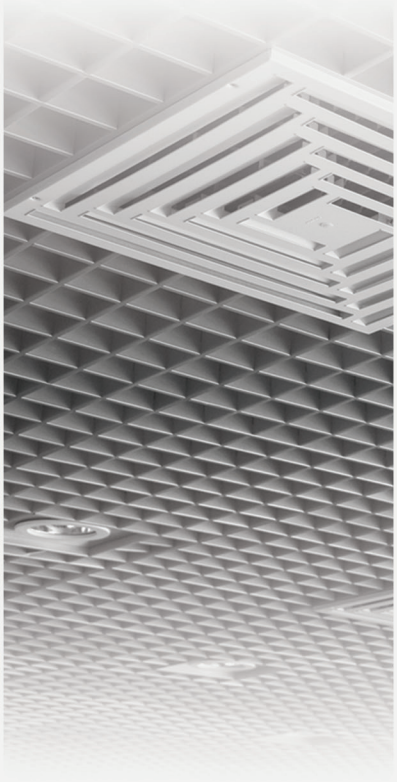
BC-HVAC

Dwyer®

Manufacturing Excellence
Since 1931



HVAC TEST & BALANCING EQUIPMENT

Pressure | Air Flow | Humidity | Gas Sensing | Temperature

Combustion | Sound | Electrical | Rotation

dwyer-inst.com

PRODUCT **OVERVIEW**

PRESSURE MANOMETERS

SERIES	AQTIA-WDPM	477AV	477B	475	490A
					
Range	2 to 350 in w.c. (0.5 to 87 kPa)	1 in w.c. to 150 psi (.25 kPa to 10.34 bar)	20 in w.c. to 100 psi (4.982 to 689.5 kPa)	1 in w.c. to 150 psi (.25 kPa to 10.34 bar)	15 to 200 psi (1 to 13.8 bar)
Service	Non-corrosive dry gases	Air and compatible gases	Air and compatible gases	Air and compatible combustible gases	Compatible gases and liquids
Accuracy	±0.5% FS	±0.5% FS	±0.1% FS	±0.5% FS	±0.5% FS
Pressure Limits	10 psi (2 to 10 in w.c.); 20 psi (20 to 30 in w.c.); 15 psi (100 in w.c.); 45 psi (200 to 350 in w.c.)	5 psig (1 to 10 in w.c.); 10 psig (20 to 40 in w.c.); 30 psig (200 in w.c. to 10 psi); 60 psig (20 to 30 psi); 150 psig (100 psi); 200 psig (150 psi)	3 psig (20 to 40 in w.c.); 15 psig (200 in w.c.); 30 psig (10 psi); 60 psig (30 psi); 100 psig (50 psi); 200 psig (100 psi)	5 psig (1 to 10 in w.c.); 10 psig (20 to 40 in w.c.); 30 psig (200 in w.c. to 10 psi); 60 psig (20 to 30 psi); 150 psig (100 psi); 200 psig (150 psi)	30 psig (15 psi); 60 psig (30 psi); 100 psig (50 psi); 200 psig (100 psi); 400 psig (200 psi); 1000 psig (500 psi)
Memory	RAM 1 GB & ROM 4 GB	40 readings	40 readings	N/A	Up to 40 readings
Approvals	CE, FCC	CE	CE	CE, FM	CE

ULTRASONIC FLOWMETER

SERIES	PUB
	
Flow Rate	0.33 to 65.62 ft/s (0.1 to 20 m/s)
Accuracy	±0.5 to 2% of flow reading for flow rate > 0.66 ft/s (0.2 m/s) and pipe ID > 2.95″ (75 mm); ±3% of flow reading for flow rate > 0.66 ft/s (0.2 m/s) and pipe ID in range 0.512 to 2.95″ (13 to 75 mm); ±6% of flow reading for flow rate < 0.66 ft/s (0.2 m/s)
Pipe Size	0.5 to 4.5″ (13 to 115 mm) or 2 to 40″ (50.7 to 1016 mm)

THERMOMETER

SERIES	472A
	
Input	Type J, K, T thermocouples
Ranges	J-type: -328 to 1400°F (-200 to 760°C); K-type: -328 to 2498°F (-200 to 1370°C); T-type: -328 to 734°F (-200 to 390°C)
Accuracy	±0.13% reading + 1.4°F + .006°/°F below 1000°F

