CFM 2
BOOKLET
03.10

How to measure CFM

Delivering test and measurement advantages for HVAC/R professionals worldwide

Test the TPI advantage

APPLICATIONS

- Air flow measurements in heating, ventilation and air conditioning systems
- Air duct analysis
- Fume hoods
- Flue Registers
- Exhaust grills
- Hotwire velocity meter enables user to read below 80fpm applications (low flow)

Vane and Hotwire Velocity Meter 575C1

Comes with protective boot (A604)
And the A901Soft Carrying Case

Features

- (Vane) Air flow 0.4 to 25 m/s (Also reads km/s, ft/min, knots/h, miles/h)
- (Hotwire) Air flow 0.2 to 20 m/s (Also reads km/s, ft/min, knots/h, miles/h
- Temperature -5° to 175° F (-20° to 80°C)
- Data record function for maximum and minimum temperature and air velocity reading
- 39" cable length with Lemo connector
- Data Hold
- Auto Power Off
- Protective boot and soft carrying case included

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The Value Leader™

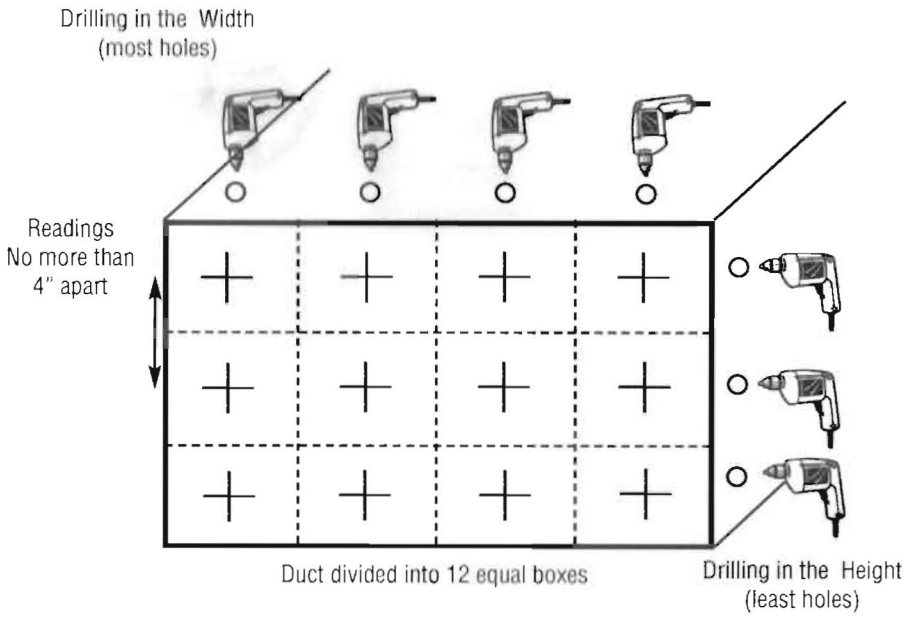
Calculating CFM Worksheet

To do a proper airflow measurement (CFM) you should do traverse readings to obtain the true average airflow through the duct. We recommend doing at least 12 points of measurement.

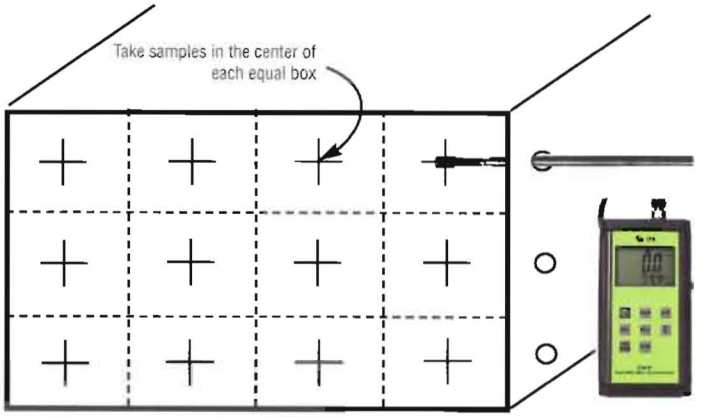
Rectangular Ducts

1. Divide the duct into at least 12 equal boxes, you will need to take the reading in the center of each box. Be sure that the sample points are no more than 4" apart from center to center. If needed you can add more sample points (boxes) to cover larger duct sizes.

