

Model 8360/8382/8383/8388

VELOCICALC® Plus

Air Velocity Meters

***Operation and Service
Manual***

*September 1998
P/N 1980253 Rev C*

Model 8360/8382/8383/8388

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Available Application Notes

- Constant Temperature Thermal Anemometry Theory#TI-105
- Traversing a Duct to Determine Average Air Velocity or Volume#TI-106
- Applications Using the VELOCICALC Plus to Measure Pressure#TI-107
- VELOCICALC Serial Interface Connections#TI-108

To obtain any of the listed Application Notes contact TSI at
 U.S. (800) 777-8356/(651) 490-2711 Fax: (651) 490-2874
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Chapter 1

Unpacking and Parts Identification

Carefully unpack the instrument and accessories from the shipping container. Check the individual parts against the list of components in Table 1. If any are missing or damaged, notify TSI or your local distributor immediately.

Table 1. List of components

| Qty | Item Description | Part/model |
|-------|--|------------|
| 1 | Model 8360 VELOCICALC Plus or | 8360 |
| | Model 8382 VELOCICALC Plus or | 8382 |
| | Model 8383 VELOCICALC Plus (Articulating Probe) or | 8383 |
| | Model 8388 VELOCICALC Plus | 8388 |
| 1 | Carrying Case | 800277 |
| 4 | AA Alkaline batteries | 1208013 |
| 1 | AC Adapter (Optional) | |
| | 115 V, NEMA-5 | 2613033 |
| | 230 V, European, CEE 7/16 | 2613078 |
| | 230 V, Great Britain | 800169 |
| | 240 V, Australian | 2613105 |
| 1 | Operation and Service Manual | 1980253 |
| 1 | Static pressure tip | 3002017 |
| 8 ft. | Rubber tubing | 801039 |

Parts Identification

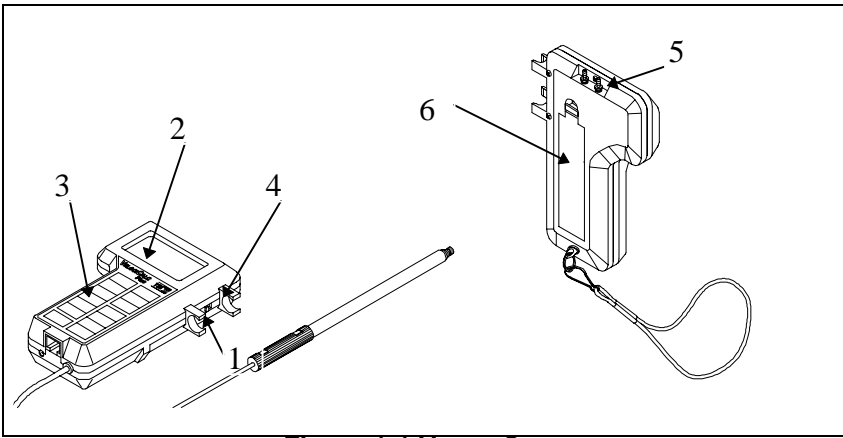


Figure 1-1 VELOCICALC

- | | |
|------------------|-------------------------------|
| 1. On/Off Switch | 4. Probe Mounting Clips |
| 2. Display | 5. Pressure Measurement Ports |
| 3. Function Keys | 6. Battery Access Cover |

Chapter 2

Setting-Up

Supplying Power to the VELOCICALC

The VELOCICALC can be powered in one of two ways: four size AA batteries or the optional AC Adapter.

Installing the Batteries

Insert four AA batteries as indicated by the diagram located on the inside of the battery compartment. TSI ships the unit with alkaline batteries. The VELOCICALC is designed to operate with either alkaline or NiCd rechargeable batteries. Carbon-zinc batteries are not recommended because of the danger of battery acid leakage.

