

## Operating manual

### Anemometer **HD2303.0**



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## GENERAL CHARACTERISTICS

The Anemometer Model **HD2303.0** is a portable instrument that allows to perform measurements in the fields of air conditioning, heating and ventilation.

It is fitted with a large LCD display for excellent visualization of the measured data.

The Anemometer Model **HD2303.0**:

- uses hot-wire or vane probes to measure **air speed**, **flow rate**, and **temperature** inside pipelines and vents;
- while **temperature** only is measured by immersion, penetration or contact probes; the temperature sensor is either a Pt100 or Pt1000.

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

The units of measurement for the measurable quantities are:

- for wind speed:
  - m/s (meter/second)
  - km/h (kilometer/hour)
  - ft/min (foot/minute)
  - mph (mile/hour)
  - knot
- for calculated flow rate:
  - l/s (liter/s)
  - m<sup>3</sup>/s (cubic meter/second)
  - m<sup>3</sup>/s (cubic meter/minute)
  - m<sup>3</sup>/h (cubic meter/hour)
  - ft<sup>3</sup>/s (cubic foot/second)
  - ft<sup>3</sup>/min (cubic foot/minute)

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.

# Anemometer HD2303.0



## HD2303.0

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: resets the maximum, the minimum and the average of the captured 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. **STD-BY**: during normal operation, it sets the hot-wire probe to stand-by; in the menu, changes the section's unit of measurement to m<sup>2</sup> or inch<sup>2</sup>.
10. **REL/▼** key: during normal operation enables the relative measurement (displays the difference between the current value and the logged value when the key is pressed); in the menu, decreases the current value.
11. **ON-OFF/AUTO-OFF** key: turns the instrument on and off; when pressed together with the HOLD key, disables the *AutoPowerOff* function.
12. **MAX** (maximum value), **MIN** (minimum value) and **AVG** (average value) symbols.
13. Main display line.
14. Line for symbols and comments.

## DESCRIPTION OF THE FUNCTIONS

The keyboard of the Anemometer Model **HD2303.0** 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.

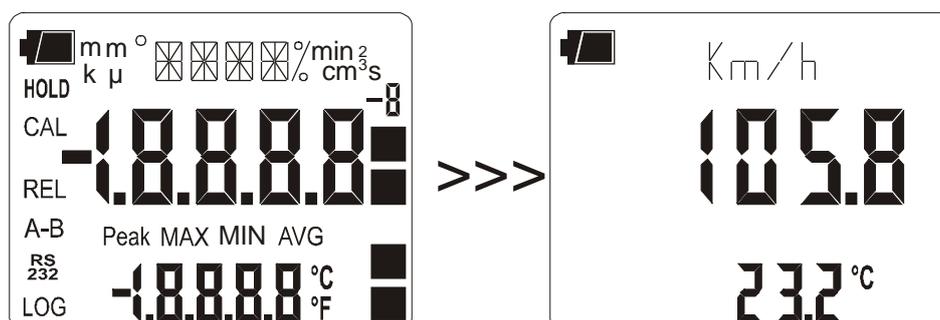


### ON-OFF and AUTO-OFF

This key has two functions:

- **ON/OFF:** press this key to turn the instrument on and off.

The turning on enables all display segments for a few seconds and starts an **Auto-test** including the detection of the probe connected to the input. For a very short time the filter used for measurements (FAST or SLOW) is displayed; then the instrument carries on with the standard measurement.



- **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, in the main line a series of dashes appears while the "**ERR**" message is shown in the secondary line.

**Caution!** As the data are captured upon turning the instrument on, it is necessary to turn it off and on again. 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/ESC key

The "**CLR**" key has two functions:

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



### DATA/ENTER key

The "**DATA**" key is used for the following functions:

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

*The acquisition frequency is once a second.*

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

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



### HOLD/▲

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** and **UNIT** keys, the ▲ key will allow to increase the value of the selected parameter.

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

**UNIT****UNIT/MENU key**

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

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

- for wind speed: m/s - km/h - ft/min - mph - knot
- for calculated flow rate: l/s - m<sup>3</sup>/s - m<sup>3</sup>/min - m<sup>3</sup>/h - ft<sup>3</sup>/s - ft<sup>3</sup>/min

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

- **MENU**: in the menu three items can be set:
  1. **SECT m<sup>2</sup> - SECT inch<sup>2</sup>**: this parameter defines a duct's **section area** for flow rate calculation.
  2. The filter **FAST** or **SLOW** used during measurements
  3. **Probe type**
    - 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.

**STD-BY****STD-BY key**

- During normal operation, it sets the hot-wire probe to stand-by if the probe is connected to the input.
- In the menu, it changes the section's unit of measurement to inch<sup>2</sup> or m<sup>2</sup>.

**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 for both measurements: main and secondary. The "REL" message is displayed on the left. To return to the normal measurement, press the key again.
- ▼: once the MENU has been opened with the **DATA/UNIT** key, the ▼ key will allow to decrease the value of the selected parameter.

## THE PROGRAMMING MENU

To access to the menu press simultaneously the following keys:



The items to be set are listed in this order:

1. **SECT m<sup>2</sup> - SECT inch<sup>2</sup>**: this parameter defines a duct's **section area** for flow rate calculation. It is expressed in **m<sup>2</sup>** or **inch<sup>2</sup>** ;

- use the ▲ and ▼ arrows (respectively located above the HOLD and REL keys) to **modify** the displayed value;
- press **STD-BY** to change the unit of measurement to **m<sup>2</sup>** or **inch<sup>2</sup>**.
- 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.

2. **Sel Vel**: selection of filter used for speed and air flow rate to reduce, when necessary, the measurement fluctuations in case of any disturb phenomenon such as turbulences on diffuser outputs. Select FAST to exclude the filter, SLO (Slow) to use it.

- to modify the displayed value, use the arrows UP and DOWN (placed respectively over the HOLD and REL keys)
- push DATA/ENTER to confirm and go on to the next item, push DATA/ENTER;
- push CLR/ESC to delete the modification;
- push UNIT/MENU key again to quit.

3. **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:

- hot-wire probes complete with SICRAM module
- vane probes complete with SICRAM module
- temperature probes Pt100 complete with SICRAM module
- direct 4 wire Pt100 probes complete with TP47 module
- 2- or 4-wire Pt1000 probes complete with TP47 module

**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.

Upon turning on the direct 4 wire Pt100 and Pt1000 temperature probes display the "**NO\_PRBE\_SER\_NUM**" message. In this case the probe type must be entered manually by the user:

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

## PROBES AND MEASUREMENTS

The Anemometer works with hot-wire, vane and temperature probes fitted with the SICRAM module. It works also with temperature probes with 4 wire Pt100 or 2- or 4-wire Pt1000 sensor.

