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# OWNER'S MANUAL

# CompuFlow®
# Thermo-anemometer
# Model 8585/8586




ALNOR®
TSI Incorporated

# WARRANTY

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**Service Policy**
Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call Customer Service at (800) 424-7427 (USA) and (1) 651-490-2811 (International).

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# SECTION 1
# General Description

The CompuFlow Model 8585/8586 thermo-anemometer is a hand-held, battery powered, microprocessor based instrument capable of measuring air velocity, temperature, and relative humidity. It can also calculate the volumetric flow rate, dew point temperature, and wet bulb temperature. This digital instrument measures velocities from 0 to 9999 ft/min (0 to 50 m/s). The unique software program incorporated into the CompuFlow allows you to take up to 1871 samples and display the average on demand. It provides steady digital readings and quick response, due to time-weighted averaging software. Readings are available in both English and metric units by changing the position of the DIP switches. To allow for maximum long-term accuracy, this instrument is electronically calibrated and should be calibrated by TSI once a year.

For measuring air velocity or temperature in difficult locations the Model 8585 probe extends to 43.25 inches (110 cm) and can be used either as a straight wand or with the probe tip at 90° to the main probe body. This allows for traversing large ducts as well as clean benches and clean room ceilings (often without requiring a ladder). The Model 8586 has a permanently straight wand for making the same measurements.

The CompuFlow kit comes in a convenient carrying case that is foam padded for maximum protection. The carrying case holds the meter, probe, and A/C adapter, and additional compartments are available for optional accessories such as the printer, printer paper, and extra batteries.

# SECTION 2
# Theory of Operation: Thermo-anemometers

Thermo-anemometers use two sensors: an air velocity sensor and a temperature compensation sensor. The velocity sensor is heated to an elevated temperature (relative to the surrounding air) by means of control electronics. The temperature compensation sensor senses the ambient air temperature and forces the velocity sensor to stay at a constant “overheat” above ambient temperature.

When air flows past the velocity sensor, the sensor tends to cool. This causes the control electronics to apply more power to keep the velocity sensor at a constant “overheat.” This power is directly related to the velocity of the air flowing past the sensor. This is the basic principle of operation for constant temperature thermo-anemometers.

## SECTION 3
## Safety

When using the CompuFlow to check air flow and/or temperature, make certain that you can safely raise and hold the instrument while making measurements. Be especially careful when working on a ladder.

Observe all necessary precautions so that the unit does not become caught in moving machinery or touch any exposed electrical wiring.

| **DANGER** |
| --- |
| The CompuFlow is **not** designed for use in gas mixtures other than air. Use with corrosive or other dangerous or explosive gas mixtures is **not** recommended. |

## SECTION 4
## About the Instrument

The CompuFlow has a digital display (shown in Figure 1). This display has two places where numbers are displayed. There are small display digits in the upper left-hand corner which are primarily used to display temperature. The large display digits, on the lower left-hand area of the display, are used to show the other measurement being taken (i.e., velocity, volume flow, temperature, humidity, etc.).