Table 2-1 Typical Battery Life at 20°C

| Air Velocity | | Alkaline | NiCd |
|--------------|-------|----------|-------|
| (ft/min) | (m/s) | (hrs) | (hrs) |
| 100 | 0.5 | 7.0 | 5.0 |
| 1000 | 5.0 | 4.4 | 3.5 |
| 9000 | 45.0 | 2.4 | 2.4 |

Using the AC Adapter

When using the AC adapter, the batteries (if installed) will be bypassed. The AC adapter is not a battery charger.

Selecting the Display Units

The VELOCICALC is capable of displaying the measured values in several different measurement units. The choices of measurement units are shown in Table 2-2.

Table 2-2. Choices of Measurement Units

| Velocity | Temperature/ Dew Point | Flow Rate | Pressure |
|---------------|---------------------------|---|--------------------------------------|
| ft/min m/s | °F °C | ft ³ /min m ³ /hr l/s | in. H ₂ O mm Hg kPa |

To change the display units on your VELOCICALC, refer to Appendix B, DIP Switch Settings.

Using The Telescoping Probe

The telescoping probe, mounted on the side of the VELOCICALC, contains the velocity, temperature, and humidity sensors (humidity sensor, Model 8360 and 8388 only). The probe is shipped pointing downward in the stowed position. The probe can be used either mounted on the VELOCICALC

or held in your hand. If the probe is to be used mounted to the VELOCICALC, remove the probe from its stowed position, turn it 180°, and reinstall (pointing upward) in the probe mounting brackets.

Extending The Probe

To extend the probe, hold the handle in one hand while pulling on the probe tip with the other hand. Do not hold the cable while extending the probe as this prevents the probe from moving.

Retracting The Probe

To retract the probe, hold the handle in one hand while pushing on the probe tip with the other hand. If you feel the probe antenna binding, pull gently on the probe cable until the smallest antenna section is retracted. Collapse the rest of the antenna by pressing the probe tip.

When using the probe, make sure the sensor window is fully exposed and the red orientation dot is facing upstream.

Chapter 3

Operation

Overview

The Model 8360/8382/8383/8388 VELOCICALC PLUS measures air velocity, temperature, differential pressure, and calculates volumetric flow rates. In addition the 8360/8388 VELOCICALC PLUS measures relative humidity and calculates dew point from the temperature and relative humidity readings. The Model 8383 VELOCICALC PLUS has an articulating probe. The VELOCICALC PLUS can store individual readings and compute the average of these readings.

Keypad Functions

When pressing the keys on the front panel, the VELOCICALC will beep to confirm the function. If you press a key and the VELOCICALC does not beep, then the VELOCICALC does not allow that function during the selected mode. The beep function can be disabled by changing the internal DIP switch (refer to Appendix B).

ON/OFF Switch

Slide the switch upward to the ON position. The power switch is marked in the international symbols 'I' for *on* and 'O' for *off*. When the instrument is first turned on it goes through a preprogrammed power-up sequence that includes an internal self-check. First, all displayable items will appear for a few seconds. If a problem is detected, the display will light 'CAL' to indicate that it should be returned for servicing and calibration. When the VELOCICALC completes the internal self-check, it will display the approximate percentage of battery life remaining. This feature is accurate for alkaline batteries only.

Measuring Velocity

Press the VELOCITY key to display velocity measurements (the VELOCICALC will automatically start in velocity mode). The velocity will be displayed in ft/min or m/s depending on the DIP switch settings (refer to Appendix B). Place the end of the probe in the location where you want to make the measurement. Make sure the sensor window is fully opened and the red orientation dot is facing upstream.

Measuring Temperature

Press the TEMP key to display air temperature readings. The VELOCICALC will display temperature readings in either degrees Celsius (°C) or degrees Fahrenheit (°F), depending on the DIP switch settings (refer to Appendix B). Allow about 30 seconds for the temperature reading to stabilize after

switching to temperature mode. This is necessary because the velocity sensor is heated during velocity mode, and some heat is conducted down to the temperature sensor.

Measuring Pressure

Press the **PRESSURE** key to measure differential pressure. To measure pressure, tubing must be connected to the pressure ports on the top back of the unit. When the pressure source is connected the same way the pressure ports are marked, the meter will display a positive number.