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

The temperature probes without SICRAM module are not automatically detected by the instrument and must be set up in the **Probe type** menu item.

**The probe is detected during turn on, and this cannot be performed when the instrument is already on, therefore if a probe is connected and the instrument is on, it is necessary to turn it off and on.**

### WIND SPEED MEASUREMENT

The probes of the **AP471** and **AP472** series measure the incident **wind speed** and **flow rate**. Some also measure air **temperature**.

The **measurement principles** used are the following:

- **hot-wire** for the **AP471** series
- **vane** for the **AP472** series.

On request, the probes of the AP471 and AP472 series can be fitted with a telescopic rod that eases measurements in areas difficult to reach (for example vents).

The **typical applications** are wind speed and flow rate checks in air conditioning, heating and cooling systems, or environmental comfort determination, etc.

The two probe models must be used according to the wind *speed*:

- hot-wire probes are usually employed for precise measurements with low-medium wind speeds (until 10 m/s);
- vane probes with speeds from 5 to 50m/s;

and according to the measured fluid *temperature*:

- hot-wire probes measure air flows at 80°C maximum temperature;
- vane probes measure air flows of up to 120°C, depending on the model.

Connecting the probe and turning the instrument on, it is possible to choose the unit of measurement for the value displayed in the main line by using the UNIT key.

The following units are available:

- for wind speed: m/s - km/h - ft/min - mph (miles/hour) - knots;
- for air temperature: °C and °F;
- for flow rate: l/s (liters/s) - m<sup>3</sup>/s - m<sup>3</sup>/min - m<sup>3</sup>/h - ft<sup>3</sup>/s - ft<sup>3</sup>/min.

## FLOW RATE MEASUREMENT

The flow rate measurement requires knowledge of the duct or vent area orthogonal to the flow: the menu items indicated by "SECT m2" and "SECT INC2" define the section area  $m^2$  or  $inch^2$ .

To set the area value:

- press simultaneously **DATA** and **UNIT** to open the menu;
- using the **▲** and **▼** arrows, set the value expressed in  $m^2$ ;
- confirm with **DATA/ENTER**.

To use the  $inch^2$  unit of measurement:

- select the "SECT m2" menu item;
- press **STD-BY** to change the unit of measurement from  $m^2$  to  $inch^2$ ;
- using the **▲** and **▼** arrows, enter the desired 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.

**The area comprised must be between  $0.0001m^2$  ( $1\text{ cm}^2$ ) and  $1.9999\text{ m}^2$ .**

After input of the duct's section area:

select the unit of measurement for the flow rate by using the UNIT key:

- l/s
- $m^3/s$
- $m^3/min$
- $m^3/h$
- $ft^3/s$
- $ft^3/min$ .

**The display shows the calculated flow rate on the section set** with the parameters "SECT m2" and "SECT INC2".

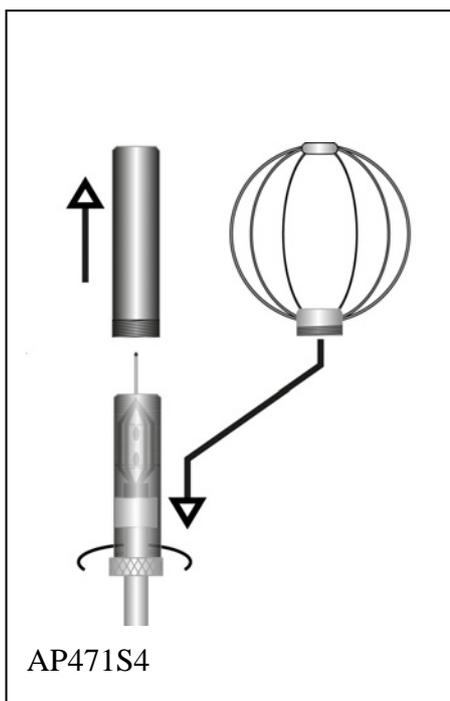
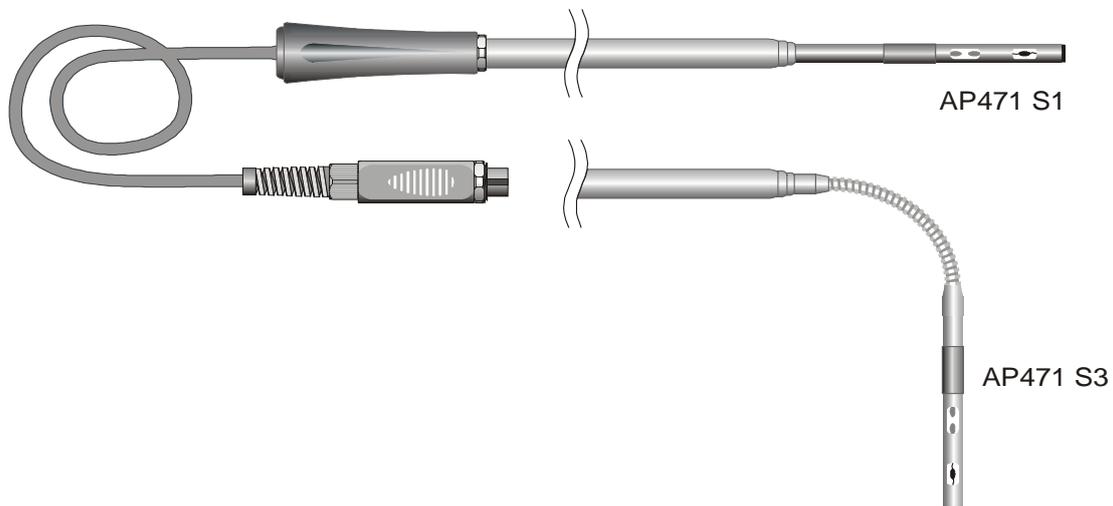
## HOT-WIRE WIND SPEED MEASUREMENT PROBES COMPLETE WITH SICRAM MODULE

The hot-wire wind speed measurement probes, fitted with SICRAM module, are the models: AP471S1, AP471S2, AP471S3, AP471S4

