

# VSX

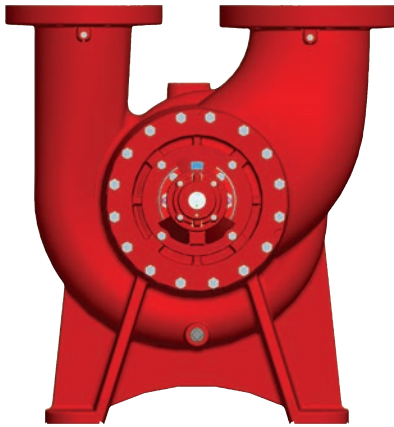
TECHNICAL BROCHURE



B-476E

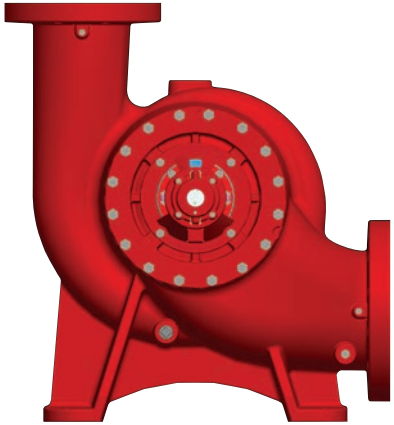
 **Bell & Gossett**  
a xylem brand

# You said you needed one pump that does it all.



VSC

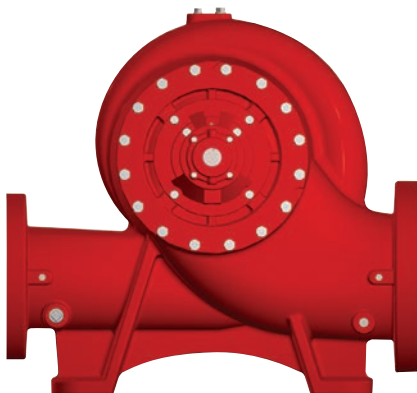
Only the VSX platform offers so many piping installation configurations, thanks to its revolutionary design. Utilizing CFD technology, we can deliver identical hydraulic performance in any flange configuration: VSC (top-top), VSCS (top-side) and VSH (side-side). In addition, every model and size is available in either right or left hand rotation providing up to six possible installation configurations. See below for availability of exact sizes and models.



VSCS

**The VSH<sup>®</sup>, VSC<sup>™</sup> and VSCS<sup>®</sup> are all available in the following pump sizes:**

|          |            |                       |
|----------|------------|-----------------------|
| 4x6x10.5 | 8x10x10.5  | 12x14x14              |
| 4x6x13.5 | 8x10x13.5  | 12x14x17.5            |
| 4x6x17.5 | 8x10x17.5  | 12x14x22              |
| 5x6x10.5 | 8x10x22    | 14x16x15              |
| 5x6x13.5 | 10x12x11.5 | 14x16x17.5            |
| 5x6x17.5 | 10x12x13.5 | 14x16x22              |
| 6x8x10.5 | 10x12x17.5 | 16x18x19*             |
| 6x8x13.5 | 10x12x22   | 18x20x22 <sup>†</sup> |
| 6x8x17.5 |            |                       |



VSH

\* Available in VSH and VSCS models only.

† Available in VSH model only.



# Standard & Optional VSX Application Envelope

|                                       | STANDARD OFFERING                       | OPTIONAL OFFERING                       |
|---------------------------------------|---|---|
| <b>Working Pressure</b>               |   |   |
| Standard                              | 175 psig                                | -                                       |
| Option                                | -                                       | 300 psig                                |
| <b>Flange Rating</b>                  |   |   |
| Standard<br>(For max. 175# Wrk Press) | FF flanges 125#<br>ANSI flange drilling | -                                       |
| Option<br>(For max. 300# Wrk Press)   | -                                       | FF flanges 250#<br>ANSI flange drilling |
| <b>Temperature</b>                    |   |   |
| (min.)                                | 0°F                                     | -                                       |
| (max.)                                | 300°F                                   | -                                       |
| <b>Volute Material</b>                |   |   |
| Standard (175 psig)                   | Cast Iron ASTM A159 <sup>†</sup>        | -                                       |
| Option (300 psig)                     | -                                       | Cast Iron ASTM A159 <sup>†</sup>        |
| <b>Shaft Material</b>                 |   |   |
| Standard                              | 1045 Steel                              | 416 SS                                  |
| <b>Impeller Material</b>              |   |   |
| Standard<br>(ASTM B584 Alloy C87600)  | Low Zinc Silicon Bronze                 | -                                       |
| <b>Shaft Sleeve Material</b>          |   |   |
| Standard                              | 304 SS covering<br>the wetted area      | 304 SS under<br>mechanical seal         |
| <b>Case Wear Ring</b>                 |   |   |
| C95400                                | -                                       | Aluminum Bronze                         |
| <b>Impeller Wear Ring</b>             |   |   |
| C95400                                | -                                       | Aluminum Bronze                         |
| <b>Seal Chamber</b>                   |   |   |
| *Mech. Seal<br>(Std. 175 psig)        | Unitized, EPR Car/SiC <sup>†</sup>      | -                                       |
| *Mech. Seal<br>(Opt. 300 psig)        | -                                       | Balanced,<br>EPR/Graphite Loaded SiC    |

