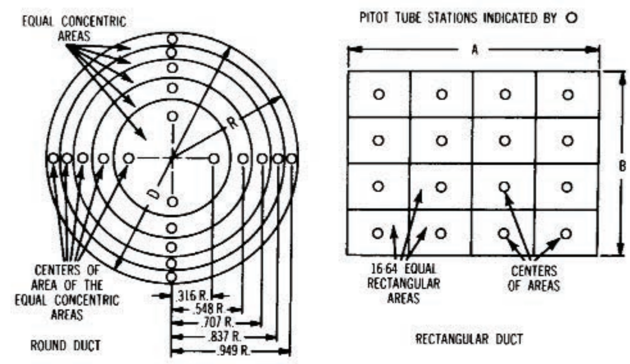
Series 160E Modified Ellipsoidal Pitot Tubes

Specifications - Installation and Operating Instructions - Flow Curves



TRAVERSE ON ROUND AND SQUARE DUCT AREAS

Series 160E Pitot tubes conform to ISO 3966 for National Physics Laboratory type Modified Ellipsoidal Tip Pitot tubes. They are constructed of 304 stainless steel materials for use in corrosive environments to 1500°F (815°C). Orientation can be visually determined by observing the alignment arm which is parallel to the tip.

These Pitot tubes provide an alternative to the Series 160 hemispherical design. All Series 160 accessories can be used with Series 160E units.

Note: The ellipsoidal tip provides improved accuracy over the hemispherical tip when alignment is maintained within 2° of flow. However this design is more prone to damage, so extra care should be taken to avoid rough handling.

INTRODUCTION

The **total pressure** of a flowing air stream in a duct or pipe is the sum of the **static** or bursting pressure exerted on the sidewalls and the **velocity** or impact pressure of the moving air. The difference between **total** and **static** pressures is called **velocity pressure** which can be used to determine the linear rate of air movement expressed in FPM or feet per minute. A Pitot tube has two tubes, one inside the other, to sense both pressures simultaneously. By connecting these two tubes differentially to a manometer, **velocity pressure** is indicated directly and the corresponding air velocity can be calculated after applying the appropriate correction factor.

For maximum accuracy of ±2% as in laboratory applications, care is required and the following recommendations should be followed.

1. Duct diameter should be 4″ or larger.
2. Point tip upstream facing flow.
3. Make an accurate traverse per drawings, calculate the velocities at each point and average them.
4. Take readings in a smooth, straight duct section a minimum of 8-1/2 duct diameters in length upstream and 1-1/2 diameters downstream from the Pitot tube.
5. Provide an egg crate type straightener upstream from the Pitot tube.

TAKING AIR VELOCITY READINGS

To measure air velocity with a Series 160E Pitot tube, make a 3/8″ (9.5 mm) diameter hole on the side of the duct. Insert Pitot tube to the required depth and connect to a manometer or pressure gage with an appropriate range. The total pressure tap should be connected to the high pressure side of the manometer and the static pressure tap to the low pressure side. If reading is negative, reverse connections.

Make a series of readings traversing the duct in horizontal and vertical planes. Using **velocity pressures** recorded at each location, calculate **velocities** and average them for final velocity value.

If circumstances do not permit or require an accurate traverse, center the Pitot tube in the duct, determine the pressure differential (velocity pressure), calculate actual center velocity and multiply this value by 0.9. Tests run in this manner should be accurate within ±5%.

CALCULATING VELOCITY

Follow instructions printed on the Dwyer Air Velocity Slide Chart included with each Pitot tube or use the following equations:

