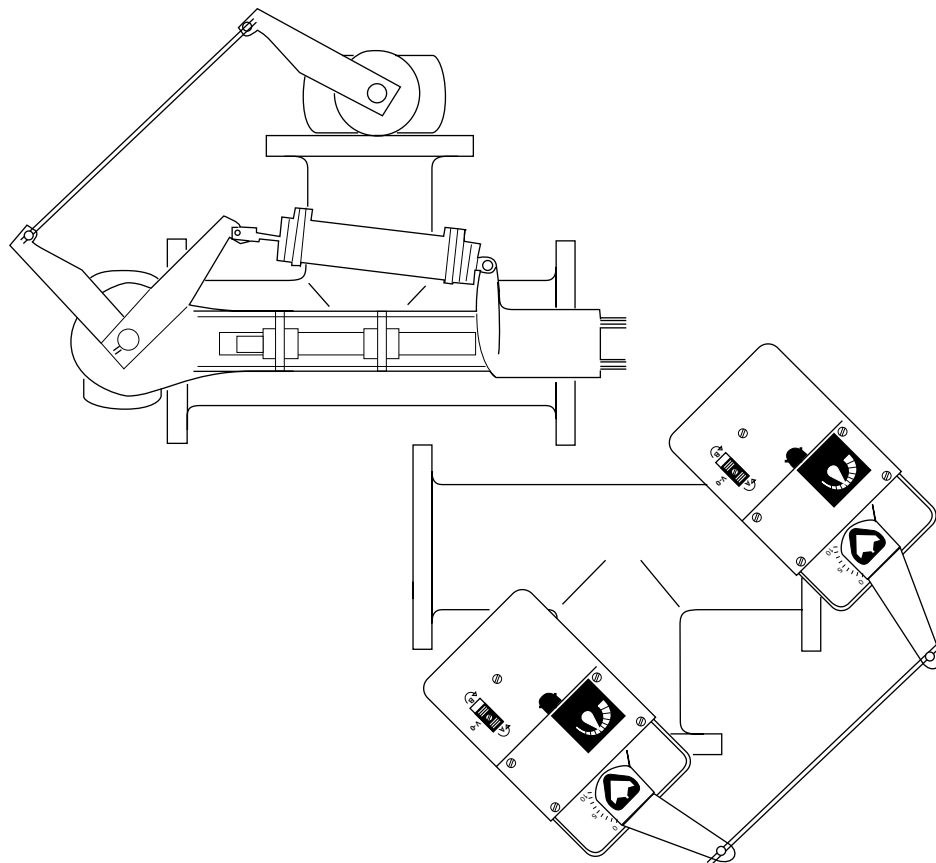


## Butterfly Control Valves

# Butterfly Control Valves



# Butterfly Control Valves

## TABLE OF CONTENTS

<b>Pneumatic Butterfly Valves .....</b>	<b>3</b>
STANDARD ASSEMBLIES	
PROPORTIONAL CONTROL & OPTIONS	
<b>Electric Butterfly Valves .....</b>	<b>3</b>
STANDARD ASSEMBLIES	
PROPORTIONAL CONTROL & OPTIONS	
<b>How to Specify Spartan Butterfly Valves .....</b>	<b>4</b>
ELECTRIC ACTUATORS	
PNEUMATIC ACTUATORS	
<b>Selection Data .....</b>	<b>5</b>
FLANGE REQUIREMENTS	
PRESSURE RATING	
VELOCITY LIMITS	
RANGEABILITY	
<b>Valve Components .....</b>	<b>6-7</b>
<b>Pneumatic Butterfly Valves .....</b>	<b>8-9</b>
ROTATING THE VALVE BODY/ACTUATOR FRAME ON TWO-WAY VALVES	
PIPING YOUR PNEUMATIC BUTTERFLY VALVES	
CHANGING FROM DA OR RA OR VICE VERSA	
CHANGING THE SENSITIVITY OF THE PILOT POSITIONER BOTH PROPORTIONAL OR 2-POSITION	
<b>Valve Selection .....</b>	<b>10</b>
SELECTING THE RIGHT BUTTERFLY VALVE FOR YOUR APPLICATION	
<b>Dimensions for Electric &amp; Pneumatic 2-way &amp; 3-way Butterfly Valves .....</b>	<b>11</b>

## Butterfly Control Valves

Spartan butterfly valves are available in electric and electronic and pneumatic versions in either two-way or three-way format.

Because these valves have larger Cv's than globe valves, they are primarily used in the HVAC industry for chiller and condenser water where high flows prohibit the use of high pressure drops and where economical and efficient flow control is nonetheless important. These butterfly valves have equal percentage characteristics, and their efficient EPDM seals provide extremely tight close-off not usually apparent in a butterfly type valve. While primarily designed as a water valve, these valves can and are used on many other media in the process industry. For other applications, contact the Spartan factory.

For further information, refer to either electric or pneumatic valves as required.

### Pneumatic Butterfly Valves VP29 or 39

Spartan pneumatic butterfly valves are driven by long stroke, double-acting cylinders for reliable, strong, smooth, hysteresis-free action.

The three-way version consists of two butterfly valves on a tee, each mechanically linked to operate in inverse proportion to each other.