\* Refer to the individual pump submittals for specific limitations

† 12x14x22, 14x16x22, 16x18x19 and 18x20x22 have balanced seals and ductile iron volutes, standard

# VSX Performance Range

|   | STANDARD OFFERING                   | OPTIONAL OFFERING               |
|---|-------------------------------------|---------------------------------|
| <b>Baseplate - Groutless</b>                        |                                     |                                 |
| Standard  | Structural Steel                    | -                               |
|   | -                                   | Galvanized Drip Pan             |
|   | -                                   | Jacking Screws                  |
| <b>Alignment Friendly Coupling*</b>                 |                                     |                                 |
| Standard up to 1000 HP<br>- suitable for VFD        | Non-spacer<br>Split Polymer Element | Spacer Split Polymer<br>Element |
| Standard up to 1500 HP - Above,<br>suitable for VFD | Non-spacer, Gear Type               | Spacer, Gear Type               |
| <b>Coupling Guard with View Ports</b>               |                                     |                                 |
| Standard  | ANSI / OSHA                         | -                               |
| <b>Pump Shaft Guards</b>                            |                                     |                                 |
| Standard  | ANSI / OSHA                         | -                               |

\* Refer to the individual pump submittals for specific limitations

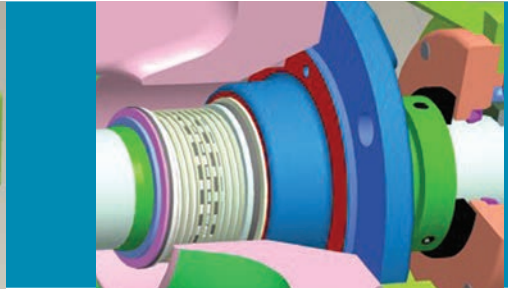
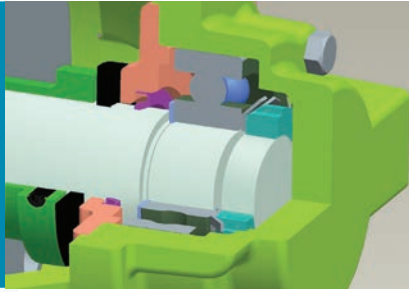
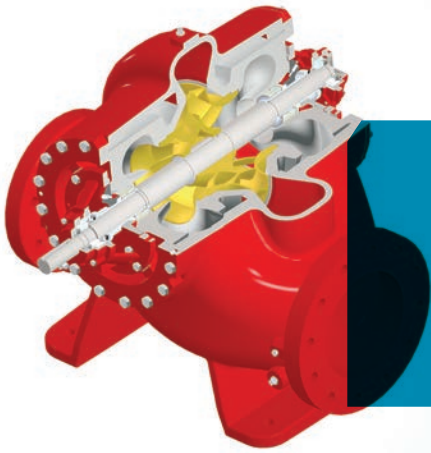




