



# AVR4000

US Patent 7,543,759

## AccuValve with Room Temperature and Airflow Tracking Control



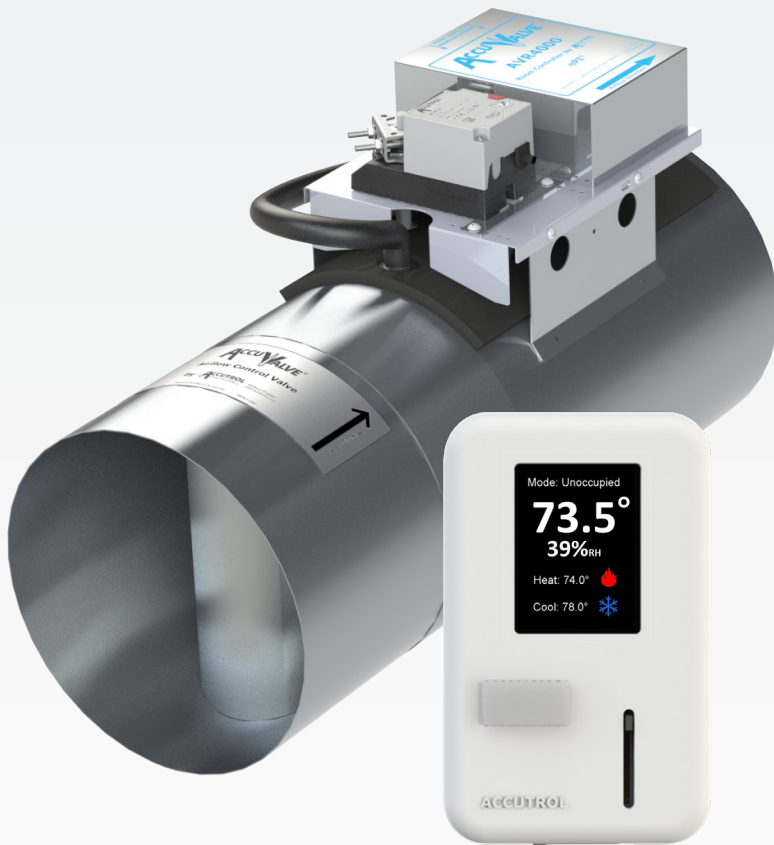
### Innovative features for the AVR4000!

- Intuitive Graphical User Interface Dashboard
- Room Temperature Control Capability
- Reheat Valve Control Capability
- Supply and Exhaust/Return Airflow Tracking
- BACnet® is Software Selectable (no dip switches)
- Bluetooth® Configuration Optional
- ARS Room Temperature / RH Sensor
- Standard Speed Actuation Only

### Plus, these standard AccuValve features...

- Exceptionally Low Pressure Drop
  - Design System Pressure – as low as 0.05" (12.5 Pa)
- Electronic Pressure Independence
- True Airflow Feedback
- No Straight Run Requirements
- Linear Control Response
- High Accuracy and Turndown
- Can be Mounted in Any Position
- Native BACnet® MS/TP
- 5-Year Manufacturer Warranty

Manufactured in the USA.



The Accutrol AVR4000 is an electronically pressure independent AccuValve®. It takes the revolutionary design of the exceptionally low pressure drop AccuValve and builds temperature and airflow control into the electronics. The AVR4000 is designed for critical airflow tracking control in research and healthcare spaces where standard speed actuation and precise airflow measurement and room temperature control is required. The integral native BACnet® MS/TP allows direct communication to the Building Automation System (BAS) where desired.

## Features & Benefits

The AccuValve's ISO 9001:2015 certified, award winning design incorporates:

### Exceptionally Low Pressure Drop

AccuValve's award winning design incorporates a streamlined compression section and a carefully designed static regain section. These features provide lower pressure drop, lower noise level and better flow measurement conditions than any other available technology.

