Model 9880 Intrinsically Safe Air Velocity Meter

Operation and Service Manual

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Service Policy

Knowing that inoperative or defective instruments are as detrimental to Alnor 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 the Customer Service department at (800) 424-7427 (USA) or (1) 847-677-3500 (International).

Chapter One

Setup

This chapter guides you through unpacking and installing batteries in your Model 9880. See chapter two for a detailed description of the operating functions.

Unpacking

Carefully unpack the instrument and accessories from the shipping container. Check the individual parts against the list of components in Table 1; if any are missing or damaged, notify Alnor immediately.

Table 1: List of Components

Qty	Item
1	Model 9880
1	Carrying Case
4	AA Alkaline batteries
1	Operation and Service Manual

Installing the Batteries

Install batteries by loosening the screw in the battery access cover located on the back of the instrument. Insert four AA-size alkaline batteries in the battery tubes according to the polarity indicated on the instrument case under the battery access cover. Replace the battery access cover and tighten the screw.

If the batteries are installed incorrectly, damage to the Model 9880 will not occur, but the instrument will not function.

WARNING: The Model 9880 is only listed for intrinsic safety when operating with four AA-size alkaline batteries. Batteries of other types (NiCd, carbon-zinc, etc.) are NOT acceptable for use in a hazardous environment.

CHAPTER TWO

Operation

This chapter thoroughly explains how to operate the Model 9880.

Extending The Probe

The Model 9880 contains a retractable velocity probe which is shipped in its retracted position. To expose the probe to the flow for air velocity measurements, grasp the black tip of the probe which is visible in the center of the top of the instrument. Pull firmly straight up on the probe. Once fully extended to its three inch length the probe can rotate 90° to facilitate measuring air from many directions.

To retract the probe, align the sensor window so that you can view straight through the window from the front of the instrument. Once the window is aligned to the front, grasp the probe tip and push firmly straight into the instrument case. Always store the probe in its retracted position when not in use in order to protect the sensor.

The Model 9880 is designed to stand either upright or on its sides in air velocities of up to several hundred feet per minute. This can be useful for making face velocity measurements in a cleanroom bench or a fume hood.

As you handle the probe, take care not to bump it against duct walls or other objects. The probe has been made as rugged as possible, but can be damaged by careless handling.

Measuring Velocity

For highest accuracy, it is important with the Model 9880 to properly align the probe to the flow. Orient the probe so that the air being measured flows straight through the sensor window in the direction indicated by the arrow at the tip of the probe. The arrow at the tip of the probe should point downstream.

Switching On The Power

Turn on the Model 9880 using the ON/OFF switch. The Model 9880 will display battery life for the first five seconds. This number represents the approximate battery life remaining, and will range from less than 0% for low batteries to something

over 100% for a short time while the “surface charge” of new batteries burn off.

After five seconds the Model 9880 will display velocity in the selected units. Units available for display are standard feet per minute (S fpm) and standard meters per second (S m/s), depending on what units were ordered when the meter was purchased. The units of measure cannot be changed in the field.

Selecting Battery Life / Velocity Display

The BATT/VEL switch on the instrument allows you to determine remaining battery life without turning the unit off. With the unit on, slide the switch to BATT to read the approximate percentage of battery life remaining. Slide the switch to the VEL position to read the current velocity.

Selecting The Sensor Response

The Model 9880 has a FAST/SLOW RESPONSE switch for setting the display averaging time. In the slow response mode, the Model 9880 displays the average velocity measured during the past 12 seconds. This is a running average, so the display is still updated once per second. In the fast response mode, the meter displays the average

velocity measured during the past 3 seconds. The way the Model 9880 averages velocity is by saving the velocity measured each second into separate locations in memory. Every second, a new reading is taken and the oldest is thrown out. Depending on the position of the sensor response switch, either the last 3 readings or all 12 readings will be averaged for display purposes.

Batteries

The Model 9880 continuously monitors its battery supply voltage. When the battery life falls below 15%, the battery indicator (BAT) in the upper left corner of the display will blink on and off. This indicates a low battery condition and means you should install fresh batteries. Battery life for a fresh set of alkaline batteries is approximately 25 hours.

Once the BAT indicator begins to blink, you still have a few minutes to complete the measurement you are making. While the indicator is blinking, the meter operates normally.

If the battery voltage falls below 5.0 VDC, the display will read “LO” and the BAT indicator will be on continuously. Batteries must then be replaced before velocity readings can be taken.

If you do not install fresh batteries and the voltage falls below 2 VDC, the display will go blank.

WARNING: Alkaline batteries are the only batteries approved for the Model 9880. Substitutions of other types will nullify the intrinsic safety rating of the meter.

CHAPTER THREE

Maintenance

The Model 9880 requires very little maintenance to keep it performing well.

