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Air Velocity Measurement

Introduction

In air conditioning, heating and ventilating work, it is helpful to understand the techniques used to determine air velocity. In this field, *air velocity* (distance traveled per unit of time) is usually expressed in feet per minute (FPM). By multiplying air velocity by the cross section area of a duct, you can determine the air volume flowing past a point in the duct per unit of time. *Volume flow* is usually measured in cubic feet per minute (CFM).

Velocity or volume measurements can often be used with engineering handbook or design information to reveal proper or improper performance of an airflow system. The same principles used to determine velocity are also valuable in working with pneumatic conveying, flue gas flow and process gas systems. However, in these fields the common units of velocity and volume are sometimes different from those used in air conditioning work.

To move air, fans or blowers are usually used. They work by imparting motion and pressure to the air with either a screw propeller or paddle wheel action. When force or pressure from the fan blades causes the air to move, the moving air acquires a force or pressure component in its direction of motion due to its weight and inertia. Because of this, a flag or streamer will stand out in the air stream. This force is called *velocity pressure*. It is measured in inches of water column (w.c.) or water gage (w.g.). In operating duct systems, a second pressure is always present. It is independent of air velocity or movement. Known as *static pressure*, it acts equally in all directions. In air conditioning work, this pressure is also measured in inches w.c.

In pressure or supply systems, static pressure will be positive on the discharge side of the fan. In exhaust systems, a negative static pressure will exist on the inlet side of the fan. When a fan is installed midway between the inlet and discharge of a duct system, it is normal to have a negative static pressure at the fan inlet and positive static pressure at its discharge.

Total pressure is the combination of static and velocity pressures, and is expressed in the same units. It is an important and useful concept to use because it is easy to determine and, although velocity pressure is not easy to measure directly, it can be determined easily by subtracting static pressure from total pressure. This subtraction need not be done mathematically. It can be done automatically with the instrument hook-up.

Sensing Static Pressure

For most industrial and scientific applications, the only air measurements needed are those of static pressure, total pressure and temperature. With these, air velocity and volume can be quickly calculated.

To sense static pressure, six types of devices are commonly used. These are connected with tubing to a pressure indicating instrument. Fig. 1-A shows a simple thru-wall static pressure tap. This is a sharp, burr-free opening through a duct wall provided with a tubing connection of some sort on the outside. The axis of the tap or opening must be perpendicular to the direction of flow. This type of tap or sensor is used where air flow is relatively slow, smooth and without turbulence. If turbulence exists, impingement, aspiration or unequal distribution of moving air at the opening can reduce the accuracy of readings significantly.

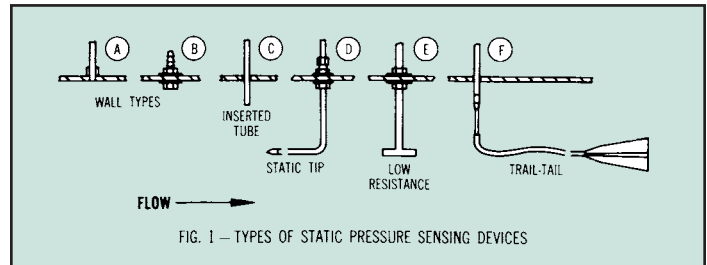


Fig. 1-B shows the Dwyer No. A-308 Static Pressure Fitting. Designed for simplified installation, it is easy to install, inexpensive, and provides accurate static pressure sensing in smooth air at velocities up to 1500 FPM.

Fig. 1-C shows a simple tube through the wall. Limitations of this type are similar to wall type Fig. 1-A.

Fig. 1-D shows a static pressure tip which is ideal for applications such as sensing the static pressure drop across industrial air filters and refrigerant coils. Here the probability of air turbulence requires that the pressure sensing openings be located away from the duct walls to minimize impingement and aspiration and thus insure accurate readings. For a permanent installation of this type, the Dwyer No. A-301 or A-302 Static Pressure Tip is used. It senses static pressure through radially-drilled holes near the tip and can be used in air flow velocities up to 12,000 FPM.

Fig. 1-E shows a Dwyer No. A-305 low resistance Static Pressure Tip. It is designed for use in dust-laden air and for rapid response applications. It is recommended where a very low actuation pressure is required for a pressure switch or indicating gage — or where response time is critical.

Under field conditions, air turbulence in a duct or plenum often makes it impossible to quickly install and align a rigid static pressure sensor to take accurate readings. Under these circumstances, the Dwyer Trail-Tail® Static Pressure Sensor (Fig. 1-F), can be quickly inserted through a small hole in the duct and will trail into automatic alignment with the air stream. The pressure sensing holes in this device are thus presented at a 90° angle to actual air flow assuring quick, consistent, accurate readings.

Measuring Total Pressure and Velocity Pressure

In sensing static pressure we make every effort to eliminate the effect of air movement. To determine velocity pressure, it is necessary to determine these effects fully and accurately. This is usually done with an impact tube which faces directly into the air stream. This type of sensor is frequently called a “total pressure pick-up” since it receives the effects of both static pressure and velocity pressure.

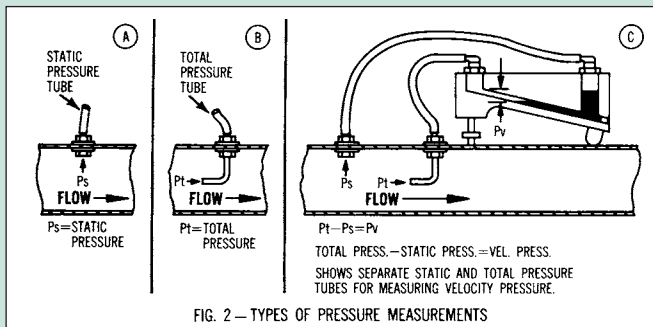


FIG. 2 — TYPES OF PRESSURE MEASUREMENTS

In Figure 2, note that separate static connections (A) and total pressure connections (B) can be connected simultaneously across a manometer (C). Since the static pressure is applied to both sides of the manometer, its effect is cancelled out and the manometer indicates only the velocity pressure.

To translate velocity pressure into actual velocity requires either mathematical calculation, reference to charts or curves, or prior calibration of the manometer to directly show velocity. In practice this type of measurement is usually made with a Pitot tube which incorporates both static and total pressure sensors in a single unit.

Essentially, a Pitot tube consists of an impact tube (which receives total pressure input) fastened concentrically inside a second tube of slightly larger diameter which receives static pressure input from radial sensing holes around the tip. The air space between the inner and outer tubes permits transfer of pressure from the sensing holes to the static pressure connection at the opposite end of the Pitot tube and then, through connecting tubing, to the low or negative pressure side of a manometer. When the total pressure tube is connected to the high pressure side of the manometer, velocity pressure is indicated directly. See Figure 3.

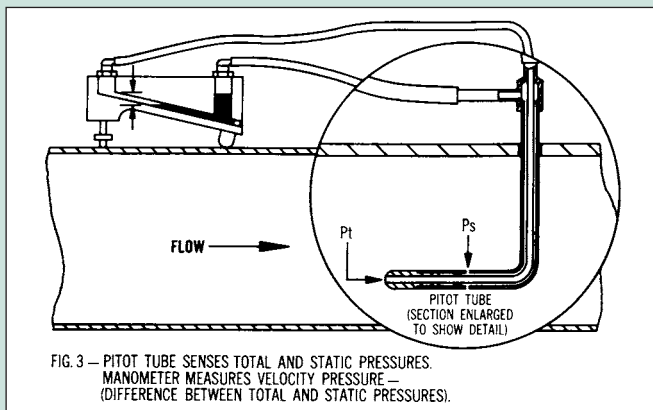


FIG. 3 — PITOT TUBE SENSES TOTAL AND STATIC PRESSURES. MANOMETER MEASURES VELOCITY PRESSURE — (DIFFERENCE BETWEEN TOTAL AND STATIC PRESSURES).

Since the Pitot tube is a primary standard device used to calibrate all other air velocity measuring devices, it is important that great care be taken in its design and fabrication. In modern Pitot tubes, proper nose or tip design — along with sufficient distance between nose, static pressure taps and stem — will minimize turbulence and interference. This allows use without correction or calibration factors. All Dwyer Pitot tubes are built to AMCA and ASHRAE standards and have unity calibration factors to assure accuracy.

To insure accurate velocity pressure readings, the Pitot tube tip must be pointed directly into (parallel with) the air stream. As the Pitot tube tip is parallel with the static pressure outlet tube, the latter can be used as a pointer to align the tip properly. When the Pitot tube is correctly aligned, the pressure indication will be maximum.

Because accurate readings cannot be taken in a turbulent air stream, the Pitot tube should be inserted at least $8\frac{1}{2}$ duct diameters downstream from elbows, bends or other obstructions which cause turbulence. To ensure the most precise measurements, straightening vanes should be located 5 duct diameters upstream from the Pitot tube.

How to Take Traverse Readings

In practical situations, the velocity of the air stream is not uniform across the cross section of a duct. Friction slows the air moving close to the walls, so the velocity is greater in the center of the duct.

To obtain the average total velocity in ducts of 4" diameter or larger, a series of velocity pressure readings must be taken at points of equal area. A formal pattern of sensing points across the duct cross section is recommended. These are known as traverse readings. Figure 4 shows recommended Pitot tube locations for traversing round and rectangular ducts.

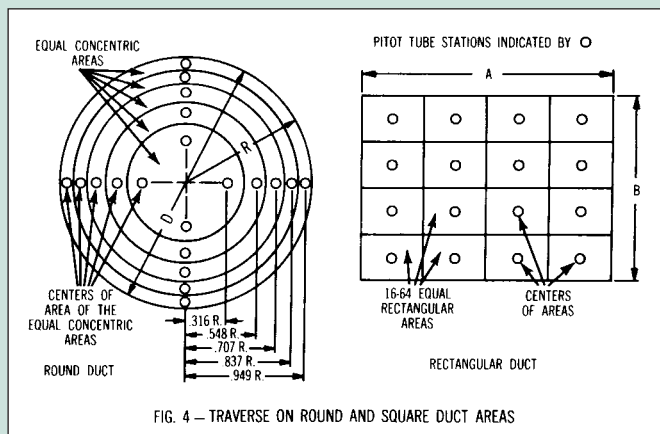


FIG. 4 — TRAVERSE ON ROUND AND SQUARE DUCT AREAS

In round ducts, velocity pressure readings should be taken at centers of equal concentric areas. At least 20 readings should be taken along two diameters. In rectangular ducts, a minimum of 16 and a maximum of 64 readings are taken at centers of equal rectangular areas. Actual velocities for each area are calculated from individual velocity pressure readings. This allows the readings and velocities to be inspected for errors or inconsistencies. The velocities are then averaged.

By taking Pitot tube readings with extreme care, air velocity can be determined within an accuracy of $\pm 2\%$. For maximum accuracy, the following precautions should be observed:

1. Duct diameter should be at least 30 times dia. of Pitot tube.
2. Locate the Pitot tube in a duct section providing $8\frac{1}{2}$ or more duct diameters upstream and 5 or more diameters downstream of Pitot tube free of elbows, size changes or obstructions.
3. Provide an egg-crate type of flow straightener 5 duct diameters upstream of Pitot tube.
4. Make a complete, accurate traverse.

In small ducts or where traverse operations are otherwise impossible, an accuracy of $\pm 5\%$ can frequently be achieved by placing Pitot tube in center of duct. Determine velocity from the reading, then multiply by 0.9 for an approximate average.

Calculating air velocity from velocity pressure

Manometers for use with a Pitot tube are offered in a choice of two scale types. Some are made specifically for air velocity measurement and are calibrated directly in feet per minute. They are correct for standard air conditions: i.e. air density of .075 lbs. per cubic foot which corresponds to dry air at 70°F, barometric pressure of 29.92 inches Hg. To correct the velocity reading for other than standard air conditions, the actual air density must be known. It may be calculated if relative humidity, temperature and barometric pressure are known.

Most manometer scales are calibrated in inches of water. Using readings from such an instrument, the air velocity may be calculated using the basic formula:

$$V = 1096.7 \sqrt{\frac{h_v}{d} \left\{ \begin{array}{l} = 4004.4 \sqrt{h_v} \text{ for } .075 \text{ lb/ft}^3 \text{ dry air} \\ @ 70^\circ\text{F, } 29.92 \text{ in. Hg Baro.} \end{array} \right\}}$$

Where: V = Velocity in *feet per minute*.
 h_v = Velocity pressure in *inches of water*.
 d = Density of air in *pounds per cubic foot*.

To determine dry air density, use the formula:

$$d = 1.325 \frac{P_B}{T}$$

Where: d = Air density in *pounds per cubic foot*.
 P_B = { Barometric (or absolute) static pressure }
 in *inches of mercury*.
 T = Absolute temperature (indicated temperature in °F plus 460°).

With dry air at 29.9 inches mercury, air velocity can be read directly from curves on the following page. For partially or fully saturated air a further correction is required. To save time when converting velocity pressure into air velocity, the Dwyer Air Velocity Calculator may be used. A simple slide rule, it provides for all the factors needed to calculate air velocity quickly and accurately. It is included as an accessory with each Dwyer Pitot tube.

To use the Dwyer Calculator:

1. Set relative humidity on scale provided. On scale opposite known dry bulb temperature, read correction factor.
2. Set temperature under barometric pressure scale. Read density of air over correction factor established in 1 (above).
3. On the other side of calculator, set air density reading just obtained on the scale provided.
4. Under Pitot tube reading (velocity pressure, inches of water) read air velocity, feet per minute.

Determining Volume Flow

Once the average air velocity is known, the air flow rate in cubic feet per minute is easily computed using the formula:

$$Q = AV$$

Where: Q = Quantity of flow in *cubic feet per minute*.
 A = Cross sectional area of duct in *square feet*.
 V = Average velocity in *feet per minute*.

Determining Air Volume by Calibrated Resistance

Manufacturers of air filters, cooling and condenser coils and similar equipment often publish data from which approximate air flow can be determined. It is characteristic of such equipment to cause a pressure drop which varies proportionately to the square of the flow rate. Figure 5 shows a typical filter and a curve for air flow versus resistance. Since it is plotted on logarithmic paper, it appears as a straight line. On this curve, a clean filter which causes a pressure drop of .50 inches w.c. would indicate a flow of 2,000 c.f.m.

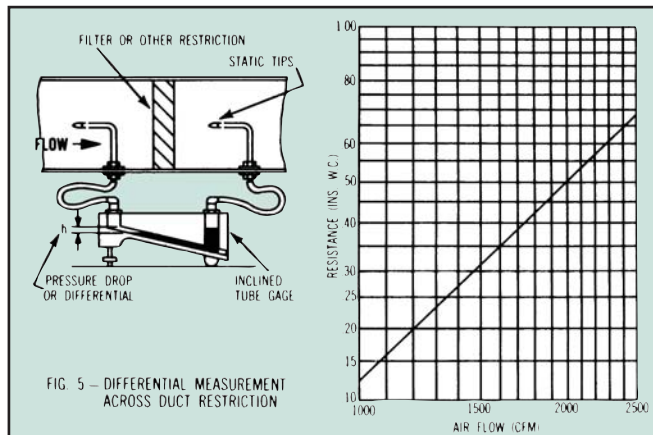


FIG 5 - DIFFERENTIAL MEASUREMENT ACROSS DUCT RESTRICTION

For example, assuming a manufacturer's specification for a filter, coil, etc:

Given Flow Q (ft³/min.) = at differential "h"
 (inches w.c.)

