User's Guide

EXTECH INSTRUMENTS

Heavy Duty Hot Wire CFM Thermo-Anemometer

Model 407119A



Warranty

EXTECH INSTRUMENTS CORPORATION *warrants this instrument to be free of defects in parts and workmanship for* ***three years*** *from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.*

Introduction

Congratulations on your purchase of the Extech 407119A Thermo-Anemometer. The 407119A measures air velocity, air volume, and air temperature. It uses a telescoping probe antenna to allow convenient access to grills and diffusers. Careful use of this meter will provide years of reliable service. The Model 407119A features are listed below.

Features

- Combination hot wire probe (for air velocity) and thermistor sensor (for temperature) deliver rapid and precise measurements even at low air velocity values.
- Slim probe design with telescoping antenna for easy grill and diffuser access
- Air Velocity, Air Volume, and Air Temperature measurements
- 20 Reading Average feature
- Zero adjustment
- Data Hold and Record/Recall Max/Min features
- Auto Power OFF
- PC Interface (RS-232) with optional software and cable for data acquisition

Applications

Environmental testing, air conveyors, flow hoods, clean rooms, air balancing, fans/motors/blowers, furnace velocity, paint spray booths, and others.

Specifications

General Specifications

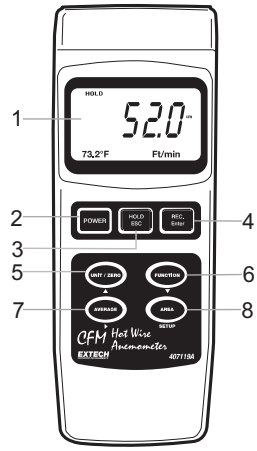
Display	Dual function 5-digit LCD
Measurement units	Air Velocity: m/s, km/h, ft/min, knots, mph; Air Flow: CMM (m^3/min) and CFM (ft^3/min);Temperature: °C and °F
Data hold	Freezes displayed reading
Sampling rate	Display update rate:1 second (approx.)
Sensors	Air velocity and temperature sensors: Thermistor type
MAX/MIN Memory	Record and view Maximum and Minimum readings
Average feature	Averages up to 20 readings
Automatic Power off	Auto shut off after 15 minutes
Data Output	RS-232 PC serial interface with 16-bit data stream output
Operating Temp.	32 to 122°F (0 to 50°C)
Operating Humidity	Max. 80% Relative Humidity
Power Supply	Four (4) 'AA' 1.5V batteries or optional AC adaptor
Power Current	70mA DC (approx.)
Weight (meter only)	1.15 lbs. (521g) with batteries installed
Dimensions	Main instrument: 7.9 x 3.0 x 1.5" (200.0 x 76.2 x 36.8mm) Telescoping Sensor: 0.5" (12.7mm) diameter head Min length of sensor: 8" (260mm); Max. length: 37" (0.94m) with 5.5' (1.7m) cable

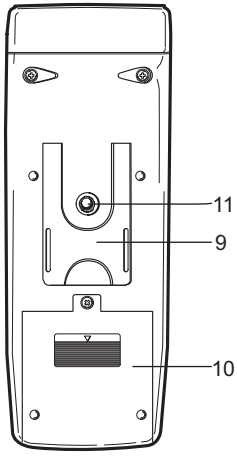
Range Specifications

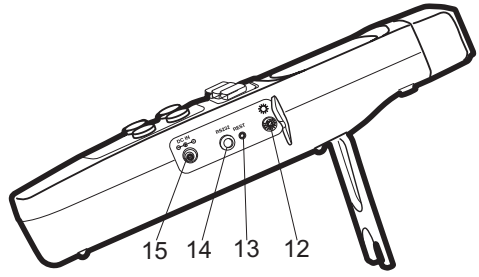
Air Velocity	**Range**	**Resolution**	**Accuracy (of rdg)**
m/s (meters per second)	0.2 – 17.0 m/s	0.1	±(5% + 5 digits)
km/h (kilometers per hour)	0.7 – 61.2 km/h	0.1	±(5% + 20 digits)
ft/min (feet per minute)	40 – 3346 ft/min	1	±(5% + 100 digits)
mph (miles per hour)	0.5 – 38.0 mph	0.1	±(5% + 10 digits)
knots (nautical miles per hour)	0.4 to 33.0 knots	0.1	±(5% + 10 digits)
Air Flow Measurements	**Range**	**Resolution**	**Area Range**
CMM (cubic meters per min.)	0 – 36,000 m^3/min	0.001 to 1	0.001 to 30.0 m^2
CFM (cubic feet per minute)	0 – 1,271,200 ft^3/min	0.01 to 100	0.01 to 322.91ft^2
Air Temperature	**Range**	**Resolution**	**Accuracy**
	32 to 122°F (0 to 50°C)	0.1°F/C	±1.5°F (0.8°C)

