



# PV Series

Pneumatic Vane Rotary Actuators



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Parker Hannifin Corporation  
Pneumatic Division  
Wadsworth, Ohio  
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**Heads**

Solid stock heads are precision machined from aluminum, then hard-coat anodized and permanently sealed to ensure long seal life and low breakaway pressure. Solid stock heads eliminate cavities where contaminants may collect and also allow rear porting.

**Body**

The precision body extrusion is hard-coat anodized and permanently sealed, resulting in a smooth, slick seal surface. This guarantees minimum breakaway and maximum seal life. The unitized body incorporates the stator(s) for superior rigidity.

**Shoulder Seal**

A nitrile energized, glass-filled Teflon® seal is utilized. It reduces bypass flow and friction, providing superior performance and long life.

**Shaft Seal**

The high quality, self-lubricated, abrasion resistant nitrile seal is a multiple lobe construction for leak-free operation and greater reliability. (Cleanroom option available on sizes 22, 42, 44 and 46.)

**Shaft**

Stainless steel provides high strength and corrosion resistance for demanding applications.

**Shaft Bearing**

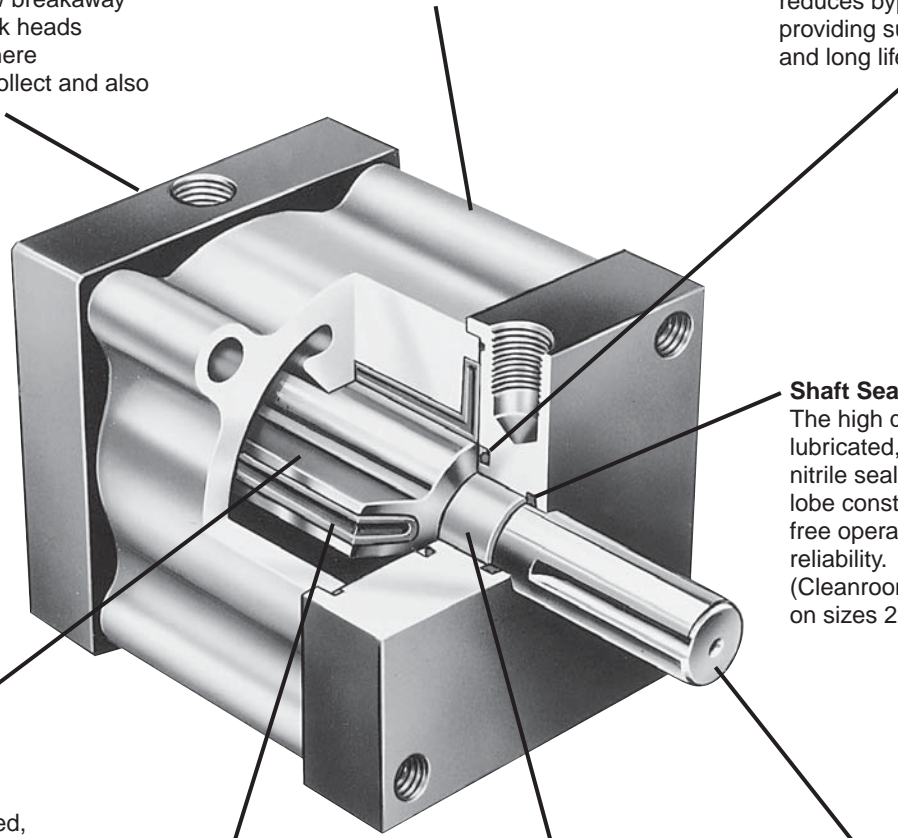
Thermoplastic journal bearing provides washdown capability and low cost. Optional radial ball bushing offers greater precision.

**Vane Seal**

A special self-lubricated, abrasion resistant nitrile compound is molded into a one-piece vane seal, providing low breakaway pressure and long life, even with no lubrication.

**Vane**

A hard-coat anodized, precision aluminum extrusion is permanently affixed to shaft. The lightweight vane reduces inertia allowing very fast rotational speeds.