To determine flow at other differentials the formula is:

$$Q_n \text{ (other flows)} = Q \sqrt{\frac{h_n}{h}}$$

Where: Q = Quantity of flow in *cubic feet per minute*
 h = differential in *inches water column*
 h_n = differential (other flow conditions)

Other Devices for Measuring Air Velocity

A wide variety of devices are commercially available for measuring air velocities. These include hot wire anemometers for low air velocities, rotating and swinging vane anemometers and variable area flowmeters.

The Dwyer No. 460 Air Meter is one of the most popular and economical variable area flowmeter type anemometers. Quick and easy to use, it is a portable instrument calibrated to provide a direct reading of air velocity.

A second scale is provided on the other side of the meter to read static pressure in inches w.c. The 460 Air Meter is widely used to determine air velocity and flow in ducts, and from supply and return grilles and diffusers. Two scale ranges are provided (high and low) with calibrations in both f.p.m. and inches w.c.

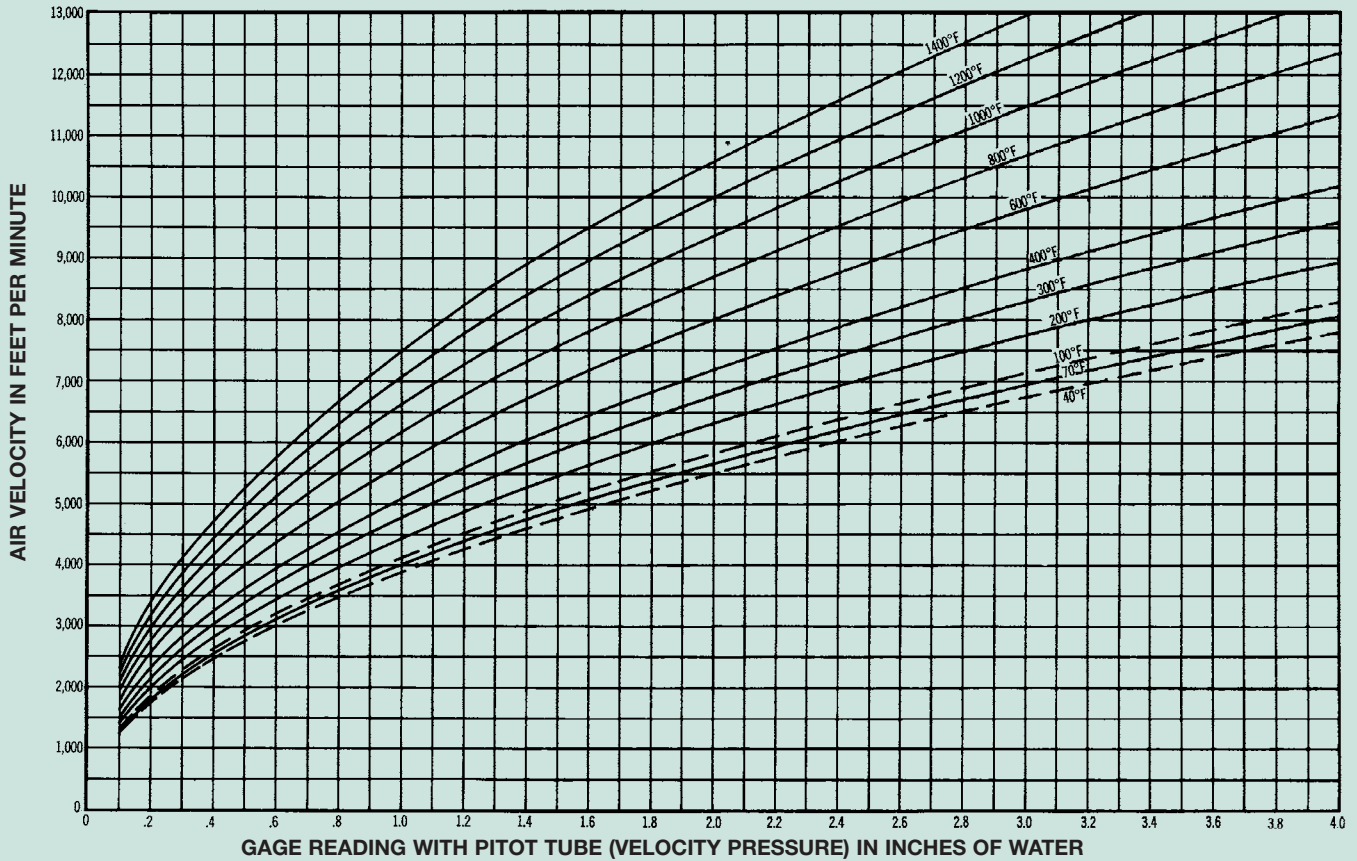
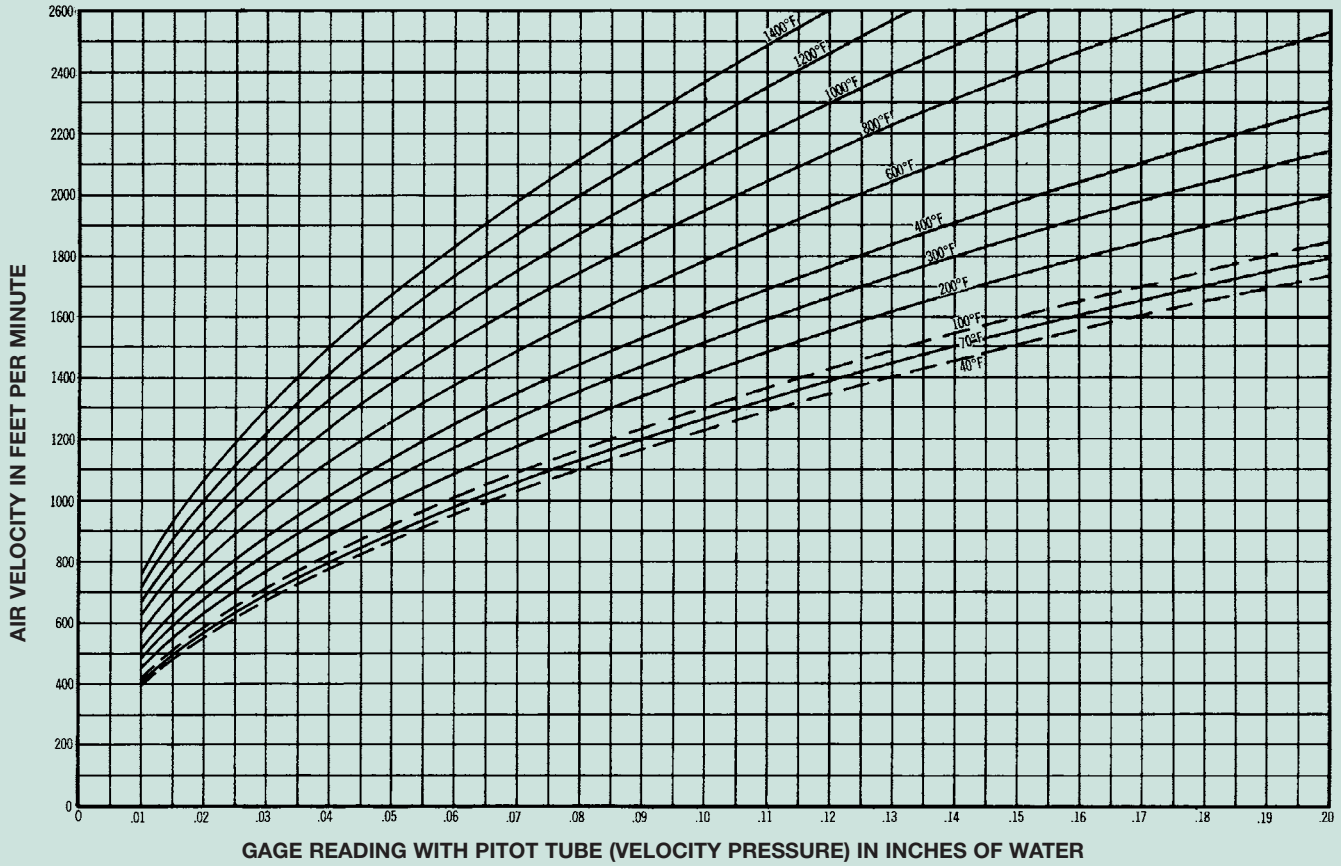
To Check Accuracy

Use only devices of certified accuracy. All anemometers and to a lesser extent portable manometers should be checked regularly against a primary standard such as a hook gage or high quality micromanometer. If in doubt return your Dwyer instrument to the factory for a complete calibration check at no charge.



AIR VELOCITY FLOW CHARTS

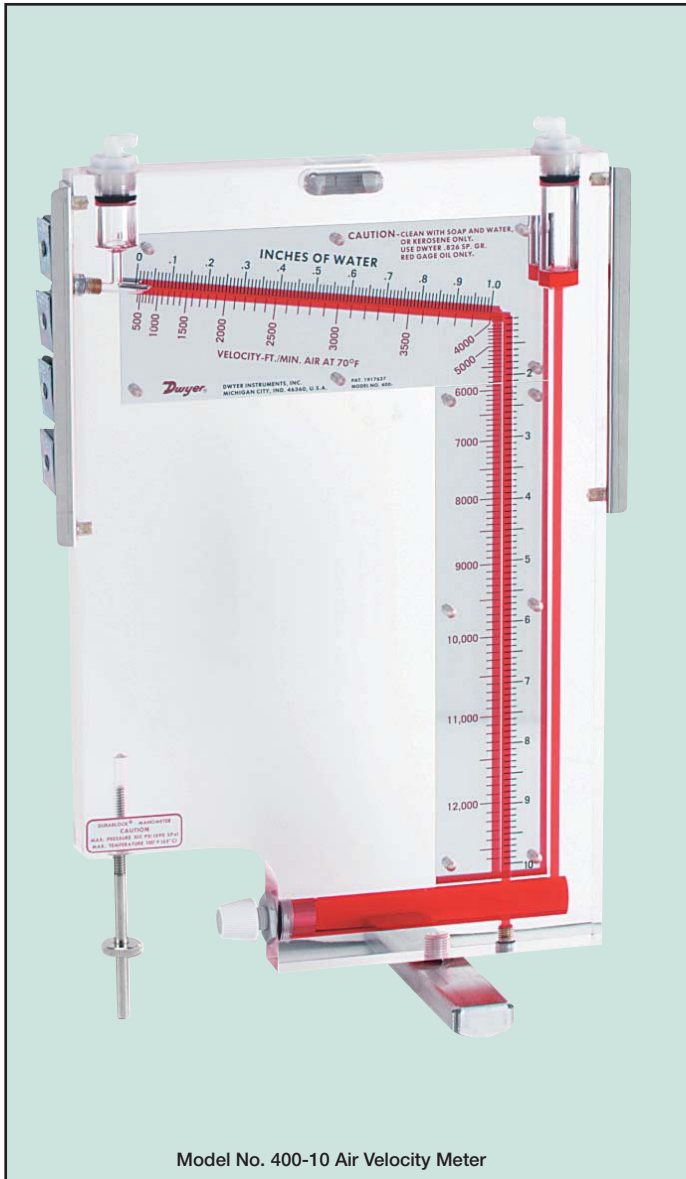
Air Velocity





Series
400

Air Velocity Meters



Model No. 400-10 Air Velocity Meter

Measure both pressure and air velocity

Read the red figures directly in feet per minute of velocity — from 400 to 10,000 f.p.m. No conversion tables needed for air at standard conditions. Read the black figures in inches of water column air pressure — from 0 to 10" w.c.

Our most popular precision air velocity instrument, the No. 400 is used to balance air conditioning systems, measure pressure drop across filters, and test fan and blower discharge and inlet pressures, as well as air velocity in ducts. It offers the convenience of a dual purpose instrument — plus high accuracy on easy-to-read scales. A versatile, all around manometer for the air conditioning and balancing contractor or industrial plant.

Kit includes No. 400 Air Meter and all accessories:

Combination Inclined/Vertical Manometer — 3 models (see table). Dwyer Durablock® precision machined solid acrylic plastic construction is virtually indestructible. Has both inclined section for high accuracy and vertical section for extended range. Pressure marked in black, Velocity in red figures. Easy to read — no reference tables needed. Has screw leveling adjustment and ground glass bubble level.

MODELS

Series 400 Air Velocity Meters with Combination Inclined/Vertical Scales Rated for total pressures to 100 psig (6.89 bar); temperatures to 150°F (65°C)					
Model Number	Range in. w.c.	Velocity FPM	Minor Div.; Range, in. w.c.		Pitot Tube
			Inclined Scale	Vertical Scale	
400-5-S-Kit	0-5	400-9000	.01, 0-1.0	.10, 1-5	8 in.
400-5-L-Kit	0-5	400-9000	.01, 0-1.0	.10, 1-5	18 in.
400-5-gage	0-5	400-9000	.01, 0-1.0	.10, 1-5	none
400-10-Kit	0-10	400-12,600	.01, 0-1.0	.10, 1-10	18 in.
400-10-gage	0-10	400-12,600	.01, 0-1.0	.10, 1-10	none
400-23-Kit	0-23	400-19,200	.02, 0-2.3	.20, 2.3-23	18 in.
400-23-gage	0-23	400-19,200	.02, 0-2.3	.20, 2.3-23	none

Accessories:

Stainless Steel Calibrated Pitot Tube — (18" Model 160-18 standard, other lengths available — see price list). Graduated both sides in inches to show insertion depth for easy accurate duct traverse. Clean, burr-free static holes. Suitable for temperatures up to 1500°F.

Rubber Tubing with Connectors — Two coils of 3/8" with metal terminal tubes.

Magneclip side mountings. Attach meter instantly to steel duct or surface.

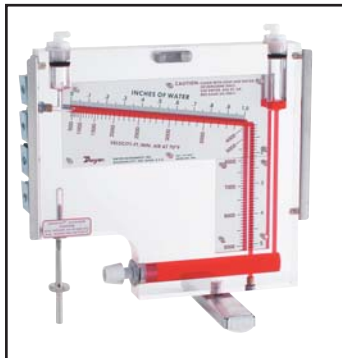
Red Gage Oil—Spare bottle. For occasional refilling. Supply sufficient for several years of normal use. (Blue Gage Oil furnished with Model 400-23).

Instruction Card — Easy to read and understand. Plastic laminated, wipes clean.

Dwyer Air Velocity Calculator — Slide rule eliminates tedious calculations — easily compensates for temperature, humidity and barometric pressure variations.

Steel Carrying Case — Professional quality. Welded seams, enamel finish. Hinged top locks with hasps. Foam plastic lined and fitted to protect meter and accessories. Size* 11½"H x 20¼"W x 1½"D. Only 13¼ lbs. with equipment.

*No. 400-5-S is 11 x 11½ x 2½". Contact factory for extra long steel cases for use with longer Pitot tubes.



Complete Kit, Model 400-10

Left — Model No. 400-5 Air Meter, 0-5" W.C., 400-9000 f.p.m.



