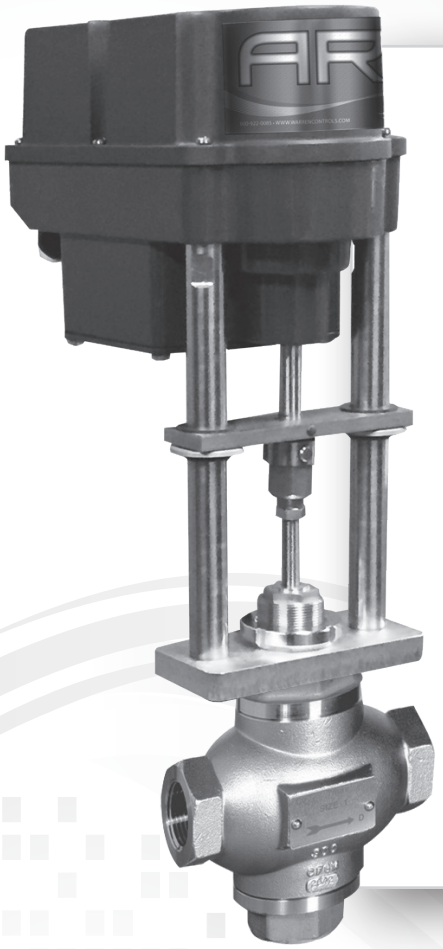
Fast Electrically Actuated Valves

FAIL-SAFE CONTROL VALVE FOR MODULATING CONTROL OF INSTANTANEOUS WATER HEATER & HEAT EXCHANGER APPLICATIONS



SERIES

ARIA

ADVANCED, RELIABLE, INDUSTRIAL ACTUATOR

MODELS

- **ARA** -3-Way ,Flanged Steel Mix Valves; 1/2″ - 2″
- **ARB** -2-Way & 3-Way, NPT Threaded Bronze & SS Valve; 1/2″ - 2″
- **ARC** -2-Way & 3-Way, Flanged, Cast Iron Valves; 2-1/2″ - 6″
- **ARD** -2-Way, Flanged Steel Cage Valves; 1/2″ - 2″

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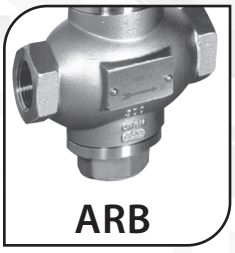


ARB PRODUCT SPEC

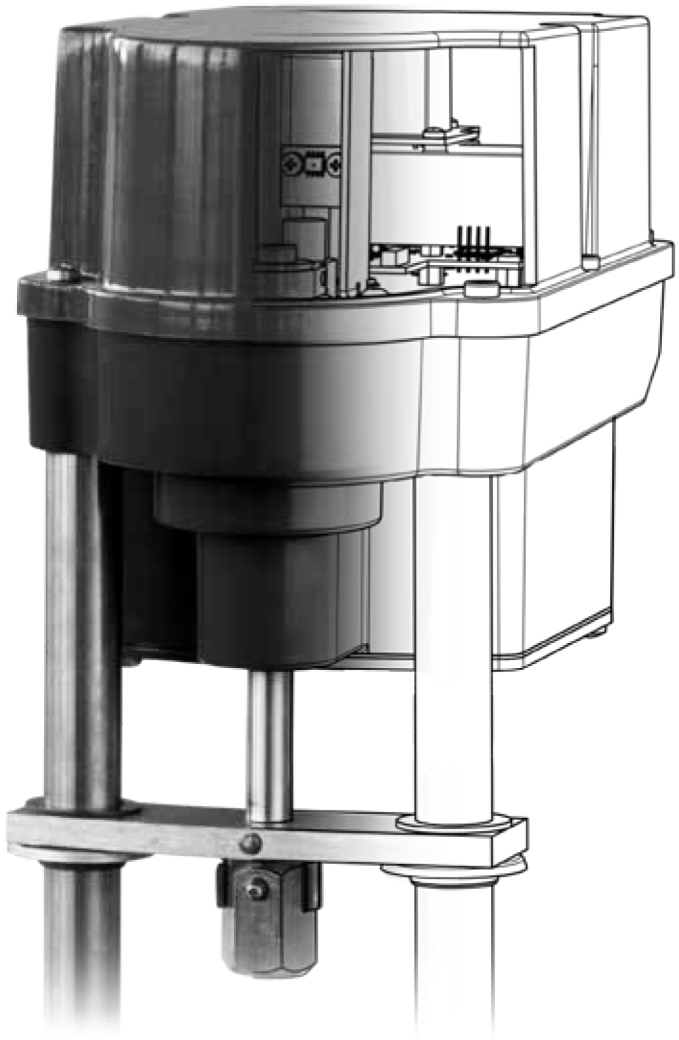
WARREN CONTROLS

2600 EMRICK BLVD • BETHLEHEM, PA 18020 • USA • 800-992-0085 • WWW.WARRENCONTROLS.COM

DEPENDABLE, RUGGED, PRECISION CONTROL VALVES AND ACCESSORIES

ARIA SERIES: small frame actuators

High Quality, Modulating, Linear, Industrial Electric Valve Actuator



WARREN CONTROLS INC.
A VETERAN OWNED, PRIVATELY HELD, SMALL BUSINESS
WARREN CONTROLS INC.

AGENCY APPROVALS

CRN REGISTERED	SEE TABLE ON PAGE 22

QAS INTERNATIONAL
ISO 9001:2015
REGISTERED FIRM

At 2mm/sec travel speed (12 seconds/inch), the ARIA Series Actuators incorporate spring-fail open or closed (model dependent) on loss of power or signal. The actuator is mounted onto the control valve via pillars and mounting base and attached via a yoke locknut. The actuator stem and valve stem are connected as well.

Based on a brushless DC motor (BLDC) the generated torque is transmitted via a multi-stage spur gear onto a spindle nut. The spindle nut transmits the input torque into an axial thrust force of 450 Lbf, via a spindle. The linear stroke is transmitted to the valve spindle by a coupling piece.

The stroke is measured and controlled by a linear 12 Bit Hall sensor. In case of mains power loss, the stroke movement is in OPEN or CLOSE direction by spring force. Electrical wiring is terminated at a terminal block under the actuator cover.

The ARIA Series actuated control valves are ideally suited for challenging, modulating, industrial processes that require electric actuation with the actuation speed and reliability of pneumatics.

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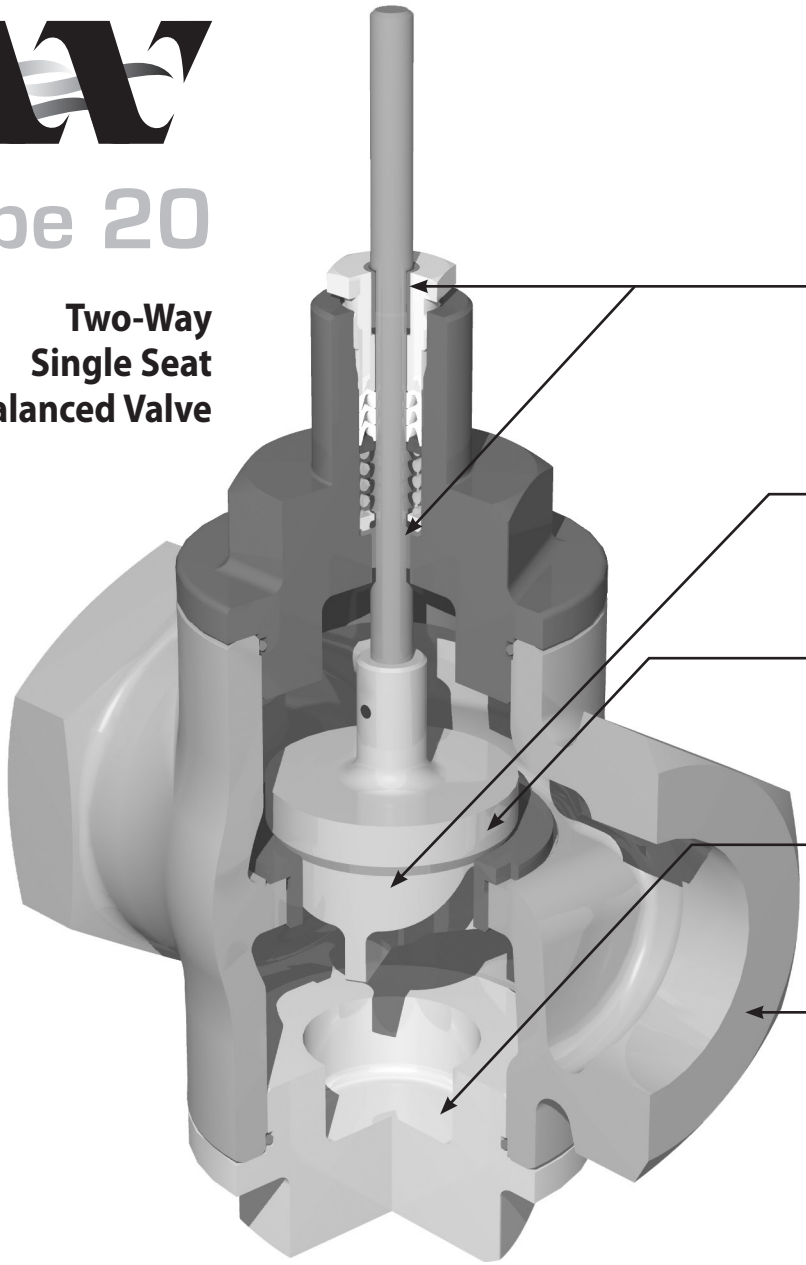
Type 20

Two-Way Single Seat Unbalanced Valve



Flexible Design Options provide optimum performance and extended reliability in a cost effective, application specific package.

Dual Point PEEK Bearing Stem Guiding provides both stability and low friction, yielding reduced hysteresis and optimum control.

Trim available in 316SS, 17-4 pH, Alloy 6, and PEEK.

Port Guided Plug Assembly provides stability and desired equal percentage flow characteristic.

Lower Plug offers easy access for inspection and clean out.