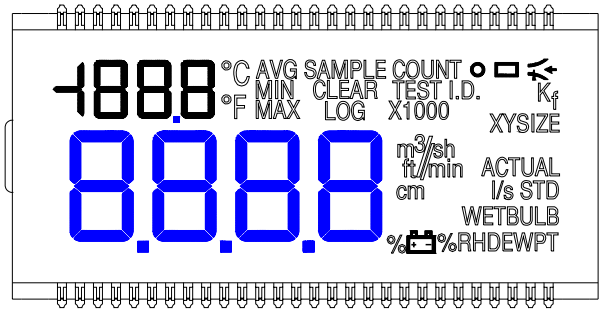



**Figure 1: CompuFlow Display**

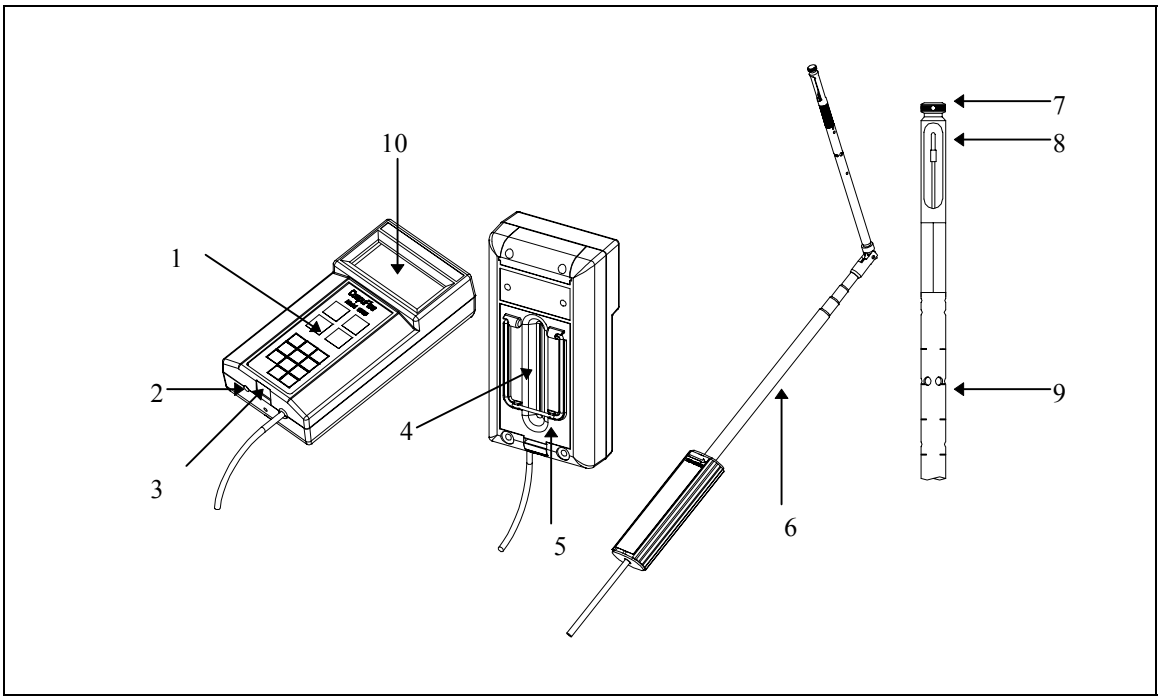



**Figure 2: CompuFlow**

In figure 2 you can see the CompuFlow and its parts.

| | |
|---|---|
| 1. Keypad | 6. Probe |
| 2. AC Adapter Port | 7. Dimple |
| 3. Printer/Computer Port | 8. Velocity Sensor |
| 4. Battery Compartment | 9. Temperature and RH Sensor |
| 5. Stand | 10. Display |

## SECTION 5
## Getting Started

***Note:*** *Instrument should be allowed to stabilize to room conditions in order to achieve the specified accuracy.*

### Taking Readings

1. Install four C-size batteries into the battery case. Make sure they are oriented as shown in the battery compartment.

2. Extend the probe to the desired length, making sure that the sensor window is fully exposed to the air stream and the orientation dimple is facing upstream.

3. Turn the instrument on by pressing the ON/OFF key on the keypad. Each time the instrument is turned on, it will display % battery life, % logging memory available, baud rate, time, entered barometric pressure, and entered ambient temperature. *You may bypass this display by pressing ↵ at any time during the start-up sequence.* The instrument is in measurement mode once the power up sequence is complete.

   The first time the instrument is turned on it will display velocity on the large digits and temperature on the small digits of the display. If the instrument was used before, it will power up and display the last measurement type that was displayed before the instrument was turned off.

4. Press the VEL/TEMP key to display velocity on the large digits and temperature on the small digits of the display. Press again to display velocity on the large digits and nothing on the small digits. Press again to display temperature on the large digits and nothing on the small digits. Finally, press this key again to return to velocity on the large digits and temperature on the small digits.