Series
100 AV

Durablock® Air Velocity Gage Kits

Suitable for Total Pressures to 100 psig (6.89 bar), Temperatures to 150°F (65.6°C)

Air Velocity



Complete Kit, Model 115-AV

Designed to measure air velocity, static pressure, vacuum or differential pressure, where the additional range of the 400 Series gages is not required. Series 100 Gages offer superb accuracy combined with portability. In Dwyer's Durablock® precision machined solid acrylic plastic construction, the wells and inclined bore are machined to tolerances of ± 0.0002 ".

Design and service features:

Plastic Body – A 1" thick solid acrylic block, virtually unbreakable. It is stable and free of the danger of distortion.

Drilled Bore – Permanently free of bends – never requires recalibration due to distortion.

Reflective Chrome Finish Scales – Easily eliminate parallax errors in reading. Adjustable, with thumbscrew locking for easy zeroing. (Model 125 AV uses screw plunger to adjust zero setting).

Red Gage Oil – .826 specific gravity. Forms a well-shaped, easy-to-read meniscus – the result of high wettability.

Leveling Adjustment – Screw allows quick, accurate leveling. Integral ground glass bubble level provides ready reference.

Standard Equipment for Dwyer Solid Plastic Portable Manometers

Magneclips for Instant Mounting on Any Steel Surface – These mounting magnets are supplied as part of each Dwyer Durablock® solid plastic portable gage. Just touch magnets to any vertical steel surface – gage "stays put" until manually detached.

Molded Nylon Rapid Shut-Off Tubing Connectors – An exclusive Dwyer feature. Leakproof, corrosion-proof, virtually unbreakable. Requires just one turn to open or close. O-rings prevent leaks and provide positive shut-off. Body is easily removed to add fluid or to clean.

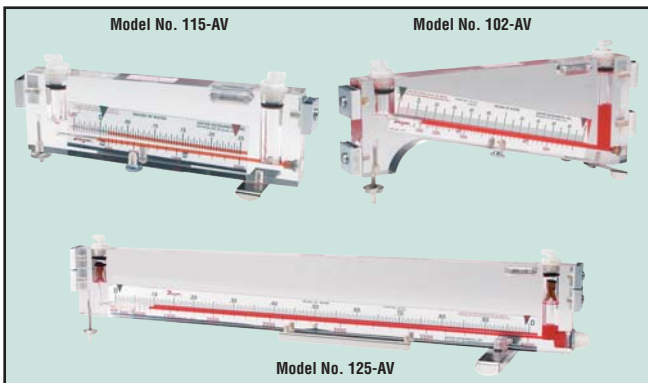
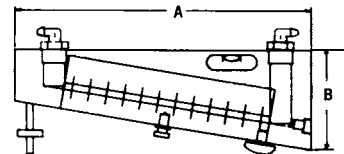
Complete Air Velocity Kits include:

Dwyer Inclined Manometer described below, stainless steel Pitot tube (12" with Models 102-AV & 115-AV, 24" with Model 125-AV and telescoping 36" with Model 115T-AV), two 9' lengths of rubber tubing with connectors, extra red gage oil, instruction card H-7, Bulletin H-11, magnetic mounting clips (see bottom of page), air velocity calculator slide rule and carrying case (plastic with models 102-AV, 115-AV and 115T-AV, steel with model 125-AV).

MODELS

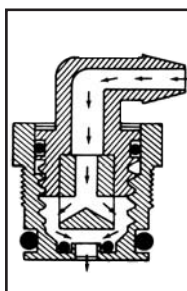
Model No.	Range, Inches of Water	Velocity, Feet per Minute	Minor Scale Divisions	Scale Length	Dimensions, In Inches		Pitot Tube Model—Length
					A	B	
102-AV	.20-0-2.0	400-5500	.02	8 3/4 in.	11 1/2	4 3/4	166-12 12 in.
115-AV	.05-0-.25	400-2000	.005	6 in.	9 3/4	3 3/4	166-12 12 in.
115T-AV	.05-0-.25	400-2000	.005	6 in.	9 3/4	3 3/4	166T 36 in.
125-AV	0-1.0	300-4000	.005	20 in.	23 3/4	4	160-24 24 in.

Model No.	Carrying Case Dimensions
102-AV	13 1/2 X 10 X 2 1/2
115-AV	13 1/2 X 10 X 2 1/2
115T-AV	13 1/2 X 10 X 2 1/2
125-AV	9 X 26 X 1 1/2



Dwyer Air Velocity Calculator — Slide rule easily calculates air velocity and compensates for temperature and pressure variations. Shows velocity pressure from .01" to 10" water column, velocities from 400 to 20,000 f.p.m., etc. Furnished as a standard accessory with all Dwyer Durablock® solid plastic air velocity gages.

Foam-Lined Carrying Cases — Most Dwyer portable air velocity gages are furnished with cases of high density polyethylene. Model No. 125-AV has a steel case. Cases have a resilient polyurethane plastic foam lining to protect and cushion gage and accessories.

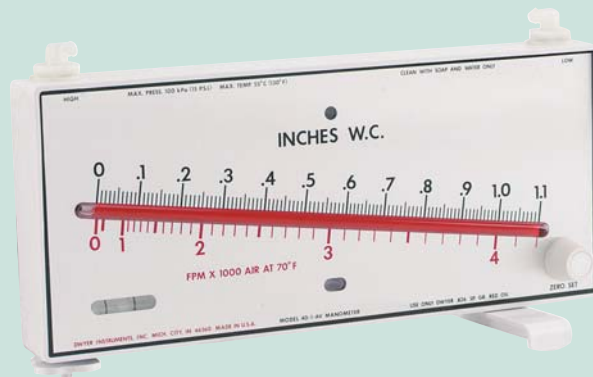




Mark II **Molded Plastic Air Velocity Meters**
 Low in Cost — Direct Reading Scales Offer 3% Accuracy —
 For Portable or Stationary Applications



MODEL 27



MODEL 40-AV — Shown with standard swing-out stand and leveling screw installed.

Air Velocity

Construction and installation features:

Construction is simple with virtually indestructible molded white styrene-acrylonitrile housing, indicating tube and fluid wells, molded ABS knobs and zero adjust plunger, shock mounted glass level vial and leak proof “O”ring seals. Scales are lithograph printed on aluminum and epoxy coated.

For stationary applications, the Mark II air velocity meters can be easily mounted on any vertical surface with the two screws provided. A built in spirit level simplifies leveling.

Just fill the reservoir, adjust fluid level to zero, connect the pitot tube, and it is ready for operation. For portable applications, the Model A-612 portable stand is available for Models 27 and 28.

A molded plastic swing-out stand and leveling screw for user installation are provided with Models 40-1-AV and 41-2-AV which also feature rapid shutoff tubing connectors and built-in over pressure traps.

Additional standard accessories include plastic connection tubing, mounting screws, 3/4 oz. bottle of indicating fluid and instructions. Metric ranges are also available.

OEM Specials — All models of the Dwyer Mark II molded plastic air velocity meters can be supplied with your logo or special scale in OEM quantities. Consult factory for details.

See also our Digital Manometers and Pitot tubes.

MODELS

Model Number	Range
Mark II 27	0-7,000 fpm
Mark II 28	0-10,500 fpm
Mark II 40-1-AV	0-4,200 fpm
Mark II 41-2-AV	0-6,300 fpm
Mark II 40-250 Pa-AV	0-21 mps

Pitot tube not included with models above.

Accessories

A-612 Portable Stand (27,28)

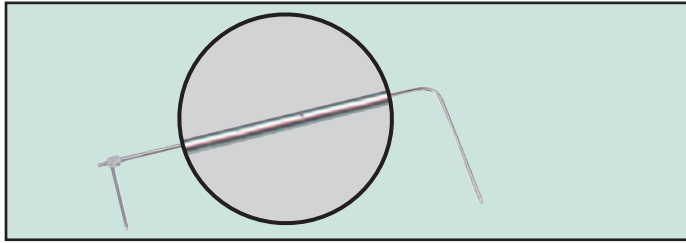


Series 160

Stainless Steel Pitot Tubes

ASME Design Meets AMCA and ASHRAE Codes

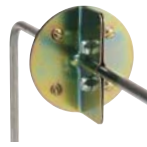
Air Velocity



Standard Model 160 Pitot Tube

Ideal for use with our precision manometers and air velocity gages, Dwyer Pitot Tubes are constructed from corrosion resistant stainless steel for a lifetime of service. ASME design meets AMCA and ASHRAE specifications for maximum accuracy over a wide variety of flow conditions. No correction factors required as ASHRAE tip design yields a calibration factor of 1. ASHRAE design needs no calibration! Permanent, stamped insertion depth graduations on sides of 160 series facilitate accurate positioning. Static pressure port is parallel to sensing tube allowing quick, easy alignment of tube with air flow. Low sensitivity to misalignment gives accurate reading even when tube is misaligned up to 15 degrees. Various standard sizes are available for use in ducts as small as 4" dia. or as large as 36 ft. dia. A universal model fits user supplied 3/4" schedule 40 (standard) pipe in any length. Several convenient mounting options are available for permanent installations.

- No calibration needed.
- Precisely located, burr-free static pressure holes.
- Hemispherical tip design, best for accuracy if imperfectly aligned and nearly impossible to damage.
- Long lasting 304 SS construction.
- Silver soldered connections for leak-proof operation.
- ASME design meets AMCA and ASHRAE specifications.
- Coefficient of "1."
- 5/16" models rated to 1500°F.
- Extended static connection helps guide tip within recommended 15° of air flow direction.
- Inch graduations on sides of 160 series to quickly determine exact insertion depth.
- Dwyer Air Velocity Calculator, direct reading flow charts and instructions included.
- Use 3/8" models in ducts as small as 4", 5/16" models in ducts 10" or larger.
- Optional mounting gland or split flange make permanent installation fast and simple.



A-158 Split Flange Mounting

ACCESSORIES

No. A-158 Split Flange Mounting can be added to any Dwyer No. 160 Standard Pitot Tube. Cadmium plated steel. Gasket is pattern for mounting holes. Secure flange loosely to tube, adjust tube depth and tighten screws. Gasket of 3/16" Neoprene fits tightly around tube and against duct for leak-proof seal. Nuts, washers included.

No. A-159 Mounting Gland — No. A-159 Mounting Gland — Versatile adapter slips on any Series 160, 5/16" standard Pitot tube made after Dec. 1990. Two-part stainless steel fitting slides over tube and provides permanent, secure mounting. Where duct interior is accessible, use the washers and jam nut supplied. For blind applications or in thicker materials, use model A-156 flange mounting plate. Once tube is adjusted to proper depth and angle, tighten smaller hex bushing to lock position. Graphite bushing inside assures leak-proof seal even at higher temperatures. Teflon® bushing also available. **NOTE:** For full insertion with this fitting, order next longer Pitot tube.

A-159 Mounting Gland is used for both duct mounting and flange mounting. To flange mount, the A-159 must be used with the A-156 flange mounting plate.

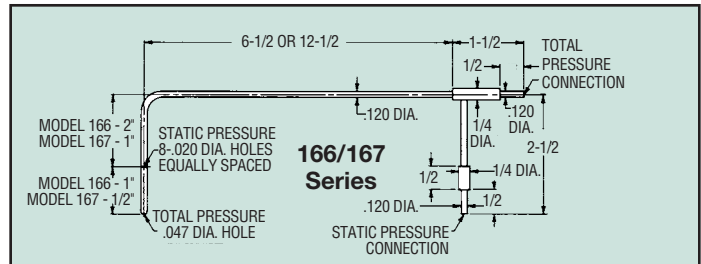
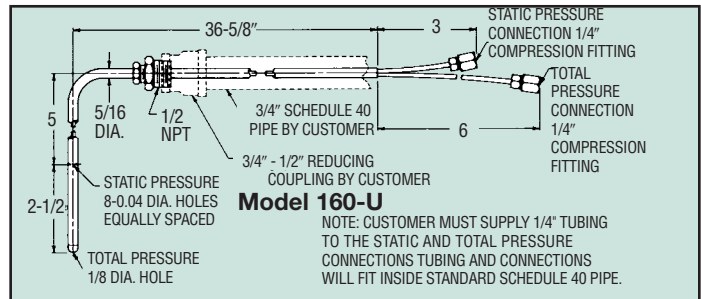
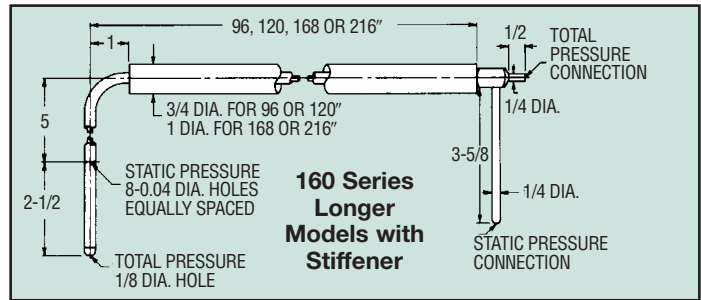
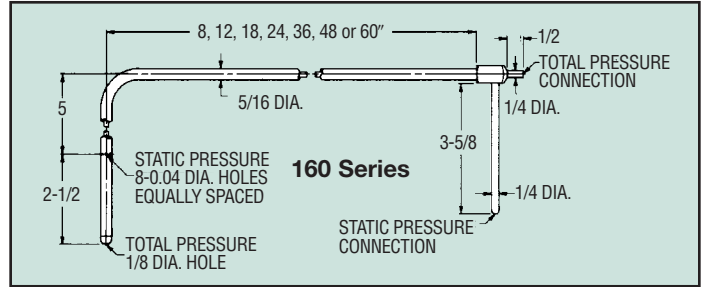


A-159 Duct Mounting Gland with 1/2" male NPT A-156 Flange Mounting Plate with 1/2" female NPT

No. A-397 Step Drill For fast, convenient installation of Pitot tubes in sheet metal ducts. No center punch needed; automatic de-burring. Drills six sizes from 3/16" - 1/2" in 1/16" increments.



A-397 Step Drill



MODELS

Standard 5/16" Dia.		Longer Length w/ Stiffener	
Model Number	Insertion Length	Model Number	Insertion Length
160-8	8"	160-96	96"
160-12	12"	160-120	120"
160-18	18"	160-168	168"
160-24	24"	160-216	216"
160-36	36"	Pocket Size 3/8" Dia.	
160-48	48"	166-6	6"
160-60	60"	166-12	12"
Universal Model for 3/4" Pipe		167-6	6"
160-U	*	167-12	12"

Accessories & Options

A-156 Flange Mounting Plate 1/2" female NPT	Compression Fitting mounting option for 166/167 Series. Add -CF suffix (166-6-CF). Add to prices above
A-158 Split Flange	
A-159 Mounting Gland	
A-397 Step Drill	

*Universal model for permanent installation and connection to metal tubing. Make any length Pitot tube with 3/4" schedule 40 pipe, 3/4" to 1/2" reducing bushing and 1/4" metal tubing.