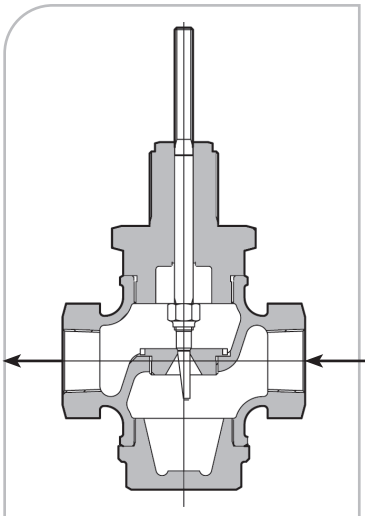
Rugged Body with a selection of port reductions.

FEATURES AND ADVANTAGES

RUGGEDNESS AND HIGH PERFORMANCE	
Features	**Advantages**
Compact rugged valve body	Reduces envelope size and weight without sacrificing pressure boundary integrity or high Cv's.
Precision manufactured valve components	Valve bodies machined in single operation in 4 axis computer numerical controlled horizontal machining centers. Bodies and trim components held to exacting geometric tolerances ensuring smooth reliable operation of finished valve.
Body materials	Standard body materials are Bronze & CF8M Stainless Steel.
Trim components	Durable rugged plug and seat construction shuts off tightly.
Equal %, Linear plug, or Low flow	Provides exceptional modulating control with 50:1 rangeability.
Reduced ports	Match valve size to line size and capacity to flow requirements. Maximizes performance. Prevents oversized valves. Simplifies piping. Reduces need for reducers or expanders. 1, 2, & 3 sizes reduced trim available.
Trim materials	Alloy 6 wrapped stainless steel trim promotes long dependable service life in applications controlling hard to handle fluids. 316 & 17-4PH stainless steel trim, PEEK soft seat trim available for ANSI Class VI shut-off in non-corrosive non-erosive service.
Oversized bearings and shafts	Ideal for high pressure drops.
Valve stem to plug connection	Rigid connection provides zero backlash. Assures minimum dead band and hysteresis.
Factory lubricated packing and valve stem	Minimizes hysteresis from packing friction.

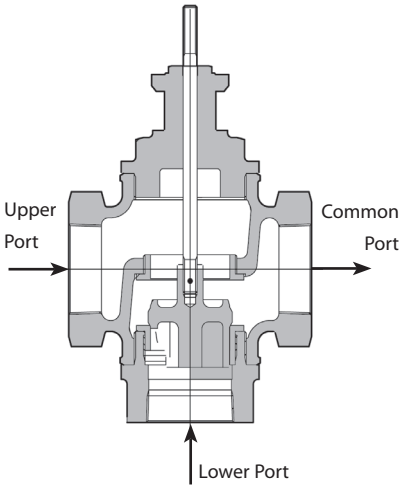
INCREASED SERVICEABILITY AND REDUCED MAINTENANCE	
Features	**Advantages**
Threaded NPT or Buttweld ends	Promote secure valve installations and piping integrity. Easy installation. Eliminate exposed line flange bolting. Shorten alignment and installation time.
ANSI Standard valve body	ANSI 250lb or 300lb Rating.
Roller burnished valve stem	Ultra smooth finish minimizes packing wear and maximizes life. Smooth function and minimum stick/slip.
Bonnet and packing nut bearings and stem wiper	Prevent external particles from infiltrating and damaging packing.

ESTABLISHED FEATURES & QUALITY	
Features	**Advantages**
Linear Control Valve	Combines reciprocating globe valve ruggedness with linear actuators to produce heavy duty automatic throttling control valve which dependably controls fluids in process industries.
Quality valve design & engineering	Components and materials designed and selected to meet or exceed demanding applications, specifications, functional and chemical and temperature compatibility requirements. Product quality built on tried and tested designs and engineering.
Fast electric actuators	Full valve travel in approximately 8 seconds, mimics performance of pneumatic actuators. Incorporates mechanical Spring-Fail for loss of power for open or closed. Available for 24 Vac/Vdc or 115/230 Vac power sources. Using all common process signals (0-10 Vdc, 2-10 Vdc, 0-20mA, 4-20 mA) the analog controls and feedback signals are galvanically isolated. Also offer flow curve correction and split-range inputs as options, all in an IP67 enclosure.
Factory testing and set-up	Each control valve undergoes careful set-up and thorough testing by our highly skilled and experienced factory assembly personnel to ensure it is pre-set for its specified service.



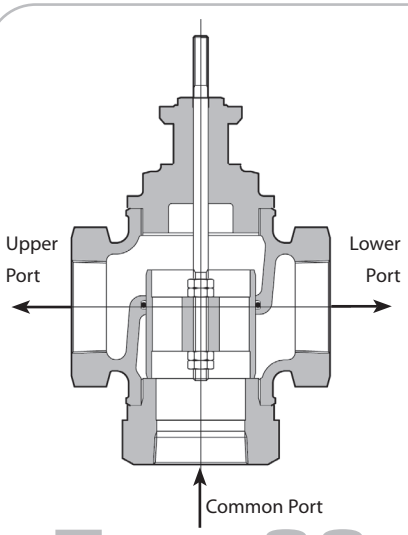
Type 28

Two-Way Single Seat Low Flow Unbalanced Valve



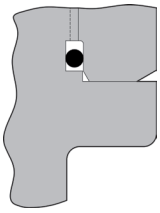
Type 30

Three-Way Mixing/ Bypass Valve

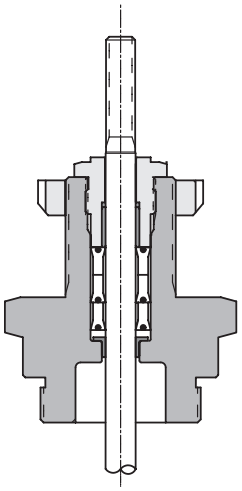


Type 32

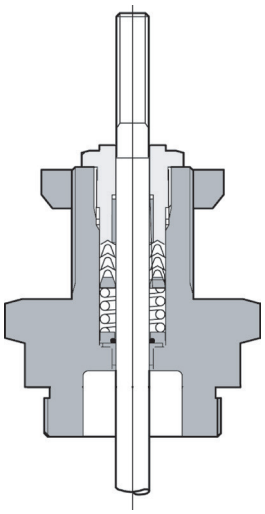
Three-Way Diverting Valve



Fluoraz O-Ring Upper and Lower Body Seals in Stainless Steel Body Valves



Long-Life Multi-Stack EPDM Lip Packing



Guided Low-Friction TFE V-Ring Packing Spring Loaded

Description:
Warren Controls Precision Globe Control Valves feature rugged bronze or stainless steel bodies with a variety of trim materials and port sizes. The equal percentage and linear plugs in the 2-way valves and linear plugs in the 3-way valves provide excellent modulating control of a wide variety of fluids for pressure, temperature, level, and flow applications from —20 to 450ºF. The AMB Series is ideally suited where value and long life are important objectives for applications including but not limited to the Chemical, Food & Beverage, General Service, Refining, District Energy, and Pharmaceutical Industries.

2-WAY VALVES
(Control of Liquids, Gases, and Steam)

Type 20 2-Way Single Seat Unbalanced Valve

The most commonly applied solution with ANSI Class IV and VI leakage rates. ***See Table on page 21 for Fluid Temperature Limits***

Sizes:	1/2, 3/4, 1, 1-1/4, 1-1/2, 2 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), or 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE) Stainless Steel body valves contain Fluoraz 797 O-Ring upper and lower body seals.*
Trim:	EQ% or Linear, 316 Stainless Steel, Alloy 6, PEEK, or 17-4 pH Hardened Stainless Steel
Leakage Rates:	ANSI Class IV (Stainless Steel and Alloy 6 Trim), ANSI Class VI (PEEK Trim)
Packing:	Long-Life Multi-Stack EPDM Lip Packing (EPDM Lip Packing is not suitable for use with oils, hydrocarbons, or acids.) Guided Low-Friction TFE V-Ring, Spring Loaded, Adjustable Graphite Packing
Rangeability:	50:1

Type 28 2-Way Single Seat Low Flow Unbalanced Valve

Low Flow Trim with ANSI Class IV and VI leakage rates.

See Table on page 21 for Fluid Temperature Limits

Sizes:	1/2, 3/4, 1 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE) Stainless Steel body valves contain Fluoraz 797 O-Ring upper and lower body seals.*
Trim:	Modified Linear, 316 Stainless Steel, or PEEK
Leakage Rates:	ANSI Class IV (Stainless Steel Trim), ANSI Class VI (PEEK Trim)
Packing:	Long-Life Multi-Stack EPDM Lip Packing (EPDM Lip Packing is not suitable for use with oils, hydrocarbons, or acids.) Guided Low-Friction TFE V-Ring, Spring Loaded
Rangeability:	40:1 for Cv 1.00 and 0.50 20:1 for Cv 0.25

Note: Fluoraz o-ring is not compatible with the following solvents: acetates, acetone, benzene, carbon tetrachloride, ethers, Freons, ketones, lacquers, methyl ethyl ketone, and toluene - Consult Factory with service conditions for alternate o-ring selection.

3-WAY VALVES
(Control of Liquids)

Type 30 3-Way Mixing/Bypass Valve

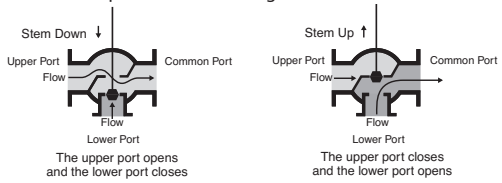
This valve has two inlets and one outlet, and is the simplest solution for mixing or bypass applications with an ANSI Class IV leakage rate. In normal applications the inlet pressures are near equal and control is possible from 5% to 95% of travel with inlet pressures up to 100 PSI.

See Table on page 21 for Fluid Temperature Limits

Sizes:	1/2, 3/4, 1, 1-1/4, 1-1/2, 2 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), or 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE) Stainless Steel body valves contain Fluoraz 797 O-Ring upper and lower body seals.*
Trim:	Linear, 316 Stainless Steel
Packing:	Long-Life Multi-Stack EPDM Lip Packing (EPDM Lip Packing is not suitable for use with oils, hydrocarbons, or acids.) Guided Low-Friction TFE V-Ring, Spring Loaded
Rangeability:	50:1

NOTE: The Type 30 Mixing/Bypass valve is designed for service with two inlets and one outlet. When it is ARIA actuated it cannot be offered for Reverse Flow / Diverting service.