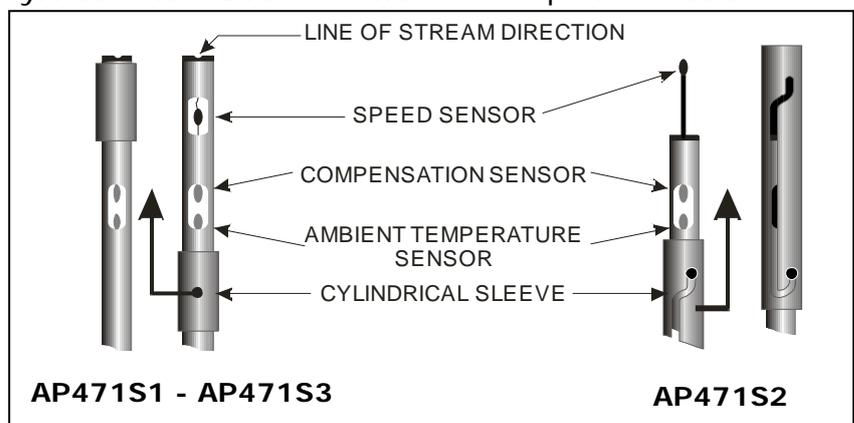
The **AP471S1** and **AP471S3** probes measure incident air flows up to 40 m/s. The **AP471S2**, **AP471S4** probes are fitted with an omnidirectional sensor allowing measurement of speeds up to 5 m/s in any direction of the air flow incident on the probe. The **AP471S4** probe is also fitted with support base and sensor protection. The wind speed measurement is compensated for according to temperature within the range of 0...+80°C.

The probes AP471S1, AP471S2, and AP471S3 measure the environment temperature in the range of -25°C...+80°C; AP471S4 in the range 0°C...+80°C.

**NOTE:** The AP471S... modules are calibrated in the factory; no calibration is required by the user.

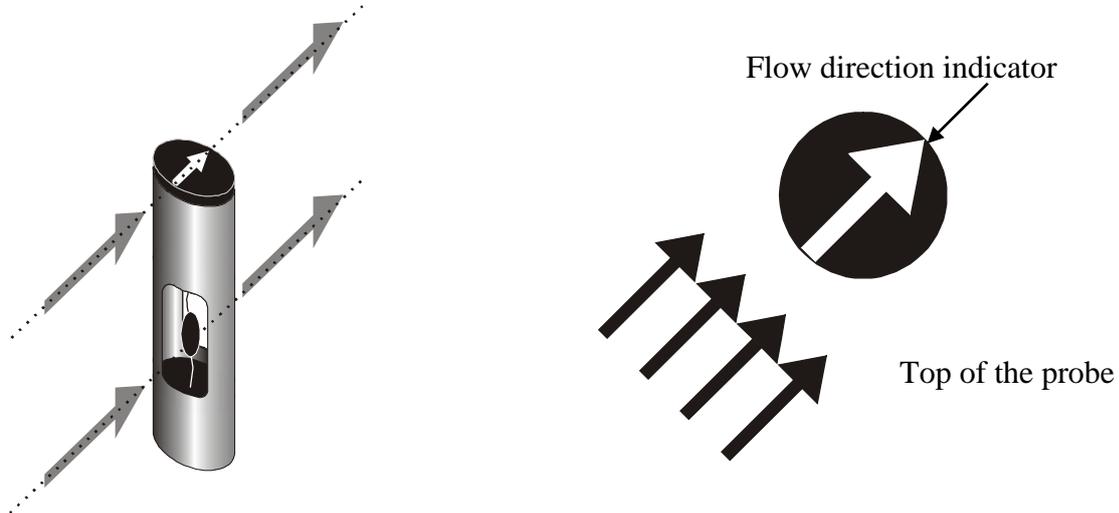


The AP471S1, S2 and S3 probes are fitted with a cylindrical protection screen that can slide longitudinally over a groove. The screen has two end-of-travel positions that block it in measurement condition (completely low) or rest condition (completely high). To reduce the space occupied when not used, the AP471S4 is supplied with a protection cylinder that can be screwed on the probe's head.

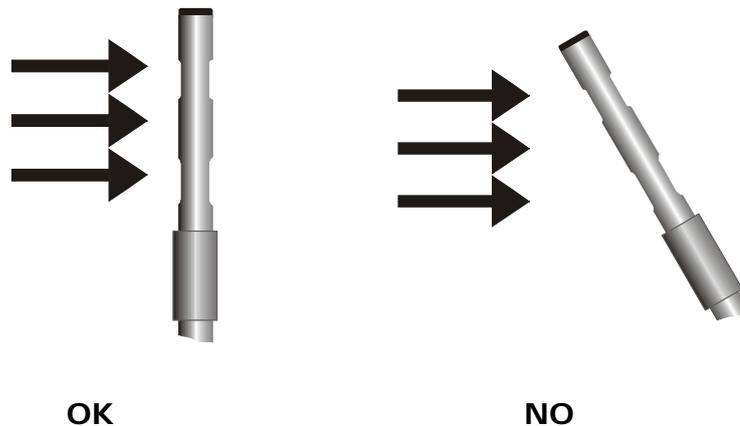


## OPERATION

Where present, extend the telescopic rod to the necessary length paying attention to the cable so that it can slide freely and without strain. Uncover the sensor and introduce the probe in the air flow being measured, maintaining the arrow at the top of the probe parallel to the flow, as indicated in the figures.



The probe should be maintained orthogonal to the flow and not tilted in relation to it:



Proceed with measurement following the instructions provided in this chapter.

