

# SAV – Smart Air Valve™

With ITAC – Intelligent Air Control™



A Diversified Manufacturer of Intelligent HVAC Products,  
Air Handling Systems, Building Technologies and  
Biogenic Ionization Technology.  
**Raising the Industry Standard!**

June 29, 2021

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## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### *A message from our CEO, Stella Karamanos*

HVAC Manufacturing and Technology is a Woman-Owned Small Business. As a vast part of our ongoing commitment, we are promoting success for women in the HVAC industry; which qualifies HVAC Manufacturing and Technology for project diversity credit. Although it is still a male-dominated industry, HVAC Manufacturing and Technology is continually affiliating itself with new opportunities for women in HVAC engineering design, sales and procurement. As the numbers of professional HVAC women continue to rise, HVAC Manufacturing and Technology plays a role with bringing awareness and showcasing women in the field. Our goal at HVAC Manufacturing and Technology is to continue offering women the necessary tools to support successful careers in the HVAC industry.



U.S. Small Business Administration



**SBA WOSB**  
Woman Owned Small Business



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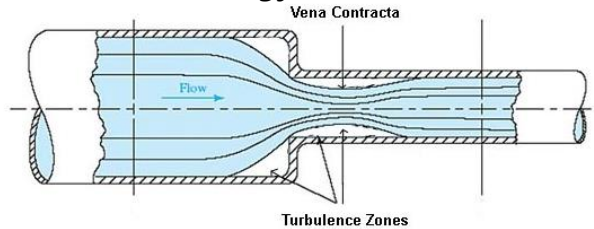
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## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Patented Variable Orifice Plate Technology



## VENA CONTRACTA

**Dr. Herbert Willke, CTO, HVAC Manufacturing and Technology (retired MIT professor of Physics, PHD Physics MIT) solved a complex Fluid dynamic problem.** Dr. Willke's research into the Vena Contracta led him to inventing new equations for orifice plate flow, leading to today's patented variable orifice plate technology.

### CONTRARY TO WHAT HAS BEEN TAUGHT ABOUT ORIFICE PLATES AND VENA CONTRACTA:

- Airflow does not anticipate where it will travel, it responds to pressures.
- Air first crashes into the face of the orifice plate.
- Pressure builds up and creates a sharp 90 degree turn with only a tiny void at the 90-degree corner of the orifice plate.
- Increasingly rapid flow heads towards the openings at right angles to the plane of the opening.
- The flow can't instantaneously turn 90 degrees at the opening, so it turns in a small radius, creating a contracted flow with area smaller than the opening: Newton's Vena Contracta.
- The Vena Contracta determines the static pressure in that downstream void.
- That downstream pressure defines the curvature leading to the Vena Contracta.

### ITAC - Intelligent Air Control™ system

The ITAC – Intelligent Air Control™ system is quiet, energy efficient/ low EUI (Energy Use Intensity), offers superior IEQ (Indoor Environmental Quality) and IAQ (Indoor Air Quality), features up to 300:1 turndown, measures flow accurately down to  $\pm 4\%$ , offers a minimal number of part numbers, mitigates acoustical issues, and optimizes the building's digital infrastructure with a single source responsibility and simplistic business model.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

Commercial, Industrial, Laboratories, Life Sciences, Healthcare....

### Introduction

The SAV™ (Smart Air Valve) is an extremely low pressure, self-balancing “true” Variable Air Volume flow measurement and flow control device. The SAV™ utilizes patented variable orifice plate technology which provides both precision air flow accuracy and flow control. Featuring high turndown throughout all air flow ranges with a single device. The SAV™ features  $\pm 4\%$  accuracy from 2500 fpm to 200 fpm and  $\pm 8$  fpm below 200 FPM with up to 300-1 turndown. The SAV™ can measure its own damper leakage when fully closed. The SAV™ is a simple factory pre-configured “plug and play” device with an integrated controller, sensors, and actuator. Power up the SAV™ and it will continuously self balance per the zone requirements in real time regardless of the duct pressure fluctuations. The accurate airflow performance at high turndowns and the low-pressure design, results in lower fan brake horsepower with the exact amount of air being metered into the room. High enough turndown, that one unit will do the work of many conventional terminal unit devices for all zones. Thus, mitigating costly duct transition change orders. Any future retrofit is a snap! Change the airflow setpoints and you’ re done!

The SAV is certified in accordance with ASHRAE 195, 130, 135, 90.1, 62.1 standards. Because of this and the high accuracy of the units, there are no K factor adjustments required in the field such as other air flow terminal devices. The SAV™ is a true “plug and play” intelligent device with all-inclusive actuator, intelligent controller, and room peripherals. The intelligent ITAC programmable controller supports IT network with security standards and WiFi/g/n. The dual ethernet port allows for daisy chain capability. It supports BACnet IP client/server, BACnet MSTP client, and Modbus RTU slave as well as Sox, TCOM, P2P and MQTT. It also features HTML5 ready dashboards and can be programmed live via CPT. Intelligence sensor options include an Intelligent Optical Array Sensor Package that includes, CO2/VOC, temperature, humidity, occupancy, IOT, voice recognition, infrared, light levels, data logging and more!

The ITAC™ controller is part of the advanced ITAC™ system that provides total building control, with precise airflow measurement and control. The ITAC™ controller uses a proprietary advanced algorithm to get unparalleled accuracy and turndown. The controller is an open source “state of the art” controller with BACnet IOT(Internet of things) Ethernet and Wireless protocols, allowing for a seamless communication and collaboration into legacy systems or IOT platforms. Due to it’ s high turndown and accuracy, a single size SAV™ can be installed at all the zones regardless of zone performance parameters. Gone are the days of tedious and laborious sizing of air terminal devices, transducers and controllers.

No longer are design engineers constrained to a small airflow performance range at high pressure drops. Originally developed for laboratory and critical environments, the SAV™ is now available for all types of commercial applications at economical price points. Get precision performance for the price of VAV terminal units! Due to it’ s high turn down and flow accuracy the SAV’ s™ one size fits all eliminating millions of part numbers, any size SAV™ can do the work of any size smaller unit therefore eliminating change orders due to design changes. Duct work is the same regardless of zone parameters changing. Accurate up to  $\pm 4\%$  down to 200 fpm, or to  $\pm 8$  fpm from less than 200 fpm to a closed damper position. Because of this, the unit is self balancing. It always knows its own airflow, from full open to full closed. No need for TAB contractors!

With operating pressure drops as low as 0.03 inH<sub>2</sub>O, all the engineer needs to take into consideration is the pressure drop of the ductwork and other airstream devices. The SAV™ keeps its minimum accuracy at all pressures. The SAV™ works in all low-pressure applications. No need for maintaining pressures of 1” or higher at the trunk or the riser! No more need for medium and high-pressure ductwork!

The SAV™ is available with standard upright and/or high-performance low profile slanted coils for heating, cooling, and combination heating/cooling packages for latent humidification zone control. All coils ship standard with project specific factory installed piping packages and control valves. Available in “project specific” 2-way, 3-way, and 6-way piping configurations. All control valve actuators and sensors are wired to the controller. Factory installed piping packages are shipped pressurized with a pressure gauge to verify a leak free operation when arriving at the job site.

Turndown high enough that one unit will do the work of many conventional terminal unit devices. Because of this and the high accuracy of the units, any future retrofit is a snap! All that needs to be done is change the airflow setpoints and you’ re done!

The specified accuracies and airflow readings are for the entire unit, not just the sensor only.

Since the SAV™ works at all operating pressures, there is nothing extra required for the ASHRAE required static pressure reset.



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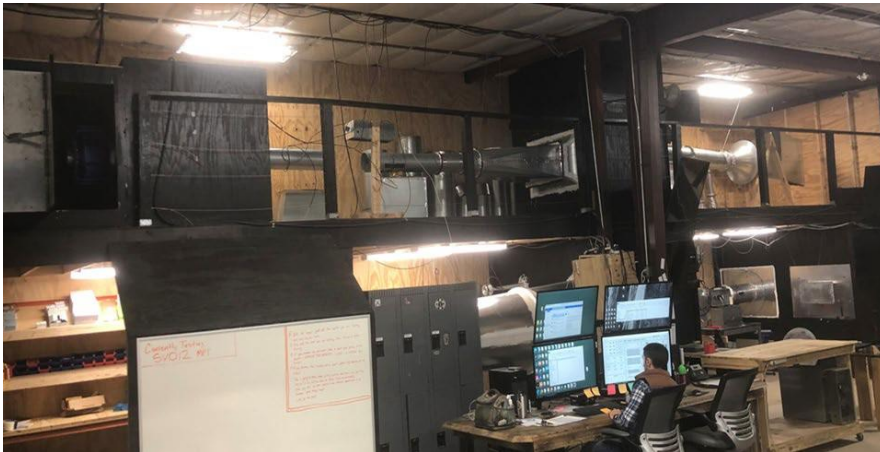
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## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Testing

- Calibrated Flow Stands With 3<sup>Rd</sup> Party Certification
- Can Simulate Every Pressure/CFM Gradient Possible In A Lab/Building
- Auto Calibration Software
- 1 CFM - 8000 CFM with +/-1.5% Accuracy
- Under Construction - 2 Additional Flow Stands  
1 CFM-32000 CFM @ .5% Accuracy



- Our Innovation Center Laboratory uses a Unique Combination of Automated and Manual Testing to Attain our Industry Disruptive Standard.
- Our Air Valves Undergo Various Types of Testing including but not limited to
  - Airflow Verification Testing
  - Repeatability Testing
  - Minimum Pressure Drop Testing
  - Multiple pressure Testing
  - Variable Elimination Testing
  - Customized Testing



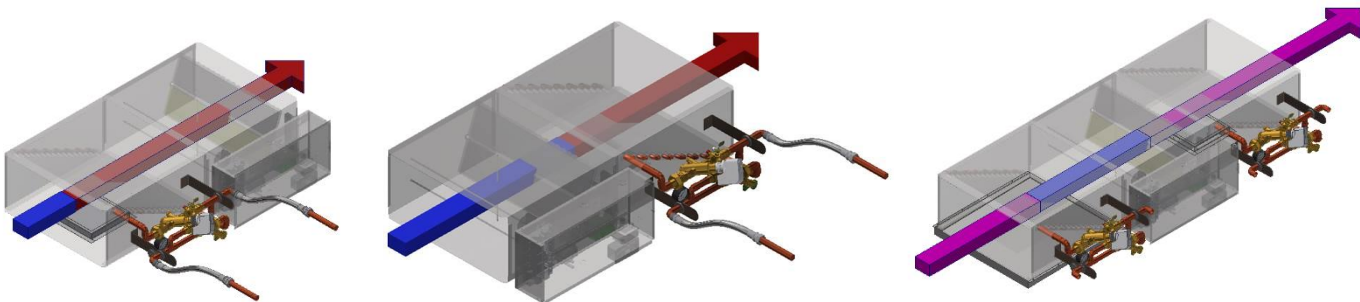


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Features

- Patented Variable Orifice Plate Technology
- Precision Air Flow Measurement and Flow Control
- Flow measurement accuracies  $\pm 4\%$  from 2500 fpm to 200 fpm and  $\pm 8$  fpm from 200 fpm to 8 fpm.
- Extremely Low Pressure Drop
- High Turndown (300:1) one size does the job of many
- Self-Balancing in real time. No field K factor adjustments
- Commercial and Critical Environment construction
- Repeatable accuracy & open-source integration
- ASHRAE 195, 135, 90.1, & 62.1 Compliant
- The SAV™ is accurate to full closed, measures its own damper leakage!
- Mitigates change orders due to universal modular plug and play design and high turn down
- Accelerates project schedules as duct work rarely changes due to modular repeatable design
- Easy installation - Plug and Play self-balancing device
- No performance penalty for oversizing the unit  
Eliminates cumbersome selection tools required – worst case building zone cfm/divide by design cfm to select the required face area. Pick largest available SAV™ for all zones regardless of cfm requirement
- All-inclusive sensors, ITAC actuator and Controller
- Intelligent Sensor Array – IOT, wireless, VOC, CO<sub>2</sub>, Motion, Infrared, Temperature, Voice Recognition, Light Color, Data Logging, and much more
- Perfect for low temperature design & underfloor applications
- IAQ interior metal liner
- Solid stainless-steel damper shaft on PTFE bushings for fast acting control and maintenance free operation.
- Ideal for low-pressure applications with the ability to operate throughout a wide range of HVAC systems.
- SAV™ can be mounted in any orientation.
- Clean, sealed shipping bags available for LEED IEQ projects
- Increases the efficiency of the whole system due to increased accuracy, low pressure drop, and superior acoustics.
- Factory configured controls – set it and forget it
- Ultra-low leak construction – Welded seam body with advanced aerospace gasket blade damper design
- Very low life cycle costs
- Economic price points for all applications
- State of the art, open source, ITAC™ controller
- Optional ionization accessories
- Optimal for use in flex spaces since SAV only requires a CFM setpoint change

### SAV™ Rectangular units with high-capacity slanted coils



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Market Technology Comparison

	SAV™ Gold	SAV™ Silver	SAV™ Bronze	Venturi Valves	Lab Terminal VAV units	Commercial VAV Terminal Units
Price	\$\$\$	\$\$	\$	\$\$\$\$	\$\$\$	\$\$
± 4% (or better) accuracy from 2500 fpm to 200 fpm ± 8 fpm (or better) accuracy from 200 fpm to 8 fpm	✓			X	X	X
± 6% accuracy (or better) from 2500 fpm to 200 fpm ± 12 fpm accuracy (or better) from 200 fpm to 12 fpm	✓	✓		X	X	X
± 8% accuracy (or better) from 2500 fpm to 200 fpm ± 16 fpm accuracy (or better) from 200 fpm to 16 fpm	✓	✓	✓	X	X	X
300:1 turndown (or better)	✓			Limited to less than 12:1 turndown based on size and flow points	Limited to less than 10:1 turndown based on size and flow points	Limited to less than 4:1 turndown based on size and flow points
100:1 turndown (or better)	✓	✓				
30:1 turndown (or better)	✓	✓	✓			
Operates at less than 0.1" inlet pressure	✓	✓	✓	X	X	X
Multiple sizes required	<b>No</b>	<b>No</b>	<b>No</b>	Yes	Yes	Yes

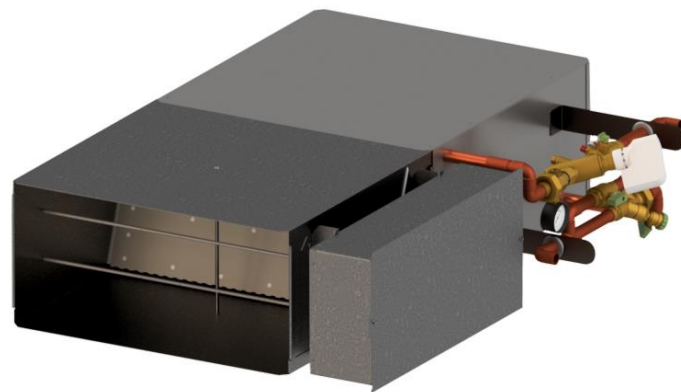
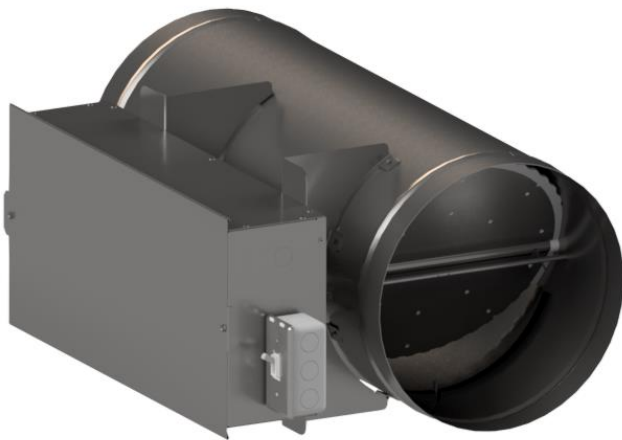


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Tracking Pairs

With guaranteed accuracy from 2500 fpm to 8 fpm, the SAV gold is the ideal solution for tracking pair applications.

The units are self-balancing and plug-and-play, so all the contractor must do is install the units and turn them over to the Building Automation System (BAS). If the building doesn't have a BAS, the controls will work as stand-alone units with only a standard BACnet interface.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Product Information

#### Unit Sizes

- 12" & 16" diameter round
- 10" x15" & 10" x21" rectangular
  - Optional Ultra Quiet version available for all rectangular units
- Optional job specific transitions and casing material available

#### Controls

- Factory installed controls
- All controls are pre-calibrated at the factory. No field adjustment is necessary.
- BACnet, TCOM, and Sox Protocol
- BACnet IP Server over WiFi or Ethernet
- HTML5 compatible interface
- BACnet MSTP Client and BACnet IP Client
- Modbus RTU Master
- Built in web server, HTML5 compatible and SSL certificate support
- WiFi Access Point, Repeater or Client Mode
- Standard slide access control enclosure with optional Universal, 3-in-1 access.

#### Ionization Accessories

- Optional ionization accessories available for superior IAQ & IEQ

#### Insulation

- Optional factory installed external insulation

#### Lighting Integration

- Factory installed and pre-configured lighting controls available
- UL 508A control panels

#### Electrical Accessories

- Optional factory supplied wired stepdown transformer
- Optional factory wired disconnect

#### Labels

- Each unit includes project specific labels

#### Coils

- Factory installed project specific coil & piping packages
- Optional high-performance coils available for chilled water, hot water, and combination applications
- Low Profile, High Performance Low Energy Slanted Re-Heat or Cooling
- Upright Re-heat Coil
- Combo Heating and Cooling Coils For Humidity Controls
- Factory Installed Project Specific Piping Structures

#### Room Sensors

- Option 1 – None
- Option 2 – Thermostat Only
- Option 3 – Thermostat + CO<sub>2</sub>
- Option 4 – Thermostat + Humidity
- Option 5 – Thermostat + CO<sub>2</sub> + Humidity
- Option 6 – Intelligent Sensor Array (temperature, humidity, occupancy, light levels, sound levels, voice recognition)
- Option 7 – Full Intelligent Sensor Array (all the performance of option 6. plus VOC/CO<sub>2</sub>)



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Product Information

**Table 1. Flow Range**

Unit Size		Maximum Flow				Minimum Flow				Flow Sensor Inlet Area	
		CFM	FPM	Lps	m/s	CFM	FPM	Lps	m/s	SQ.FT	M <sup>2</sup>
12"	Gold	1965	2500	927	12.7	6	8	2.83	0.041	0.785	0.073
	Silver	1965	2500	927	12.7	9	12	4.25	0.061	0.785	0.073
	Bronze	1965	2500	927	12.7	12	16	5.66	0.081	0.785	0.073
16"	Gold	3490	2500	1647	12.7	11	8	5.19	0.041	1.396	0.130
	Silver	3490	2500	1647	12.7	16	12	7.55	0.061	1.396	0.130
	Bronze	3490	2500	1647	12.7	22	16	10.38	0.081	1.396	0.130
10"x15"	Gold	2600	2500	1229	12.7	8	8	3.78	0.041	1.042	0.097
	Silver	2600	2500	1229	12.7	12	12	5.66	0.061	1.042	0.097
	Bronze	2600	2500	1229	12.7	16	16	7.55	0.081	1.042	0.097
10"x21"	Gold	3650	2500	1722	12.7	11	8	5.19	0.041	1.460	0.136
	Silver	3650	2500	1722	12.7	17	12	8.02	0.061	1.460	0.136
	Bronze	3650	2500	1722	12.7	23	16	10.85	0.081	1.460	0.136



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Specifications

#### Materials (within air stream)

- Construction A - Standard
  - 22-gauge galvanized steel casing
  - 18-gauge galvanized steel damper
  - 20-gauge galvanized steel orifice (optional)
  - Stainless steel pitot tubes
  - Advanced low-leak aerospace damper gasket
- Damper Shaft
  - PTFE shaft bushings
  - ½" (12.7mm) diameter stainless steel shaft
- Construction B – Optional Stainless Steel (Gold Only)
  - 20-gauge stainless steel casing
  - 18-gauge stainless steel damper
  - 20-gauge stainless steel orifice (optional)
  - Stainless steel pitot tubes
  - Advanced low-leak aerospace damper gasket
- Flanges
  - Complies with SMACNA specifications
  - Stainless steel only

#### Materials (outside air stream)

- Control Enclosure (Optional 3-in-1)
  - 22-gauge galvanized steel
- Pneumatic Tubing
  - UL 94 rated
- Pneumatic fittings
  - Brass or Plastic

#### Airflow measurement

- Factory installed and calibrated patented airflow sensing system
- Patented variable orifice plate technology
- Sensor Type A
  - Pitot
- Sensor Type B
  - Orifice (Gold Only)

#### Accuracy

- |  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>• Flow Measurement*           <ul style="list-style-type: none"> <li>• Gold               <ul style="list-style-type: none"> <li>○ ± 4% of actual flow from 2500 fpm to 200 fpm</li> <li>○ ± 8 fpm from 200 fpm to 8 fpm</li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Silver               <ul style="list-style-type: none"> <li>○ ± 6% of actual flow from 2500 fpm to 200 fpm</li> <li>○ ± 12 fpm from 200 fpm to 12 fpm</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Bronze               <ul style="list-style-type: none"> <li>○ ± 8% of actual flow from 2500 fpm to 200 fpm</li> <li>○ ± 16 fpm from 200 fpm to 16 fpm</li> </ul> </li> </ul> |
|--|---|---|

#### Airflow Control

- Damper Blade
  - Single blade matching unit size and shape

#### Environmental

- Operating Temperature
  - 40°F to 120°F
- Relative Humidity
  - 0% to 95% non-condensing

#### Dimensions

- Sizes
  - See page 19-32
- Weight
  - See page 19-32

#### Installation Requirements

- Rigid straight duct of the same size
  - 3x equivalent duct diameters upstream of the unit
  - 3x equivalent duct diameters downstream of the unit

\*Accuracy statements are based on tests of typical units on a Flowstand that is certified by a third party with NIST traceable equipment. Results may vary under field conditions.





# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

## ITAC™ Controllers

Simply Connect Controller To IOT Platform and Room Peripherals

“Plug And Play” - No More Programming Of Controller, Setting K Factors BTL BacNet Objects List Can Be Set From IOT Platform or Controller

Several High End BTL BacNet Controllers Available With High Processing Power and 14 -16 Bit Resolution

Saves Money -No Programing Or Configuration Required

Room Peripherals Include IOT Sensor HUB, Wall Stats,

VOC, CO2 Sensors, Lighting Interface

“Plug And Play” Operation - Factory Configured Economical Price

Points– Electrical Contractor Connects – System Integrator

Custom Controller Design Available



### ITAC Controllers

- 580 MGHZ – 1.8 GHZ 14 Bit Resolution
- BACnet, Modbus, TCOM and Sox protocol
- BACnet IP Server over WiFi or Ethernet
- ITAC Peer to Peer Protocol, compatible with FS, FG+, FW and FT Series
- Built in web server, HTML5 compatible and SSL certificate support
- MQTT, RESTful API and other web services
- Built in dashboard
- WiFi Access Point, Repeater or Client Mode
- 2 Ethernet ports act as a normal network switch and support Ethernet daisy chain up to 9 units
- Network Time Protocol (NTP) Client
- SMTP protocol (outgoing email) with SSL authentication
- SQL Lite up to 6,000 records

ITAC™ Controller's support IT network and security standards and WiFi b/g/n. These can be used as part of an existing network or as an isolated BMS WiFi network. The dual Ethernet port capability allows for daisy chain capability within the recommended IT standards. ITAC™ Controllers support BACnet IP client/server, BACnet MSTP client, and Modbus RTU slave as well as Sox, TCOM, P2P and MQTT.





# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

## SAV™ Product Comparison

	SAV™ Gold	SAV™ Silver	SAV™ Bronze
	300:1 Turndown	100:1 Turndown	30:1 Turndown
	Healthcare/ Critical Environment	Commercial	Commercial
	\$\$\$	\$\$	\$
<b>Airflow Range/ Accuracy</b>			
2500 fpm - 200 fpm, ± 4%, 200 fpm - 25 fpm, ± 8 fpm	✓		
2500 fpm - 200 fpm, ± 6%, 200 fpm - 50 fpm, ± 12 fpm		✓	
2500 fpm - 200 fpm, ± 8%, 200 fpm - 100 fpm, ± 16 fpm			✓
<b>Unit Size</b>			
12" diameter	✓	✓	✓
16" diameter	✓	✓	✓
10"x15"	✓	✓	✓
10"x21"	✓	✓	✓
<b>Casing Material</b>			
Galvanized	✓	✓	✓
Stainless Steel	✓		
Job Specific Optional Coating	✓		
<b>Duct Connections</b>			
Slip	✓	✓	✓
Flanged	✓		
<b>Flow Sensor</b>			
Pitot	✓	✓	✓
Orifice	✓		
<b>Controller</b>			
DDC controls with enclosure (includes WiFi/g/n, BACnet IP, BACnet MSTP, Modbus RTU, Sox, TCOM, P2P, MQTT, and HTMLS)	✓	✓	✓
<b>Room Sensor</b>			
Option 1. None	✓	✓	✓
Option 2. Thermostat only	✓	✓	✓
Option 3. Thermostat + CO <sub>2</sub>	✓	✓	✓
Option 4. Thermostat + Humidity	✓	✓	✓
Option 5. Thermostat + CO <sub>2</sub> + Humidity	✓	✓	✓
Option 6. Intelligent Sensor Array (temperature, humidity, occupancy, light, sound level, voice recognition)	✓	✓	
Option 7. Full Intelligent Sensor Array (all of the performance of option 6. plus VOC/Co2)	✓	✓	
<b>Heating Coils (Rectangular Units Only)</b>			
Standard Capacity	✓	✓	✓
High Capacity (Slant)	✓	✓	✓
<b>Cooling Coils (Rectangular Units Only)</b>			
Standard Capacity	✓		
High Capacity (Slant)	✓		
<b>Combination Coils (Rectangular Units Only)</b>			
Cooling and Heating coils with multiple job specific configurations for multiple requirements including dehumidification	✓		
<b>Accessories</b>			
Project specific retrofit transitions	✓	✓	✓
Ionization accessories	✓	✓	✓
<b>Operation</b>			
Ultra-low inlet pressure design	✓	✓	✓
<b>Applications</b>			
Commercial	✓	✓	✓
Healthcare	✓	✓ (noncritical applications)	
Critical Environment	✓		
Lab	✓		
Industrial	✓	✓	



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## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

**Table 2. Minimum Pressure Drop at Listed Airflow**

Unit Size	Flow		Minimum Operating Pressure Drop	
	CFM	Lps	IN WG	Pa
12"	25	11.80	0.030	7.47
	500	235.97	0.030	7.47
	1000	471.95	0.030	7.47
	2000	943.89	0.070	17.44
	2500	1179.87	0.100	24.91
16"	34	16.05	0.030	7.47
	698	329.42	0.030	7.47
	1396	658.84	0.030	7.47
	2791	1317.21	0.070	17.44
	3489	1646.62	0.100	24.91
10" x15"	26	12.27	0.030	7.47
	520	245.41	0.030	7.47
	1041	491.30	0.030	7.47
	2083	983.07	0.070	17.44
	2604	1228.95	0.100	24.91
10"x21"	36	17.1	0.030	7.47
	725	342.1	0.030	7.47
	1450	684.3	0.030	7.47
	2900	1368.5	0.070	17.44
	3625	1710.6	0.100	24.91

**Performance Notes:** 1. Test data obtained in accordance with AHRI Standard 880-2017 and ASHRAE Standard 130-2016.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

**Table 3. Terminal Casing Leakage**

SAV Casing Leakage (Per ASHRAE 130-1996)							
Imperial Units (CFM, Inches Water)							
Unit Size	1" WC	2" WC	3" WC	Unit Size	1.0" WC	2" WC	3" WC
12"	<2.36*	<2.36	<2.36	10"x21"	<2.36	<2.36	<2.36
Metric Units (LPS, Pascals)							
Unit Size	250 Pa	500 Pa	750 Pa	Unit Size	250 Pa	500 Pa	750 Pa
12"	<1.11	<1.11	<1.11	10"x21"	<1.11	<1.11	<1.11

\*3<sup>rd</sup> Party measurement unable to accurately measure below this level

**Table 4. Terminal Damper Leakage**

SAV Blade Seal Leakage (Per ASHRAE 130-1996)							
Imperial Units (CFM, Inches Water)							
Unit Size	1" WC	2" WC	3" WC	Unit Size	1" WC	2" WC	3" WC
12"	4.41	5.78	7.14	10"x21"	12.8	14.4	16
Metric Units (Lps, Pascals)							
Unit Size	250 Pa	500 Pa	750 Pa	Unit Size	250 Pa	500 Pa	750 Pa
12"	2.08	2.73	3.37	10"x21"	6.04	6.80	7.55



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

**Table 5. Radiated Sound Data for Terminal. Sound Power Levels, Lw dB, re 10<sup>-12</sup> Watts.**

Pressure Drop	0.2" W.G. (50 Pa) (Recommended Operating Pressure)											0.5" W.G. (125 Pa)											1.0" W.G. (250 Pa)										
	Unit Airflow		Octave Band								NC	Octave Band								NC	Octave Band								NC				
	Size	CFM	Lps	1 63 Hz	2 125 Hz	3 250 Hz	4 500 Hz	5 1000 Hz	6 2000 Hz	7 4000 Hz		8 8000 Hz	1	2	3	4	5	6	7		8	1	2	3	4	5	6	7		8			
12	393	185	46.7*	36.1*	30.2*	24.7*	27.0*	16.0*	16.7*	20.3*	25	46.8*	36.8*	32.2*	30.9	29.4*	24.4	19.2*	20.5*	30	47.9*	40.9	38.5	39.2	36.9	33.5	28.7	23.4*	35				
	786	371	47.6	39.2	33.8	29.7	28.3	18.2	17.1	20.4	30	50	41.5	36.2	35.3	32	26.7	21.7	20.9	35	53.1	46.4	41.2	41.1	38.2	34.2	29.4	24.1	40				
	1178	556	48.5*	42.2	37.3	34.7	29.5*	20.3*	17.5*	20.4*	30	53.2*	46.1	40.1	39.6	34.6	29	24.2	21.2*	35	58.2*	51.8	43.9	43	39.5	34.8	30.1	24.7*	40				
	1571	741	51.1	45.2	41.9	40.2	34.8	27	22.7	21.8	35	56.7	50.2	44.2	43.5	38.4	32.5	27	22.1	40	61	55.4	47.5	46.4	42.5	37.4	32.4	26.4	45				
10x21	1964	927	53.7*	48.1	46.5	45.6	40.1	33.6	27.9	23.2*	40	60.2*	54.3	48.2	47.4	42.1	36	29.7	22.9*	45	63.7	58.9	51.1	49.7	45.4	39.9	34.6	28.1	45				
	730	345	47.1	44.6	44.2	36.5	37.0	20.8	21.4	24.6	35	46.2	45.5	43.7	44.0	43.8	37.5	31.6	31.6	45	48.4	47.7	44.6	44.0	43.8	37.5	31.6	31.6	45				
	1090	514	48.7	47.7	46.0	38.9	35.6	25.3	22.0	23.1	35	53.7	54.0	48.1	45.8	41.9	36.2	30.3	28.4	45	56.8	57.5	50.2	47.8	44.7	38.9	33.9	32.2	45				
	2190	1034	50.3	50.9	47.9	41.3	34.2	29.7	22.6	21.5	40	61.1	62.4	52.5	47.6	40.0	34.9	29.1	25.2	50	65.3	67.3	55.8	51.5	45.6	40.2	36.2	32.8	55				
10x21	3645	1720	64.2	59.6	55.5	54.3	45.0	39.5	32.1	25.1	50	72.8	68.9	60.4	58.8	49.7	45.6	38.3	31.7	60	78.6	76.8	65.2	61.7	55.1	51.9	45.0	38.5	70				
	730	345	51.0	43.4	35.8	31.7	37.0	21.8	22.9	21.1	35	48.5	42.1	36.3	37.7	38.3	31.7	25.0	20.3	40	51.1	45.3	38.8	43.6	45.3	39.8	34.0	31.4	45				
	1090	514	51.9	46.2	39.7	34.8	35.6	25.1	22.3	20.4	35	57.1	51.9	43.4	42.0	41.0	36.2	29.7	24.1	40	61.0	56.4	46.5	46.8	47.2	42.6	37.3	33.7	50				
	2190	1034	52.9	48.9	43.6	37.9	34.3	28.3	21.6	19.7	35	65.7	61.7	50.5	46.3	43.7	40.7	34.4	27.8	50	70.8	67.4	54.2	50.1	49.2	45.4	40.6	35.9	55				
Quiet	3645	1720	64.5	59.1	54.1	54.4	44.0	38.2	31.4	23.9	50	71.6	67.6	56.9	56.4	47.0	42.2	36.6	30.6	55	79.0	74.7	59.9	58.0	52.3	48.0	43.4	38.4	65				

\* Lower than room ambient

**Table 6. Discharge Sound Data for Terminal. Sound Power Levels, Lw dB, re 10<sup>-12</sup> Watts.**

Pressure Drop	0.2" W.G. (50 Pa) (Recommended Operating Pressure)											0.5" W.G. (125 Pa)											1.0" W.G. (250 Pa)										
	Unit Airflow		Octave Band								NC	Octave Band								NC	Octave Band								NC				
	Size	CFM	Lps	1 63 Hz	2 125 Hz	3 250 Hz	4 500 Hz	5 1000 Hz	6 2000 Hz	7 4000 Hz		8 8000 Hz	1	2	3	4	5	6	7		8	1	2	3	4	5	6	7		8			
12	393	185	61.0*	47.1*	43.3	37.5	33.3*	30.7	25.9	21.3	35	62.0*	52.8*	49.6	45.4	44.3	43.4	40.7	37.2	45	64.9*	59.5	55.5	53.4	53.9	54.6	50.9	48.9	55				
	786	371	63.9	54.5	48.9	44.8	40.3	37.1	32.6	27.4	40	67.7	60	54.6	50.9	48.4	46.5	44.2	41.1	50	71	65.9	59.4	56.4	55.4	54.4	51.9	50	55				
	1178	556	66.7	61.8	54.4	52	47.3	43.5	39.3	33.4	50	73.3	67.2	59.5	56.3	52.5	49.5	47.7	44.9	55	77.1	72.2	63.2	59.3	56.8	54.2	52.8	51	60				
	1571	741	69.3	64.9	57.9	55.7	52	50.2	47.2	43.8	55	77.2	71.2	63.5	60	56.3	53.3	50.7	47.4	60	80.7	76	67	63	59.8	57.2	55.3	53.3	65				
10x21	1964	927	71.9	68	61.4	59.4	56.7	56.9	55.1	54.2	60	81.1	75.1	67.4	63.6	60	57	53.7	49.9	65	84.3	79.7	70.7	66.6	62.8	60.2	57.8	55.5	70				
	730	345	56.9	45.6	46.0	40.7	41.9	43.6	35.2	26.6	45	58.0	51.7	53.0	50.2	52.6	55.7	51.3	45.5	60	63.8	57.4	54.7	55.5	58.6	61.9	58.2	56.2	65				
	1090	514	68.3	54.1	52.4	48.1	47.1	46.7	40.0	33.4	50	69.7	61.2	59.2	55.7	54.9	56.4	52.1	48.5	60	72.4	66.6	61.3	59.5	60.5	62.2	59.8	57.3	65				
	2190	1034	79.8	62.5	58.9	55.5	52.2	49.7	44.8	40.2	65	81.4	70.7	65.4	61.2	57.3	57.1	52.9	51.4	70	81.0	75.8	67.9	63.4	62.4	62.4	61.5	58.3	70				
10x21	3645	1720	84.2	69.6	61.9	56.1	54.7	47.9	40.5	36.7	70	86.3	77.1	72.9	70.5	63.7	62.8	57.5	55.7	70	90.2	83.1	77.3	72.7	67.8	67.2	65.1	62.6	70				
	730	345	59.0	46.6	42.7	40.0	37.8	39.4	36.1	29.3	40	56.7	49.9	51.8	49.6	48.1	51.4	48.4	44.6	55	60.5	53.1	53.2	54.5	52.4	56.8	54.3	50.4	60				
	1090	514	62.0	53.6	50.2	46.7	41.9	42.2	38.0	32.3	45	64.5	59.0	57.9	54.7	50.5	53.1	49.8	46.9	55	69.4	63.9	60.4	59.1	55.8	58.6	57.1	54.5	60				
	2190	1034	65.1	60.5	57.7	53.3	46.1	45.0	39.8	35.3	50	72.3	68.1	64.0	59.9	53.0	54.7	51.2	49.1	60	78.3	74.7	67.7	63.8	59.2	60.5	59.9	58.6	65				
Quiet	3645	1720	80.6	76.6	72.0	66.1	57.2	54.4	48.4	43.4	70	82.4	78.3	74.2	69.6	59.1	59.2	54.5	52.4	70	87.5	83.0	76.2	71.5	63.5	64.5	62.9	61.5	70				

\* Lower than room ambient

Performance Notes:

1. Test data obtained in accordance with AHRI Standard 880-2017 and ASHRAE Standard 130-2016.
2. Sound power levels include duct end corrections per AHRI Standard 880-2017.
3. Airflow given in liters/seconds (L/s); and in cubic feet per minute (cfm).
4. Pressure given in Pascal (Pa) and inches of water gauge (in W.G.).



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x15

180 Entering Water Temperature

Project Specific piping packages available

Table 7. Heating Capacity (MBH) - 10x15

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM								
			50	100	150	250	500	1000	1500	2000	2500
1-Row Standard Coil Capacity (MBH)	1	0.67	3.90	6.22	7.95	10.46	14.30	18.90	21.50	23.24	25.51
	2.5	1.35	4.00	6.51	8.46	11.45	16.32	21.73	25.35	28.03	31.70
	5	0.70	4.02	6.59	8.61	11.74	16.99	23.10	26.83	30.33	33.53
	7.5	1.36	4.06	6.71	8.82	12.14	17.88	24.85	29.29	32.50	37.01
	10	1.57	4.09	6.77	8.93	12.36	18.39	25.87	30.75	34.34	39.48
	12.5	2.32	4.10	6.81	9.00	12.50	18.71	26.54	31.72	35.58	39.48
2-Row Standard Coil Capacity (MBH)	15	2.76	4.11	6.84	9.05	12.60	18.94	27.89	32.43	36.48	42.41
	1	1.35	5.34	9.13	12.05	16.31	22.64	29.73	33.41	35.74	38.59
	2.5	1.84	5.46	9.59	12.96	18.27	27.11	36.78	43.16	47.80	54.00
	5	0.95	5.49	9.72	13.23	18.89	28.74	40.37	47.41	54.11	59.91
	7.5	1.87	5.53	9.85	13.49	19.47	30.25	43.64	52.20	58.35	66.84
	10	2.46	5.55	9.92	13.63	19.79	31.08	45.53	55.03	62.01	71.89
1-Row High Capacity Slanted Coil Capacity (MBH)	12.5	3.66	5.56	9.97	13.72	19.99	31.62	46.77	56.92	64.48	75.35
	15	4.64	5.57	10.00	13.78	20.13	31.99	48.03	58.27	66.26	77.89
	1	1.34	4.55	7.54	9.84	13.28	18.74	25.40	29.18	31.69	33.51
	2.5	2.32	4.66	7.89	10.50	14.65	21.79	30.17	36.01	40.41	43.80
	5	1.22	4.69	7.99	10.70	15.08	22.89	32.64	38.92	43.46	47.29
	7.5	1.40	4.68	7.97	10.66	15.01	22.75	32.43	38.69	43.25	46.78
2-Row High Capacity Slanted Coil Capacity (MBH)	10	1.18	4.70	8.05	10.80	15.30	23.47	33.98	40.99	46.20	50.30
	12.5	1.64	4.72	8.10	10.89	15.49	23.94	35.02	42.54	48.22	52.74
	15	1.49	4.73	8.13	10.96	15.63	24.28	35.77	43.67	49.70	54.54
	1	2.69	5.79	10.32	13.97	19.49	27.91	37.09	41.66	44.40	46.24
	2.5	3.33	5.89	10.78	14.98	21.91	34.17	48.36	57.89	64.86	70.06
	5	1.71	5.92	10.92	15.29	22.70	36.54	54.22	65.54	73.55	80.29
1-Row High Capacity Slanted Coil Capacity (MBH)	7.5	1.54	5.92	10.92	15.29	22.73	36.70	54.81	66.63	75.17	81.72
	10	1.43	5.93	10.99	15.44	23.10	37.78	57.48	70.82	80.74	88.51
	12.5	2.00	5.94	11.03	15.53	23.32	38.47	59.24	73.63	84.53	93.19
	15	2.01	5.95	11.06	15.60	23.48	38.95	60.49	75.66	87.29	96.64

Heating capacity data in tables assume an entering water temperature (EWT) of 180°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 125°F. Smaller temperature differences will result in a decrease of heating capacity.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x21

180 Entering Water Temperature

Project Specific piping packages available

Table 8. Heating Capacity (MBH) - 10x21

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM										
			50	100	150	250	500	1000	1500	2000	3000	3500	3700
1-Row Standard Coil Capacity (MBH)	1	0.80	4.22	6.86	8.86	11.82	16.43	22.01	25.17	27.29	30.04	31.01	31.34
	2.5	1.43	4.33	7.19	9.45	12.98	18.91	25.68	30.30	33.75	38.53	40.29	40.91
	5	0.75	4.35	7.28	9.62	13.34	19.77	27.52	32.38	41.58	41.30	43.44	44.20
	7.5	1.44	4.39	7.39	9.82	13.74	20.71	29.47	35.20	39.41	45.39	47.75	48.70
	10	1.71	4.41	7.45	9.93	13.95	21.23	30.58	36.84	41.53	48.31	50.91	51.84
	12.5	2.52	4.42	7.48	9.99	14.09	21.56	31.31	37.94	42.95	50.30	53.14	54.17
	15	3.04	4.43	7.51	10.04	14.19	21.80	32.26	38.72	43.97	51.74	54.78	55.87
2-Row Standard Coil Capacity (MBH)	1	1.6	5.58	9.74	13.02	17.89	25.25	33.41	40.16	41.94	43.25	44.26	44.61
	2.5	2.02	5.69	10.21	13.98	19.32	30.56	42.35	55.96	60.25	63.62	66.37	67.33
	5	1.03	5.72	10.35	14.28	20.80	32.55	46.98	62.23	67.49	72.17	76.06	77.44
	7.5	0.97	5.75	10.33	14.25	20.75	32.48	47.01	62.66	67.58	80.37	74.85	76.25
	10	0.88	5.76	10.41	14.43	21.16	33.59	49.54	67.55	73.42	78.15	82.07	83.46
	12.5	1.26	5.75	10.47	14.54	21.41	34.31	51.22	70.93	77.51	82.87	87.36	88.96
	15	3.05	5.76	10.50	14.61	21.60	34.81	56.26	73.41	80.54	86.40	91.34	99.05
1-Row High Capacity Slanted Coil Capacity (MBH)	1	1.51	4.84	8.15	10.75	14.67	20.95	28.62	32.93	35.77	39.36	40.58	41.00
	2.5	2.47	4.95	8.53	11.48	16.23	24.60	34.64	41.73	47.12	54.67	57.46	60.91
	5	1.3	4.98	8.65	11.71	16.75	25.96	37.82	50.32	51.35	60.60	64.30	65.64
	7.5	1.42	4.98	8.64	11.69	16.73	25.95	40.17	45.84	51.72	60.08	63.37	64.71
	10	1.22	5.00	8.71	11.82	17.01	26.67	39.55	48.37	55.05	64.77	68.49	69.82
	12.5	1.69	5.01	8.75	11.91	17.19	27.14	40.64	50.06	57.30	68.01	72.17	73.67
	15	1.57	5.02	8.78	11.96	17.31	27.47	43.78	51.28	58.93	70.39	74.89	76.52
2-Row High Capacity Slanted Coil Capacity (MBH)	1	3	5.95	10.80	14.77	20.89	30.29	40.28	45.06	47.82	50.85	51.76	52.06
	2.5	3.58	6.04	11.25	15.81	23.50	37.45	53.99	65.12	73.23	83.94	87.71	93.45
	5	1.85	6.06	11.38	16.12	24.34	40.17	61.12	81.08	84.70	100.42	106.63	108.84
	7.5	1.58	6.06	11.39	16.15	24.44	40.55	65.34	76.97	87.75	102.78	108.63	111.07
	10	1.5	6.07	11.44	16.28	24.77	41.59	65.09	81.52	93.95	111.91	131.91	134.60
	12.5	2.12	6.08	11.48	16.35	24.97	42.25	66.90	84.53	98.13	131.42	140.00	143.09
	15	2.16	6.08	11.50	16.40	25.11	43.19	69.11	86.67	101.14	136.57	145.98	149.38

Heating capacity data in tables assume an entering water temperature (EWT) of 180°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 125°F. Smaller temperature differences will result in a decrease of heating capacity.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x15

160 Entering Water Temperature

Project Specific piping packages available

Table 9. Heating Capacity (MBH) - 10x15

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM								
			50	100	150	250	500	1000	1500	2000	2500
1-Row Standard Coil Capacity (MBH)	1	0.69	3.27	5.21	6.64	8.73	11.91	15.69	17.82	19.25	20.30
	2.5	1.36	3.35	5.45	7.08	9.56	13.59	18.05	21.01	23.19	24.86
	5	0.71	3.37	5.52	7.20	9.80	14.15	19.17	22.22	24.36	26.12
	7.5	1.37	3.41	5.62	7.38	10.15	14.92	20.68	24.33	26.96	29.00
	10	1.59	3.43	5.68	7.48	10.34	15.36	21.56	25.59	28.55	30.87
	12.5	2.35	3.44	5.71	7.54	10.47	15.64	22.15	26.43	29.62	32.14
2-Row Standard Coil Capacity (MBH)	15	2.80	3.45	5.74	7.59	10.56	15.85	22.57	27.05	30.40	33.07
	1	1.37	4.48	7.65	11.10	13.63	19.79	25.46	28.44	30.37	31.76
	2.5	1.86	4.58	8.04	10.85	15.28	23.64	31.15	36.12	39.79	42.57
	5	0.96	4.61	8.15	12.22	15.79	25.04	34.05	39.44	43.19	46.34
	7.5	1.90	4.64	8.26	12.48	16.30	26.38	36.77	43.30	48.00	51.65
	10	0.85	4.62	8.20	12.35	17.35	25.78	35.63	41.77	46.17	49.57
1-Row High Capacity Slanted Coil Capacity (MBH)	12.5	1.21	4.64	9.22	11.31	17.63	26.44	36.97	43.66	48.54	52.36
	15	1.17	4.65	8.30	11.38	17.82	26.91	37.94	45.06	50.30	54.44
	1	1.36	4.53	7.38	9.46	12.42	16.83	22.10	25.06	27.05	28.52
	2.5	2.35	4.64	7.74	10.13	13.75	19.61	26.12	30.60	33.99	36.61
	5	1.23	4.67	7.85	10.34	14.18	20.61	28.20	32.96	36.37	39.27
	7.5	2.33	4.70	7.96	10.54	14.58	21.54	30.07	35.64	39.77	43.03
2-Row High Capacity Slanted Coil Capacity (MBH)	10	1.19	4.68	7.90	10.44	14.39	21.14	29.32	34.62	38.53	41.61
	12.5	1.65	4.70	7.96	10.54	14.59	21.59	30.23	35.93	40.18	43.57
	15	1.51	4.71	8.00	10.61	14.73	21.91	30.89	36.88	41.39	45.01
	1	2.75	5.43	9.76	13.14	18.05	25.13	32.63	36.36	38.65	40.22
	2.5	3.37	5.51	10.17	14.09	20.36	30.83	42.26	49.81	55.34	59.50
	5	1.74	5.53	10.29	14.38	21.10	32.99	47.29	56.11	62.30	67.51
1-Row High Capacity Slanted Coil Capacity (MBH)	7.5	3.39	5.54	10.38	14.57	21.61	34.46	50.75	61.37	69.14	75.18
	10	1.44	5.54	10.35	14.52	21.47	34.13	50.08	60.48	68.10	74.04
	12.5	2.02	5.54	10.39	14.61	21.70	34.78	51.65	62.88	71.25	77.87
	15	2.03	5.55	10.41	14.67	21.85	35.25	52.77	64.62	73.54	80.68

Heating capacity data in tables assume an entering water temperature (EWT) of 160°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 105°F. Smaller temperature differences will result in a decrease of heating capacity.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x21