Meter Description

1. Display
2. POWER button
3. HOLD and ESC button
4. REC and ENTER button
5. UNIT, ZERO, and ▲up arrow button
6. Function and ▼down arrow button
7. AVG. START, CLEAR, and ►right arrow button
8. AREA SET button
9. Tilt stand
10. Battery compartment / Cover
11. Tripod mount
12. LCD contrast adjustment pot
13. System reset switch
14. RS-232 Output terminal
15. DC9V power adaptor







Operation

Initialization and Zero procedures (please follow these steps before use)

Important Note: The meter's probe locking switch must be in the locked position (with the probe inserted) for the meter to turn on and operate correctly. Refer to the accompanying diagram or the diagram at the top of the meter for switch orientation.

TOP VIEW OF METER



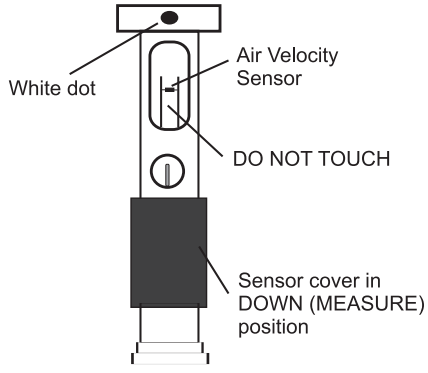
LOCKED Position



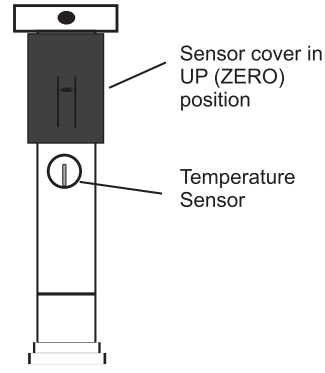
UNLOCKED Position

For the best accuracy and for proper operation, the following steps must be performed.

1. Connect the sensor to the input jack on top of the meter by first unlocking the sensor jack and then inserting the sensor plug. Lock the sensor jack after the probe is inserted.
2. Press the POWER button to turn on the meter. The meter will perform a self-test during which the display will count down from 9999 to 0000.
3. Select the air velocity function using the FUNCTION button. The LCD will display the most recently selected unit of measure for air velocity.
4. To change the temperature units of measure (C/F), use the advanced programming mode discussed later in this manual.
5. Momentary presses of the UNIT button changes the air velocity units. The LCD will reflect the selection.
6. Place the sensor cover in the up (ZERO) position (see diagram below).
7. Open the telescoping sensing antenna to a convenient length.
8. Place the sensor in the area to be measured and allow a short time for it to stabilize to the ambient temperature.
9. To Zero the meter display, press and hold the ZERO button until the second beep.



Measurement Position



Zero Position

Warning! Do not touch the air velocity or temperature thermistors inside the sensor head while moving the sensor cover.

Air Velocity Measurements

1. Follow the Initialization and Zeroing procedures above before continuing.
2. Open the antenna to the desired length.
3. Slide the air velocity sensor cover down.
4. Press the POWER button to turn the meter on.
5. Place the sensor in the air current to be measured. Have the air flow meet the sensor head in the direction of the white dot (as shown in diagram).



6. View the air velocity and temperature readings on the LCD Display. The large main LCD display shows the Air Velocity reading. The lower LCD sub-display shows the temperature reading (left) and the unit of measure (right).
7. To turn the meter off, press and hold the POWER button until the meter switches off.