## CARE AND MAINTENANCE OF THE PROBES

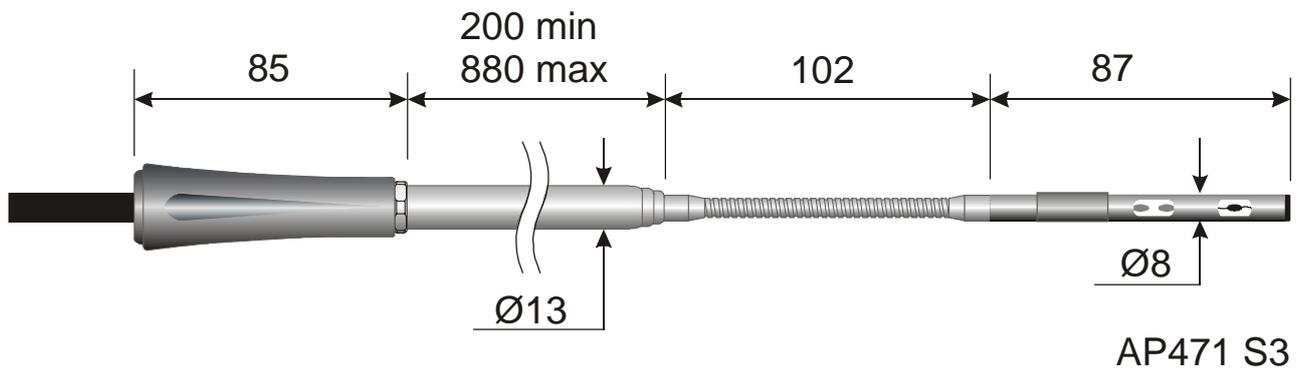
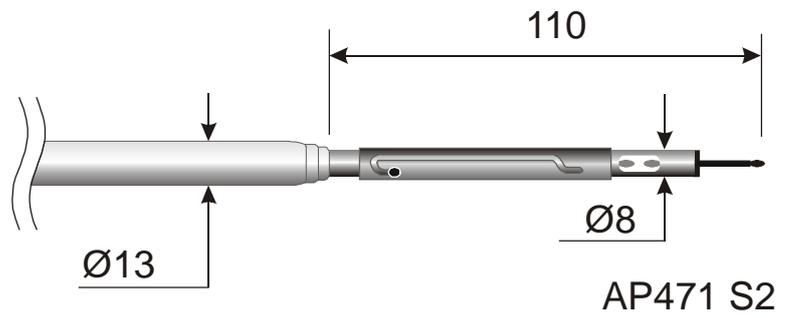
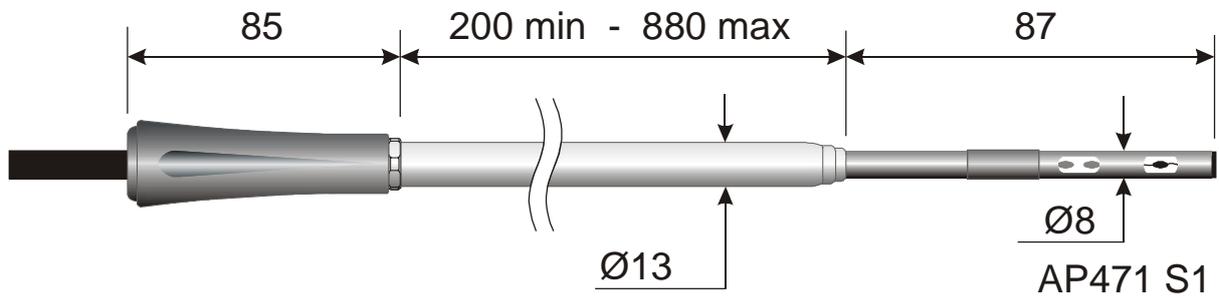


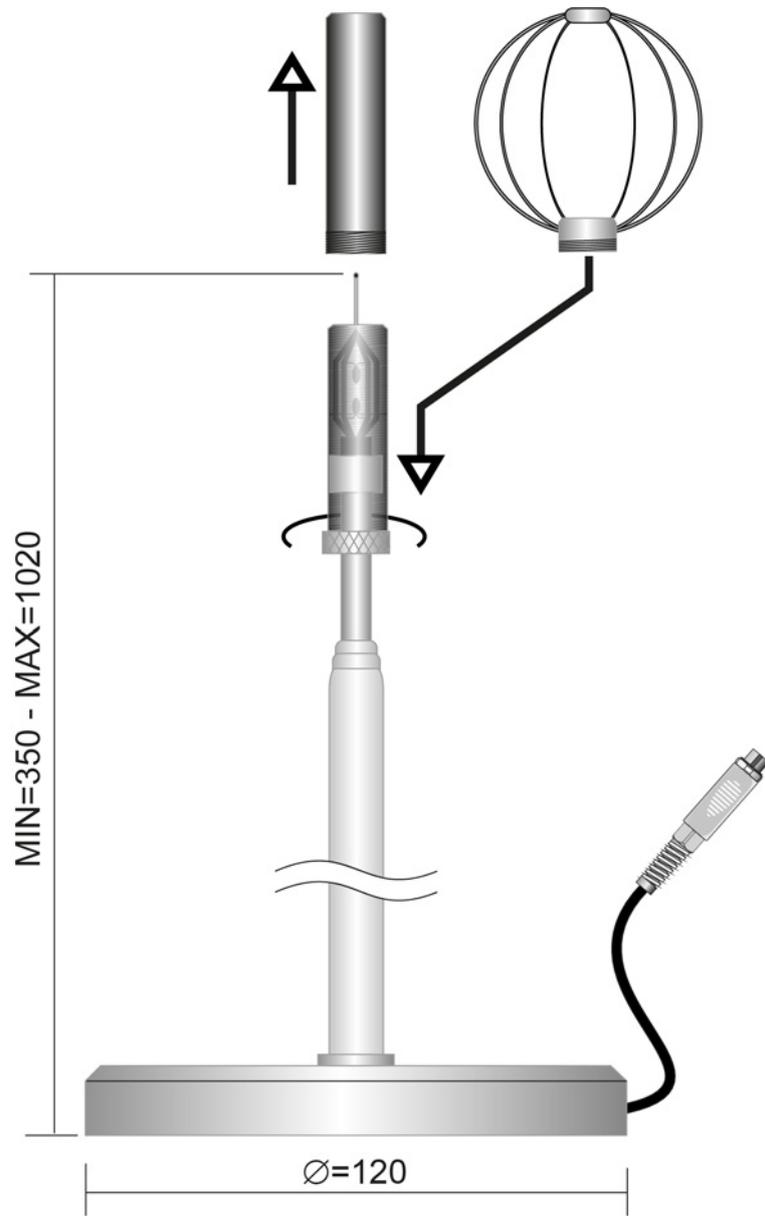
The speed sensor of the AP471S... probes is heated and, **in the presence of gas vapours, could trigger a fire or explosion. Do not use the probe in the presence of inflammable gases. Ensure that no gas or explosive vapor leakage is present in the measurement spaces.**

The probe is very delicate and should be handled with extreme care. Even a simple collision, especially of the omnidirectional probes that have an uncovered sensor, could render the probe unusable. After measurement, the sensor set on the probe head must be protected with the supplied metallic screen or threaded cylinder. During use, the AP471S4 omnidirectional probe must be protected with the special metallic grid. During transportation, the sensor must be closed into a cylinder screwed on the end part of the probe.