See also: Ellipsoidals "S" Type Pitot Tubes - page 205



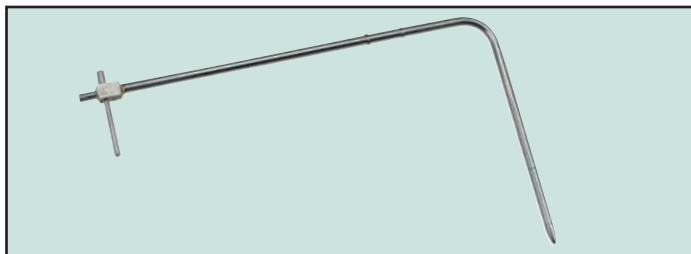
Series
160E

Ellipsoidal Tip Pitot Tube

Designed to Meet British Standard 1042

- Ellipsoidal tip design for improved accuracy, 1.0 coefficient
- 304 SS construction adds strength, resists corrosion
- Adjustable depth indicators for fast, consistent traverses
- Alignment indicator helps keep tip parallel to flow

Series 160E Pitot Tubes are widely used in the U.K. and Europe for applications demanding high accuracy when measuring the flow of air or other compatible gases. Precision crafted tip configuration allows air to pass smoothly with minimum turbulence for consistent, reliable readings. Exterior indicator arm is aligned parallel to the 5 in. (13 cm) sensing tip so you always know that unit is properly positioned inside duct. Sliding depth indicators grip firmly to ensure uniform insertion – critical when making multiple measurements as part of a complete traverse; the best way to determine average velocity. Total and static pressure taps are 1/8" (6 mm), permanently silver soldered to the connection block, leak-proof and durable. Seven fixed length sizes are offered plus a universal model which attaches to any length of 1/2" sch. 40 pipe. See 160-U drawing.



MODELS

Model Number	Insertion in Meters
160E-00	0.2
160E-01	0.3
160E-02	0.48
160E-03	0.8
160E-04	1.0
160E-05	1.22
160E-06	1.52
160E-U	



Handy A-532 Slide Chart speeds air velocity calculations. All plastic, stays clean for years. Included with each Pitot tube.

Air Velocity



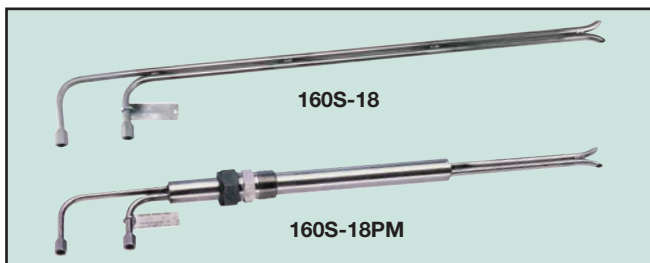
Series
160S

"S" Type Stainless Steel Pitot Tubes

Large, Open Tip Design Resists Fouling; Optional Permanent Mount Models

- Meets EPA specification 40 CFR (ch. 1)
- Long lasting, welded stainless steel construction
- 1/2" female NPT connections, permanently welded
- Rated to 1500°F (815°C)
- 0.84 flow coefficient

Series 160S Pitot Tubes are designed specifically for flow measurement of dirty, particulate laden air or gas streams typical in smoke stack and other environmental testing. Large 1/8" dia. stainless steel tubing resists plugging under harsh, sooty conditions which quickly block conventional flow sensors. Total and static pressure tubes are precisely aligned and welded together every six inches for maximum accuracy, strength and long term durability. Versatile 1/2" female NPT connections easily adapt to any type of pipe or tubing. A pair of 1/2" NPT to 3/8" I.D. tubing adapters is included plus a handy molded vinyl cap to protect tip when not in use. Supplied with complete instructions.



MODELS

Model Number	Perm. Mtg. Model No.	Insertion In Inches
160S-18	160S-18PM	18
160S-24	160S-24PM	24
160S-36	160S-36PM	36
160S-48	160S-48PM	48
160S-60	160S-60PM	60
160S-72	160S-72PM	72

Permanent Mounting (PM) models include 1 inch dia. welded stainless steel sleeve and adjustable compression fitting with 1 inch male NPT mounting treads. Adjust depth, lock in place.



Model
166T

Telescoping Stainless Steel Pitot Tube

Adjustable Design Extends Insertion Length to 36 Inches

The Model 166T Telescoping Pitot tube is a unique air flow sensor which can quickly and easily be adjusted for any duct insertion length from 11.5 to 36 inches (29.2 to 91.4 cm). Now, this single compact unit can replace up to five conventional fixed length Pitot tubes. For even greater convenience, it is securely protected by a custom fitted polyethylene carrying case. Telescoping sections lock in place as they are extended, enabling use of the handle grip to gauge proper alignment of the tip within the airstream. Stainless steel construction resists corrosion. Hemispherical tip has 1.0 flow coefficient, is 1/8" dia. (3.2 mm). Largest section is 3/8" (9.5 mm). Weight (with case) 1 lb, 9 oz (709 g). Case: 12.5 x 6.25 x 1.75 in.



Model 166T

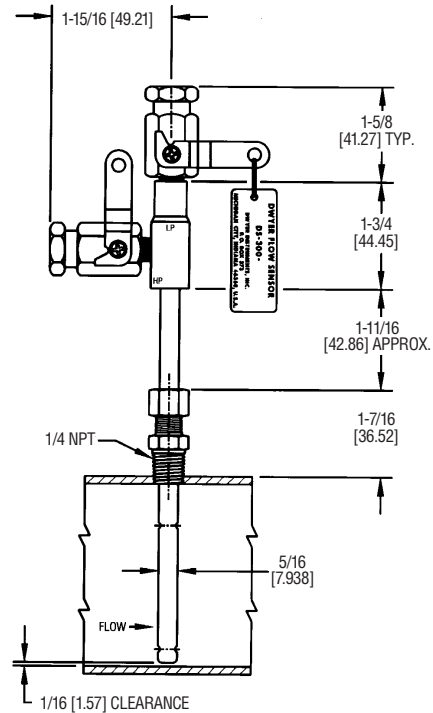
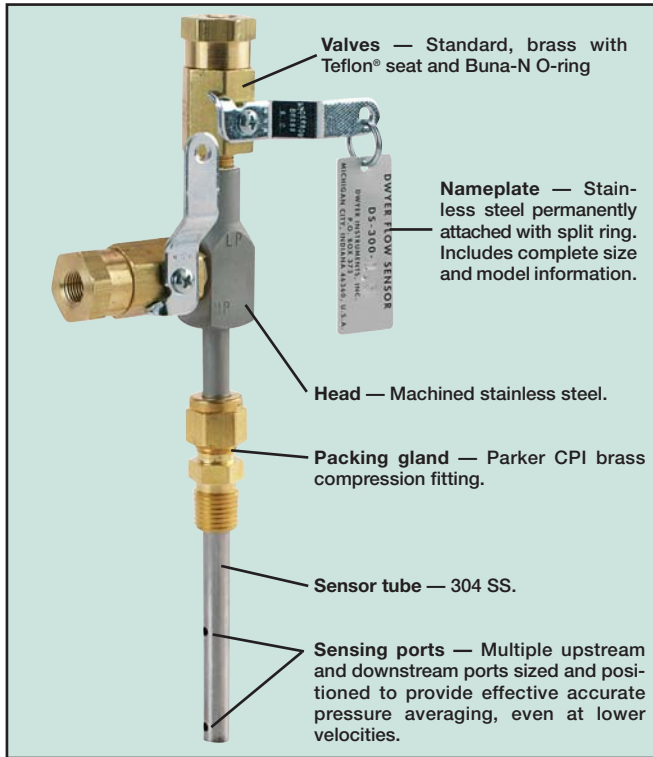


Series
DS

In-Line Flow Sensors

Use with the Dwyer Differential Pressure Gages or Transmitters

Air Velocity



Dwyer Flow Sensors are averaging Pitot tubes that provide accurate and convenient flow rate sensing for schedule 40 pipe. When purchased with a Dwyer Capsuhelic® differential pressure gage of appropriate range, the result is a flow indicating system delivered off the shelf at an economical price.

Pitot tubes have been used in flow measurement for years. Conventional pitot tubes sense velocity pressure at only one point in the flowing stream. Therefore, a series of measurements must be taken across the stream to obtain a meaningful average flow rate. The Dwyer flow sensor eliminates the need for “traversing” the flowing stream because of its multiple sensing points and built-in averaging capability.

Dwyer Series DS-300 flow sensors are designed to be inserted in the pipeline through a compression fitting. They are furnished with instrument shut-off valves on both pressure connections. Valves are fitted with 1/8" female NPT connections. Accessories include adapters with 1/4" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® kit. Standard valves are rated at 200 psig (13.7 bar) and 200°F (93.3°C). Where valves are not required, they can be omitted at reduced cost. Series DS-300 flow sensors are available for pipe sizes from 1" to 10".

DS-400 Averaging Flow Sensors are quality constructed from extra strong 3/4" dia. stainless steel to resist increased forces encountered at higher flow rates with both air and water. This extra strength also allows them to be made in longer insertion lengths up to 24 inches (61 cm). All models include convenient and quick-acting quarter-turn ball valves to isolate the sensor for zeroing. Process connections to the valve assembly are 1/8" female NPT. A pair of 1/8" NPT × 1/4" SAE 45° flared adapters are included, compatible with hoses used in the Model A-471 Portable Capsuhelic® Gage Kit. Supplied solid brass mounting adapter has a 3/4" dia. compression fitting to lock in required insertion length and a 3/4" male NPT thread for mounting in a thread-let (not included).

Select model with suffix which matches pipe size

- DS-300-1"
- DS-300-1 1/4"
- DS-300-1 1/2"
- DS-300-2"
- DS-300-2 1/2"
- DS-300-3"
- DS-300-4"
- DS-300-6"
- DS-300-8"
- DS-300-10"

- DS-400-6"
- DS-400-8"
- DS-400-10"
- DS-400-12"
- DS-400-14"
- DS-400-16"
- DS-400-18"
- DS-400-20"
- DS-400-24"

Options and Accessories

A-160 Thredolet, 3/8" NPT, forged steel, 3000 psi

A-161 Brass Bushing, 1/4" x 3/8"

(DS-300) To order, add suffix -LVdeduct

Ⓢ Items subject to Schedule B discounts

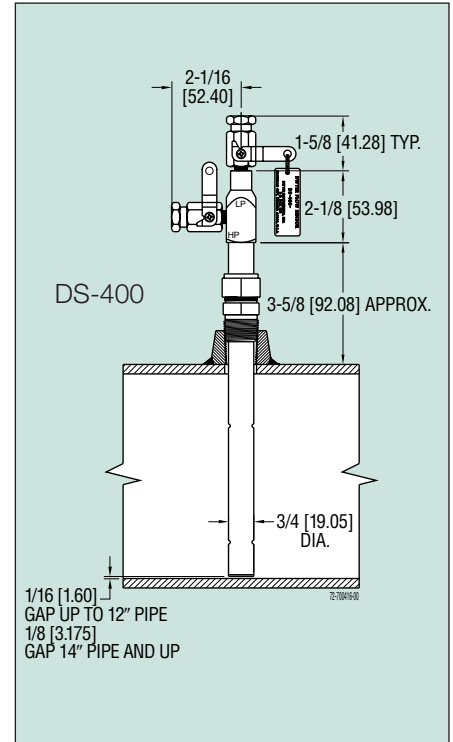
How To Order

Merely determine the pipe size into which the flow sensor will be mounted and designate the size as a suffix to Model DS-300. For example, a flow sensor to be mounted in a 2" pipe would be a Model No. DS-300-2".

For non-critical water and air flow monitoring applications, the chart below can be utilized for ordering a stock Capsuhelic® differential pressure gage for use with the DS-300 flow sensor. Simply locate the maximum flow rate for the media being measured under the appropriate pipe size and read the Capsuhelic® gage range in inches of water column to the left. The DS-300 sensor is supplied with installation and operating instructions, Bulletin F-50. It also includes complete flow conversion information for the three media conditions shown in the chart below. This information enables the user to create a complete differential pressure to flow rate conversion table for the sensor and differential pressure gage employed. Both the Dwyer Capsuhelic® gage and flow sensor feature excellent repeatability so, once the desired flow rate is determined, deviation from that flow in quantitative measure can be easily determined. You may wish to order the adjustable signal flag option for the Capsuhelic® gage to provide an easily identified reference point for the proper flow.

Capsuhelic® gages with special ranges and/or direct reading scales in appropriate flow units are available on special order for more critical applications. Customer supplied data for the full scale flow (quantity and units) is required along with the differential pressure reading at that full flow figure. Prior to ordering a special Capsuhelic® differential pressure gage for flow read-out, we recommend you request Bulletin F-50 to obtain complete data on converting flow rates of various media to the sensor differential pressure output. With this bulletin and after making a few simple calculations, the exact range gage required can easily be determined.

Large 3/4 Inch Diameter for Extra Strength in Lengths to 24 Inches



Air Velocity

GAGE RANGE (IN. W.C.)	MEDIA @ 70°F	FULL RANGE FLOWS BY PIPE SIZE (APPROXIMATE)									
		1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"
2	Water (GPM)	4.8	8.3	11.5	20.5	30	49	86	205	350	560
	Air @ 14.7 PSIA (SCFM)	19.0	33.0	42.0	65.0	113	183	330	760	1340	2130
	Air @ 100 PSIG (SCFM)	50.0	90.5	120.0	210.0	325	510	920	2050	3600	6000
5	Water (GPM)	7.7	14.0	18.0	34.0	47	78	138	320	560	890
	Air @ 14.7 PSIA (SCFM)	30.0	51.0	66.0	118.0	178	289	510	1200	2150	3400
	Air @ 100 PSIG (SCFM)	83.0	142.0	190.0	340.0	610	820	1600	3300	5700	10000
10	Water (GPM)	11.0	19.0	25.5	45.5	67	110	195	450	800	1260
	Air @ 14.7 PSIA (SCFM)	41.0	72.0	93.0	163.0	250	410	725	1690	3040	4860
	Air @ 100 PSIG (SCFM)	120.0	205.0	275.0	470.0	740	1100	2000	4600	8100	15000
25	Water (GPM)	18.0	32.0	40.5	72.0	108	173	310	720	1250	2000
	Air @ 14.7 PSIA (SCFM)	63.0	112.0	155.0	255.0	390	640	1130	2630	4860	7700
	Air @ 100 PSIG (SCFM)	185.0	325.0	430.0	760.0	1200	1800	3300	7200	13000	22000
50	Water (GPM)	25.0	44.0	57.5	100.0	152	247	435	1000	1800	
	Air @ 14.7 PSIA (SCFM)	90.0	161.0	205.0	360.0	560	900	1600	3700	6400	
	Air @ 100 PSIG (SCFM)	260.0	460.0	620.0	1050.0	1700	2600	4600	10000	18500	
100	Water (GPM)	36.5	62.0	82.0	142.0	220	350	620	1500		
	Air @ 14.7 PSIA (SCFM)	135.0	230.0	300.0	505.0	800	1290	2290	5000		
	Air @ 100 PSIG (SCFM)	370.0	660.0	870.0	1500.0	2300	3600	6500	15000		

Model A-471 Portable Kit

The Dwyer Series 4000 Capsuhelic® differential pressure gage is ideally suited for use as a read-out device with the DS-300 Flow Sensors. The gage may be used on system pressures of up to 500 psig even when the flow sensor differential pressure to be read is less than 0.5" w.c. With accuracy of ±3% of full scale, the Capsuhelic® gage can be used in ambient temperatures from 32 to 200°F (0 to 93.3°C). Zero and range adjustments are made from outside the gage. The standard gage with a die cast aluminum housing can be used with the flow sensor for air or oil applications. For water flow measurements, the optional forged brass housing should be specified. The Capsuhelic® gage may be panel or surface mounted and permanently plumbed to the flow sensor if desired. The optional A-610 pipe mounting bracket allows the gage to be easily attached to any 1/4" - 2" horizontal or vertical pipe.