#### STANDARD ASSEMBLIES:

Each valve comes complete with resilient lining for tight close-off. Included in the assembly are:

- a heavy, adjustable, cast aluminum linkage frame,
- strong 8" crank arm(s),
- a two-position switching relay,
- 8" stroke double-acting cylinder(s) (10" for 90° travel), in either 2", 2 1/2" or 3" bore as required to effortlessly stroke the valve.

#### PROPORTIONAL CONTROL AND OPTIONS:

A slot in the valve linkage frame allows for the addition of pilot positioners, reversing relays, position transmitters, two-position switching relays, etc. Proportional control requires the addition of a pilot positioner.

Cylinder mounted end switches allow for the electrical transmission of either complete open or complete closed (or both) positions, or any position in between.

Proportional position indication requires the installation of a pneumatic position transmitter.

While two-position operation can be had as a standard by supplying pilot air or not, two-position action can be had from a modulating or proportional input with the addition of a pneumatic switching relay with adjustable set point and adjustable differential to sequence with cooling tower fans, etc.



### Electric Butterfly Valves VE 29 or 39

Spartan electric butterfly valves are driven by reliable, strong, smooth, hysteresis-free electric actuators.

The three-way version consists of two butterfly valves on a tee, each mechanically linked to operate in inverse proportion to each other.

#### STANDARD ASSEMBLIES:

Each valve comes complete with resilient lining for tight close-off. Included in the assembly are:

- heavy zinc-plated steel linkage frame(s),
- strong valve stem adapter(s),
- two-position modulating or floating actuators in sizes as required to effortlessly stroke the valve.

#### PROPORTIONAL CONTROL AND OPTIONS:

The electric actuators themselves incorporate numerous features such as:

- two-position or modulating action,
- end switches,
- position feedback potentiometers.

(Refer to the respective actuator data sheets.)

## Butterfly Control Valves

### How to Specify Spartan Butterfly Valves

Provide Spartan electric control valve assemblies in either two-way version V2900, or three-way version V3900 (two butterfly valves on a tee) to suit the application. Three-way versions shall be built with orientations to suit site conditions.

Each valve assembly shall be equipped with a proven butterfly valve design with fully lined replaceable rubber seat suitable for ANSI flanges 125/150 (or ISO, JIS, DIN, or BSP when specified) and each shall have been factory bubble tight tested to 110% of shut-off rating. No lubrication of the bushings shall be required, and the discs shall have hand polished edges and through-shaft.

The body shall be provided with four tapped lugs and the three-way versions shall be equipped with and shall be bolted to a cast iron flanged tee with mechanical cross connection arranged in either right corner, left corner or cross tee orientation as required to suit the site installation requirements.

#### ELECTRIC ACTUATORS:

Provide electric or electronic actuator(s) as required to suit the torque and control input signal requirements. The actuators shall be suitable for two-position, floating or modulating (0 - 10 VDC or 4 - 20 MA) service and shall be equipped with clutch for manual override, clear position indicator, reversible overload protected electric motor and limit adjustment to allow for 60° or 90° travel or other as required.

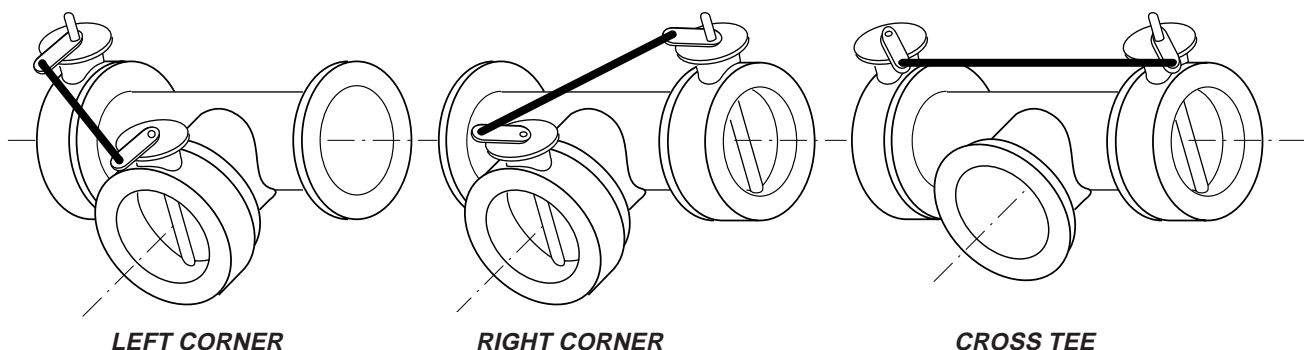
Refer to separate electric actuator data sheets.

#### PNEUMATIC ACTUATORS:

Provide powerful and smooth acting long bore pneumatic cylinder actuator(s) of size to suit the torque requirements, mounted on a heavy, heat treated, cast aluminum linkage frame and couple with 8" crank arms to provide reliable and hysteresis-free action without strain or rubbery action.

Cylinder lengths are available for 60°, 75° or 90° rotation (with 60 degree being standard). The assembly shall be equipped with the following accessories to adapt to the instrumentation requirements:

- Two-position switching relay.
- Two-position switching relay with adjustable differential and set point for controlling from a proportional input.
- Four-way pilot positioner with adjustable sensitivity and adjustable starting point suitable for use on 3 - 15 or 0 - 20psi pilot signal.
- Pneumatic position transmitter for remote indication of valve position.
- Electric field adjustable end switch or switches.