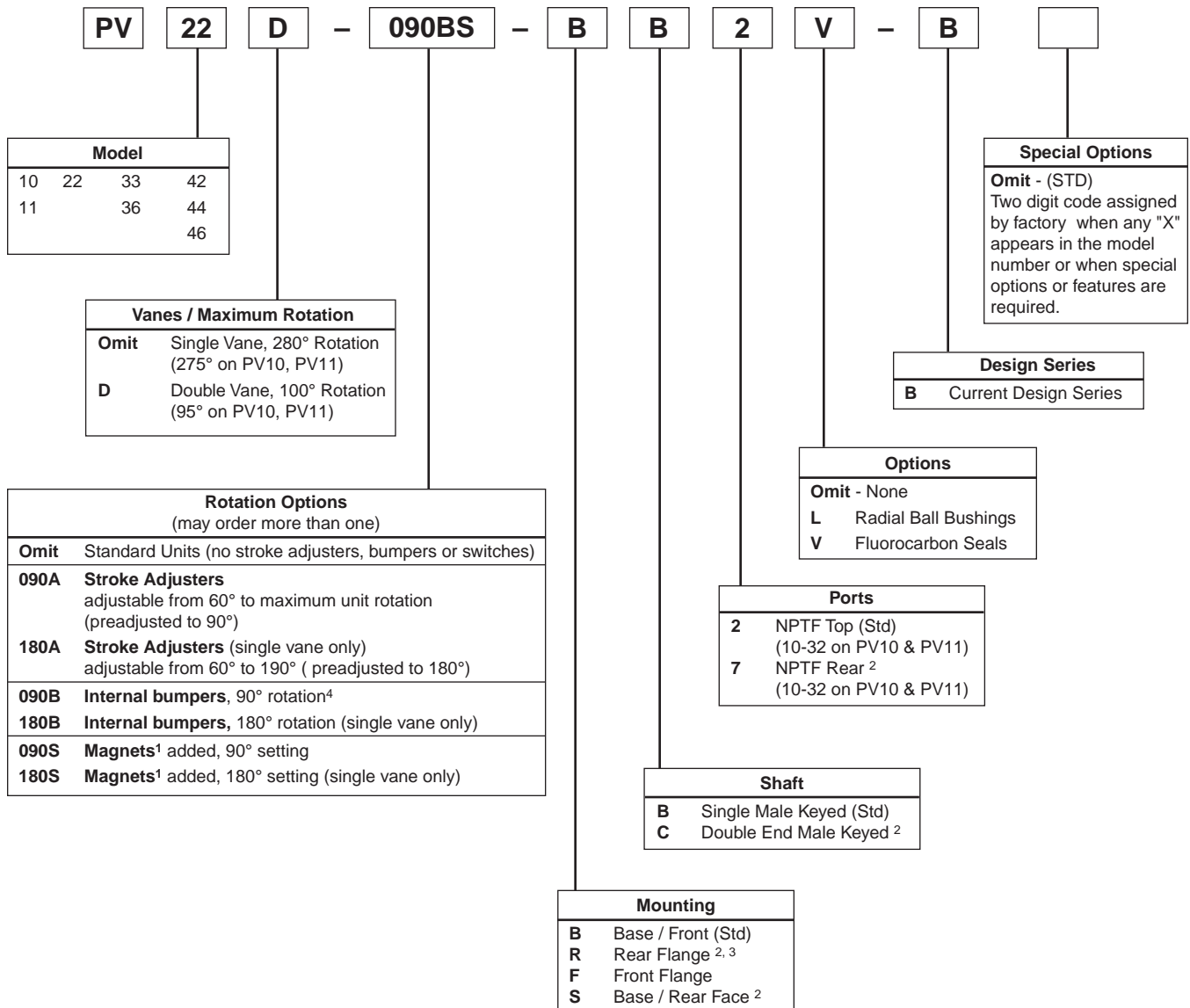


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**3D CAD FILES**  
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**Model Code and Ordering Information**

Example: PV22D - 090BS - BB2V - B



- Switches can be used with stroke adjusters or bumpers (example: PV22D-090BS-BB2-B).
- Not available with switches or stroke adjusters.
- No tapped mounting holes in face opposite the flange.
- 90° bumpers (090B) not available on PV10/11 sizes.

**Note:**  
 Order Hall effect sensors and reed switches separately from the Electronic Sensors section.



**Specifications**

- Maximum operating pressure: 150 psi air
  - Output torque @ 100 psi: 8 to 1800 lb-in
  - Standard rotations: Single vane units: 280° ± 1° (except size 10 & 11: 275° ± 2.5°)  
 Double vane units: 100° ± 1° (except size 10 & 11: 95° ± 2.5°)  
 Also available with stroke adjusters and internal stops to provide 90° and 180° rotation
  - Maximum breakaway pressure and bypass leakage: see table
  - Mounting orientation: unrestricted
  - Operating temperature range†: Nitrile seals 30 to 180°F  
 Fluorocarbon seals\* 30 to 250°F
  - Filtration requirement: 40 micron filtered, dry air
- \* See Fluorocarbon seal option for high temperature applications.  
 † For low temperature version, please consult factory.