### True Airflow Measurement

The integral high accuracy vortex airflow sensing provides high turndown while maintaining accuracies of 5% of reading over the flow range, ensuring precise airflow control.

### No Straight Run Requirements

There are no straight duct runs required before or after the valve, making application of the valve very simple. The air compression in the valve provides laminar airflow throughout the airflow range providing repeatable airflow measurement regardless of inlet or outlet conditions.

### ASHRAE Standard 90.1 Compliant without need for additional hardware

ASHRAE Standard 90.1 calls for the reset of the static pressure setpoint in VAV systems equipped with DDC controls. The AccuValve design allows the Building Automation System to provide this benefit to the owner without the requirement of any additional hardware or complexity. This is unique to the AccuValve for critical environments.

### Simple Layout and Installation

All parts of the AccuValve are accessible from the front of the valve simplifying installation requirements. In addition, the valve can be mounted at any angle and rotated 360°.

## Intuitive Insight Software

The AVR4000 also incorporates a simple and intuitive graphical user interface which enables the user to configure the valve for their specific airflow and temperature control requirements. Accutrol's Insight software, provided free of charge, insures that the owner is not required to contact the manufacturer of the airflow control system when changes are required in the field.

### BACnet®

The integral, native BACnet® MS/TP allows direct communication to the Building Automation System (BAS) where desired.

### AVR Provides

- Four user-defined modes to meet the most demanding energy conservation requirements
- Accurate volumetric flow tracking control to maintain precise room pressurization

### ARS Room Sensor Provides

- Accurate thermistor-based temperature sensor
- Relative humidity sensor
- Optional digital display
- Optional setpoint slider
- Optional motion sensor
- Communications to minimize A/O

### Bluetooth® Configuration Option

The AVR4000 is available with a Bluetooth® configuration option, which alleviates the requirement for a USB connector when accessing the airflow valve via Accutrol's Insight graphical user interface software.

### Dual Maximum Control (DMC) Logic

- First Stage of Heating Resets Discharge Air Temperature
- Second Stage of Heating Increases the Airflow Rate to Heating Maximum Airflow Setpoint
- DMC Logic Combined with the AccuValve's provide the most energy efficient solution available



Accutrol's Insight Software Dashboard

The AVR adds room temperature control and tracking control to the AccuValve package.