# Butterfly Control Valves

## Selection Data

### FLANGE REQUIREMENTS

Spartan butterfly valves are designed for installation between 125/150 ANSI, flat-faced or raised-face, weld-neck flanges, with ID equal to ID of pipe. When using raised face flanges, care must be taken to ensure correct valve/flange alignment.

Valves may be installed between flat-faced or raised-face flanges, whose ID is larger than the pipe ID and smaller than, or equal to, the pipe OD, but the pressure rating must be reduced by 25%.

For installation between flanges with an ID greater than the OD of the pipe, consult factory.

Optional I.S.O., J.I.S., D.I.N. and B.X. flange drillings are available. Consult factory.

### PRESSURE RATING:

(for bubble tight shut-off)

50mm-250mm (2" - 10")	1400 kPa (200 PSIG)
300mm-500mm (12" - 20")	1000 kPa (150 PSIG)
600mm-900mm (24" - 36")	500 kPa (75 PSIG)
600mm-900mm (24" - 36")	F1000G 500 kPa (75 PSIG)
	F1000H 1000 kPa (150 PSIG)

Pressure ratings are with standard disc diameters. For valves 500mm (20") and smaller, on low pressure service, the disc diameter can be reduced (under-cut) to provide lower required actuator torques and extended seat life.

Available pressure ratings for "under-cut" service are 0 kPa (0 PSIG) (gravity fed powders etc.) and 350 kPa (50 PSIG).

For dead end service the maximum shut-off pressure should be reduced by 50%.

### VELOCITY LIMITS:

Spartan butterfly valves are suitable for the following pipeline velocities:

Fluids - 100 m/s, (30 ft./sec.)

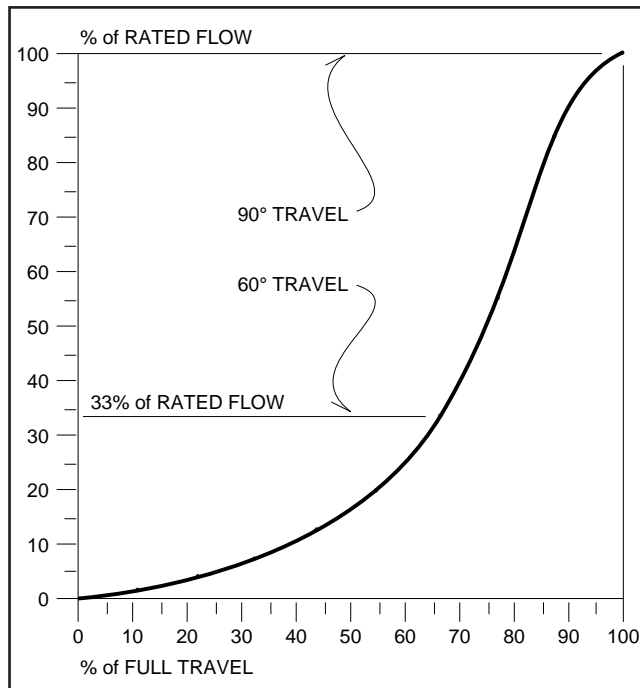
Gases - 65 m/s, (200 ft./sec.)

For velocities greater than these, consult factory.

### RANGEABILITY:

33:1 The ratio of the maximum controllable flow of a valve to the minimum controllable flow that it can control with the same inherent characteristic.

### VALVE CHARACTERISTICS



### CV VALUES - VALVE SIZING COEFFICIENT

Valve Size	Disc Position								
	90°	70°	80°	60°	50°	40°	30°	20°	10°
2"	144	114	84	61	43	27	16	7	1
2 1/2"	282	223	163	107	67	43	24	11	1.5
3"	461	364	267	154	96	61	35	15	2
4"	841	701	496	274	171	109	62	27	3
5"	1376	1146	775	428	268	170	98	43	5
6"	1850	1542	1025	567	354	225	129	56	6
8"	3316	2842	1862	1081	680	421	241	102	12
10"	5430	4525	2948	1710	1076	667	382	162	19
12"	8077	6731	4393	2563	1594	1005	555	235	27
14"	10538	8874	5939	3384	2149	1320	756	299	34
16"	13966	11761	7867	4483	2847	1749	1001	397	45
18"	17214	14496	10065	5736	3643	2237	1281	507	58
20"	22339	18812	12535	7144	4536	2786	1595	632	72

Cv is defined as the volume of water in U.S.G.P.M. that will flow through a given restriction or valve opening with a pressure drop of one (1) psi at room temperature. Recommended control angles are between 25° – 70° open. Preferred angle for control valve sizing is 60° – 65° open.

## Butterfly Control Valves

### Valve Components

Spartan Peripheral Devices is using Bray valves for all butterfly valve assemblies. Combining years of field applications experience, research & development, Bray has designed many unique features that result in longer service life, greater reliability, ease of parts replacement and interchangeability of components.

#### DISC AND STEM CONNECTION ( A )

Features a high-strength through-stem design. The close tolerance, double 'D' connection that drives the valve disc eliminates stem retention components being exposed to the line media, which commonly results in leak paths, corrosion and vibration failures. Disassembly of the butterfly valve stem is just a matter of pulling the stem out of the disc. Without fasteners obstructing the line flow, the valve Cv values are higher than other valves, turbulence is reduced and pressure recovery is increased.

#### DISC ( B )

Casting is spherically machined, hand polished to provide an bubble type shut off at 50 psi and minimum torque and longer seat life.