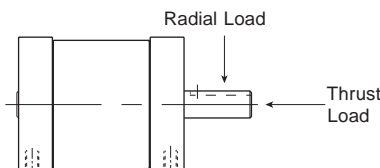
**Quick Reference Data**

| Model | Maximum Rotation (Deg) | Actual Output Torque (lb-in) at Specified Input Pressure (PSI) |      |      | Displacement (in <sup>3</sup> ) | Maximum Breakaway Pressure (PSI) | Maximum Bypass Leakage @100 PSI (cfm) | Unit Weight (lb) |
|-------|------------------------|--|------|------|---------------------------------|----------------------------------|---------------------------------------|------------------|
|       |                        | 50   | 75   | 100  |                                 |                                  |                                       |                  |
| 10    | 275                    | 4  | 6    | 8    | 0.52                            | 25                               | 0.15                                  | 0.38             |
| 10D   | 95                     | 8  | 12   | 16   | 0.37                            | 20                               | 0.20                                  | 0.38             |
| 11    | 275                    | 8  | 12   | 16   | 1.04                            | 20                               | 0.15                                  | 0.50             |
| 11D   | 95                     | 17   | 25   | 33   | 0.74                            | 15                               | 0.20                                  | 0.50             |
| 22    | 280                    | 32   | 48   | 64   | 3.67                            | 15                               | 0.20                                  | 0.50             |
| 22D   | 100                    | 68   | 101  | 135  | 2.62                            | 10                               | 0.25                                  | 1.75             |
| 33    | 280                    | 75   | 112  | 150  | 8.70                            | 15                               | 0.20                                  | 3.44             |
| 33D   | 100                    | 155  | 235  | 315  | 6.20                            | 10                               | 0.25                                  | 3.56             |
| 36    | 280                    | 150  | 220  | 300  | 17.40                           | 15                               | 0.20                                  | 5.19             |
| 36D   | 100                    | 315  | 470  | 630  | 12.40                           | 10                               | 0.25                                  | 5.50             |
| 42    | 280                    | 140  | 210  | 285  | 17.80                           | 15                               | 0.20                                  | 7.13             |
| 42D   | 100                    | 300  | 450  | 600  | 14.58                           | 10                               | 0.25                                  | 7.50             |
| 44    | 280                    | 285  | 425  | 570  | 35.61                           | 15                               | 0.20                                  | 8.81             |
| 44D   | 100                    | 600  | 900  | 1200 | 29.17                           | 10                               | 0.25                                  | 9.38             |
| 46    | 280                    | 425  | 640  | 850  | 53.41                           | 15                               | 0.20                                  | 10.50            |
| 46D   | 100                    | 900  | 1350 | 1800 | 43.75                           | 10                               | 0.25                                  | 10.75            |

**Kinetic Energy Ratings and Bearing Load Capacities**

| Model | Composite Bushing Load Capacities (lb)* |        | Radial Ball Bushing Load Capacities (lb)* |        | Distance Between Centerline Bearings | Maximum Kinetic Energy Rating for Models Based on Configuration (in-lb) |                  |         |
|-------|---|--------|---|--------|--------------------------------------|---|------------------|---------|
|       | Radial                                  | Thrust | Radial                                    | Thrust |                                      | Standard  | Stroke Adjusters | Bumpers |
| 10    | 15                                      | 7      | 50  | 15     | 0.88                                 | 0.03  | 0.12             | 0.05    |
| 11    | 15                                      | 7      | 50  | 15     | 1.50                                 | 0.06  | 0.12             | 0.09    |
| 22    | 50                                      | 25     | Consult Factory                           |        | 2.38                                 | 0.25  | 0.50             | 0.38    |
| 33    | 100                                     | 50     | Consult Factory                           |        | 3.50                                 | 0.75  | 1.50             | 1.13    |
| 36    | 100                                     | 50     | Consult Factory                           |        | 6.50                                 | 1.00  | 1.50             | 1.50    |
| 42    | 200                                     | 75     | Consult Factory                           |        | 2.75                                 | 2.00  | 4.00             | 3.00    |
| 44    | 200                                     | 75     | Consult Factory                           |        | 4.75                                 | 2.50  | 4.00             | 3.75    |
| 46    | 200                                     | 75     | Consult Factory                           |        | 6.75                                 | 3.00  | 4.00             | 4.75    |

\* Bearing capacities only. Check Kinetic Energy ratings to determine if actuator will stop load.



**Kinetic Energy Basic Formula**

$$KE = 1/2 Jm\omega^2$$

$$\omega = 0.035 \times \frac{\text{Angle Traveled (Deg.)}}{\text{Rotation Time (Sec.)}}$$

where:

KE = Kinetic Energy (in-lb)

Jm = Rotational mass moment of inertia (in-lb-sec<sup>2</sup>)  
 (Dependent on physical size of object and weight)