Zeroing Pressure

If the zero reading of pressure has drifted, the pressure function can be easily re-zeroed. To reset the zero, make sure that the pressure ports are exposed to the exact same pressure. The easiest way to do this is to remove the pressure hoses and leave both ports exposed to ambient pressure.

Press and hold the **PRESSURE** key down for at least three seconds. The **VELOCICALC** will give a double beep and the display will show “0 in. H₂O” (or whatever units have been selected). When the key is released the display will be re-zeroed.

Measuring Humidity (Model 8360 and 8388 Only)

Press the **HUMIDITY** key to display humidity readings. The readings will be in units of percent relative humidity (%RH). The reading may need time to stabilize if the ambient conditions have recently changed.

In order to see if the humidity reading has stabilized, extend the probe and gently wave it back and forth (or place it in a location where there is a sufficient quantity of moving air), while checking the display for an upward or downward trend in the readings. When no particular trend is apparent, the reading has stabilized.

Situations that may require time to stabilize the sensor would be when moving the instrument from a cold vehicle or storage place into a heated building. Also, if the end of the probe has been warmed by being handled, it will need to cool to ambient temperature. Another example would be when moving from a location with low humidity to high humidity, or vice versa.

Dew Point Function (Model 8360 and 8388 Only)

Press the **DEW POINT** key to display the dew point temperature. The dew point is calculated using the temperature and relative humidity measurements. Because dew point is not measured directly, accuracy of this calculation depends on both ambient temperature and relative humidity. The dew point reading will be most accurate when the relative humidity is 50% and above (and dew point temperature is closer to the actual temperature). It

will be less accurate when the relative humidity is less than 50% (and dew point temperature is farther away from the actual temperature).

Flow Rate Function

The VELOCICALC's flow rate function can calculate flow rate using a known area. The Model 8382/8383/8388 VELOCICALC can also calculate flow rate through diffusers by multiplying the square root of the pressure reading by a manufacturer-supplied flow factor. The VELOCICALC displays the volumetric flow rate in ft^3/min , m^3/hr , or l/s , depending on the DIP switch setting (refer to Appendix B).

Flow Rate (Calculated Using Velocity and Duct Area)

The flow rate can be calculated for a round, square or rectangular duct. The shape and size of the duct or other area through which the flow will be measured must be entered.

Entering Shape and Size

Press the FLOWRATE key to put the VELOCICALC in flow rate mode. The VELOCICALC will prompt the user to enter the shape and size, if this has not been done since the instrument was turned on. The VELOCICALC will request entry of the shape by alternately flashing the circle and rectangle (and pressure units, if DIP switch #6 is ON) on the display. If shape and size have been entered, the VELOCICALC will go directly to displaying flow rate.

Press the SHAPE key to select the shape of the area, rectangular (square) or circular, to measure. Each time the SHAPE key is pressed the shape will change back and forth between the circle and rectangle. When the desired shape appears on the display press the ENTER key. This will enter the shape and the VELOCICALC will then ask for the size.

Use the LARGER and SMALLER keys to select the size of the flow rate area. For a circular flow shape the VELOCICALC will ask for one size, the diameter of the circular area. Select the size and press ENTER to accept it. For a rectangular area the VELOCICALC will ask for two dimensions. First select the horizontal dimension and press the ENTER key, then select the vertical dimension and press ENTER.

To change the shape, press the SHAPE key to select the desired shape. Proceed as above to enter the shape and dimensions. To change the size, hold the LARGER or SMALLER key to enter the new dimensions, then press the ENTER key to accept them.

Flow Rate (Calculated Using Pressure and Flow Factor, Model 8382, 8383, and 8388 Only)

This option is available with Model 8382/8383/8388 only when DIP switch #6 is ON (refer to Appendix B). The flow rate through a diffuser is calculated by multiplying a pressure reading by a manufacturer-supplied flow factor. This flow rate measurement method is applicable for diffusers that contain pressure taps designed for this purpose.