Air Flow (Volume) Measurements (CMM / CFM)

NOTE: Temperature is not displayed while the meter is in the Air Flow mode.

1. Follow the steps in the Initialization and Zeroing section before continuing.
2. Select the air flow mode using the Function button. The LCD will display CMM (cubic meters per minute) or CFM (cubic feet per minute) when Air Flow is selected.
3. Press the UNIT button momentarily to select the desired air flow units: CMM or CFM. The LCD display will reflect the selection.
4. Calculate the area of the duct or vent under test (refer to the Useful Conversions and Equations section in the back of this manual for assistance). Be sure to compute the area of the vent or duct in square feet or meters. If you have the area in inches, convert inches to feet before programming the meter with the area value.
5. Press the AREA SET button to begin entering the area in m^2 or ft^2. The left digit will begin flashing. Follow the steps below to enter the area of the duct or vent in question:

   Use the ► button to select a digit to change (digit will flash)
   Use the ▲ button increase the value of the flashing digit
   Use the ▼ button to decrease the value of the flashing digit

6. Press the REC/Enter button and then the AREA SET button to save the new area value
7. After the area has been entered, the new area value will be shown on the lower left of the LCD display in ft^2 or m^2. If the unit of measure is CFM, the area will be shown in square feet. If the unit of measure is CMM, the area will be shown in meters squared.
8. Press the ESC button to abort the programming at any time.
9. Place the probe in the area under test. The main LCD digits will indicate the air flow in CFM or CMM. If the CFM or CMM reading exceeds 99999, use the displayed X10 multiplier to calculate the reading.
10. To turn the meter off, press and hold the POWER button until the meter switches off.

AVERAGE Feature for the Air Flow Mode

In the Average mode, up to 20 readings can be stored and averaged.

1. In the Air Flow Mode (discussed earlier), press the FUNCTION button momentarily until the AVG icon and a 'zero' appears on the lower LCD display line.
2. Press the AVG START button to record the current reading. A '1' will appear on the lower LCD line indicating that one reading has been stored.
3. Press the AVG START for up to a total of 20 measurements. The number on the lower LCD line will increment with each press of the AVG START button letting the user know how many readings are currently being averaged. Note that only the averaged reading is shown while in this mode, not the actual reading.
4. To clear (erase) all of the currently stored readings and start again, press and hold the AVG button until the meter beeps twice. Note that the counter resets to '0' and that the meter is ready to start another averaging session.
5. Use the FUNCTION button to exit this mode of operation.

Data Hold Feature

1. While taking measurements, press the HOLD button to freeze a reading.
2. The HOLD indicator will appear on the LCD when the display is in Data Hold mode.
3. Press HOLD again to return to normal operation.

Maximum (MAX) and Minimum (MIN) Recording

The MAX / MIN Record-Recall feature allows the user to record and view the highest and lowest readings during a measurement session.

1. Press the REC button once. The REC indicator will appear on the display and the meter will begin keeping track of the MAX and MIN values.
2. To view the MAX reading, press REC again. The MAX indicator along with the maximum reading will appear on the LCD display.
3. Press REC again to view the minimum value, the MIN indicator along with the minimum reading will appear on the LCD display.
4. To return to normal operation, press and hold the REC button for approx. 3 seconds (until the meter beeps). The display indicators REC, MAX, and MIN will disappear.

Note: Auto Power Off is disabled in the RECORD mode.

Auto Power Off

To save battery life, the meter will automatically shut off after approximately 15 minutes of operation. To temporarily disable this feature (until the meter's power is cycled), press the REC button and enter the RECORD mode. Alternatively, go to the advanced programming section (later in this manual) for instructions on how to disable it long term.

Advance Programming Mode

From the Air Velocity mode of operation, press and hold the SET button until the meter beeps and a '1' is displayed. The advanced programming mode is now accessed. The Auto Power OFF Enable/Disable and the Temperature Units selections are available in the advanced programming mode. Use the ESC button to exit this mode at any time.

Auto Power Enable/Disable

The first parameter in the advanced mode is the Auto Power OFF enable/disable. Use the up and down arrow keys to select the desired value. '0' defeats the Auto Power OFF feature; '1' enables the Auto Power OFF feature. Momentarily press the SET button to move to the next parameter temperature units (see below).