MULTIMETERS

SERIES	MM-1	MM-2	CM-1
			
Range (Accuracy)	DC Voltage: 0.1 mV to 600 V (0.8% + 2 digits); AC Voltage: 0.001 V to 600 V (0.8% + 3 digits); DC Current: 0.01 A to 10 A (1.2% + 3 digits); AC Current: 0.01 A to 10 A (1.2% + 3 digits)	DC Voltage: 0.1 mV to 1000 V (0.5% + 2 digits); AC Voltage: 0.1 mV to 750 V (1.3% + 5 digits); DC Current: 0.1 uA to 10 A (1.0% + 3 digits); AC Current: 0.1 uA to 10 A (1.5% + 5 digits)	DC Voltage: 0.1 mV to 600 V ± (1.0% + 3 digits); AC Voltage: 0.1 mV to 600 V ± (1.0% + 5 digits); DC Current: 10 mA to 400 A ± (2.0% + 10 digits); AC Current: 10 mA to 400 A ± (2.0% + 10 digits); Resistance: 0.1 to 40 MΩ ± (1.0% + 3 digits)
Protection	600 Vrms	1000 Vrms	N/A

PRODUCT **OVERVIEW**

SMART AIR HOOD® BALANCING INSTRUMENT

SERIES	SAH
Range	Volume flow: Supply: 40 to 2000 CFM (68 to 3398 m^3/h); Exhaust: 80 to 2000 CFM (136 to 3398 m^3/h).
Accuracy	Volume flow: ±3% of reading ±7 CFM.
Hood Sizes	2´ x 2´ (standard); 1´ x 4´, 2´ x 4´ (optional accessories)

TACHOMETERS

SERIES	TAC3-K	TAC-L
Range	999,999 units	Non-contact: 2.5 to 99,999 RPM; Contact: 0.5 to 19,999 RPM; Surface speed: 0.05 to 1999.9 m/min
Accuracy	Non-contact: ±0.01% of reading; Contact: ±0.05% of reading; Timer: ±0.2 s	±(0.05% + 1 digit)
Measuring Distance	25´ and up to 70° from perpendicular.	2 to 20˝ (5 to 50 cm)

THERMO-ANEMOMETERS

SERIES	AQTIA-AP2	AQTIA-VP2	VT-300	473B	471B
Air Velocity Range	0 to 6000 FPM (0 to 30 m/s)	50 to 5000 FPM (0.25 to 25 m/s)	98.4 to 3937 FPM (0.5 to 20 m/s)	40 to 5000 FPM (0.2 to 25 m/s)	0 to 6000 FPM (0 to 30 m/s)
Air Velocity Accuracy	±3% FS	±1.5% of reading ±20 FPM	±3% of reading ± 0.2 m/s	±1.5% of reading ±20 FPM	±3% FS
Temperature Range	-40 to 212°F (-40 to 100°C)	-22 to 140°F (-30 to 60°C)	-4 to 140°F (-20 to 60°C)	-20 to 212°F (-29 to 100°C)	-40 to 212°F (-40 to 100°C)
Temperature Accuracy	±0.5°F (±0.28°C)	±0.54°F (±0.3°C)	±1°F (±0.6°C)	±0.54°F (±0.3°C)	±0.5°F (±0.28°C)
Humidity Range	N/A	0 to 100% RH	0.1 to 99.9% RH	0 to 100% RH	N/A
Humidity Accuracy	N/A	±2% RH	±3% RH	±2% RH	N/A
Air Volume Range	999,999 in selected flow units	999,999 in selected flow units	99,999 (CFM or m^3/s)	19,999 in selected flow units	19,999 in selected flow units
Wet Bulb Range	N/A	N/A	-7.6 to 158°F (-22 to 70°C)	N/A	N/A

PITOT TUBES

SERIES	160	160F	166T	160G	ANE-1
Available Lengths	8 to 216˝ (203 to 5486 mm)	18 to 60˝ (457 to 1524 mm)	Telescoping from 11.5 to 36˝ (29 to 91 mm)	16-15/32˝ x 16-15/32˝ (418 mm x 418 mm)	4-23/64˝ (111 mm) diameter
Diameter	5/16˝ (8 mm) [standard] or 1/8˝ (3 mm)	5/16˝ (8 mm)	7/16˝ (11 mm)	N/A	N/A
Material	304 SS	304 SS	304 SS	Black polycarbonate	ABS
Accuracy	±2% FS	±2% FS	±2% FS	±2% FS	±1% of reading ±0.03 m/s
K-Factor	1.0	0.81	1.0	0.84	0.843

