class A. Temperature range -50…+200 °C. Stem Ø3 mm, L=70 mm. 1 m cable with 8-pole connector. |

### Accessories

| | |
|---|---|
| **TP47** | 8-pole connector for **non** SICRAM Pt100/Pt1000 temperature probes. |

### Spare parts

| | |
|---|---|
| **BAG23** | Carrying case for HD23… series. |

# Notes

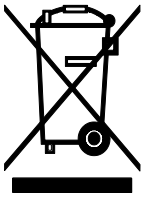
## WARRANTY

The manufacturer is required to respond to the "factory warranty" only in those cases provided by Legislative Decree 6 September 2005 - n. 206. Each instrument is sold after rigorous inspections; if any manufacturing defect is found, it is necessary to contact the distributor where the instrument was purchased from. During the warranty period (24 months from the date of invoice) any manufacturing defects found will be repaired free of charge. Misuse, wear, neglect, lack or inefficient maintenance as well as theft and damage during transport are excluded. Warranty does not apply if changes, tampering or unauthorized repairs are made on the product. Solutions, probes, electrodes and microphones are not guaranteed as the improper use, even for a few minutes, may cause irreparable damages.
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales of Goods" apply.

## TECHNICAL INFORMATION

The quality level of our instruments is the result of the continuous product development. This may lead to differences between the information reported in the manual and the instrument you have purchased.
We reserve the right to change technical specifications and dimensions to fit the product requirements without prior notice.

## DISPOSAL INFORMATION



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

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

CE RoHS

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