   ***Note**: When measuring temperature, make sure that at least 3.5 inches (9 cm) of the probe is in the air flow to allow the temperature sensor to be in the air stream.*

5. Press VOLUME to display volumetric flow rate on the large digits and temperature on the small digits.

   ***Note**: If this is the first time the key has been pressed, or the desired measurement parameters need to be changed, refer to the Detailed Operation section for a explanation of entering volumetric flowrate parameters.*

   Press the key again to display volume on the large digits and nothing on the small digits. Press again to return to volume on the large digits and temperature on the small digits.

6. Press the HUMIDITY key to display %RH on the large digits and temperature on the small digits. Press again to display dew point temperature on the large digits and temperature on the small digits. Press again to display wet bulb temperature on the large digits and temperature on the small digits. Press again to return to %RH on large digits and temperature on the small digits.

   ***Note**: When measuring humidity, dew point, or wet bulb, make sure that at least 3 inches (7.5 cm) of the probe is in the air flow to allow the temperature and humidity sensors to be in the air stream.*

7. When in measurement mode, press the ↵ key to record sample readings and store them in the current Test ID.

# SECTION 6
# Detailed Operation

## Changing the Baud Rate

The CompuFlow has a variable baud rate that is used when downloading or printing information from the instrument. By increasing the baud rate, the data will be downloaded faster.

***Note**: The baud rate must be equal to that of your computer or printer*.

The baud rate is displayed during the initial power up sequence. To change the baud rate, press and hold both ↑↓ arrow keys while the baud rate is displayed during the power up sequence. Release the keys when the unit beeps twice. Use the ↑ and ↓ arrow keys to scroll through the options (1200, 2400, 4800, 9600, 19200). Press ↵ to set the value that is on the display.

## Changing the Real Time Clock

The CompuFlow comes with the real time clock set to US Central time. It is important to set the time and date correctly, or date and time stamping of the recorded data will be incorrect.

To change the clock, press and hold both ↑↓ arrow keys while the time is being displayed during the power up sequence. Release the keys when the CompuFlow beeps twice. You will then be able to either view and/or change the hours, minutes, year, month, and day of month in sequence. Use the ↑↓ arrow keys to change the setting. Press the ↵ key to accept your choice and advance to the next setting.

## Entering the Barometric Pressure and Temperature

The CompuFlow measures standard air velocity or flow rate. In order to read in actual velocity or flow rate, the barometric pressure and temperature must be entered correctly in the CompuFlow. In order to read wet bulb, barometric pressure must be entered. The instrument will come with the barometric pressure and temperature entered to standard conditions (29.92 inches Hg, 70°F).

To change the settings, press and hold the ACT/STD key. The barometric pressure units and the last entered value for barometric pressure will be displayed. Use the ↑↓ arrow keys to change the setting and press ↵ to accept the value. Then the temperature units will flash and the last ambient temperature entered will be displayed. Use the ↑↓ arrow keys to change the setting and press ↵ to accept the value and return to measuring mode.

## Measuring Flow Rate

The first time the VOL key is pressed, the type of volume measurement to be made must be selected. The symbols shown are: circle – for a round duct; rectangle—for a square or rectangular duct; and the third choice is a horn. Use the ↑↓ arrow keys to choose one of the symbols.

If circle is chosen, SIZE will light up on the display. Use the ↑↓ arrow keys to select the size (diameter). Press ↵ to accept the choice and return to measuring mode. The circle symbol will remain lit on the display.

If rectangle is chosen, X SIZE will light up on the display. Use the ↑↓ arrow keys to select the x-size of the duct, then press ↵ to accept the choice and advance to the next dimension. Y SIZE will light up on the display. Use the ↑↓ arrow keys to select the y-dimension of the duct, then press ↵ to accept the choice and return to measurement mode. The rectangle will remain lit on the display.