160 Entering Water Temperature

Project Specific piping packages available

Table 10. Heating Capacity (MBH) - 10x21

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM										
			50	100	150	250	500	1000	1500	2000	3000	3500	3700
1-Row Standard Coil Capacity (MBH)	1	0.81	4.21	6.71	8.50	11.04	14.82	19.34	21.91	23.65	25.95	26.77	27.06
	2.5	1.45	4.32	7.05	9.10	12.18	17.11	22.54	26.24	29.03	32.94	34.40	34.93
	5	0.76	4.35	7.14	9.28	12.53	17.90	24.13	28.00	30.76	35.18	36.94	37.57
	7.5	1.46	4.39	7.26	9.49	12.94	18.80	25.88	30.45	33.82	38.59	40.58	41.36
	10	1.74	4.41	7.33	9.61	13.17	19.30	26.89	31.90	35.65	41.13	43.25	44.02
	12.5	2.56	4.42	7.37	9.68	13.31	19.63	27.55	32.86	36.87	42.81	45.14	45.98
	15	3.09	4.43	7.39	9.73	13.41	19.86	28.02	33.54	37.75	44.03	46.51	47.41
2-Row Standard Coil Capacity (MBH)	1	1.64	5.28	9.24	12.26	16.59	22.80	29.57	33.04	35.22	37.89	38.78	39.09
	2.5	2.05	5.37	9.68	13.19	18.69	27.69	37.40	43.82	48.55	54.93	57.24	58.06
	5	1.05	5.39	9.80	13.47	19.37	29.52	41.44	48.71	53.78	61.91	65.14	66.29
	7.5	2.08	5.42	9.91	13.71	19.92	30.99	44.69	53.51	59.93	68.93	72.47	73.96
	10	0.89	5.41	9.86	13.61	19.71	30.47	43.67	52.12	58.24	66.85	70.06	71.21
	12.5	1.27	5.42	9.92	13.72	19.97	31.17	45.22	54.40	61.18	70.88	74.56	75.88
	15	1.26	5.42	9.95	13.80	20.15	31.66	46.33	56.08	63.35	73.90	77.95	79.41
1-Row High Capacity Slanted Coil Capacity (MBH)	1	1.63	4.84	8.13	10.59	14.14	19.48	25.79	29.29	31.60	34.56	35.59	35.95
	2.5	2.54	4.95	8.52	11.36	15.75	23.04	31.32	37.07	41.43	47.54	49.82	50.63
	5	1.32	4.98	8.64	11.59	16.27	24.36	34.22	40.51	45.07	52.49	55.48	56.56
	7.5	2.51	5.01	8.74	11.79	16.69	25.40	36.45	43.84	49.36	57.39	60.61	61.94
	10	1.24	4.99	8.70	11.71	16.54	25.06	35.80	42.93	48.26	56.00	58.96	60.03
	12.5	1.71	5.01	8.75	11.80	16.73	25.54	36.84	44.49	50.29	58.82	62.14	63.35
	15	1.60	5.02	8.78	11.87	16.87	25.88	37.60	45.62	51.76	60.91	64.50	65.81
2-Row High Capacity Slanted Coil Capacity (MBH)	1	3.27	4.99	9.06	12.40	17.52	25.38	33.74	37.75	40.07	42.63	43.40	43.65
	2.5	2.05	5.07	9.44	13.26	19.70	31.37	45.15	54.40	61.14	70.05	73.19	55.89
	5	1.92	5.09	9.55	13.53	20.41	33.63	51.07	67.72	70.61	83.58	88.70	90.52
	7.5	1.60	5.09	9.56	13.55	20.48	33.92	54.66	64.08	72.96	85.30	90.06	92.05
	10	1.03	5.10	9.61	13.66	20.76	34.81	54.36	67.97	78.24	93.03	98.60	98.08
	12.5	2.15	6.08	9.63	13.72	20.94	35.38	55.91	70.55	81.81	98.39	104.76	107.05
	15	2.21	5.11	9.65	13.77	21.06	36.18	57.53	72.39	84.39	102.34	109.33	111.85

Heating capacity data in tables assume an entering water temperature (EWT) of 160°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 105°F. Smaller temperature differences will result in a decrease of heating capacity.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x15

140 Entering Water Temperature

Project Specific piping packages available

Table 11. Heating Capacity (MBH) - 10x15

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM								
			50	100	150	250	500	1000	1500	2000	2500
1-Row Standard Coil Capacity (MBH)	1	0.70	3.08	4.75	5.92	7.54	9.91	12.73	14.33	15.42	16.24
	2.5	1.37	3.16	4.99	6.32	8.27	11.29	14.52	16.69	18.31	19.57
	5	0.72	3.18	5.05	6.43	8.48	11.73	15.37	17.58	19.14	20.45
	7.5	1.39	3.22	5.16	6.61	8.80	12.39	16.56	19.19	21.10	22.61
	10	1.62	3.24	5.21	6.71	8.98	12.76	17.26	20.15	22.29	23.99
	12.5	2.39	3.26	5.25	6.77	9.10	13.01	17.72	20.80	23.10	24.94
2-Row Standard Coil Capacity (MBH)	15	2.85	3.27	5.28	6.82	9.18	13.18	18.05	21.26	23.68	25.63
	1	1.40	4.07	6.88	8.94	11.81	15.87	20.39	22.77	24.31	25.41
	2.5	1.89	4.15	7.23	9.63	13.26	18.96	24.92	28.85	31.75	33.94
	5	0.97	4.18	7.33	9.83	13.71	20.06	27.20	31.45	34.40	36.87
	7.5	1.93	4.21	7.44	10.05	14.18	21.18	29.45	34.63	38.35	41.23
	10	0.85	4.19	7.38	9.94	13.94	20.64	28.45	33.27	36.73	39.39
1-Row High Capacity Slanted Coil Capacity (MBH)	12.5	1.22	4.20	7.43	10.05	14.17	21.20	29.56	34.85	38.69	41.69
	15	1.18	4.21	7.47	10.12	14.33	21.59	30.38	36.01	40.16	43.42
	1	1.39	3.65	5.94	7.61	9.99	13.52	17.72	20.08	21.67	22.84
	2.5	2.38	3.74	6.24	8.16	11.06	15.75	20.94	24.49	27.17	29.25
	5	1.25	3.77	6.32	8.32	11.40	16.54	22.58	26.34	29.04	31.32
	7.5	2.36	3.79	6.42	8.49	11.73	17.31	24.13	28.56	31.84	34.42
2-Row High Capacity Slanted Coil Capacity (MBH)	10	1.20	3.78	6.37	8.40	11.57	16.95	23.46	27.65	30.74	33.16
	12.5	1.66	3.79	6.41	8.49	11.73	17.33	24.22	28.74	32.11	34.79
	15	1.52	3.80	6.45	8.54	11.85	17.60	24.77	29.54	33.12	35.99
	1	2.81	4.39	7.88	10.60	14.55	20.22	26.25	29.26	31.10	32.37
	2.5	3.42	4.45	8.21	11.37	16.40	24.80	33.94	39.95	44.36	47.67
	5	1.76	4.47	8.31	11.60	16.99	26.51	37.92	44.94	49.85	53.96
1-Row High Capacity Slanted Coil Capacity (MBH)	7.5	3.45	4.48	8.38	11.76	17.41	27.73	40.76	49.24	55.43	60.23
	10	1.45	4.48	8.36	11.71	17.29	27.41	40.13	48.38	54.40	59.10
	12.5	2.05	4.48	8.39	11.78	17.48	27.97	41.43	50.37	57.00	62.24
	15	2.06	4.49	8.41	11.84	17.61	28.35	42.36	51.81	58.91	64.57

Heating capacity data in tables assume an entering water temperature (EWT) of 140°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 85°F. Smaller temperature differences will result in a decrease of heating capacity.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x21

140 Entering Water Temperature

Project Specific piping packages available

Table 12. Heating Capacity (MBH) - 10x21

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM										
			50	100	150	250	500	1000	1500	2000	3000	3500	3700
1-Row Standard Coil Capacity (MBH)	1	0.83	3.39	5.40	6.84	8.86	10.81	15.48	17.51	18.89	20.71	21.36	21.58
	2.5	1.47	3.48	5.67	7.32	9.78	13.71	18.02	20.95	23.15	26.22	27.37	27.78
	5	0.76	3.51	5.75	7.46	10.06	14.34	19.28	22.32	24.50	27.95	29.32	29.81
	7.5	1.48	3.54	5.85	7.64	10.41	15.09	20.73	24.36	27.02	30.83	32.33	32.95
	10	0.75	3.52	5.78	7.53	10.20	14.66	19.95	23.30	25.74	29.21	30.52	31.00
	12.5	1.06	3.54	5.84	7.62	10.38	15.05	20.69	24.33	27.03	30.91	32.39	32.93
	15	0.96	3.55	5.87	7.69	10.50	15.32	21.22	25.09	27.98	32.18	33.80	34.39
2-Row Standard Coil Capacity (MBH)	1	1.67	4.26	7.45	9.88	13.35	16.98	23.74	26.52	28.27	30.41	31.13	31.38
	2.5	2.08	4.34	7.81	10.63	15.04	22.24	29.97	35.06	38.82	43.87	45.70	46.35
	5	1.07	4.36	7.91	10.85	15.58	23.68	33.16	38.91	42.92	49.31	51.84	52.75
	7.5	2.11	4.38	8.00	11.05	16.04	24.90	35.84	42.85	47.94	55.06	57.84	59.01
	10	0.90	4.37	7.96	10.97	15.85	24.44	34.92	41.58	46.41	53.15	55.66	56.56
	12.5	1.28	4.38	8.00	11.06	16.07	25.02	36.20	43.48	48.83	56.47	59.36	60.39
	15	1.27	4.38	8.03	11.13	16.22	25.44	37.13	44.87	50.63	58.96	62.15	63.30
1-Row High Capacity Slanted Coil Capacity (MBH)	1	1.66	3.91	6.55	8.53	11.38	15.66	20.72	23.53	25.38	27.75	28.57	28.86
	2.5	2.57	3.99	6.87	9.15	12.67	18.52	25.13	29.71	33.18	38.03	39.84	40.48
	5	1.34	4.02	6.97	9.34	13.09	19.57	27.42	32.43	36.04	41.90	44.26	45.11
	7.5	2.55	4.04	7.05	9.50	13.44	20.43	29.27	35.16	39.56	45.94	48.48	49.53
	10	1.25	4.03	7.01	9.43	13.30	20.12	28.67	34.33	38.55	44.65	46.98	47.82
	12.5	1.73	4.04	7.05	9.51	13.47	20.52	29.55	35.63	40.23	46.98	49.60	50.55
	15	1.61	4.05	7.08	9.57	13.58	20.81	30.18	36.57	41.46	48.71	51.55	52.59
2-Row High Capacity Slanted Coil Capacity (MBH)	1	3.35	4.49	8.28	11.34	15.90	21.47	29.28	32.49	34.37	36.49	37.14	37.36
	2.5	3.82	4.54	8.59	12.11	17.93	28.01	39.29	46.67	52.04	59.15	61.68	62.56
	5	1.95	4.55	8.68	12.34	18.57	30.08	44.47	53.54	59.93	70.13	74.18	75.62
	7.5	3.83	4.56	8.73	12.47	18.96	31.34	47.74	58.71	66.83	78.31	82.80	84.70
	10	1.55	4.56	8.72	12.45	18.89	31.15	47.36	58.24	66.31	77.82	82.15	83.69
	12.5	2.18	4.56	8.74	12.50	19.05	31.70	48.79	60.54	69.42	82.36	87.31	89.09
	15	2.25	4.56	8.75	12.54	19.17	32.08	49.81	62.19	71.68	85.70	91.15	93.11

Heating capacity data in tables assume an entering water temperature (EWT) of 140°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 85°F. Smaller temperature differences will result in a decrease of heating capacity.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x15

120 Entering Water Temperature

Project Specific piping packages available

Table 13. Heating Capacity (MBH) - 10x15

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM								
			50	100	150	250	500	1000	1500	2000	2500
1-Row Standard Coil Capacity (MBH)	1	0.72	2.34	3.60	4.48	5.70	7.47	9.57	10.76	11.56	12.17
	2.5	1.39	2.40	3.79	4.79	6.26	8.52	10.92	12.52	13.72	14.64
	5	0.73	2.42	3.83	4.87	6.41	8.84	11.54	13.17	14.32	15.27
	7.5	1.40	2.45	3.92	5.02	6.67	9.37	12.48	14.44	15.86	16.97
	10	1.65	2.47	3.97	5.10	6.82	9.67	13.04	15.20	16.79	18.06
	12.5	2.43	2.48	4.00	5.15	6.91	9.86	13.41	15.72	17.43	18.81
2-Row Standard Coil Capacity (MBH)	15	2.90	2.49	4.02	5.19	6.98	10.00	13.68	16.09	17.90	19.35
	1	1.43	3.10	5.23	6.79	8.95	12.01	15.40	17.18	18.34	19.16
	2.5	1.92	3.17	5.50	7.32	10.05	14.33	18.79	21.70	23.85	25.48
	5	0.99	3.19	5.57	7.47	10.39	15.15	20.47	23.62	25.79	27.60
	7.5	1.96	3.21	5.66	7.64	10.76	16.04	22.23	26.09	28.85	30.99
	10	0.86	3.19	5.61	7.55	10.56	15.58	21.39	24.95	27.49	29.45
1-Row High Capacity Slanted Coil Capacity (MBH)	12.5	1.23	3.21	5.66	7.63	10.75	16.03	22.27	26.20	29.03	31.24
	15	1.20	3.21	5.69	7.70	10.88	16.35	22.92	27.12	30.19	32.60
	1	1.43	2.78	4.52	5.78	7.58	10.24	13.40	15.17	16.36	17.24
	2.5	2.41	2.85	4.74	6.20	8.39	11.92	15.81	18.46	20.46	22.01
	5	1.26	2.87	4.81	6.32	8.64	12.51	17.03	19.84	21.84	23.52
	7.5	2.40	2.89	4.88	6.46	8.91	13.13	18.25	21.57	24.02	25.94
2-Row High Capacity Slanted Coil Capacity (MBH)	10	1.21	2.88	4.84	6.38	8.77	12.82	17.69	20.80	23.09	24.87
	12.5	1.67	2.89	4.88	6.45	8.91	13.13	18.29	21.67	24.17	26.15
	15	1.54	2.90	4.91	6.50	9.00	13.34	18.73	22.30	24.97	27.10
	1	2.86	3.35	6.00	8.07	11.06	15.36	19.93	22.21	23.61	24.58
	2.5	3.47	3.40	6.26	8.65	12.47	18.81	25.70	30.20	33.52	36.00
	5	1.79	3.41	6.34	8.83	12.91	20.10	28.66	33.91	37.57	40.62
1-Row High Capacity Slanted Coil Capacity (MBH)	7.5	3.51	3.42	6.39	8.96	13.25	21.05	30.88	37.25	41.88	45.48
	10	1.47	3.42	6.37	8.91	13.14	20.77	30.31	36.46	40.94	44.42
	12.5	2.07	3.42	6.40	8.98	13.29	21.21	31.33	38.02	42.97	46.87
	15	2.09	3.43	6.42	9.02	13.40	21.52	32.07	39.16	44.47	48.69

Heating capacity data in tables assume an entering water temperature (EWT) of 120°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 65°F. Smaller temperature differences will result in a decrease of heating capacity.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COIL DATA 10x21

120 Entering Water Temperature

Project Specific piping packages available

Table 14. Heating Capacity (MBH) - 10x21

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM										
			50	100	150	250	500	1000	1500	2000	3000	3500	3700
1-Row Standard Coil Capacity (MBH)	1	0.86	2.58	4.10	5.19	6.71	8.11	11.66	13.18	14.21	15.56	16.04	16.21
	2.5	1.49	2.65	4.31	5.55	7.41	10.36	13.58	15.74	17.37	19.64	20.48	20.78
	5	0.77	2.67	4.37	5.66	7.62	10.82	14.50	16.76	18.36	20.89	21.89	22.25
	7.5	1.50	2.70	4.45	5.80	7.90	11.42	15.65	18.35	20.33	23.15	24.23	24.70
	10	0.76	2.68	4.39	5.71	7.72	11.07	15.00	17.47	19.27	21.81	22.77	23.11
	12.5	1.07	2.69	4.44	5.79	7.87	11.37	15.58	18.29	20.28	23.13	24.22	24.62
	15	0.97	2.70	4.47	5.84	7.97	11.60	16.02	18.90	21.04	24.14	25.33	25.77
2-Row Standard Coil Capacity (MBH)	1	1.71	3.25	5.67	7.51	10.14	12.80	17.97	20.07	21.39	23.01	23.56	23.74
	2.5	2.12	3.31	5.95	8.03	11.42	16.84	22.63	26.43	29.23	33.00	34.36	34.84
	5	1.08	3.33	6.02	8.25	11.82	17.91	25.00	29.28	32.25	36.96	38.82	39.49
	7.5	2.15	3.34	6.10	8.41	12.19	18.88	27.09	32.34	36.13	41.42	43.47	44.34
	10	0.91	3.33	6.06	8.34	12.02	18.48	26.30	31.24	34.81	39.77	41.61	42.26
	12.5	1.30	3.34	6.10	8.42	12.20	18.95	27.32	32.74	36.71	42.34	44.47	45.23
	15	1.30	3.35	6.12	8.47	12.33	19.28	28.05	33.84	38.12	44.29	46.65	47.49
1-Row High Capacity Slanted Coil Capacity (MBH)	1	1.70	2.98	4.99	6.49	8.65	11.88	15.70	17.82	19.21	21.00	21.62	21.84
	2.5	2.60	3.05	5.23	6.96	9.62	14.04	19.02	22.44	25.03	28.66	30.00	30.49
	5	1.36	3.06	5.30	7.10	9.94	14.82	20.72	24.46	27.15	31.49	33.24	33.87
	7.5	2.59	3.08	5.37	7.23	10.21	15.50	22.17	26.59	29.89	34.65	36.53	37.31
	10	1.26	3.07	5.34	7.17	10.10	15.23	21.65	25.87	29.00	33.52	35.24	35.85
	12.5	1.74	3.08	5.37	7.23	10.23	15.56	22.34	26.90	30.32	35.34	37.28	37.98
	15	1.64	3.09	5.39	7.28	10.32	15.79	22.84	27.64	31.29	36.70	38.81	39.58
2-Row High Capacity Slanted Coil Capacity (MBH)	1	3.43	3.43	6.32	8.65	12.11	16.27	22.27	24.72	26.16	27.79	28.29	28.46
	2.5	3.88	3.47	6.55	9.23	13.65	21.28	29.80	35.35	39.41	44.77	46.67	47.34
	5	1.99	3.48	6.62	9.40	14.13	22.83	33.67	40.48	45.26	52.87	55.89	56.97
	7.5	3.90	3.48	6.66	9.51	14.44	23.82	36.21	44.47	50.57	59.18	62.52	63.95
	10	1.57	3.48	6.65	9.49	14.37	23.64	35.83	43.97	49.99	58.55	61.76	62.90
	12.5	2.21	3.49	6.67	9.53	14.51	24.07	36.96	45.77	52.42	62.07	65.75	67.08
	15	2.29	3.49	6.68	9.57	14.60	24.38	37.76	47.07	54.18	64.67	68.73	70.20

Heating capacity data in tables assume an entering water temperature (EWT) of 120°F, and an entering air temperature (EAT) of 55°F, which corresponds to a temperature difference of 65°F. Smaller temperature differences will result in a decrease of heating capacity.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COOLING COIL DATA 10x15

45 Entering Water Temperature

Project Specific piping packages available

Table 15. Cooling Capacity (MBH) - 10x15

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM											
			50		100		150		200		250		500	
			Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible
1-Row Standard Coil Capacity (MBH)	1	0.81	1.85	1.21	2.61	1.81	3.09	2.23	3.42	2.56	3.67	2.84	4.43	3.81
	2.5	1.47	2.01	1.29	2.93	1.95	3.52	2.42	3.95	2.79	4.29	3.10	5.30	4.17
	5	0.77	2.05	1.30	3.01	1.98	3.63	2.47	4.09	2.85	4.44	3.16	5.52	4.27
	7.5	1.49	2.14	1.35	3.22	2.08	3.95	2.61	4.50	3.03	4.93	3.38	6.30	4.59
	10	1.79	2.19	1.37	3.35	2.14	4.14	2.70	4.75	3.14	5.24	3.51	6.82	4.81
	12.5	2.65	2.23	1.39	3.43	2.18	4.28	2.76	4.93	3.22	5.46	3.61	7.19	4.98
	15	3.20	2.25	1.40	3.49	2.21	4.37	2.80	5.06	3.28	5.62	3.68	7.47	5.10
2-Row Standard Coil Capacity (MBH)	1	1.59	2.45	1.59	3.72	2.57	4.54	3.29	5.12	3.88	5.61	4.39	7.22	6.22
	2.5	2.07	2.72	1.71	4.35	2.84	5.47	3.69	6.31	4.37	6.97	4.95	8.97	7.03
	5	1.07	2.81	1.76	4.56	2.94	5.79	3.83	6.72	4.55	7.45	5.16	9.73	7.34
	7.5	2.13	2.90	1.80	4.83	3.06	6.23	4.03	7.33	4.82	8.22	5.50	11.07	7.91
	10	2.87	2.95	1.83	4.98	3.13	6.49	4.15	7.70	4.99	8.69	5.71	11.95	8.29
	12.5	4.29	2.98	1.84	5.08	3.18	6.67	4.23	7.95	5.11	9.01	5.86	12.57	8.56
	15	5.51	3.00	1.85	5.15	3.22	6.79	4.29	8.13	5.19	9.24	5.96	13.05	8.77
1-Row High Capacity Slanted Coil Capacity (MBH)	1	1.60	2.25	1.45	3.38	2.28	4.11	2.89	4.64	3.37	5.05	3.78	6.39	5.28
	2.5	2.56	2.47	1.56	3.86	2.50	4.82	3.20	5.55	3.76	6.14	4.24	7.99	5.94
	5	1.35	2.54	1.59	4.01	2.57	5.05	3.30	5.85	3.90	6.50	4.40	8.58	6.19
	7.5	2.57	2.62	1.63	4.22	2.67	5.39	3.46	6.32	4.11	7.08	4.66	9.61	6.64
	10	1.25	2.57	1.61	4.09	2.61	5.17	3.36	6.01	3.97	6.69	4.48	8.89	6.33
	12.5	1.74	2.61	1.63	4.20	2.66	5.35	3.44	6.26	4.08	7.00	4.62	9.44	6.56
	15	1.63	2.64	1.64	4.28	2.70	5.48	3.50	6.44	4.16	7.23	4.73	9.87	6.75
2-Row High Capacity Slanted Coil Capacity (MBH)	1	3.14	2.65	1.70	4.24	2.88	5.31	3.80	6.10	4.57	6.81	5.27	9.52	7.93
	2.5	3.75	2.98	1.86	5.10	3.27	6.69	4.40	7.94	5.34	8.96	6.16	12.23	9.20
	5	1.94	3.10	1.92	5.44	3.43	7.25	4.65	8.70	5.68	9.91	6.58	13.93	9.91
	7.5	3.83	3.17	1.95	5.67	3.54	7.67	4.85	9.33	5.97	10.74	6.95	15.62	10.64
	10	1.55	3.17	1.95	5.62	3.52	7.55	4.79	9.12	5.88	10.44	6.82	14.91	10.33
	12.5	2.19	3.20	1.97	5.73	3.57	7.75	4.89	9.43	6.02	10.85	7.01	15.77	10.70
	15	2.26	3.22	1.98	5.80	3.60	7.90	4.96	9.65	6.12	11.15	7.15	16.43	10.99

Cooling capacity data in tables assume an entering water temperature (EWT) of 42°F, an entering air dry bulb temperature (EDB) of 80°F, and an entering wet bulb temperature (EWB) of 67°F.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### COOLING COIL DATA 10x21

45 Entering Water Temperature

Project Specific piping packages available

Table 16. Cooling Capacity (MBH) - 10x21

Rows	GPM	Water Pressure Drop (ft)	Airflow CFM													
			50		100		150		200		250		500		700	
			Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible	Total	Sensible
1-Row Standard Coil Capacity (MBH)	1	0.97	2.06	1.34	2.99	2.05	3.59	2.55	4.02	2.96	4.34	3.29	5.35	4.50	5.85	5.15
	2.5	1.59	2.24	1.42	3.38	2.22	4.15	2.79	4.71	3.25	5.16	3.64	6.54	4.99	7.17	5.74
	5	0.83	2.29	1.45	3.49	2.27	4.31	2.86	4.91	3.34	5.40	3.74	6.90	5.14	7.61	5.92
	7.5	1.61	2.38	1.49	3.71	2.37	4.64	3.02	5.35	3.54	5.93	3.98	7.80	5.53	8.71	6.38
	10	1.99	2.43	1.51	3.83	2.43	4.84	3.11	5.62	3.66	6.26	4.12	8.39	5.78	9.44	6.70
	12.5	2.94	2.46	1.53	3.91	2.47	4.97	3.17	5.80	3.74	6.49	4.23	8.80	5.97	9.97	6.93
	15	3.61	2.48	1.54	3.97	2.49	5.06	3.21	5.93	3.80	6.66	4.31	9.11	6.10	10.37	7.10
2-Row Standard Coil Capacity (MBH)	1	1.90	2.56	1.66	4.01	2.74	4.97	3.57	5.66	4.24	6.26	4.85	8.36	7.07	9.21	8.13
	2.5	2.30	2.87	1.80	4.74	3.06	6.11	4.06	7.15	4.87	7.98	5.57	10.58	8.09	11.81	9.53
	5	1.19	2.98	1.85	5.03	3.20	6.54	4.25	7.72	5.12	8.67	5.87	11.73	8.57	13.18	10.10
	7.5	2.37	3.06	1.89	5.28	3.32	6.97	4.45	8.34	5.40	9.47	6.22	13.24	9.22	15.11	10.90
	10	0.97	3.03	1.88	5.17	3.27	6.77	4.36	8.02	5.26	9.05	6.03	12.37	8.84	13.96	10.42
	12.5	1.38	3.07	1.90	5.30	3.33	6.99	4.46	8.34	5.41	9.46	6.22	13.17	9.19	14.99	10.86
	15	1.41	3.10	1.91	5.38	3.37	7.15	4.54	8.58	5.51	9.77	6.36	13.79	9.46	15.80	11.20
1-Row High Capacity Slanted Coil Capacity (MBH)	1	1.90	2.40	1.55	3.69	2.49	4.55	3.18	5.19	3.75	5.68	4.23	7.39	6.04	8.23	7.01
	2.5	2.79	2.66	1.66	4.28	2.75	5.44	3.57	6.35	4.25	7.08	4.82	9.44	6.90	10.58	8.07
	5	1.46	2.74	1.71	4.48	2.84	5.76	3.72	6.76	4.43	7.59	5.05	10.32	7.27	11.67	8.53
	7.5	2.81	2.81	1.74	4.68	2.94	6.10	3.88	7.24	4.65	8.20	5.32	11.47	7.77	13.16	9.16
	10	1.31	2.78	1.73	4.59	2.89	5.93	3.79	6.99	4.54	7.86	5.17	10.80	7.48	12.27	8.78
	12.5	1.83	2.82	1.74	4.69	2.94	6.10	3.88	7.23	4.65	8.18	5.32	11.40	7.74	13.06	9.12
	15	1.75	2.84	1.76	4.76	2.98	6.23	3.94	7.41	4.73	8.41	5.42	11.87	7.95	13.67	9.39
2-Row High Capacity Slanted Coil Capacity (MBH)	1	3.74	2.69	1.73	4.38	2.98	5.54	3.97	6.40	4.80	7.17	5.57	10.51	8.68	11.71	10.05
	2.5	4.21	3.05	1.90	5.34	3.41	7.12	4.65	8.55	5.71	9.74	6.64	13.64	10.16	15.70	12.29
	5	2.18	3.18	1.96	5.74	3.60	7.80	4.97	9.48	6.12	10.97	7.19	15.96	11.14	18.51	13.45
	7.5	4.31	3.24	2.00	5.95	3.70	8.22	5.16	10.14	6.44	11.81	7.57	17.81	11.94	21.02	14.52
	10	1.67	3.25	2.00	5.95	3.70	8.18	5.14	10.06	6.40	11.67	7.51	17.35	11.74	20.31	14.21
	12.5	2.37	3.28	2.01	6.05	3.75	8.37	5.23	10.35	6.53	12.06	7.69	18.26	12.14	21.58	14.76
	15	2.51	3.29	2.02	6.11	3.78	8.50	5.30	10.55	6.63	12.35	7.83	18.94	12.45	22.54	15.19