#### SPIROLOX® RETAINING RING ( C )

The stem is retained in the body by means of a unique Stainless Steel *Spirolox*® retaining ring. With a standard hand tool, the retaining ring may be removed for easy disassembly. The ring also prevents unintentional removal of stem during field service

#### STEM RETAINING C-RINGS ( D )

Manufactured from bronze material.

#### STEM BUSHING ( E )

Non-corrosive, heavy duty acetal bushing absorbs actuator side thrusts.

#### STEM SEAL ( F )

Double 'D' cup seal design is self-adjusting and gives positive sealing in both directions. Prevents external substances from entering stem bore.

#### NECK ( G )

Extended neck length allows for 2" of piping insulation and is easily accessible for mounting actuators.

#### PRIMARY AND SECONDARY SEALS ( H )

The primary seal is achieved by an interference fit of the unique moulded seat flat with the disc hub. The secondary seal is an interference fit because the stem diameter is greater than the seat's stem hole diameter. These seals prevent line media from coming in contact with the stem or body.

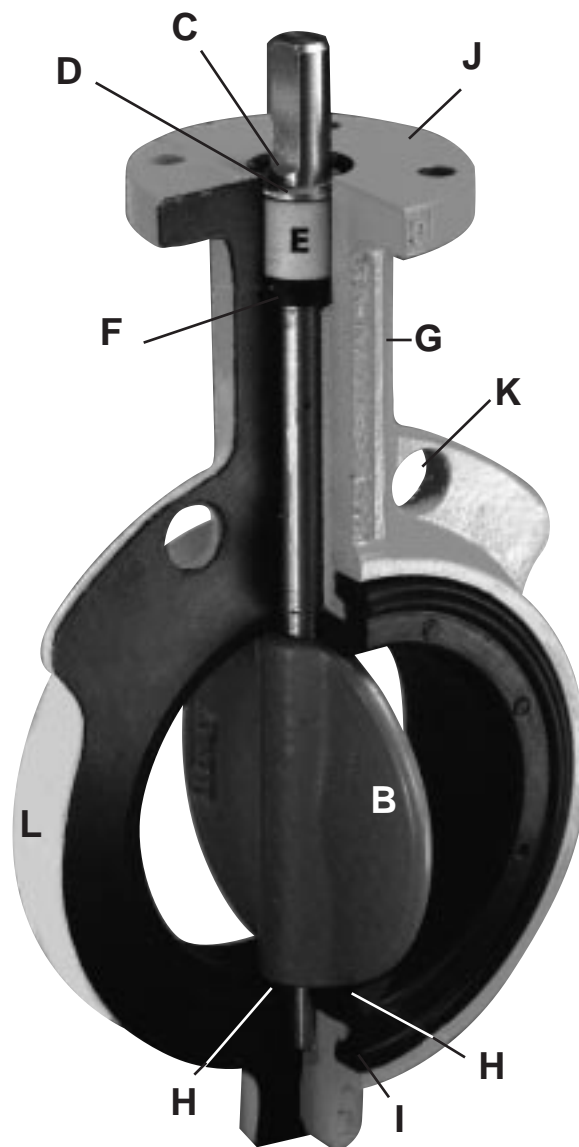
#### BRAY UNIQUE SEAT DESIGN ( I )

One of the valve's key elements is Bray's unique tongue and groove seat design. This resilient seat features lower torque

than many valves on the market today and provides complete isolation of flowing media from the body by a totally encasing design. The tongue and groove seat-to-body retention method is superior to many traditional designs, making field replacement simple and fast. The seat is specifically designed to seal with slip-on or weld-neck flanges. The seat features a moulded O-ring which eliminates the need for flange gaskets. It is important to point out that all resilient seats on Bray butterfly valves are completely interchangeable.

#### BODY ( L )

The body is a one-piece lug style, epoxy coated for excellent corrosion, humidity and water resistance. It has been outdoor tested for weatherability and resistance to ultraviolet radiation. All bodies meet ANSI 150 pressure ratings for hydrostatic requirements and comply with ISO 5752 and ISO 5211 standards.



## Butterfly Control Valves

### Materials Selection

(2"-20" (50mm-500mm))