2. You will need to determine the easiest access to take your readings. Normally it is best to enter from the side (or Height) of the duct since you will have to drill less holes, but you may have to drill from the bottom (or Width) of the duct.



3. Take your measurements in the center of each box. Be sure you have the tip of the hotwire pointed into the flow of air, there is a white dot on the tip, this should be inline with the flow.
HINT: If you turn the probe you will see the readings change up or down, when the reading is at the highest you are in the proper position.



4. Record your readings in each box where it was taken.

5. Add up all of your readings and record the total.

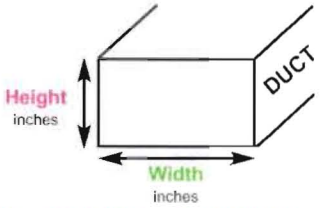
_____ ft/min	_____ ft/min	_____ ft/min	_____ ft/min	= _____ ft/min
_____ ft/min	_____ ft/min	_____ ft/min	_____ ft/min	+ = _____ ft/min
_____ ft/min	_____ ft/min	_____ ft/min	_____ ft/min	+ = _____ ft/min

Total of all readings taken = _____ ft/min

6. Divide your total reading by 12 (if you used more readings (boxes) divide by the total number of readings (boxes) used instead) This will give you an average of all your readings.

_____ ft/min ÷ 12 = _____ AVERAGE READING

7. We now have to determine the area of the duct. This is done by multiplying the duct width by the height. Or refer to table on 6 page.



WIDTH X HEIGHT = sq.inches

_____ X _____ = _____

8. We now have to convert sq.inches to sq.feet

_____ sq.inches ÷ 144 = _____ sq.feet

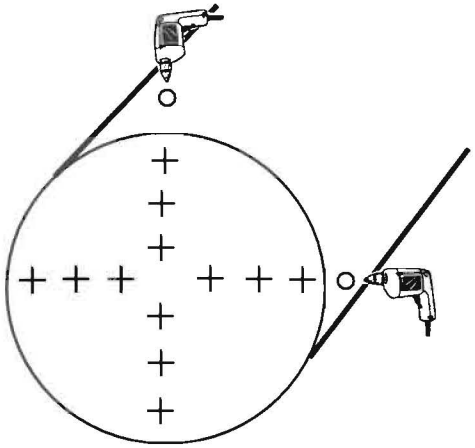
9. We now multiply our average reading by our area (sq.ft)

_____ sq.feet X AVERAGE READING= _____ CFM

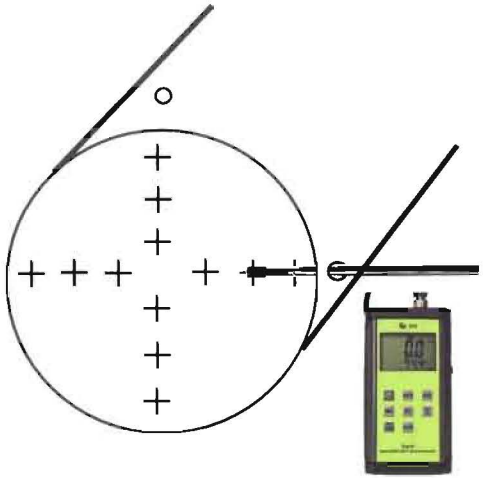
Round Ducts

You will also have to take traverse readings in round ducts.

1. You will need to take a minimum of 10 readings (more depending on duct size). You will need to drill 2 holes at 90 degrees to each other, similar to the drawing below.



2. Take your measurements by inserting the hotwire probe into the drilled holes and use the insertion depth chart to determine how far in the duct you will go for each point. Then you will repeat for the other hole.