NOTE: When using this option, make sure that the VELOCICALC pressure measurement units and flow rate measurement units are set using the DIP switches to correspond to those provided by the diffuser manufacturer (refer to Appendix B). If using kPa to do this measurement, flow factors should be entered using Pa, not kPa. If they are set incorrectly, the calculated flow rate will be incorrect.

The VELOCICALC will display flow rate and pressure units simultaneously to indicate that the flowrate is being measured from pressure and not from velocity and area. To zero the pressure transducer while in this measurement mode, press and hold the PRESSURE key. The pressure will zero and the VelociCalc will return to flow rate from pressure measurement mode.

Entering Flow Factor

Press the FLOWRATE key to put the VELOCICALC in flow rate mode. The VELOCICALC will prompt you to enter the shape, size, or flow factor if this has not been done since the instrument was turned on. The VELOCICALC will alternately flash the circle, rectangle, and pressure units on the display. If shape, size, or flow factor have been entered, the VELOCICALC will go directly to displaying flow rate.

Press the SHAPE key to select the pressure-flow rate measurement method. Each time the SHAPE key is pressed the shape will change between the circle, rectangle, and pressure units. When the pressure units appear on the display, press the ENTER key. The VELOCICALC will then ask for the flow factor.

The VELOCICALC will display 'Fact = ' and the current flow factor. Use the LARGER and SMALLER keys to select the value of the flow factor and press ENTER to accept it.

To change the flow factor, press the SHAPE key to select the pressure units. Proceed as above to enter the value.

Time Constant Function

Momentarily press and release the TIME CONSTANT key to view the current time-constant. To change the time-constant, press and hold the key. The available time-constant choices (1, 5, 10, 15 and 20 seconds) will sequence on the display. When the desired value is displayed immediately release the key. The VELOCICALC will always reset the time constant to 1 second when turned off.

The time-constant is actually an averaging period. The VELOCICALC display is always updated every second, however, the reading displayed is the average reading over the last time-constant period. For example, if the current time-constant is set to 10 seconds, the display will show readings averaged over the previous 10 seconds, updated every second. This is also called a 10 second “moving average.”

Using the Clear, Store and Average Functions

The VELOCICALC has the ability to compute the average of a number of individual stored readings. Every time the STORE key is pressed, the currently displayed reading is added to a store buffer. When the AVERAGE key is pressed, the readings in the store buffer are divided by the number of stored readings to get the average. The CLEAR key is used to clear out the store buffer in order to start taking a new average.

Store Function

Press and hold the STORE key to store the currently displayed measurement. The display will show “STORE” and the number of stored data points that are in memory for about two seconds, and then the recorded value will be displayed until the STORE key is released.

The individual stored values can not be recalled. Only the average of the stored values can be recalled. There are five different store buffers: one for both velocity and flow rate from area, one for temperature, one for humidity, one for pressure, and one for dew point. Models 8382, 8383, and 8388 have a sixth storage buffer for flow rate from pressure. You can switch between measuring modes and store data without affecting data stored in the buffer for another measuring mode. You can later return to any mode and add additional values to the already stored values.

The flow rate from area function (measures and stores velocity readings, calculates flow rate) and velocity function use the same storage buffer. Measurements made in one mode are added to those made in the other mode.

When using the flow rate from pressure measurement mode, changing the flow factor value will automatically clear the flow rate storage buffer.

Average Function

Press the **AVERAGE** key to display the average of the stored values of the current operating mode. The message “AVG” will appear along with a number (between 1 and 255) indicating how many stored values are in the memory buffer. The average value is then displayed for one second. To keep displaying the average value, press and hold the **AVERAGE** key. Additional values can be stored after the **AVERAGE** key has been pressed. The next time the **AVERAGE** key is pressed, the additional values are averaged with those already accumulated.

Clear Function

Press the **CLEAR** key to erase the stored value in the buffer of the currently active function. Pushing the **CLEAR** key in one function will not affect the values stored in other buffers. However, velocity and flow rate from area use the same buffer, so clearing velocity will also clear the flow rate. Flow rate from pressure is not affected by clearing velocity. For example, pushing **CLEAR** while measuring velocity will not affect the values stored for temperature.