## VSX Operational Data

| [Pump Size]  | 4x6x10.5                | 4x6x13.5                | 4x6x17.5                | 5x6x10.5                | 5x6x13.5                |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| <b>CASING DATA</b>   |                         |                         |                         |                         |                         |
| <b>125# FF, ANSI Flanges Maximum 175 PSI Working Pressure Supplied with Unitized Seal</b>  |                         |                         |                         |                         |                         |
| Max. Suction pressure  | 175                     | 175                     | 175                     | 175                     | 175                     |
| Max. Working pressure  | 175                     | 175                     | 175                     | 175                     | 175                     |
| Max. hydrostatic test pressure   | 262                     | 262                     | 262                     | 262                     | 262                     |
| Casing material  | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               |
| <b>250# FF, ANSI Flanges Maximum 300 PSI Working Pressure Supplied with Unitized Seal*</b> |                         |                         |                         |                         |                         |
| *Max. Suction pressure   | 200                     | 200                     | 200                     | 200                     | 200                     |
| Max. Working pressure  | 300                     | 300                     | 300                     | 300                     | 300                     |
| Max. hydrostatic test pressure   | 450                     | 450                     | 450                     | 450                     | 450                     |
| Casing material  | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               |
| <b>250# FF, ANSI Flanges Maximum 300 PSI Working Pressure Supplied with Balanced Seal</b>  |                         |                         |                         |                         |                         |
| Max. Suction pressure  | 300                     | 300                     | 300                     | 300                     | 300                     |
| Max. Working pressure  | 300                     | 300                     | 300                     | 300                     | 300                     |
| Max. hydrostatic test pressure   | 450                     | 450                     | 450                     | 450                     | 450                     |
| Casing material  | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               |
| <b>MECHANICAL SEAL DATA</b>  |                         |                         |                         |                         |                         |
| <b>Mechanical Seal on sleeve for 175 and 300 psi working pressure*</b>                     |                         |                         |                         |                         |                         |
| Type   | Unitized                | Unitized                | Unitized                | Unitized                | Unitized                |
| Material   | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Car/SiC             |
| Min Temp - 0 deg. F  | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| Max Temp - 300 deg. F  | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |
| <i>* Refer to max. suction pressure limitation for 300psi working pressure rating.</i>     |                         |                         |                         |                         |                         |
| <b>Mechanical Seal on sleeve for max. 300 psi working pressure</b>                         |                         |                         |                         |                         |                         |
| Type   | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                |
| Material   | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC |
| Min Temp   | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| Max Temp   | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |
| <b>IMPELLER DESIGN DATA</b>  |                         |                         |                         |                         |                         |
| Number of vanes  | 7                       | 6                       | 5                       | 6                       | 5                       |
| Maximum Impeller Diameter  | 10.5"                   | 13.5"                   | 17.5"                   | 10.5"                   | 13.5"                   |
| Minimum Impeller Diameter  | 7"                      | 9.5"                    | 12.5"                   | 7"                      | 9"                      |
| Maximum Sphere   | .63"                    | .82"                    | .845"                   | .55"                    | 1.00"                   |





**5x6x17.5**

**6x8x10.5**

**6x8x13.5**

**6x8x17.5**

**8x10x10.5**

**8x10x13.5**

**8x10x17.5**

**8x10x22**

|           |           |           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 175       | 175       | 175       | 175       | 175       | 175       | 160       | 125       |
| 175       | 175       | 175       | 175       | 175       | 175       | 175       | 175**     |
| 262       | 262       | 262       | 262       | 262       | 262       | 262       | 262       |
| Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron |

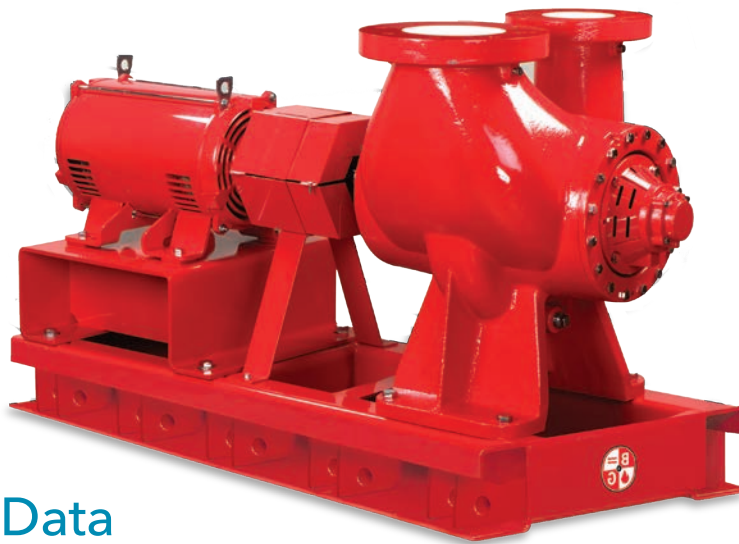
|           |           |           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 200       | 200       | 200       | 200       | 200       | 200       | 160       | 125       |
| 300       | 300       | 300       | 300       | 300       | 300       | 300       | 300       |
| 450       | 450       | 450       | 450       | 450       | 450       | 450       | 450       |
| Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron |

|           |           |           |           |           |           |           |           |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 300       | 300       | 300       | 300       | 300       | 300       | 300       | 300       |
| 300       | 300       | 300       | 300       | 300       | 300       | 300       | 300       |
| 450       | 450       | 450       | 450       | 450       | 450       | 450       | 450       |
| Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron | Cast Iron |

|             |             |             |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Unitized    | Unitized    | Unitized    | Unitized    | Unitized    | Unitized    | Unitized    | Unitized    |
| EPR/Car/SiC | EPR/Car/SiC | EPR/Car/SiC | EPR/Car/SiC | EPR/Car/SiC | EPR/Car/SiC | EPR/Car/SiC | EPR/Car/SiC |
| 0 deg F     | 0 deg F     | 0 deg F     | 0 deg F     | 0 deg F     | 0 deg F     | 0 deg F     | 0 deg F     |
| 300 deg F   | 300 deg F   | 300 deg F   | 300 deg F   | 300 deg F   | 300 deg F   | 300 deg F   | 300 deg F   |

|                         |                         |                         |                         |                         |                         |                         |                         |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Balanced                | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                |
| EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC |
| 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |

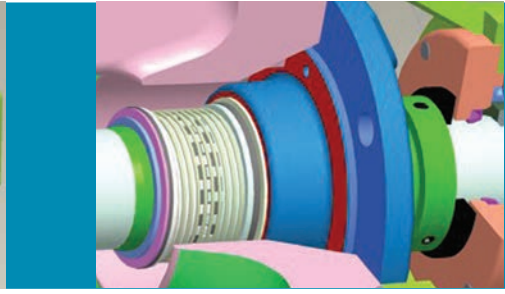
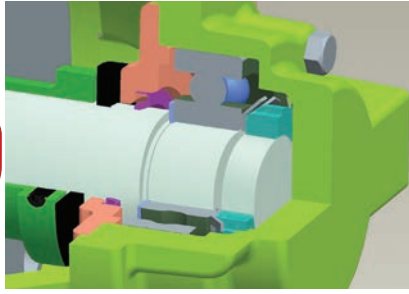
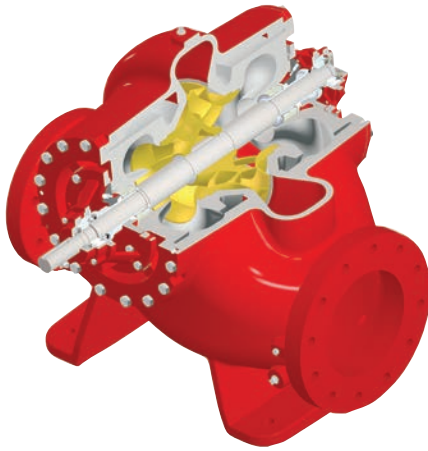
|       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|
| 6     | 7     | 6     | 5     | 7     | 7     | 7     | 6     |
| 17.5" | 10.5" | 13.5" | 17.5" | 10.5" | 13.5" | 17.5" | 22"   |
| 12.5" | 6.5"  | 10"   | 12.5" | 7"    | 9.5"  | 12.5" | 16.5" |
| .82"  | .70"  | 1.08" | .80"  | .57"  | 1.00" | 1.25" | 1.35" |