If horn symbol is chosen, use the ↑↓ arrow keys to scroll through the horn model numbers on the display. The choices are 100, 300, 600, 1200 or $K_f$.

***Note**: $K_f$ is the number by which the instrument multiplies the velocity measurement to display volume.*

Press ↵ to accept the choice. If a horn model number is chosen, press ↵ to return to measurement mode. If $K_f$ is chosen, the K factor choices will be shown in the following order: last 5 values used, then a new value which can be adjusted from 0.01 to 999.9. Use the ↑↓ to scroll through the $K_f$ choices, then press ↵ to accept the choice and return to measurement mode. The horn symbol will remain lit on the display.

To change the flow rate parameters once set, press either ↑ or ↓ while displaying flow rate and use the ↑↓ arrow keys to change your settings as stated above.

## Choosing a Time Constant

Press the TC key to display the current time constant. Press the ↑↓ arrow keys to scroll through the choices and press ↵ key to confirm your choice and return to measuring mode. The choices for the time constant are: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, and 30 seconds.

The time constant is an averaging period. It is used to dampen the display. If you are experiencing fluctuating flows, a longer time constant will slow down those fluctuations. The display will update every second, but the displayed reading will be the average over the last time constant period. For example, if the time constant is 10 seconds, the display will update every second, but the displayed reading will be the average from the last 10 seconds. This is also referred to as a “moving average”.

## Taking and Storing Measurements

All readings are stored in test IDs. You may store up to 1871 samples in 285 IDs. To advance to a new test ID, press the NEXT TEST key.

Press the ↵ key to store a reading. "SAMPLE" will light up on the display, and a countdown the length of the time constant will begin. At the end of the countdown, the sample number is displayed for one second, then the value stored, and then the instrument will return to normal measurement mode.

The readings that are stored depend on what is on the display. When %RH is displayed on the large digits, %RH, dew point, wet bulb, and temperature will be stored. When any other parameter is on the large digits, all the displayed parameters and %RH will be stored.

***Note:*** *If measuring volume, both velocity and volume will be stored for that test ID. However, if you change from volume to another measurement, the test ID will automatically increment.*

***Note:*** *If LOG shows on the display, you are still in the datalogging mode. When you press ↵, you will start the time log. To turn this option off, press the TIME LOG key. Use the ↑↓ arrow keys to choose "OFF". Press the ↵ key to accept the choice.*

## Continuous Data Storage (Datalogging)

This option will allow automatic storage of data over time, e.g. if looking for trends.

All readings are stored in test IDs. You may store up to 1871 samples in 285 IDs. To advance to a new test ID, press the NEXT TEST key.

To set up the datalog feature:

1. Press the TIME LOG key. Use the ↑↓ arrow keys to select "On". Press the ↵ key to accept your choice.
2. "LOG" will light up on the display and the logging interval is shown. Use the ↑↓ arrow keys to scroll through the log interval choices. The choices are: 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, and 30 seconds, and 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, and 60 minutes. Press the ↵ key to accept your choice.
3. Next, you will choose the number of samples. The choices are "CONT" or 1 to 999. Use the ↑↓ arrow keys to scroll through the choices, and press ↵ to accept your choice. The instrument will then return to measuring mode. If "CONT" is chosen, the instrument will sample continuously until it is either stopped manually, runs out of memory, or the batteries run out. To stop manually, press ↵. If a number between 1 and 999 is chosen, the instrument will take that number of samples and then stop storing readings.
4. To start the logging, press the ↵ key.

The log mode remains programmed until you go into TIME LOG and turn this feature "OFF". This was done so you can use continuous datalogging in various locations without resetting the TIME LOG. When "LOG" is on the display, pressing ↵ starts the TIME LOG operation.

### Averaging

1. Store readings as discussed in the previous two sections.

2. When all readings have been taken, press the AVE key to display the average. The number of samples will be displayed for a second, then the average of the stored readings.