## AVR Standard Applications (for Standard Speed Actuation)

### App 1

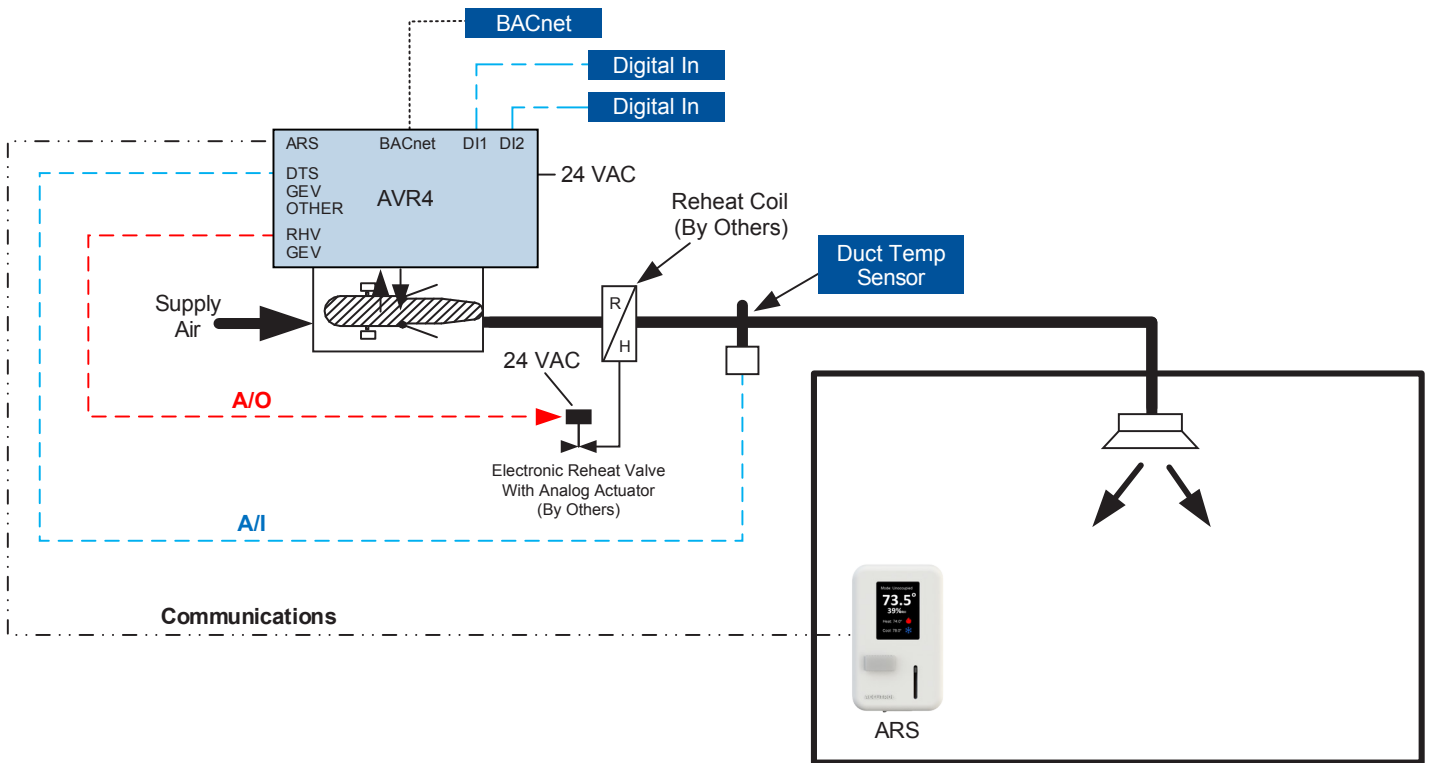
#### Supply with Reheat Control

App 1 is used for rooms that require a single supply valve where precise airflow and room temperature control are required. The AVR AccuValve controls the supply airflow volume and reheat valve modulation based on the parameters configured using the AccuValve Insight Software or via BACnet. A duct temperature sensor can be included for applications that require reheat discharge air temperature control.

Room temperature / RH measurement is provided by the Accutrol ARS room sensor module, which is available with an

optional display, setpoint adjustment and motion sensor. The ARS also includes a USB port that is used for connecting a computer equipped with the AccuValve Insight Configuration Software.

The AVR can provide up to 4 preconfigured setpoint modes to maximize energy savings and accommodate application-specific sequences such as: occupied, unoccupied, decontamination, emergency. The AVR also includes Dual Maximum Logic to help meet the latest energy conservation standards including ASHRAE Standard 90.1 and California Title 24 criteria.



