Air Velocity Transducer

Model 8455/8465/8475

Operation and Service Manual

1980239, Revision K
July 2022

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Seller warrants the goods, excluding software, sold hereunder, under normal use and service as described in the operator's manual, to be free from defects in workmanship and material for **24 months**, or if less, the length of time specified in the operator's manual, from the date of shipment to the customer. This warranty period is inclusive of any statutory warranty. **This limited warranty is subject to the following exclusions and exceptions**:

a. Hot-wire or hot-film sensors used with research anemometers, and certain other components when indicated in specifications, are warranted for 90 days from the date of shipment;
b. Pumps are warranted for hours of operation as set forth in product or operator's manuals;
c. Parts repaired or replaced as a result of repair services are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment;
d. Seller does not provide any warranty on finished goods manufactured by others or on any fuses, batteries or other consumable materials. Only the original manufacturer's warranty applies;
e. This warranty does not cover calibration requirements, and seller warrants only that the instrument or product is properly calibrated at the time of its manufacture. Instruments returned for calibration are not covered by this warranty;
f. This warranty is VOID if the instrument is opened by anyone other than a factory authorized service center with the one exception where requirements set forth in the manual allow an operator to replace consumables or perform recommended cleaning;
g. This warranty is VOID if the product has been misused, neglected, subjected to accidental or intentional damage, or is not properly installed, maintained, or cleaned according to the requirements of the manual. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

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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

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Introduction

The TSI® air velocity transducer is a precision instrument designed to measure air velocity in fixed installations or test applications. **TSI Transducers indicate velocity at standard conditions of 21.1°C (70°F) and 101.4 kPa (14.7 psia).** Each transducer must be setup in the field for the desired velocity units, full-scale velocity, output signal and time constant.

Parts Identification

Carefully unpack the instrument and accessories. Check the parts against Figure 1. If any are missing or damaged notify your local distributor or TSI® immediately.

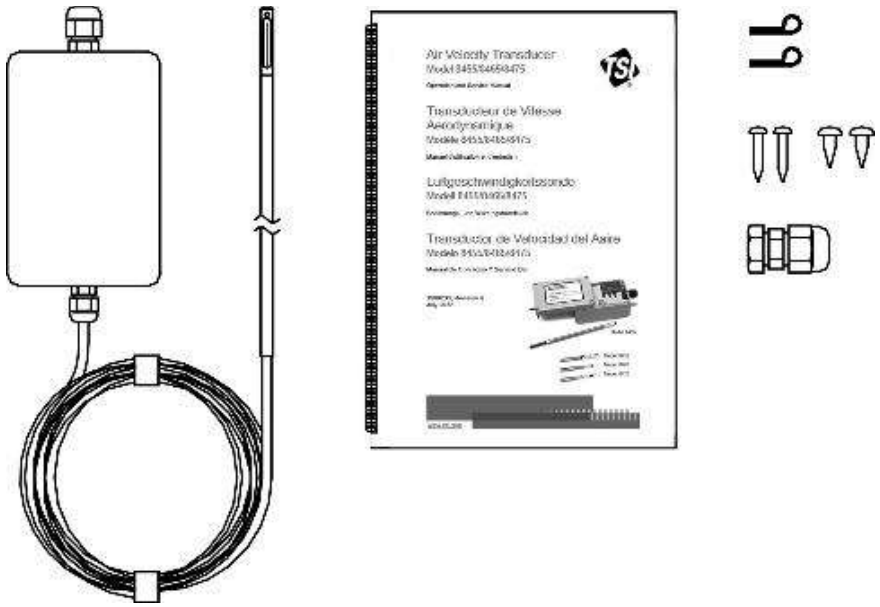


Figure 1/F

8455/65/75	Transducer
1980239	Manual
1309091	Probe mounting clips
5000285	#6 Sheet Metal Screws
5000286	#10 Sheet Metal Screws
2919020	Compression Fitting
2404624	Instruction Labels