Probe Tip

Periodically inspect the probe tip to ensure that it is clean. Dust and oil deposits on the tip and sensor decrease the accuracy of the Model 9880.

CAUTION: The meter must be switched OFF for cleaning. Do not use high-pressure air, strong solvents, or brushes to clean the sensor tip; damage to the sensor could result.

To remove dust, blow it off with a gentle stream of air or rinse it off with a gentle stream of water. To remove a combination of dust and oil, rinse the probe tip in isopropyl alcohol and them blow it off with a gentle stream of air. (Do not use isopropyl alcohol which contains Lanolin.) Never use heat to dry the probe.

Touching the probe with any object is not recommended. Allow the sensor to dry thoroughly before use.

Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth and isopropyl alcohol or a mild detergent. Never submerse the Model 9880.

Storage

When storing the Model 9880 for more than a month, it is recommended that you remove the batteries to prevent damage due to leaking batteries.

Calibration

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

Probe Replacement

If your probe becomes damaged, the Model 9880 must should be returned to Alnor Instrument Company. Please call Customer Service to obtain an RMA number and return instructions.

CHAPTER FOUR

Troubleshooting

Table 2 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the meter. If your symptom is not listed, or if none of the solutions solve your problem, please contact Alnor.

WARNING: There is a five-pin connector on the Model 9880 which is visible when the battery cover is removed. This connector is meant for factory calibration purposes only and must not be used in a hazardous environment.

Table 2: Troubleshooting

Symptom	Possible Causes	Corrective Action
No display	Unit not switched on	Switch unit on
	Low or dead batteries	Replace batteries
	Dirty battery contacts	Clean battery contacts

Symptom	Possible Causes	Corrective Action
No display	Batteries installed incorrectly	Check battery alignment against illustration inside battery cover
BAT is blinking	Batteries are getting low	Replace batteries
Display reads "LO" and the BAT indicator is on	Batteries are low	Replace the batteries
	Dirty battery contacts	Clean the battery contacts
Velocity reading fluctuates badly	The flow is fluctuating	Reposition the probe in a less turbulent section of the flow or set the RESPONSE switch to SLOW

Symptom	Possible Causes	Corrective Action
Velocity reading blinks 2000 fpm or 10.16 m/s	The velocity exceeds 2000 fpm or 10.16 m/s	Use an alternative method to measure the velocity
	Sensor may be damaged	Contact Alnor
Display indicates greater than 10 fpm (0.05 m/s) in zero flow condition	Sensor may be damaged	Contact Alnor

APPENDIX A

Standard Velocity vs. Actual Velocity

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

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

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

Because actual air density is rarely equal to air density at standard conditions, actual velocity usually differs from standard velocity.

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

$$Act.Vel. = Std.Vel.\left[\frac{460+T}{460+70}\right]\frac{14.7}{P}$$

Where

T = Ambient temperature in °F
P = Ambient pressure in psia

If you use metric units, the equation becomes:

$$Act.Vel. = Std.Vel.\left[\frac{273+T_m}{273+21.1}\right]\frac{101.4}{P_m}$$

Where

T_m = Ambient temperature in °C
P_m = Ambient pressure in kPa

Example No. 1

You want to measure the actual velocity in a duct. The air temperature in the duct is 55°F and the pressure is 14.24 psia. You take a measurement and the display reads 1200 fpm.

$$Act.Vel. = 1200\left[\frac{460 + 55}{460 + 70}\right]\frac{14.7}{14.24} = 1203.7\, ft / \min$$

Example No. 2

You need to measure the actual velocity in a plenum. The air pressure is 99.4 kPa and the temperature is 27°C. The display reading on the Model 9880 is 2.30 m/s.

$$Act.Vel. = 2.30\left[\frac{273 + 27}{273 + 21.1}\right]\frac{101.4}{99.4} = 2.39 m/s$$

APPENDIX B

Specifications

Display:	4-digit LCD display 0.4 in. character height
Operating Temperature Range	
Instrument:	32°F to 122°F (0°C to 50°C)
Probe:	32°F to 122°F (0°C to 50°C)
Range:	25 to 2000 fpm (0.13 to 10.16 m/s)
Accuracy:	±5% of reading or ±5 fpm (0.03 m/s), whichever is greater
Resolution:	1 fpm (0.01 m/s)
Batteries:	Four (4) AA-size alkaline **only**
Instrument	2.75 in. x 1.3 in. x 5.2 in.

Dimensions: (70 mm x 33 mm x 132 mm)

Probe Dimensions: 0.25 in. diameter (6.4 mm) 3.1 in. length (79 mm)

Weight (with batteries): 9 oz.

Safety Rating:

UL Listed
Intrinsically safe for use in hazardous locations for Class I Groups C and D, Class II Groups E, F, and G, and Class III, only when used with four AA-size alkaline batteries.