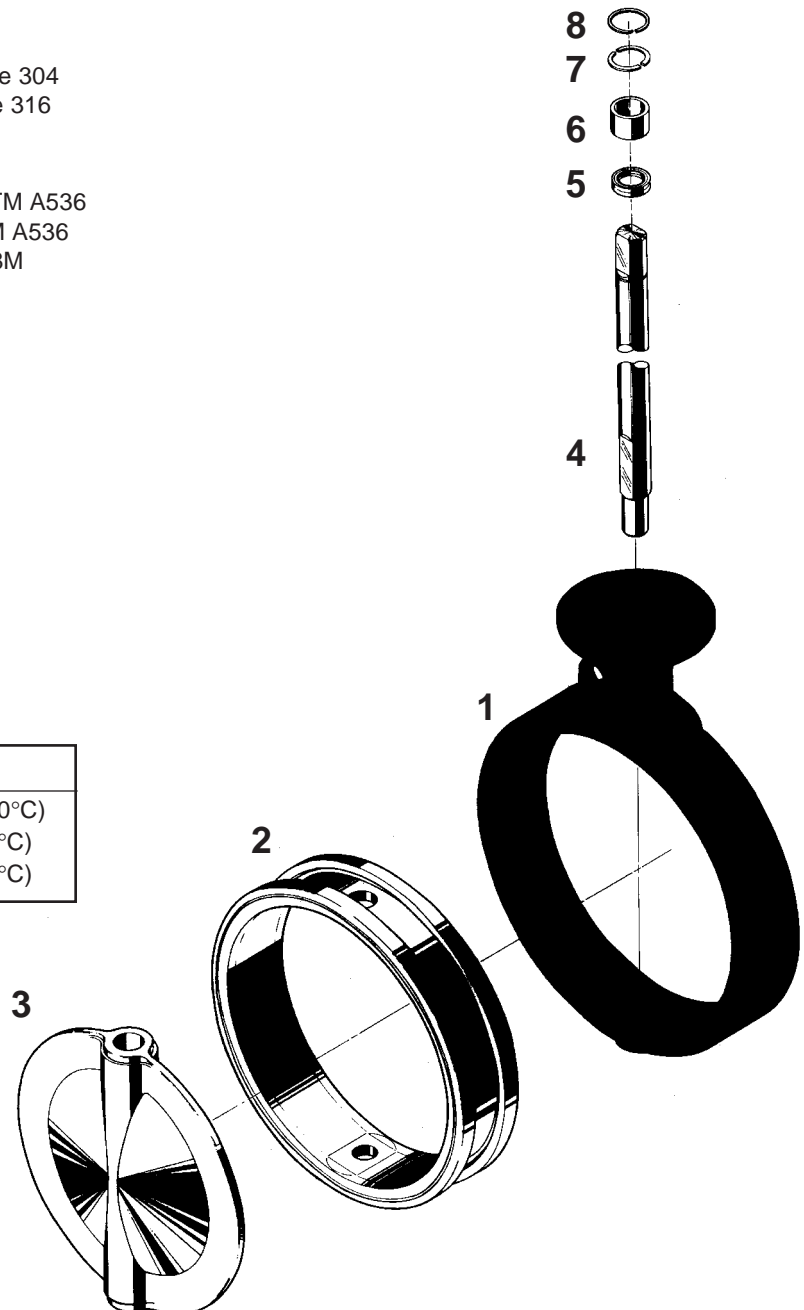
- BODY**
- Cast Iron ASTM A126 Class B
  - Ductile iron ASTM A536
  - Cast steel ASTM A216 WCB
  - Aluminum ASTM B26
- SEAT**
- BUNA-N (Nitrile)- food grade
  - EPDM - food grade
  - Viton GF®
  - White BUNA-N (Nitrile) - food grade
- STEM**
- Carbon steel, phosphate coated
  - 304 stainless steel ASTM A276 Type 304
  - 316 stainless steel ASTM A276 type 316
  - Monel
- DISC**
- Aluminum bronze ASTM B148-953
  - Ductile iron, phosphate coated, ASTM A536
  - Ductile iron, Nylon 11 coated, ASTM A536
  - 316 stainless steel ASTM A351 CF8M

### COMPONENTS

Item	Qty.	Description
1	1	Body
2	1	Seat
3	1	Disc
4	1	Stem
5	1	Stem Seal
6	1	Stem Bushing
7	2	Stem Retainer
8	1	Retaining Ring

### TEMPERATURE RANGE OF SEATS

Type	Max.	Min.
EPDM	250°F (121°C)	-40°F (-40°C)
BUNA-N	212°F (100°C)	0°F (-18°C)
Viton GF®	400°F (204°C)	0°F (-18°C)



## Butterfly Control Valves

### Pneumatic Butterfly Valves VP2900 or VP3900 Series

Spartan butterfly valves include the valve body (or bodies in the case of three-way valves), the cylinder (or cylinders in the case of larger three-way valves), a relay, and all interconnecting tubing, etc. Accessories include pilot positioners, position transmitters and end switches. A unique and flexible construction allows that the valve can be rearranged in the field to suit site conditions, as follows:

1. The valve body can be at right angles to the actuator frame, in line with the frame, or at 45° to the valve frame.
2. The valve can be normally open or normally closed (reverse acting or direct acting).
3. All the above accessories can be ordered from the factory as an assembly, or can be added in this field later if required.
4. The pilot positioner can be used as a pilot positioner, or as a two-way switching relay for two-position action from a proportioned signal.
5. Up to two end switch kits can be provided for the valves. Each switch provides SPDT action, and can be adjusted for either open or closed ends, or intermediate position.

#### ROTATING THE VALVE BODY/ACTUATOR FRAME ON TWO-WAY VALVES

Spartan valves have been built with long cylinders of smaller bore rather than with large bore and short stroke because of the resultant, smooth, friction-free action and because of the reduced wear and reduced strain of longer lever arms, less stressed lever bearings, clevis, etc. The negative in this formula is the extra space needed for the longer piston actuators.

