Ventilation Testing/Balancing

Model 8321 VelociCalc® Rotating Vane Air Velocity Meter

Operation and Service Manual

1980438, Revision B
February 2003

TSI®

Model 8321
VelociCalc®
Rotating Vane
Air Velocity Meter

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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 TSI's Customer Service department at (800) 874-2811 (USA) and (001 651) 490-2811 :(International).

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Chapter 1

Setup

This chapter guides you through unpacking and installing batteries into your VELOCICALC® Rotating Vane. See Chapter 2 for a detailed description of the digital VELOCICALC Rotating Vane's operating functions.

Unpacking

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 immediately.

Table 1: List of Components

Qty	Item	Part #
1	VELOCICALC Rotating Vane	8321
1	Carrying case	1319291
4	AA alkaline batteries	1208013
1	Operation and service manual	1980438

Installing the Batteries

The VELOCICALC Rotating Vane requires four (4) AA batteries. The batteries are not installed when the instrument is shipped. Remove the battery cover by pressing on the latch. Install the batteries noting the correct polarity orientation.

Low Battery Indication

When the "**LO BATT**" icon appears, the VELOCICALC Rotating Vane has about 10 minutes of battery life remaining after which the instrument will display ***"Batt"*** and shut off.

Auto Shut Off

The VELOCICALC Rotating Vane has an auto shut off feature to help preserve battery life. If no keys are pressed for 10 minutes, the instrument will automatically turn itself off. You cannot disable this function.

Safety

Observe common sense safety precautions when using the VELOCICALC Rotating Vane. Exercise care to ensure that the instrument does not interfere with any moving equipment or electrical wiring.

Product Registration

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

Chapter 2

Operation

This chapter thoroughly explains how to operate the VELOCICALC Rotating Vane.

General Information

The VELOCICALC Rotating Vane is intended for measurement of air velocity and volume flow at return grilles, fume hoods, kitchen exhausts, etc. It uses rotating vane anemometer technology. Air movement causes rotation of a multi-blade fan mounted in low-friction bearings. An infrared sensor translates fan blade movement into measured air velocity.

In addition, the temperature of the airflow is measured and displayed simultaneously with the flow reading.

Vane Head Orientation

The VELOCICALC Rotating Vane features a 270-degree rotating head with detents at every 90° and will function satisfactorily in any angular position. This allows the LCD display to be

viewed from the front of the instrument while the head is oriented with the flow direction.

LCD Display

The large four digits will display the velocity or volume reading. The smaller digits near the upper left corner will always display temperature.

There are thirteen arrow indicators—seven along the top of the display and six along the bottom of the display. These indicators show: units of measure, statistics (min, max, avg.), the X1, 000 multiplier, and area.

Detailed Operation

Press the **ON\OFF** key to turn the VELOCICALC Rotating Vane on and off. When the instrument is first turned on, it briefly illuminates all the LCD display segments. The VELOCICALC Rotating Vane powers up reading in the unit of measure used last.

English/Metric Unit Selection

To select between English (Imperial) and Metric units, press the **CLEAR/MENU** key twice. The

display will show "E n G"(for English) or "ΠΠ E t" (for Metric). Use either the ▲ or ▼ key to make your selection. Press the **CLEAR/MENU** key to accept the selection.

Once English or Metric are chosen, the ▲ or ▼ arrows can be pressed to move between displaying in different units. In Metric units, the choices are m/s, km/hr, l/s or m^3/h. In English, the choices are fpm (ft/m), mph and cfm.

Measuring Air Velocity

Once the Model 8321 VELOCICALC Rotating Vane has started up, it will begin reading velocity in "real time." This means the display will update continuously with the current value.

To read "real time" velocity of a location, hold the rotating vane in the air stream noting the flow direction arrow on the instrument head. Keep the vane in the air stream about five seconds. This allows the vane anemometer to reach steady speed.

To hold a velocity reading on the display, press the **SAMPLE** key. The instrument will beep and the measured value will be displayed.

***Note**: The average, maximum and minimum values may be viewed after a "hold" sample, but they will all be the same since there was only one sample value taken.*

To hold another reading, press the **SAMPLE** key again. To return to reading "real time" velocity, press the **CLEAR/MENU** key.

To take a "sweep" reading, press and hold the **SAMPLE** key for the desired time-period. The instrument will beep approximately every second. Release the **SAMPLE** key to stop the measurement and display the average value.

After a time averaged reading is made, you can view the average, maximum and minimum values of the measuring sequence. Press the ▲ or ▼ key to toggle through average, maximum and minimum. Press the **CLEAR/MENU** key to exit the statistics for the sample and go back to real time measuring.

Measuring Air Volume

The operation for air volume measuring is the same as air velocity. Once a volumetric unit of

measure is chosen, the VELOCICALC Rotating Vane is in volume mode.

Press the **CLEAR/MENU** key once. The display will show "ArEA." Use ▲ and ▼ keys to select a value for area. Press **CLEAR/MENU** key ***twice*** to accept the value and begin reading in flow rate.

The area value must be in either ft^2 for English units or m^2 for metric units. To calculate the square area of your measurement area, use one the following formulas:

square or rectangle:

$$length(ft.)xwidth(ft.) = area(ft^2)$$

$$\frac{length(in.)xwidth(in.)}{144} = area(ft^2)$$

$$length(m.)xwidth(m.) = area(m^2)$$

$$\frac{length(cm.)xwidth(cm.)}{10{,}000} = area(m^2)$$

round:

$\pi \times r^2 = \text{area}(ft^2)$

where $\pi \approx 3.14$ and r = radius(ft)

$\pi \times r^2 = \text{area}(m^2)$

where $\pi \approx 3.14$ and r = radius(m)

$(\pi \times r^2) / 144 = \text{area}(ft^2)$

where $\pi \approx 3.14$ and r = radius(in.)