3. Press the ↵ key to return to measuring mode.

***Note*** *You may add more readings to this test ID, or you may move to a new test ID by pressing the* NEXT TEST *key.*

### Recalling Stored Data

You can either review stored data on the instrument display or download it to a printer or computer.

To recall the data on the display, follow these steps:

1. Press the RECALL key to show the test ID number on the small display and "TEST ID" will appear on the display.

2. Use the ↑↓ keys to select the desired test ID and press ↵ to accept the choice. Use ↑↓ keys to view average, count, minimum, maximum, and then sample numbers and values. The samples will be displayed in the order that they were taken.

3. Press ↵ at any time to return to measuring mode.

### Clearing Memory

You can either clear the entire memory or the last reading that was stored. This is done by pressing and holding the DEL key until a countdown from 3 to 0 is started. If the key is released when 3, 2, or 1 is displayed, only the last stored reading will be deleted and "CLEAR SAMPLE" will show on the display. If the key is released when 0 is displayed, all the stored readings will be deleted. When the entire memory is cleared, "CLEAR LOG" will appear on the display. If the key is released after 0 is no longer displayed, nothing will be deleted.

### Downloading Data to a Computer

The COMPUDAT program will download all information that is stored in the instrument. It is not possible to extract specific test IDs.

COMPUDAT is a Windows-based program designed to download the data stored in the memory of the CompuFlow to a computer. This data includes the test ID, measurement, unit of measure, correction factors, actual/standard parameter, flow area, and time constant. This data is date and time stamped. In addition, the statistics for each test ID are provided. The file containing the downloaded data is sorted and tab delimited allowing it to be imported into a spreadsheet for further data analysis.

To download data from the CompuFlow the program must first be installed. (TSI part number 634-858-386.) Computer must be IBM-compatible, 386 or higher, with 4mb available memory and Windows® 3.1 or higher. Any serial port from COM1 to COM4 can be used. In Windows 3.1, insert the diskette and choose File ... Run ... x:\setup.exe (where x: is the drive containing the first setup diskette). For Windows 95 choose Start ... Run ... x:\setup.exe.

When finished installing the program, double click the COMPUDAT icon to start the program. The program is self-directing; it provides all the necessary instructions for downloading data.

### Printing Data to the Portable Printer

Printer should be set with bit length 8, one stop bit, and no parity. To print all data in memory, press and hold the RECALL key to start a countdown from 3 to 0. When 0 is on the display, release the key. If the key is released at any other time, nothing will be printed.

To print only a selected test ID, press the RECALL key to show the test ID number on the small display. Using the ↑↓ keys, select the desired test ID that you would like to print. Then press and hold the RECALL key until the display counts down to zero. The selected test ID will then print, including the statistics for all measurement parameters stored as well as the data points for only the parameter displayed on the large digits.

If the printer is connected to the instrument while taking readings, each time the ↵ key is pressed, the reading(s) will be printed to the portable printer. Also, each time a parameter is changed (type of flow rate, time constant, etc.), the new setting will also be printed.

### Backlighting

The backlight is for use in areas where there is little or no lighting. To turn on the display backlight, press the light key. Press again to turn off the light. When the instrument is turned off, the light will also turn off and will not automatically turn on the next time the instrument is turned on.

### Auto Shut Off

The CompuFlow is designed to automatically shut off 10 minutes after no keys have been pressed. The only exception is when you are performing continuous data logging or printing; then you must shut off the instrument by pressing the ON/OFF key. You can disable the function by switching DIP switch 2 to ON.