For portable operation, the A-471 Capsuhelic® Portable Gage Kit is available complete with tough polypropylene carrying case, mounting bracket, 3-way manifold valve, two 10' high pressure hoses, and all necessary fittings. See pages 6 and 7 for complete information on the Capsuhelic® gage.



**CAPSUHELIC® GAGE SHOWN
INSTALLED IN A-471 PORTABLE KIT**



Series
471

Digital Thermo-Anemometer

Four Field Selectable Ranges from 500 to 15,000 FPM

Air Velocity



Model 471-1

Model 471-2 w/
Telescopic Probe

Model 471-3 w/
Telescopic Bendable Tip

The Series 471 Digital Thermo Anemometers are versatile dual function instruments that quickly and easily measure air velocity in four field selectable ranges, in either feet per minute or meters per second, plus air temperature in °F or °C. High contrast LCD display shows both range selected and present velocity. Convenient backlight provides perfect visibility in low light conditions. Light automatically shuts off after 2-1/2 minutes to prolong battery life. Low battery warning is included.

Stainless steel probe with comfortable hand grip is etched with insertion depth marks from 0-8 inches and 0-20 cm on the Model 471-1. When fully extended, the probe length on models 471-2 and 471-3 reach 33 inches (83 cm). Model 471-3 features a telescoping bendable probe for easy access in hard-to-reach locations.

Extruded aluminum housing fully protects electronics, yet is lightweight and comfortable to hold even when taking multiple readings as part of duct traverses. An integral sliding cover protects sensors when not in use.

Standard accessories are 9 volt alkaline battery, wrist strap, custom fitted carrying case and step drill for making duct holes from 3/16" to 1/2".

Note: Ranges are field selectable.

Range Number	Velocity, FPM	Velocity, MPS	Accuracy
1	0-500	0-3.0	±3% F.S.
2	0-1500	0-7.0	±3% F.S.
3	0-5000	0-30	±4% F.S.
4	0-15000	0-75	±5% F.S.

SPECIFICATIONS

AIR VELOCITY SPECIFICATIONS:

Service: Air.

Range: Field Selectable 0-500, 0-1500, 0-5000, 0-15000 FPM (see chart for Metric Conversions).

Accuracy: Depending on range (See chart) @ 59 to 86°F (15 to 30°C). Outside this range add 0.11% per °F (0.2% per °C).

Temperature Limits: Probe: 0 to 200°F (-18 to 100°C).

Ambient: 32 to 104°F (0 to 40°C).

Display: 4-1/2 Digit 0.4" High.

Resolution: 1 FPM / 0.1 MPS.

Response Time: 15 Seconds.

Power Requirements: 9 volt alkaline battery, included.

Probe: 5/16" (8.13 mm) diameter probe with integral hand grip and 6 ft. (15.2 cm) coiled cord. Length of probe: Model 471-1=10" (25.4 cm); Models 471-2 and 471-3= 33" (83 cm) extended.

Weight: 12 oz (340 g).

TEMPERATURE SPECIFICATIONS:

Range: 0 to 200°F (-18 to 100°C).

Accuracy: ±2°F (1°C).

Temperature Limits: Probe: 0 to 200°F (-18 to 100°C).

Ambient: 32 to 104°F (0 to 40°C).

Display: 4-1/2 Digit 0.4" high.

Resolution: 0.1°.

Response Time: 30 Seconds.

Model 471-1 Digital Thermo Anemometer

includes battery, wrist strap, 6-step drill, carrying case and instructions.

Model 471-2 Digital Thermo Anemometer with telescoping probe

includes battery, wrist strap, 6-step drill, carrying case and instructions.

Model 471-3 Digital Thermo Anemometer with telescoping bendable tip

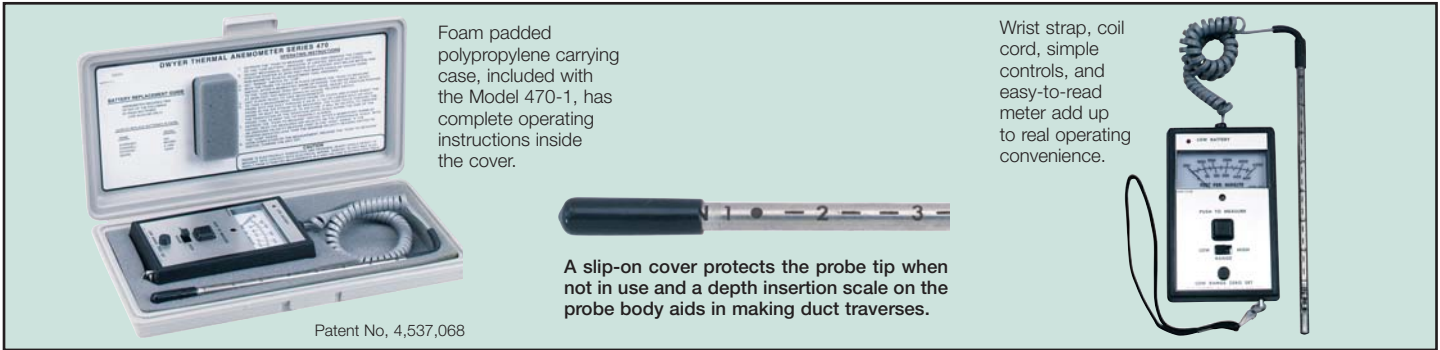
includes battery, wrist strap, 6-step drill, carrying case and instructions.



Model 470-1

Handheld Thermal Anemometer

Measures Air Velocity to 6,000 Feet Per Minute, $\pm 5\%$ Accuracy, Low Cost



Foam padded polypropylene carrying case, included with the Model 470-1, has complete operating instructions inside the cover.

Wrist strap, coil cord, simple controls, and easy-to-read meter add up to real operating convenience.

A slip-on cover protects the probe tip when not in use and a depth insertion scale on the probe body aids in making duct traverses.

Patent No. 4,537,068

The versatility of the Dwyer Model 470-1 Handheld Thermal Anemometer makes it ideal for a wide range of air velocity measurements. Easy to carry and use in the field, the 470-1 can be used to balance heating and air conditioning systems, measure velocity in HVAC ducts, read fume and exhaust hood face velocities, as well as make wind speed measurements associated with agricultural, forestry, highway and recreational activities. This low cost battery powered electronic instrument features an LED low-battery indicator and provides two switch selected air velocity ranges of 0-600 FPM and 500-6000 FPM displayed on an easily read analog meter.

Sophisticated temperature compensation circuitry maintains $\pm 5\%$ of full range accuracy over an air stream temperature of 30 to 180°F.

Included are two 9 volt alkaline batteries, a wrist strap for the unit and a durable polypropylene, foam-lined carrying case.

470-1, dual range, 0-600 and 500-6000 FPM

M470-1, dual range, 0-3 and 2-30 MPS

SPECIFICATIONS

Service: Air.

Accuracy: $\pm 5\%$ F.S.

Temperature Limits: 32 to 180°F (0 to 82.2°C).

Ambient Temperature Limits: 32 to 160°F (0 to 71.1°C).

Display: Analog dial.

Response Time: 1 sec. for velocity change; 5 sec. for temperature change (in air moving over 50 FPM).

Power Requirements: Two 9 volt alkaline batteries.

Probe: 316 SS, 10' long by 5/16" diameter with 8" insertion depth scale and tip shield.

Weight: 13 oz (unit only); 1 lb 9 oz (in carrying case).

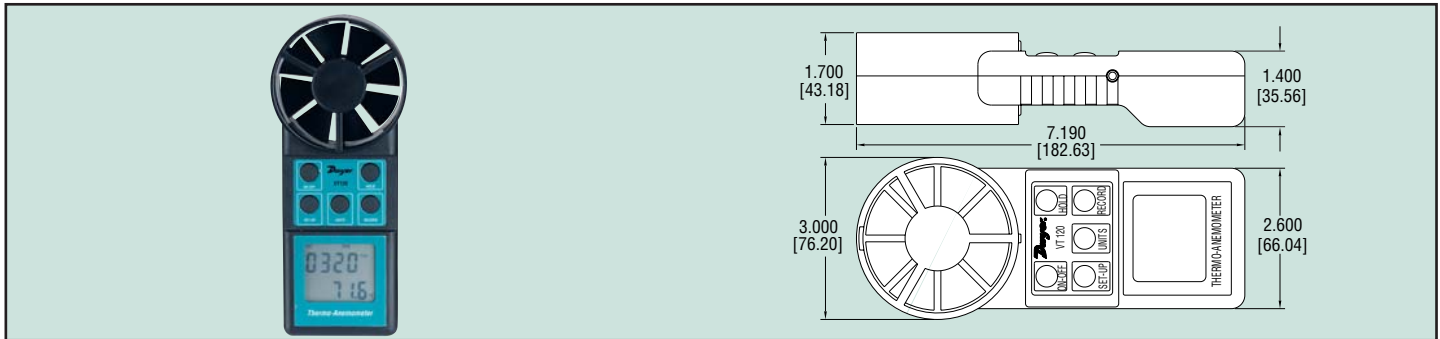
Air Velocity



Model VT120

Integral Vane Thermo-Anemometer

Large 1 1/4" Dual Display, One Hand Operation



Simultaneously measure air velocity and temperature with the Model VT120 Integral Vane Thermo-Anemometer. Easily view readings on the large 1.25" (31.75 mm) dual display. User-selectable air velocity ranges include ft/min, m/sec, mph, knots, and km/hr. Built-in thermistor records ambient temperature in °F or °C. Model VT120 features include data hold and record/recall minimum, maximum and average readings. Also, units have the ability to record and average up to 2 hours of data while displaying the continuous running average. If desired, sleep mode automatically shuts down the meter after 20 minutes of non-use. Model VT120 includes hard carry case, one 9V battery, and instruction manual.

SPECIFICATIONS

Air Velocity Ranges: 80 to 5900 ft/min, 0.4 to 30 m/sec, 0.9 to 68 mph, 0.8 to 58 knots, 1.4 to 108 km/hr.

Temperature Range: 14 to 122°F (-10 to 50°C).

Accuracy: Air velocity: $\pm 3\%$, Temperature: $\pm 1^\circ\text{F}$ ($\pm 0.6^\circ\text{C}$).

Resolution: 1 ft/min, 0.01 m/sec, 0.1 mph, 0.1 knots, 0.1 km/hr, 0.1°F, 0.1°C.

Temperature Sensor: Thermistor.

Temperature Limits: 14 to 122°F (-10 to 50°C) max 80% RH.

Power Supply: One 9V battery.

Battery Life: 100 hours continuous (with 20 min sleep mode enabled).

Display: Large 1.25 x 1.62" (37 x 42 mm) LCD, 9999 count.

Housing: ABS plastic.

Sensor Diameter: 2.87" (70 mm).

Weight: 1.5 lb (680 g).

Agency Approvals: CE.

APPLICATIONS

Air duct measurement and analysis, fume hood analysis, ionizer flow output monitoring, positive pressure reading in clean rooms, or ventilation system inspection.

Model VT120 Integral Vane Thermo-Anemometer

Model VT120-N includes NIST certification



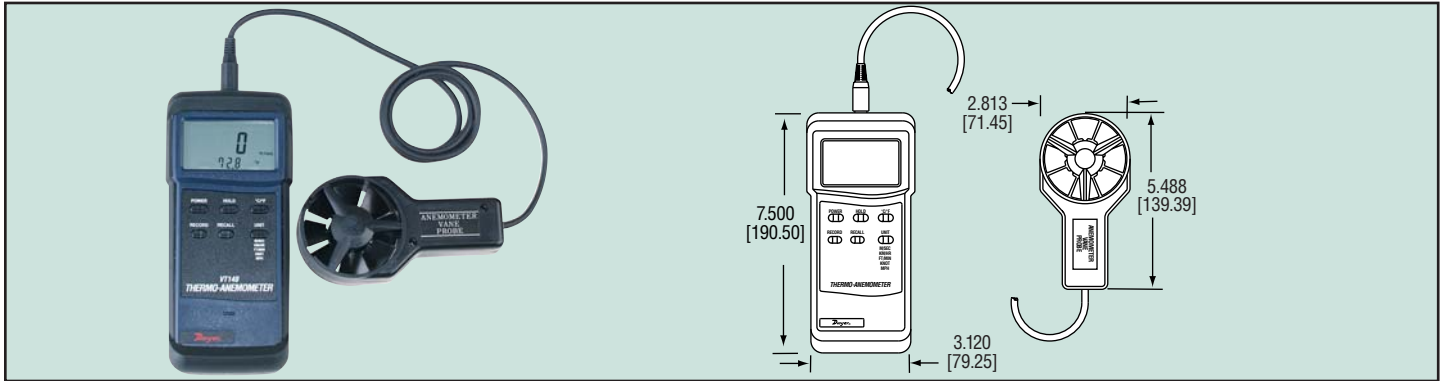
Model
VT140

Vane Thermo-Anemometer

Simultaneously Displays Air Velocity and Temperature, RS232 Output



Air Velocity



Measure airflow and temperature simultaneously with Model VT140 Vane Thermo-Anemometer. Remote probe is designed with twisted vane arms and low friction ball bearings for accurate airflow readings in low or high velocities. Microprocessor-based unit provides fast, reliable air velocity measurement in five different scales. Model VT140 features RS232 output, selectable °F or °C, Record/Recall minimum, maximum, and average readings, display hold, and automatic shut-off to preserve battery. The large 1.4" (3.5 cm), dual function LCD with contrast adjustment allows easy viewing at any angle. Unit includes rugged holster with stand, one 9V battery, and instruction manual.

VT140 Vane Thermo-Anemometer

VT140-N Vane Thermo-Anemometer with NIST

SPECIFICATIONS

Air Velocity Ranges: 80 to 4925 ft/m, 1.4 to 90.0 kph, 0.9 to 55.9 mph, 0.4 to 25.0 m/s, 1.9 to 38.8 knots.

Temperature Range: 32 to 140°F (0 to 60°C).

Accuracy: Air Velocity: ±2% + 1 digit, Temperature: 1.5°F (0.8°C).

Resolution: 10 ft/m, 0.1 kph, 0.1 mph, 0.1 m/s, 0.1 knots, 0.1°F, 0.1°C.

Temp. Sensor: Thermistor.

Temperature Limits: 32 to 122°F (0 to 50°C) max 80% RH.

Power Supply: One 9V battery.

Output: RS232 serial interface via 3.5 mm terminal.

Housing: ABS plastic.

Weight: 0.84 lb (381 g).

Agency Approval: CE.