Reverse flow would be, "Flow-Over-The-Plug", regardless of port. With the ARIA actuator, stroke in the spring-fail direction is driven by the actuator fail-spring with the gear train. As such, in this flow condition, with the flow stream flowing over the plug, the plug would slam into the seat and result in excessive trim wear or damage. As such, the ARIA / Type 30 valve is not possible for diverting service.

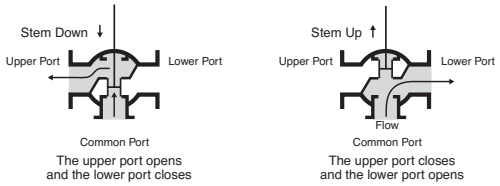


Type 32 3-Way Diverting Valve

Designed as a diverting valve with one inlet and two outlets with ANSI Class III leakage rate. The difference between the upper port and lower port pressure must not exceed 50 PSID.

See Table on page 21 for Fluid Temperature Limits

Sizes:	1, 1-1/2, 2 inch
Body:	ANSI B16.15 Bronze 250LB Threaded (NPT), or 316 Stainless Steel 300LB Threaded (NPT), or 316 Stainless Steel 300LB SCH 40 Buttweld (BWE) Stainless Steel body valves contain Fluoraz 797 O-Ring upper and lower body seals.*
Trim:	Linear, Bronze (Bronze 250LB Threaded), or 316 Stainless Steel (316 Stainless Steel 300LB Threaded or Buttweld)
Packing:	Long-Life Multi-Stack EPDM Lip Packing (EPDM Lip Packing is not suitable for use with oils, hydrocarbons, or acids.) Guided Low-Friction TFE V-Ring, Spring Loaded
O-Ring:	EPR (Bronze 250LB Threaded), Fluoraz 797 (316 Stainless Steel 300LB Threaded or Buttweld)*
Rangeability:	50:1



Body Pressure-Temperature Ratings (PSIG):		
Temp. (°F)	**250 THD Bronze**	**300 THD & BWE SS**
-20° To 100°F	400	720
150°	400	670
175°	392	645
200°	285	620
225°	375	605
250°	365	590
275°	350	575
300°	335	560
325°	317	548
350°	300	537
375°	275	526
400°	250	515
450°	-	497
500°	-	480

Pressure ratings are PSIG

For applications below 32°F, consult factory.

For applications above 375°F, the 300 THD Stainless Steel Body is recommended.

Body Pressure — Temperature Ratings conform to ANSI based on body rating and body material. As the fluid temperature increases, the maximum allowable internal pressure decreases. Verify maximum pressures and temperatures prior to selecting body material and body/flange rating.

Trim Materials	Flowing Differential Pressure Limit
Bronze	50 PSID
316 Stainless Steel	100 PSID
PEEK	100 PSID
17-4 pH Hardened Steel	200 PSID
Alloy 6	300 PSID

NOTE: Approaching limits for continuous use will reduce trim life. For continuous use, stay within half of rated maximum.

NOTE ON BEARINGS: PEEK Bearings should not be used for temperatures above 450°F or flowing differential pressure above 300 PSIG.

ALLOWABLE SEAT LEAKAGE CLASSES				
Leakage Class	**Maximum Seat Leakage**	**Test Fluid**	**Test Pressure**	**Relative Seat Tightness ****
ANSI Class IV	0.01% of rated CV	Water	45 to 60 PSI	50
ANSI Class VI	Class VI about 0.9 ml/min *	Air	50 PSI	600,000

* Leakage rate varies by valve size, Refer to the ANSI/FCI Standard 70.2.
** Relative to ANSI Class II Leakage Class Maximum Seat Leakage of 0.5% at rated Cv.

ANSI Class VI is reserved for soft seated valves, available with PEEK seat inserts.

ARB ATTRIBUTE SELECTION CRITERIA

TRIM STYLE

EQUAL % VS. LINEAR
Trim style describes how the plug's shape (style) changes a valve's capacity as the plug moves (travels) inside it. With the Equal % Trim Style, the shape of the plug produces an equal percentage change in capacity for each equal incremental change in travel. As a typical case this results in 3% of capacity at 10% of travel, 4.4% of capacity at 20% of travel, 6.7% of capacity at 30% of travel, on up to 100% of capacity at 100% of travel. With the Linear Trim Style, the shape of the plug produces a linear incremental change in capacity for each incremental change in travel. This results in 10% of capacity at 10% of travel, 20% of capacity at 20% of travel, 30% of capacity at 30% of travel, on up to 100% of capacity at 100% of travel. Compared to the Linear Trim Style, the Equal % Trim Style produces smaller capacities for equal travels. This makes the Equal % Trim Style better suited for flows that are a small percentage of its total capacity, which may occur if the valve is not operating near full capacity, or when flows vary widely over time. The Linear Trim Style is better suited for flows that are a larger percentage of its total capacity which may occur if the valve is operating near full capacity and flows are more steady over time.

MODIFIED LINEAR
Trim style describes how the plug's shape (style) changes a valve's capacity as the plug moves (travels) inside it. With the Modified Linear Trim Style, the shape of the plug produces an incremental change in capacity that falls between that of the EQ% and Linear Trim Styles. This results in 5% of capacity at 10% of travel, 11% of capacity at 20% of travel, 17% of capacity at 30% of travel, on up to 100% of capacity at 100% of travel. This makes the Modified Linear Trim Style suitable for flows ranging from a small to large a percentage of its total capacity.

TRIM MATERIAL

316 STAINLESS STEEL
316 stainless steel is our most common and lowest cost trim material choice. 316 stainless steel trim is suitable for flowing differential pressures up to 100 psig, is capable of tight Class IV and Class IV+ leakage ratings, is corrosion resistant to many fluids, but is less erosion resistant than Alloy 6 wrapped trims. It contains nickel and molybdenum, and a greater amount of chromium, making it more corrosion resistant than 400 series stainless steel

PEEK SOFT SEAT
PEEK remains harder than TFE at higher temperatures making it our most durable choice for a resilient trim material. PEEK soft seat trim is suitable for flowing differential pressures up to 100 PSIG and temperatures to 450°F, is capable of our tightest Class VI leakage rating, is corrosion resistant to many fluids, but is much less erosion resistant than other trim materials. PEEK soft seat trim is not recommended for use in valves with socket weld end connections. When the valve is being installed in the piping, the heat generated by the welding process may damage the soft seat. Consult the factory if the application requires a soft seat in a valve with a socket weld end connection.

ALLOY 6 WRAPPED 316 STAINLESS STEEL
Alloy 6 wrapped 316 stainless steel is an extremely durable choice for trim material. Alloy 6 wrapped trim is suitable for flowing differential pressures up to 300 psig, is capable of tight Class IV leakage rating. While somewhat corrosion resistant, Alloy 6 wrapped trim is particularly well suited to wear longer in a cavitation prone environment. Alloy 6 wrapped 316 stainless steel is more corrosion resistant, but less erosion resistant, than Alloy 6 wrapped 400 stainless steel trim.

17-4 PH STAINLESS STEEL
17-4 PH stainless steel is our most durable stainless steel trim material choice. 17-4 PH stainless steel trim is suitable for flowing differential pressures up to 200 PSIG, is capable of tight Class IV and Class IV+ leakage ratings, is corrosion resistant to many fluids, but is less erosion resistant than Alloy 6 wrapped trims. 17-4 PH stainless steel contains a greater amount of carbon, so it can be heat treated, making it harder and more erosion resistant than 316 stainless steel.

BRONZE
Bronze trim is reserved for low differential pressure water service or steam, 15 PSI or less.

PACKING TYPE

TEFLON V-RING
Teflon v-ring packing is the most common choice for steam and most chemical applications. Teflon v-ring packing is good from 60°F to 450°F. TFE v-ring packing is not suitable for service below 60°F.

EPDM LIP
EPDM lip packing is commonly used for water packing. EPDM lip packing is good from -20°F to 450°F. EPDM lip packing is not suitable for fluids containing or contaminated with oil. For applications from 32°F to -20°F when condensation on the stem can turn to ice (consult factory) an optional stem heater is also recommended.

VACUUM SERVICE
Vacuum service packing is teflon v-ring packing that is designed for use when the pressure inside the valve is lower than the atmospheric pressure outside the valve. Like teflon v-ring packing, vacuum service packing is good from 60°F to 450°F. Vacuum service packing is not suitable for service below 60°F.

ADJUSTABLE GRAPHITE
Adjustable graphite is our most durable packing choice for when other choices are incompatible. The temperature limit exceeds the temperature limits of the pressure boundary, -20°F to 450°F.

BONNET CONSTRUCTION

PEEK BEARINGS
Bonnet constructions using PEEK Bearings are our most common and lowest cost choices for water and chemical applications. PEEK bearings are good to 450°F. PEEK Bearings are used with EPDM lip, teflon v-ring, graphite, or vacuum service packing.

ARIA SERIES: small frame actuators

Fast-Acting, Modulating, Linear, Industrial Electric Valve Actuator

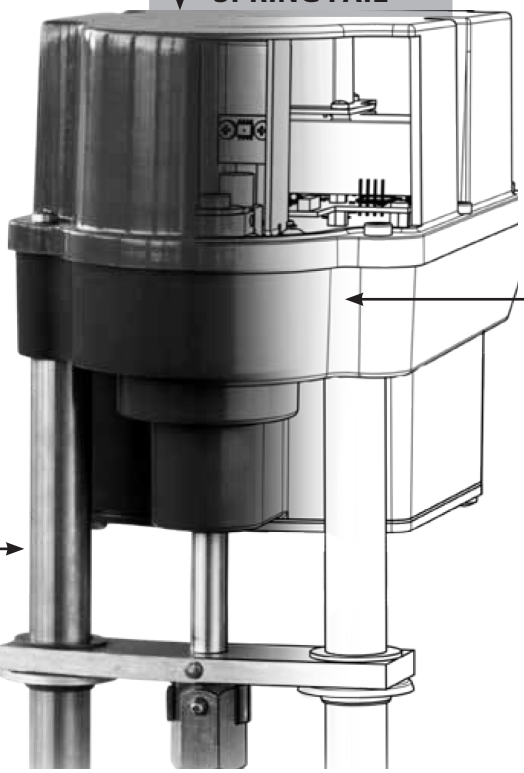
For smaller sized control valves, this compact design packs a nice set of features at an economical price point. The Brushless DC motor ensures long life.

Robust industrial design with polycarbonate cover, enclosure IP67

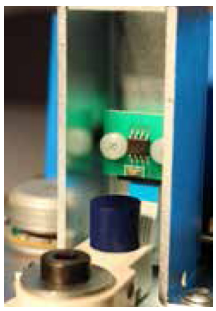
Compact design with low installation height, durable aluminium gearbox

Integrated power spring for fail safe function in case of loss of power supply, either extending or retracting actuator stem

SPRING FAIL



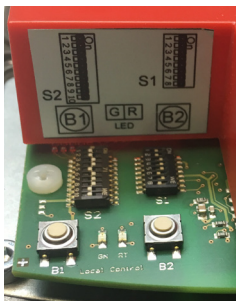
DESIGN FEATURES



Contactless, non-wearing travel detection with Hall sensor for exact positioning

Brushless DC motor (BLDC). Controller with integrated positioner function. Status display and automatic commissioning

Manual operation with push buttons or handwheel. Parameter setting via DIP switches



ADDITIONAL ARIA SPECIFICATIONS

Power Supply	24 VAC/DC, optionally wide range power supply (100-240 VAC)
Motor Protection	Electronic motor current monitoring with safety cut-off
Duty cycle as per IEC 60034-1,8	S2 30 min / S4 1200c/h - 50% ED
Isolation	Galvanically isolated inputs and outputs
Permitted ambient temperature	-4°F to 140°F (-20 to +60°C)
Signal to Stroke Resolution	~2000 Parts to full scale stroke
Accuracy	±0.1 mA or ±50 mV
Linearity	±1.0%
Repeatability	±0.2%
Internal fault monitoring	Thrust, set value, temperature, power supply
Binary control	24 - 230 VAC for ON/OFF service
Control Signal and Feedback	0-20 mA, 4-20 mA, 0-10 V, 2-10 V, selectable (or split - ranges)
Mounting position	Any position, except below horizontal
Conduit entries	Up to 3 each 1/2 NPT
Enclosure Rating	NEMA 4X/IP67
Cover material	Polycarbonate
Gear case material	High quality aluminium die casting, powder-coated (60 µm thickness)
Pillar material	Steel 1.4104

	UNITS	SPECIFICATIONS
Thrust / Force	(Lbf)	450
MAX Stroke	(Inches)	1.31
Pillar distance, C to C	(Inches)	4
Weight, approx. kg 5.6	(Lbs.)	12.3
Stroke Speed	(Secs / Inch)	12
Approximate Height	(Inches)	11
Approx. clearance above to remove cover	(Inches)	3.25
Manual Override		Electrically via 2 push buttons
What happens under the condition of:		
Overvoltage/Undervoltage on the power supply or loss of power		Actuator engages Spring Fail, to Open or Closed, depending on model
Loss of Analog Control Signal		Actuator engages Spring Fail, to Open or Closed, depending on model
Loss of Binary Input Control Signal		Actuator stops in position when event occurs
Loss of Binary Override		Actuator responds to Analog Control Signal

ENERGY CONSUMPTION

ELECTRIC PARAMETER	UNITS	POWER SUPPLY VOLTAGE			
		115 VAC	230 VAC	24 VAC	24 VDC
Nominal Current	(Amps)	0.2	0.4	2.0	1.2
Max Current	(Amps)	0.2	0.4	2.0	1.2
Power Consumption	(Watts)	28	28	28	27

FACTORY DEFAULT SOFTWARE SETTINGS & ALTERNATE SOFTWARE SETTINGS

Control Signal:
- 4-20 mA (2-10 Vdc, wiring dependent) <FACTORY DEFAULT>
- 0-20 mA (0-10 Vdc, wiring dependent)

Control Action:
- Decreasing Signal Closes valve (2-way) closes Lower Port (3-Way) <FACTORY DEFAULT>
- Increasing Signal Opens valve (2-way) opens Lower Port (3-Way)

Feedback Signal:
- 4-20 mA (2-10 Vdc, wiring dependent) <FACTORY DEFAULT>
- 0-20 mA (0-10 Vdc, wiring dependent)

Feedback Action:
- Closing Valve (2-way), Lower Port Closing (3-Way); Decreases Signal <FACTORY DEFAULT>
- Closing Valve (2-way), Lower Port Closing (3-Way); Increases Signal

Control Signal Ranges:
- 4-20 mA (2-10 VDC) <FACTORY DEFAULT>
- 0-20 mA (0-10 VDC)
- 12-20 mA (6-10 VDC) Split Range HIGH
- 10-20 mA (5-10 VDC) Split Range HIGH
- 4-12 mA (2-6 VDC) Split Range LOW
- 0-10 mA (0-5 VDC) Split Range LOW

} Split-Range capability for parallel high/low valve configurations

Flow Curve Correction:
- Travel is Linear w/Signal <FACTORY DEFAULT>
- Travel is Quick Opening w/Signal

BLANKETS & ACTUATOR ORIENTATION

Fluid Temperature Limit Thresholds

The engineering data within our product specification will share information about MAX fluid temperature limits as if it is an absolute for any configurable valve assembly. It is not. The MAX fluid temperatures listed, sometimes as high as 800°F depending on the valve, is only an absolute one for the valve body itself. It does not take into consideration the actuation or accessories. Actuators and accessories each have their own MAX ambient temperature limits that may be anywhere from 122°F to 250°F depending on the items for the electronics or soft goods these items contain. ***It is nearly impossible to correlate JUST fluid temperature to determine when any of these actuators or accessories will have their ambient exceeded.***

Predicting Safe Fluid Temperatures for Actuators & Accessories

THERE ARE SEVERAL FACTORS THAT DETERMINE FLUID TEMPERATURE LIMIT THRESHOLDS WHICH INCLUDE BUT ARE NOT LIMITED TO:

- valve size
- actuator orientation
- room ambient temperature
- distance from the valve body to the components of interest
- bonnet style/size
- conducted heat versus radiated heat
- ventilation

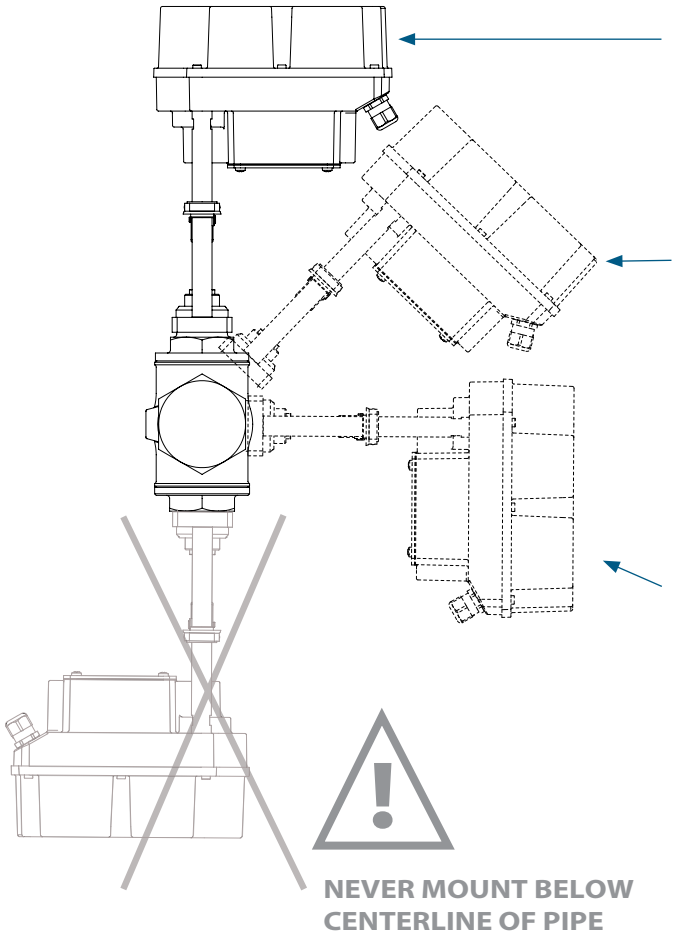
With all of these variables it is a challenge to come up with reliable guidelines.

However, we have attempted to do that in the table that follows on page 14. Realize these are only guidelines.

Actuator Mounting VS *Insulating Blankets*

When working with higher fluid temperatures, thermal insulating blankets can ***dramatically reduce surface temperatures on pipes, valves and other fixtures*** in a fluid control system such that the ambient room temperatures in these environments are dramatically reduced as well. This is often required for valve actuators and accessories to reliably survive when fluid temperatures rise well above the safe ambient temperatures of the devices. Radiant heat and convected heat are the major sources for damage to these actuators and accessories. When a valve actuator is mounted to the side of a valve there is still radiant heat, but convected heat is mostly eliminated. ***For globe control valves, having the actuator mounted vertically above the valve is best for optimum valve packing life but will then suffer the most with both radiant and convected heat to deal with.*** Alternatives to blankets and the mounting orientation listed include longer yoke actuators and extension bonnets on valves. These put distance between the heat sources and the components you are trying to protect from heat.

Actuator Mounting Orientations



VERTICAL ABOVE PIPING

This is the recommended position for mounting as it is the best position to ensure the service life of the equipment; however this is where it will encounter the most heat and sound vibrations.

45° FROM VERTICAL ABOVE PIPING ON EITHER SIDE

You may mount in this position to try to reduce the heat in high temperature applications; however this will reduce the life of the packing.

90° TO PIPING HORIZONTAL ON EITHER SIDE

This orientation provides the best temperature relief w/higher fluid temperatures but places the greatest strain on the valve packing, reducing packing life.

The table that follows on page 14 will identify temperature ranges, valve size ranges, actuator orientation and use of thermal blankets to determine what is required to get longevity out of your actuators.

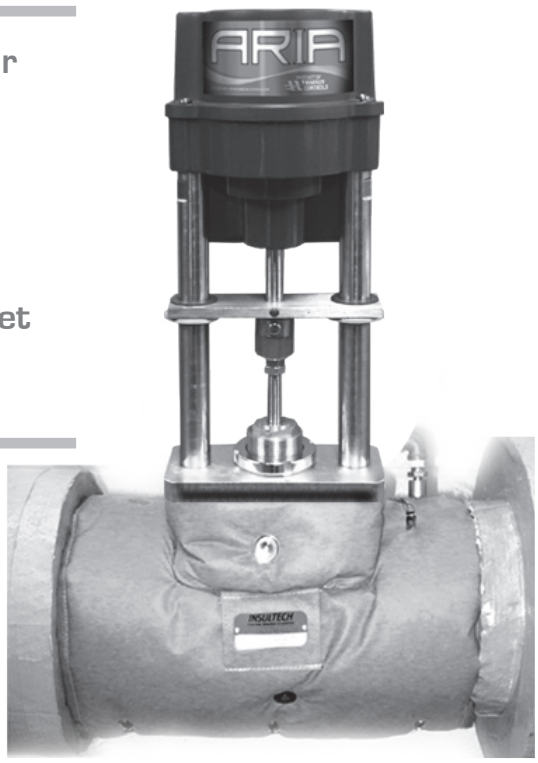
Choose the right blanket

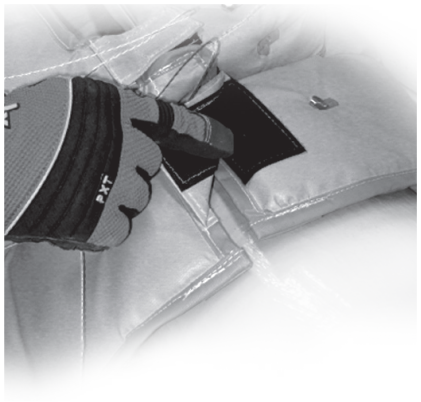
ACOUSTIGUARD™ VS THERMIGUARD™

At Warren Controls our ***AcoustiGuard™ & ThermiGuard™*** blankets are nearly identical. In fact, they have identical thermal properties. The ***AcoustiGuard™*** has an additional layer of high density barium sulfate vinyl reflector for sound reflection. Each blanket is specifically designed in a one or two piece design that is made to be easily removable for valve servicing. When used in conjunction with high temperature fluids, significant energy savings, lower surface and ambient temperatures and a ***safer environment for employees*** are just some of the benefits.

BLANKETS & ACTUATOR ORIENTATION

Whether you need to lower your mechanical room temperature, protect your actuator, avoid getting burned, reduce harmful noise or save energy, our blanket wraps are your solution!





AcoustiGuard™ & ThermiGuard™ are custom fit high quality insulation blanket systems pre-engineered to either reduce harmful noise or save energy by retaining radiant heat. Both are designed to improve the surrounding work environment. While ***AcoustiGuard™*** is designed to act as a "sound attenuation" and thermal barrier, ***ThermiGuard™*** is capable of withstanding weather conditions and chemical environments. Both are capable of withstanding maximum service temperatures of 450°F (***AcoustiGuard™ & ThermiGuard™***) or up to 800°F with the High Temperature option. Any piece will not exceed 40 pounds. ***AcoustiGuard™*** comes with two fastening options: Lacing Pins or Metal "D" Ring Strap with Velcro Tab. In addition to these fastening options, ***ThermiGuard™*** comes with two additional fastening options: Velcro Flaps & Side Release Buckles. The ***AcoustiGuard™ & ThermiGuard™*** products are designed to be flexible and easier to install, easy to remove and reinstall, allowing quick access and easy equipment serviceability.

- ***EASY TO INSTALL AND REINSTALL***
- ***CAN WITHSTAND UP TO 450°F OR 800°F***
- ***MULTIPLE FASTENING OPTIONS***

AcoustiGuard Insertion Loss Sound Pressure Levels

107 dBA Source	A-Weighted Measurements	Linear Weighted Measurements
Test Frequency (In Hz)	Noise Reduction (In dBA)	Insertion Loss (In dBA)
100	13	13
125	14	13
160	13	13
200	13	13
250	13	12
315	15	15
400	19	19
500	25	25
630	26	33
800	39	39
1000	38	39
1250	42	42
1600	43	43
2000	43	43
2500	44	44
3150	45	44
4000	44	45
5000	46	45

Fluid Temperature Limit Guidelines

ARIA SERIES • MODEL: ARB

Ensures reliable, long-term performance of electric actuator.

STANDARD BONNET

ACTUATOR ORIENTATION	***Valves: 1/2" - 2"***
	FLUID TEMPERATURE LIMIT
Above the Valve	300°F
45° To the Side of the Valve	325°F
Either way w/ ThermiGuard*	400°F (Bronze) / 450°F (CF8M)

**Custom Fit Insulating Blankets, assumes pipes are insulated as well.*

These are simply rough guidelines and not absolute thresholds.

As a matter of reliability, for all steam applications ABOVE 52 PSI (300°F), Warren Controls will require the use of a Thermiguard Insulating Blanket when actuator orientation is directly above the valve. Alternatively, the customer can opt in writing that they will take the responsibility for insulating the valve, and/or alternate actuator orientations.

THE MAXIMUM PERMITTED RUNNING AMBIENT TEMPERATURE FOR THE ARIA ACTUATOR IS 140°F (60°C).

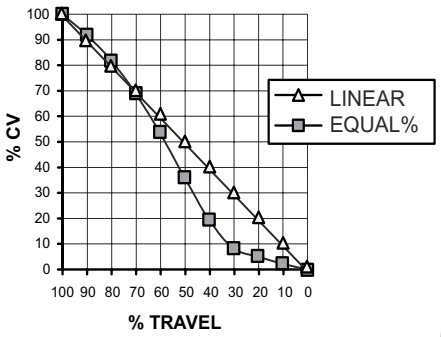
IF AN OVER-TEMPERATURE EVENT OCCURS, THE ACTUATOR WILL STILL FAIL TO ITS PRESCRIBED FAILURE MODE.

VALVE Type 20 FLOW COEFFICIENTS (Cv) 2-Way Single Seat Unbalanced Valve

Valve Size (IN)	Trim Style	Trim Size (IN)	Port Size	%Travel 100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
1/2	EQ%	0.876	FULL	4.90	4.78	3.53	2.57	1.92	1.20	0.95	0.69	0.43	0.17
		0.876	1SR	3.20	3.16	2.29	1.61	1.19	0.75	0.51	0.39	0.26	0.13
		0.626	2SR	1.50	1.44	0.96	0.72	0.52	0.42	0.31	0.21	0.10	0.06
	LINEAR	0.876	FULL	6.00	5.40	4.80	4.20	3.60	3.00	2.40	1.80	1.20	0.60
3/4	EQ%	0.876	FULL	7.20	7.09	5.53	3.51	2.53	1.73	1.24	0.88	0.52	0.27
		0.876	1SR	5.50	5.31	3.73	2.64	1.95	1.21	0.96	0.70	0.43	0.17
		0.876	2SR	3.30	3.30	2.34	1.63	1.20	0.75	0.51	0.39	0.26	0.13
		0.626	3SR	1.50	1.45	0.96	0.73	0.52	0.42	0.31	0.21	0.10	0.06
	LINEAR	0.876	FULL	7.20	6.48	5.76	5.04	4.32	3.60	2.88	2.16	1.44	0.72
1	EQ%	1.126	FULL	10.0	9.70	6.52	4.40	2.82	2.04	1.36	0.81	0.55	0.30
		0.876	1SR	8.60	8.38	6.09	3.64	2.58	1.74	1.25	0.89	0.52	0.27
		0.876	2SR	6.00	5.79	3.88	2.70	1.97	1.22	0.96	0.70	0.43	0.17
		0.876	3SR	3.40	3.41	2.38	1.64	1.20	0.75	0.51	0.39	0.26	0.13
		0.626	4SR	1.50	1.46	0.97	0.73	0.53	0.42	0.31	0.21	0.10	0.06
	LINEAR	1.126	FULL	10.0	9.00	8.00	7.00	6.00	5.00	4.00	3.00	2.00	1.00
1-1/4	EQ%	1.438	FULL	16.0	15.5	10.4	7.04	4.51	3.26	2.18	1.30	0.88	0.48
		1.126	1SR	10.0	9.70	6.52	4.40	2.82	2.04	1.36	0.81	0.55	0.30
		0.876	2SR	8.60	8.38	6.09	3.64	2.58	1.74	1.25	0.89	0.52	0.27
		0.876	3SR	6.00	5.79	3.88	2.70	1.97	1.22	0.96	0.70	0.43	0.17
		0.876	4SR	3.40	3.41	2.38	1.64	1.20	0.75	0.51	0.39	0.26	0.13
	LINEAR	1.676	FULL	17.2	15.5	13.8	12.0	10.3	8.60	6.88	5.16	3.44	1.72
1-1/2	EQ%	1.676	FULL	24.0	22.5	19.7	15.1	10.3	7.30	4.90	3.20	1.90	0.90
		1.438	1SR	16.0	15.5	10.4	7.04	4.51	3.26	2.18	1.30	0.88	0.48
		1.126	2SR	10.0	9.70	6.52	4.40	2.82	2.04	1.36	0.81	0.55	0.30
		0.876	3SR	8.60	8.38	6.09	3.64	2.58	1.74	1.25	0.89	0.52	0.27
		0.876	4SR	6.00	5.79	3.88	2.70	1.97	1.22	0.96	0.70	0.43	0.17
	LINEAR	1.676	FULL	18.0	16.2	14.4	12.6	10.8	9.00	7.20	5.40	3.60	1.80
2	EQ%	2.126	FULL	40.0	37.1	33.1	27.3	19.8	13.2	8.50	5.30	2.80	1.10
		1.676	1SR	24.0	22.5	19.7	15.1	10.3	7.30	4.90	3.20	1.90	0.90
		1.438	2SR	16.0	15.5	10.4	7.04	4.51	3.26	2.18	1.30	0.88	0.48
		1.126	3SR	10.0	9.70	6.52	4.40	2.82	2.04	1.36	0.81	0.55	0.30
		0.876	4SR	8.60	8.38	6.09	3.64	2.58	1.74	1.25	0.89	0.52	0.27
	LINEAR	2.126	FULL	37.0	33.3	29.6	25.9	22.2	18.5	14.8	11.1	7.40	3.70

Type 20

TYPICAL FLOW CURVES

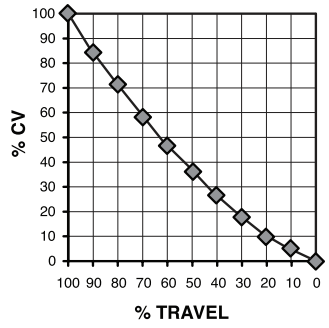


VALVE Type 28 FLOW COEFFICIENTS (Cv) 2-Way Single Seat Low Flow Unbalanced Valve

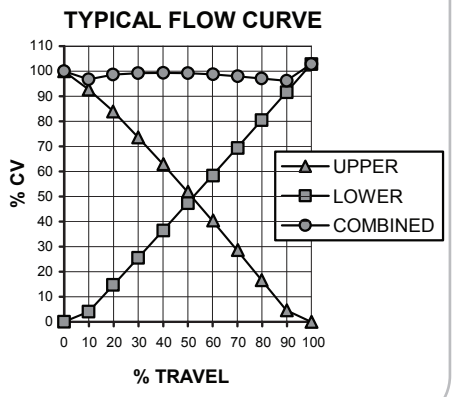
Valve Size (IN)	Trim Style	Trim Size (IN)	Port Size	%Travel 100%	90%	80%	70%	60%	50%	40%	30%	20%	10%
1/2	MODIFIED LINEAR	0.250	FULL	1.00	0.85	0.72	0.58	0.47	0.36	0.26	0.17	0.10	0.05
			1SR	0.50	0.43	0.36	0.29	0.23	0.18	0.13	0.09	0.05	0.03
			2SR	0.25	0.21	0.18	0.15	0.12	0.09	0.07	0.04	0.03	0.01
3/4	MODIFIED LINEAR	0.250	FULL	1.00	0.85	0.72	0.58	0.47	0.36	0.26	0.17	0.10	0.05
			1SR	0.50	0.43	0.36	0.29	0.23	0.18	0.13	0.09	0.05	0.03
			2SR	0.25	0.21	0.18	0.15	0.12	0.09	0.07	0.04	0.03	0.01
1	MODIFIED LINEAR	0.250	FULL	1.00	0.85	0.72	0.58	0.47	0.36	0.26	0.17	0.10	0.05
			1SR	0.50	0.43	0.36	0.29	0.23	0.18	0.13	0.09	0.05	0.03
			2SR	0.25	0.21	0.18	0.15	0.12	0.09	0.07	0.04	0.03	0.01

Type 28

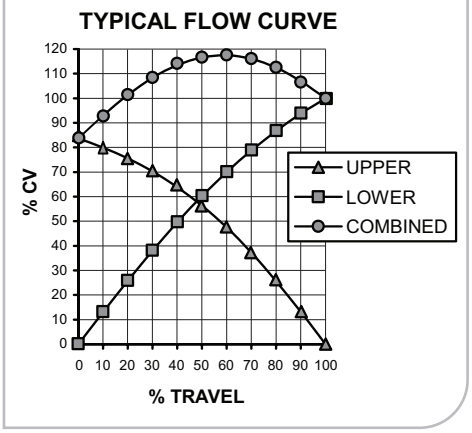
TYPICAL FLOW CURVE



Type 30 Mixing/Bypass



Type 32 Diverting



3-Way Valves (Control of Liquids)

VALVE **Type 30** FLOW COEFFICIENTS (CV) 3-Way Mixing/Bypass Valve

Valve Size (IN)	Trim Style	Trim Size (IN)	Port Size	Travel 100%
1/2	LINEAR	1.126	FULL	6.30
		0.876	1SR	4.00
		0.626	2SR	2.00
		0.626	3SR	1.00
3/4	LINEAR	1.126	FULL	8.20
		0.876	1SR	4.00
		0.626	2SR	2.00
		0.626	3SR	1.00
1	LINEAR	1.126	FULL	10.0
		0.876	1SR	4.00
		0.626	2SR	2.00
		0.626	3SR	1.00
1-1/4	LINEAR	1.676	FULL	18.5
		1.126	1SR	10.0
1-1/2	LINEAR	1.676	FULL	20.0
		1.126	1SR	10.0
2	LINEAR	2.126	FULL	40.0
		1.676	1SR	20.0

VALVE **Type 32** FLOW COEFFICIENTS (CV) 3-Way Diverting

Valve Size (IN)	Trim Style	Travel 100%	
		Upper	Lower
1	LINEAR	12	15
1-1/2	LINEAR	22	26
2	LINEAR	40	47

ARB Close-Off ΔP Ratings

NOTES:
1) Type 20 leakage rates are ANSI Class IV (Stainless Steel Trim and Alloy 6 Trim), ANSI Class VI (PEEK Trim) Type 28 leakage rates are ANSI Class IV (Stainless Steel Trim), ANSI Class VI (PEEK Trim).

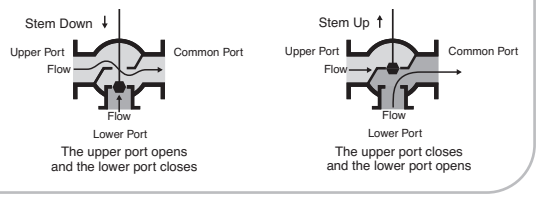
2) Inlet pressure **cannot** exceed Body Pressure-Temperature Rating.

Close-off values are for valves with TFE or EPDM packing. For valves with Graphite packing, contact factory for Close-offs.

VALVE				TYPE 20 CLOSE-OFF ΔP (PSIG) 2-WAY SINGLE SEAT UNBALANCED
Trim Size (IN)	Valve Size (IN)	Cv Rating	Plug Travel (IN)	Fail Open or Closed
0.626	1/2" thru 1-1/4"	See Tables	3/4	720
0.876	1/2 thru 2"	See Tables	3/4	519
1.126	1" thru 2"	See Tables	3/4	298
1.438	1-1/4" thru 2"	See Tables	3/4	171
1.676	1-1/4" thru 2"	See Tables	3/4	119
2.126	2"	See Tables	3/4	66

VALVE			TYPE 28 CLOSE-OFF ΔP (PSIG) 2-WAY, SINGLE SEAT LOW FLOW, UNBALANCED
ValveSize (IN)	Cv Rating	Plug Travel (IN)	Fail Open or Closed
1/2 thru 1" (All Ports)	See Cv Tables	3/4	720

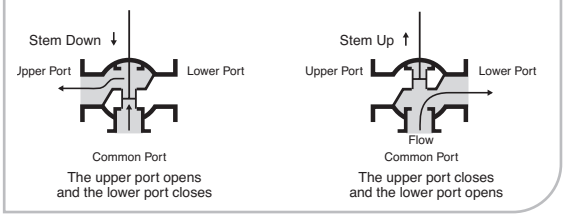
ARB, TYPE 30
Three-Way Mixing/Bypass Valve



VALVE				TYPE 30 CLOSE-OFF (PSIG) ΔP 3-WAY MIXING/BYPASS VALVE	
Trim Size (IN)	Valve Size (IN)	Cv Rating	Plug Travel (IN)	Fail Lower Port Open or Closed	
				Lower Port	Upper Port
0.626	1/2" thru 1"	See Tables	9/16	720	720
0.876	1/2" thru 1"	See Tables	9/16	519	592
1.126	1/2" thru 2"	See Tables	9/16	298	343
1.676	1-1/4" thru 2"	See Tables	3/4	119	139
2.126	2"	See Tables	3/4	66	78

NOTES:
1) Type 30 Mixing Valves have two inlets and one outlet. Published shut-off values are with respect to worst case conditions with zero downstream pressure on the outlet port and zero upstream pressure on the opposing inlet port.
2) Type 30 leakage rate is ANSI Class IV.
3) Inlet pressure **cannot** exceed Body Pressure-Temperature Rating.

ARB, TYPE 32
Three-Way Diverting Valve



VALVE			TYPE 32 CLOSE-OFF ΔP (PSIG) 3-WAY DIVERTING	
Valve Size (IN)	Cv Rating	Plug Travel (IN)	Fail Lower Port Open or Closed	
			Lower Port	Upper Port
1"	12 / 15	3/4	100	100
1-1/2"	22 / 26	3/4	100	100
2"	40 / 47	3/4	100	100

NOTES:
1) Published shut-off values are for diverting applications. The values are worst case and based on the pressure difference between the inlet and the outlet that is closed. Consult the factory if the required shut-off exceeds the published value and the pressure at the inlet and both outlets is known. For proper operation in diverting applications, the pressure difference between both outlets must not exceed 50 PSI.
2) Type 32 leakage rate is ANSI Class II.
3) Inlet pressure **cannot** exceed Body Pressure-Temperature Rating.

****PIPING NOTE***: The Type 32 is **NOT** compatible with an elbow directly connected to or in close proximity to the common port without the use of a flow straighter. Otherwise a minimum of 10 diameters of straight pipe are required for the common port connection.

STEAM TABLE					
Steam Pressure	Temp. °F	Temp. °C	Sensible Heat BTU/Lb.	Latent Heat BTU/Lb.	Total Heat BTU/Lb.
0	212	100	180	971	1151
10	239	115	207	952	1159
25	266	130	236	934	1170
50	297	147	267	912	1179
75	320	160	290	896	1186
100	338	170	309	881	1190
125	353	178	325	868	1193
150	365	185	339	858	1197
200	387	197	362	838	1200
250	406	208	381	821	1202
300	422	217	399	805	1204
400	448	231	438	778	1216
500	470	243	453	752	1205
600	489	254	475	729	1204

Rectangular Tank Capacity in Gallons

$$\text{Gallons} = \frac{\text{Height x Width x Length (inches)}}{230}$$

or

Gallons = H x W x L (Ft.) x 7.5

Circular Tank Storage Capacity in Gallons

Storage = $6D^2$ x L (Gallons)

Where:
D = Tank Diameter in Feet
L = Length in Feet

Heating Water with Steam

Quick Method

$$\text{Lbs./Hr.} = \frac{\text{GPM}}{2} \times \Delta T$$

Accurate Method

$$\text{Lbs./Hr.} = \frac{\text{GPM} \times 500 \times \Delta T}{h_{fg}}$$

Heating or Cooling Water with Water

$$GPM_1 = GPM_2 \times \frac{\text{°F water}_2 \text{ temp. rise or drop}}{\text{°F water}_1 \text{ temp. rise or drop}}$$

Heating or Cooling Water

$$\text{GPM} = \frac{\text{BTU / Hr.}}{(\text{°F water temp. rise or drop}) \times 500}$$

Heating Oil with Steam

$$\text{Lbs./Hr.} = \frac{\text{GPM}}{4} \times (\text{°F oil temp. rise})$$

Conversion Factors

1 Lb. Steam / Hr. =	1000 BTU / Hr.
1 Cubic Meter =	264 U.S. Gallons
1 Cubic Foot Water =	62.4 Lbs.
1 PSI =	2.04 Inches of Mercury
1 PSI =	2.3 Feet of Water
1 PSI =	27.7 Inches of Water
1 U.S. Gallon Water =	231 Cubic Inches
1 U.S. Gallon Water =	8.33 Lbs.

Heating Air with Water

$$\text{GPM} = 2.16 \times \frac{\text{CFM x (°F air temp. rise)}}{1000 \times (\text{°F water temp. drop})}$$

Heating Liquids with Steam

$$\text{Lbs./Hr.} = \frac{\text{GPM} \times 60 \times Cp \times W}{h_{fg}} \times \Delta T$$

Heating Liquids in Steam Jacketed Kettles

$$\text{Lbs./Hr.} = \frac{\text{Gallons} \times Cp \times S \times 8.33}{h_{fg} \times t} \times \Delta T$$

General Liquid Heating

$$\text{Lbs./Hr.} = \frac{W \times Cp}{h_{fg} \times t} \times \Delta T$$

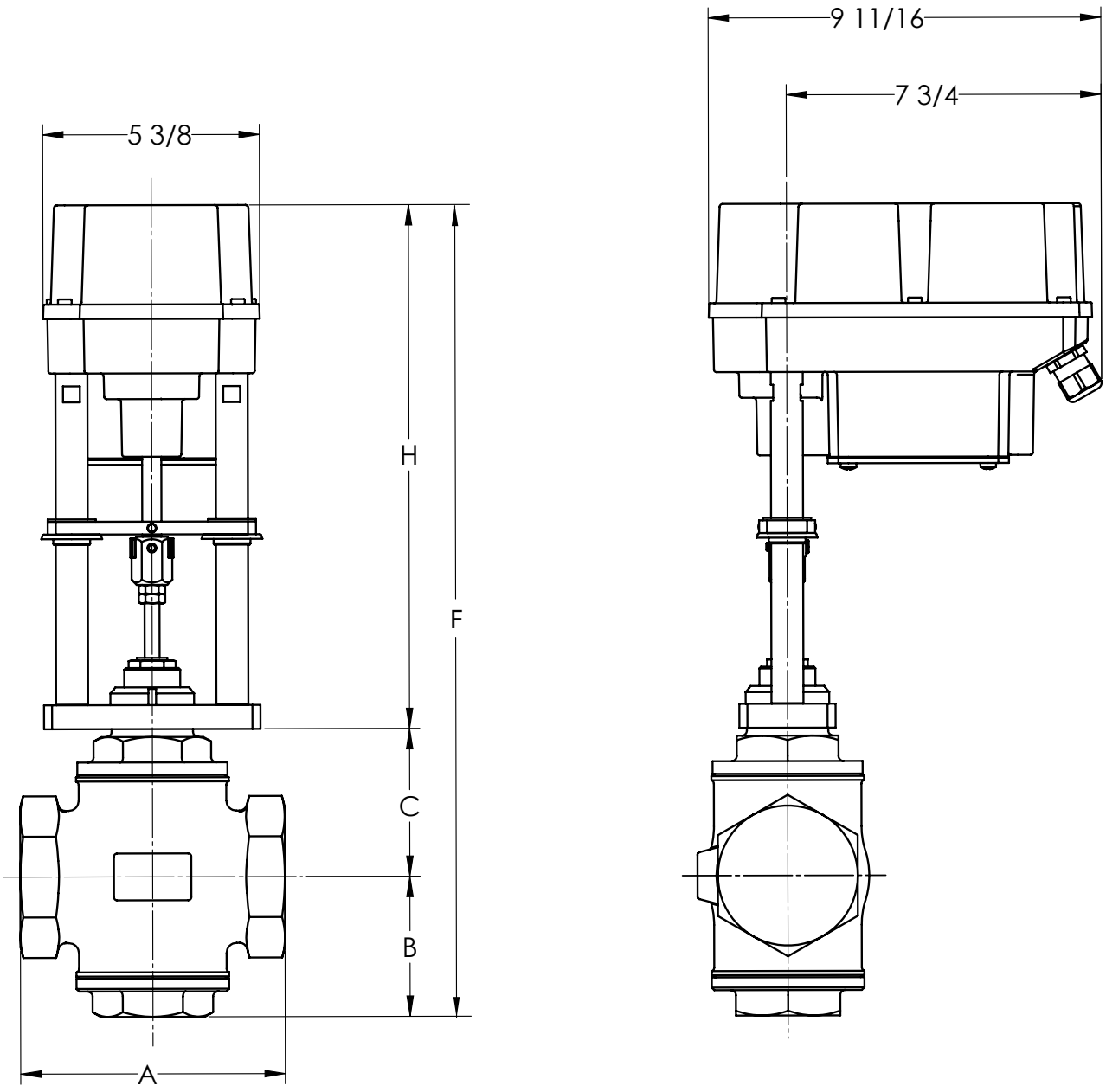
Heating Air with Steam

$$\text{Lbs./Hr.} = \frac{\text{CFM}}{900} \times \Delta T$$

Glossary of Terms

t = Time in Hours
Cp = Specific Heat of Liquid
S = Specific Gravity of Fluid
W = Weight in Lbs.
ΔT = Temperature Rise or Fall in °F
hf_g = Latent Heat of Steam

MEASUREMENT IN INCHES



2-WAY or 3-WAY

Actuator Removal Clearance
Above actuator on 1/2 thru 1 inch Type 30 valve allow 5-7/8 inch
Above actuator on all other valves allow 6-1/8 inch
Allow 3-1/4 inch above actuator for cover removal

MODEL: ARB
Type 20, 28

DIMENSION (IN) Type 20		VALVE SIZE (IN)		
Variable		**1/2, 3/4, 1**	**1-1/4 & 1-1/2**	**2**
A	250THD	4-7/8	5-3/4	6-1/2
	300THD	5	6-1/8	6-1/2
	300BWE	15-3/8	16-7/8	17
B	250THD	2-3/4	3-1/4	3-5/8
	300THD & BWE	3	3-1/2	3-7/8
C	250THD	2-7/8	3-1/2	3-3/4
	300THD & BWE	2-7/8	3-1/2	3-3/4
H		12-7/8		
F	250THD	18-1/2	19-5/8	20-1/4
	300THD & BWE	18-3/4	19-7/8	20-1/2
Weight (LB) Body Only	250THD	8-1/2	14-1/2	18-1/2
	300THD	8	15-1/2	19
	300BWE	9-1/2	18	22-1/2
Weight (LB) Actuator Only		12.5		

DIMENSION (IN) Type 28		VALVE SIZE (IN)
Variable		**1/2, 3/4, 1**
A	250THD	4-7/8
	300THD	5
	300BWE	15-3/8
B	250THD	2-3/4
	300THD & BWE	3
C	250THD	2-7/8
	300THD & BWE	2-7/8
H		12-7/8
F	250THD	18-1/2
	300THD & BWE	18-3/4
Weight (LB) Body Only	250THD	8-1/2
	300THD	8
	300BWE	9-1/2
Weight (LB) Actuator Only		12.5

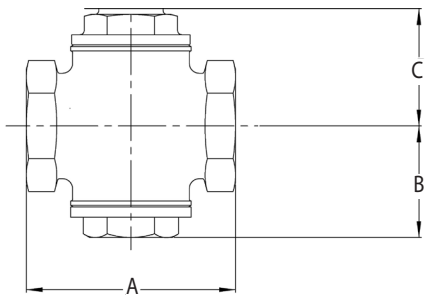
MODEL: ARB
Type 30, 32

DIMENSION (IN) Type 30		VALVE SIZE (IN)		
Variable		**1/2, 3/4, 1**	**1-1/4 & 1-1/2**	**2**
A	250THD	4-7/8	5-3/4	6-1/2
	300THD	5	6-1/8	6-1/2
	300BWE	15-3/8	16-7/8	17
B	250THD	2-23/32	3-13/16	4
	300THD	2-23/32	3-3/8	3-3/4
	300BWE	8	8-3/4	9
C	250THD	2-7/8	3-1/2	3-3/4
	300THD & BWE	2-7/8	3-1/2	3-3/4
H		12-7/8		
F	250THD	18-1/2	20-1/4	20-5/8
	300THD	18-1/2	19-3/4	20-3/8
	300 BWE	23-3/4	25-1/8	26-5/8
Weight (LB) Body Only	250THD	9	15-1/2	20
	300THD	8	15	18-1/2
	300BWE	10-1/2	19	23-1/2
Weight (LB) Actuator Only		12.5		

DIMENSION (IN) Type 32		VALVE SIZE (IN)		
Variable		**1**	**1-1/2**	**2**
A	250THD	4-7/8	5-3/4	6-1/2
	300THD	5	6-1/8	6-1/2
	300BWE	15-3/8	16-7/8	17
B	250THD	3-15/32	3-13/16	4
	300THD	2-23/32	3-3/8	3-3/4
	300 BWE	8	8-3/4	9
C	250THD	2-7/8	3-1/2	3-3/4
	300THD & BWE	2-7/8	3-1/2	3-3/4
H		12-7/8		
F	250THD	19-1/4	20-1/4	20-5/8
	300THD	18-1/2	19-3/4	20-3/8
	300 BWE	23-3/4	25-1/8	26-5/8
Weight (LB) Body Only	250THD	9	16-1/2	21
	300THD	8	16	19-1/2
	300BWE	10-1/2	20	24-1/2
Weight (LB) Actuator Only		12.5		

Actual shipping weights may vary.

Face to face dimensions conform to Historical Warren Controls Standards and are NOT ANSI/ISA compatible.



2-Way or 3-Way

VBA Series

1. SELECTIONS

Please make a selection from each table of OPTIONS below to make a complete model number string.