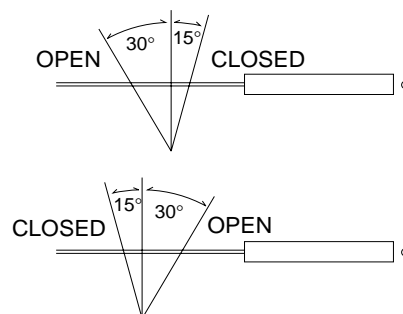
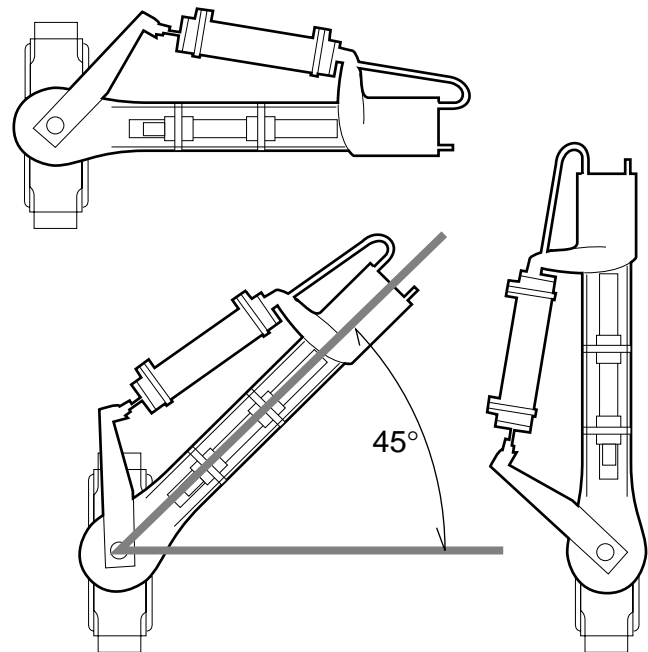
Accordingly, Spartan valves have been developed in such a way that they can be adapted to numerous positions.

The actuator frame can be rotated through 360° in 45° increments. To do this, remove the four bolts holding the frame to the valve, swing the frame around to the required 45° sector and replace the nuts, bolts and lock washers.

Once the frame is in place, the linkage will need realignment (except in the 180° position which is identical). Proceed as follows:

- a. Remove the pilot positioner spring from the crank arm. Remove the piston clevis from the crank arm, and use the crank arm to rotate the valve to the closed position.
- b. Remove the crank arm from the valve and reinstall so that the crank arm is in the 15° from right angle position. The valve must operate through 60° with the 15° at closed to 45° degree at open totalling 60° from open to closed (new keyway may be needed).
- c. Release the bolts from the piston clevis clamp and slide the entire piston assembly to the required position so that the piston stem end clevis mates with the realigned arm.
- d. Tighten and test run the assembly. Reconnect and recalibrate the pilot positioner and/or end switches as necessary.

**Note:** To achieve the results noted above, you may find that the valve now closes in the opposite rotation. This is acceptable, for Spartan valves are equipped with resilient seals designed to rotate into the seat either CW or CCW. However, you may now find the valve to be DA or RA while you require the reverse.





## Butterfly Control Valves

### PIPING YOUR PNEUMATIC BUTTERFLY VALVE

The standard actuator on Spartan valves uses a pneumatic cylinder sized for 20 psi air. In operation, this powerful cylinder with long, even stroke working 8" crank arms provides smooth, effortless action free of hysteresis, and is suitable for both two-position or modulating (with pilot positioner) control.

In 2-position format (standard) each valve is equipped with changeover relay to drive the cylinder one way or the other from a single on or off pneumatic pilot signal.

20# is required at all times on the main air, for both 2-position or modulating versions.

A standard damper motor with roll diaphragm and spring return can be used on smaller valves, but these actuators generally suffer from too little power, short strokes and resultant hysteresis-prone short crank arms, and a rubbery and sticky feeling action. They do have the advantage of spring return and in 2-position format only require a single input signal 0 - 20 psi. In modulating format they require a pilot positioner and additional 20 psi main air supply.

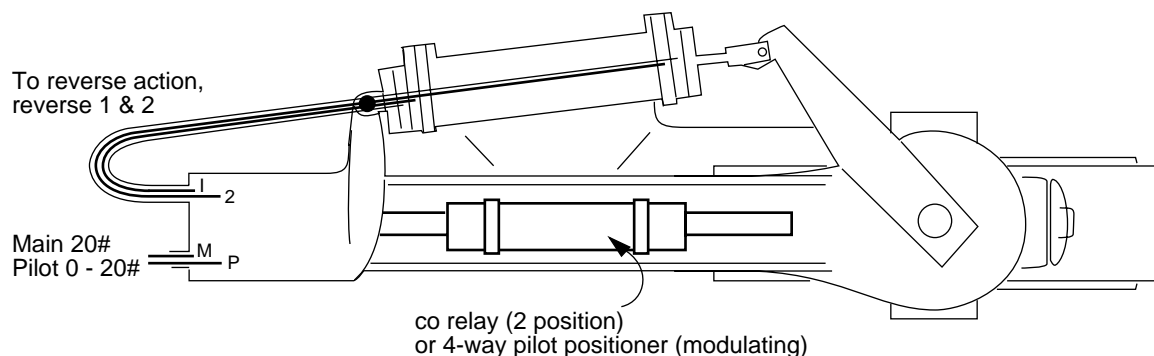
### CHANGING FROM DA TO RA OR VICE VERSA

Your Spartan valve was shipped with plastic tubing neatly clipped and tie-wrapped in place. To reverse the valve action, you need to reverse the lines from ports 1 and 2 to the opposite cylinder ends. To simplify this change, two barbed connectors were supplied with the valve. We suggest you cut both lines, insert the two barbed connectors, and reverse the lines. The valve action will now be reversed, but on pilot equipped models, the feedback may also be reversed.