App1 – Single Supply AccuValve

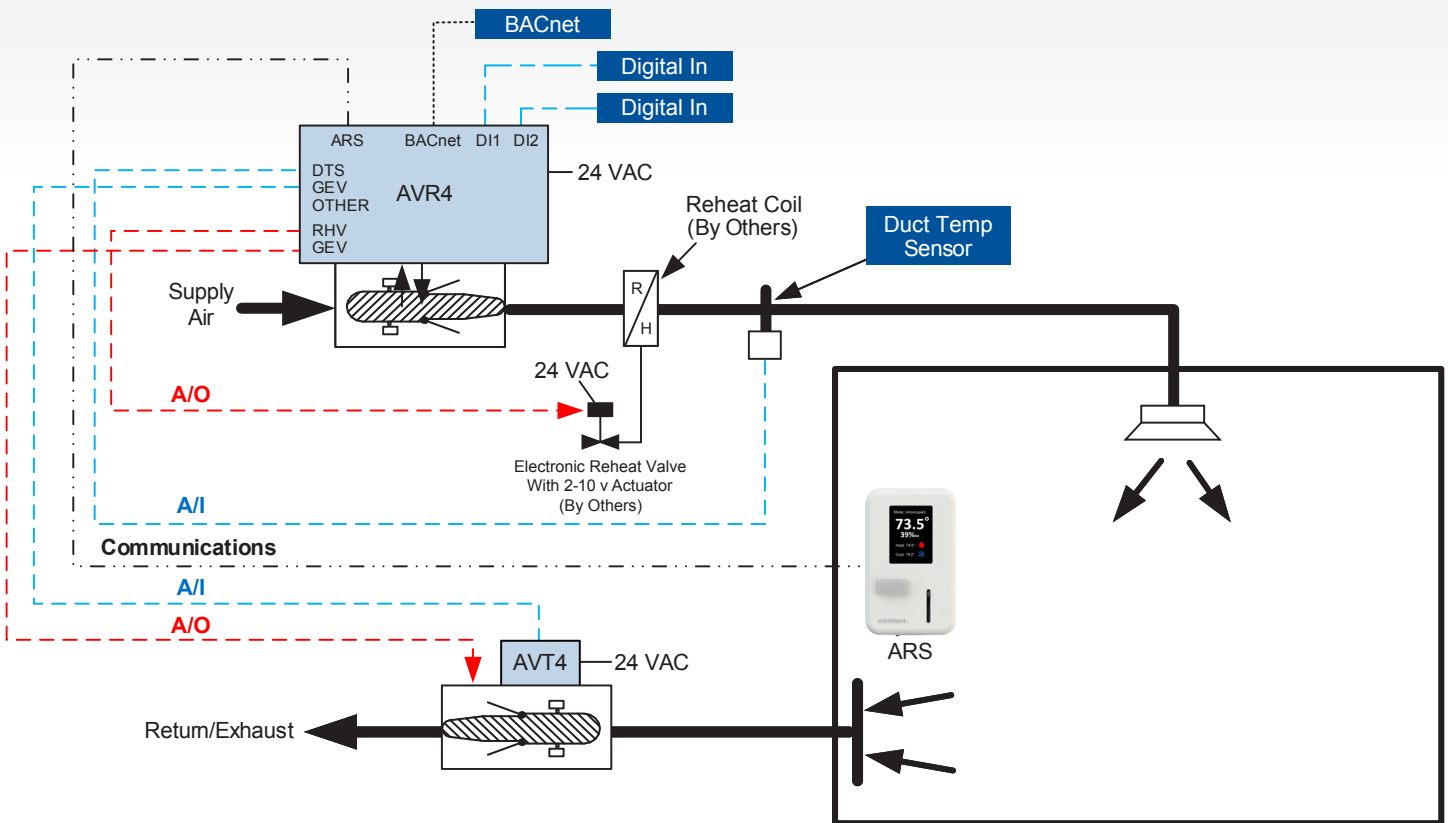
## AVR Standard Applications (for Standard Speed Actuation)

### App 2

#### Supply with Reheat Control and Tracking Exhaust/Return

App 2 is similar to App 1. However, the addition of an exhaust/return valve provides accurate volumetric airflow tracking control for maintaining precise room pressurization as the supply airflow

demand changes. The exhaust/return valve provided is an AVT AccuValve which is hardwired directly to the AVR supply valve for immediate and reliable response.