Do not let fingers touch the sensors. Use only alcohol to clean the probe.

**DIMENSIONS**





AP471S4

## VANE WIND SPEED MEASUREMENT PROBES COMPLETE WITH SICRAM MODULE

The AP472S1 and AP472S2 vane probes measure the incident wind speed and flow rate. The probe AP472S1 measures also the temperature using a thermocouple of type K. On request, they can be fitted with a telescopic rod that eases measurements in areas difficult to reach (for example vents). The probes' speed and temperature measurement ranges are outlined in the table below:

	Speed (m/s)	Temperature (°C)	Temperature sensor	Diameter (mm)
<b>AP472S1</b>	0.6...25	-25...+80	Thermocouple K	100
<b>AP472S2</b>	0.5...20	-25...+80 (working temperature)	----	60

Greater diameters are suitable for flow measurements in the presence of turbulence with medium-low air speeds (i.e. at the exit of the ducts). Lower diameters are suitable in applications where the probe surface must be much slower than the duct cross section within which the measurement is carried out, i.e. ventilation ducts.

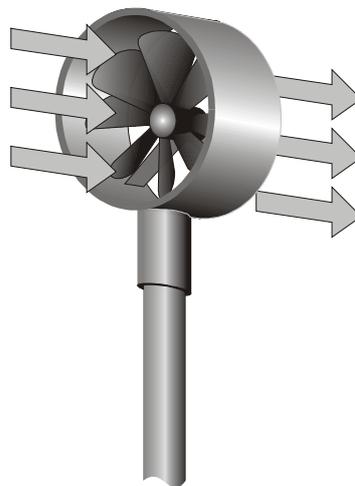
## CALIBRATION

The AP472S1 and AP472S2 probes are calibrated in the factory; no calibration is required by the user.

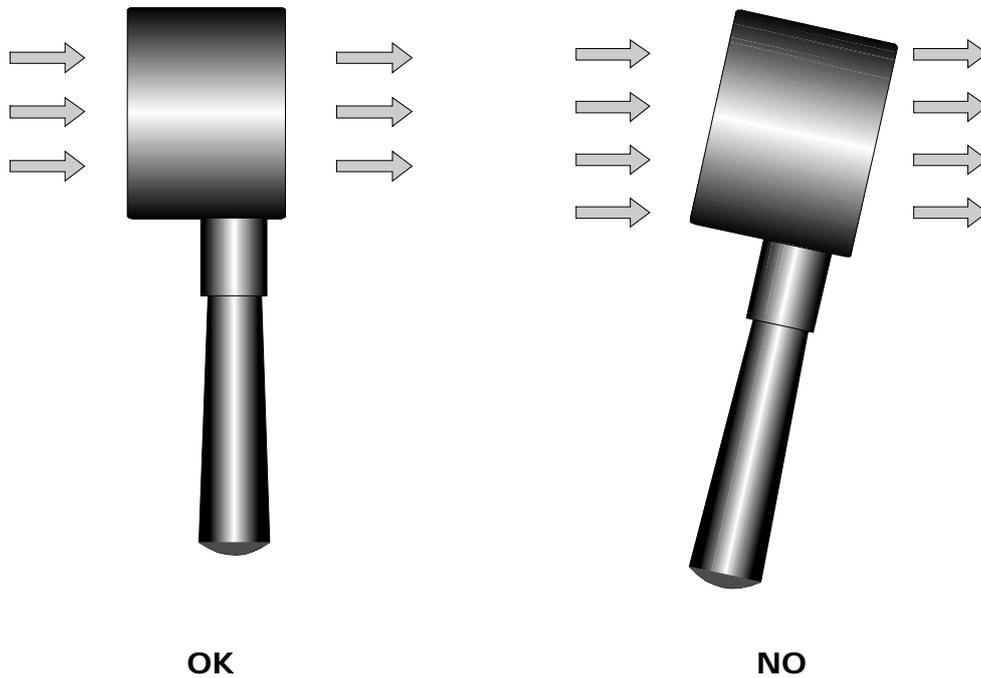
## OPERATION

Where present, extend the telescopic rod to the necessary length paying attention to the cable so that it can slide freely and without strain.

Introduce the probe in the air flow being measured, maintaining the arrow at the top of the probe parallel to the flow as indicated in the following figure.



The probe should be maintained orthogonal to the flow and not tilted in relation to it

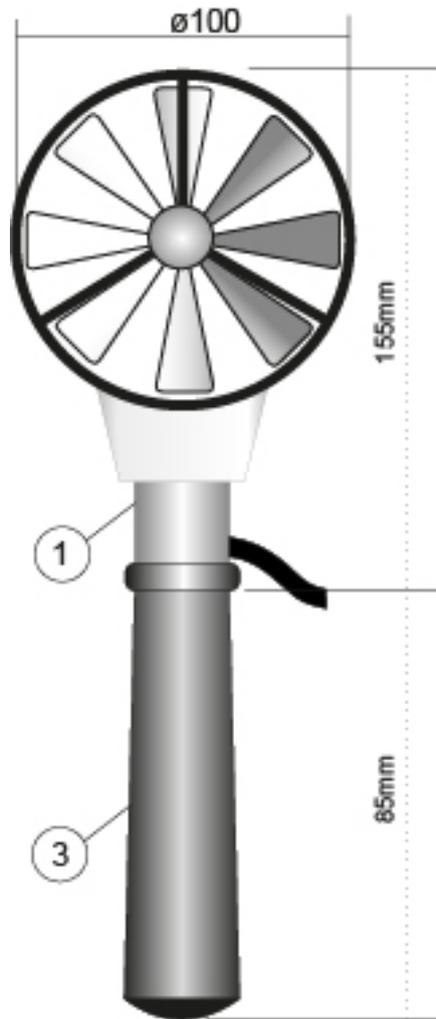


The probe is correctly positioned in relation to the air-flow when the value measured is the maximum possible.  
Proceed with measurement following the instructions provided in this chapter.