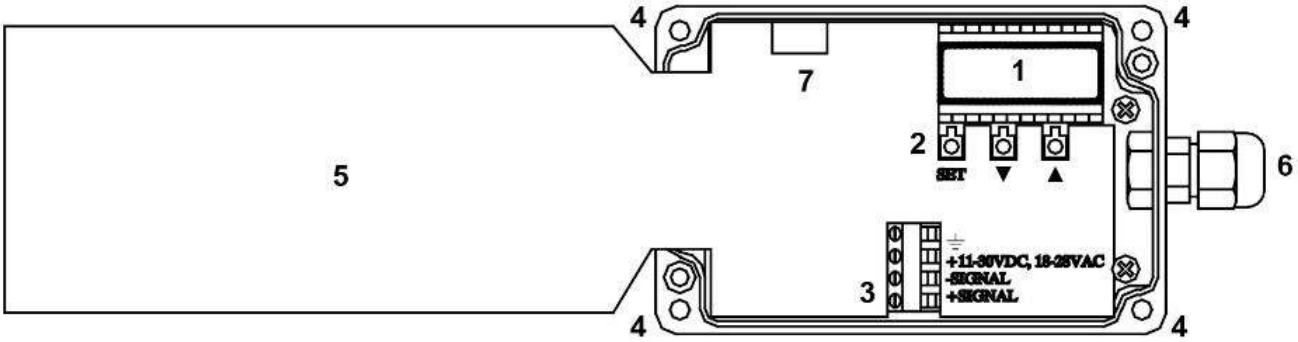


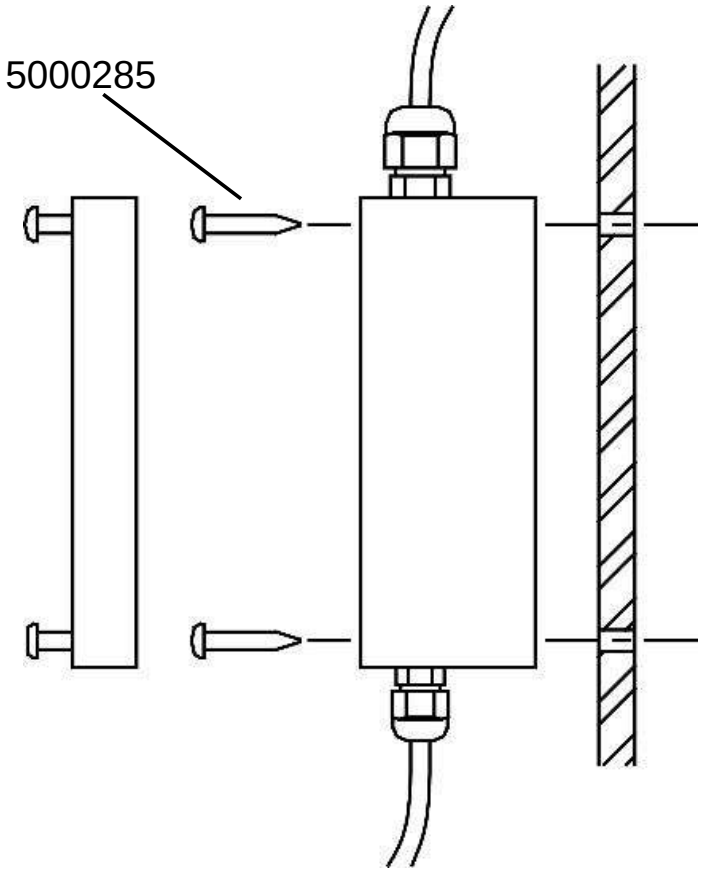
Figure 2: Inside of Electronic Enclosure

1. Setup/Troubleshooting Display
2. Push-Buttons (SET, ▲, ▼)
3. Terminal Block
4. Mounting Holes
5. Programming Instructions (foldout)
6. Compression Fitting (Power)
7. Calibration Connector, Factory use only

Mounting the Transducer Electronics Enclosure

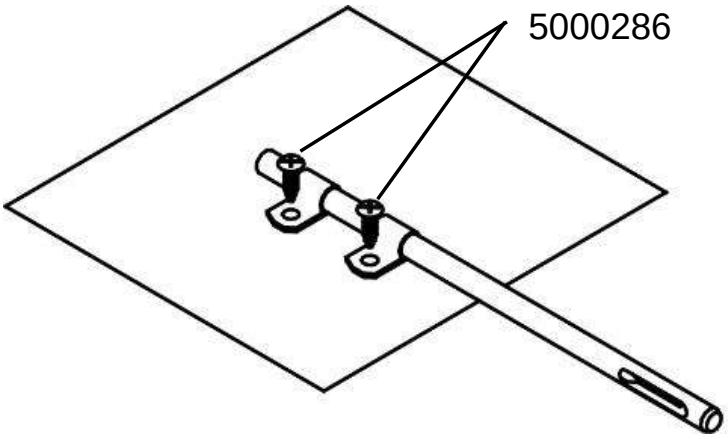
The electronics enclosure should be mounted to a secure surface.