### CHANGING THE SENSITIVITY OF THE PILOT POSITIONER BOTH PROPORTIONAL OR 2-POSITION

Pilot positioner equipped valves can be adjusted from two-position action through proportional action by connecting the positioner position feedback spring either on the left or right of fulcrum. A number of holes are available. The closer to the center, the greater the sensitivity. Usually Spartan pilot positioner valves are tested and shipped with 5 psi span and modulation. Replacing the spring to the opposite but matching hole will provide on-off control with a 5 psi differential. Moving to the outside will provide 10 psi span or 10 psi differential. Moving to the center will provide an overly sensitive action. Experiment until your best needs are met. The set point or the starting point of the pilot positioner can be changed by rotating the knurled knob at the base of the position feedback chains.

The reversing relay set point was set at 10 psi output, with the pilot positioner set at 10 psi output (assuming 20# main air) and should be set at 50% of the working pressure. Adjust the pilot positioner to deliver 10 psi or 50% of air pressure. Adjust reversing relay to deliver 50% of air pressure. Reconnect feedback spring and check operation.



## Butterfly Control Valves

### Valve Selection

#### SELECTING THE RIGHT BUTTERFLY VALVE FOR YOUR APPLICATION

Your butterfly valves will be either pneumatic or electric, but additionally the valve body itself can be constructed with numerous materials. Listed below are the types of materials available.

If no options are requested, the standard model will be shipped as indicated. For special applications, check with the factory for information and pricing.

	Standard	Options
<b>Actuator</b>	<input type="checkbox"/> Electric <input type="checkbox"/> Pneumatic cylinder	<input type="checkbox"/> 0-10 VDC modulating <input type="checkbox"/> Pneumatic roll diaphragm <input type="checkbox"/> Pilot Positioner
<b>Valve body</b>	<input type="checkbox"/> Cast Iron	<input type="checkbox"/> Plastic
<b>Disc</b>	<input type="checkbox"/> Bronze	<input type="checkbox"/> Cast Iron <input type="checkbox"/> Plastic
<b>Shaft</b>	<input type="checkbox"/> Thrushaft Stainless	<input type="checkbox"/> Stub Shafts
<b>Seat</b>	<input type="checkbox"/> EMPT (Omega Seat)	<input type="checkbox"/> Metal-to-metal
<b>Configuration for 3-ways</b>	<input type="checkbox"/> Left Corner <input type="checkbox"/> Right Corner	<input type="checkbox"/> Cross Tee
<b>Flanges</b>	<input type="checkbox"/> 125#	<input type="checkbox"/> 250#
<b>Gaskets</b>	<input type="checkbox"/> Integral	<input type="checkbox"/> Composition Gaskets
<b>Shaft Seal</b>	<input type="checkbox"/> Self Adjust "4" Cup	<input type="checkbox"/> Graphite Teflon Braid/Bronze
<b>Opening *</b>	<input type="checkbox"/> 60° (V-2960) <input type="checkbox"/> 90° (V-2990)	

\* 60° valves perform better on modulating service but do not open to the same Cv as 90° valves (see tables).

NOTE: Other options available on request



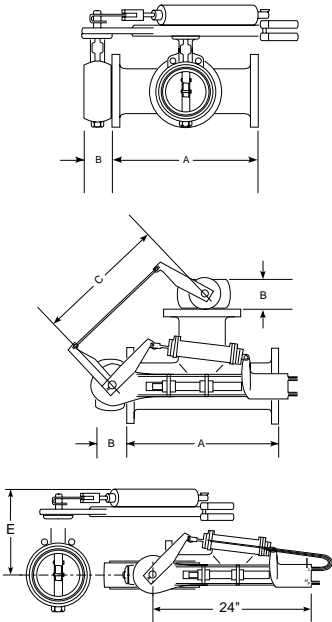
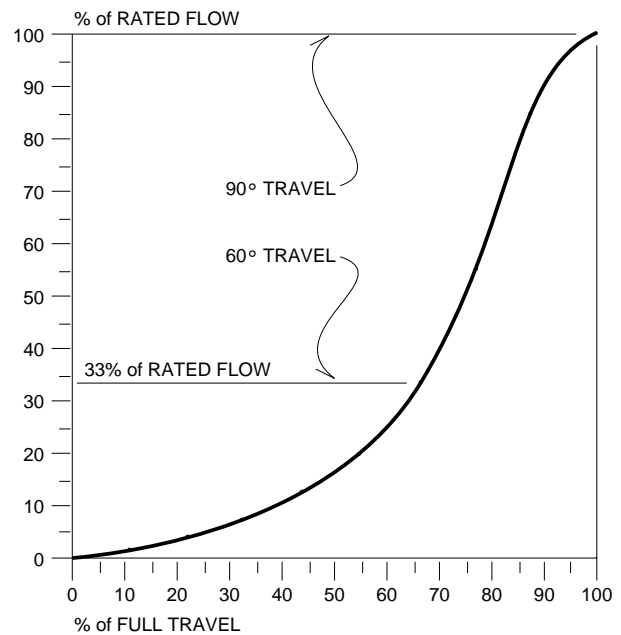
## VP2900 / 3900 Series 2-way & 3-way Pneumatic Butterfly Control Valves