Air Velocity = $1096.7 \sqrt{\frac{P_V \, C}{D}}$

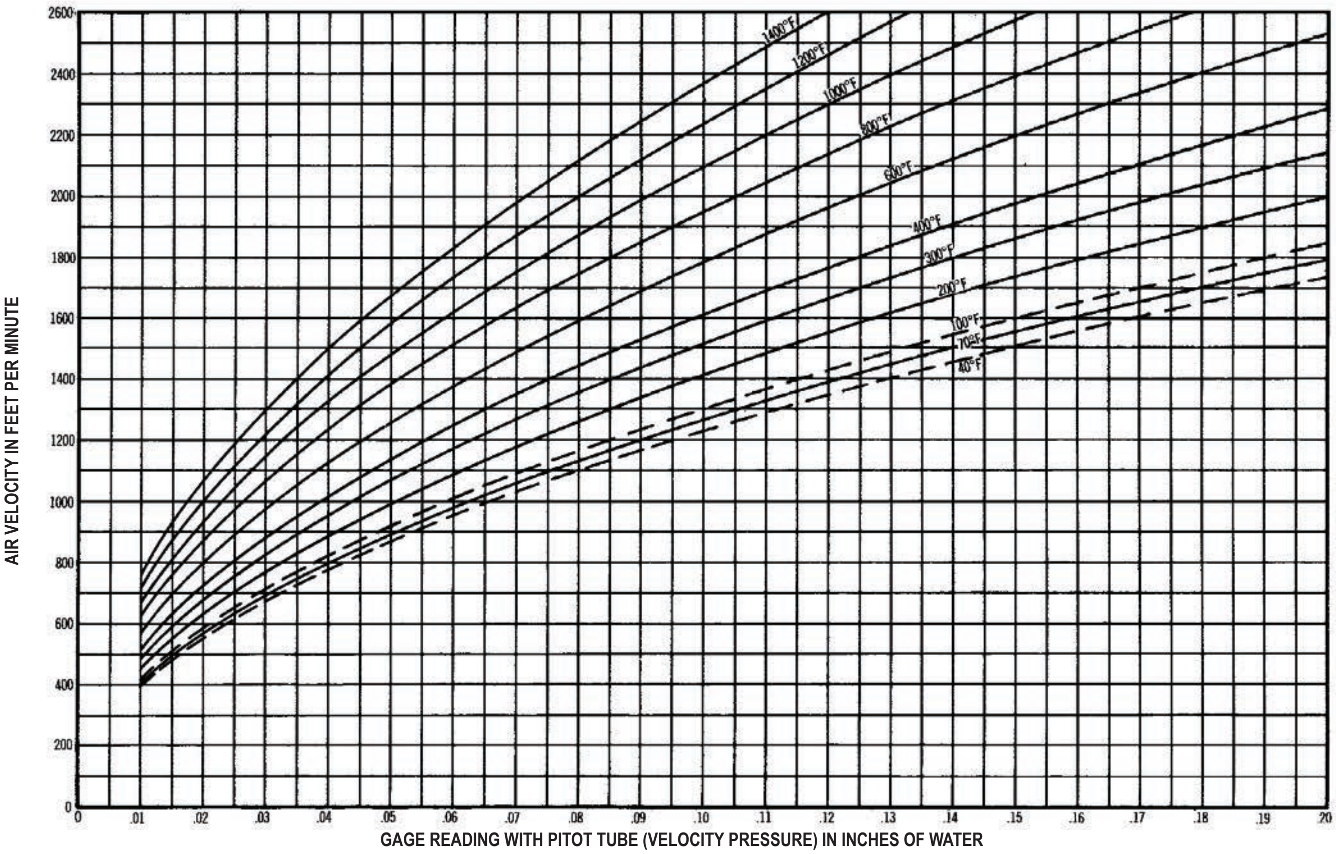
where P_V = Sensed pressure difference (velocity pressure) in inches of water column
D = Air density in pounds/cubic foot (dry air = .075)
C = Pitot tube coefficient - 1.0