DUCT SIZE	Insertion length for each test point - 10 point transverse									
	1	2	3	4	5	6	7	8	9	10
8"	1/4"	5/8"	1 1/8"	1 3/4"	2 3/4"	5 1/4"	6 1/4"	6 7/8"	7 3/8"	7 3/4"
10"	1/4"	7/8"	1 1/2"	2 1/4"	3 3/8"	6 5/8"	7 3/4"	8 1/2"	9 1/8"	9 3/4"
12"	1/4"	1"	1 3/4"	2 3/4"	4 1/8"	7 7/8"	9 1/4"	10 1/4"	11"	11 3/4"
14"	3/8"	1 1/8"	2"	3 1/8"	4 3/4"	9 1/4"	10 7/8"	12"	12 7/8"	13 5/8"
16"	3/8"	1 1/4"	2 3/8"	3 5/8"	5 1/2"	10 1/2"	12 3/8"	13 5/8"	14 3/4"	15 5/8"
18"	1/2"	1 1/2"	2 5/8"	4 1/8"	6 1/8"	11 7/8"	13 7/8"	15 3/8"	16 1/2"	17 1/2"
20"	1/2"	1 5/8"	2 7/8"	4 1/2"	6 7/8"	13 1/8"	15 1/2"	17 1/8"	18 3/8"	19 1/2"
22"	1/2"	1 3/4"	3 1/4"	5"	7 1/2"	14 1/2"	17"	18 3/4"	20 1/4"	21 1/2"
24"	5/8"	2"	3 1/2"	5 3/8"	8 1/4"	15 3/4"	18 5/8"	20 1/2"	22"	23 3/8"

3. Record your readings.

4. Add up all of your readings and record the total.

_____ _____ _____ _____ _____ = _____ ft/min
ft/min ft/min ft/min ft/min ft/min +

_____ _____ _____ _____ _____ = _____ ft/min
ft/min ft/min ft/min ft/min ft/min

Total of all readings taken = _____ ft/min

5. Divide your total reading by 10 (if you used more readings divide by the total number of readings taken). This will give you an average of all your readings.

_____ ft/min ÷ 10 = _____ AVERAGE READING ft/min

6. We now have to determine the area of the duct. Select the area from the list below. Or you can use this formula.

$$\text{Area(sq.in)} = \pi \times \left(\left(\frac{d}{2}\right) \times \left(\frac{d}{2}\right)\right)$$

$\pi = 3.14$
d = diameter

DUCT SIZE	AREA	DUCT SIZE	AREA
4"	0.087 sq.ft	16"	1.40 sq.ft
6"	0.196 sq.ft	18"	1.77 sq.ft
8"	0.349 sq.ft	20"	2.18 sq.ft
10"	0.545 sq.ft	22"	2.63 sq.ft
12"	0.785 sq.ft	24"	3.14 sq.ft
14"	1.07 sq.ft		

7. We now multiply our average reading by our area (sq.ft)

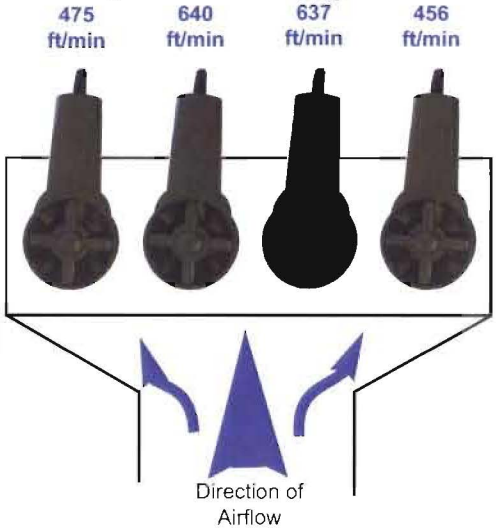
_____ sq.feet X AVERAGE READING= _____ CFM

Example of taking traverse readings of a 4" x 10" grill.

1. Add up the **readings** and divide by the total number of readings to get your **average velocity**.

2. Multiply the **average velocity** by the **area** = CFM

552 ft/min X 0.277 sq.ft = 152.9 CFM



Area of Common Rectangular Ducts

DUCT SIZE	AREA	DUCT SIZE	AREA
8 x8	0.444 sq.ft	10 x 10	0.694 sq.ft
8 x10	0.555 sq.ft	10 x 12	0.833 sq.ft
8 x12	0.666 sq.ft	10 x 14	0.972 sq.ft
8 x 14	0.777 sq.ft	10 x 16	1.111 sq.ft
8 x16	0.888 sq.ft	10 x 18	1.250 sq.ft
8 x18	1.000 sq.ft	10 x 20	1.388 sq.ft
8 x 20	1.111 sq.ft	10 x 22	1.527 sq.ft
8 x 22	1.222 sq.ft	10 x 24	1.666 sq.ft
8 x 24	1.333 sq.ft	10 x 26	1.805 sq.ft
8 x 26	1.444 sq.ft	10 x 28	1.944 sq.ft
8 x 28	1.555 sq.ft	10 x 30	2.083 sq.ft
8 x 30	1.666 sq.ft	10 x 32	2.222 sq.ft
		10 x 34	2.361 sq.ft
		10 x 36	2.500 sq.ft

Other Common Areas: Floor Grills, Returns etc

SIZE	AREA	SIZE	AREA
4 x8	0.222 sq.ft	6 x 8	0.333 sq.ft
4 x10	0.277 sq.ft	6 x 12	0.500 sq.ft
4 x12	0.333 sq.ft	12 x 24	2.000 sq.ft
8 x 10	0.555 sq.ft	24 x 24	4.000 sq.ft
8 x12	0.666 sq.ft		

750a

- 0.2 ounces per year sensitivity
- Detects all existing refrigerants and blends including 404A, PURON, and R507 (AZ50)
- 400 hour sensor life under normal use
- Easy one-hand, thumb wheel operation

753a

- 0.2 ounces per year sensitivity
- Detects all existing refrigerants and blends including 404A, PURON, and R507 (AZ50)
- 400 hour sensor life under normal use
- Pump driven finds and clears quicker for finding leads faster

315C

- Auto field calibrate to +/- 2F in less than 10 seconds in ice water
- Tapered stem (3.1 mm diameter) to fit into a Pete's plug
- Reinforced, heavy duty Housing for strength
- Waterproof
- Fits in your pocket
- -58 to 300 F

343C1

- Auto field calibrate in less than 10 seconds in ice water to achieve +/- 1 F system (tester & probe) accuracy within 30 F to 120 temperature range.
- 343 can measure -58 to +2,462 depending upon the probe used

- GK11M fiberglass probes measure -40 to 950 F
- T1, T2, T-differential, Min, Max, Data hold, and selectable C/F
- Comes with A304 tilt-stand protective boot, two GK11M, and A340 soft pouch

381

- Measure -31 to +999 F, 9:1 D:S
- Repeatable, 0.1 F resolution
- Temperature compen sated for accurate readings at low temperatures
- Last reading hold function
- Easy to use one button operation
- Selectable C/F
- Easy to read LCD with backlight

265

- Slim jaw and body design for use in crowded electrical panels
- Up to 400 AC amps with 0.01 resolution
- Capacitance up to 4,000 microfarads & Frequency
- AC/DC volts up to 600
- 0.1 DC millivolt resolution
- Diode, resistance and audible continuity

605

- Measure vacuum zero to 12,000 microns; over pressure 500 PSI
- Read vacuum in seven international units of measure: microns, PSI, inHg, mBar, Pascals, Torr, and mTorr
- Display updates every 0.5 seconds

270

- Measure motor in-rush current & run current
- Measure temperature differential with relative mode using any K-type sub-mini probe (no adapter required)
- NCV function detects down to 24 V
- Slim jaw and body design for use in crowded electrical panels
- Up to 400 AC amps with 0.01 resolution
- Capacitance, frequency, ACV, DCV, resistance, and continuity