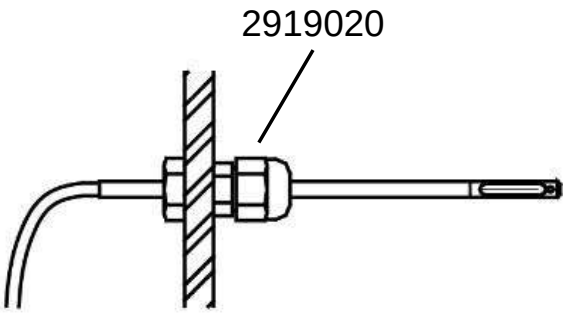
W A R N I N G
DO NOT change the length of the transducer probe cable. Changing the cable length will alter the performance and calibration of the Transducer.



Mounting the Transducer Probe

The probe should be securely mounted before use. If mounted in a duct or pipe the probe should be at least 7.5 duct diameters downstream and 3 duct diameters upstream of anything that could cause flow turbulence. The orientation dot on the probe should face upstream.

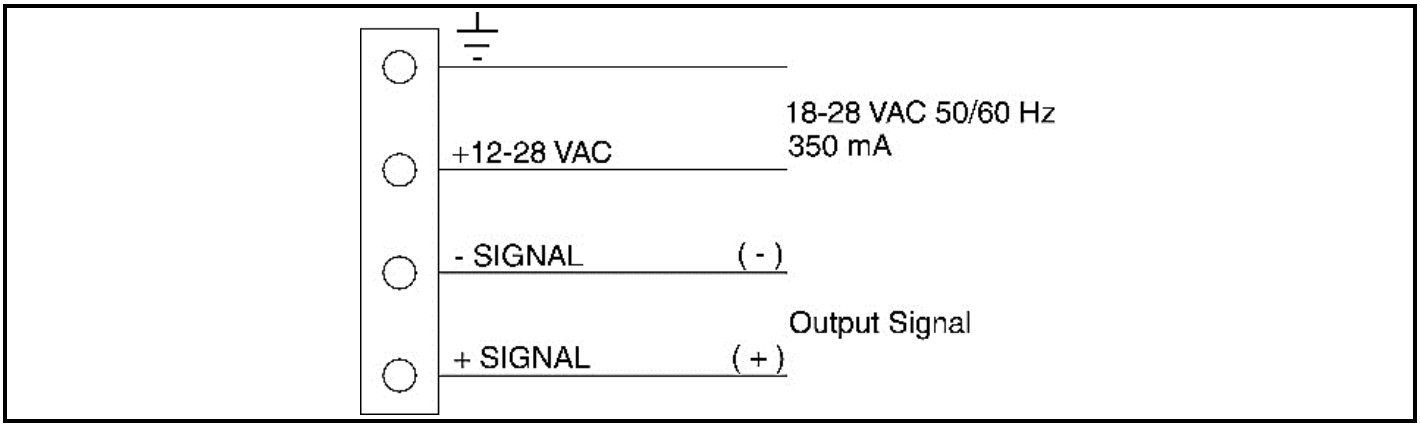




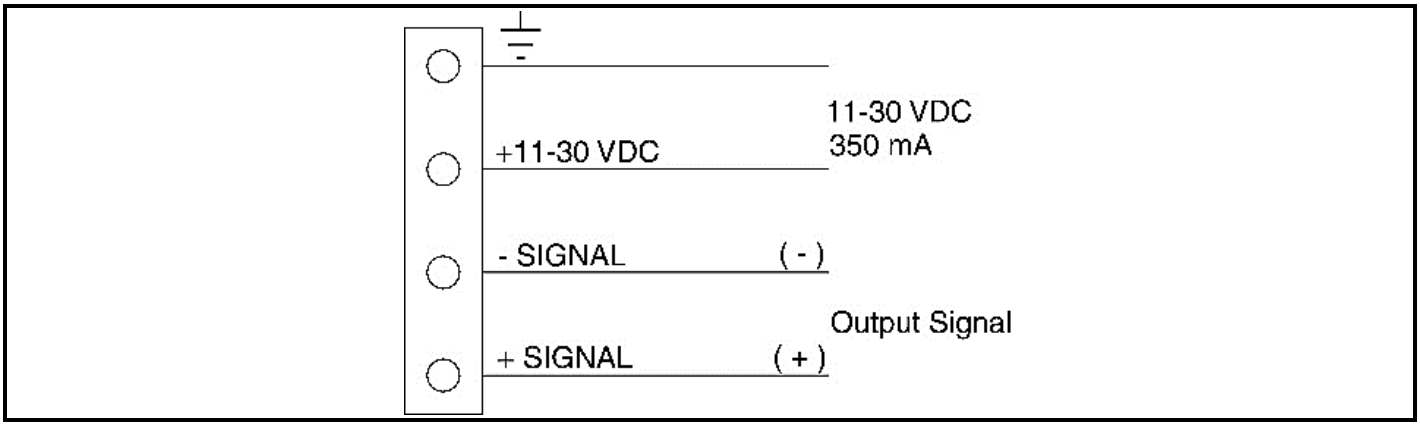
Wiring the Transducer

Position the wires away from the SET - ▲ - ▼ push-buttons

Power Requirements	11-30 VDC or 18-28 VAC 50/60 Hz, 350 mA
Recommended Wire	18 gauge shielded cable. To avoid electrical interference, connect shield to ground on transducer and ground or minus(-) terminal on power supply.
Recommended Transformer	24 VAC, 20 VA. Each transducer should have a separate AC transformer to avoid shorting through the ground circuit.



Wiring for AC-Powered Operation



Wiring for DC-Powered Operation

Output Measuring Device: Use a fully differential input device (no ground connection, plus (+) and minus (-) terminals are independent), so the signal can float at the measuring device. If fully differential input is not available, current (mA) output should be selected.

Setting Up the Transducer

1. Turn the transducer power supply on. The instrument will go through a preprogrammed power-up sequence. The internal display will sequence through the current settings: Calibration date "**CALdAtE**", "**=**", month and year "**03.2013**"(March 2013), measurement units "**mEtErS**"(m/s) or "**FEET**"(ft/min), "**=**", selected output type and range "**0-5V**" and the time constant "**tc = 1.00**" in seconds. The display will then show velocity readings.
2. Push the **SET** button to enter setup mode. When setup mode is entered, the transducer voltage/current output will drop below zero.
3. Use the ▲ and ▼ buttons to select the desired setting.
4. Use the **SET** button to advance to the next setup message.

N O T I C E
The output signal is disabled during the 15 second warm-up period and when the transducer is in setup mode.