App 2 – One Supply and One Exhaust/Return

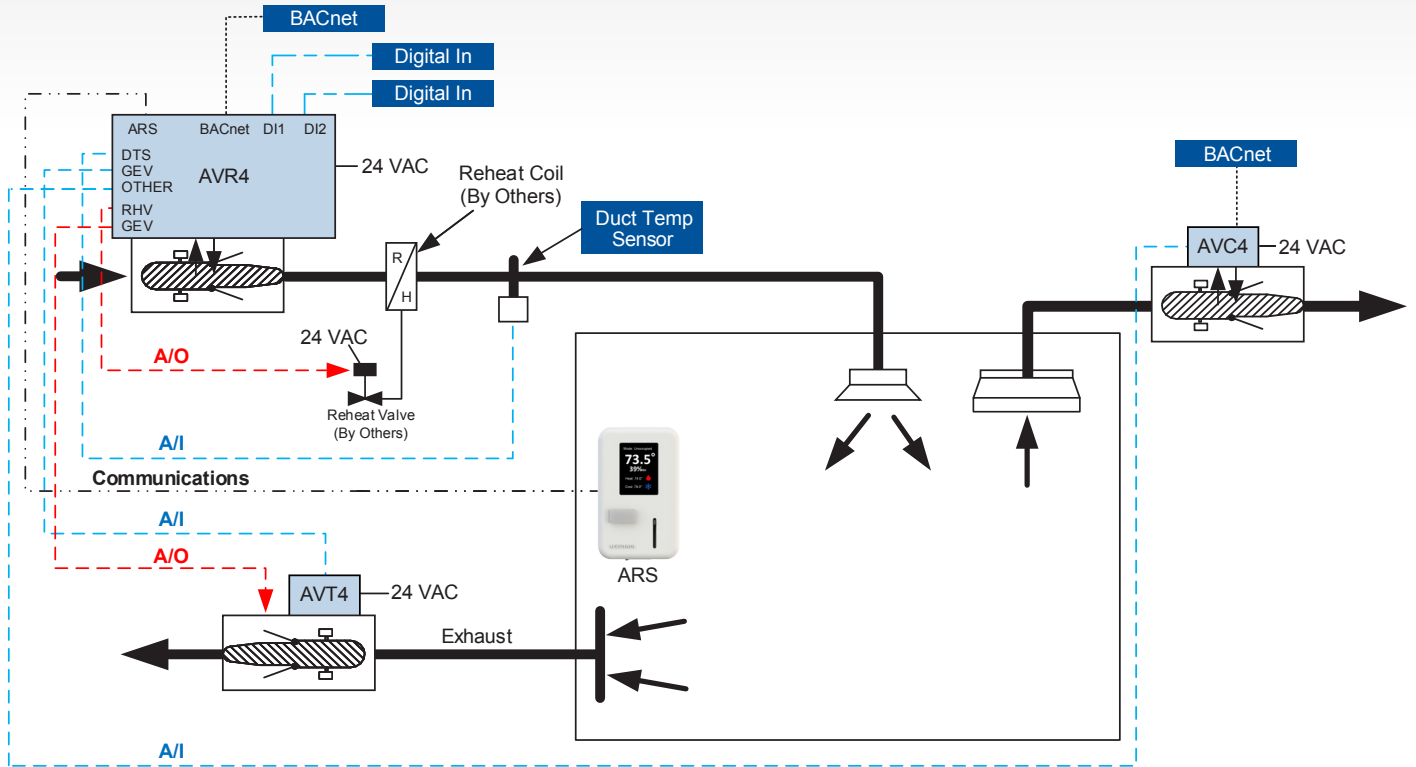
## AVR Standard Applications (for Standard Speed Actuation)

### App 3

#### Supply with Reheat Control, General Exhaust and One Other Exhaust

App 3 is similar to App 2 with the addition of a single exhaust device located within the controlled room. Control of the other exhaust valve is provided by an AVC4 AccuValve which sends the real-time exhaust airflow volume to the AVR via a

hardwired analog signal so the AVR can calculate the total exhaust airflow and provide tracking control to maintain precise room pressurization as the airflow demand changes.