APPLICATIONS

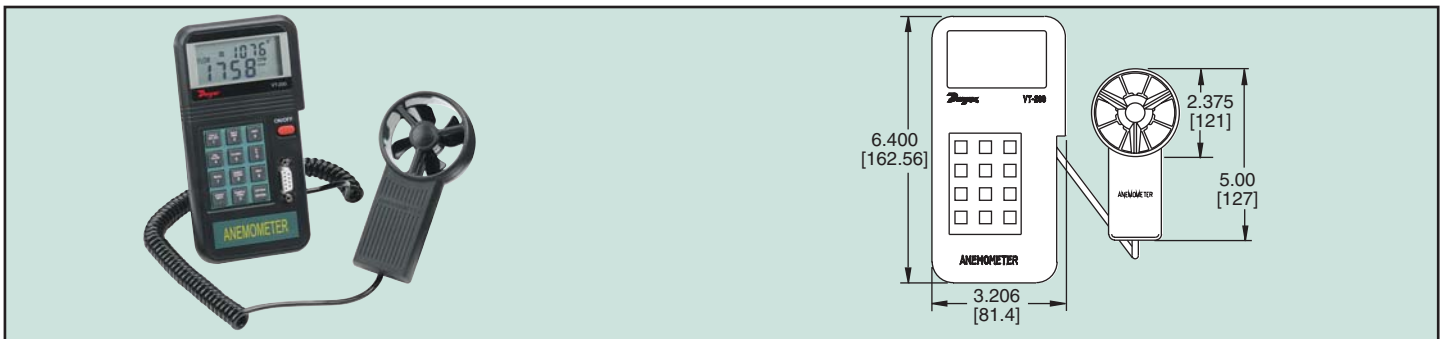
Airflow measurements in heating, ventilation, and air conditioning systems, air duct analysis, wind tunnel studies, or monitoring of process air.



Model
VT-200

Vane Thermo-Anemometer

Measures Air Volume, Air Velocity, and Temperature, Built-in Datalogging



Model VT-200 Vane Thermo-Anemometer is ideal for balancing air conditioning and heating ducts or checking the operation of fans and blowers. Model VT-200 measures air volume in cubic feet per minute and cubic meters per minute. Air velocity measurements can be viewed in ft/min, m/s, knots, km/hr, and mph with ±3% accuracy. The multifunction LCD can simultaneously display air velocity and temperature in selectable units or air flow and air area. Built-in datalogger can store up to 1000 measurements or transfer the data to a PC via RS-232 communication. Additional features include data hold and record/recall minimum, maximum and average readings. Model VT-200 includes RS-232 interface, PC Windows™ software, cable, 9V battery, carrying case, and instruction manual.

Model VT-200 Vane Thermo-Anemometer

SPECIFICATIONS

Air Velocity Ranges: 0.3 to 45 m/s; 0.7 to 100 mph; 0.6 to 88.0 knots; 1 to 140.0 km/hr; 60 to 8,800 ft/min.

Temperature Range: 32 to 122°F (0 to 50°C).

Air Volume Ranges: CFM (ft³/min) or CMM (m³/min).

Accuracy: Air Velocity: ±3% of reading ± 0.1, whichever is greater; Temperature: ±1.5 °F (±0.8°C).

Resolution: 0.1 knots, m/s, km/hr, and mph; 0.1/1 ft/min; 0.1°C.

Temperature Sensor: Type K thermocouple.

Temperature Limits: 32 to 140°F (0 to 60°C).

Display: Dual line, 4-digit, 1.1" (27.9 mm) height.

Power: 9V alkaline battery (included). Battery Life: Approx. 50 hours.

Output: RS232 serial interface via DB9 female connector.

Housing: ABS plastic, 1" (25 mm) diameter.

Weight: 12.3 oz (350 g).

Agency Approval: CE.

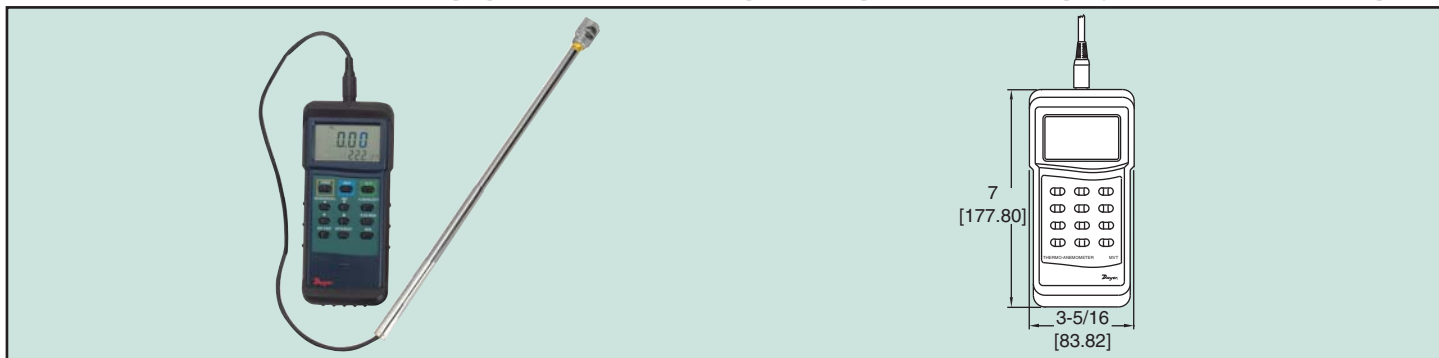


Series
MVT

Mini-Vane Thermo-Anemometer



Display Air Flow, Air Velocity and Temperature, Telescoping Mini-Vane, RS232 Output



Sense air velocity, air flow and temperature with the Series MVT Mini-Vane Thermo-Anemometer. The meter uses a 1/2" (12.7 mm) diameter metal telescoping antenna sensor to detect air flows up to 2358 ft/min and temperatures to 176°F (80°C). High accuracy is ensured with the low friction ball bearing mini-vane. Air flow can be measured in CMM (m³/min) or CFM (ft³/min) and temperature is selectable °F or °C. The MVT features a 4-digit LCD display, data hold, record/recall maximum and minimum, RS232 output, averaging up to 20 measurements, 2/3 the measured value and auto shut-off to prolong life. The unit includes telescoping mini-vane probe, hard case, 9V battery and protective rubber holster with stand.

MVT176 Mini-Vane Thermo-Anemometer
MVT176-N Mini-Vane Anemometer with NIST

Accessories

MVT07 Mini-Vane Anemometer Soft Case

SPECIFICATIONS

Air Velocity Ranges: 160 to 2358 ft/min; 1.8 to 26.8 mph; 1.6 to 23.3 knots; 0.8 to 12.00 m/s; 2.8 to 43.2 km/h.

Temperature Ranges: 32 to 176°F (0 to 80°C).

Accuracy: Air Velocity: ±2%; Temperature: 1.5°F (0.8°C).

Resolution: 1 ft/min; 0.1 mph; 0.1 knots; 0.01 m/s; 0.1 km/h; 0.001 to 100 CMM/CFM; 0.1 °F/°C.

Temperature Sensor: Thermistor.

Ambient Operating Temperature: Meter: 32 to 122°F (0 to 50°C); Sensor: 32 to 176°F (0 to 80°C).

Ambient Operating Humidity: Maximum 80% RH.

Display: Dual function 0.5" (13mm) 4-digit LCD.

Sampling Rate: 1 second approx.

Output: RS232 PC serial interface with 16-bit data stream output.

Power Requirements: 9V battery (included).

Auto Shut-off: 15 minutes to preserve battery life.

Housing: ABS Housing.

Telescoping Sensor Length: 23.6" (600mm) max. with 39" (1m) cable.

Weight: 1.6 lb (700 g) including battery and probe.

Agency Approval: CE.

Air Velocity



Model
PATH

PATH SUPER KIT

Complete Pressure, Air Velocity, Temperature & Humidity Measurement Kit

PATH Super Kit incorporates three of Dwyer's latest hand-held meters for pressure, air velocity, and temperature/humidity applications. The Series 477 Digital Manometer measures from 0-20 in. w.c. with ±0.5% F.S. accuracy and has nine field selectable units. The kit also includes a 36" SS telescoping Pitot tube, two static pressure tips and 9 ft. of rubber tubing for quick pressure measurements. The Series 485 Digital Hygrometer enables you to simultaneously read humidity and temperature on the 0.4" LCD. For air velocity, the Series 471 Digital Thermo-Anemometer measures up to 15,000 fpm or 70 mps as well as temperatures ranging from 0 to 200 °F or -17 to 100 °C. All instruments are fitted in an extra durable polyethylene case for transport convenience and heavy duty protection.

PATH

PATH-N with NIST calibration certificates (available only on 477-1 and 471-2)

Complete Kit Includes:

- Model 477-1FM Digital Manometer, range 0-20 in. w.c. (0.5 kPa)
- Model 471-2 Digital Thermo-Anemometer, 33" Adjustable Telescoping Tip
- Model 485-1 Digital Hygrometer, Simultaneously Displays % Relative Humidity and Temperature
- Model 166T, 36" Telescoping Stainless Steel Pitot Tube
- Two No. A-303 Static Pressure Tips with Magnetic Mounting
- Two 4½ Ft. Lengths ⅜" I.D. Rubber Tubing
- No. A-397 Step Drill for ⅜" - ½" Holes in ⅛" Increments
- No. A-532 AV Slide Chart
- Three 9V Battery
- Fitted Polyethylene Case, dimensions 17" x 142" x 42" (431.8 x 368.3 x 114.3 mm).





Model
475-1-FM-AV

Air Velocity Kit

Includes Digital Manometer, Pitot Tube, Accessories

Convenient all-in-one kit is small, light and easy to use. No set-up or leveling needed. Digital manometer reads from 0-19.99 in. w.c. with $\pm 0.5\%$ F.S. accuracy and minor divisions to 0.01. Large $\frac{1}{2}$ " LCD readout is easy to see in poorly lighted areas and has "low battery" warning. Included is a 6" stainless steel Pitot tube with integral compression fitting to hold it securely when taking readings. Also, two static pressure tips with magnetic mounting measure pressure drop across filters, condenser coils, etc. Kit comes complete with rubber tubing, 9V battery, step drill, AV calculator slide rule, and custom fitted carrying case. An indispensable test kit for the plant engineer, industrial hygienist and HVAC technician.

Complete Kit Includes:

- Model 475-1 Digital Manometer, range 0-19.99 in. w.c.
- Model 166-6-CF, 6" Pitot Tube with Compression Fitting
- Two No. A-303 Static Pressure Tips with Magnetic Mounting
- Two 9 Ft. Lengths $\frac{3}{16}$ " I.D. Rubber Tubing
- No. A-397 Step Drill for $\frac{3}{16}$ " - $\frac{1}{2}$ " Holes in $\frac{1}{16}$ " Increments
- No. A-532 AV Slide Chart
- 9 Volt Battery
- Fitted Polyethylene Case



475-1-FM-AV Air Velocity Kit

Air Velocity



Model
475-1T-FM-AV

Air Velocity Kit

Includes Digital Manometer, Telescoping 36 Inch Pitot Tube, Accessories

Convenient all-in-one kit is small, light and easy to use. No set-up or leveling needed. Digital manometer reads from 0-19.99 in. w.c. with $\pm 0.5\%$ F.S. accuracy and minor divisions to 0.01. Large $\frac{1}{2}$ " LCD readout is easy to see in poorly lighted areas and has "low battery" warning. Kit includes convenient telescoping Pitot tube, Model 166T, fully adjustable from 11.5 to 36 inches (29.2 to 91.4 cm). Also, two static pressure tips with magnetic mounting measure pressure drop across filters, condenser coils, etc. Kit comes complete with rubber tubing, 9V battery, step drill, AV calculator slide rule, and custom fitted carrying case. An indispensable test kit for the plant engineer, industrial hygienist and HVAC technician.

Complete Kit Includes:

- Model 475-1 Digital Manometer, range 0-19.99 in. w.c.
- Model 166T, 36" Telescoping Stainless Steel Pitot Tube
- Two No. A-303 Static Pressure Tips with Magnetic Mounting
- Two 4 $\frac{1}{2}$ Ft. Lengths $\frac{3}{16}$ " I.D. Rubber Tubing
- No. A-397 Step Drill for $\frac{3}{16}$ " - $\frac{1}{2}$ " Holes in $\frac{1}{16}$ " Increments
- No. A-532 AV Slide Chart
- 9 Volt Battery
- Fitted Polyethylene Case



475-1T-FM-AV Air Velocity Kit



Model
477-1T-FM-AV

Air Velocity Kit

Includes Digital Manometer, Telescoping 36 Inch Pitot Tube, Accessories

Convenient all-in-one kit is small, light and easy to use. No set-up or leveling needed. Digital manometer reads from 0-20 in. w.c. with $\pm 0.5\%$ F.S. accuracy. The Series 477 stores up to 20 readings in memory for later reference, instantly selecting up to nine English/Metric pressure units that are visible on a large, backlit 0.4" LCD readout. Both audible and visual overpressure alarms and a "low battery" warning are standard features.

Each kit includes convenient telescoping Pitot tube, Model 166T which is fully adjustable from 11.5 to 36 inches (29.2 to 91.4 cm). In addition, two static pressure tips with magnetic mountings measure pressure drop across filters, condenser coils, etc.

Kit comes complete with rubber tubing, 9V battery, step drill, AV calculator slide rule, and custom fitted carrying case. An indispensable test kit for the plant engineer, industrial hygienist and HVAC technician.

Complete Kit Includes:

- Model 477-1 Digital Manometer, range 0-20 in. w.c.
- Model 166T, 36" Telescoping Stainless Steel Pitot Tube
- Two No. A-303 Static Pressure Tips with Magnetic Mounting
- Two 4 $\frac{1}{2}$ Ft. Lengths $\frac{3}{16}$ " I.D. Rubber Tubing
- No. A-397 Step Drill for $\frac{3}{16}$ " - $\frac{1}{2}$ " Holes in $\frac{1}{16}$ " Increments
- No. A-532 AV Slide Chart
- 9 Volt Battery
- Fitted Polyethylene Case



477-1T-FM-AV Air Velocity Kit



Series
641

Air Velocity Transmitter

16 Field Selectable Ranges in FPM or MPS



641 AVT WITH DISPLAY OPTION	
A DIMENSION	B DIMENSION
7-63/64 [202.80]	9-13/16 [249.24]
13-63/64 [355.20]	15-13/16 [401.64]
19-63/64 [507.60]	21-13/16 [554.04]
26-63/64 [685.40]	28-13/16 [731.84]
32-63/64 [837.80]	34-13/16 [884.24]
37-63/64 [964.80]	39-13/16 [1011.24]

641 AVT WITHOUT DISPLAY OPTION	
A DIMENSION	B DIMENSION
7-7/16 [188.91]	9-9/32 [235.74]
13-7/16 [341.31]	15-9/32 [388.14]
19-7/16 [493.71]	21-9/32 [540.54]
26-7/16 [671.51]	26-9/32 [718.34]
29-7/16 [747.71]	34-9/32 [870.74]
37-7/16 [950.91]	39-9/32 [997.74]

Air Velocity

The new Dwyer Series 641 Air Velocity Transmitter is the ideal instrument for monitoring air flow. This transmitter uses a heated mass flow sensor which allows for precise velocity measurements at various flow rates and temperatures. The 641's 16 field selectable ranges provides it the versatility to be selected for several air flow applications. The optional LED produces a complete, low-cost solution for local indication of air flow.