Printer Port

While pushing the **STORE**, **AVERAGE** or **CLEAR** key the data is automatically transmitted to the printer port. If the optional Model 8925 Portable Printer is connected the readings will be printed.

Chapter 4

Maintenance

Probe Tip

Periodically inspect the probe tip to ensure that it is clean. Dust and oil deposits on the velocity sensor decrease the accuracy of the VELOCICALC.

| |
|--|
| Caution: The VELOCICALC must be switched off for cleaning. Do not use high-pressure air, strong solvents, or brushes to clean the sensor tip; damage to the sensors could result. |
|--|

To remove dust, blow it off with a gentle stream of air or rinse it off with a gentle stream of water. To remove a combination of dust and oil, rinse the probe tip in isopropyl alcohol and then blow it off with a gentle stream of air. ***Be careful not to get the humidity sensor wet!*** (The humidity sensor on Models 8360 and 8388 is located at the base of the probe window, just inside the antenna tube.) Also, for the 8383, be careful not to allow water to enter the articulating probe joint.

| |
|---|
| Caution: Never use heat to dry the probe. Permanent damage to the sensor could result. |
|---|

Recalibration

To maintain a high degree of accuracy in your measurements, TSI recommends that you return your instrument for annual recalibration. For a nominal fee, we will recalibrate the unit and return it to you with a certificate of calibration and US National Institute of Standards Technology (NIST) traceability. This 'annual checkup' assures you of consistently accurate readings; it is especially important in applications where strict calibration records must be maintained.

Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth and isopropyl alcohol or a mild detergent. Never submerge the VELOCICALC.

Storage

When storing the VELOCICALC for more than a month, it is recommended to remove the batteries. This prevents damage due to battery leakage.

Chapter 5

Troubleshooting

Table 5 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the VELOCICALC. If your symptom is not listed, or if none of the solutions solves your problem, please contact TSI.

Table 5. Troubleshooting the VELOCICALC

| Symptom | Possible Causes | Corrective Action |
|-----------------------------------|---|---|
| No display | Unit not switched on | Switch on the unit. |
| | Low or dead batteries | Replace the batteries or plug in the AC adapter. |
| | Dirty battery contacts | Clean the battery contacts. |
| BAT is blinking | Batteries are low | Replace or recharge batteries. |
| Display reads "LO BAT" | Low battery charge | Replace or recharge batteries. |
| | Wrong AC adapter | Replace with the correct AC adapter. |
| | Low AC line voltage | Correct the AC line voltage or use batteries. |
| | Dirty battery contacts | Clean the battery contacts. |
| Temperature initially reads high | Temperature sensor is still warm from velocity mode | Allow about 30 seconds before reading temperature. |
| Display reads "ERR" | You are trying to enter more than 255 readings | Read or record the average; clear the storage register and proceed. |
| Display reads "CAL" | The VELOCICALC has detected an internal fault | Return to factory for service. |
| Velocity reading fluctuates badly | The flow is fluctuating | Reposition the probe in a less turbulent section of the flow or use a longer time constant. |
| Display says "OVER" | The velocity, temperature or pressure is too high | Use an alternate measurement method. |

Warning! Remove the probe from excess temperature immediately: excessive heat can damage the sensor. The pressure sensor is protected from damage up to 10 psi. (75 kPa or 560 mm Hg) At higher pressures it can burst!

Notice: There is sometimes confusion between dew point temperature and wet-bulb temperature when comparing VELOCICALC humidity readings to sling psychrometer readings. (Dew point temperature and wet bulb temperature are not the same thing.) On the psychrometric chart used with a sling psychrometer, dew point temperature is a flat horizontal line, wet bulb temperature is a straight line angling downwards from the left, dry bulb temperature is a straight vertical line and relative humidity is a curved line angling upwards from the left.