Setup Message	Available Settings
SELECt UnitS	FEEt (ft/min) or mEtErS (m/s)
SELECt FULL SCALE	Select full scale of the velocity range
SELECt OUtPUt	Select Output Type: 0-5V, 0-10V, 1-5V, 2-10V, 4-20 mA, 0-20 mA
SELECt tc	Select Time Constant: 0.05 to 10 seconds (see page 12)
AdJUSt ZErO	Adjusts voltage/current output signal at zero velocity (see page 14)
AdJUSt SPAn	Adjusts the voltage/current output by ±15% (see page 13)

More Detail on the Time Constant

In order to make a fluctuating display easier to read, the output time constant can be set between 0.05 and 10 seconds. The time constant is actually an averaging period. The output is the average of readings taken over the last time-constant period. Readings are taken 20 times per time constant period for a time constant greater than one second and 20 times per second for a time constants of one second or less.

More Detail on Span Adjustment

A span factor can be entered to adjust the output signal up or down by fifteen percent. While the span factor is shown on the display, the transducer will measure velocity and output the appropriate voltage or current for that velocity. (The time constant will not be active). By changing the span factor, the transducer's output signal can be adjusted up or down by up to fifteen percent.

More Detail on Adjusting Output Signal at Zero Velocity

In certain cases, the remote display will not read the same as the transducer display output at zero velocity. To correct this discrepancy you will need to adjust the output signal at zero velocity. Put the transducer into setup mode and sequence through the setup messages until "**AdJUSt ZErO"** is shown on the display. The transducer then displays and outputs the voltage or current that has been set as the zero value. Adjust the transducer output voltage or current using the ▲ and ▼ pushbuttons. Adjust the output signal until the remote device displays the expected zero. The transducer displays the voltage or current that corresponds to the factory calibration. The velocity readings should now be the same on both the setup/troubleshooting display and the remote display.

Converting the Output Signal

In order to convert the transducer output signal into a velocity, use the following equation:

$$V = \frac{E_{out} - E_o}{E_{FS} - E_o} * V_{FS}$$

V = Measured Velocity
V_{FS} = Full Scale Velocity Setting in ft/min or m/s
E_{out} = Measured output Voltage or Current Signal
E_o = Zero Flow Output Voltage or Current
E_{FS} = Full Scale Voltage or Current Output

For example, if the actual output voltage is 2.6 volts for a transducer with Full scale Velocity = 50 m/s and output type = 1-5 Volts:

$$V = \frac{2.6\ Volts - 1.0\ Volts}{5.0\ Volts - 1.0\ Volts} * 50\ m/s = 20\ m/s$$

Troubleshooting

Symptom	Possible Problem & Solutions
No output or low output	Incorrect input voltage
	Sensor positioned incorrectly
	Sensor not extended beyond protective shield
	Wrong output type/range selected
	Loose power or signal connections
	Incorrect full scale velocity range selected
Displayed velocity is hard to read	Internal display is for setup/troubleshooting only
Accuracy of velocity reading suspect	Dirty sensor, check for dirt or dust buildup.
Erratic readings	Turbulent flow, check positioning of sensor, increase time constant to dampen reading.

Cleaning the Sensor

Dust and dirt may build up on the sensor. If necessary, carefully clean the sensor using a soft bristle brush dipped in a mild solvent like alcohol.

Recalibration

To maintain a high degree of accuracy in your velocity measurements, TSI® recommends that you have your instrument recalibrated annually.

Specifications

Models 8455, 8465, 8475

	8455	8465	8475
Accuracy.....	±2.0% of reading[1]	±2.0% of reading[1]	±3.0% of reading[2]
	±0.5% of full scale of selected range	±0.5% of selected full scale range	±1.0% of selected full scale range
Repeatability	<±1.0% of reading[3]	<±1.0% of reading[3]	NA
Response Time to Flow...	0.2 sec[4]	0.2 sec[4]	5 sec[5]

Common specifications to all models
Field Selectable Velocity Ranges
Model 8455/8465 .....0.125 m/s to 1.0, 1.25, 1.50, 2.0, 2.5, 3.0, 4.0, 5.0, 7.5, 10.0, 12.5, 15.0, 20.0, 25.0, 30.0, 40.0, 50.0 m/s (25 ft/min to 200, 250, 300, 400, 500, 750, 1000, 1250, 1500, 2000, 2500, 3000, 4000, 5000, 7500, 10000 ft/min)
Model 8475 .....0.05 m/s to 0.5, 0.75, 1.00, 1.25, 1.50, 2.0, 2.5 m/s (10 ft/min to 100, 125, 150, 200, 250, 300, 400, 500 ft/min)
Minimum Resolution ....0.07% of selected full scale
Input Power .....11-30 VDC or 18-28 VAC, 350 mA max[6]
Output Impedance .....Voltage mode: less than 1 ohm, 20 mA max source current
Output Resistance .....Current mode: 500 ohms maximum load resistance
Output Signal (field selectable).....0-5V, 0-10V, 1-5V, 2-10V, 0-20 mA, 4-20 mA
Output Time Constant (field selectable) ..... 0.05 to 10 seconds.
Probe Length.....7.5 cm, 15 cm, 21.5 cm or 30 cm (3 in, 6 in, 9 in or 12 in)
Temperature .....**Compensation Range:** 0 to 60°C (32 to 140°F)
Sensor Operation: 0 to 93°C (32 to 200°F)
Electronics Operation: 0 to 93°C (32 to 200°F)
Storage: 0 to 93°C (32 to 200°F)

1 from 18 to 28°C (64.4 to 82.4°F), outside this range add 0.2% per °C (0.11% per °F), within temperature compensation range.
2 from 20 to 26°C (68 to 78.8°F), outside this range add 0.5% per °C (0.28% per °F), within temperature compensation range. Uncertainty increases in downward vertical flow at velocities less than 0.25 m/s (50 ft/min). Directional sensitivity of the Model 8475 is +5%/-20% of reading +0/-0.05 m/s (+0/-10 ft/min) over 270° solid angle regardless of flow direction.
3 Standard deviation based on one minute average from 0.5 to 5.0 m/s (100 to 1000 ft/min).
4 For 63% of final value, tested at 7.5 m/s (1000 ft/min).
5 For 63% of final value, tested at 2.5 m/s (500 ft/min).
6 Input voltage must be maintained within specifications at the transducer. Calibration occurs with sensor oriented horizontally in a horizontal air flow.