$(\pi \times r^2) / 10{,}000 = \text{area}(m^2)$

where $\pi \approx 3.14$ and r = radius(cm.)

Helpful Information in Using Rotating Vane Anemometers

When used in airstreams of similar size or smaller than the VELOCICALC Rotating Vane head, blockage effects may occur. Velocity readings should be considered a relative measurement in this case. This effect is somewhat variable depending on the size of the airway and the distance from the duct walls. If

the area is larger than 2.15 ft^2 (0.2 m^2), the effect should be minimal.

Flow Rate in Larger Areas

When checking air velocity or volume flow rate over large areas, multiple spot readings should be taken either using the "sweep" technique or by averaging the readings by hand. When taking multiple readings, it should be noted that large variations might be observed between individual readings. In general, the more readings taken, the more accurate the averaged result will be.

Use on Grilles

Better measuring conditions can be obtained on grilles with adjustable direction vanes if the vanes on the grilles are temporarily straightened before making measurements. This should not significantly affect the flow rate as long as any built in dampers are not accidentally disturbed. It is advisable to use the aperture (the actual effective area of air flow), not the surface area of the grill, in any flow rate calculation. The VELOCICALC Rotating Vane is suitable for both supply and exhaust grilles, and the procedure for both is the same except that the direction arrow

on the instrument head must be aligned correctly with the direction of the air flow. The head should be held close to the grille on exhaust, but the head should not touch the grille.

"Sweep" Technique

In addition to traditional traverse methods, you may prefer to use a "sweep" technique. A continuous and uniform movement of the VELOCICALC Rotating Vane over the entire measurement plane, while the **SAMPLE** key is depressed, will produce a time-averaged reading.

If you attempt to rely solely on this method, you should verify your "sweep" technique against conventional traverse methods.

Chapter 3

Maintenance

The VELOCICALC® Rotating Vane requires very little maintenance to keep it performing well.

Care and Maintenance

Remove the batteries from the instrument if not used for an extended period of time.

Do *not* bend or touch blades or accuracy will be affected. Do *not* immerse in liquids. Do *not* drop the instrument.

Use the carrying case for storage, transport, and protection from dust. Use a clean damp cloth to wipe the instrument case. Do *not* wipe the blades.

Return the VELOCICALC Rotating Vane for service if the instrument was dropped, blades were deformed, or liquid spilled on the instrument, the blades in particular.

Service and Calibration Information

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

Before sending your instrument for calibration or repair, you should call TSI Customer Service at (800) 874-2811. TSI will provide you with the cost of service or calibration, Return Material Authorization (RMA) number, and shipping instructions.

Chapter 4

Troubleshooting

Table 2 lists the symptoms, possible causes, and recommended solutions for common symptoms encountered with the VELOCICALC® Rotating Vane. If your symptom is not listed, or none of the solutions solves your problem, please contact TSI.

Table 2: Troubleshooting the VELOCICALC

Symptom	Possible Causes	Corrective Actions
No display	Unit not switched on	Press the **ON/OFF** key
	Low or dead batteries	Replace the batteries
	Dirty battery contacts	Clean the battery contacts
	Batteries installed incorrectly	Check the battery alignment against illustration inside battery cover
Display reads "LO BATT"	Batteries are getting low	Replace the batteries

Symptom	Possible Causes	Corrective Actions
BATT flashes and then no display	Batteries are dead	Replace the batteries
Display reads “Ur” for temp value	Temperature is under range	Make sure parameters are within range
	Temperature sensor is damaged	Return to factory for repair
Display reads “Or” for temp value	Temperature is over range	Make sure parameters are within range
	Temperature sensor is damaged	Return to factory for repair
Display reads “Or” for Velocity value	Velocity is over range	Make sure parameters are within range
	Instrument is damaged	Return to factory for repair
Display reads “CAL”	Instrument is out of calibration	Return to factory for recalibration

Appendix A

Specifications

Specifications are subject to change without notice.
Specifications in parentheses () indicate metric equivalents.

MEASUREMENT RANGE:

Velocity	50 – 6,000 fpm (0.25 - 30 m/s) 0.57 - 68 mph (0.9 - 110 km/h)
Temperature	32 - 140 °F (0 - 60 °C)

DISPLAYED VOLUMETRIC FLOW RATE:
4 - 5400 x 1,000 cfm (1.9 - 2548 x 1,000 l/s;
6.8 - 9174 x 1,000 m^3/h)
Actual range is a function of velocity x area input.

Area Input	0.08 - 900 ft^2 (0.007 - 83 m^2)

DISPLAY RESOLUTION:

Velocity	1 fpm (0.001 m/s under 10.00 m/s, 0.01 m/s otherwise)
Temperature	1 °F (1 °C)

ACCURACY:

Velocity	±1% of reading or 5 fpm (or 0.025 m/s), whichever is greater
Temperature	±2 °F (1 °C)

DISPLAY:
4 digit, 0.45 in. (11 mm) high LCD with 2.5 digit, 0.15 in. (3.8 mm) high temperature indicator

INSTRUMENT STORAGE TEMPERATURE:
14 - 140 °F (-10 - 60 °C)

INSTRUMENT OPERATING TEMPERATURE:
32 - 140 °F (0 - 60 °C)

POWER SOURCE:
4 AA-size Alkaline or NiCd batteries

BATTERY LIFE:
Approximately 24 hours continuous use with alkaline batteries. NiCd batteries will result in less battery life.

OVERALL DIMENSIONS:
11.5 L x 4.0 H x 1.8 D in. (29.2 L x 10.2 H x 4.7 D cm)

WEIGHT: (batteries included) 13.1 oz. (370 g)

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