Cooling capacity data in tables assume an entering water temperature (EWT) of 42°F, an entering air dry bulb temperature (EDB) of 80°F, and an entering wet bulb temperature (EWB) of 67°F.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Electric Heat Capacities – 10x15 & 10x21 SAV

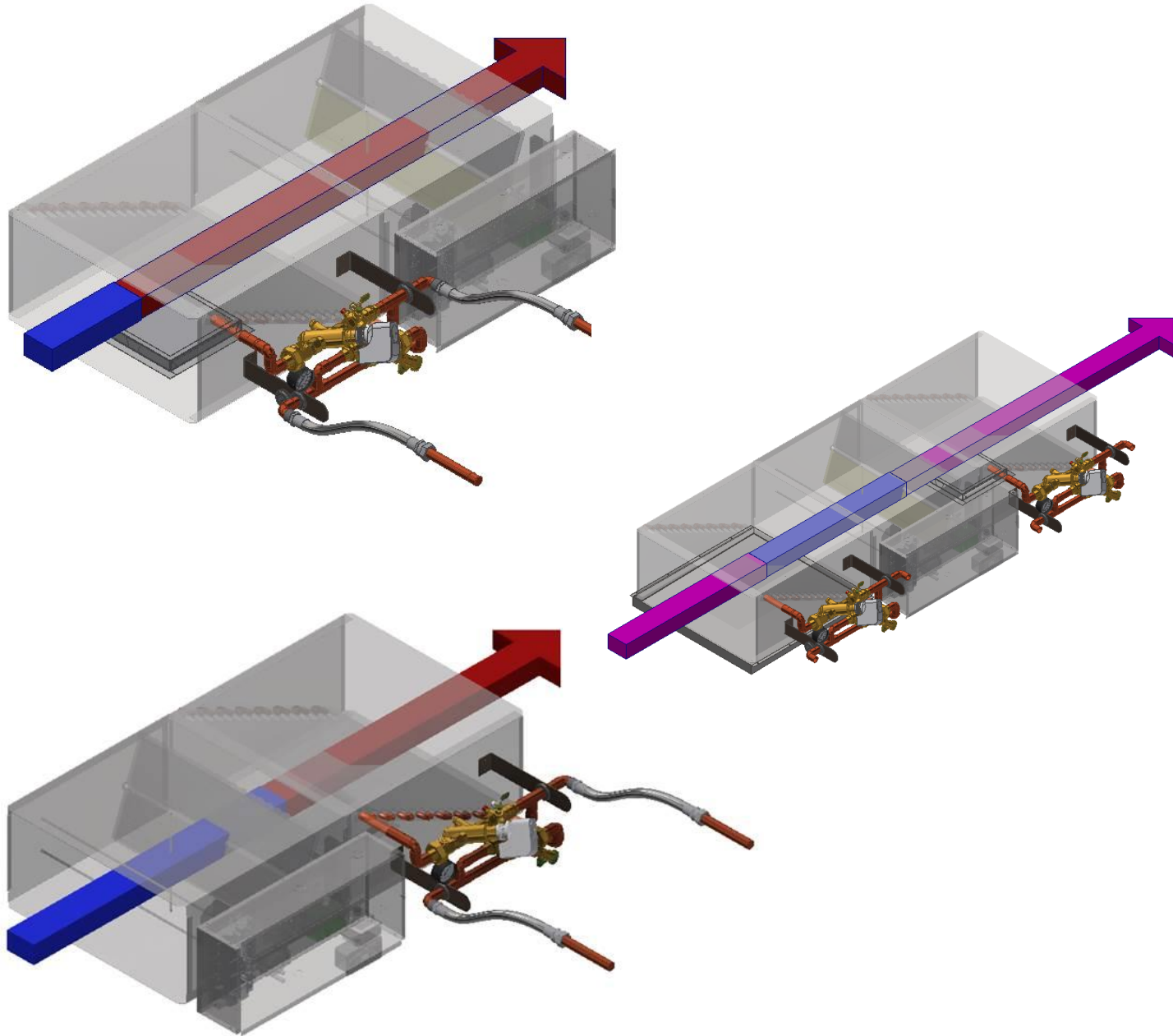
Table 17. Heating Capacity (kW) – 10 x 15 & 10x21 SAV			
Capacity (kW)	Capacity (MBH)	Steps	Voltage
3	10.24	1	120/1
			208-230/1
			208-230/3
			460/3
5	17.06	1	120/1
			208-230/1
			208-230/3
			460/3
10	34.12	1/2	120/1
			208-230/1
			208-230/3
			460/3

Other capacities and voltages available



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Coil Layout



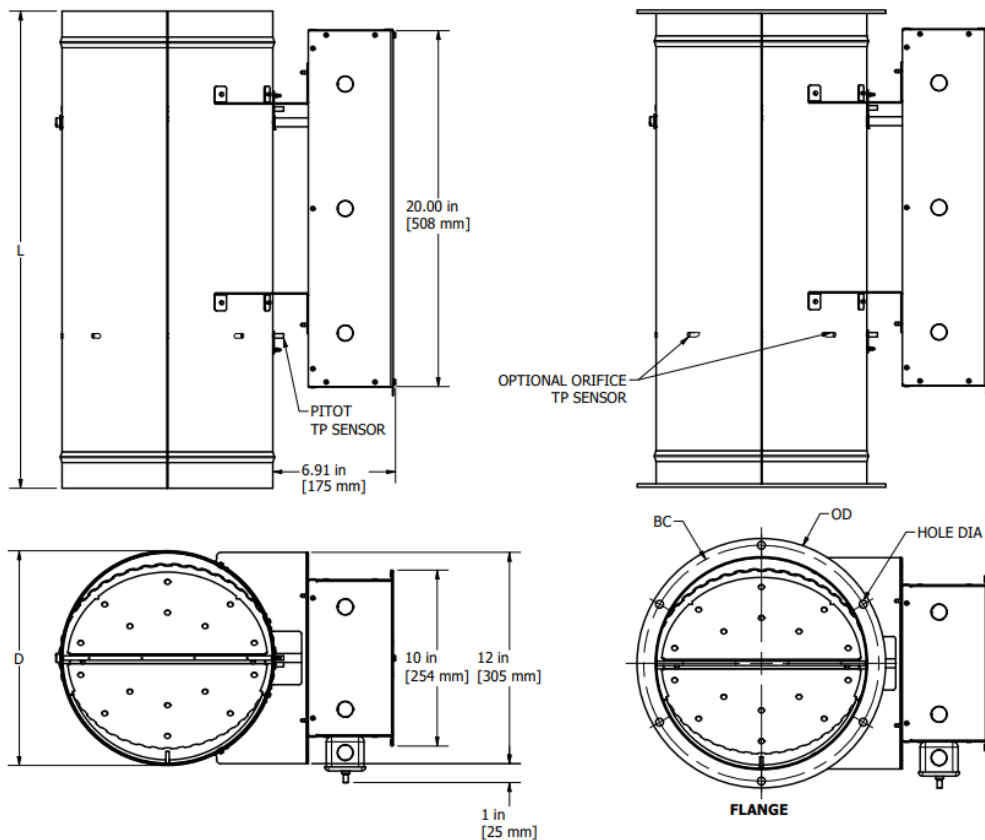


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

#### SAV™ Round units with and without optional flange



#### Imperial/(Metric)

Unit Size	D	L	W	Flange				Weight
				BC	OD	# of Holes	HOLE DIA	
12	11.875 in (302 mm)	26.81 in (681 mm)	19.14 in (486 mm)	13.25 in (337 mm)	14 in (356 mm)	6	0.4375 in (11 mm)	30 lbs. (13.6 Kg)
16	15.875 in (403 mm)	27.50 in (699 mm)	15.875 in (403 mm)	17.75 in (451 mm)	19 in (483 mm)	8	0.4375 in (11 mm)	30 lbs. (13.6 Kg)

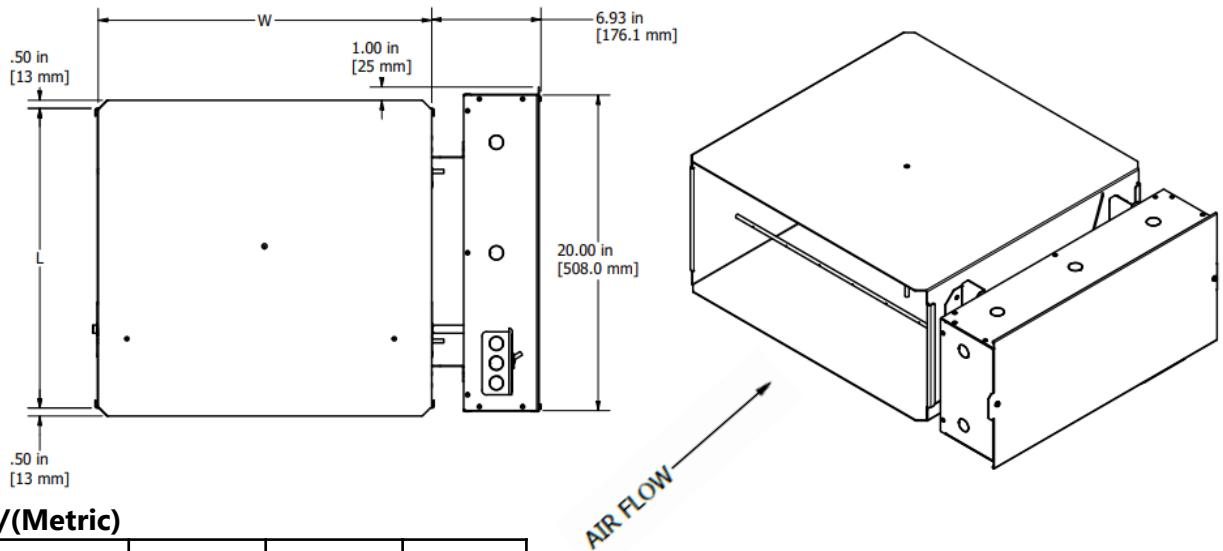
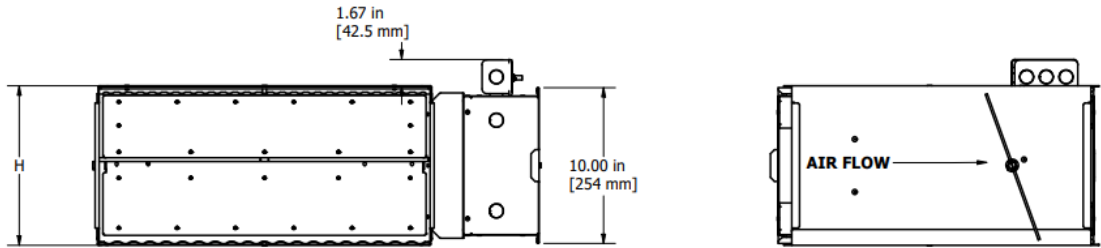


# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

## SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

### SAV™ Rectangular units without coils



### Imperial/(Metric)

Unit Size	H	L	W	Weight
10x15	10 in (254 mm)	19 in (483 mm)	15 in (381 mm)	40 lbs. (18.2 Kg)
10x21	10 in (254 mm)	19 in (483 mm)	21 in (534 mm)	40 lbs. (18.2 Kg)

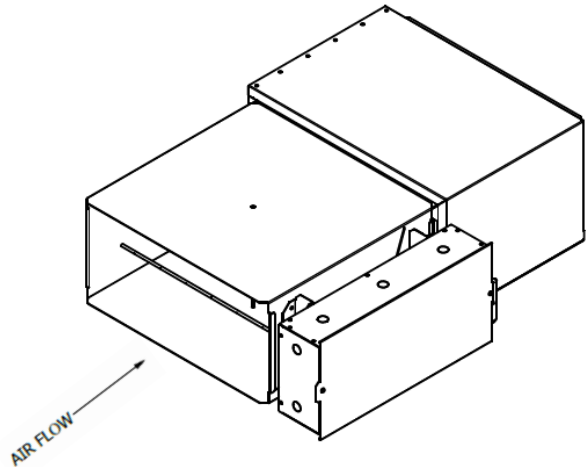
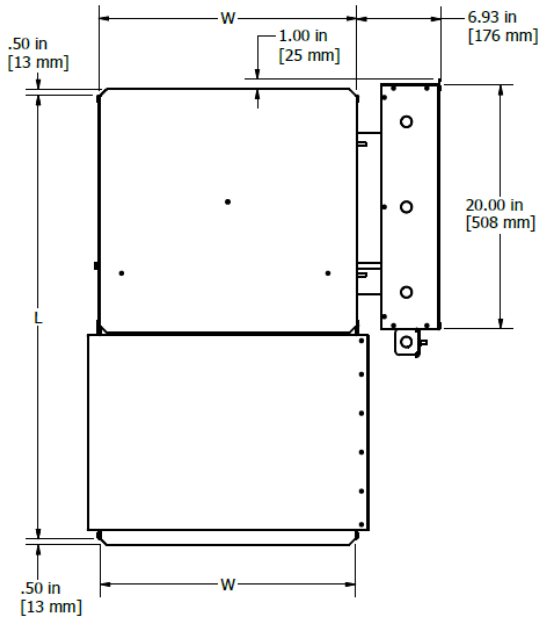
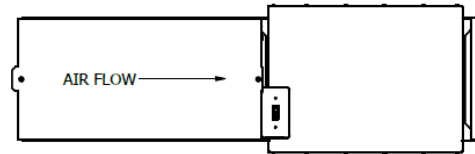
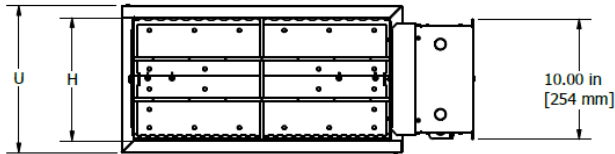


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

### SAV™ Ultra Quiet Rectangular units without coils



### Imperial/(Metric)

Unit Size	H	L	W	U	Weight
10x15	10 in (254 mm)	36.5 in (927 mm)	15 in (381 mm)	12 in (305 mm)	60 lbs. (27.3 Kg)
10x21	10 in (254 mm)	36.5 in (927 mm)	21 in (534 mm)	12 in (305 mm)	60 lbs. (27.3 Kg)

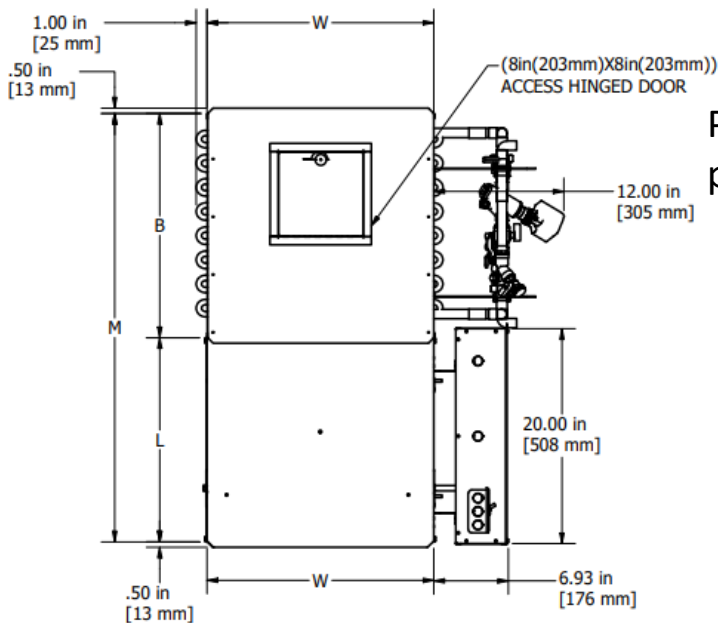
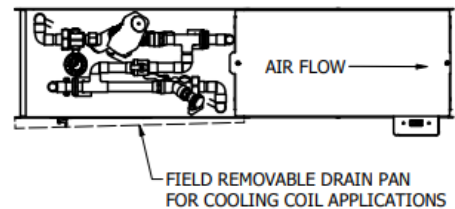
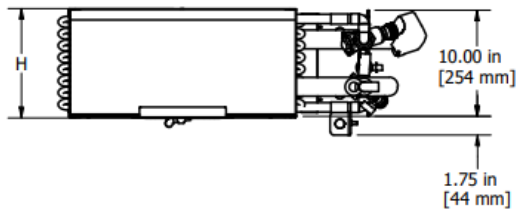


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

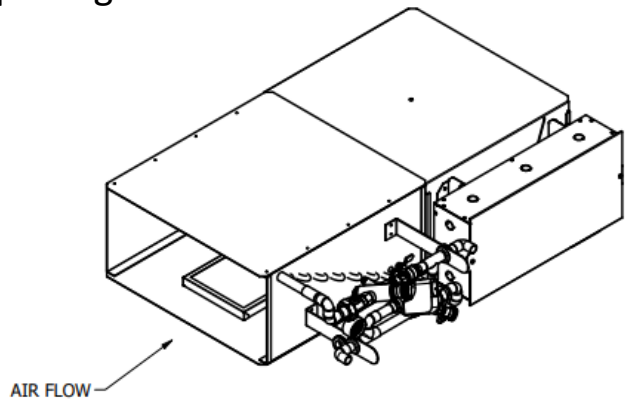
### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

### SAV™ Rectangular units with upstream high capacity coils



Project Specific factory installed piping packages available



### Imperial/(Metric)

All factory piping shipped under pressure with gage.

Unit Size	H	W	L	B	M	U
10x15	10 in (254 mm)	15 in (381 mm)	36.5 in (927 mm)	21 in (534 mm)	57.5 in (1461 mm)	12 in (305 mm)
10x21	10 in (254 mm)	21 in (534 mm)	36.5 in (927 mm)	21 in (534 mm)	57.5 in (1461 mm)	12 in (305 mm)



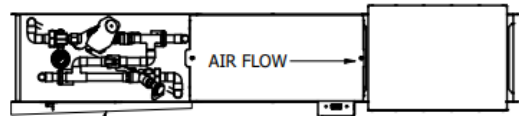
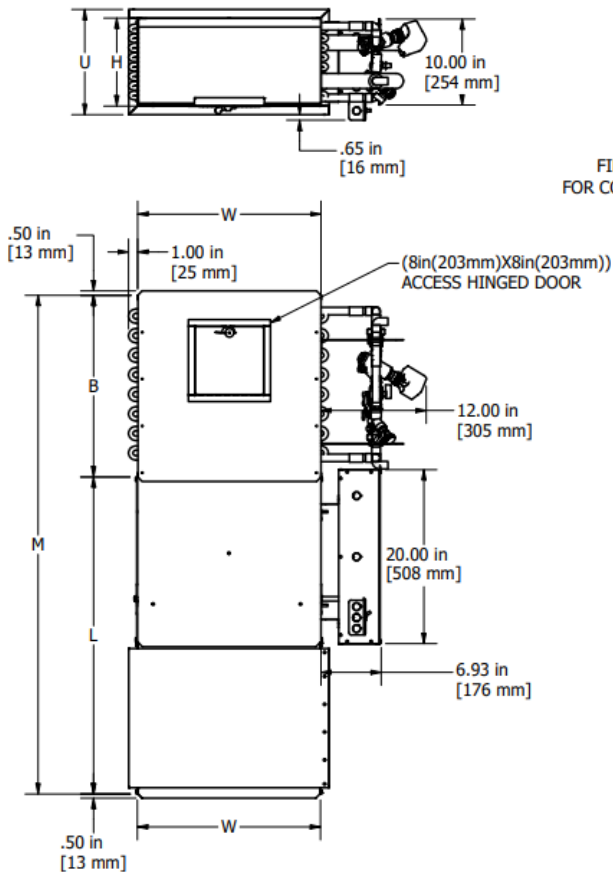


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

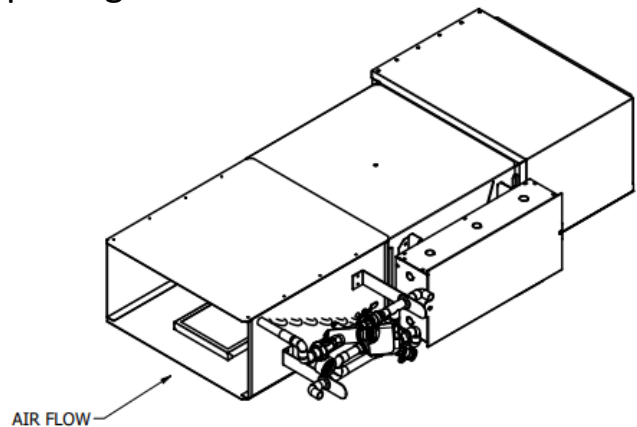
SAV™ Unit with Electronic Controls, Inlet & Side Views

#### SAV™ Ultra Quiet Rectangular units with upstream high capacity coils



FIELD REMOVABLE DRAIN PAN FOR COOLING COIL APPLICATIONS

Project Specific factory installed piping packages available



#### Imperial/(Metric)

All factory piping shipped under pressure with gage.

Unit Size	H	W	L	B	M
10x15	10 in (254 mm)	15 in (381 mm)	19 in (483 mm)	21 in (534 mm)	40 in (1017 mm)
10x21	10 in (254 mm)	21 in (534 mm)	19 in (483 mm)	21 in (534 mm)	40 in (1017 mm)

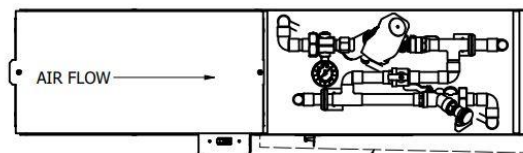
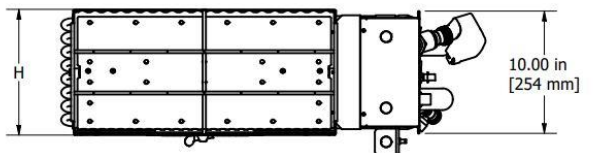


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

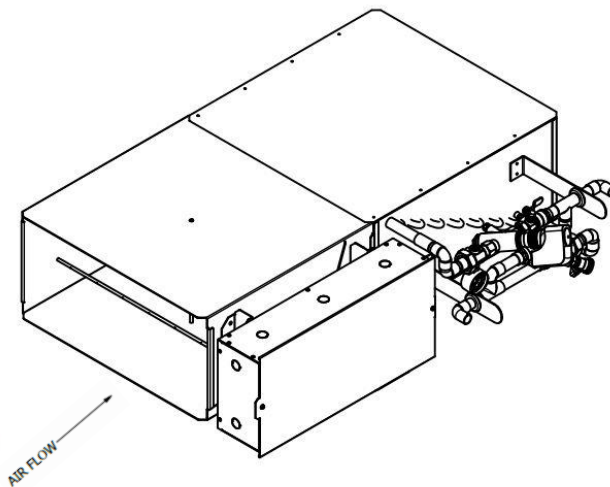
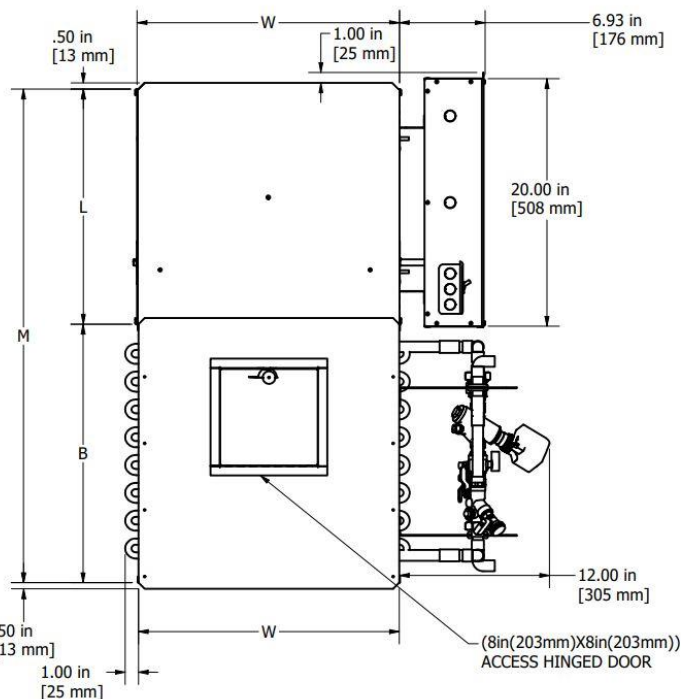
SAV™ Unit with Electronic Controls, Inlet & Side Views

### SAV™ Rectangular units with downstream high capacity coils



FIELD REMOVABLE DRAIN PAN FOR COOLING COIL APPLICATIONS

Project Specific factory installed piping packages available



### Imperial/(Metric)

All factory piping shipped under pressure with gage.