App 3 – One Supply, One General Exhaust and One Other Exhaust

## Operating Pressure Selector

Valve Size (mm)	Eng Units	Airflow Range							
		Minimum	Maximum Design Airflow						Maximum
6" (152)	CFM	30	99	143	174	206	230	254	315
	L/S	14	47	67	82	97	108	120	149
	CMH	51	168	243	296	350	391	432	535
8" (203)	CFM	80	252	367	447	528	589	650	800
	L/S	38	119	173	211	249	278	307	378
	CMH	136	428	624	760	897	1000	1104	1359
10" (254)	CFM	120	428	606	733	860	958	1056	1300
	L/S	57	202	286	346	406	452	498	614
	CMH	204	727	1030	1245	1461	1627	1794	2209
12" (305)	CFM	180	591	840	1016	1192	1326	1461	1790
	L/S	85	279	396	479	563	626	690	845
	CMH	306	1004	1427	1726	2025	2253	2482	3041
14" (356)	CFM	250	979	1364	1624	1884	2079	2275	2750
	L/S	118	462	644	766	889	981	1074	1298
	CMH	425	1663	2317	2759	3201	3533	3865	4672
12"x18" (305x457)	CFM	260	1003	1437	1761	2086	2341	2596	3200
	L/S	123	473	678	831	984	1104	1225	1510
	CMH	442	1704	2441	2992	3544	3977	4411	5437
12"x24" (305x610)	CFM	350	1261	1812	2213	2614	2925	3237	4000
	L/S	165	595	855	1044	1234	1381	1528	1888
	CMH	595	2142	3079	3760	4441	4970	5500	6796
Operating Pressure	"W.C.	< 0.01	0.05	0.1	0.15	0.2	0.25	0.3	0.45
	Pa	< 2.5	12.5	25	37.5	50	62.5	75	112.5



\* Minimum operating pressure when tested in accordance with ANSI/ASHRAE 130-2008

**For further assistance in making your AccuValve selections, please refer to the AccuValve Selection Guide for Operating Pressure. An AccuValve selection tool for iPhone, iPad and Android devices is also available to assist with AccuValve selections.**

## Specifications

### ELECTRICAL

<b>Input Power</b>	24VAC $\pm$ 20% 50/60Hz (Cl 2 power source) 18VA 24VDC $\pm$ 10% 10W
<b>Dedicated Analog Inputs</b>	<b>AI-1 (DTS)</b> <b>Supply Air Discharge Temperature Signal</b> Source Duct Temperature Sensor Signal Type Resistance Range 10K-ohm NTC thermistor; Type II or III <b>AI-2 (GEV)</b> <b>General Exhaust Airflow Volume Signal</b> Source AVT exhaust valve transmitter Signal Type Voltage Range 0-10VDC <b>AI-3</b> <b>Other Exhaust Airflow Volume Signal</b> Source AVC exhaust valve Signal Type Voltage Range 0-10VDC
<b>Dedicated Digital Inputs</b>	<b>DI-1 and DI-2 Set Point Mode Selectors</b> Signal Type Dry contact only
<b>Dedicated Analog Outputs</b>	<b>AO-1 Reheat Valve Control Signal</b> Signal Type Voltage or current Range Voltage: 0-10, 2-10, 0-5 or 1-5VDC Current: 0-20 or 4-20mA <b>AO-2 General Exhaust Control Signal</b> Signal Type Voltage or current Range Voltage: 0-10, 2-10, 0-5 or 1-5VDC Current: 0-20 or 4-20mA
<b>Network</b>	BACnet MS/TP Signal Type EIA 485 2-wire Impedance $\frac{1}{4}$ Unit load Speed 9600, 19200, 38400, 76800, 1152000 Network bias and termination are not provided internally by the AVR control module
<b>Configuration Port</b>	<b>PC Connection with AccuValve Insight Software</b> USB "C" type communications port Optional Wireless Bluetooth®
<b>Device Port</b>	<b>Accutrol Room Sensor</b> RJ-45 port for factory-cable connection
<b>Terminal Blocks</b>	<b>Power &amp; BACnet</b> 2-Position Removable Vertical Plugs, Wire Size Range 16-30 AWG <b>Inputs &amp; Outputs</b> Dual 7-Position Terminal Block, Wire Size Range 16-30 AWG
<b>Electromagnetic Compatibility</b>	2014/30/EU, EMC Directive EN61236-1:2013 2014/53/EU, Radio Equipment Directive EN301489-1, V1.9.2:2011 ETSI EN301489-1, V2.2.0:2017 ETSI EN301489-3, V1.6.1:2013/V2.1.1:2017 ETSI EN301489-17, V2.2.1:2012/V3.2.0:2017
<b>Product Safety</b>	2014/35/EU, Low Voltage Directive EN61010-1:2010/A1:2019/AC:2019