AIR BALANCING **TEST INSTRUMENT KITS**

AQTIA KITS

AQTIA-AP2
UHH2 + thermo-anemometer probe

AQTIA-RP2
UHH2 + thermo-hygrometer probe

AQTIA-VP2
UHH2 + 100 mm vane thermo-anemometer probe

AQTIA-WDPM
UHH2 + wireless differential pressure module

The **Series AQTIA Air Balancing Test** Instruments combine the versatile Model UHH2 handheld base with various compatible wireless probes and modules. Professional kits are available that include the components necessary to take accurate air velocity, air flow, temperature, humidity, and differential pressure measurements.

Readings from traverse measurement can be stored by pushing a button on the probe or within the app. Data can be transferred from the Model UHH2 to a spreadsheet program for report generation.

FEATURES/BENEFITS
- Rugged IP68 housing withstands 1.5 meter drop test
- Wireless measurement of pressure, air velocity, air flow, temperature, and humidity

POPULAR MODELS
AQTIAP-WDPM-005-PKIT
Air quality test instrument kit with UHH2 base unit, AP2, RP2, VP2, WDPM, 5 in w.c. manometer, UHH-BTG wireless mobile gateway in hard carrying case with NIST certificate

47X KITS

473B

AP1

RP1

VP1

477AV

The **Series 47X Air Balancing Test Instruments** combine our time proven wired test instrument platforms into an all-in-one balancing solution. For lower air velocities, our Model AP1 hot wire thermo-anemometer probe or VP1 vane thermo-anemometer probes can be interchanged for register or duct measurements. Humidity, dew point, and wet bulb temperatures can be measured using the Model RP1 thermo-hygrometer probe. Our Series 477AV line of digital manometers can be combined with a traditional or straight pitot tube to directly measure air velocity or air flow.

FEATURES/BENEFITS
- Rugged, extruded aluminum housing protects the device from damage
- Interchangeable probes are automatically recognized
- Magnetic mount, protective boot allows hands free operation of the device

POPULAR MODELS
477AV-0-PKIT
Wired Professional Kit includes 10 in w.c. Manometer, universal base unit, vane thermo-anemometer probe, hot-wire thermo-anemometer probe, thermo-hygrometer probe, and 12″ Pitot Tube, 18″ Straight Pitot Tube, two static fittings, air flow grid, hard carrying kit, and NIST Certificate

AIR BALANCING **HVAC SYSTEMS**

METHODS OF AIR BALANCING

Air balancing a distribution system is needed to properly direct the air flow in order to optimize the system's design. Flow rates are tested, adjusted, and balanced as cubic feet per minute (CFM) or cubic meters per hour (m^3/h). There are two traditional methods for balancing airflow at the terminals. The first is sequential balancing, which involves setting the zone and branch dampers in sequence. However, the most common method of air balancing is called proportional balancing.

For traditional proportional balancing, an air flow hood, or capture hood, is the most popular test instrument used to take air flow readings. Traverse readings in the duct with a Pitot tube or a hot-wire thermo-anemometer is another accepted method of capturing the actual air flow.

Dwyer has designed a variation of proportional balancing, which is called Predictive Balancing used in Dwyer's Series SAH SMART Air Hood® Balancing Instrument. Predictive Balancing is designed to be a faster process and give more accurate results than traditional proportional balancing.

PROPORTIONAL BALANCING

With proportional balancing (reference Figure 2), the technician balances a terminal proportional to the key terminal. To start a proportional balance of a system, one requirement is that the system has an 80% to 120% rate to the total design flow. Systems that are higher or lower than this range will not balance properly. If the system is outside of this range, the fan speed should be adjusted to get within range. Once set, the air flow from each terminal will remain the same ratio to other terminals.

If key Terminal 1 has a design flow percent of 60%, then Terminal 2 is 57%, Terminal 3 is 65%, and the ratio to the key Terminal 1 is 57% / 60% = 0.95. Meaning Terminal 2 will deliver 95% of the air volume of Terminal 1. With Terminal 1 as the key, delivering 100% of design flow, then Terminal 2 will be delivering 95% of the design flow. This will meet the design requirements. For example, if the damper for Terminal 3 is adjusted down to 525 CFM, the flow from Terminal 1 may increase to 550 CFM. In this case, Terminal 2 is within the design range; 550 * 0.95 = 523 CFM.

Once the terminals are in balance, with the proper ratio of tolerance with each other, they remain in balance with each other even though the air volume may change. All terminals in the system are then proportionally balanced. The fan RPM can be set to deliver the intended total air volume and all terminals will deliver the design flow within the established tolerances.

This process requires the balancing technician to adjust the flow from the terminal under-adjustment (TUA) to the key to gain the correct flow proportion. The key terminal's flow changes when the TUA damper is changed. It may take several iterations to achieve the proper flow proportion.

Since the technician is estimating where to set the flow rate of the TUA relative to the key, the tolerance can vary considerably, which limits the accuracy of the balancing. The illustration in Figure 2 shows the potential number of lengthy steps involved with proportional balancing.

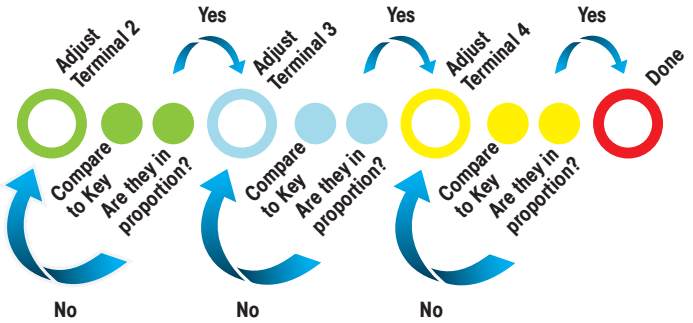


Figure 2 – Proportional Balancing

Figure 1 – Traditional air flow hood (left picture) versus Dwyer Smart Air Hood® balancing instrument (right picture)

PREDICTIVE BALANCING

The Predictive Balancing (reference Figure 3) process begins by opening the dampers to capture the total flow. The total flow is distributed into the four terminal flows. The terminal flows are determined by the terminal and damper loads and the pressure drop in the system.

Terminal 2 is the first damper adjusted in the system, and Terminal 1 is the key. Predictive Balancing calculates the ideal flow set point for Terminal 2 for TUA and predicts flows for Terminals 1, 3, and 4.

After adjusting the Terminal 2 flow to the ideal flow set point, Predictive Balancing calculates the ideal set point for Terminal 3 and predicts the new flows for terminals 1, 2, and 4.

To finish, Predictive Balancing calculates the ideal set point for the last Terminal, number 4, and flows for Terminals 1, 2, and 3 are correctly proportioned to the target.

Finally, Predictive Balancing calculates the ideal flow for Terminal 4 so the blower flow can be adjusted to bring all the terminal flows to the target flows.

Predictive Balancing also monitors and compensates for load on the blower/fan from the damper closures during the balancing process.

Figure 3 – Predictive Balancing

SMART AIR HOOD® **BALANCING INSTRUMENT**

SAH

The **Series SAH SMART Air Hood® Balancing Instrument** is the most accurate and easy to operate air flow hood on the market. By using the included hood stand and wireless communications to the handheld, a single operator can balance a branch in less time than traditional balancing teams. Besides being lighter than most traditional capture hoods, the ergonomic design makes the Series SAH easy to maneuver, with less physical stress. The rugged polypropylene base hood features Quad Flow Design Technology for controlling air flow and minimizing back pressure, which yields superior measurement accuracy. The Wi-Fi direct communication gives reliable communication with a distance of up to 200 yards (183 m) between the hood and the handheld test instrument.

The SMART Air Hood® Balancing Instrument includes the PredictAir™ Application Software which reduces the number of steps in the air flow balancing process using Predictive Balancing's Express Balance mode. Predictive Balancing is a method of predicting the optimal flow set point for each register and the order in which they should be adjusted.