Unit Size	H	W	L	B	M
10x15	10 in (254 mm)	15 in (381 mm)	19 in (483 mm)	21 in (534 mm)	40 in (1017 mm)
10x21	10 in (254 mm)	21 in (534 mm)	19 in (483 mm)	21 in (534 mm)	40 in (1017 mm)

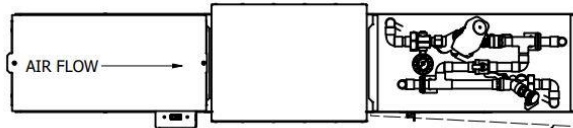
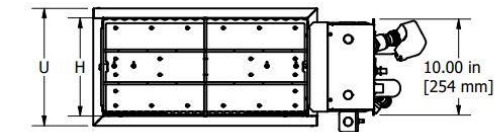


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

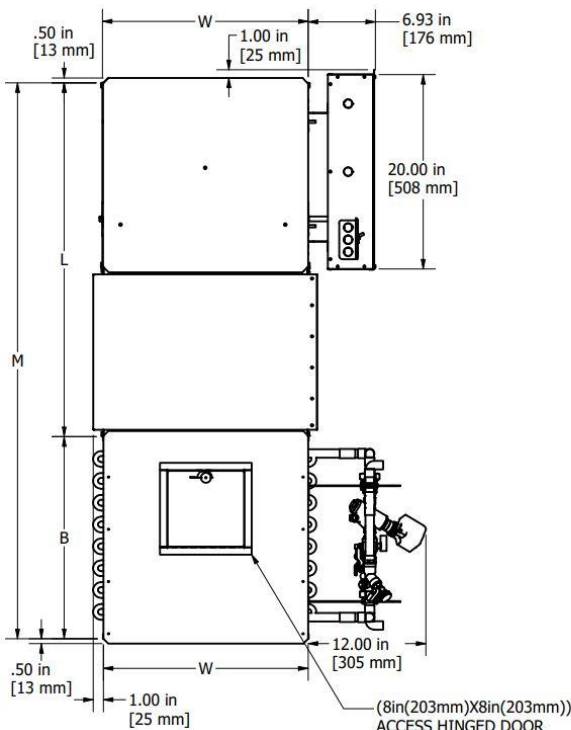
### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

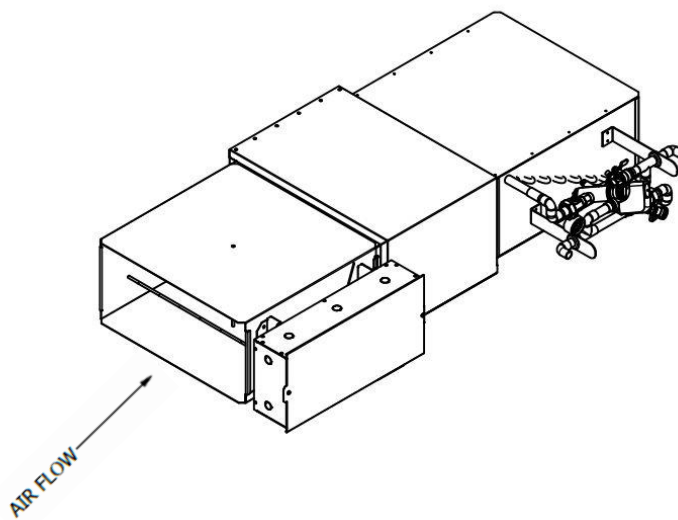
### SAV™ Ultra Quiet Rectangular units with downstream high capacity coils



FIELD REMOVABLE DRAIN PAN  
FOR COOLING COIL APPLICATIONS



Project Specific factory installed piping packages available



### Imperial/(Metric)

All factory piping shipped under pressure with gage.

Unit Size	H	W	L	B	M	U
10x15	10 in (254 mm)	15 in (381 mm)	36.5 in (927 mm)	21 in (534 mm)	57.5 in (1461 mm)	12 in (305 mm)
10x21	10 in (254 mm)	21 in (534 mm)	36.5 in (927 mm)	21 in (534 mm)	57.5 in (1461 mm)	12 in (305 mm)

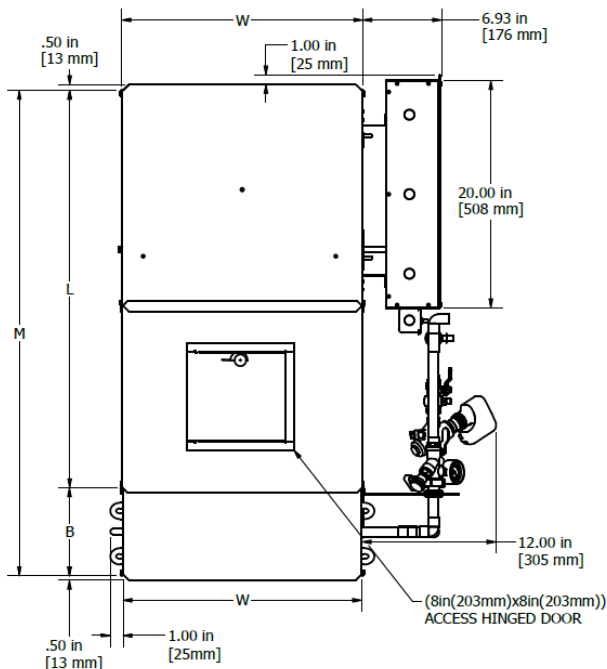
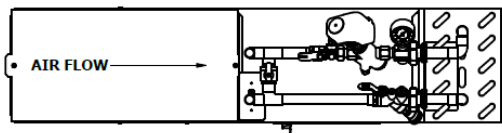


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

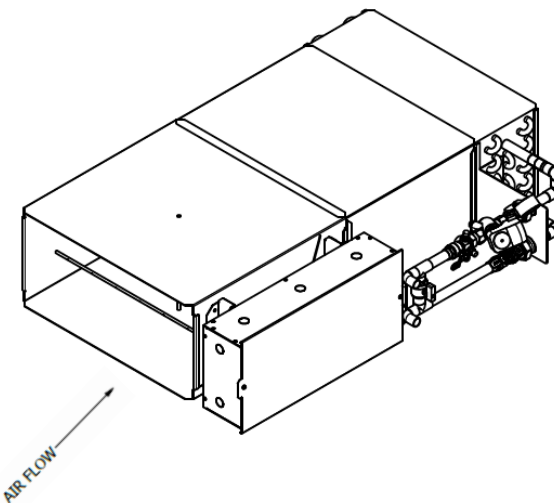
### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

### SAV™ Rectangular units with standard capacity coils and duct extension



Project Specific factory installed piping packages available



### Imperial/(Metric)

Unit Size	H	L	W	B	M	U
10x15	10 in (254 mm)	35 in (927 mm)	15 in (381 mm)	7.5 in (191 mm)	42.5 in (1080 mm)	11 in (279 mm)
10x21	10 in (254 mm)	35 in (927 mm)	21 in (534 mm)	7.5 in (191 mm)	42.5 in (1080 mm)	11 in (279 mm)

All factory piping shipped under pressure with gage.



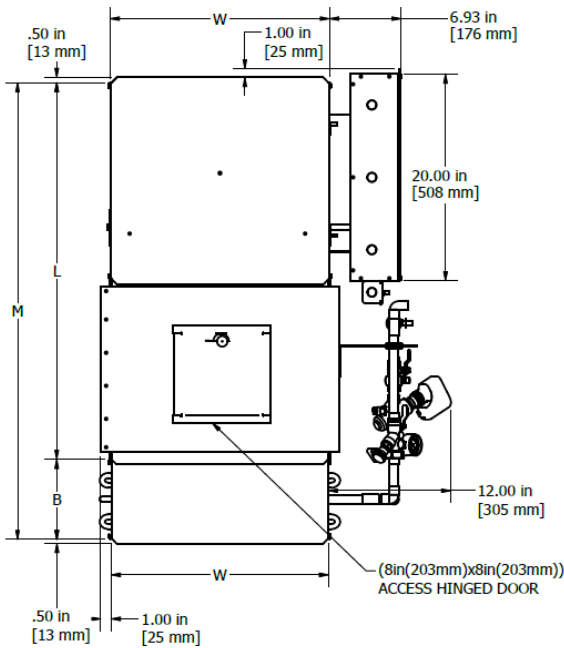
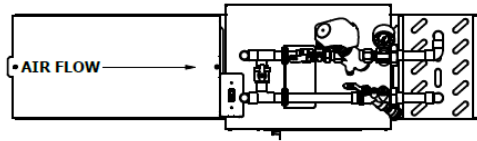
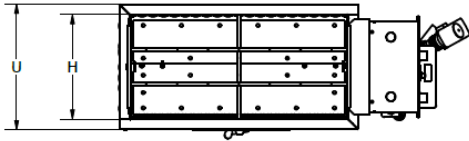


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

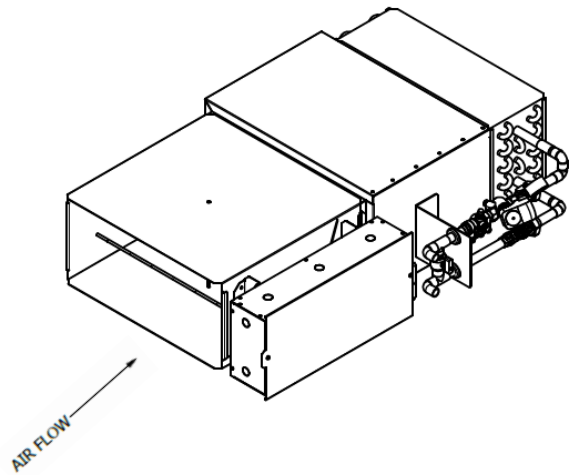
### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

### SAV™ Ultra Quiet Rectangular units with standard capacity coils



Project Specific factory installed piping packages available



### Imperial/(Metric)

All factory piping shipped under pressure with gage.

Unit Size	H	L	W	B	M	U
10x15	10 in (254 mm)	36.5 in (927 mm)	15 in (381 mm)	7.5 in (191 mm)	44 in (1118 mm)	12 in (305 mm)
10x21	10 in (254 mm)	36.5 in (927 mm)	21 in (534 mm)	7.5 in (191 mm)	44 in (1118 mm)	12 in (305 mm)

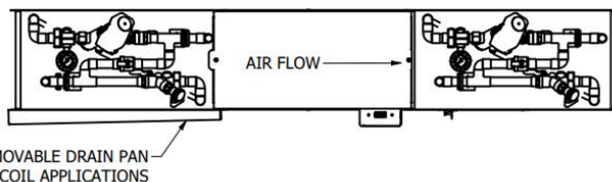
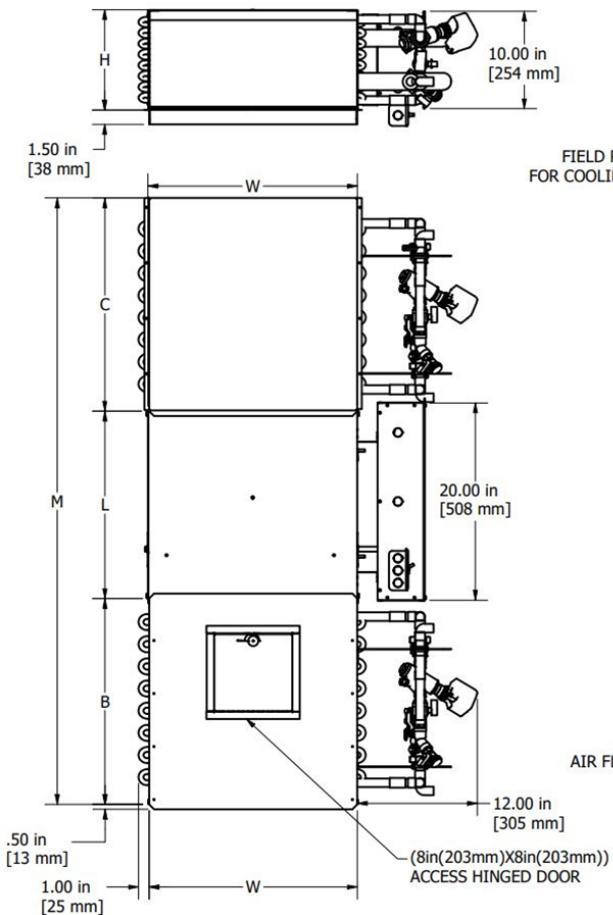


# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

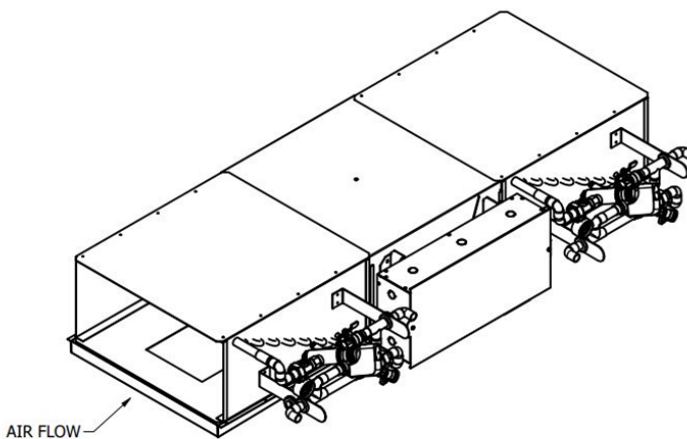
## SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

**SAV™ Rectangular units with upstream cooling coils and downstream high capacity coils**



Project Specific factory installed piping packages available



All factory piping shipped under pressure with gage.

### Imperial/(Metric)

Unit Size	H	W	L	B	C	M
10x15	10 in (254 mm)	15 in (381 mm)	19 in (483 mm)	21 in (534 mm)	22 in (559 mm)	62 in (1576 mm)
10x21	10 in (254 mm)	21 in (534 mm)	19 in (483 mm)	21 in (534 mm)	22 in (559 mm)	62 in (1576 mm)

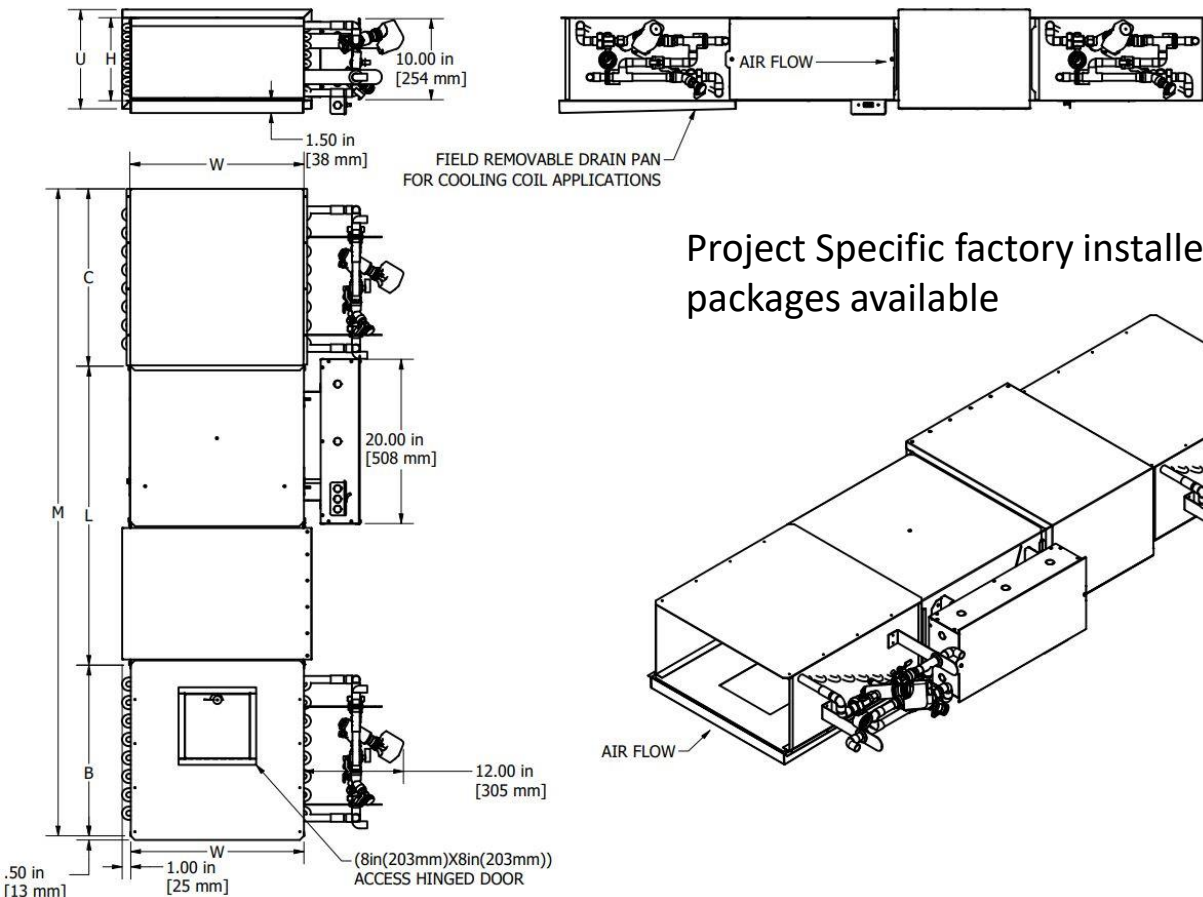


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

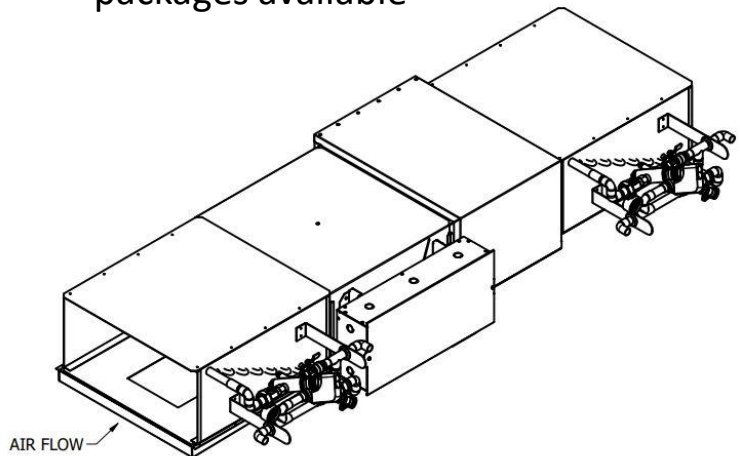
### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

**SAV™ Rectangular units with upstream high capacity coils and downstream high capacity coils**



Project Specific factory installed piping packages available



### Imperial/(Metric)

All factory piping shipped under pressure with gage.

Unit Size	H	W	L	B	C	M	U
10x15	10 in (254 mm)	15 in (381 mm)	36.5 in (927 mm)	21 in (534 mm)	22 in (559 mm)	79.5 in (2020 mm)	12 in (305 mm)
10x21	10 in (254 mm)	21 in (534 mm)	36.5 in (927 mm)	21 in (534 mm)	22 in (559 mm)	79.5 in (2020 mm)	12 in (305 mm)

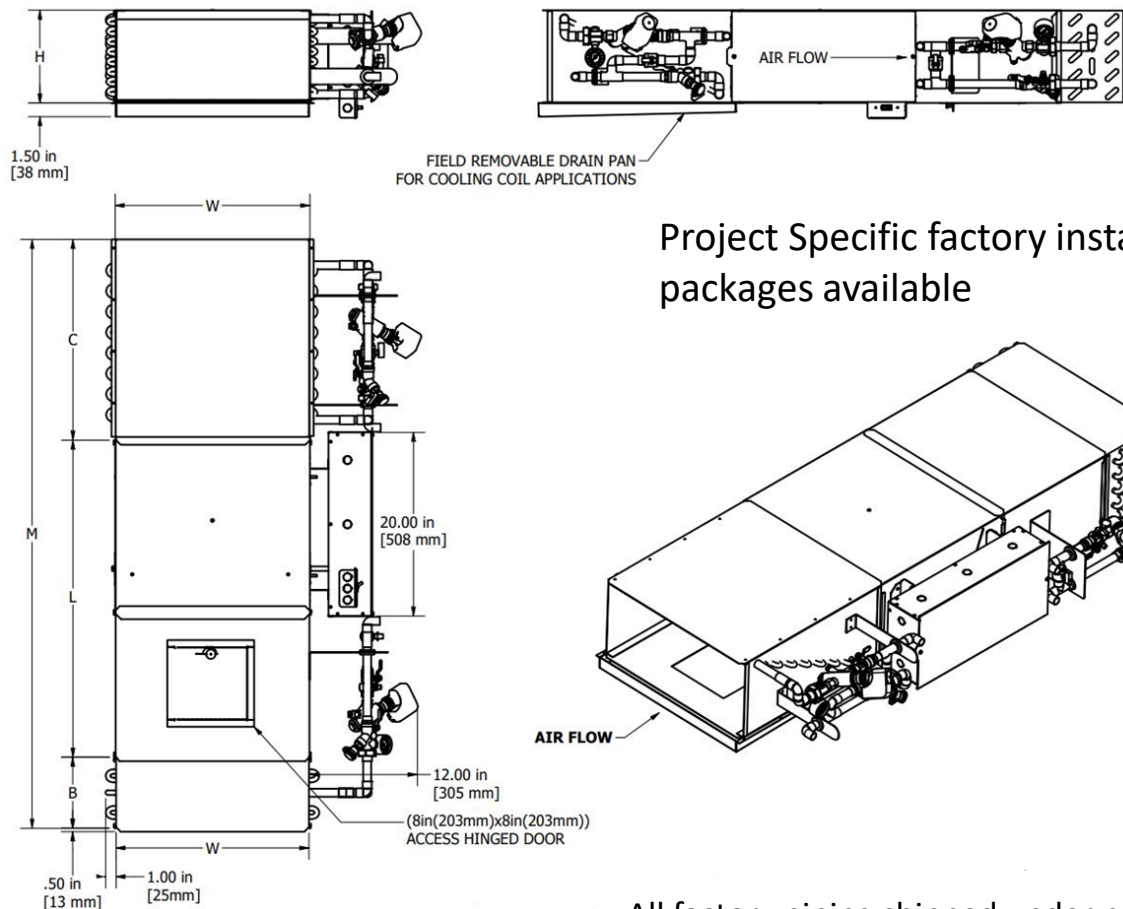


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

**SAV™ Rectangular units with upstream high capacity cooling coils and downstream heating coils**



#### Imperial/(Metric)

Unit Size	H	W	L	B	C	M
10x15	10 in (254 mm)	15 in (381 mm)	35 in (889 mm)	7.5 in (191 mm)	22 in (559 mm)	64.5 in (1639 mm)
10x21	10 in (254 mm)	21 in (534 mm)	35 in (889 mm)	7.5 in (191 mm)	22 in (559 mm)	64.5 in (1639 mm)

All factory piping shipped under pressure with gage.



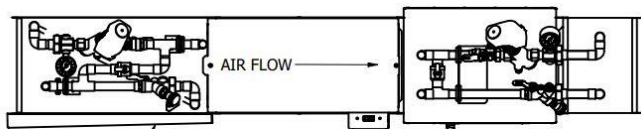
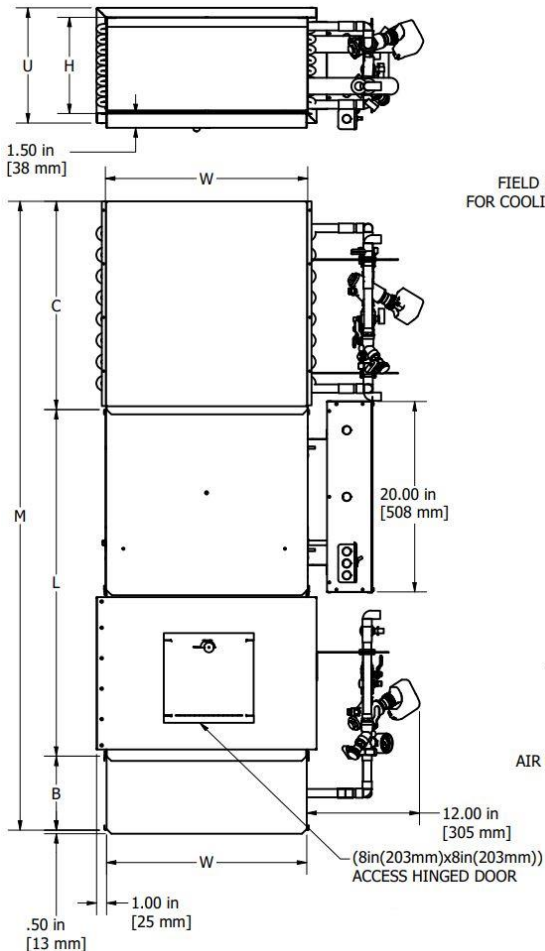


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

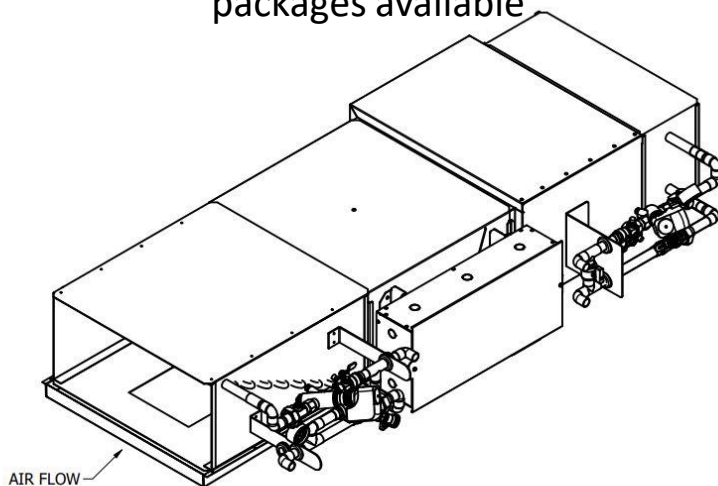
SAV™ Unit with Electronic Controls, Inlet & Side Views

#### SAV™ Rectangular units with upstream high capacity coils



FIELD REMOVABLE DRAIN PAN  
FOR COOLING COIL APPLICATIONS

Project Specific factory installed piping packages available



All factory piping shipped under pressure with gage.