Temperature Units selection (C/F)

The second parameter in the advanced mode is the Temperature Units selection. Use the up and down arrow keys to select the desired value. '0' selects degrees 'C'; '1' selects degrees 'F'. Press the ESC button to exit the advanced programming mode.

System Reset

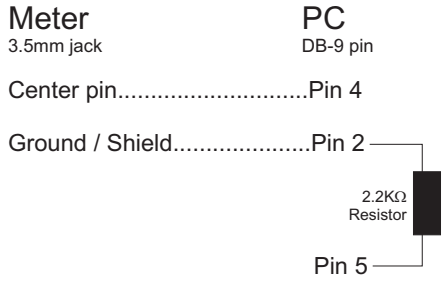
If the meter's display 'locks up' and/or the button presses do not cause the display to change, try a system reset. To reset the meter, use one of the following methods.

1. Move the probe lock switch from the ON to the OFF to the ON position again. Turn the meter on.
2. While powering the meter, press the RESET switch (side compartment) using the point of a paper clip.

PC Interface

The 407119A is equipped with a 3.5mm jack (side compartment) for connection to a PC for data acquisition purposes. The meter's data output is a 16 bit data stream. To obtain PC interface cabling and Windows™ data acquisition software, contact Extech Instruments. Instructions for use are provided with the software. The PC interface cable schematic, data stream protocol, and RS-232 communication settings are provided below.

PC Interface Cable schematic



Protocol for 16-bit data stream

D0	End Word = '0D'
D1 & D8	Displayed reading; D1 = LSD; D8 = MSD. For example, For a displayed reading of 1234, D8 through D1 is 00001234
D9	Decimal point (right to left): 0 = no decimal; 1 = 1 place; 2 = 2 places; 3 = 3 places
D10	Polarity: 0 = positive; 1 = negative
D11 & D12	Displayed unit of measure: 01 = °C; 02 = °F; 08 = m/s; 09 = knots; 10 = km/hr; 11 = ft/min; 12 = MPH; 84 = CMM; 85 = CFM; 0A = Square meter (area); 0B = Square feet (area)
D13	1 = Upper LCD display digits; 2 = Lower LCD display digits
D14	Always '4'
D15	Start word '02'

RS-232 Settings

Baud rate: 9600

Parity: No parity

Data bits: 8

Stop bits: 1

Battery Replacement

When the battery icon appears on the lower left corner of the LCD display, the four (4) 'AA' batteries must be replaced.

1. Remove the rear Phillips head screw
2. Slide off the rear battery compartment
3. Replace the batteries
4. Secure the battery compartment

Calibration and Repair Services

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.

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Support line (781) 890-7440

Technical support: Extension 200; E-mail: support@extech.com

Repair & Returns: Extension 210; E-mail: repair@extech.com

Product specifications subject to change without notice

For the latest version of this User's Guide, Software updates, and other up-to-the-minute product information, visit our website: www.extech.com

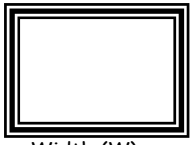
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Useful Equations and Conversions

Area equation for rectangular or square ducts

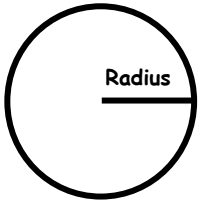


Height (H)

Width (W)

Area (A) = Width (W) x Height (H)

Area equation for circular ducts



Area (A) = π x r^2

Where π = 3.14 and r^2 = radius x radius

Cubic equations

CFM (ft^3/min) = Air Velocity (ft/min) x Area (ft^2)

CMM (m^3/min) = Air Velocity (m/sec) x Area (m^2) x 60

NOTE: Measurements made in *inches*
must be converted to *feet* or *meters* before using the above formulae.

Unit of Measure Conversion Table

	m/s	ft/min	knots	km/h	MPH
1 m/s	1	196.87	1.944	3.6	2.24
1 ft/min	0.00508	1	0.00987	0.01829	0.01138
1 knot	0.5144	101.27	1	1.8519	1.1523
1 km/h	0.2778	54.69	0.54	1	0.6222
1 MPH	0.4464	87.89	0.8679	1.6071	1