Features

- Ranges to 15,000 FPM or 75 MPS
- Optional Bright LED Display
- Easy Push Button Set-up
- Compact Housing
- 4-20 mA Output
- Digital Filter for Signal Damping

Applications

- Exhaust Stack Flow Monitoring
- Air Control in Drying Processes
- HVAC Air Velocity Measurements
- Fan Supply and Exhaust Tracking

MODELS

Model Number	Probe Length*
641-6	6" (152.4 mm)
641-6-LED	6" (152.4 mm)
641-12	12" (304.8 mm)
641-12-LED	12" (304.8 mm)
641-18	18" (457.2 mm)
641-18-LED	18" (457.2 mm)
641-24	24" (609.6 mm)
641-24-LED	24" (609.6 mm)
641-30	30" (762 mm)
641-30-LED	30" (762 mm)
641-36	36" (914 mm)
641-36-LED	36" (914 mm)

*Other probe lengths available contact factory.

SPECIFICATIONS

Service: Clean air and compatible, non-combustible gases.

Accuracy:

3% FS Process gas: 32 to 122°F (0 to 50°C).
4% FS Process gas: -40 to 32°F & 122 to 212°F (-40 to 0°C & 50 to 100°C).

Response Time: Flow: 1.5 seconds to 95% of final value (Output filter set to minimum).

Temperature Limits: Process: -40 to 212°F (-40 to 100°C).
Ambient: 32 to 140°F (0 to 60°C).

Pressure Limit: 100 psi (6.89 bar) maximum.

Humidity Limit: Non-Condensing.

Power Requirements: 12-35 VDC, 10-16 VAC.

Output Signal: 4-20 mA, isolated 24V source, 3 or 4-wire connection.

Output Filter: Selectable 0.5 -15 (seconds).

Loop Resistance: 600 ohms max.

Current Consumption: 300 mA max.

Electrical Connections: Screw terminal.

Process Connections: 1/2" male NPT.

Enclosure Rating: Designed to meet NEMA 4X (IP66) for non LED models only.

Mounting Orientation: Unit not position sensitive. Probe must be aligned with airflow.

Weight: 12.6 oz (357.2 g).

Agency Approval: CE.

OPTIONAL DISPLAY VERSION:

Display: 4-1/2 digit 1/2" red LED.

Resolution: 1 FPM, 0.01 MPS
(10 FPM @ 10,000 and 15,000 FPM ranges).

Weight: 13.3 oz (377 g).

ACCESSORIES

A-156 Universal Mounting Plate 1/2" female NPT

No. A-158 Split Flange Mounting Kit

No. A-159 Duct Mounting Gland

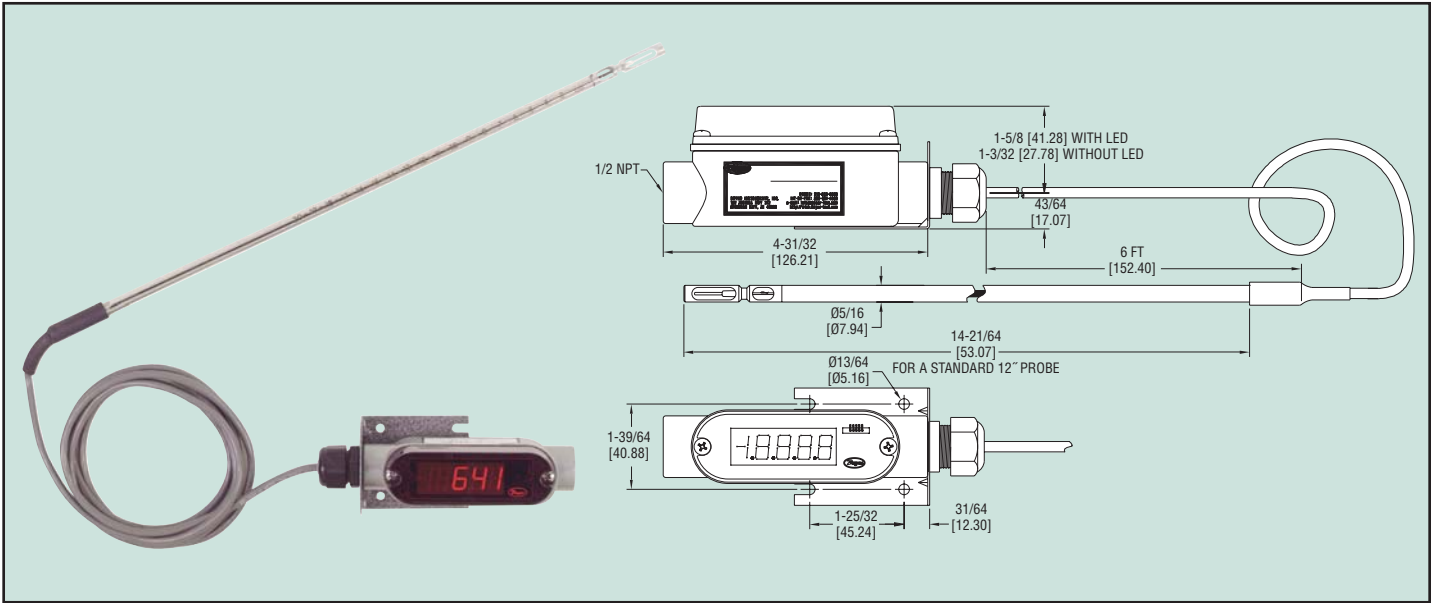


Series
641RM

Air Velocity Transmitter with Cable

For Remotely Mounting Electronic Enclosure

Air Velocity



The Series 641RM is the ideal instrument for monitoring air flow. This transmitter uses a heated mass flow sensor, which allows for precise velocity measurements at various flow rates and temperatures. The 641's 16 field selectable ranges from 0-250 to 15,000 FPM (0-1.25 to 75 MPS) provide it the versatility to be selected for a multitude of applications. The unit's 6' cable which connects the sensing probe with the electronic enclosure allows the enclosure to be mounted where it can be more easily accessed. Longer cable lengths are available for ducts that are at very high elevations from the plant floor. The optional LED produces a complete, compact solution for local indication of air flow.

Model 641RM-12, Air Velocity Transmitter with 6' cable

Model 641RM-12-LED, same as above with LED display

ACCESSORIES

A-156 Universal Mounting Plate, 1/2" female NPT

No. A-159 Duct Mounting Gland

No. A-158 Split Flange Mounting Kit

SPECIFICATIONS

Service: Air and compatible, non-combustible gases.

Accuracy:

3% FS Process gas: 32 to 122°F (0 to 50°C).

4% FS Process gas: -40 to 32°F & 122 to 212°F

(-40 to 0°C & 50 to 100°C).

Response Time: Flow: 1.5 seconds to 95% of final value (output filter set to minimum).

Temperature Limits: Process: -40 to 212°F (-40 to 100°C). Ambient: 32 to 140°F (0 to 60°C).

Pressure Limit: 100 psi (6.89 bar) maximum.

Humidity Limit: Non-Condensing.

Power Requirements: 12-35 VDC, 10-16 VAC.

Output Signal: 4-20 mA, isolated 24V source, 3 or 4-wire connection.

Output Filter: Selectable 0.5-15 (seconds).

Loop Resistance: 600 ohms max.

Current Consumption: 300 mA max.

Electrical Connections: Screw terminal.

Mounting Orientation: Unit not position sensitive.

Probe must be aligned with airflow.

Weight: 13.2 oz (374.26 g).

Cable Length: 6 ft (1.82 m).

Probe Length: 12" (30.48 cm) standard.

Probe Diameter: 5/16" (0.79 cm).

OPTIONAL DISPLAY VERSION:

Display: 4-1/2 digit 1/2" red LED.

Resolution: 1 FPM, 0.01 MPS

(10 FPM @ 10,000 and 15,000 FPM ranges).

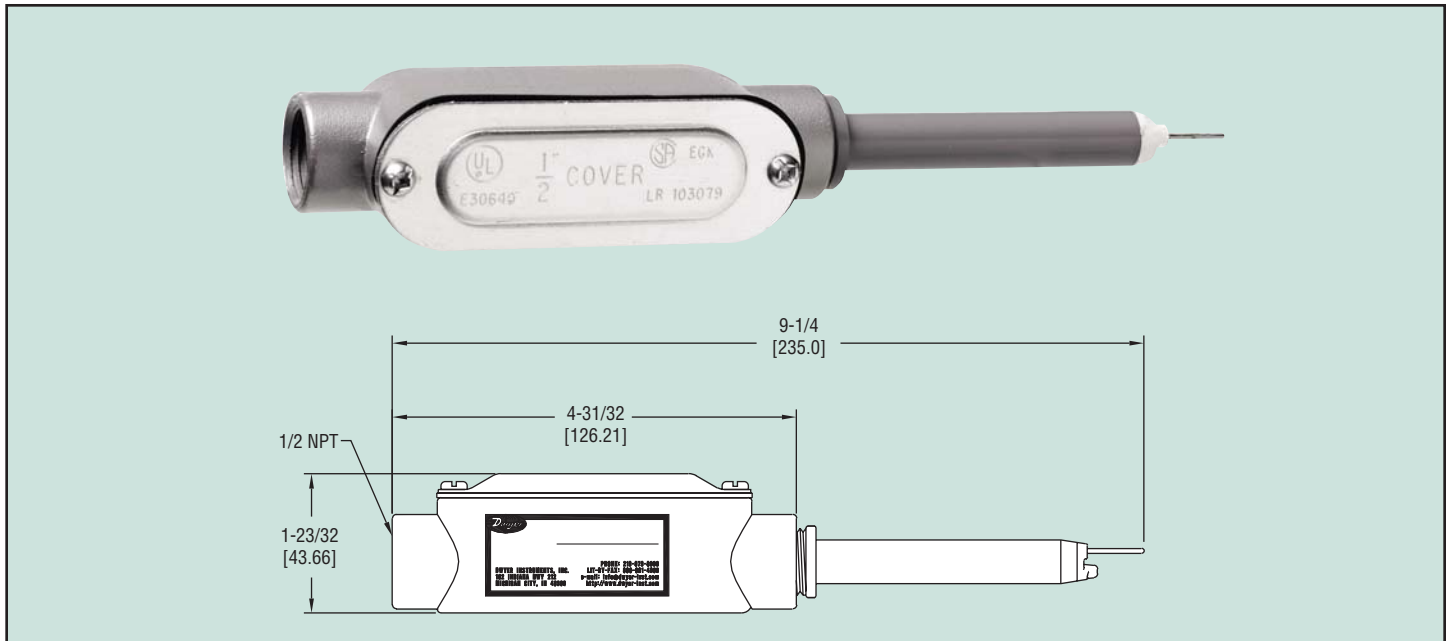
Weight: 13.9 oz (394.16 g).



Series
641B

Air Velocity Transmitter

8 Field Selectable Ranges in FPM or MPS



Air Velocity

The Series 641B Air Velocity Transmitter uses a heated mass flow sensor technology. It has 4 user-selectable ranges from 250 FPM to 2000 FPM with corresponding metric ranges from 1.25 MPS to 10 MPS. The 641B provides an isolated 4-20 mA output proportional to the velocity.

The Series 641B's steel sensor allows the unit to be used in dirty air environments. This rugged sensor is ideally suited for quick field cleaning from a simple cloth to a pulse of air from an air source. Proper sensor performance can be maintained in these polluted environments by easily removing dust and debris from the sensor which is problematic for pitot tubes and other flow sensing transmitters.

641B-4 Air Velocity Transmitter

Accessories

A-156, Flange Mounting Plate with 1/2" female NPT

A-155, Mounting Gland with 1/2" male NPT fitting

SPECIFICATIONS

Service: Air and compatible, non-combustible gases.

Accuracy:

5% FS Process gas: 32 to 122°F (0 to 50°C).

6% FS Process gas: -40 to 32°F & 122 to 176°F
(-40 to 0°C & 50 to 80°C).

Response Time: Flow: 1.5 seconds to 95% of final value
(Output filter set to minimum).

Temperature Limits: Process: -40 to 176°F (-40 to 80°C).
Ambient: 32 to 140°F (0 to 60°C).

Humidity Limit: Non-condensing.

Power Requirements: 12–35 VDC, 10–16 VAC.

Output Signal: 4-20 mA, isolated 24V source, 3 or 4-wire connection.

Output Filter: Selectable 0.5 –15 (seconds).

Loop Resistance: 600 ohms max.

Current Consumption: 300 mA max*.

Electrical Connections: Screw terminal.

Enclosure Rating: Designed to meet NEMA 4X.

Mounting Orientation: Unit not position sensitive.

Weight: 12.6 oz (357.2 g).

* A brief current transient exceeding 300 mA may be seen on startup.

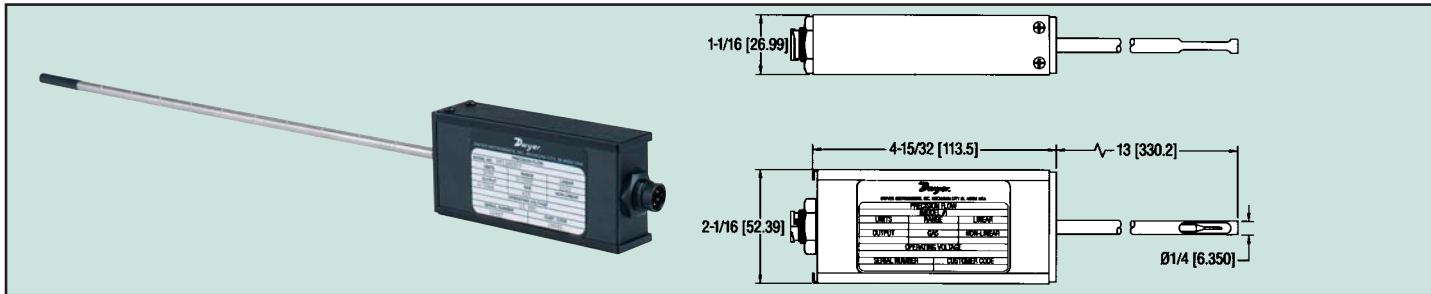


Series
PF

Precision Flow™ Air Velocity Transmitter

High Accuracy, 0.2 Second Response, 4 to 20 mA Output

Air Velocity



Precision Flow™ Air Velocity Transmitters directly monitor gas mass flow rates of free air flows or single point flows in pipes, ducts and stacks. The 4 to 20 mA output signal is linearly proportional to gas mass velocity without additional compensation needed for pressure and temperature variations. The 304 SS insertion probe contains a velocity sensor to monitor mass flow and a temperature sensor to automatically correct for temperature changes. The probe is directly mounted to a NEMA 2 anodized aluminum enclosure. Stocked models are calibrated for air.

MODELS

Model Number	Range
PF1300202	0 to 2000 SFPM
PF1300204	0 to 4000 SFPM
PF1300206	0 to 6000 SFPM

APPLICATIONS

Heating, ventilation and air conditioning (HVAC); hood and gas cabinet monitoring; cleanroom and cleanbench face velocity monitoring.