#### Imperial/(Metric)

Unit Size	H	W	L	B	C	M	U
10x15	10 in (254 mm)	15 in (381 mm)	36.5 in (927 mm)	7.5 in (191 mm)	22 in (559 mm)	66 in (1677 mm)	12 in (305 mm)
10x21	10 in (254 mm)	21 in (534 mm)	36.5 in (927 mm)	7.5 in (191 mm)	22 in (559 mm)	66 in (1677 mm)	12 in (305 mm)

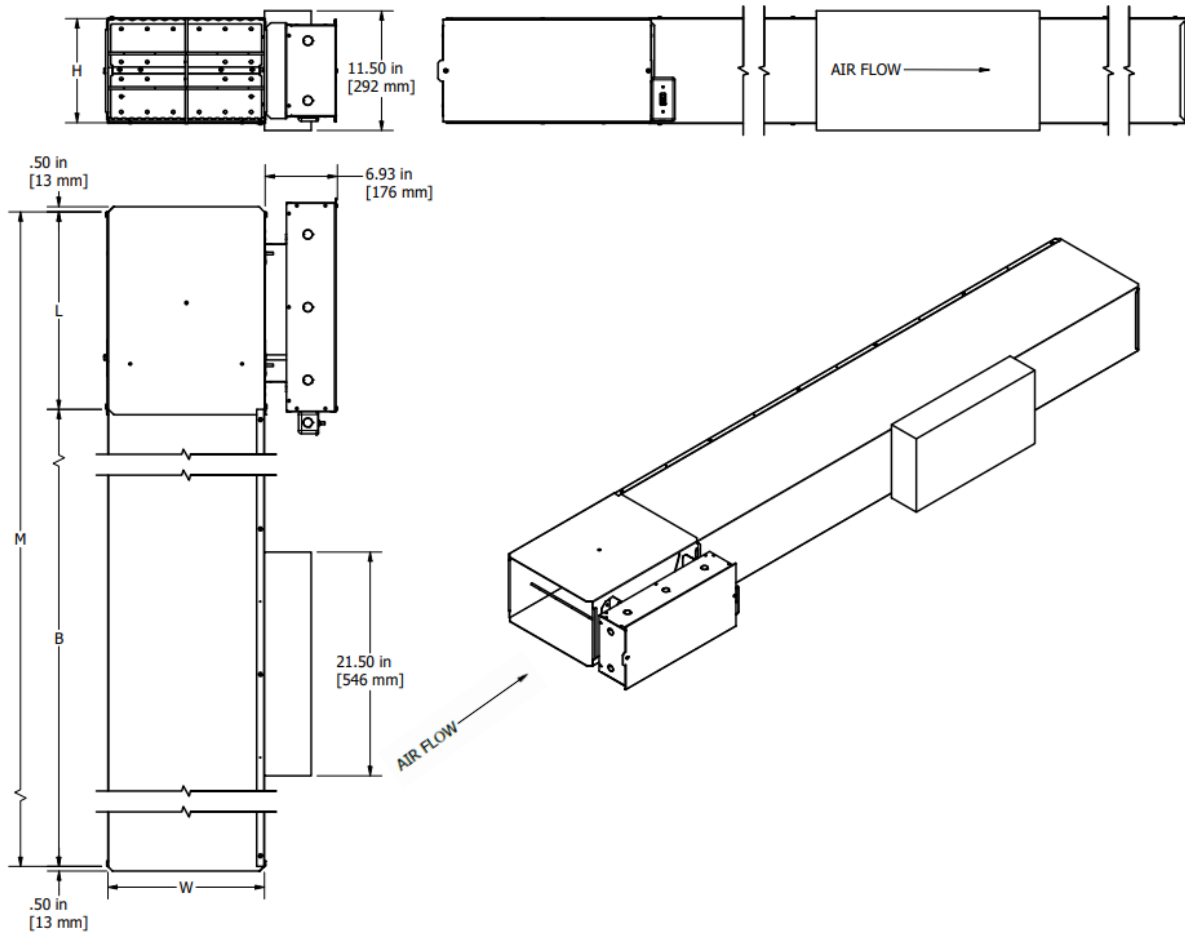


## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### SAV™ Dimensional Information

SAV™ Unit with Electronic Controls, Inlet & Side Views

#### SAV™ Rectangular units with electric heat



#### Imperial/(Metric)

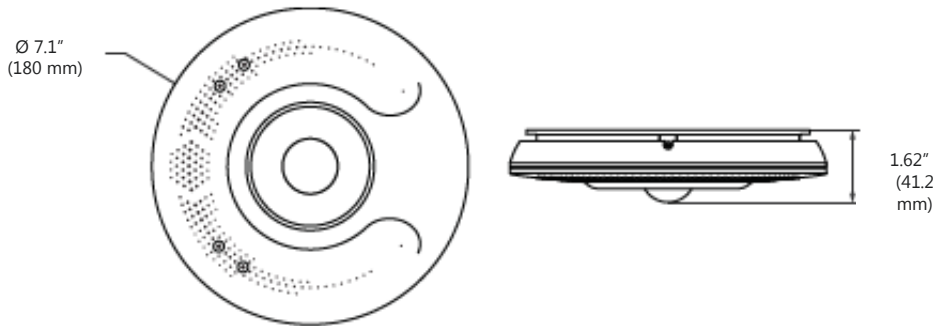
Unit Size	H	W	L	B	M
10x15	10 in (254 mm)	15 in (381 mm)	19 in (483 mm)	80 in (2032 mm)	99 in (2514 mm)
10x21	10 in (254 mm)	21 in (534 mm)	19 in (483 mm)	80 in (2032 mm)	99 in (2514 mm)



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC™ Intelligent Sensor Array

#### Dimensions



#### Description

The ITAC™ - Intelligent Sensor Array uses industry-leading sensor fusion technology to deliver the most accurate view of an interior space available on the market.

Integrating temperature, humidity, motion, sound, and light sensing in a single device, the sensor hub uses machine learning to provide fast, accurate feedback on the monitored space.

The sensor hub is easy to install and can be configured out of the box with just a smartphone.

Combine with optional VOC.Co2 sensors for full zone control.

#### Application

The ITAC™ - Intelligent Array is an open platform IoT device with support for BACnet, MQTT, REST, and BLE protocols, allowing it to integrate with almost any system.

It also comes with two universal I/O points capable of controlling or accepting inputs from nearby devices—ideal for controlling light ballasts or other devices in the zone.

#### Specifications

**Temperature Sensors** Composite temperature value  $\pm 1.0^{\circ}\text{F}$  ( $\pm 0.5^{\circ}\text{C}$ ) with calibration

Digital temperature sensor  $\pm 1.0^{\circ}\text{F}$  ( $\pm 0.5^{\circ}\text{C}$ )

Infrared temperature sensor  $\pm 1.8^{\circ}\text{F}$  ( $\pm 1.0^{\circ}\text{C}$ ) typical

#### Humidity Sensor

Accuracy  $\pm 3\%$  for 20% to 80% RH @  $59^{\circ}\text{F}$  to  $86^{\circ}\text{F}$  ( $15^{\circ}\text{C}$  to  $30^{\circ}\text{C}$ )

#### Motion Sensor

Passive infrared (PIR) motion sensor

Motion sensing range:  
30 ft (9.1 m) diameter @

15ft (4.6m) mounting height  
18 ft (5.5 m) diameter @

8 ft (2.4 m) mounting height

#### Audio Input

2 microphones for acoustic occupancy detection

#### Light Sensor

$\pm(6 + 5\%$  reading) lx

#### LED Ring F

Full color articulated with 12 RGB LEDs

#### Universal Points

Up to 2 inputs (16-bit), software configurable for the following types:

0–5 VDC

0–10 VDC

10K thermistor

Dry contact (using 10K thermistor software setting)

4–20 mA (using external 250  $\Omega$  resistor on 0–5 V setting)

**Up to 2 outputs (12-bit), software configurable for the following types:**

0–10 V @ 20 mA max (sourcing)

1–10 V @ 10 mA max (sinking)



# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

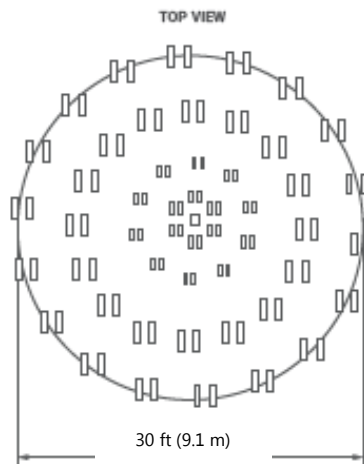
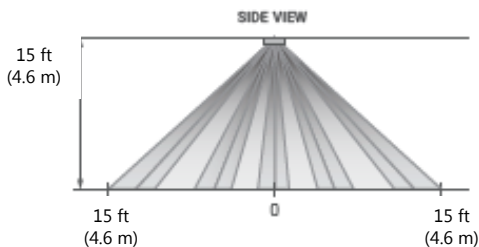
## ITAC™ Intelligent Sensor Array

### Features

- Composite temperature, humidity, PIR motion, sound, and light sensors combined in a single device
- User feedback via speaker and full-color LED ring with customizable audio tones and colors
- IR blaster for A/V remote control
- Dual Ethernet connection for daisy-chaining in large spaces; provides pass-through communication even during power outages
- Cloud-based configuration via mobile app
- BLE API for developing custom apps

### Passive Infrared Motion Coverage

Mounting Height	PIR Sensing Range
15 ft (4.6 m)	30 ft (9.1 m)
8 ft (2.4 m)	18 ft (5.5 m)



### Specifications (Continued)

#### Audio Output

1.0 W mono speaker for tones and audio output

#### Connectors

Removable screw-type terminal connectors

#### Wiring Class

Class 2 / SELV

#### Power

24 VDC, 2 W typical, 10 W max, Class 2

#### Technology

Arm® Cortex®-A7 MPU + Cortex-M4 MCU  
256 DDR3L RAM  
4 GB eMMC flash memory  
Real-time clock (RTC)  
Supercapacitor power backup for RTC

#### Communication Ports

Dual Ethernet (10/100Base-T)

#### Interfaces and Protocols

BACnet (BACnet/IP, BACnet/Ethernet)  
MQTT  
REST  
BLE 5.0

#### Ambient Rating

32°F to 113°F (0°C to 45°C)  
10% to 95% RH (non-condensing)

#### Dimensions

7.1 × 1.6 in. (180 × 41.5 mm)

#### Weight

0.77 lb (350 g)





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-ZNS - Intelligent Air Control™ System

#### Description

The ITAC-ZNS network sensor offers building occupants an intuitive touch interface to adjust individual comfort levels while tailoring to the needs of their specific market. Featuring a standard temperature sensor with humidity, CO<sub>2</sub> and motion options, the ITAC-ZNS also offers a choice of backlit colors to provide additional user feedback and aesthetic appeal.

#### Features

- RGB backlight allows choice of colors to indicate conditions, alarms and night mode
- Large easy-to-read LCD screen. On-screen visual feedback on button selection.
- Capacitive touch zones allow custom button sizes
- Multiple button layout options. Simple one-touch buttons, or two-touch buttons for added functionality.
- Slider to quickly adjust setpoint or tap for precise changes
- Fully programmable in GCL+
- USB service port, software enabled or disabled. Service tool not required.
- Smartphone and tablet integration and setup using NFC technology
- Fits most electrical boxes worldwide
- Two-piece design with tamper set screw lock



#### Specifications

##### Inputs

1 10 kΩ input (16-bit A/D)  
LCD (Optional)  
2-line custom segmented display with icons

##### Buttons

2 rows of 4 capacitive touch zones, allowing up to 8 individual buttons or combined to form larger buttons

##### Backlight (Optional)

Optional RGB LED backlight for multicolor LCD and button illumination

##### Temperature

Digital temperature sensor ± 0.2°C (± 0.36°F)

##### Humidity Sensor (Optional)

Accuracy ± 3%

##### CO<sub>2</sub> Sensor (Optional)

Dual-channel NDIR detection  
Range: 0–2000 ppm  
Accuracy @ 25°C (77°F): ± (30 ppm + 3% of value)

##### Occupancy Sensor (Optional)

Passive infrared motion (PIR) sensor  
Range: 5 m (16.4 ft.)  
Coverage: 100° horizontal

##### Connectors

Screw-type terminal connectors

##### Wiring Class

Class 2 / SELV

#### Application

The ITAC-ZNS is suitable for a wide range of sensing applications, from basic temperature monitoring, to indoor air quality and occupancy sensing. A customizable interface allows for intuitive user interaction.

An available external input allows for additional zone monitoring such as window or door contact, temperature averaging or other dry contact sensor information.

When paired with an application controller, the ITAC-ZNS supports advanced control strategies, such as demand control ventilation, energy savings based on occupancy and optimal user comfort.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-ZNT - Intelligent Air Control™ System

#### Description

The ITAC-ZNT adds an MS/TP network sensor option to the ITAC line of sensors and thermostats. The ITAC-ZNT gives building occupants an intuitive touch-interface to adjust individual comfort levels while tailoring to the needs of their specific market. Featuring a universal input and a standard temperature sensor with humidity, CO<sub>2</sub> and motion options, the ITAC-ZNT also offers a choice of backlight colors to provide additional user feedback and aesthetic appeal.

The ITAC NFC technology allows installers to use NFC-enabled mobile devices to configure the sensor on the wall or in its shipped box.

#### Features

- Native BACnet® firmware
- Standard RGB backlight allows choice of colors to indicate conditions, alarms and night mode
- Large easy-to-read LCD screen. On-screen visual feedback on button selection.
- Multiple button and slider layout options. Custom button design available through Partner Applications Services (PAS).
- Support for custom button and screen interactions through GCL+ programming
- Support for local scheduling, trending and alarming
- USB service port, software enabled or disabled. Service tool not required.
- Smartphone and tablet integration and setup using NFC technology
- Fits most electrical boxes worldwide
- 2-piece design with tamper set screw lock



#### Specifications

##### Input

1 universal input (12-bit), software configurable for:  
0–5 VDC  
0–10 VDC  
10 kΩ thermistor  
Dry contact

##### LCD

2-line custom segmented display with icons

##### Buttons

2 rows of 4 capacitive touch zones, allowing up to 8 individual buttons or combined to form larger buttons

##### Backlight

RGB LED backlight for multicolor LCD and button illumination

##### Temperature

Digital temperature sensor  
+/- 0.2°C (+/- 0.36°F)

##### Digital Humidity Sensor (Optional)

Accuracy +/- 3%

##### CO<sub>2</sub> Sensor (Optional)

Dual-channel NDIR detection  
Range: 0–2000 ppm  
Accuracy @ 25°C (77°F): ± (30 ppm + 3% of value)

##### Occupancy Sensor (Optional)

Passive infrared motion (PIR) sensor  
Range: 5 m (16.4 ft.)  
Coverage: 100° horizontal

##### Connectors

Screw-type terminal connectors

##### Wiring Class

Class 2 / SELV

#### Application

The ITAC-ZNT has the same sensing functionality as the ITAC-ZNS but instead communicates on an MS/TP network that allows easy integration with other Delta or third-party MS/TP networks. The ITAC-ZNT is suitable for a wide range of sensing applications, from basic temperature monitoring, to indoor air quality and occupancy sensing. A customizable interface allows for intuitive user interaction.

The external universal input allows for additional zone monitoring, such as window or door contact, external motion sensor for larger rooms, temperature averaging or other local sensor information.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-TS - Intelligent Temperature Sensor

#### Description

The ITAC-TS is a hardwired 10kΩ wall-mounted unit. The precision temperature sensor is placed in the same plastic enclosure used by the ITAC product line and provides a consistent aesthetic across the ITAC sensor family.

#### Features

- 10kΩ Type 3 thermistor
- Identical styling as existing ITAC products
- Tamper-resistant enclosure
- Surface mounted on drywall or any standard North American or European electrical box



#### Specifications

##### Thermistor

10kΩ Type 3 @ 25°C (77°F)  
Accuracy ± 0.2°C (0.36°F)  
Stability of 0.13°C (0.24°F) over 5 years

##### Connectors

Non-removable screw-type terminal connectors

##### Ambient

0° to 55°C (32° to 131°F) 10 to 90% RH (non-condensing)

##### Dimensions

133 x 93 x 23 mm (5.3 x 3.6 x 0.9 in.)

##### Weight

62 g (0.14 lb)

##### Compliance

CE

#### Application

The ITAC-TS is a non-communicating temperature sensor suitable for sites that require a remote hardwired temperature sensor like hallways, mechanical rooms, and data centers. The ITAC-TS uses a standard 10kΩ type 3 sensor that can be wired to the external input of an ITAC sensor for temperature averaging, or to a 10k input of any HVAC MFG controller. The ITAC-TS provides a cost-effective solution that complements the ITAC product lines to create a common look throughout a building.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-VOC/P - Intelligent VOC Sensor

#### Description

- VOC Alone or Temperature and Humidity Combination
- Achieves True Indoor Air Quality, Not Just CO2 Dilution
- Output is Correlated to a CO2 Value Allowing You to Ventilate Using ASHRAE' s CO2-Based VRP Algorithm

Humans respire Volatile Organic Compounds (VOCs) as well as CO2. The ITAC sensor is able to measure these VOCs and indicate when a space is occupied just as well as a CO2 sensor.

The advantage of the VOC sensor is that it measures air contaminants from other sources besides respiration, such as building materials, cleaners, perfumes and furniture and carpet off-gassing. So using this sensor for Demand Controlled Ventilation is a way of achieving true indoor air quality, rather than CO2 dilution.

A further benefit is that it requires no additional work on your part. That' s because the sensor converts the VOC reading to a CO2 equivalent level. This lets you use ASHRAE' s CO2- based VRP schedule to ventilate.

The unit is available as VOC alone or with temp and humidity sensing, temp setpoint and override. The optional display alternates between the measured values. The VOC level is indicated as "Good, Fair or Poor" by LEDs on the front of the unit. A 60mm mounting base is also available to fit European style junction boxes.





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-VOCP - Intelligent VOC Sensor

#### Specifications

**Power:** (No AC Power) 0 to 5 VDC Output Units:

9 to 35 VDC @ 50 mA Max (9 to 15 VDC recommended)

0 to 10 VDC Output Units:

15 to 35 VDC @ 50mA Max (15 VDC recommended)

**Sensing Elements:** Humidity: Capacitive Polymer, ±2% RH Accuracy VOCs: Micro-machined Metal Oxide

**Temp Sensor:** Thermistor or RTD

**Mounting:** Standard 2" x4" junction box, European junction box or drywall mount (screws provided)

**VOC Detection Range:** 0 to 2,000 CO2 PPM equivalent

**Response Time:** Less Than 60 Sec. (after Start-Up Time)

**Operating Environment:**

32 to 122°F (0 to 50°C) • 0 to 95% RH non-condensing

**Material:** ABS Plastic, Material Rated UL94V-0

**Start-Up Time:** 15 minutes

**Cover LED VOC/CO2 Equivalent Level:**

Good, Green < 1,000 PPM

Fair, Yellow = 1,000 to 1,500 PPM

Poor, Red > 1,500 PPM

**Agency:** RoHS

**Warranty Period:** 5 years



#### Application

The ITAC-VOCP is suited to measure pollution from multiple sources besides CO2 . A customizable interface allows for intuitive user interaction. Setup the same way a CO2 sensor is installed.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-VOC - Intelligent VOC Sensor

#### Specifications

**Power:** 12 to 24VDC, 35mA Peak • 18 to 24VAC, 4VA Peak

**Measurement Range:** 0 to 2,000 PPM  
CO2 Equivalent

**Selectable Output:** 0 to 5 or 0 to 10VDC > 4KΩ impedance

**Sensing Element:** Micro-machined Metal Oxide

**Termination:** 3 Terminals, 16 to 22 AWG

**Wiring:** 2 Pair

**Operating Environment:**

32 to 122°F (0 to 50°C) • 5 to 95%RH non-condensing

**Enclosure Material:** ABS Plastic, Material Rated UL94V-O

**VOC Detection Range:** 0 to 2,000 ppm  
CO2 Equivalent

**Start-Up Time:** 15 Minutes

**Response Time:** Less Than 2 Minutes  
(after Start-Up Time)

**Mounting:** Standard 2" x4" junction box, European junction box or drywall mount (screws provided)

**Cover LED VOC/CO2 Equivalent Level:**

Good, Green < 1,000 PPM

Fair, Yellow = 1,000 to 1,500 PPM

Poor, Red > 1,500 PPM

**Agency:** RoHS, CE.



#### Application

The ITAC-VOC is suited to measure pollution from multiple sources besides CO2 . Setup the same way a CO2 sensor is installed.



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-FLEX - Intelligent Environmental Monitor

**Description:** The ITAC FLEX™ provides a flexible room environmental control and monitoring solution in a simple-to-use package. An attractive flush-mount faceplate is complemented by an intuitive graphical display to meet any architectural requirement. The unit supports 3 rooms, monitoring up to 6 parameters for each room. An optional differential pressure sensor can be either factory-installed in the unit or ordered separately and installed above the ceiling. Integration with building automation systems is made easy through either BACnet/IP or BACnet MS/TP network protocols.

A modular hardware design enables the FLEX monitor to fit in various wall thickness found around the globe. For applications which require the monitor to fit in wall depths less than 50mm, the FLEX can be ordered with an external pressure sensor. When mounting in a three gang electrical box, the FLEX can be ordered with an integrated on-board sensor. Sufficient on-board I/O provides connectivity for most common equipment and sensor applications. If additional connections are required, or if more advanced HVAC applications demand it, FLEX can work directly with a third party controller over BACnet. A high accuracy 0.25% differential pressure transducer is used in all pressure sensing options. A projected capacitive touch screen provides swipe functionality and allows for use with medical gloves. The faceplate is attached to the unit body, enabling both tamper resistant operation and easy opening for pressure calibration.

The FLEX monitor is both a controller and monitor, with audible and visual alarming on all room environmental parameters. The FLEX monitor enables users to save energy by choosing from two PI control loops and two monitoring sets for any of four room modes, such as occupied and unoccupied.