## Changing Measurement Units

The measurement units can easily be changed by changing a few DIP switch positions. To access the DIP switches, turn the instrument off and remove the batteries from the battery compartment. On the inside of the battery compartment, there is a window with eight DIP switches (see figure 3). The table below shows the functions of each switch.

| Switch | Function | Settings |
|---|---|---|
| 1 | Temperature | OFF: Degrees Fahrenheit (°F)<br>ON: Degrees Celsius (°C) |
| 2 | Auto Shut Off | OFF: Enabled<br>ON: Disabled |
| 3, 4 | Velocity /<br>Flow rate | 3 ON, 4 OFF: m/s, l/s<br>3 OFF, 4 ON: m/s, $m^3$/hr<br>3 OFF, 4 OFF: fpm, cfm<br>3 ON, 4 ON: m/s, $m^3$/min |
| 5 | Barometric<br>Pressure | ON: BP units are in.Hg.<br>OFF: BP units are mmHg |
| 6 | Unused | Always leave in OFF position |
| 7 | Calibration adjust | Factory use only. |
| 8 | Data format | OFF: Decimals; MM/DD/YY<br>ON: Commas; DD/MM/YY |

***Note:*** *Switch 8 OFF will show decimal points for numbers less than one and dates in month/day/year format.*

*Switch 8 ON will show commas for numbers less than one and dates in day/month/year format.*

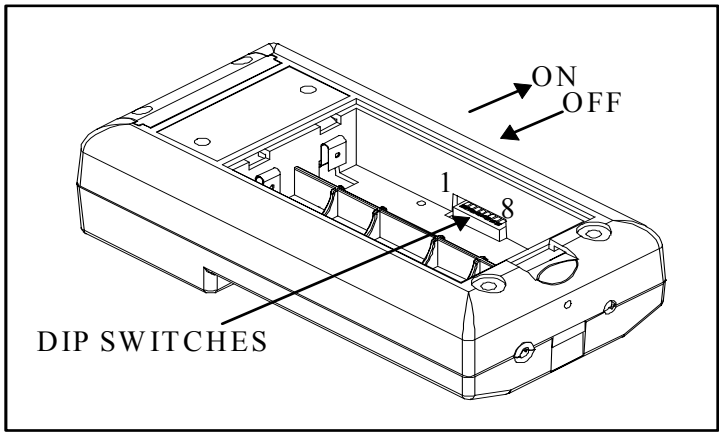



**Figure 3: DIP Switch Locations**

## SECTION 7
## Troubleshooting

| Symptom | Possible Cause and Corrective Action |
|---|---|
| Meter does not turn on. | • Batteries may be discharged. Charge or replace them.<br>• Switch failure, wiring failure, or circuit failure. Contact Customer Service. |
| Meter reading lower or higher than expected. | • Odd air flow pattern. Perform traverse to get average air flow.<br>• Meter out of calibration. Contact Customer Service. |

## SECTION 8
## Maintenance

### Carrying Case

The carrying case can be cleaned using a wet cloth.

### Calibration

It is recommended that you return your CompuFlow to the factory once per year for a calibration check. When shipping the CompuFlow for factory calibration, pack it carefully, and follow the Instructions for Return in this manual.

## SECTION 9
## Service Information

### Service and Repair

Please return your Product Registration Card immediately. This allows us to send service reminders, special offers, and important information about your product.

Before sending your instrument for calibration or repair, you should call Customer Service. The service department will provide you with the cost of service or calibration, Return Material Authorization (RMA) number, and shipping instructions.

Please have the following information available when you call:

- Owner's name, address, and phone number
- Billing address, if different and applicable
- Instrument name and model
- Serial number
- Date of purchase
- Where purchased

We recommend that you keep a "calibration log" and keep all records of service on your instrument.

### Instructions for Return

Send the instrument prepaid. Securely package your instrument in a strong container surrounded by at least 2 inches (5 cm) of suitable shock-absorbing material. Include the purchase order showing instrument model number, cost of service and/or calibration, and the RMA number. Mark the outside of the shipping container with the RMA number. This will expedite processing of your instrument when we receive it.

Please note that instruments received improperly marked or without an accompanying purchase order may be returned at your expense. See back cover for factory address.