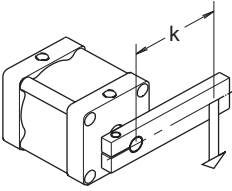
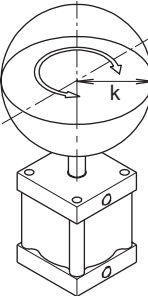
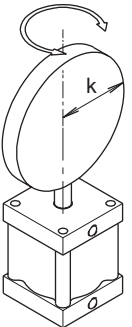
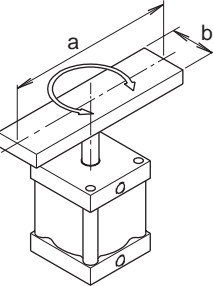
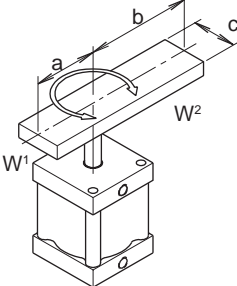
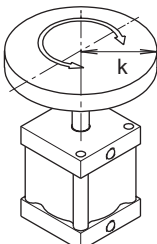
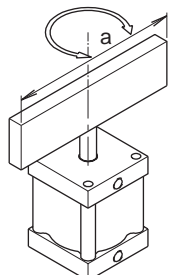
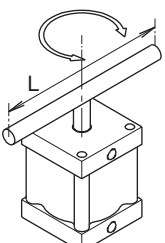
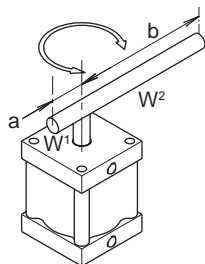
$\omega$  = Peak Velocity (rad/sec) (Assuming twice average velocity)

W = Weight of load (lb)

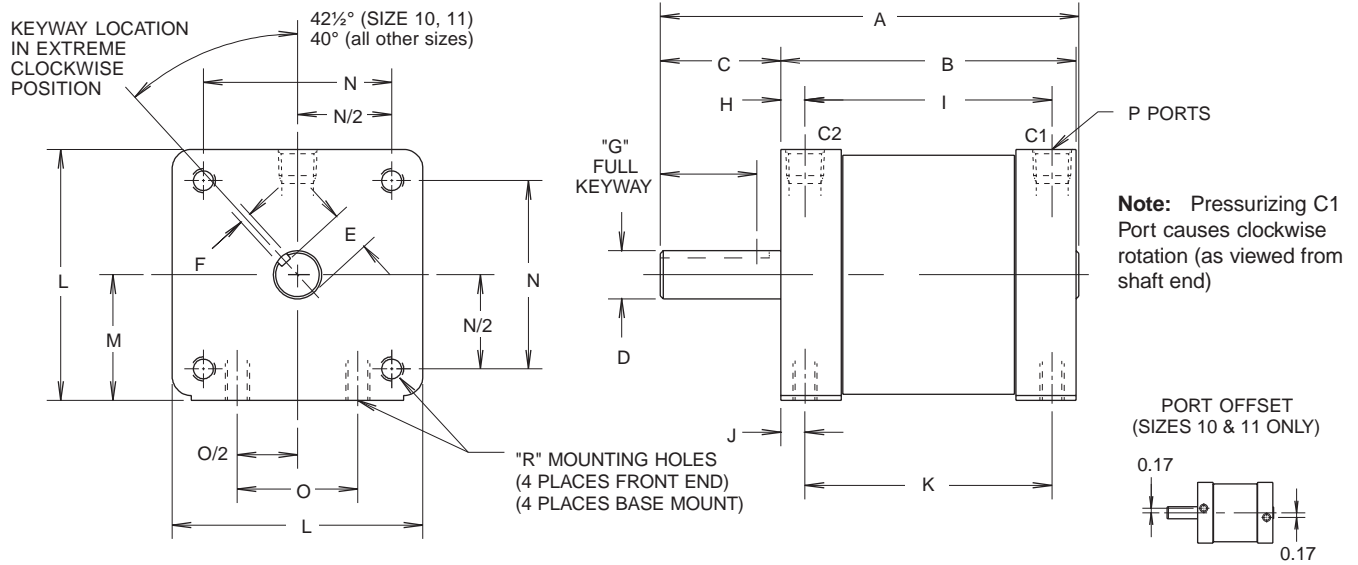
g = Gravitational constant = 386.4 in/sec<sup>2</sup>

k = Radius of gyration (in)

**Moments of Inertia**

|  |   |  |
|--|---|--|
| <p><b>POINT LOAD</b></p>  $Jm = \frac{W}{g} \times k^2$   | <p><b>SOLID SPHERE -<br/>                 Mounted on center</b></p>  $Jm = \frac{2}{5} \times \frac{W}{g} \times k^2$  | <p><b>THIN DISK-<br/>                 End mounted on center</b></p>  $Jm = \frac{W}{g} \times \frac{k^2}{4}$  |
| <p><b>THIN RECTANGULAR PLATE -<br/>                 Mounted on center</b></p>  $Jm = \frac{W}{g} \times \frac{a^2 + b^2}{12}$ | <p><b>THIN RECTANGULAR PLATE -<br/>                 Mounted off center</b></p>  $Jm = \frac{W^1}{g} \times \frac{4a^2 + c^2}{12} + \frac{W^2}{g} \times \frac{4b^2 + c^2}{12}$ | <p><b>THIN DISK-<br/>                 Mounted on center</b></p>  $Jm = \frac{W}{g} \times \frac{k^2}{2}$  |
| <p><b>THIN RECTANGULAR PLATE-<br/>                 End mounted on center</b></p>  $Jm = \frac{W}{g} \times \frac{a^2}{12}$    | <p><b>SLENDER ROD-<br/>                 Mounted on center</b></p>  $Jm = \frac{W}{g} \times \frac{L^2}{12}$  | <p><b>SLENDER ROD -<br/>                 Mounted off center</b></p>  $Jm = \frac{W^1}{g} \times \frac{a^2}{3} + \frac{W^2}{g} \times \frac{b^2}{3}$ |