Appendix A

Specifications

| | Model 8360/8388 VELOCICALC Plus | Models 8382/8383 VELOCICALC Plus |
|-------------------------------------|--|--|
| Velocity | | |
| Measurement Range | 30 to 9,999 ft/min (0.15 to 50 m/s) | Same |
| Accuracy ¹ | 3% of reading or 3 ft/min (0.02 m/s), whichever is greater | Same |
| Temperature | | |
| Measurement Range | 14 to 140°F (-10 to 60°C) | 0 to 200°F (-17.8 to 93.3°C) |
| Resolution | 0.1°F (0.1°C) | Same |
| Accuracy | ±0.5°F (0.3°C) ² | Same |
| Instrument Temp. Range | | |
| Electronics | | |
| Operation | 40 to 113°F (5 to 45°C) | Same |
| Storage | -4 to 140°F (-20 to 60°C) | -22 to 194°F (-30 to 90°C) |
| Probe | | |
| Operation | 14 to 140°F (-10 to 60°C) | 0 to 200°F (17.8 to 93.3°C) |
| Storage | -4 to 140°F (-20 to 60°C) | -22 to 194°F (-30 to 90°C) |
| Relative Humidity Range | 0 to 95% | N/A |
| Accuracy | ±3% rh ³ | N/A |
| Dew point Range | 5 to 120°F (-15 to 49°C) | N/A |
| Static/Differential Pressure | | |
| Range ⁴ | -10.00 to +10.00 inches H ₂ O (-2.500 to +2.500 kPa or -20.00 to +20.00 mm Hg) | Same |
| Accuracy ⁵ | ±0.5% of rdg ±0.01 in H ₂ O (±0.002 kPa or ±0.02 mm Hg) | Same |
| Volumetric Flow Rate | 0.2 to 4,50,000 ft ³ /min (0.0424 to 1,170,000 m ³ /hr or 0.1 to 325,000 l/s) | Same |
| Duct Sizes | 1 to 100 inches in increments of 0.5 inch, 100 to 255 inches in increments of 1 inch (1 to 100 cm in increments of 0.5 cm, 100 to 255 cm in increments of 1 cm) | Same |
| Averaging Capability | Up to 255 values each of velocity, temperature, pressure, humidity, or pressure flow | Up to 255 values each of velocity, temperature, pressure, or pressure flow |

| | Model 8360/8388 VELOCICALC Plus (Cont.) | Models 8382/8383 VELOCICALC Plus (Cont.) |
|---|---|---|
| Response Time (63% of final value) To Velocity To Temperature | 200 milliseconds 8 seconds | Same Same |
| Time Constant | Adjustable from 1 to 20 sec. | Same |
| Physical Dimensions External Dimensions Probe Length Weight (with batteries) Display | 4.2 in x 7.2 in x 1.5 in (107 mm x 183 mm x 38 mm) 29 in (735 mm) 1.2 lbs (0.54kg) 4-digit LCD, 0.6 in (15 mm) digit height | Same 37 in (940 mm) 1.1 lbs (0.5 kg) Same |
| Printer Interface | Type: Serial BAUD Rate: 1200 | Same |
| Power | Four AA-size NiCd rechargeable or Alkaline Batteries (included) or AC adapter | Same |

- 1 Temperature compensated over an air temperature range of 40 to 150°F (5 to 65°C)
- 2 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.
- 3 Accuracy with probe at 77°F (25°C).
Add uncertainty of 0.1%rh/°F (0.2%rh/°C) for change in probe temperature. Includes 1% hysteresis.
- 4 Overpressure range = 300 inches H₂O (75 kPa, 560 mm Hg)
Specifications within parentheses indicate metric equivalents.
- 5 Add uncertainty of ±0.02%/°F (±0.03%/°C) for change in instrument temperature.