Air Density = 1.325 x P_B T

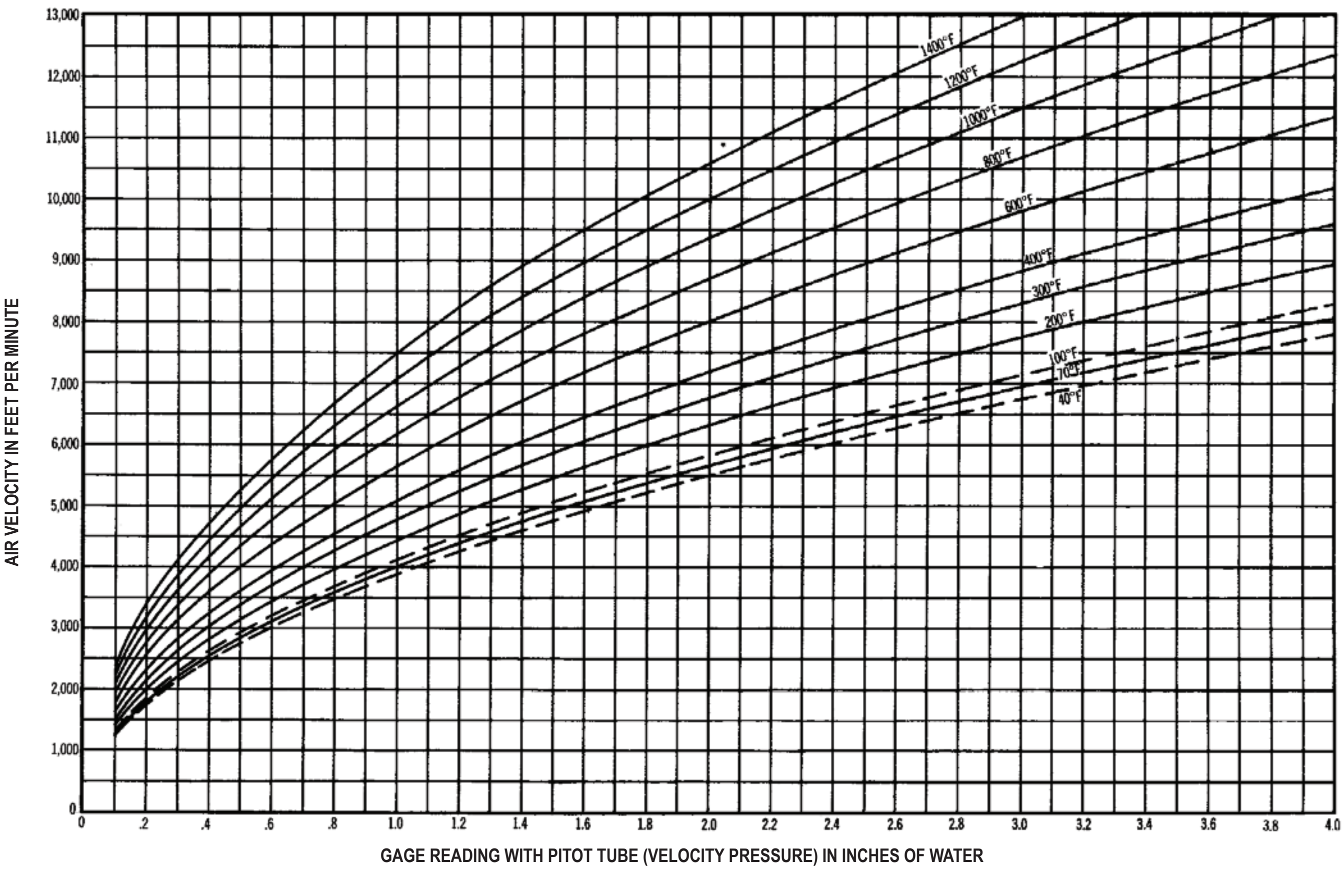
where P_B = Barometric pressure in inches of mercury
T = Absolute temperature (indicated temperature in°F plus 460)

Flow in **cubic** feet per minute equals duct cross sectional area in square feet x air velocity in **feet per minute**.

With dry air at 29.9 inches mercury, air velocity can be read directly from temperature correction charts on reverse.



AIR VELOCITY IN FEET PER MINUTE
GAGE READING WITH PITOT TUBE (VELOCITY PRESSURE) IN INCHES OF WATER
1400°F
1200°F
1000°F
800°F
600°F
400°F
300°F
200°F
100°F
70°F
40°F



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