### AIRFLOW PERFORMANCE

<b>Airflow Accuracy</b>	$\pm$ 5% of reading or 5 CFM (2 L/S; 8 CMH), whichever is greater
<b>Speed of Response</b>	< 2 seconds
<b>Shut-off Leakage Rate @ 3"wc valve DP</b>	Standard round valves (size 06 through 14) <1.5% FS max. Round valves with blade seals (size 08 through 14) <0.5% FS max. Standard rectangular valves (size 18 through 24) <2% FS max.
<b>Max. Operating Pressure</b>	3"wc differential pressure across valve
<b>Failure Mode</b>	Fail Last Position

### TEMPERATURE PERFORMANCE

<b>Room Temperature Measurement</b>	Range 32° F to 132° F (0° C to 56° C) Resolution 0.02° F (0.01° C) Accuracy $\pm$ 0.25° F ( $\pm$ 0.14° C)
<b>Supply Duct Discharge Temperature Measurement</b>	Range 47° F to 147° F (8° C to 64° C) Resolution 0.1° F (0.06° C) Accuracy $\pm$ 0.25° F ( $\pm$ 0.14° C)

### RELATIVE HUMIDITY MEASUREMENT

<b>Range</b>	0 to 100% RH
<b>Resolution</b>	0.02° RH
<b>Accuracy</b>	$\pm$ 2% typical, $\pm$ 2.5% maximum

### ENVIRONMENTAL

<b>Temperature</b>	Air Stream -20° to 165° F (-29° to 74° C) Ambient -20° to 125° F (-29° to 52° C) Storage -40° to 165° F (-40° to 74° C)
<b>Humidity</b>	0% to 90% non-condensing

### MATERIALS OF CONSTRUCTION

<b>Valve Housing</b>	Aluminum (16 Gauge) 304SS (20 Gauge) 316SS (20 Gauge)
<b>Shafts</b>	316SS
<b>Shaft Bearings</b>	Teflon®
<b>Seals</b>	EPDM with aluminum valves Viton with stainless steel valves
<b>Airflow Sensors</b>	Polycarbonate plastic, UL94-VO Polycarbonate plastic, UL94-VO
<b>Control Module Enclosure</b>	16 Gauge aluminum

## Ordering Guides

Please see the following page for Ordering Guides.



# AVR4000 AccuValve® Ordering Guide



**Valve Housing Material**

- 2** = 304SS, 20 Gauge
- 3** = 316SS, 20 Gauge
- 4** = Aluminum, 16 Gauge

**Size**

- 06** = 6" Diameter
- 08** = 8" Diameter
- 10** = 10" Diameter
- 12** = 12" Diameter
- 14** = 14" Diameter
- 18** = 12"h x 18"w
- 24** = 12"h x 24"w

**Options**

- Blank = No Options
- F** = Flanges
- I** = Insulation
- S** = Tight Shut-off\*
- W** = Wireless Bluetooth® Configuration
- \*Blade seals are standard on all 6" valves

**Actuator Type**

- 17** = Fail Last Position, 2-10v (Standard Speed)

## Additional Accutrol Product Reference

- ARS2 Room Sensor*
- ADS2 Duct Mounted Room Temperature and RH Sensor*
- DTS100 Duct Temperature Sensor*

Your representative is: