

# High Temperature Characterized Control Valves (HTCCV)



## BENEFIT OF THE BELIMO CHARACTERIZING DISC

- Equal percentage flow characteristic.
- Excellent control stability assured with the characterizing disc.
- $C_v$  values equal to  $C_v$  values for globe valves of the same size.
- The need for multiple pipe reduction is usually eliminated.
- Better control prevents “hunting” of the control loop, increasing life span of actuator and valve.

## FEATURES

- Thermal isolating adapter between flange and actuator.
- Easy direct coupling of actuator with a single screw.
- Perpendicular mounting flange and square drive head eliminate lateral forces on the stem.
- Blow-out proof stem with thrust-bearing Teflon® disc and double O-ring design for long service life.\*
- Stainless steel ball and stem.
- Vent holes reduce condensation build-up.
- Forged dezincified brass valve body — no pin-hole leaks.
- Characterizing disc — made of Tefzel® known for excellent strength and chemical resistance.
- Teflon® seats with O-rings provide constant seating force against the ball and reduce torque requirement.
- Actuator can be mounted in four different positions.

\* Designed for service life of over 100,000 full cycles.  
 Teflon® and Tefzel® are both registered trademarks of Dupont.

## EQUAL PERCENTAGE VALVE CHARACTERISTIC

In order to ensure good stability of control, it is essential for a control valve to have an equal percentage characteristic. This type of characteristic produces a linear variation in thermal output according to the amount of opening of the valve (also known as the system characteristic). Under normal testing conditions a conventional ball valve exhibits an S-shaped characteristic. When it is installed in a real system, however, this characteristic is seriously deformed because, compared with its nominal size, a ball valve possesses an extremely high flow coefficient. Whether used with or without pipe reducers or a reduced bore, they do not normally allow stable regulation of the thermal capacity.

Belimo’s unique High Temperature Characterized Control Valve (HTCCV) is very different. A special characterizing disc inside the valve gives it an equal percentage characteristic which makes it out perform a globe valve of the same nominal size. The flow (the  $C_v$  value) is reduced to the required value by a combination of the hole in the ball and the shaped aperture in the disc. The increase in flow as the valve is opened is very slow and controlled, and it also reduces turbulence.

This produces better part-load behavior and improved stability of control while also optimizing energy consumption.

# Feature / Benefits

## High Temperature Characterized Control Valves™ (HTCCV)



### COORDINATED MOTORIZED OPERATION

The optimum functionality of the Belimo HTCCV is assured by properly coordinating its actuation with MFT. Specially developed rotary actuators provide the necessary precision for modulating, floating-point, and on/off methods of control.

All HTCCVs are supplied with the appropriate rotary actuator to provide the close-off and operation desired.

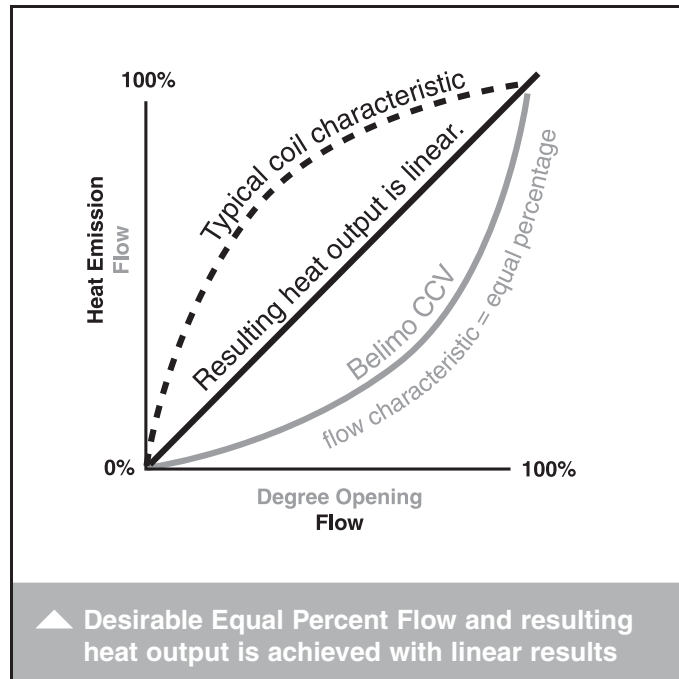
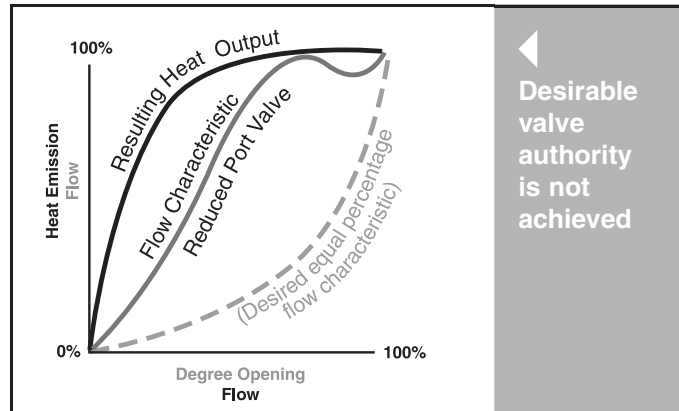
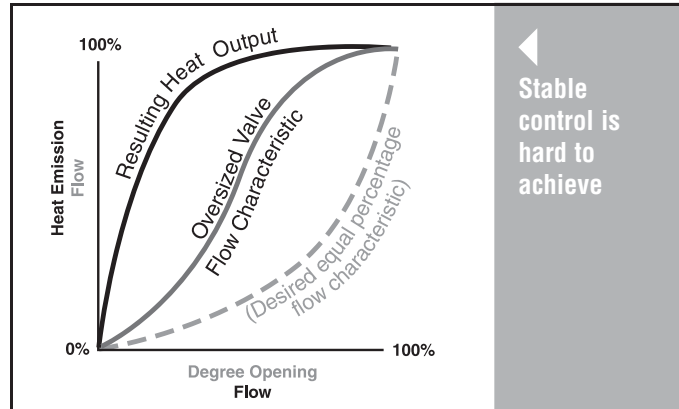
### OPTIMIZED FOR CONTROL

The Belimo HTCCV marries known technology with an innovative development – the unique fluid dynamical designed characterizing disc.

The marriage of HTCCV and MFT technologies has produced a range of valuable features which surpass the capabilities of globe valves at a very attractive price level:

- An equal-percentage valve characteristic
- Unlike a globe valve, no sudden change in inlet flow upon opening
- Excellent stability of control
- C<sub>v</sub> values comparable with those of globe valves of the same size
- Higher close-off ratings than standard globe valves
- 100% tight shut-off on two-way valves means NO leak-by unlike globe valves that have ANSI IV shutoff (leakage rate of 0.01% of the C<sub>v</sub> rating)

### Flow Characteristics of Conventional Ball Valves versus BELIMO CHARACTERIZED CONTROL VALVES



<b>B2 Series</b>	<b>Two-way</b>
<b>½" to 1"</b>	
<b>Service:</b>	Water/low pressure steam 60% glycol
<b>C<sub>v</sub> Range</b>	0.29-28
<b>Material:</b>	Stainless trim
<b>Control:</b>	On/Off, Floating, 2-10 VDC Multi-Function Technology® Spring Return or Non-Spring Return

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SET-UP - Specify Upon Ordering

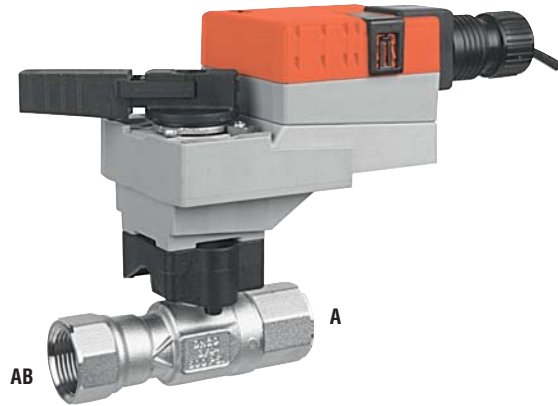
2-WAY VALVE

NON-SPRING RETURN Stays in Last Position	<b>TR24-3 US</b>	Power to pin 2 will drive valve CCW. Power to pin 3 will drive valve CW.	
	<b>TR24-SR US</b>	<b>NC:</b> Closed A to AB, will open as voltage increases.	<b>NO:</b> Open A to AB, will close as voltage increases (Can be chosen with switch inside terminal block of actuator).
	<b>LRB24-3, LRB..., LRX...</b>	Power to pin 2 will drive valve CW. Power to pin 3 will drive valve CCW. The above will function when the directional switch is in the "1" position, to reverse select the "0" position.	<b>NO:</b> Open A to AB, will close as power is applied.
SPRING RETURN Note Fail Position	<b>TFRB24 LF24 US</b>	<b>NO/FO</b> Valve: Open A to AB will drive closed. Spring Action: Will spring open A to AB upon power loss.	<b>NC/FC</b> Valve: Closed A to AB will drive open. Spring Action: Will spring closed A to AB upon power loss.
	<b>TFRB (-3), -MFT, -SR LF (-3), -MFT, -SR</b> Floating or Modulating type actuators	<b>NC/FO</b> Valve: Closed A to AB will drive open or increase in voltage. Spring Action: Will spring open A to AB upon power loss.	<b>NC/FC</b> Valve: Closed A to AB or Open A to AB. Spring Action: Will spring closed A to AB upon power loss.
		<b>NO/FO</b> Valve: Open A to AB will drive closed or increase in voltage. Spring Action: Will spring open A to AB upon power loss.	<b>NO/FC</b> Valve: Open A to AB. Spring Action: Will spring closed A to AB upon power loss.

# Technical Data, Flow, Assembly and Installation High Temperature Characterized Control Valves™ (HTCCV)

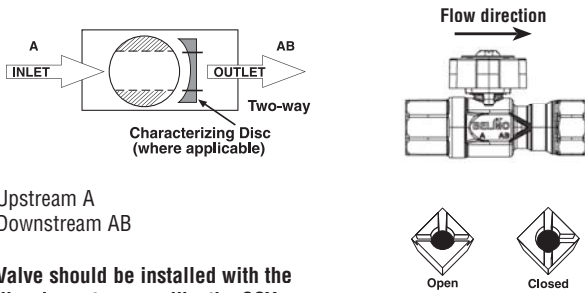


Service	High temperature hot water, low pressure steam, 60% glycol
Flow characteristic	A-port equal percentage
Media temp range	60°F to 266°F [15.6°C to 130°C] Water max 250°F (120°C) Steam
Maximum differential pressure (ΔP)	60 psi typical application 116 psi full open only (Model # B215HT455) steam: 15 psi
Maximum inlet	steam: 15 psi
Leakage	0% for A to AB



## FLOW PATTERN

### 2-way High Temperature Characterized Control Valves™

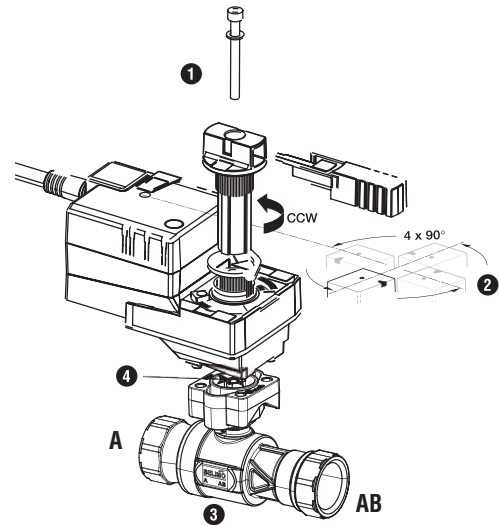


Upstream A  
Downstream AB

Valve should be installed with the disc downstream unlike the CCV.

## ASSEMBLY

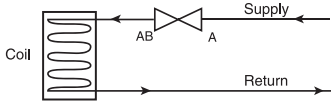
- 1 One screw attaches to valve
- 2 Four actuator mounting positions
- 3 2-way flow pattern
- 4 Top of valve stem indicates direction of flow (Flow A to AB shown)



## OPERATION/INSTALLATION

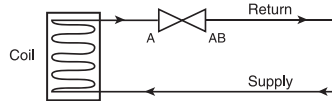
### For Steam

2-way Valve Piping Diagram  
(1 Input, 1 Output)

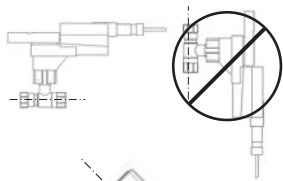


### For Hot Water

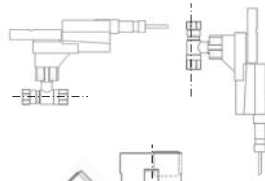
2-way Valve Piping Diagram  
(1 Input, 1 Output)



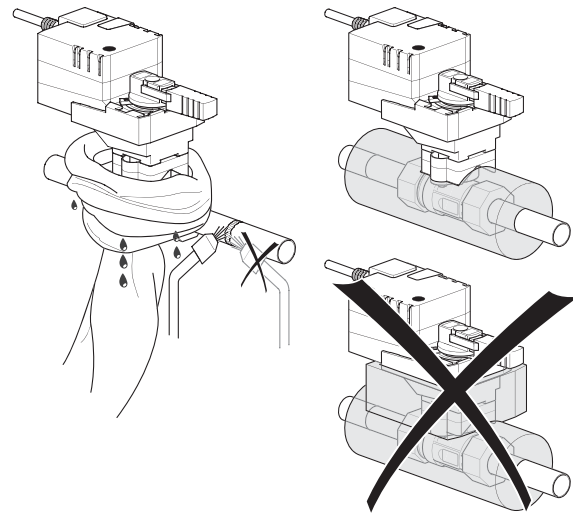
Assembly can be mounted horizontally or vertically for water applications. For steam applications the valve cannot be mounted vertically and if mounted horizontally the valve must be 0° to 45° off center of the pipe. Do not install with actuator below pipe.



Steam Applications



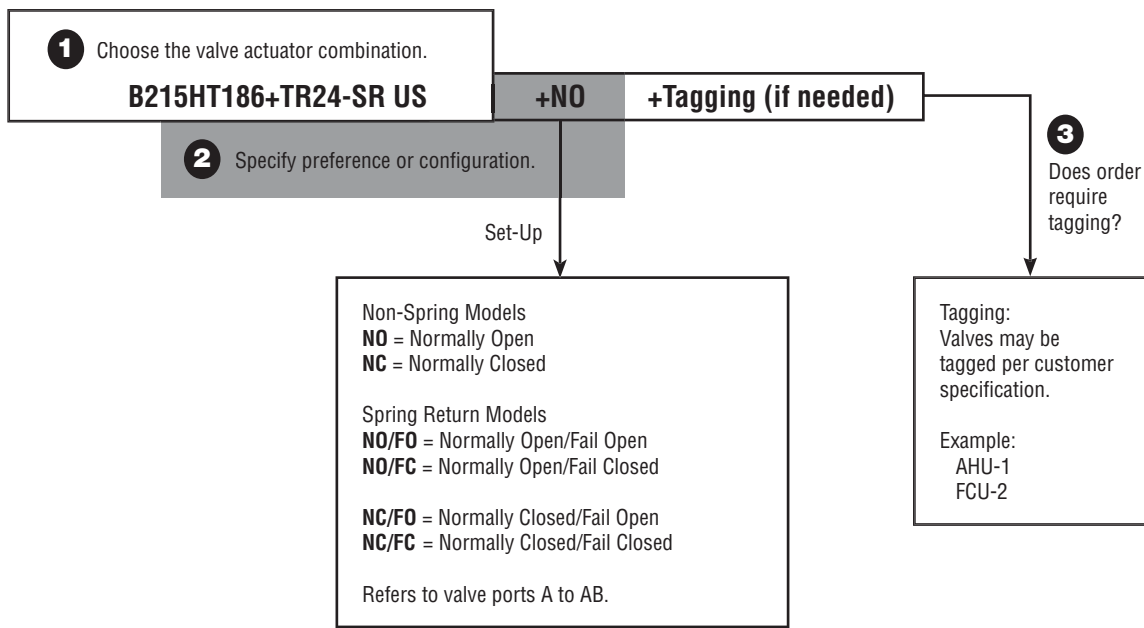
Water Applications



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<b>B2</b>	<b>15</b>	<b>HT</b>	<b>186</b>	<b>TR</b>	<b>24</b>	<b>-SR</b>	
<b>Valve</b> B2 = 2-way	<b>Valve Size</b> 15-25 = 1/2" -1"	High Temperature	<b>Cv Rating</b> 1.86 Refer to Table	<b>Actuator Type</b> Non-Spring Return TR... LR... Spring Return TF... LF...	<b>Power Supply</b> 24 = 24 VAC/DC 120 = 120 VAC*	<b>Control</b> Blank = On/Off -3 = Floating Point -SR = 2-10 VDC -MFT = Multi-Function Technology	-S = Built-in Auxiliary Switch

**ORDERING EXAMPLE**



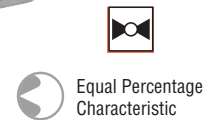
**4** Complete Ordering Example: **B215HT186+TR24-SR US+NO**

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\*TF Series has 100 to 240 VAC nominal power supply.

C <sub>v</sub>	Valve Nominal Size		Type	Suitable Actuators	
	Inches	DN [mm]		Spring Return	Non-Spring Return
0.29	½	15	B215HT029	TFR Series	TR Series
0.46	½	15	B215HT046		
0.73	½	15	B215HT073		
1.16	½	15	B215HT116		
1.86	½	15	B215HT186		
2.90	½	15	B215HT290		
4.55	½	15	B215HT455*	LF Series	LR Series
1.86	¾	20	B220HT186		
2.90	¾	20	B220HT290		
4.64	¾	20	B220HT464		
7.31	¾	20	B220HT731		
9.28	¾	20	B220HT928		
13.20	¾	20	B220HT1320		
4.64	1	25	B225HT464		
7.31	1	25	B225HT731		
11.6	1	25	B225HT1160		
18.56	1	25	B225HT1856		
28.00	1	25	B225HT2800		

\* modified equal percentage



### Applications

- Water/low pressure steam control of air handling apparatus in ventilation and air-conditioning systems
- District heating
- Humidifier

### Mode of Operation

The control valve is operated by an electronic actuator that responds to a standard voltage for on/off control, by a proportional VDC/4...20 mA, or 3-point control system. The actuator will then move the ball to the valve to the position dictated by the control signal and change the flow.

### Product Features

Equal-percentage characteristic of the flow; models with \* have modified equal percentage characteristic.

### Actuator Specifications

Control type	On/Off, Floating Point, 2-10 VDC Multi-Function Technology (MFT)
Manual override	(only LR, TR Series)
Electrical connection	3 ft [1m] cable with ½" conduit fitting (except TR)

### Valve Specifications

Service	High temperature hot water, low pressure steam, 60% glycol
Flow characteristic	A-port equal percentage
Controllable flow range	75°
Sizes	½" - 1"
Type of end fitting	NPT female ends
<b>Materials</b>	
Body	brass (DZR) P-CuZn35Pb2
Ball	stainless steel
Stem	stainless steel
Seats	Tefzel®
Characterizing disc	Tefzel®
Packing	Viton
Pressure rating	600 psi
<b>Media temp range</b>	
Steam	250°F
Water	60°F to 266°F
Close off pressure	200 psi
Maximum differential pressure (DP)	60 psi partially open ball 116 psi full open only (Model #B215HT455)
Steam	15 psi
<b>Maximum inlet pressure</b>	
Steam	15 psi
Leakage	bubble tight 0%
C <sub>v</sub> rating	see above product chart for values

# MFT Standard Configuration



	Configuration (Substitute 'V' for 'P' for NV(F) actuators)	Code	Control		Motion			List Price
			Input Range	Position Feedback	Running Time†	Torque %	Adaptation	
Voltage	P-10001	A01	2.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10002	A02	0.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	Manual	●
	P-10003	A03	2.0 to 10.0 VDC	0.0 to 5.0 VDC	150	100	Manual	●
	P-10004	A04	4.0 to 7.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10005	A05	6.0 to 9.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10006	A06	10.5 to 13.5 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10007	A07	0.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10009	A09	5.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10010	A10	5.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	Manual	●
	P-10013	A13	0.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10015	A15	2.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10016	A16	2.0 to 6.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10017	A17	6.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10018	A18	14.0 to 17.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10020	A20	9.0 to 12.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10028	A28	0.0 to 10.0 VDC	0.0 to 10.0 VDC	100	100	Manual	●
P-10031	A31	0.0 to 4.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●	
P-10063	A63	0.5 to 4.5 VDC	0.5 to 4.5 VDC	150	100	Manual	●	
P-10064	A64	5.5 to 10.0 VDC	5.5 to 10.0 VDC	150	100	Manual	●	
PWM	P-20001	W01	0.59 to 2.93 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20002	W02	0.02 to 5.00 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20003	W03	0.10 to 25.50 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20004	W04	0.10 to 25.60 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20005	W05	0.10 to 5.20 sec.	0.0 to 5.0 VDC	150	100	Manual	●
Floating Point	P-30001	F01	Floating point	2.0 to 10.0 VDC	150	100	Manual	●
	P-30002	F02	Floating point	0.0 to 10.0 VDC	150	100	Manual	●
	P-30003	F03	Floating point	2.0 to 10.0 VDC	100	100	Manual	●
	P-30004	F04	Floating point	0.0 to 5.0 VDC	100	100	Manual	●
	P-30005	F05	Floating point	0.0 to 10.0 VDC	100	100	Manual	●
	P-30006	F06	Floating point	0.0 to 5.0 VDC	150	100	Manual	●
On/Off	P-40001	J01	On/Off	2.0 to 10.0 VDC	75	100	Manual	●
	P-40002	J02	On/Off	2.0 to 10.0 VDC	150	100	Manual	●
	P-40003	J03	On/Off	2.0 to 10.0 VDC	75	100	Manual	●
	P-40004	J04	On/Off	0.0 to 5.0 VDC	100	100	Manual	●
	P-40005	J05	On/Off	0.0 to 10.0 VDC	100	100	Manual	●

\*P-10001 is the default configuration.

Example: AF24-MFT US is the basic model. Add the P... pre-set MFT configuration number and list price to the actuator when ordering, as needed

Note: Most popular configurations available at no additional cost.

Note: If the configuration needed is not listed, please fill in pg 239 or call Customer Service.

Note: For Non-Spring Return Actuators the 3-digit code can be used in place of the P... pre-set MFT configuration number.

PIGCV CONFIGURATION CODES						
Description	Code	Control Input	Running Time	Built-in Feedback	List Price	
P-10019	A19	2-10 VDC	100	2-10 VDC	●	
P-10028	A28	0-10 VDC	100	0-10 VDC	●	
P-20031	W31	0.02-5.00 sec. PWM	100	2-10 VDC	●	
P-20032	W32	0.10-25.5 sec. PWM	100	2-10 VDC	●	
P-20034	W34	0.59-2.93 sec. PWM	100	2-10 VDC	●	
P-30003	F03	Floating Point	100	2-10 VDC	●	
P-40013	J13	On/Off	100	2-10 VDC	●	
P-30001	F01	Floating Point	150	2-10 VDC	●	

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## PRODUCTS

	MODEL	Base Actuator Codes	Control Input	Feedback	Running Time	Angle of Rotation/Stroke	Power Supply	VA Rating	Weight (lb)	List Price (add to valve assembly)
45 in-lb [5 Nm]	LRX24-3	LR000	On/Off, Floating Point	—	95 (Default)	95 deg	24 VAC/DC	3	1.08	●
	LRX24-SR	LR030	2-10 VDC (4-20mA*)	—	95 (Default)	95 deg	24 VAC/DC	3	1.08	●
	LRX24-MFT	LR100	2-10 VDC (Default)	2-10 VDC	150 (Default)	95 deg	24 VAC/DC	3	1.08	●

	Configuration (Substitute 'V' for 'P' for NV(F) actuators)	Code	Control		Running Time†	Motion		List Price
			Input Range	Position Feedback		Torque %	Adaptation	
Voltage	P-10001	A01	2.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●*
	P-10002	A02	0.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	Manual	●
	P-10003	A03	2.0 to 10.0 VDC	0.0 to 5.0 VDC	150	100	Manual	●
	P-10004	A04	4.0 to 7.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10005	A05	6.0 to 9.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10006	A06	10.5 to 13.5 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10007	A07	0.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10009	A09	5.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10010	A10	5.0 to 10.0 VDC	0.0 to 10.0 VDC	150	100	Manual	●
	P-10013	A13	0.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10015	A15	2.0 to 5.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10016	A16	2.0 to 6.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10017	A17	6.0 to 10.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10018	A18	14.0 to 17.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10020	A20	9.0 to 12.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10028	A28	0.0 to 10.0 VDC	0.0 to 10.0 VDC	100	100	Manual	●
	P-10031	A31	0.0 to 4.0 VDC	2.0 to 10.0 VDC	150	100	Manual	●
	P-10063	A63	0.5 to 4.5 VDC	0.5 to 4.5 VDC	150	100	Manual	●
P-10064	A64	5.5 to 10.0 VDC	5.5 to 10.0 VDC	150	100	Manual	●	
PWM	P-20001	W01	0.59 to 2.93 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20002	W02	0.02 to 5.00 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20003	W03	0.10 to 25.50 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20004	W04	0.10 to 25.60 sec.	2.0 to 10.0 VDC	150	100	Manual	●
	P-20005	W05	0.10 to 5.20 sec.	0.0 to 5.0 VDC	150	100	Manual	●
Floating Point	P-30001	F01	Floating point	2.0 to 10.0 VDC	150	100	Manual	●
	P-30002	F02	Floating point	0.0 to 10.0 VDC	150	100	Manual	●
	P-30003	F03	Floating point	2.0 to 10.0 VDC	100	100	Manual	●
	P-30004	F04	Floating point	0.0 to 5.0 VDC	100	100	Manual	●
	P-30005	F05	Floating point	0.0 to 10.0 VDC	100	100	Manual	●
	P-30006	F06	Floating point	0.0 to 5.0 VDC	150	100	Manual	●
On/Off	P-40001	J01	On/Off	None	75	100	Manual	●
	P-40002	J02	On/Off	2.0 to 10.0 VDC	150	100	Manual	●
	P-40003	J03	On/Off	None	75	100	Manual	●
	P-40004	J04	On/Off	0.0 to 5.0 VDC	100	100	Manual	●
	P-40005	J05	On/Off	0.0 to 10.0 VDC	100	100	Manual	●

\*P-10001 is the default configuration.

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