The **PREDICTAIR™ Application Software** displays flow measurements from Dwyer's SMART Air Hood® Balancing Instrument and guides balancers through the balancing process using Predictive Balancing. Predictive Balancing is a method of predicting the optimal flow setting for each register in order to balance the HVAC system accurately and efficiently. PredictAir™ Application Software is factory installed into the handheld unit that comes with the SMART Air Hood® Balancing Instrument.

FEATURES/BENEFITS

- Patent pending Quad Flow Design Technology directs the circulating air patterns to provide a more even air flow that minimizes backpressure enabling accurate readings
- Predictive Balancing is a process that guides the balancing technician on setting the optimal flow set point for each sequential terminal. With the PredictAir™ Application Software, the balancing process takes much less time than traditional air balancing methods
- The ergonomic design is much lighter and easier to work with than the existing bulky air hoods, providing greater maneuverability and less physical strain. One technician can complete the air balancing
- Wi-Fi direct wireless communication provides a range up to 200 yards (183 m)

POPULAR MODELS

SAH-22
SMART Air Hood® Balancing Instrument with 2´ x 2´ (0.6 m x 0.6 m) opening

A-SAH-12P
4.5´ to 12´ (1.4 m x 3.7 m) extendable pole **(Required for operation)**

SAH-22HC
SMART Air Hood® Balancing Instrument with 2´ x 2´ (0.6 m x 0.6 m) opening, with hard travel case

ADAPTER HOOD ACCESSORIES

A-SAH-14S
Canvas hood 1´ x 4´ (0.3 m x 1.2 m)

A-SAH-24S
Canvas hood, 2´ x 4´ (0.6 m x 1.2 m)

A-SAH-BK
SAH adapter base kit for canvas hood

A-SAH-CK
Calibration base kit (sensing arrays and calibrated pressure module)

AIR QUALITY **TEST INSTRUMENT KITS**

NEW! 490W

Series 490W Wireless Hydronic Differential Pressure Manometer is the most accurate and easy to operate manometer on the market. By using wireless transducers and a versatile handheld, a single operator can monitor and balance a hydronic system in less time than traditional hydronic balancers. The Series 490W utilizes mobile technology to communicate via a Bluetooth connection with the transducers to monitor differential pressure and flow on up to three different valves. Being wireless means there are no hoses to carry, snag on equipment or needing to be drained. The 490W includes the Dwyer Hydronic Application Software that contains valve charts for numerous manufacturers, which converts differential pressure to flow directly on the screen.

FEATURES/BENEFITS
- No more hoses or bleed buckets necessary
- Lightweight wireless sensors and easy to carry up and down a ladder
- Built-in valve charts eliminate the need for multiple slide wheels
- Wireless log readings
- Rugged carrying case
- Handheld device with protective OtterBox® case included

490A-HKIT

The **Series 490A-HKIT Hydronic Differential Pressure Meter Kit** features the 490A Hydronic Differential Pressure Manometer and all the necessary attachments and accessories to meet all your balancing, measuring, and pressure needs. The manometer featured in this kit is a versatile, handheld, battery operated manometer available in several ranges for positive or positive differential pressure measurement and can tolerate most liquid media compatible with 316L SS.

FEATURES/BENEFITS
- Digital dampening for low pressure stability
- Automatic resolution adjustment for finer control
- Hard carrying case protects products
- Stores up to 40 readings for later recall
- Backlight for use in dim areas
- Magnetic back mount for ease of use
- Rubber boot for easy handling and all day comfort

PITOT TUBE KITS

160-KIT

160F-KIT

Dwyer Instruments, Inc. is the largest manufacturer of traditional and straight Pitot Tubes in the world. The **Model 160-KIT** and **Model 160F-KIT** bundle our most popular Pitot tubes with a protective hard carrying case to prevent damage during transport. Each kit comes with an 18″, 24″, 36″, and 48″ Pitot tube. All of our Pitot tubes are constructed of 304 SS.

FEATURES/BENEFITS
- Etched ruler markings simplify duct traverse measurements
- Protective carrying case prevents damage during transport
- ASME design meets AMCA and ASHRAE codes

DWYER INSTRUMENTS, INC.
P.O. Box 373
Michigan City, IN 46360

Return Service Requested

HVAC TEST & BALANCING EQUIPMENT

ORDER ONLINE TODAY!
dwyer-inst.com

Printed in U.S.A. 12/19

FR # 150002-17