**VALVE DIMENSIONS**

VALVE SIZE	TEE DIMS. FACE / FACE		VALVE THICKNESS	STEM CENTERS	FACE TO CENTERLINE		HT. FROM CENTERLINE	SHAFT SIZE	VALVE MTNG.		ACTUATOR TYPE	* CV (60)	* CV (90)
	A	B			D	E			HOLE SIZE	CIRCLE			
2	10.0	1.62	8.31	5.00	10.00	0.55	0.44	3.25	1.7 X 4	61	144		
3	11.0	1.75	9.02	5.50	10.25	0.55	0.44	3.25	1.7 X 6	154	461		
4	13.00	2.00	10.61	6.50	11.00	0.63	0.44	3.25	1.7 X 8	274	841		
5	15.00	2.13	12.11	7.50	11.50	0.75	0.44	3.25	2 X 8	428	1376		
6	16.00	2.13	12.82	8.00	12.00	0.75	0.44	3.25	2 X 8	567	1850		
8	18.00	2.50	14.50	9.00	13.50	0.87	0.56	5.00	2 X 8	1081	3316		
10	22.00	2.50	17.32	11.00	14.75	1.18	0.56	5.00	2.5 X 8	1710	5430		
12	24.00	3.00	19.09	12.00	16.25	1.18	0.56	5.00	2.5 X 8	2563	8077		
14	28.00	3.00	21.92	14.00	16.00	1.38	0.56	5.00	3 X 8	3384	10538		
16	30.00	4.00	24.04	15.00	17.00	1.38	0.56	5.00	3 X 8	4483	13966		
18	33.00	4.25	26.34	16.50	18.50	1.77	0.891	6.50	3 X 8	5736	17214		
20	36.00	5.00	38.99	18.00	19.88	1.7	0.81	6.50	3 X 8	7144	22339		
24	44.00	6.00	35.36	22.00	23.50	2.00	0.81	6.50	4 X 8	10000	30000		

\* Cv's based on use in full size pipe. Reduce Cv 20% for each pipe size reduction, i.e.: 8" valve in 12" pipe =  $1100 \times .8 \times .8 = 704$

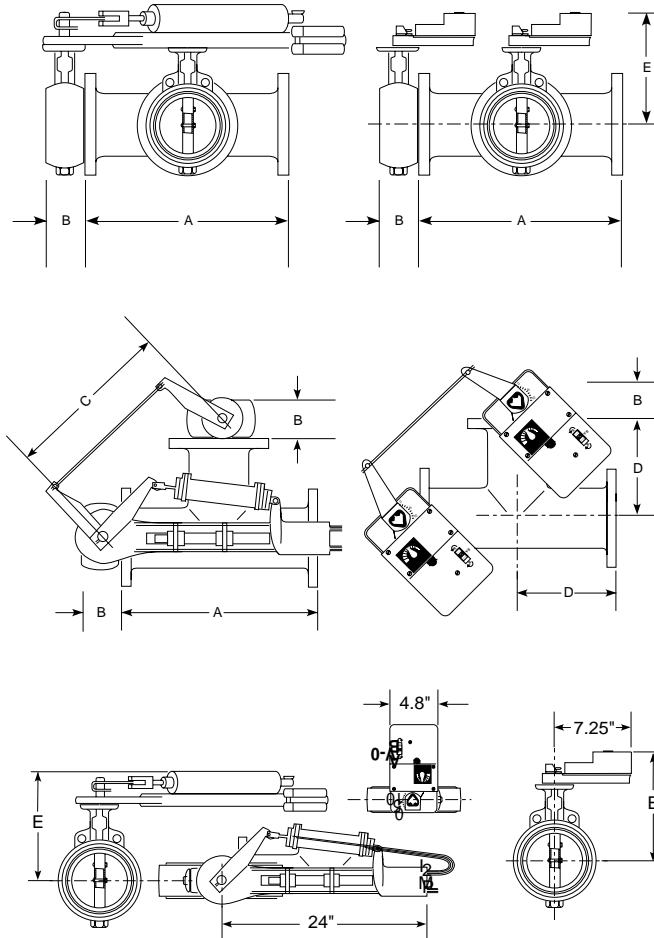
† These valves to be supplied undercut for low torque 50 psig differential close-off rating (above 50# some leakage may be apparent).


**VALVE FLOW CHARACTERISTICS**

**HOW TO ORDER**


<b>2</b>	2-way	<b>6</b>	60°, modulating
<b>3</b>	3-way	<b>9</b>	90°, 2-position

	Cv 60	Cv 90		Cv 60	Cv 90
2"	<b>80</b>	<b>220</b>	8"	<b>1100</b>	<b>3300</b>
2 1/4"	<b>110</b>	<b>320</b>	10"	<b>1800</b>	<b>5400</b>
3"	<b>170</b>	<b>500</b>	12"	<b>2700</b>	<b>8000</b>
4"	<b>280</b>	<b>820</b>	14"	<b>3400</b>	<b>10000</b>
5"	<b>450</b>	<b>1300</b>	16"	<b>4500</b>	<b>13000</b>
6"	<b>640</b>	<b>1900</b>			

## Butterfly Control Valves



### SPARTAN PERIPHERAL DEVICES

#### Canada

187 Joseph Carrier  
Vaudreuil, Quebec  
Canada J7V 5V5

#### U.S.A.

100 Walnut Street  
Champlain, New York  
U.S.A. 12919

PHONE (450) 424-6067  
FAX (450) 424-6071  
E-MAIL [info@spartan-pd.com](mailto:info@spartan-pd.com)  
WEBSITE [www.spartan-pd.com](http://www.spartan-pd.com)