## VSX Operational Data

| [Pump Size]  | 10x12x11.5              | 10x12x13.5              | 10x12x17.5              | 10x12x22                | 12x14x14                |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| <b>CASING DATA</b>   |                         |                         |                         |                         |                         |
| <b>125# FF, ANSI Flanges Maximum 175 PSI Working Pressure Supplied with Unitized Seal (Balanced Seal where noted) †</b>  |                         |                         |                         |                         |                         |
| Max. Suction pressure  | 175                     | 160                     | 160                     | 125                     | 160                     |
| Max. Working pressure  | 175                     | 175                     | 175                     | 175**                   | 175                     |
| Max. hydrostatic test pressure   | 262                     | 262                     | 262                     | 262                     | 262                     |
| Casing material  | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               |
| <b>250# FF, ANSI Flanges Maximum 300 PSI Working Pressure Supplied with Unitized Seal* (Balanced Seal where noted) †</b> |                         |                         |                         |                         |                         |
| *Max. Suction pressure   | 200                     | 160                     | 160                     | 125                     | 160                     |
| Max. Working pressure  | 300                     | 300                     | 300                     | 300                     | 300                     |
| Max. hydrostatic test pressure   | 450                     | 450                     | 450                     | 450                     | 450                     |
| Casing material  | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               |
| <b>250# FF, ANSI Flanges Maximum 300 PSI Working Pressure Supplied with Balanced Seal</b>                                |                         |                         |                         |                         |                         |
| Max. Suction pressure  | 300                     | 300                     | 300                     | 300                     | 300                     |
| Max. Working pressure  | 300                     | 300                     | 300                     | 300                     | 300                     |
| Max. hydrostatic test pressure   | 450                     | 450                     | 450                     | 450                     | 450                     |
| Casing material  | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               | Cast Iron               |
| <b>MECHANICAL SEAL DATA</b>  |                         |                         |                         |                         |                         |
| <b>Mechanical Seal on sleeve for 175 and 300 psi working pressure*</b>   |                         |                         |                         |                         |                         |
| Type   | Unitized                | Unitized                | Unitized                | Unitized                | Unitized                |
| Material   | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Car/SiC             |
| Min Temp - 0 deg. F  | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| Max Temp - 300 deg. F  | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |
| <i>* Refer to max. suction pressure limitation for 300psi working pressure rating.</i>                                   |                         |                         |                         |                         |                         |
| <b>Mechanical Seal on sleeve for max. 300 psi working pressure</b>   |                         |                         |                         |                         |                         |
| Type   | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                |
| Material   | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC |
| Min Temp   | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| Max Temp   | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |
| <b>IMPELLER DESIGN DATA</b>  |                         |                         |                         |                         |                         |
| Number of vanes  | 7                       | 7                       | 7                       | 6                       | 7                       |
| Maximum Impeller Diameter  | 11.5"                   | 13.5"                   | 17.5"                   | 22"                     | 14.1"                   |
| Minimum Impeller Diameter  | 9.25"                   | 10"                     | 12.5"                   | 16.5"                   | 10.875"                 |
| Maximum Sphere   | .60"                    | .91"                    | 1.35"                   | 1.5"                    | .88"                    |





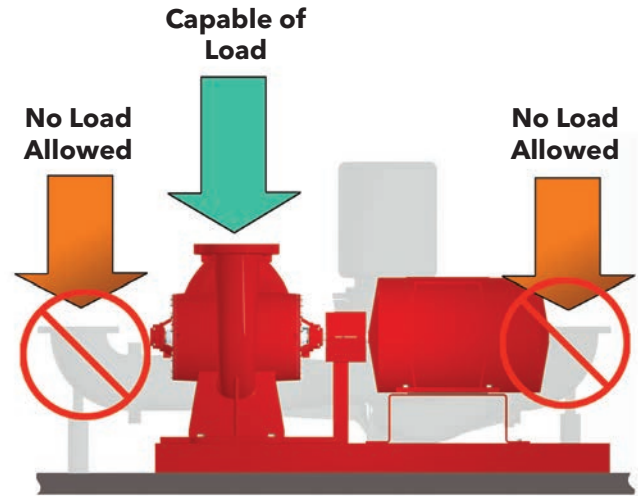
| 12x14x17.5              | 12x14x22                | 14x16x15                | 14x16x17.5              | 14x16x22                | 16x18x19                | 18x20x22                |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Balanced Seal           |                         |                         | Balanced Seal           | Balanced Seal           | Balanced Seal           |                         |
| 125                     | 175                     | 160                     | 125                     | 175                     | 175                     | 175                     |
| 175                     | 175                     | 175                     | 175                     | 175                     | 175                     | 175                     |
| 262                     | 262                     | 262                     | 262                     | 262                     | 262                     | 262                     |
| Cast Iron               | Ductile Iron            | Cast Iron               | Cast Iron               | Ductile Iron            | Ductile Iron            | Ductile Iron            |
| Balanced Seal           |                         |                         | Balanced Seal           | Balanced Seal           | Balanced Seal           |                         |
| 125                     | 300                     | 160                     | 125                     | 300                     | 300                     | 300                     |
| 300                     | 300                     | 300                     | 300                     | 300                     | 300                     | 300                     |
| 450                     | 450                     | 450                     | 450                     | 450                     | 450                     | 450                     |
| Cast Iron               | Ductile Iron            | Cast Iron               | Cast Iron               | Ductile Iron            | Ductile Iron            | Ductile Iron            |
| 300                     | 300                     | 300                     | 300                     | 300                     | 300                     | 300                     |
| 300                     | 300                     | 300                     | 300                     | 300                     | 300                     | 300                     |
| 450                     | 450                     | 450                     | 450                     | 450                     | 450                     | 450                     |
| Cast Iron               | Ductile Iron            | Cast Iron               | Cast Iron               | Ductile Iron            | Ductile Iron            | Ductile Iron            |
| Unitized                | Balanced                | Unitized                | Unitized                | Balanced                | Balanced                | Balanced                |
| EPR/Car/SiC             | EPR/Graphite Loaded SiC | EPR/Car/SiC             | EPR/Car/SiC             | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC |
| 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |
| Balanced                | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                | Balanced                |
| EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC | EPR/Graphite Loaded SiC |
| 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 | 0 deg F                 |
| 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               | 300 deg F               |
| 7                       | 7                       | 7                       | 7                       | 6                       | 7                       | 6                       |
| 17.5"                   | 22"                     | 15.0"                   | 17.5"                   | 22"                     | 19"                     | 22"                     |
| 13"                     | 16"                     | 11.375"                 | 12.5"                   | 16"                     | 13.85"                  | 14.85"                  |
| 1.12"                   | 1.25"                   | .83"                    | 1.46"                   | 1.72"                   | 1.47"                   | 1.74"                   |