#### Features

- Supports 3 rooms, 6 parameters each
- 7" Projected capacitive touch screen
- BACnet/IP & BACnet MS/TP
- Flush mount to wall
- Mounts in standard electrical boxes
- Full touch response with medical gloves
- No programming required
- 4 Inputs & 2 outputs on-board
- On-board or external pressure transducer
- High accuracy 0.25% sensor standard
- Monitor and control pressure, temperature, humidity, air change rate, and 2 user-defined parameters
- 4 Customizable room profiles
- 2 Levels of password security
- User-defined on-screen text and icons
- Configuration options help reduce nuisance alarms
- 50mm Wall depth when sensor is mounted remotely
- Cloning features reduces time required for multi-unit installation
- Remote duplicate display shows parameters inside and outside of rooms



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-FLEX - Intelligent Environmental Monitor

## Specifications

Physical Description	
<b>Dimensions</b>	9.25" W x 6.3" H x 0.65" D (215.0mm x 160.0mm x 16.51 mm)
<b>Mounting</b>	Triple-gang, double deep electrical box. RACO 697, Appleton M3-350, or equivalent.
<b>Case</b>	Fire-retardant plastic UL94 V-0
<b>Weight</b>	2 lbs
<b>Display</b>	7" Projected Capacitive (PCAP) multi-touch. 800 x 480. Usable with medical gloves.
<b>Display brightness</b>	1-7
<b>USB port</b>	Micro-USB port for configuration cloning between units and software upgrades.
<b>Audible alarm</b>	Dual piezo
<b>Communications</b>	
<b>Protocols BTL – compliant</b>	BACnet/IP using IPv4, Ethernet CAT5 cables with RJ45. BACnet MS/TP up to 76.8 kbps, 3-conductor, twisted, shielded 16-24 AWG cable
<b>Electrical</b>	
<b>Power</b>	24 VDC, 24 VAC (18-30 VAC operational), 50-60 Hz
<b>Power draw</b>	13 W max, 10 W typical
<b>Wire</b>	2 or 3-conductor (depending on application) stranded unshielded twisted pair, 16-24 AWG
<b>Connections</b>	Removable Terminal Blocks
<b>Regulatory compliance</b>	CSA, CE, RpHS, WEEE





## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

ITAC-FLEX - Intelligent Environmental Monitor

### Specifications continued

<b>Environmental data</b>	
<b>Operating temp. °F (°C)</b>	32 to 120 (0 to 50)
<b>Storage temp. °F (°C)</b>	-40 to 185 (-40 to 85)
<b>Operating Humidity</b>	5 to 95% RH (non-condensing)
<b>Ingress Protection (IP) rating</b>	IP54
<b>Chemical Resistance</b>	Exposed surfaces are chemically resistant to vaporized hydrogen peroxide (VHP), formaldehyde, chlorine dioxide (Clidox), perchloric acid, sodium hypochlorite 3-6% (bleach), quaternary ammonium 7% in 1:128 tap water (ammonia).
<b>Performance</b>	
<b>Accuracy RSS</b>	±0.25%
<b>Non-linearity (BFSL)</b>	±0.24%
<b>Hysteresis</b>	±0.05%
<b>Non-repeatability</b>	±0.05%
<b>Span setting tol.</b>	±0.05% Rdg
<b>Zero/ span shift % FS</b>	±0.03% PSI (±0.05% FS)
<b>Overpressure</b>	±1 PSI (15" WC for ≤ 0.10" WC FS)
<b>Pressure media</b>	Air or non-conductive, non-explosive gases
<b>Pressure fittings</b>	3/16" barbed fittings
<b>Altitude</b>	6562 ft. (2000 m) max.
<b>Position</b>	Housing to be 90° in reference to level surface, ±5°



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### ITAC-FLEX - Intelligent Environmental Monitor

## Software Features

<b>Home Screen</b>	
<b>Rooms supported (3)</b>	Carousel display to show up to 3 rooms, with monitor and control for each.
<b>Parameters per room (6)</b>	Badges display pressure, temperature, humidity, air change rate, and 2 user-defined parameters. Each capable of monitor or control. All information over BACnet.
<b>Room profiles (4)</b>	Define profiles for room environmental control and monitoring. User-defined text. Used for modes such as occupied, unoccupied, cleaning, or decontamination.
<b>Pressure modes (3)</b>	Positive, Negative, Neutral
<b>Background colors (5)</b>	Green, yellow, blue, red, orange for room condition.
<b>Text (2)</b>	User defined lines text that describe room condition.
<b>Icons (32)</b>	Choose from a palette of icons to represent room condition.
<b>Control</b>	Control loops assignable per device. PI control loop for on-board analog outputs. User-defined set point limits. All information is available over BACnet.
<b>Alarming</b>	
<b>Parameters per room (6)</b>	Visual and audible alarms for pressure, temperature, humidity, air change rate, and 2 user-defined parameters
<b>Visual</b>	Green=normal, Red=alarm, Yellow=warning
<b>Audible</b>	Dual buzzers
<b>Disable</b>	One-touch all alarms disable function
<b>Silence</b>	Selectable 0-60 seconds
<b>Delay</b>	Selectable 0-9999 seconds
<b>Latch</b>	Alarm option to hold alarm state until manually reset by operator.
<b>Remote</b>	Remote annunciation to dedicated unit (p/n SRAN) or to multi-room monitor



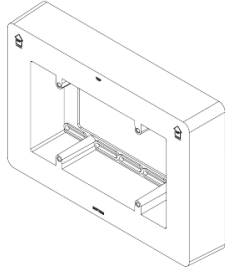
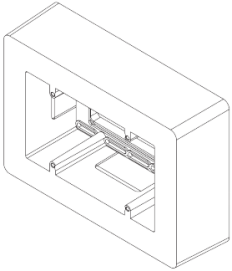
# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

## ITAC-FLEX - Intelligent Environmental Monitor

### Surface Mount Adapter Boxes

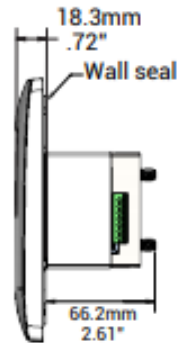
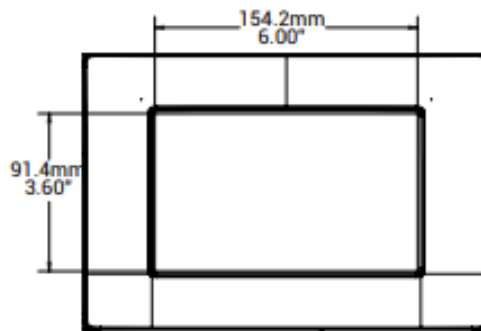
229971  
(For FLEX with on-board pressure module)

229973  
(For FLEX without on-board pressure module)

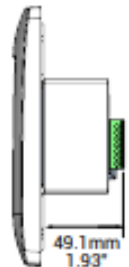
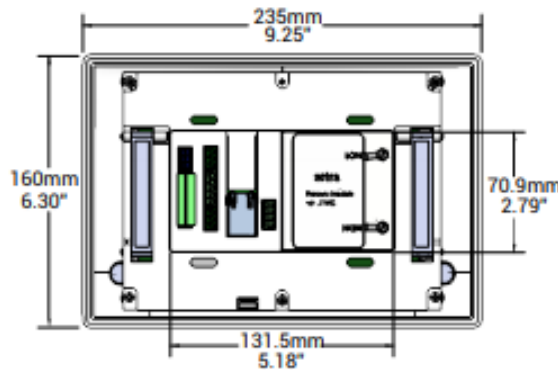


Mounting hardware included with adapter box.

## Dimensions



Shown with in-wall transducer attached



Shown with no transducer attached



## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Valve Ordering Information

Valve Model Number Configuration	1-3	4	5-8	9	10	11	12	13	14	15-16	17	18	19	20	21	22-23
<b>Valve Type</b>																
SAV Gold	SVG															
SAV Silver	SVS															
SAV Bronze	SVB															
<b>Flow Sensor</b>																
Pitot		P														
Orifice Ring		R														
<b>Size</b>																
Round 12"			RD12													
Round 16"			RD16													
Rectangular 10x15"			1015													
Rectangular 10x21"			1021													
<b>Material</b>																
Galvanized				G												
Stainless, 316SS				S												
<b>Connection</b>																
Slip					S											
Flanged					F											
<b>Coils</b>																
None						0										
Hydronic Heat Only						H										
Electric Heat Only						E										
Hydronic Cooling Only						C										
4 Pipe Coil (Heating and Cooling)						4										
Hydronic Cooling with Hydronic Heating						5										
6-way (change over)						6										
Special						Y										
<b>Coil Handing</b>																
No Coil							0									
Right							R									
Left							L									
<b>Extension</b>																
None								0								
Standard Sound								S								
Coil								C								
Special								Y								
<b>Control Handing</b>																
Right										R						
Left										L						
<b>Controller</b>																
No controller											00					
ITAC-FT04											04					
ITAC-FW08											08					
ITAC-FW14											14					
ITAC-FW32											32					
EZVP-440											DM					
EZVP-440E											DE					
<b>Sensor Package</b>																
None												0				
T-Stat												1				
T-Stat + CO2												2				
T-Stat + Humidity												3				
T-Stat + CO2 + Humidity												4				
Intelligent Array												5				
Intelligent Array + VOC/Co2												6				







# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

## Valve Ordering Information (cont'd)

Valve Model Number Configuration	1-3	4	5-8	9	10	11	12	13	14	15-16	17	18	19	20	21	22-23	
<b>Actuator</b>																	
Standard Speed													L				
High Speed (coming soon)													H				
Delta													D				
<b>Control Transformer</b>																	
None													0				
24v													1				
120v													2				
277v													3				
<b>Duct Temperature Sensor</b>																	
None														0			
Nickel Thermistor														D			
<b>Ionization Accessories</b>																	
None																0	
Bar																B	
Remote																R	
<b>Flow Type</b>																	
Supply																	OS
Return																	OR
Exhaust																	OE
Tracking Supply																	TS
Tracking Return																	TR
Tracking Exhaust																	TE



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# SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

## Coil Ordering Information

Coil Model Number Configuration	1-2	3-6	7	8	9	10	11	12	13	14	15-18	19
Coil Part Number	SC											
<b>Type</b>												
Hydronic Heat Only		HW00										
Electric Heat Only		EH00										
Hydronic Cooling Only		CW00										
4-pipe Hydronic Cooling with Hydronic Heating		CWH4										
6-way (change over)		CWH6										
<b>Voltage</b>												
None			0									
120 Single Phase			1									
208 Single Phase			2									
208 Three Phase			3									
277 Single Phase			4									
480 Three Phase			5									
<b>Performance</b>												
Standard				S								
High Capacity				H								
<b>Electric Staging</b>												
Hydronic					0							
1 Stage					1							
2 Stage					2							
3 Stage					3							
4 Stage					4							
SCR Modulating					S							
<b>Handing</b>												
Right						R						
Left						L						
<b>Fin Material</b>												
Electric									0			
Aluminum									A			
Copper									C			
<b>Fins per Inch</b>												
Electric									0			
Eight									8			
Ten									10			
Twelve									12			
<b>Rows Deep</b>												
One											1	
Two											2	
<b>Circuits</b>												
												0
												1
												2
												3
<b>Casing Size</b>												
10x15												1015
10x21												1021
<b>Location</b>												
Up Stream												U
Down Stream												D



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## SAV – Smart Air Valve™ with ITAC – Intelligent Air Control™

### Piping Ordering Information

Piping Model Number Configuration	1-2	3	4	5	6	7	8	9	10	11	12
<b>Piping</b>	SP										
<b>Configuration</b>											
2-way		2									
3-way		3									
PICV		P									
6-way		6									
<b>Pipe Size</b>											
1/2"			A								
3/4"			B								
1"			C								
1.25"			D								
1.5"			E								
2"			F								
<b>Material</b>											
Stainless				S							
Brass				B							
<b>Valve Size</b>											
1/2"					A						
3/4"					B						
1"					C						
<b>Fail Mode</b>											
Normally Open						A					
Normally Closed						B					
Fail in Place						C					
<b>Type</b>											
Ball							B				
Globe							G				
PICV							P				
<b>Actuator</b>											
Floating								F			
0-10v								A			
<b>Balancing Valve</b>											
None									O		
Automatic									A		
Manual									M		
<b>Bypass</b>											
None										0	
Yes										1	
<b>Flex Hose Kit</b>											
12" Length											12
18" Length											18
24" Length											24
36" Length											36
48" Length											48





## SAV™ with Intelligent Air Control Technology

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**SECTION 23 36 00  
SMART AIR VOLUME UNITS**

**PART 1 – GENERAL**

- I. SCOPE – This section includes specifications for Smart Air Volume (SAV) self-balancing equipment. Included are the following topics:
  - A. PART 1 – GENERAL
    - 1. Scope
    - 2. Related Work
    - 3. Reference
    - 4. Reference Standards
    - 5. Quality Assurance
    - 6. Shop Drawings
    - 7. Operation and Maintenance Data
    - 8. Design Criteria
  - B. PART 2 – PRODUCTS
    - 1. Smart Supply Air Boxes
    - 2. Smart Exhaust/ Return Air Boxes (*Gold Only*)
  - C. PART 3 – EXECUTION
    - 1. Installation
    - 2. Adjusting
    - 3. Construction Verification
    - 4. Functional Performance Testing
    - 5. Agency Training
  - D. RELATED WORK
    - 1. Section 01 40 00 – Quality Requirements.
    - 2. Section 01 74 19 – Construction Waste Management and Disposal.
    - 3. Section 01 78 00 – Closeout Submittals.
    - 4. Section 01 79 00 – Demonstration and Testing.
    - 5. Section 23 09 00 – BAS Instrumentation and Control.
    - 6. Section 23 09 93 – Sequence of Operations for HVAC Controls.
    - 7. Section 23 21 13 – Hydronic Piping: Connections to Heating Coils.
    - 8. Section 23 21 14 – Hydronic Specialties: Connections to Heating Coils.
    - 9. Section 23 31 00 – HVAC Ducts and Casings.
    - 10. Section 23 33 00 – Air Duct Accessories.
    - 11. Section 23 37 00 – Air Outlets and Inlets.
    - 12. Section 23 82 00 – Convection Heating and Cooling Units: Air coils.
    - 13. Section 26 27 17 – Equipment Wiring: Electrical characteristics and wiring connections.
  - E. REFERENCE
    - 1. Applicable provisions of Division 1 govern work under this section.
  - F. REFERENCE STANDARDS
    - 1. AHRI 410 – Standard for Forced-Circulation Air-Cooling and Air-Heating coils.
    - 2. AHRI 880- Performance Rating of Air Terminals.
    - 3. AHRI 885 – Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
    - 4. ARI-ADC Standard 880.
    - 5. ASHRAE 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
    - 6. ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality.
    - 7. ASHRAE 130 – Methods of Testing for Rating Ducted Air Terminal Units.
    - 8. ASHRAE 195 – Method of Testing for Rating Air Terminal Unit Controls.
    - 9. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
    - 10. ASTM E84 – Surface Burning Characteristics of Building Materials.

11. ASTM E488/E488M – Standard Test Methods for Strength of Anchors in Concrete Elements.
  12. CSA C22.2 No. 236 – Heating and Cooling Equipment.
  13. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
  14. NFPA 70 – National Electric Code.
  15. NFPA 90A – Installation of Air Conditioning and Ventilation Systems.
  16. UL 94 – Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
  17. UL 181 – Factory-Made Air Ducts and Connectors.
  18. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
  19. UL 1995 – Standards for Heating and Cooling Equipment.
  20. UL-508A Control Panel Certification.
- G. QUALITY ASSURANCE
1. Refer to division 1, General Conditions, Equals and Substitutions.
- H. Administrative Requirements
1. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section and require attendance by all affected installers.
  2. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.
- I. Submittals
1. Submit in accordance with Section 01 30 00, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
    - a) Provide six copies of shop drawings and other submittals on hardware, software and equipment to be installed or furnished. Do not begin installation work until submittals have been approved for conformity with design intent. Provide drawings as PDF format for electronic submittals.
    - b) Provide Submittals within 2 weeks of contract award.
    - c) The SAV manufacturer shall be responsible for preparing all-inclusive turnkey factory submittals to ensure proper balancing of hydronics and air side SAV components in conjunction with DDC controller/ software, power and lighting options. Submittals prepared by a manufacturer's representative of terminal units are not acceptable. Submit complete factory drawings indicating configuration, general assembly and integral materials used in fabrication. Include scheduled performance ratings which indicate SAV type, inlet size, air flow, inlet static pressure, NC designation (discharge and radiated), EWT, LWT, EAT, LAT, GPM, Cv, MBH, air and water pressure drop, coil construction data including copper tube wall thickness, copper tube diameter, casing construction, FPI, fin construction and thickness. Complete hydronics performance information including the balancing valve, orifice number, control valve model number, type, size, performance data and sequence of operation/ application number for DDC controller, ancillary controls hardware data such as sensors mounted and wired on the DDC controller including the programmable room sensor, piping configuration and arrangement shall be supplied.
  2. Manufacturer's Literature and Data:
    - a) *SAV Units: Submit test data.* (Performance difference based on type.)
      1. Manufacturer shall provide single unit test showing that unit has an airflow error of no more than what is specified below per unit type and Tables A through C. Multiple sized units are not accepted.
        - a. The provided test shall be factory witnessed.

1. Unit shall have an airflow error of no more than  $\pm 4\%$  from 2500 fpm to 200 fpm and no more than 8 fpm from 200 fpm to 8 fpm. (*Gold Units*)
  2. Unit shall have an airflow error of no more than  $\pm 6\%$  from 2500 fpm to 200 fpm and no more than 12 fpm from 200 fpm to 12 fpm. (*Silver Units*)
  3. Unit shall have an airflow error of no more than  $\pm 8\%$  from 2500 fpm to 200 fpm and no more than 16 fpm from 200 fpm to 16 fpm. (*Bronze Units*)
- b. The test shall be performed with a calibrated air flow stand with a minimum accuracy of 1.5% of reading across the entire flow as verified by third party using NIST traceable devices and calibrated orifices.
  - c. Manufacturer's test shall have a minimum of 90 test points with the airflow spacing in between points no greater than 2% of maximum airflow and the first test point starting at damper leakage.
  - d. Damper blade shall close off against gasket to limit leakage to 1.5 CFM at .25 inches of differential static pressure.
3. Operation and Maintenance Manuals: Submit in accordance with paragraph, INSTRUCTIONS, in Section 01 00 00, GENERAL REQUIREMENTS.
  4. A sample 12-inch inlet production run SAV with a UL-508A control panel and all associated HVAC, lighting, and power controls; wiring and room peripherals shall be submitted for examination and approval by the owner and owner's representative per the specifications. All contractors, system integrators, and any associated trades shall base their bid on installing the sample SAV provided. This SAV product submittal shall be submitted, in addition to the required written submittal, well in advance of any requirement for installation of boxes, but absolutely no later than sixty days after the date of the start of construction stipulated in the Work Order letter from the owner to the General Contractor. For any project with over 300 units the manufacturer shall provide test results from two random units from the job using a flowstand with the specifications detailed in Section I. 2. a) of this document with the option for a factory-witnessed test.
- J. OPERATION AND MAINTENANCE DATA
1. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.
- K. DESIGN CRITERIA
1. Select sizes, capacities, configuration, and operating characteristics as shown on the plans and/ or as scheduled.
- L. WARRANTY
1. See Section 01 78 00 – Closeout Submittals, for additional warranty requirements.
  2. Provide 18-month manufacturer warranty from date of shipment for SAV units, integral sound attenuators, integral heating coils, and integral controls or 12 months from start of operation, whichever comes first.

## PART 2 – PRODUCTS

### I. SMART AIR VAVLE SUPPLY TERMINALS

- A. Factory calibrated, self-balancing, pressure independent valve for constant volume or variable volume applications.
- B. MANUFACTURERS:
  - 1. HVAC Manufacturing and Technology, Best Technologies, Siemens, Distech Controls, Delta Controls or pre-approved equal. VAV air terminals are NOT ACCEPTABLE.
- C. CONSTRUCTION:
  - 1. Unit casing shall be minimum 22-gauge galvanized steel (*Silver and Bronze*) or 20-gauge stainless steel (*Gold*) and externally factory insulated as described in Section 23 31 00. Construction to meet UL 181 and NFPA 90A. Casing shall be welded seam construction sealed to limit leakage to a maximum of 1.5 CFM at .25 inches of static pressure.
  - 2. A single 14-gauge galvanized steel (*Silver and Bronze*) or 14-gauge stainless steel (*Gold*) metal damper blade assembly shall be mounted to the stainless steel shaft having self-lubricated bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking. Damper blade shall close off against gasket to limit leakage to 1.5 CFM at .25 inches of differential static pressure. Multiple blade assembly in parallel are not accepted.
  - 3. All SAVs come standard with IAQ internal liner. Internal insulation is not acceptable.
  - 4. Low Speed Actuation: Damper actuator and all required linkages shall be factory provided and mounted. Actuator shall be low speed with a maximum of a 90 second response time for a 90° rotation. Size operators for smooth and positive operation of devices served, and with sufficient torque capacity to provide tight shutoff against system temperatures and pressure encountered. All electric actuators will be provided with overload protection to prevent motor from damage when stall condition is encountered. Actuator shall use 24 VAC power.
  - 5. Unit shall be provided with a pressure sensing system that provides a minimum accuracy specified in section D between an entering duct velocity of 2500 fpm and 16 fpm (*Bronze*), 12 fpm (*Silver*), or 8 fpm (*Gold*). Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire retardant (FR) type.
  - 6. A UL-508A control panel shall be supplied with specified controls and accessories including but not limited to HVAC, lighting and power.
  - 7. Each SAV control panel with controls and peripherals shall be pre-configured at the factory to mitigate field systems integrations time.
  - 8. When pre-piped coils are supplied Mechanical Contractor shall be responsible for factory installed bypass valve to be in open position and supply and return isolation valves in closed positions before running water through the SAV coil. After flushing all the dirty water out of the system, Mechanical Contractor to close bypass valve and open supply and return isolation valves. Balancer to then balance hydronics on SAV.
  - 9. All integral appurtenances of the SAV, including the factory-installed hydronics, coil, terminal unit, controls, and peripherals shall be assembled and tested by the same manufacturer of the SAV. All testing, commissioning, programming, certification and validation of the SAV shall be performed by the same SAV manufacturer. Hydronics piping structure shall be project specific and include cooling, heating, or combo coils, valves, Y-strainer, balancing valve, control valve and pressure gauge to verify leak free operation. Hydronic coils can be located upstream or downstream.
  - 10. All SAVs with hydronics shall ship pressurized with 40 psig of pressure to the job site with a pressure gauge to verify leak-free operation.
  - 11. A frameless low-leak 8-inch by 8-inch gasketed hinged access door shall be provided on the SAV coil. Door frame may be bolted, sealed, or flanged to the casing. The door shall be frameless, gasketed and insulated with double wall



- construction. Door shall be held in place with a cam lock latch allowing quick access without the use of tools.
12. Coils shall be factory installed with a maximum of ten (10) aluminum fins per inch and rated in accordance with ARI 410. The coil circuiting shall be a multi circuited header with corrosion free brass manual air vent piped in at the highest and drain at the lowest point of piping to ensure efficient drainage and air removal from the coil.
  13. Coils are available in a high performance-low profile slanted configuration or upright configuration, for both heating and cooling applications. A combo coil assembly is available for humidification control. A stainless steel IAQ drain pan shall be supplied with a cooling coil.
  14. All factory-installed piping assemblies for the SAV's supplied shall be identical and interchangeable. The piping aspect ratio is identical for all SAV's supplied. Mechanical Contractor shall provide documentation of compliance at bid time. Products without this documentation are not acceptable. Any non factory-approved or field installed coils and piping on SAV's is not acceptable.
  15. The shipping brackets shall use 4 military grade rubber grommets for elimination of galvanic corrosion and isolation between copper piping and support handles when feasible. The rubber grommets shall be made of a Standard Nitrile also known as Buna-N and has excellent resistance to petroleum-based oils and fuels, water and alcohols. Nitrile also has good resistance to acids and bases, except those with a strong oxidizing effect.
  16. Project specific factory installed piping structures with control valves shall be supplied by the SAV manufacturer. The following minimum piping components:
    - a) Pressure Independent Control valve with modulating actuator sized per the coil schedule and factory configured with two P/T (pressure temperature) ports and isolation valve, a ball valve with a #20 stainless steel screen to act as a strainer, a union, P/T port, drain or blow-down with integrated ball valve, 3/4 inch male garden hose end connection with a durable plastic retainer, cap. Union with P/T port. Type "L" 3/4 inch copper pipe. Two (2) 24-inch-long stainless-steel hose kits tested and meet UL94 with a VO rating and Kevlar hose material with factory installed copper air chambers at the end and isolation valves. A factory installed bypass with isolation valve shall be installed before the valve assemblies of the hydronics structure on the SAV. The purpose of the bypass is to allow the installing Contractor to flush out dirty water and particles from the system without contaminates flowing through the valve components, control valve and coil on the SAV.
  17. (OPTIONAL) HOT WATER REHEAT COIL
    - a) Coils must be ARI 410 approved and shall meet project schedule requirements.
    - b) Coils and control piping shall be factory installed. Field installed coils and valve packages shall not be accepted.
  18. (OPTIONAL) CHILLED WATER COIL
    - a) Coils must be ARI 410 approved and shall meet project schedule requirements.
    - b) Coils and control piping shall be factory installed. Field installed coils shall not be accepted.
  19. (OPTIONAL) ELECTRIC HEATING COIL:
    - a) The electric heating coil shall be ETL listed to UL 1995 and CSA 22.2, and provided by the terminal unit manufacturer.
    - b) The electric coil casing shall be constructed from a minimum 22-gauge, 0.038-inch galvanized steel.