**Standard Face/Base Mount (B) and Male Keyed Shaft (B)**



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| Model | A      | B    | C    | D              | E              | F              | G    | H    | I    | J    | K     | L    | M     | N     | O     | P        | R                      |
|-------|--------|------|------|----------------|----------------|----------------|------|------|------|------|-------|------|-------|-------|-------|----------|------------------------|
| 10    | 2.280  | 1.38 | 0.88 | 0.312<br>0.311 | 0.258<br>0.253 | 0.094<br>0.095 | 0.63 | 0.19 | 1.00 | 0.19 | 1.000 | 1.62 | 0.810 | 1.220 | 0.750 | 10-32    | 8-32 x<br>0.25 DP      |
| 11    | 2.905  | 2.00 | 0.88 | 0.312<br>0.311 | 0.258<br>0.253 | 0.094<br>0.095 | 0.63 | 0.19 | 1.63 | 0.19 | 1.625 | 1.62 | 0.810 | 1.220 | 0.750 | 10-32    | 8-32 x<br>0.25 DP      |
| 22    | 4.340  | 3.06 | 1.25 | 0.500<br>0.499 | 0.423<br>0.418 | 0.125<br>0.126 | 0.94 | 0.25 | 2.56 | 0.25 | 2.560 | 2.50 | 1.250 | 2.000 | 1.250 | 1/8 NPTF | 1/4-20NC x<br>0.38 DP  |
| 33    | 6.180  | 4.40 | 1.75 | 0.749<br>0.748 | 0.644<br>0.639 | 0.188<br>0.189 | 1.38 | 0.35 | 3.70 | 0.26 | 3.875 | 3.00 | 1.500 | 2.436 | 1.500 | 1/4 NPTF | 5/16-18NC x<br>0.47 DP |
| 36    | 9.180  | 7.40 | 1.75 | 0.749<br>0.748 | 0.644<br>0.639 | 0.188<br>0.189 | 1.38 | 0.35 | 6.70 | 0.26 | 6.875 | 3.00 | 1.500 | 2.436 | 1.500 | 1/4 NPTF | 5/16-18NC x<br>0.47 DP |
| 42    | 6.280  | 4.00 | 2.25 | 0.999<br>0.998 | 0.859<br>0.854 | 0.250<br>0.251 | 2.00 | 0.50 | 3.00 | 0.50 | 3.000 | 4.50 | 2.250 | 3.500 | 2.375 | 1/4 NPTF | 3/8-16NC x<br>0.75 DP  |
| 44    | 8.280  | 6.00 | 2.25 | 0.999<br>0.998 | 0.859<br>0.854 | 0.250<br>0.251 | 2.00 | 0.50 | 5.00 | 0.50 | 5.000 | 4.50 | 2.250 | 3.500 | 2.375 | 1/4 NPTF | 3/8-16NC x<br>0.75 DP  |
| 46    | 10.280 | 8.00 | 2.25 | 0.999<br>0.998 | 0.859<br>0.854 | 0.250<br>0.251 | 2.00 | 0.50 | 7.00 | 0.50 | 7.000 | 4.50 | 2.250 | 3.500 | 2.375 | 1/4 NPTF | 3/8-16NC x<br>0.75 DP  |



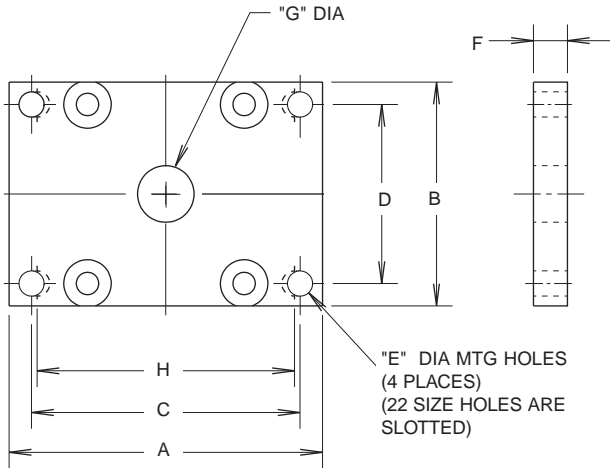
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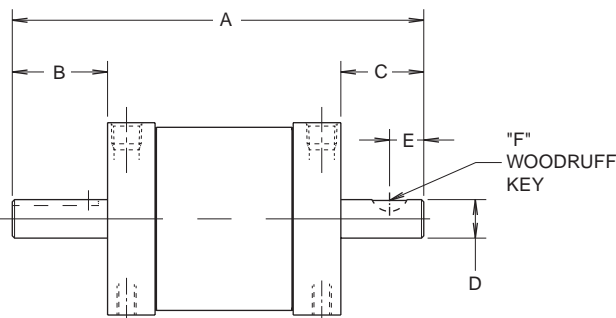
**Flange Mount (F, R)\***