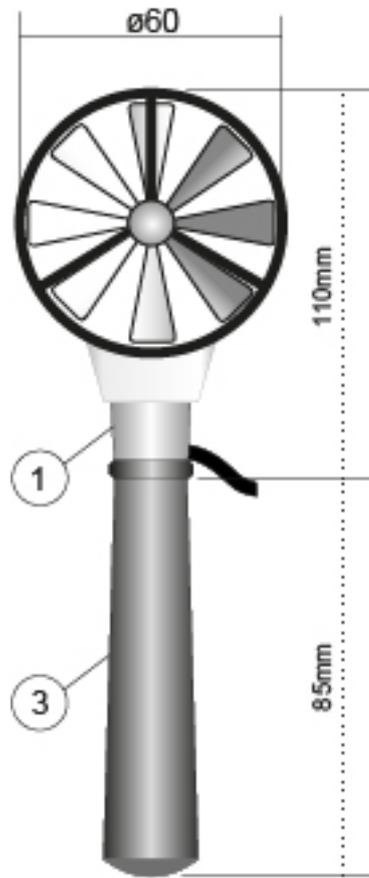
#### **CARE AND MAINTENANCE OF THE PROBES**

The probe performance, mainly at low speeds, largely depends on the very slow friction of the vane on its own axis. In order not to compromise this characteristic, it is recommended that forcing is avoided, as well as blocking or rotating the vane with the fingers, and if possible, avoid inserting it in air flows that could spoil the probe.

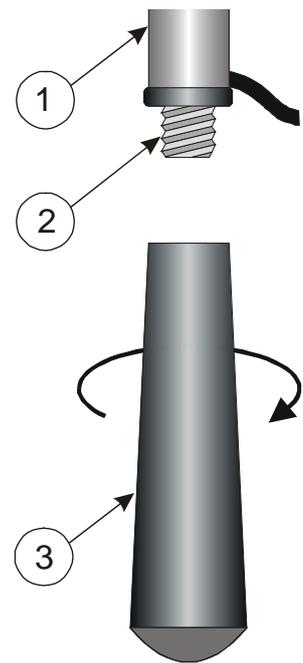
## DIMENSIONS



**AP472S1**



**AP472S2**



To mount the telescopic rod on the probes, unscrew the handle (3) holding the probe body still in the point (1). Screw the rod end on the screw (2). The handle (3) is screwed on the telescopic rod.

## DIRECT INPUT Pt100 AND Pt1000 TEMPERATURE PROBES

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

The Pt100 are connected to 4 wires, the Pt1000 to 2 or 4 wires; the excitation current was chosen in order to minimize the sensor self-heating effects.

All probes with SICRAM module are calibrated in the factory; the 2 or 4 wire probes with direct input are **checked for conformity with class A tolerance** according to norm IEC751 - BS1904 - DIN43760.

For the temperature probes without SICRAM module (Pt100 4 wires, and Pt1000) the model configuration is required (please see the description of the Probe Type menu).

## TEMPERATURE MEASUREMENT

The temperature measurement by **immersion** is carried out by inserting the probe in the liquid for at least 60 mm; the sensor is housed in the end part of the probe.

In the temperature measurement by **penetration** the probe tip must be inserted to a depth of at least 60 mm, the sensor is housed in the end part of the probe.

**NOTE:** when measuring the temperature on frozen blocks it is convenient to use a mechanical tool to bore a cavity in which to insert the tip probe.

In order to perform a correct **contact** measurement, the measurement surface must be even and smooth, and the probe must be perpendicular to the measurement plane.

**So as to obtain the correct measurement, the insertion of a drop of oil or heat-conductive paste between the surface and the probe is useful (do not use water or solvents). This method also improves the response time.**

## CONNECTING THE TP47 CONNECTOR FOR 4 WIRE Pt100 AND Pt1000 PROBES

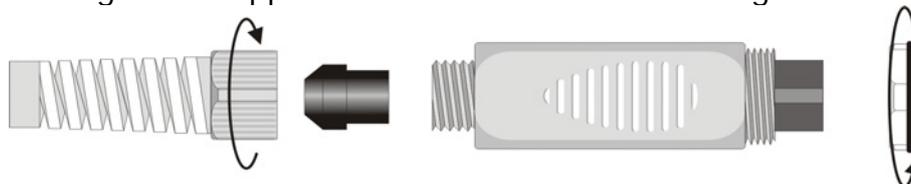
All probes produced by Delta OHM are provided with a connector.

**HD2303.0** also work with direct 4 wire Pt100, and 2- or 4-wire Pt1000 probes manufactured by other producers: for the instrument connection is prescribed the **TP47** connector to which the probe's wires should be welded.

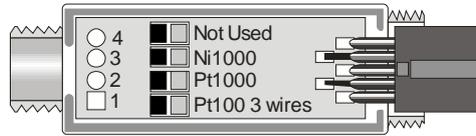


The instructions to connect the Platinum probe to the TP47 module are provided below. The **TP47** module is supplied complete with fairlead and gasket for 5 mm maximum diameter cables. Do the following to open the module and connect a probe:

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



- 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		None
Pt1000 2 wires		JP2
Pt1000 4 wires		JP2

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.

#### DIRECT CONNECTION OF 4-WIRE Pt100 SENSORS

Sensor	Direct soldering to the connector
Pt100 4 wires	

**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 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.

## WARNINGS

1. Temperature probes are not insulated from their external casing; be very careful  not to come into contact with live parts (above 48V). This could be extremely dangerous for the instrument as well as for the operator, who could be electrocuted.
2. Do not expose the probes to gases or liquids that could corrode the material of the sensor or the probe itself. Clean the probe carefully after each measurement.
3. Do not bend the probe connectors or force them upward or downward.
4. Do not bend or force the contacts when inserting the probe connector into the instrument.
5. Do not bend, deform or drop the probes, as this could cause irreparable damage.
6. Always select the most suitable probe for your application.
7. Do not use the temperature probes in presence of corrosive gases or liquids. The sensor container is made of AISI 316 stainless steel, while the contact probe container is made from AISI 316 stainless steel plus silver. Avoid contact between the probe surface and any sticky surface or product that could corrode or damage it.
8. Above 400°C and below –40°C, avoid violent blows or thermal shocks to Platinum temperature probes as this could cause irreparable damage.
9. To obtain reliable measurements, temperature variations that are too rapid must be avoided.
10. Temperature probes for surface measurements (contact probes) must be held perpendicular against the surface. Apply oil or heat-conductive paste between the surface and the probe in order to improve contact and reduce reading time. Whatever you do, do not use water or solvent for this purpose. A contact measurement is always very hard to perform. It has high levels of uncertainty and depends on the ability of the operator.
11. Temperature measurements on non-metal surfaces usually require a great deal of time due to the low heat conductivity of non-metal materials.
12. Avoid taking measurements in presence of high frequency sources, microwave ovens or large magnetic fields; results may not be very reliable.
13. Clean the probe carefully after use.
14. The instrument is water resistant and IP67, but should not be immersed in water. The probe connectors must be fitted with sealing gaskets. Should the instrument fall into the water, check for any water infiltration. Gently handle the instrument in such a way as to prevent any water infiltration from the connectors' side.