- c) The heating elements shall be open wire nickel chrome construction, supported by ceramic insulators.
  - d) The integral control panel shall be a NEMA 250, Type 1 enclosure with hinged access door for access to all controls and safety devices.
  - e) The electric coils shall be provided with a primary automatic reset thermal cutout, a manual reset thermal cutout, and a differential pressure airflow switch for proof of airflow.
  - f) (Optional) The electric coils shall be provided with a non-fused door interlocking disconnect switch.
  - g) (Optional) The electric coils shall be provided with a silicon-controlled rectifier (SCR) controller.
  - h) (Optional) The electric coils shall be provided with insulation. Fiber free foam insulation not available.
20. (OPTIONAL) CONTROL TRANSFORMERS:
- a) The terminal unit shall be supplied with a factory mounted 50 VA control transformer.
21. A notarized letter signed by an officer of the company manufacturing the SAV other than HVAC MFG & Technology, Siemens, Best Technologies, Delta Controls or Distech Controls shall be submitted stating the product submitted does not violate patents and/or patents pending.
22. Manufacturer shall coordinate shipping schedule with project team. SAV shall ship Just in Time (JIT) by quadrant/zone as required by the project team with integrated project delivery methods. The project team shall give adequate notice to the manufacturer upon approval of submittals for manufacturer to properly plan material flow so as to meet required delivery dates with staging of product as required.
23. Tagging – labels shall be generated per the project requirements and shall include, but are not limited to total room automation labeling.
- a) Controllers shall be tagged with discoverable addresses and tag numbers.
  - b) Proper labels on any and all wires, cables and room peripherals for, but not limited to power, HVAC, lighting, and communications.
24. Inside of SAV shall be cleaned. Inlet and discharge shall be wrapped with a protective cover. All SAV's shall be individually strapped down, palletized, enclosed in cardboard boxes and shrink wrapped with a pallet stretch machine. Internal liner shall be an IAQ metal liner. No internal insulation is acceptable.
25. The SAV exterior shall be wrapped with a rigid insulation- closed cell 100% non-particulating polyethylene foam pipe insulation certified in accordance with ASTM C 1427 – ½" THICKNESS OR 1" OPTIONAL THICKNESS

#### D. PERFORMANCE

1. *SAV Units: Submit test data.* (Performance difference based on type.)
  - a) Manufacturer shall provide single unit test showing that unit has an airflow error of no more than what is specified below per unit type and Tables A through C. Multiple sized units are not accepted.
    1. The provided test shall be factory witnessed.
      - a. Unit shall have an airflow error of no more than  $\pm 4\%$  from 2500 fpm to 200 fpm and no more than 8 fpm from 200 fpm to 8 fpm. (*Gold Units*)
      - b. Unit shall have an airflow error of no more than  $\pm 6\%$  from 2500 fpm to 200 fpm and no more than 12 fpm from 200 fpm to 12 fpm. (*Silver Units*)
      - c. Unit shall have an airflow error of no more than  $\pm 8\%$  from 2500 fpm to 200 fpm and no more than 16 fpm from 200 fpm to 16 fpm. (*Bronze Units*)

2. The test shall be performed with a calibrated air flow stand with a minimum accuracy of 1.5% of reading across the entire flow as verified by third party using NIST traceable devices and calibrated orifices.
3. Manufacturer's test shall have a minimum of 90 test points with the airflow spacing in between points no greater than 2% of maximum airflow and the first test point starting at damper leakage.
4. Damper blade shall close off against gasket to limit leakage to 1.5 CFM at .25 inches of differential static pressure.

E. ELECTRICAL REQUIREMENTS:

1. Terminal units shall be provided with single-point power connection that meets all project requirements.
2. The terminal unit equipment wiring shall comply with the requirements of NFPA 70.

II. EXHAUST/ RETURN SAVS (*GOLD ONLY*)

A. Factory calibrated, self-balancing, pressure independent valve for constant volume or variable volume applications.

B. MANUFACTURERS:

1. Siemens, HVAC Manufacturing and Technology, Best Technologies, Distech Controls, Delta Controls or pre-approved equal.

C. CONSTRUCTION

1. Unit casing shall be minimum 22-gauge galvanized steel (*Silver and Bronze*) or 20-gauge stainless steel (*Gold*) and externally factory insulated as described in Section 23 31 00. Construction to meet UL 181 and NFPA 90A. Casing shall be welded seam construction sealed to limit leakage to a maximum of 1.5 CFM at .25 inches of static pressure.
2. A single 14-gauge galvanized steel (*Silver and Bronze*) or 14-gauge stainless steel (*Gold*) metal damper blade assembly shall be mounted to the stainless steel shaft having self-lubricated bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking. Damper blade shall close off against gasket to limit leakage to 1.5 CFM at .25 inches of differential static pressure. Multiple blade assembly in parallel are not accepted.
3. All SAVs come standard with IAQ internal liner. Internal insulation is not acceptable.
4. Low Speed Actuation: Damper actuator and all required linkages shall be factory provided and mounted. Actuator shall be low speed with a maximum of a 90 second response time for a 90° rotation. Size operators for smooth and positive operation of devices served, and with sufficient torque capacity to provide tight shutoff against system temperatures and pressure encountered. All electric actuators will be provided with overload protection to prevent motor from damage when stall condition is encountered. Actuator shall use 24 VAC power.
5. Unit shall be provided with a pressure sensing system that provides a minimum accuracy specified in section D between an entering duct velocity of 2500 fpm and 16 fpm (*Bronze*), 12 fpm (*Silver*), or 8 fpm (*Gold*). Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire retardant (FR) type.
6. The shipping brackets shall use 4 military grade rubber grommets for elimination of galvanic corrosion and isolation between copper piping and support handles when feasible. The rubber grommets shall be made of a Standard Nitrile also known as Buna-N and has excellent resistance to petroleum-based oils and fuels, water and alcohols. Nitrile also has good resistance to acids and bases, except those with a strong oxidizing effect.

7. A notarized letter signed by an officer of the company manufacturing the SAV other than HVAC MFG & Technology, Siemens, Best Technologies, Delta Controls or Distech Controls shall be submitted stating the product submitted does not violate patents and/or patents pending.
8. Manufacturer shall coordinate shipping schedule with project team. SAV shall ship Just in Time (JIT) by quadrant/zone as required by the project team with integrated project delivery methods. The project team shall give adequate notice to the manufacturer upon approval of submittals for manufacturer to properly plan material flow so as to meet required delivery dates with staging of product as required.
9. Tagging – labels shall be generated per the project requirements and shall include, but are not limited to total room automation labeling.
  - a) Controllers shall be tagged with discoverable addresses and tag numbers.
  - b) Proper labels on any and all wires, cables and room peripherals for, but not limited to power, HVAC, lighting, and communications.
10. Inside of SAV shall be cleaned. Inlet and discharge shall be wrapped with a protective cover. All SAV's shall be individually strapped down, palletized, enclosed in cardboard boxes and shrink wrapped with a pallet stretch machine. Internal liner shall be an IAQ metal liner. No internal insulation is acceptable.
11. The SAV exterior shall be wrapped with a rigid insulation- closed cell 100% non-particulating polyethylene foam pipe insulation certified in accordance with ASTM C 1427 – ½” THICKNESS OR 1” OPTIONAL THICKNESS

#### D. FUME EXHAUST

1. Round duct assembly shall be constructed from a minimum of 20-gauge stainless steel and damper blade constructed from a minimum of 18-gauge stainless steel. Construction to meet UL 181 and NFPA 90A. Casing shall be sealed to limit leakage to a maximum of 1.5 CFM at .25 inches of static pressure.
2. Stainless steel damper blade shall be mounted to a stainless-steel shaft on Teflon bearings. Shaft end shall be marked to indicate damper position. Damper blade at full closed shall have a minimum leakage of 1.5 CFM at .25 inches of differential static pressure. Damper shaft shall be provided with a marking indicating damper position.
3. Unit shall be provided with a stainless-steel pressure sensing system. Pneumatic tubing from flow sensor to differential pressure transducer shall be UL listed, fire retardant (FR) type.

#### E. PERFORMANCE

1. *SAV Units: Submit test data.* (Performance difference based on type.)
  - a) Manufacturer shall provide single unit test showing that unit has an airflow error of no more than what is specified below per unit type and Tables A through C. Multiple sized units are not accepted.
    1. The provided test shall be factory witnessed.
      - a. Unit shall have an airflow error of no more than  $\pm 4\%$  from 2500 fpm to 200 fpm and no more than 8 fpm from 200 fpm to 8 fpm. (*Gold Units*)
      - b. Unit shall have an airflow error of no more than  $\pm 6\%$  from 2500 fpm to 200 fpm and no more than 12 fpm from 200 fpm to 12 fpm. (*Silver Units*)
      - c. Unit shall have an airflow error of no more than  $\pm 8\%$  from 2500 fpm to 200 fpm and no more than 16 fpm from 200 fpm to 16 fpm. (*Bronze Units*)
    2. The test shall be performed with a calibrated air flow stand with a minimum accuracy of 1.5% of reading across the entire



flow as verified by third party using NIST traceable devices and calibrated orifices.

3. Manufacturer's test shall have a minimum of 90 test points with the airflow spacing in between points no greater than 2% of maximum airflow and the first test point starting at damper leakage.
4. Damper blade shall close off against gasket to limit leakage to 1.5 CFM at .25 inches of differential static pressure.

F. (OPTIONAL) CONTROL TRANSFORMERS:

1. The terminal unit shall be supplied with a factory mounted 50 VA control transformer that meets all project requirements.

G. ELECTRICAL REQUIREMENTS:

1. Terminal units shall be provided with single point power connection that meets all project requirements.
2. The terminal unit equipment wiring shall comply with the requirements of NFPA 70.

III. SMART AIR VALVE TOTAL ROOM AUTOMATION PACKAGE

A. ALL CONTROLS MOUNTED IN UL508A PANEL:

1. Unit shall be provided with factory mounted DDC controller.
2. All room devices including, but not limited to thermostats, humidistats, room pressure sensors, lighting, power, and room peripherals shall be manufacturer provided, factory programmed, and pre-configured at the factory to minimize field system integration time.
3. See Section 23 09 13 – Instrumentation and Control Devices for HVAC: Room peripherals and actuators for controls requirements.
4. See Section 23 09 93 – Sequence of Operations for HVAC Controls for controls sequence requirements.
5. SAV Manufacturer is responsible for supplying total room automation peripherals to meet performance requirements.

IV. Universal control panel cover shall be hinged, slideable, or removeable without the use of tools.

**PART 3 – EXECUTION**

I. INSTALLATION

- A. Install SAV units as indicated on project drawings and in accordance with the manufacturer's installation instructions.
- B. Mount SAV boxes with a minimum 3 feet of straight ductwork upstream of inlet flow sensor for sizes 12" diameter and below. Provide a minimum of 3X the inlet diameter of straight duct upstream of the inlet flow sensor for inlet sizes above 12" diameter.
- C. Provide at least 24" of clearance on control panel side of the SAV unit. The clearance area shall extend the full length of the supply SAV unit and the full length (including the access door) of the exhaust/ return SAV unit.
- D. Support SAV units from building structure using factory provided aircraft cables or Unistrut or trapeze hanger with rods. Do not pierce valve body, do not mount SAV units from adjacent ductwork or piping.
- E. Provide ceiling access doors or locate units above easily removable ceiling components.
- F. Verify that the specified voltage and phase are available.
- G. BALANCING
  1. The Smart Air Valve is factory calibrated and self-balancing, any unauthorized field adjustment of the damper, the actuator, or any other physical part of the unit will void the warranty. If supplied with a coil, balancing is still required for the coil only. There is no need to access the control panel.
- H. CONSTRUCTION VERIFICATION
  1. Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 23 08 00 in accordance with the procedures

defined for construction verification in Section 01 91 01 or 01 91 02.

**PART 4 – TABLES**

**Table A. Typical Smart Air Valve Test performed on Single 12” Φ SAV with Minimum 300:1 Turndown (Gold Unit) and Multiple Unit Sizes are not Accepted.**

Reference CFM	Static Pressure	Pressure Drop	Nozzle Size	SAV Damper	SAV Pressure	SAV CFM	CFM error (Unit flow <200 fpm)	% error (Unit flow > 200fpm)
0.9501212	0.038212	0.039779	1.25	0.023414	0.034747	0.782911	0.17	
3.4429646	0.51343	0.509018	1.25	0.015609	0.502473	1.508455	1.93	
4.1371795	0.760839	0.75334	1.25	0.020812	0.745901	1.980683	2.16	
5.9424664	1.579248	1.569706	1.25	0.023414	1.559084	2.848835	3.09	
6.7773733	2.03317	2.021822	1.25	0.013008	2.016658	2.791346	3.99	
7.3878282	0.204538	0.194372	1.25	2.775754	0.191242	9.907888	-2.52	
9.4156397	0.062822	0.046705	1.25	9.859522	0.048282	10.50792	-1.09	
11.415838	0.468266	0.438579	1.25	2.885016	0.444039	14.27174	-2.86	
16.987148	0.35487	0.291729	1.25	5.816858	0.296981	18.87536	-1.89	
17.162713	1.116661	1.048898	1.25	2.905828	1.0693	19.24583	-2.08	
18.933677	0.438588	0.361333	1.25	5.913111	0.36986	20.7798	-1.85	
19.50479	0.424382	0.342228	1.25	6.823622	0.350078	21.91721	-2.41	
22.615542	1.868048	1.757379	1.25	3.015089	1.804984	25.46852	-2.85	
22.621031	0.481831	0.371964	1.25	8.902186	0.387298	26.24708	-3.63	
28.03038	0.903691	0.736582	1.25	6.899064	0.764706	29.65274	-1.62	
33.701211	0.678077	0.439949	1.25	13.02029	0.440265	35.75265	-2.05	
33.999653	0.44351	0.204267	1.25	17.00312	0.206793	33.49651	0.50	
34.564	1.529364	1.28131	1.25	5.96514	1.336348	34.14096	0.42	
37.459938	1.807829	1.519915	1.25	5.991155	1.590903	37.41989	0.04	
38.969668	1.783403	1.47598	1.25	6.966702	1.530323	40.36667	-1.40	
40.879757	1.2898	0.94276	1.25	11.00156	1.004815	45.38013	-4.50	
44.413086	1.955831	1.54881	1.25	8.990635	1.62949	49.60769	-5.19	
50.588982	1.562481	1.041269	1.25	13.20239	1.044573	54.68974	-4.10	
52.357895	1.487929	0.933066	1.25	14.07128	0.934995	55.40725	-3.05	
62.296759	1.188483	1.161366	3	14.1155	1.168337	62.21211	0.08	
67.548875	0.778414	0.747015	3	17.07596	0.766983	64.24438	3.30	
72.994276	1.77085	1.73614	3	13.23621	1.74538	71.35649	1.64	
74.30875	0.535615	0.496828	3	20.14308	0.513014	68.20964	6.10	
82.748796	0.149648	0.106704	3	30.24454	0.116346	77.93264	4.82	
85.60884	0.073139	0.028536	3	40.37721	0.0326	83.53559	2.07	
94.854396	1.527435	1.466384	3	17.13319	1.498699	91.11802	3.74	
167.25156	0.478749	0.295864	3	33.35588	0.333615	162.2098		3.0%
284.05834	0.36098	0.294744	5	41.46722	0.368103	281.3312		1.0%

292.05628	0.177298	0.110806	5	50.68939	0.161635	291.674		0.1%
325.17312	0.093052	0.008929	5	76.02237	0.036569	328.9442		-1.2%
378.01692	0.711969	0.587169	5	40.47607	0.725924	373.0733		1.3%
397.35743	0.135056	0.003766	5	91.39698	0.027785	393.2811		1.0%
436.38389	1.268376	1.106207	5	37.46878	1.316242	419.3242		3.9%
457.89018	0.181931	0.007167	5	100	0.031689	465.1912		-1.6%
459.50157	0.283662	0.095947	5	60.79865	0.187988	450.8083		1.9%
477.37895	1.525146	1.326979	5	37.46358	1.577954	458.863		3.9%
541.89532	1.461765	1.219675	5	40.47607	1.503514	534.0975		1.4%
603.55445	0.320459	0.020667	5	81.11863	0.109318	590.5484		2.2%
620.86121	0.554159	0.240892	5	57.74714	0.420419	605.679		2.4%
762.94704	1.06907	0.554241	5	53.76431	0.878644	758.4483		0.6%
776.04716	1.607812	1.113339	5	47.6769	1.542231	775.3544		0.1%
828.80282	0.662816	0.113234	5	71.00416	0.343701	807.1488		2.6%
1012.8897	0.891522	0.034164	5	98.45213	0.177316	982.1741		3.0%
1050.9336	1.460331	0.510041	5	60.8949	1.001301	1032.77		1.7%
1115.6344	0.576668	0.423705	20	63.96982	0.92146	1086.547		2.6%
1161.7001	0.213207	0.053244	20	100	0.239849	1151.954		0.8%
1214.1341	0.426751	0.245065	20	71.01977	0.729698	1170.198		3.6%
1225.1691	0.693361	0.513069	20	63.96202	1.11615	1193.504		2.6%
1226.72	0.264911	0.085058	20	81.20448	0.519391	1239.977		-1.1%
1227.8437	0.223623	0.043243	20	95.45005	0.292751	1201.899		2.1%
1288.4361	0.243636	0.047119	20	94.40947	0.326718	1252.07		2.8%
1314.7691	0.268059	0.057092	20	88.33767	0.40734	1262.695		4.0%
1333.0947	0.265344	0.051524	20	92.34652	0.385476	1311.993		1.6%
1364.5416	0.278183	0.053297	20	95.47347	0.363743	1337.851		2.0%
1368.2485	1.114111	0.876427	20	60.99896	1.720263	1347.021		1.6%
1456.0436	0.325591	0.068777	20	98.48074	0.393936	1442.641		0.9%
1628.9132	0.427901	0.107625	20	100	0.472996	1604.739		1.5%
1717.5875	0.854764	0.493111	20	71.12903	1.465318	1648.465		4.0%
1738.2307	0.470145	0.100545	20	88.32987	0.724363	1672.744		3.8%
1875.03	0.577563	0.153073	20	84.21436	0.987637	1803.561		3.8%
1950.376	0.592175	0.12905	20	98.60041	0.701588	1914.197		1.9%
2023.7275	0.617554	0.118403	20	92.35692	0.882418	1968.469		2.7%
2079.4544	0.660888	0.124924	20	95.45786	0.872267	2042.416		1.8%
2167.4478	0.703958	0.133074	20	94.41208	0.972866	2127.23		1.9%
2293.974	0.856426	0.211777	20	100	0.955362	2281.71		0.5%
2305.0604	0.840134	0.190729	20	87.3283	1.361596	2213.603		4.0%
2316.7983	0.820586	0.157933	20	95.5359	1.08752	2284.8		1.4%
2329.291	0.976624	0.313011	20	81.54266	1.952694	2350.217		-0.9%
2381.1715	0.939412	0.247783	20	84.42508	1.663392	2312.827		2.9%

2469.9315	0.944635	0.205343	20	88.45214	1.525182	2379.342		3.7%
2505.7604	0.972845	0.196237	20	90.40582	1.445796	2411.664		3.8%
2547.3406	1.05409	0.26136	20	100	1.208811	2552.518		-0.2%
2705.0287	1.15916	0.258261	20	98.61862	1.388209	2679.018		1.0%
2814.1563	1.208986	0.233538	20	94.61238	1.660854	2743.731		2.5%
3023.9554	1.493691	0.378	20	100	1.716944	3023.228		0.0%
3220.4664	1.729542	0.447814	20	100	1.945797	3204.389		0.5%

**Table B. Typical Smart Air Valve Test performed on Single 12” Φ SAV with Minimum 100:1 Turndown (Silver Units) and Multiple Unit Sizes are not Accepted.**

Reference CFM	Static Pressure	Pressure Drop	Nozzle Size	SAV Damper	SAV Pressure	SAV CFM	CFM error (Unit flow <200 fpm)	% error (Unit flow >200fpm)
1.343082	0.037649	0.038866	1.25	0	0.042491	0	1.91	
4.963655	0.513425	0.503947	1.25	0	0.502711	0	6.82	
5.917233	0.760539	0.747292	1.25	0	0.741685	0.581225	5.34	
8.464379	1.569947	1.549496	1.25	0	1.532308	4.389336	4.08	
9.35489	0.061119	0.040149	1.25	10.045	0.051783	9.818833	-0.46	
9.657485	2.031365	2.005445	1.25	0	1.977094	2.628202	7.03	
10.037025	0.208088	0.181887	1.25	2.836793	0.195409	5.65213	4.38	
14.827023	0.469818	0.412303	1.25	2.846504	0.437265	11.41559	3.41	
18.126329	0.356283	0.280941	1.25	6.106764	0.29514	16.84364	1.28	
20.048618	0.440669	0.346449	1.25	6.102974	0.363077	18.8448	1.20	
20.442713	0.423912	0.332025	1.25	6.820889	0.351746	20.00019	0.44	
23.024784	1.113882	0.987045	1.25	2.836724	1.044884	18.79865	4.23	
24.300989	0.483677	0.351873	1.25	9.285256	0.370647	25.12234	-0.82	
30.050493	0.903851	0.703142	1.25	7.300574	0.747399	29.15115	0.90	
34.169763	0.444748	0.194189	1.25	17.24465	0.202637	36.06247	-1.89	
34.657757	0.681027	0.420179	1.25	13.24634	0.426178	35.12132	-0.46	
37.009813	1.532358	1.236289	1.25	6.100411	1.28718	31.76581	5.24	
40.230286	1.802898	1.458699	1.25	6.100593	1.517043	33.12418	7.11	
42.223905	1.781915	1.408916	1.25	7.299467	1.48854	37.39441	4.83	
43.150329	1.286938	0.894949	1.25	11.18536	0.900513	41.61096	1.54	
48.579661	1.950174	1.465246	1.25	9.287225	1.538169	45.86925	2.71	
52.400502	1.562031	0.991663	1.25	13.24038	0.995409	51.48447	0.92	
53.457372	1.486809	0.891596	1.25	14.03183	0.901929	52.32141	1.14	
60.999784	1.185448	1.157122	3	14.03829	1.170012	60.36749	0.63	
65.848328	1.767859	1.73752	3	13.26922	1.748962	72.76319	-6.91	
65.988739	0.780947	0.749465	3	17.23989	0.769622	64.19018	1.80	
72.94498	0.535352	0.500816	3	20.50587	0.520635	71.3265	1.62	
79.741934	0.154839	0.106666	3	30.48203	0.122637	84.30496	-4.56	
85.437953	0.077111	0.0292	3	40.89947	0.040928	95.34076	-9.90	



94.149791	1.520617	1.46192	3	17.43968	1.49475	97.1438	-2.99	
107.715731	0.350455	0.269059	3	28.47811	0.295775	108.5485	-0.83	
119.159256	0.494913	0.402457	3	27.28809	0.435751	119.4281	-0.27	
148.452851	2.074596	1.93187	3	20.51148	1.99326	156.726	-8.27	
150.953622	0.480205	0.326515	3	31.75711	0.367717	155.6921	-4.74	
168.100583	0.481453	0.301689	3	33.74293	0.347155	174.2824		-3.7%
281.33527	0.358933	0.289697	5	41.70048	0.370745	293.5742		-4.4%
291.102224	0.18434	0.106577	5	50.9779	0.164542	303.5742		-4.3%
323.607664	1.707595	1.614995	5	30.57908	1.782222	320.6973		0.9%
381.759877	0.715514	0.591403	5	40.92609	0.737778	396.6589		-3.9%
428.84744	1.274347	1.117101	5	37.70422	1.321368	438.1532		-2.2%
470.460049	1.527238	1.337096	5	37.71917	1.58422	475.611		-1.1%
470.831082	0.287062	0.093466	5	61.31933	0.194139	474.4051		-0.8%
527.753582	0.291522	0.059996	5	68.19073	0.164103	528.1794		-0.1%
546.250017	1.466738	1.21078	5	40.92314	1.498901	552.2807		-1.1%
577.711971	0.390682	0.107997	5	64.22484	0.247619	577.5744		0.0%
602.775238	0.321339	0.020201	5	81.75578	0.115409	595.5626		1.2%
613.727604	0.569507	0.224643	5	58.13602	0.411868	614.0246		0.0%
634.210767	1.965764	1.615986	5	40.92299	1.990134	621.1729		2.1%
778.361946	1.068746	0.558493	5	54.14965	0.892992	772.6154		0.7%
781.720484	1.602871	1.072594	5	48.09008	1.499293	772.0815		1.2%
830.69341	0.666701	0.11093	5	71.37022	0.34737	809.6148		2.5%
1013.30522	0.888786	0.036737	5	98.99664	0.192576	999.6132		1.4%
1059.31818	1.444981	0.491807	5	61.35018	0.98202	1021.047		3.6%
1111.407774	0.57818	0.423298	20	64.05577	0.921387	1071.898		3.6%
1160.112605	0.212474	0.044975	20	99.09559	0.26398	1164.886		-0.4%
1216.397618	0.435098	0.250009	20	71.31993	0.750602	1174.052		3.5%
1221.841532	0.269962	0.085107	20	81.78856	0.495948	1197.226		2.0%
1224.280547	0.227543	0.045803	20	95.79871	0.309011	1194.225		2.5%
1231.151911	0.704881	0.512867	20	64.16508	1.119799	1178.397		4.3%
1272.052497	0.252061	0.049625	20	95.02717	0.339878	1237.589		2.7%
1317.259942	0.271397	0.054585	20	93.04885	0.382857	1274.245		3.3%
1319.701816	0.277342	0.062273	20	88.56849	0.439258	1271.644		3.6%
1363.769716	0.281873	0.056482	20	95.76981	0.384273	1332.749		2.3%
1393.272702	1.135907	0.894106	20	61.23076	1.726703	1322.548		5.1%
1440.745108	0.324891	0.068504	20	98.95876	0.408694	1439.073		0.1%
1638.77413	0.41764	0.088252	20	99.084	0.514483	1617.93		1.3%
1722.511237	0.863097	0.496296	20	71.34652	1.483376	1633.888		5.1%
1734.846434	0.474292	0.105998	20	89.05471	0.737714	1680.36		3.1%
1846.309243	0.589295	0.160573	20	84.54653	1.021489	1829.227		0.9%
1936.453302	0.591635	0.126037	20	99.00258	0.735839	1935.699		0.0%

1995.503306	0.621742	0.125301	20	93.04938	0.897316	1983.376		0.6%
1997.63134	1.154797	0.655007	20	71.77698	1.958592	1882.282		5.8%

END OF SECTION