### Damaged in Transit

All orders are carefully packed for shipment. On receipt, if the shipping container appears to have been damaged during shipment, the instrument should be thoroughly inspected. The delivering carrier's papers should be signed noting the apparent damage. DO NOT DISCARD THE BOX.

If the instrument itself has been damaged, a claim should be promptly filed against the carrier by the customer. The selling agent will assist the customer by supplying all pertinent shipping information; however, the claim must be filed by the insured. If the instrument is damaged beyond use, a new order should be placed with TSI while awaiting reimbursement from the carrier for the damaged instrument. Call TSI directly for assistance if necessary.

# COMPUFLOW® MODEL 8585/8586 SPECIFICATIONS

**Velocity**

| | |
|---|---|
| Range: | 0 - 9999 ft/min (0-50 m/s) |
| Accuracy:[1&2] | ±3 % of reading or ±3 ft/min, whichever is greater |
| Resolution: | 1 ft/min under 500 ft/min (0.05 m/s under 10.00 m/s), 5 ft/min at 500 ft/min and over (0.1 m/s at and over 10.00 m/s) |

**Volumetric Flow Rate**

| | |
|---|---|
| Range: | Actual range is a function of maximum velocity and duct size |

**Duct Dimensions**

1 to 250 inches in increments of 0.1 inches (1 to 635 cm in increments of 0.1 cm)

**Temperature**

| | |
|---|---|
| Range: | 14 to 140°F (-10 to 60°C) |
| Accuracy:[3] | ±0.5°F (±0.3°C) |
| Resolutions: | 0.1°F (0.1°C) |

**Relative Humidity**

| | |
|---|---|
| Range: | 0 to 95% RH |
| Accuracy:[4] | ±3% RH |
| Resolution: | 0.1% RH |

**Wet Bulb Temperature**

| | |
|---|---|
| Range: | 40 to 140 °F (5 to 60°C) |
| Resolution: | 0.1°F (0.1°C) |

**Dew Point Temperature**

| | |
|---|---|
| Range: | 5 to 120 °F (-15 to 49°C) |
| Resolution: | 0.1°F (0.1°C) |

**Time Constant**

| | |
|---|---|
| Intervals: | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, or 30 seconds |

**Logging Intervals**

| | |
|---|---|
| Intervals: | 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, or 30 seconds<br>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, or 60 minutes |

**Data Storage Capabilities**

| | |
|---|---|
| Range: | Up to 1871 samples, up to 285 test IDs |

**Instrument Dimensions**: 3.8 x 7.5 x 2.35 inches (9.65 x 19 x 6 cm)

**Probe Dimensions** (all models)

| | |
|---|---|
| Length: | 43.25 inches (110 cm) including handle |
| Diameter (tip): | 0.276 inches (7.01 mm) |
| Diameter (base): | 0.395 inches (10.03 mm) |

**Probe Dimensions** (Model 8585)

| | |
|---|---|
| Diameter (knuckle): | 0.372 inches (9.45 mm) |

**Weight**: 1.9 lbs. (0.86 kg)

**Display**

| | |
|---|---|
| Primary Display: | 4-digit LCD, 0.6 in. (15 mm) digit height |
| Secondary Display: | 3.5-digit LCD, 0.3 in. (8 mm) digit height |

**Power Source**: Four C size batteries

**Battery Life**: 24 hours average

---

1 Temperature compensated over an air temperature range of 40-150°F (5 to 65°C).

2 The accuracy statement of ±3.0% of reading or ±3 ft/min (±0.015m/s), whichever is greater, begins at 30 ft/min through 9999 ft/min (0.15 m/s through 50 m/s).

3 Accuracy with instrument case at 77°F(25°C), add uncertainty of 0.05°F/°F (0.03°C/°C) for change in instrument temperature.

4 Accuracy with instrument case at 77°F(25°C), add uncertainty of 0.1% RH/°F (0.2% RH/°C).

ALNOR®

TSI Incorporated

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INTERTEK CERTIFICATION

ACCREDITED REGISTRAR ANSI-RAB

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