Appendix B

DIP Switch Settings

To access the DIP switches, remove the batteries from the battery compartment. On the inside of the battery compartment, there is a window with eight DIP switches. The table below shows the functions for each switch.

| | |
|-----------------|--|
| Caution: | Make certain that power is turned off before changing DIP switch settings. |
|-----------------|--|

| Switch | Function | OFF | ON |
|--------|-----------------------------------|----------------------------------|---|
| 1 | Velocity | ft/min & ft ³ /min | m/s |
| 2 | Flow Rate* | l/s | m ³ /hr |
| 3 | Pressure | in. H ₂ O | kPa and mm Hg |
| 4 | Pressure** | kPa | mm Hg |
| 5 | Temperature | Degrees Fahrenheit (°F) | Degrees Celsius (°C) |
| 6 | Flow Rate (8382, 8383, 8388 only) | Flow rate from velocity and area | Flow rate from pressure and flow factor or from velocity and area |
| 7 | | Reserved | Reserved |
| 8 | Beep | Beep Disabled | Beep Enabled |

- The ON position is away from the batteries and OFF is towards the batteries.
- Always leave DIP switch #7 in the OFF position.

- * To select flow rate to display l/s or m³/hr, DIP switch #1 must be in the ON position.
- ** To select Pressure to display kPa or mm Hg, DIP switch #3 must be in the ON position.

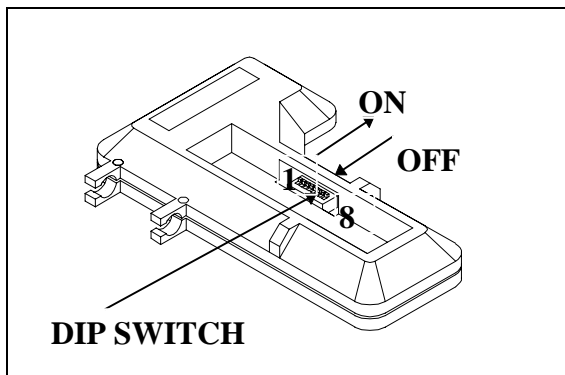


Figure B - 1: DIP Switch Location

Appendix C

Standard Velocity vs. Actual Velocity

Since thermal air velocity sensors are sensitive to changes in air density and air velocity, all thermal anemometers indicate velocities with reference to a set of standard conditions. For TSI instruments, standard conditions are defined as 70° F (21.1° C) and 14.7 psia (101.4 kPa). Other manufacturers may use different values.

Standard velocity is the velocity the air would be moving if the temperature and pressure were at standard conditions. It is usually the most useful measure of airflow because it defines the heat-carrying capacity of the air.

Actual velocity is the velocity at which a microscopic particle of dust would be traveling if it were in the air stream.

In some instances, actual air velocity rather than standard velocity may be of interest. To obtain the value for actual velocity, multiply your standard velocity by the following density correction factor:

$$\text{Actual Velocity} = (\text{Standard Velocity}) \left[\frac{460 + T}{460 + 70} \right] \left[\frac{14.7}{P} \right]$$

Where

T = Ambient temperature in degrees Fahrenheit

P = Ambient pressure in psia

If you use metric units, the equation becomes:

$$\text{Actual Velocity} = (\text{Standard Velocity}) \left[\frac{273 + T_m}{273 + 21.1} \right] \frac{101.4}{P_m}$$

Where

T_m = Ambient temperature in degrees Celsius

P_m = Ambient pressure in kPa

Example No. 1:

You want to measure the actual velocity in a duct. The air temperature in the duct is 55°F and the pressure is 14.24 psia. You take a measurement and the display reads 1200 feet per minute (ft/min).

$$\text{ActualVelocity} = 1200 \left[\frac{460 + 55}{460 + 70} \right] \frac{14.7}{14.24} = 1203.7 \text{ ft} / \text{min}$$

Example No. 2:

You need to measure the actual velocity in a plenum. The air pressure is 99.4 kPa and the temperature is 27°C. The display reading is 2.3 meters per second (m/s).

$$\text{ActualVelocity} = 2.3 \left[\frac{273 + 27}{273 + 21.1} \right] \frac{101.4}{99.4} = 2.39 \text{ m} / \text{s}$$