| Model | A    | B    | C     | D     | E     | F    | G    | H     |
|-------|------|------|-------|-------|-------|------|------|-------|
| 10    | 2.50 | 1.62 | 2.000 | 1.250 | 0.203 | 0.19 | 0.41 | N/A   |
| 11    | 2.50 | 1.62 | 2.000 | 1.250 | 0.203 | 0.19 | 0.41 | N/A   |
| 22    | 3.50 | 2.50 | 3.000 | 2.000 | 0.281 | 0.25 | 0.66 | 2.875 |
| 33    | 4.50 | 3.00 | 3.750 | 2.000 | 0.344 | 0.38 | 0.84 | N/A   |
| 36    | 4.50 | 3.00 | 3.750 | 2.000 | 0.344 | 0.38 | 0.84 | N/A   |
| 42    | 7.32 | 4.51 | 5.905 | 2.953 | 0.551 | 0.63 | 1.61 | N/A   |
| 44    | 7.32 | 4.51 | 5.905 | 2.953 | 0.551 | 0.63 | 1.61 | N/A   |
| 46    | 7.32 | 4.51 | 5.905 | 2.953 | 0.551 | 0.63 | 1.61 | N/A   |

**Note:** The face opposite the flange mount does not contain tapped mounting holes. Consult factory if needed.

**Double End Male Keyed Shaft (C)**



| Model | A     | B    | C    | D              | E    | F      |
|-------|-------|------|------|----------------|------|--------|
| 10    | 2.75  | 0.88 | 0.50 | 0.312<br>0.311 | 0.28 | #302.5 |
| 11    | 3.38  | 0.88 | 0.50 | 0.312<br>0.311 | 0.28 | #302.5 |
| 22    | 5.06  | 1.25 | 0.75 | 0.500<br>0.499 | 0.44 | #404   |
| 33    | 7.15  | 1.75 | 1.00 | 0.749<br>0.748 | 0.56 | #606   |
| 36    | 10.15 | 1.75 | 1.00 | 0.749<br>0.748 | 0.56 | #606   |
| 42    | 7.53  | 2.25 | 1.28 | 0.999<br>0.998 | 0.72 | #808   |
| 44    | 9.53  | 2.25 | 1.28 | 0.999<br>0.998 | 0.72 | #808   |
| 46    | 11.53 | 2.25 | 1.28 | 0.999<br>0.998 | 0.72 | #808   |

**Note:** Not available with switches or stroke adjustment. Consult factory for rear port option.

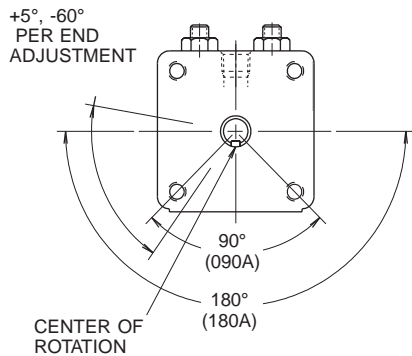
### Adjustable Rotation Stop (090A, 180A)

An adjustable positive stop is available to provide end of rotation adjustability in a compact package. Total adjustment range is 60° to 190° on single vane actuators, and 60° to 100° on double vane actuators (95° on PV10/11 sizes). The rotation is factory preset to a nominal 90° or 180° (090A or 180A) for convenient installation.

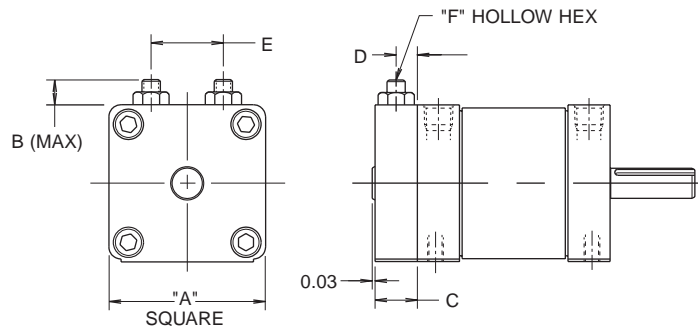
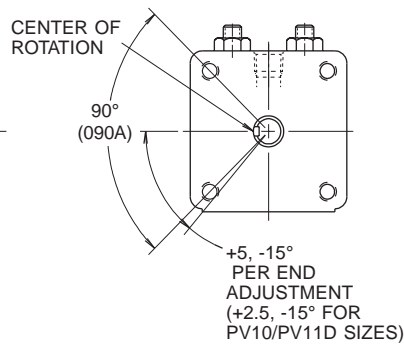
**NOTE:**