## 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
- - -	This appears in the display central line when a temperature only probe is connected. In the lower line the temperature is shown correctly.
>>>_PRBE_TYPE	Type of probe connected
<b>BATT TOO LOW CHNG NOW</b>	Indication of insufficient battery charge appearing on turning on. The instrument issues a long beep and turns off. Replace the batteries.
<b>CAL LOST</b>	Program error: it appears after turning on for a few seconds. Contact the instrument's supplier.
<b>ERR</b>	This appears if the probe has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
<b>FUNC CLR D</b>	Max, min and average values cleared
<b>NO_PRBE_ SER_NUM</b>	The connected probe's serial number is absent
<b>OVER</b>	Measurement overflow: indicates that the probe is measuring a value exceeding the measuring range.
<b>PLS_EXIT &gt;&gt;&gt; FUNC RES_FOR_FACT ONLY</b>	Please exit using ESC >>> function reserved to factory calibration
<b>PRBE_SER ##### #####</b>	Serial number ##### ##### of the connected probe
<b>PROB ERR</b>	A probe with SICRAM module has been inserted when not admissible for that specific instrument.
<b>PROB COMM LOST</b>	This appears if the probe has already been detected by the instrument, but is disconnected. At the same time an intermittent beep is issued.
<b>SECT inch<sup>2</sup></b>	Section in inch <sup>2</sup>
<b>SECT m<sup>2</sup></b>	Section in m <sup>2</sup>
<b>SYS ERR #</b>	Instrument management program error. Contact the instrument's supplier and communicate the numeric code # reported by the display.

## 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.

### **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.

## 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.

## 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

# INSTRUMENT TECHNICAL CHARACTERISTICS

## TECHNICAL INFORMATION ON THE ANEMOMETER

### *Instrument*

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

### *Operating conditions*

Operating temperature	-5 ÷ 50°C
Warehouse temperature	-25 ÷ 65°C
Working relative humidity	0 ÷ 90%RH without condensation

**Protection degree of the case IP67**

### *Power*

Batteries	3 1.5V type AA batteries
Autonomy (*)	200 hours with 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*

m/s - km/h - ft/min - mph - knot  
l/s - m<sup>3</sup>/s - m<sup>3</sup>/min - m<sup>3</sup>/h - ft<sup>3</sup>/s - ft<sup>3</sup>/min  
°C - °F;

### *Measurement of temperature by Instrument*

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

(\*) Valid for all probes except hot-wire probes. For their autonomy see the characteristics below.

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

**WIND SPEED MEASUREMENT PROBES**

**Hot-wire probes: AP471S1 - AP471S2 - AP471S3 - AP471S4**

	<b>AP471S1 - AP471S3</b>	<b>AP471S2</b>	<b>AP471S4</b>
Type of measure	Wind speed, calculated flow rate, air temperature		
Type of sensor		Omnidirectional NTC thermistor	
<i>Speed</i>	NTC thermistor		
<i>Temperature</i>	NTC thermistor	NTC thermistor	
Measurement range		0.02...5 m/s	
<i>Speed</i>	0.02...40 m/s		
<i>Temperature</i>	-25...+80 °C	-25...+80 °C	0...80 °C
Air temperature compensation	0...80 °C		
Measurement resolution:			
<i>Speed</i>	0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot		
<i>Temperature</i>	0.1 °C		
Measurement accuracy:			
<i>Speed</i>	±0.2 m/s (0.02...0.99 m/s) ±0.4 m/s (1.00...9.99 m/s) ±0.8 m/s (10.00...40.00 m/s)	±0.2 m/s (0.02...0.99 m/s) ±0.3 m/s (1.00...5.00 m/s)	
<i>Temperature</i>	±0.8 °C (-10...+80°C)		
Minimum speed	0.02 m/s		
Battery life	Approx. 20 hours @ 20 m/s with alkaline batteries	Approx. 30 hours @ 5 m/s with alkaline batteries	
Unit of Measurement			
<i>Speed</i>	m/s – km/h – ft/min – mph – knot		
<i>Flow rate</i>	l/s - m <sup>3</sup> /s - m <sup>3</sup> /min - m <sup>3</sup> /h - ft <sup>3</sup> /s - ft <sup>3</sup> /min		
Pipeline section for flow rate calculation	0.0001...1.9999 m <sup>2</sup>		
Cable length	~2 m		

## Vane probes: AP472S1 - AP472S2

	AP472S1	AP472S2
Type of measure	Wind speed, calculated flow rate, air temperature	Wind speed, calculated flow rate
Diameter	100 mm	60 mm
Type of measurement <i>Speed</i> <i>Temperature</i>	Vane  K thermocouple	Vane  ----
Measurement range <i>Speed</i> <i>Temperature</i>	0.6...25 m/s -25...+80 (*)	0.5...20 m/s -25...+80 (*)
Resolution <i>Speed</i>  <i>Temperature</i>	  0.1 °C	  0.01 m/s 0.1 km/h 1 ft/min 0.1 mph 0.1 knot  ----
Accuracy <i>Speed</i> <i>Temperature</i>	± (0.4 m/s + 1.5% f.s.) ±0.8 °C	± (0.4 m/s + 1.5% f.s.) ----
Minimum speed	0.6 m/s	0.5 m/s
Unit of Measurement <i>Speed</i> <i>Flow rate</i>	m/s – km/h – ft/min – mph – knot l/s - m <sup>3</sup> /s - m <sup>3</sup> /min - m <sup>3</sup> /h - ft <sup>3</sup> /s - ft <sup>3</sup> /min	
Pipeline section for flow rate calculation	0.0001...1.9999 m <sup>2</sup>	
Cable length	~2 m	

(\*) The indicated value refers to the vane's working range.