ARB – □□ □□□ □ □ □ □ □ □

VALVE BODY

Model	Valve Type	Size	Body Material	End Connection	Trim Style	Trim Material	Trim Cv	Packing Type
	20 2-Way Single Seat	**050** 1/2 inch	**B** Bronze	**S** Screwed	**E** Equal %	**S** 316 SS*	**F** Full Port	**T** Teflon
	28 2-Way Lo-Flow	**075** 3/4 inch	**F** CF8M	**B** Buttweld End	**L** Linear	**B** Bronze	**1** 1st Port Reduction	**V** Vacuum Service
	30 3-Way Mixing	**100** 1 inch			**M** Mod Lin	**6** Alloy 6	**2** 2nd Port Reduction	**L** EPDM Lip
	32 3-Way Diverting	**125** 1-1/4 inch			*Type 20 Equal % or Linear ONLY, Types 30/32, Linear Only, Types 28 Mod Lin Only*	**H** 17-4 PH	**3** 3rd Port Reduction	**G** Graphite
		150 1-1/2 inch				**P** PEEK	**4** 4th Port Reduction	
		200 2 inch				*NOTE: *Type 28, 316SS trim uses a harder Nitronic 60 seat.*	*NOTE: Port reductions only available on Type 20/28/30.*	

Type	Size Available
TYPE 20	1/2 inch 3/4 inch 1 inch 1-1/4 inch 1-1/2 inch 2 inch
TYPE 28	1/2 inch 3/4 inch 1 inch
TYPE 30	1/2 inch 3/4 inch 1 inch 1-1/4 inch 1-1/2 inch 2 inch
TYPE 32	1 inch 1-1/2 inch 2 inch

VALVE TYPE/TRIM MATERIAL COMBINATIONS

Size	TRIM MATERIAL S 316 SS	B Bronze	6 Alloy 6	H 17-4 PH	P PEEK
1/2 inch	20, 28, 30	N/A	20	20	20, 28
3/4 inch	20, 28, 30	N/A	20	20	20, 28
1 inch	20, 28, 30, 32 SS	32 BRZ	20	20	20, 28
1-1/4 inch	20, 30	N/A	20	20	20
1-1/2 inch	20, 30, 32 SS	32 BRZ	20	20	20
2 inch	20, 30, 32 SS	32 BRZ	20	20	20

FLUID TEMPERATURE LIMITS

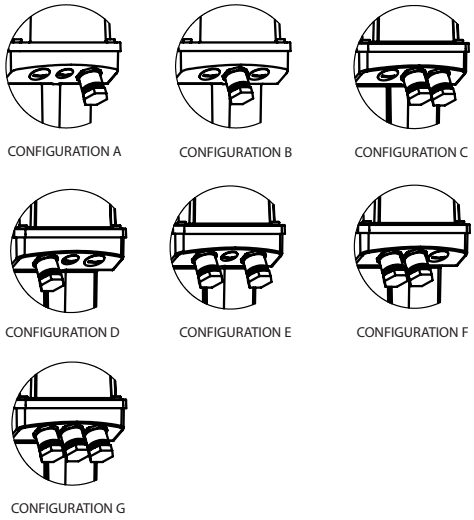
Valve Type	Body Material & Code	Trim Material & Code	Packing Type & Code	T MAX	T MIN
20 2-Way Single Seat	Bronze **B**	316 **S**, Alloy 6 **6**, 17-4 PH **H**, PEEK **P**	EPDM **L**	400°F	-20°F
			Teflon **T**, Vacuum Service **V**	400°F	60°F
	CF8M **F**	316 **S**, Alloy 6 **6**, 17-4 PH **H**	EPDM **L**	450°F	-20°F
			Teflon **T**, Vacuum Service **V**	450°F	60°F
			Graphite **G**	450°F	-20°F
		PEEK **P**	EPDM **L**	450°F	-20°F
			Teflon **T**, Vacuum Service **V**	450°F	60°F
28 2-Way Low Flow	Bronze **B**	316 **S**, PEEK **P**	EPDM **L**	400°F	-20°F
			Teflon **T**, Vacuum Service **V**	400°F	60°F
	CF8M **F**	316 **S**	EPDM **L**	450°F	-20°F
			Teflon **T**, Vacuum Service **V**	450°F	60°F
		PEEK **P**	EPDM **L**	450°F	-20°F
			Teflon **T**, Vacuum Service **V**	450°F	60°F
30 3-Way Mixing	Bronze **B**	316 **S**	EPDM **L**	400°F	-20°F
			Teflon **T**, Vacuum Service **V**	400°F	60°F
	CF8M **F**	316 **S**	EPDM **L**	450°F	-20°F
			Teflon **T**, Vacuum Service **V**	450°F	60°F
32 3-Way Diverting	Bronze **B**	Bronze **B**	Teflon **T**, Vacuum Service **V**	300°F	60°F
			EPDM **L**	300°F	-20°F
	CF8M **F**	316 **S**	EPDM **L**	450°F	-20°F
			Teflon **T**, Vacuum Service **V**	450°F	60°F

NOTE: -20°F T MIN temperature limit is for indoor applications with low humidity where ice will not form on the valve stem.

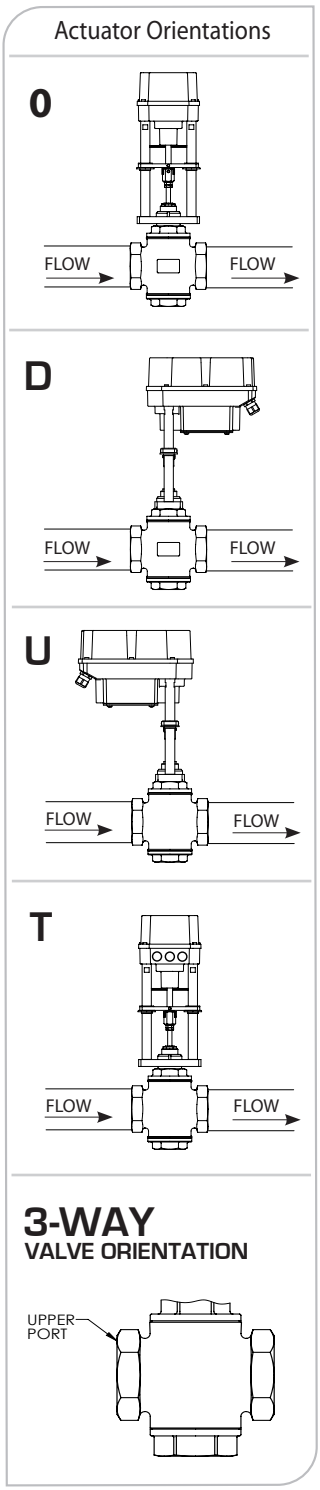
ARIA ACTUATOR ATRIBUTES

Failure Mode		Voltage Supply		Electrical Connectors		Heater		Limit Switches		Actuator Orientation	
D	Spring Fail Down	**1**	115/230 Vac	**A**	(Left) Capped (Middle) Capped (Right) 1/2 NPT	**0**	None (Default)	**0**	None (Default)	**0**	None (Default)
U	Spring Fail Up	**4**	24 Vac/ Vdc	**B**	(Left) Capped (Middle) 1/2 NPT (Right) Capped	**H**	Heater	**S**	Silver Contact Limit Switches	**D**	Pointing Down Stream
				C	(Left) Capped (Middle) 1/2 NPT (Right) 1/2 NPT					**U**	Pointing Up Stream
				D	(Left) 1/2 NPT (Middle) Capped (Right) Capped					**T**	Pointing Towards
				E	(Left) 1/2 NPT (Middle) Capped (Right) 1-2 NPT						
				F	(Left) 1/2 NPT (Middle) 1/2 NPT (Right) Capped						
				G	(Left) 1/2 NPT (Middle) 1/2 NPT (Right) 1/2 NPT						

Electrical Connectors Orientation



Actuator Orientations



CRN
REGISTERED

Valve	Body Mat'l	CRN (Canadian Registration Number) Size (inch) 1/2	3/4	1	1-1/4	1-1/2	2
2820	BRZ	Y	Y	Y	Y	Y	Y
	SS	P	P	P	P	P	P
2828	BRZ	Y	Y	Y	-	-	-
	SS	P	P	P	-	-	-
2830	BRZ	Y	Y	Y	Y	Y	Y
	SS	P	P	P	P	P	P
2832	BRZ	-	-	Y	-	Y	Y
	SS	-	-	P	-	P	P

Y = Yes, currently registered - CRN # CSA - OC18997
P = Registration pending, Starting Process

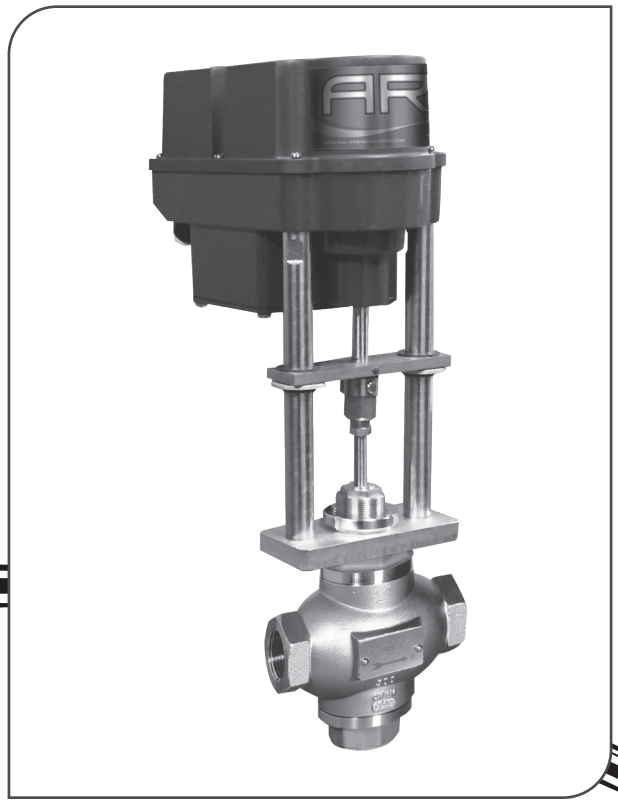
Warren Controls does not assume responsibility for the selection, use, or maintenance of any product. Responsibility for proper selection, use, and maintenance of any Warren Controls product remains solely with the purchaser and end-user.

3-WAY VALVE ORIENTATION

MODEL ARB PRODUCT SPEC

ARIA SERIES

MODEL ARB Control Valves are the breed defined for a wide range of compact 2-way and 3-Way applications. Available in bronze or CF8M bodies, this NPT end design is chocked full of design choices, from five different kinds of hard and soft trim to Cv's ranging from 0.25 up to 40 and from 1/2" through 2".



WARREN CONTROLS

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ARIA_PS_ARB_RevE_1222