SPECIFICATIONS

- Service:** Air, nitrogen, or non-corrosive, non-combustible gases.
- Wetted Materials:** 304 SS probe, glass coated sensor, epoxy.
- Accuracy:** ±1% FS, ±0.5% of reading over 32 to 122°F (0 to 50°C) and 5 to 30 psia (0.35 to 2 kg/cm²).
- Repeatability:** 0.2% F.S.
- Temperature Limits:** -40 to 250°F (-40 to 121°C).
- Pressure Limits:** 150 psig (10 kg/cm² G) max.
- Power Requirements:** 15 to 18 VDC, 300 mA max.
- Output:** 4 to 20 mA, linear.
- Response Time:** 0.2 seconds to 63% of final velocity value.
- Loop Resistance:** 400 K max.

Electrical Connection: Four wire standard connector.

Probe Dimensions: ¼" (6.35 mm) O.D., 13" (33 cm) length.

Operating Temperature: 32 to 122°F (0 to 50°C).

Weight: 0.7 lb (0.30 kg).

Suggested Specifications

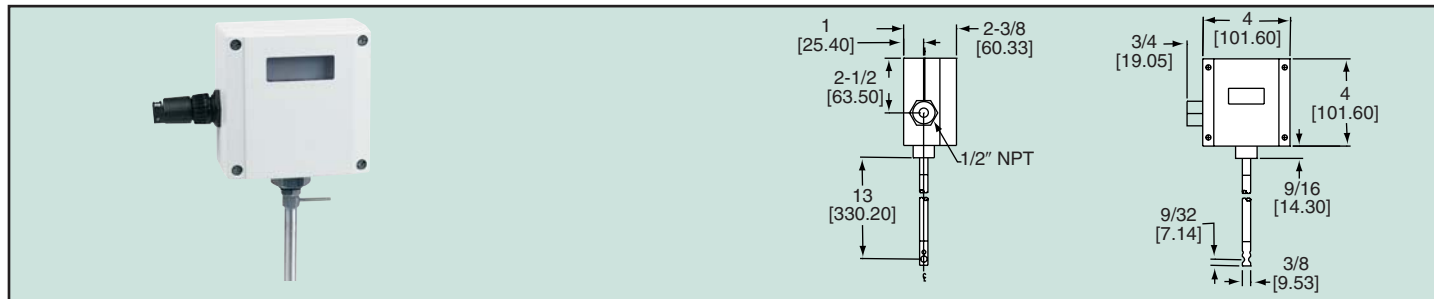
Air velocity transmitter shall be an insertion type mass flow meter with accuracy of ±1% FS, +0.5% of reading and a 0.2 second response time. Transmitter shall provide a 4-20 mA output signal linearly proportional to gas mass velocity. Insertion probe shall be constructed of 304 SS with a glass coated sensor assembly. Electronics shall be housed in a NEMA 2 enclosure. Air velocity transmitter shall be Dwyer Model No. PF_____.



Series
PFS

Smart Air Velocity Transmitter

Field Rangeable, 0.1 Second Response, ±0.2% Repeatability



Series PFS Smart Air Velocity Transmitter measures mass flow rate of air, nitrogen, or other non-combustible gases and delivers a linear 4 to 20 mA output signal. The smart electronics permit field configuration of flow range and full validation of calibration. Compensate for flow profile variations or specific application conditions with the K-Factor correction feature. Series PFS include user-adjustable high and low alarm outputs and adjustable time response to track flow fluctuations. View flow rate on units with built-in display. All parameters can be quickly programmed via three push buttons or RS-232 and the Windows™ 95 based software (sold separately).

MODELS

Model Number	Range	Display
PFS1300204	0 to 4000 SFPM	No
PFS1300210	0 to 10,000 SFPM	No
PFS1300215	0 to 15,000 SFPM	No
PFS13002041	0 to 4000 SFPM	Yes
PFS13002101	0 to 10,000 SFPM	Yes
PFS13002151	0 to 15,000 SFPM	Yes

SPECIFICATIONS

- Service:** Air, nitrogen, or non-corrosive, non-combustible gases.
- Wetted Materials:** 304 SS probe, glass filled polyester sensor, epoxy, and ceramic.
- Accuracy:** ±1% FS.
- Repeatability:** ±0.2% full scale.
- Temperature Limits:** -40 to 250°F (-40 to 120°C).
- Pressure Limits:** 150 psig (10 bar) max.
- Power Requirements:** 18 to 30 VDC, 625 mA max.
- Output:** 4 to 20 mA linear, optical/galvanic isolated; proportional to point mass flow rate or velocity.
- Zero and Span Adjustment:** 50 to 100% FS.

Response Time: 0.1 seconds to 63% of final velocity value.

Loop Resistance: 700K max.

Relay Rating: Maximum 42 VAC/VDC, 140 mA.

Electrical Connection: 1/2" female NPT.

Enclosure Rating: NEMA 4X (IP65) powder-coated cast aluminum.

Mounting: 3/8" tube compression fitting (not included).

Correction Factor Setting: 0.5 to 2.

Computer Requirements: IBM compatible 386 or above and Windows™ 95 or later with minimum 8 mB RAM (16 mB preferred) and one serial port.

Weight: 0.7 lb (0.30 kg).

Agency Approvals: CE.

Accessories

No. PFS60 Windows™ Software and Connecting Cable



Model
AFH

Electronic Balometer

Measures Volumetric Flow Rate and Temperature

CE



SPECIFICATIONS

Service: Air.

Volume Flow Rate: 30 to 1180 cfm (50 to 2000 m³/h).

Temperature Limits: 32 to 176°F (0 to 80°C).

Accuracy: ±2% of reading.

Temperature Accuracy: ±0.5% of reading.

Display: 4 digit LCD, 0.45" High.

Output: RS 232 serial interface.

Memory Capability: 99 readings.

Volume Flow Resolution: (1 m³/h, l/s, or cfm).

Temperature Resolution: (0.1°C or 1°F).

Velocity Resolution: 1 fpm (0.01 m/s)

Power Requirements: 4 AA batteries (included).

Pressure Drop Across: 0.22" H₂O Max (55 Pa).

Weight: 26.55 lb (12.04 kg).

Agency Approvals: CE.

Air Velocity

Rapidly obtain accurate measurements of airflow distribution in HVAC systems. The versatile design of the AFH electronic balometer allows easy data acquisition on ceiling, wall-mounted, and floor-level diffusers, working in supply or exhaust. View measurements easily on the large LCD display, and store up to 100 readings in its non-volatile memory for later analysis. Download data to your computer via the A-547 RS-232 cable (sold separately). Eliminating time-consuming calculations, this instrument utilizes a sixteen-point measurement array to display flow in cfm, m³/h, or l/s. Light weight and easy to handle, the AFH requires only one person to operate. Standard 2'x2'; hood fits over most standard grills and exhausts. Additional hood expansion kits are sold separately. Each unit includes: AFH meter, 2' x 2' hood, rugged carrying case, four universal hood-support poles, four AA batteries and calibration data sheet.

Model AFH

Accessories

A-542: 1'x4' hood expansion kit

A-543: 1'x5' hood expansion kit

A-544: 2'x4' hood expansion kit

A-545: 3'x3' hood expansion kit

A-546: Vane anemometer (used in conjunction with base unit to calculate air velocity)

A-547: RS-232 computer cable



No. 480

Vaneometer™

Swing Vane Anemometer. Use This Sensitive New Dwyer Unit to Measure Low Air Velocities — at Low Cost*

The Dwyer 480 Vaneometer™ Swing Vane Anemometer is a durable low-priced instrument specifically designed to simplify the measurement of low air velocities from 25 to 400 feet per minute. OSHA, EPA and other safety ventilation requirements for spray booths and at fume, smoke and dust exhaust hoods can now be quickly checked, even by untrained personnel. Its small size and light weight — only four ounces make it ideal to carry from one work station to another. A versatile steel mounting bracket for continuous monitoring is also included. The Vaneometer™ Swing Anemometer is accurate to $\pm 5\%$ of full scale to 100 FPM and $\pm 10\%$ from 100 FPM to top of scale. It has a spirit level to ensure accurate readings and the large scales are easy to read and visible from both sides. The housing is molded from tough ABS plastic and easy to clean with soap and water. The polyester vane can be cleaned with lacquer thinner. A spare vane is provided.



Air Velocity

Use a Vaneometer™ to measure velocity of air flow into laboratory fume hoods and at paint spray booths to determine when to change filters. Or wherever needed to meet OSHA standards of ventilation for smoke, dust or fume removal.



MODELS

Model	Description
480	Vaneometer™, 25-400 fpm
M480	Vaneometer™, 0-2.0 m/s
A-390	Extra vanes, pkg. of 2
A-406	Molded carrying case
A-407	Plastic carrying pouch

*U.S. Patent No. 4,154,101

No. 460

Air Meter

A Low-Cost, Direct Reading Instrument Used for Both Air Velocity & Static Pressure Tests



Simple and quick, the No. 460 Air Meter is popular for servicing air conditioning, heating and ventilating equipment. Direct reading velocity and static pressure scales — both low and high ranges — show supply and return grille velocities, furnace draft, pressure drop across filters, etc. The 460 gives consistent, accurate results with no tedious calibration. Rugged plastic for rough daily use. Dual velocity ranges read 260-1200 and 1000-4000 fpm; pressure ranges from .005-.09 and .05 - 1.0 inches w.c.

- 460 Air Meter, complete kit
- A-378 Tube of 3 replacement floats
- A-379 Supply grill probe
- A-380 Return grill probe
- A-381 Cleaning kit including 3 anti-static chemically treated pipe stem cleaners and nylon high range orifice cleaner



A COMPLETE POCKET-SIZE KIT

Includes air meter, return and supply grille probes, angle connector, cleaning materials, instruction card, air velocity calculator, carrying case and one extra plastic ball in plastic tube (not shown).



Furnace draft (left)



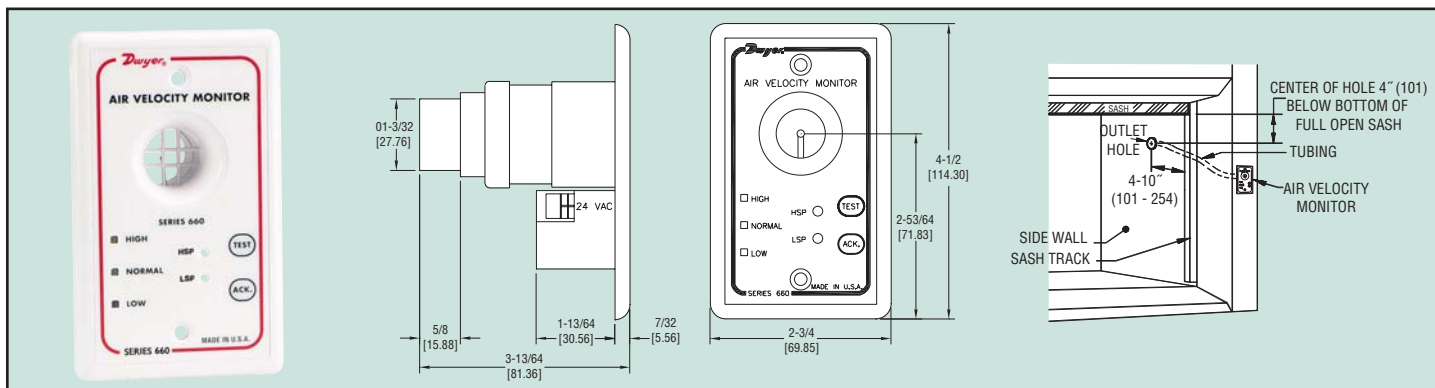
Grille velocities (right)



Model
660

Air Velocity Monitor

Continuously Measures Fume Hood Airflow



Air Velocity

Model 660 Air Velocity Monitors are a practical, affordable way to continuously monitor for safe airflows through laboratory fume hoods. They are typically installed in the fume hood side fascia and connected to the interior sidewall via 1/8" flexible tubing. As the exhaust fan draws air through the device, a sensitive constant temperature thermistor measures flow and lights a green (normal), yellow (high) or red (low) LED. An audible alarm also warns of low flow and requires manual resetting. Mounting holes fit standard single gang electrical box.

Model 660 Air Velocity Monitor. Includes 3' flexible tubing, pre-fittings and 90° elbow, 120 VAC to 24 VAC power transformer.

SPECIFICATIONS

Service: Air and non-combustible, non-corrosive gases.

High Setpoint Range: 0-275 FPM (0-1.397 m/s).

Low Setpoint Range: 0-150 FPM (0-.792 m/s).

Repeatability: ±7% of full span, 0-50 and 150-275 FPM; ±5% of full span, 50-150 FPM.

Compensated Temperature Range: 50 to 90°F (10 to 32.2°C).

Operating Temperature Range: 32 to 120°F (0 to 48.9°C).

Power Supply: 24 VAC, 3 watts maximum.

Response Time: 6-10 seconds.

Warm-Up Time: 3-5 minutes (no flow).

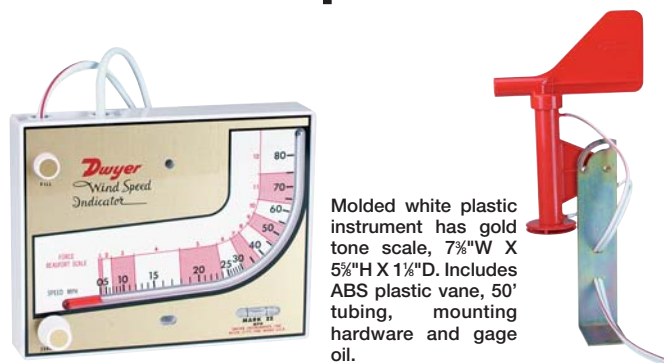
Audible Alarm: 75 dB between 3-10 feet.

Weight: 3 oz (85 g).

Mounting Hardware: (2) #6 x 1" sheet metal screws, (2) 6-32 x 3/8" machine screws.

(Note: Standard discounts do not apply to the Wind Speed Indicator or Windmeter. Sporting goods dealers and distributors: Contact factory for quantity discounts.)

Mark II Wind Speed Indicator



Molded white plastic instrument has gold tone scale, 7 3/8" W X 5 1/2" H X 1 1/8" D. Includes ABS plastic vane, 50' tubing, mounting hardware and gage oil.

Perfect for your living room, den, workshop or office. Instruments are accurate, low-cost and practical. Standard model indicates wind speed directly on liquid filled scale reading in both Miles per Hour (0-80) and Beaufort scale (1-12). Also available is metric model, same as above but reading 0-130 kilometers per hour. To order, specify Mk II Wind Speed Indicator, MPH or Mk II Wind Speed Indicator, KPH.

Mark II WSI, mph scale
Mark II WSI Metric, kph scale

Portable Wind Meter



Ideal for yachtsmen, outdoorsmen, farmers, etc. A welcome gift. Use anywhere. Direct reading, no calculations. Hold meter at eye level, back of unit to wind. White ball in tube indicates wind speed. Meter has two scales for maximum accuracy and easy reading - low, 2-10 and high, 4-66 m.p.h. range. For high range, cover hole with finger. Pocket size, sturdy plastic, has case.

Hold this way for low scale reading.



For high scale reading, finger covers hole.



Dimensions: 5/8" W X 6-3/4" H X 17/32" D.

Wind Meter-MPH, mph scale
Wind Meter-KNOT, knots scale
Wind Meter-KPH, kph scale
Wind Meter-MPS, mps scale

A-376 Replacement floats for windmeter, tube of 3
A-377 Tube cleaning kit for windmeter