1. Not available with double end shaft.
2. Not available with rear ports.

**SINGLE VANE UNIT**



**DOUBLE VANE UNIT**



| Model | A    | B    | C    | D    | E    | F    |
|-------|------|------|------|------|------|------|
| 10    | 1.62 | 0.63 | 0.47 | 0.24 | 0.75 | 3/32 |
| 11    | 1.62 | 0.63 | 0.47 | 0.24 | 0.75 | 3/32 |
| 22    | 2.50 | 1.00 | 0.72 | 0.36 | 1.25 | 5/32 |
| 33    | 3.00 | 1.16 | 0.97 | 0.48 | 1.56 | 3/16 |
| 36    | 3.00 | 1.16 | 0.97 | 0.48 | 1.56 | 3/16 |
| 42    | 4.50 | 1.38 | 1.25 | 0.56 | 2.25 | 7/32 |
| 44    | 4.50 | 1.38 | 1.25 | 0.56 | 2.25 | 7/32 |
| 46    | 4.50 | 1.38 | 1.25 | 0.56 | 2.25 | 7/32 |

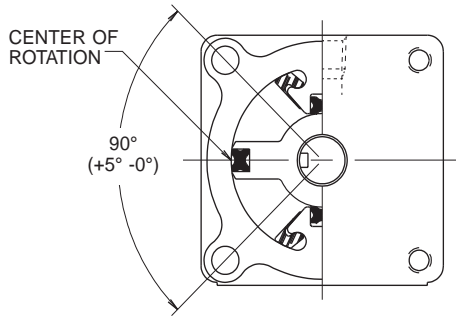
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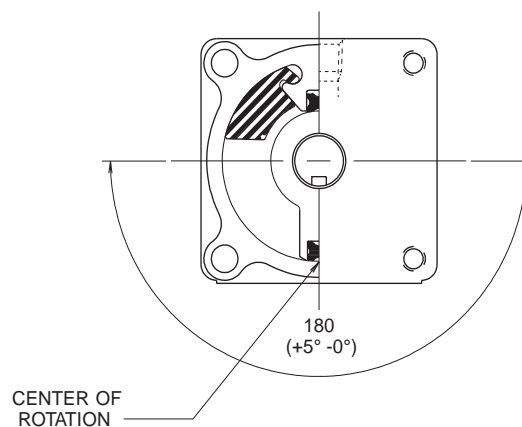
### 90° or 180° Bumpers (090B, 180B)

Bumpers are available to reduce noise and dissipate energy. This permits faster cycle times and increased production rates. Single vane units are available with 90° or 180° bumpers and double vane units are available with 90° bumpers.

**90° BUMPERS (090B)**



**180° BUMPERS (180B)**



### 90° or 180° Magnet (S)

Option "S" provides a magnet(s) attached to the actuator shaft. Hall effect or reed switches sense the position of these magnets. The switches are available in two nominal rotations, 90° or 180°, and the adjustment is  $\pm 20^\circ$  for each switch to provide a total adjustment of  $\pm 40^\circ$ . Adjustable stops, "A", or bumpers, "B", can be supplied in addition to magnets. Order switches separately.

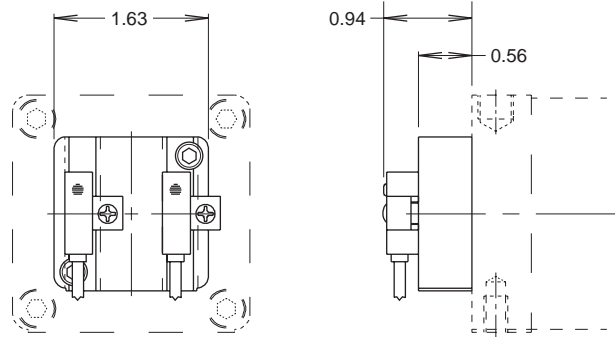
### Example Ordering Codes, Keyway Positions and Switch Sensing Locations:

Please note the following keyway position and switch sensing locations, with respect to ordering codes and options, with porting at the 12:00 position as viewed from the output shaft end (as shipped from the factory).

**180S,180AS, 180BS** - Single vane actuator with magnet or with magnet and stroke adjusters and/or bumpers: Keyway midstroke position at 6:00, magnet positioned to sense at 3:00 and 9:00.

**090S, 090AS** - Single vane actuator with magnet or with magnet and stroke adjusters: Keyway midstroke position at 6:00, magnet positioned to sense at 4:30 and 7:30.