**TEMPERATURE PROBES Pt100 SENSOR USING SICRAM MODULE**

Model	Type	Application range	Accuracy
TP472I	Immersion	-196°C...+500 °C	$\pm 0.1^{\circ}\text{C}$ (@ 0 °C) $\pm 0.2^{\circ}\text{C}$ (-50 °C $\leq$ t $\leq$ 250 °C) $\pm 0.3^{\circ}\text{C}$ (t < -50 °C; t > 250 °C)
TP472I.O	Immersion	-50°C...+300 °C	
TP473P.I	Penetration	-50°C...+400 °C	
TP473P.O	Penetration	-50°C...+300 °C	
TP474C.O	Contact	-50°C...+300 °C	
TP475A.O	Air	-50°C...+250 °C	
TP472I.5	Immersion	-50°C...+40 0°C	
TP472I.10	Immersion	-50°C...+400 °C	
TP49A.I	Immersion	-70°C...+250 °C	
TP49AC.I	Contact	-70°C...+250 °C	
TP49AP.I	Penetration	-70°C...+250 °C	
TP875.I	Globe-thermometer Ø 150 mm	-30°C...+120 °C	
TP876.I	Globe-thermometer Ø 50 mm	-30°C...+120 °C	
TP87.O	Immersion	-50°C...+200 °C	

*Common characteristics*

<b>Resolution</b>	<b>0.1 °C</b>
Temperature drift @ 20°C	0.003%/°C

**4 WIRES Pt100 AND Pt1000 PROBES**

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

*Common characteristics*

<b>Resolution</b>	<b>0.1 °C</b>
Temperature drift @ 20°C	
Pt100	0.003%/°C
Pt1000	0.005%/°C

## ORDER CODES

**HD2303.0** The kit is composed of the HD2303.0, 3 1.5V alkaline batteries, operating manual, and case. **The probes must be ordered separately.**

### PROBES COMPLETE WITH SICRAM MODULE

#### WIND SPEED MEASUREMENT PROBES

##### *HOT-WIRE PROBES*

- AP471S1** Hot-wire telescopic probe, measuring range: 0.02...40 m/s. Cable length 2 metres.
- AP471S2** Omnidirectional hot-wire telescopic probe, measuring range: 0.02...5 m/s. Cable length 2 metres.
- AP471S3** Hot-wire telescopic probe with terminal tip for easy position, measuring range: 0.02...40 m/s. Cable length 2 metres.
- AP471S4** Omnidirectional hot-wire telescopic probe with base, measuring range: 0.02...5 m/s. Cable length 2 metres.

##### *VANE PROBES*

- AP472S1** Vane probe with thermocouple, Ø100 mm. Speed from 0.6 to 25 m/s; temperature from -25 to 80 °C. Cable length 2 metres.
- AP472S2** Vane probe, Ø60 mm. Measurement range: 0.5...20 m/s. Cable length 2 metres.
- AST.1** Telescopic shaft (minimum length 210 mm, maximum length 870 mm) for AP472S1 and AP472S2 vane probes.
- AP471S1.23.6** Fixed extension shaft Ø16 x 300 mm, M10 male thread on a side, female on the other. For vane probes AP472S1 and AP472S2.
- AP471S1.23.7** Fixed extension shaft Ø16 x 300 mm, M10 female thread on a side only. For vane probes AP472S1 and AP472S2.

#### TEMPERATURE MEASUREMENT PROBES

- TP472I** Immersion probe, sensor Pt100. Stem Ø3 mm, length 300 mm. Cable length 2 metres.
- TP472I.O** Immersion probe, sensor Pt100. Stem Ø3 mm, length 230 mm. Cable length 2 metres.
- TP473P.I** Penetration probe, sensor Pt100. Stem Ø4 mm, length 150 mm. Cable length 2 metres.
- TP473P.O** Penetration probe, sensor Pt100. Stem Ø4 mm, length 150 mm. Cable length 2 metres.
- TP474C.O** Contact probe, sensor Pt100. Stem Ø4 mm, length 230 mm, contact surface Ø 5 mm. Cable length 2 metres.

- TP475A.O** Air probe, sensor Pt100. Stem Ø4 mm, length 230 mm. Cable length 2 metres.
- TP472I.5** Immersion probe, sensor Pt100. Stem Ø6 mm, length 500 mm. Cable length 2 metres.
- TP472I.10** Immersion probe, sensor Pt100. Stem Ø6 mm, length 1000 mm. Cable length 2 metres.
- TP49A.I** Immersion probe, sensor Pt100. Stem Ø2.7 mm, length 150 mm. Cable length 1.5 metres. Aluminium handle.
- TP49AC.I** Contact probe, sensor Pt100. Stem Ø4 mm, length 150 mm. Cable length 1.5 metres. Aluminium handle.
- TP49AP.I** Penetration probe, sensor Pt100. Stem Ø2.7 mm, length 150 mm. Cable length 1.5 metres. Aluminium handle.
- TP875.I** Globe-thermometer Ø150 mm with handle. Cable length 2 metres.
- TP876.I** Globe-thermometer Ø50 mm with handle. Cable length 2 metres.
- TP87.O** Immersion probe, sensor Pt100. Stem Ø3 mm, length 70 mm. Cable length 2 metres.

#### **TEMPERATURE PROBES WITHOUT SICRAM MODULE**

- TP47.100.O** Immersion probe, sensor Pt100 direct 4 wires. Probe's stem Ø3 mm, length 230 mm. 4-wire connection cable with connector, length 2 metres.
- TP47.1000.O** Immersion probe, sensor Pt1000. Probe's stem Ø3 mm, length 230 mm. 4-wire connection cable with connector, length 2 metres.
- TP87.100.O** Immersion probe, sensor Pt100 direct 4 wires. Probe's stem Ø3 mm, length 70 mm. 4-wire connection cable with connector, length 2 metres.
- TP87.1000.O** Immersion probe, sensor Pt1000. Probe's stem Ø3 mm, length 70 mm. 4-wire connection cable with connector, length 2 metres.
- TP47** Only connector for probe connection: Pt100 direct 3 and 4 wires, Pt1000 and Ni1000 2 wires.

**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.**

## NOTES

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## 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.

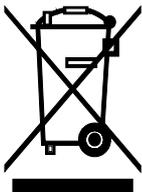
The manufacturer repairs the products that show defects of construction in accordance with the terms and conditions of warranty included in the manual of the product. For any dispute, the competent court is the Court of Padua. The Italian law and the "Convention on Contracts for the International Sales 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 reserves the right to change technical specifications and dimensions to fit the product requirements without prior notice.

## DISPOSAL INFORMATION



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

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

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