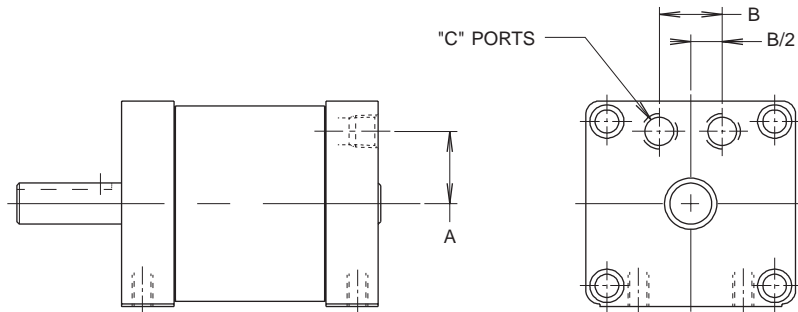
**090S, 090AS, 090BS** - Double vane actuator with magnet or with magnet and stroke adjusters or bumpers; or single vane actuator with magnet and bumpers: Keyway midstroke position at 9:00, magnet positioned to sense at 7:30 and 10:30.



**Rear Port (7)**

Rear porting provides convenience for confined mounting on very small units being face mounted.

This option is not available with switches or stroke adjustment. Consult factory for double end shaft option.

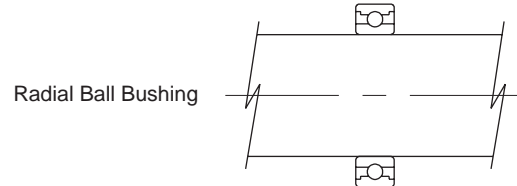
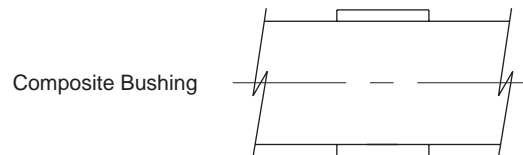


| Model | A    | B    | C        |
|-------|------|------|----------|
| 10    | 0.54 | 0.50 | 10-32    |
| 11    | 0.54 | 0.50 | 10-32    |
| 22    | 0.88 | 0.75 | 1/8 NPTF |
| 33    | 1.09 | 0.90 | 1/8 NPTF |
| 36    | 1.09 | 0.90 | 1/8 NPTF |
| 42    | 1.68 | 1.00 | 1/4 NPTF |
| 44    | 1.68 | 1.00 | 1/4 NPTF |
| 46    | 1.68 | 1.00 | 1/4 NPTF |

**Bearings - Radial Ball Bushings (L)**

Composite bushings should be used for washdown, highly contaminated, and low priced applications. Radial ball bushings provide greater precision. For bearing load capacities, reference the Engineering Data section of the catalog.

Consult factory for pricing and availability.



**Fluorocarbon Seals (V)**

Standard self-lubricating, abrasion resistant nitrile seals should be used for general purpose applications with temperatures of 0 to 180°F. Fluorocarbon seals are recommended for high temperature applications up to 250°F.

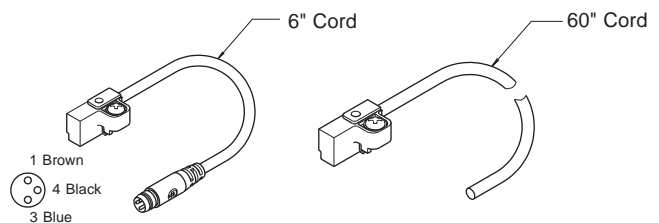
| Option   | Temperature Range* (°F) |
|----------|-------------------------|
| Bumpers  | 0 - 200                 |
| Magnets  | 0 - 155                 |
| Switches | 14 - 185                |

\*Consult factory for higher temperature operation.

**Solid State (Hall Effect) and Reed Sensors**

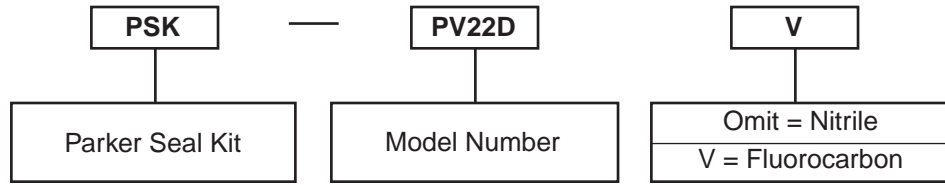
Sensors are available in a normally open or normally closed configuration. The low amp reed sensor is suitable for connection to PLCs or other low current devices. The high amp sensor can be used to drive sequencers, relays, coils or other devices directly.

Sensors must be ordered separately from the Electronic Sensors section.



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**Seal Kit Ordering Information**



**Seal Kit Installation Tool**

| Model (S)     | Items  | Seal Guide Kit Number |
|---------------|--------|-----------------------|
| PV10 & 11 (D) | 21, 22 | ATS-PV1               |
| PV22 (D)      | 21, 22 | ATS-PV2               |
| PV33 & 36 (D) | 21, 22 | ATS-PV3               |

- H**
- PV**
- PRN(A)
- WR
- PTR
- B671
- HP

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