\*\* Applicable for 1480 RPM and slower speeds.

† 12x14x22, 14x16x22, 16x18x19 and 18x20x22 have balanced seals and ductile iron volutes, standard

# Reduce Space and Cost with VSX

Only the VSX offers you so many configurations for piping design flexibility. And only the top suction and discharge flange offering of the VSC offers exceptional space savings. Utilizing a VSC model can reduce your equipment footprint by up to 40 percent over traditional double-suction and large vertical inline pumps. The VSC optimizes the advantages of vertical suction and discharge piping applications by eliminating the added costs of space robbing elbows, protruding accessories and pipe supports.



## VSX-VSC Series

Floor space savings for a VSC pump as compared to a vertical in-line pump.

### Series VSC

**Floor Space - 13 sq. ft.**

- Up to 40% smaller footprint than VIL
- Static vertical load on flanges allowed
- Pipe spool not required
- Fewer components for installation

### Vertical In-Line

**Floor Space - 21 sq. ft.**

- Installed floor space is as much as 40% larger
- Discharge spool required to prevent hydraulic noise
- Static vertical load not allowed on valve or diffuser
- Additional components to purchase and install

### ESTIMATED ADDITIONAL INSTALLED COSTS FOR VERTICAL IN-LINE PUMPS

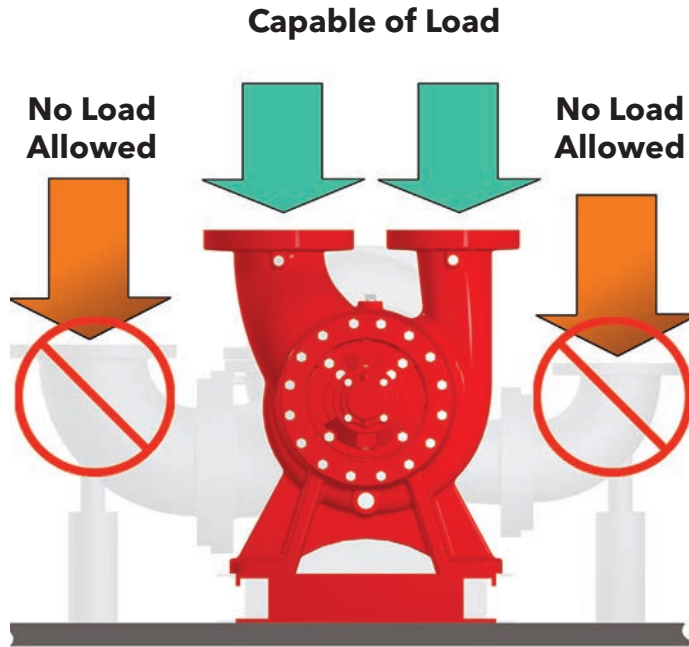
| ITEM | DESCRIPTION  | 4" PIPE    | 6" PIPE    | 8" PIPE    | 10" PIPE   |
|------|--|------------|------------|------------|------------|
| 1    | Suction Diffuser   | \$ 277.00  | \$ 409.00  | \$ 777.00  | \$1,030.00 |
| 2    | Triple Duty Valve  | 404.00     | 602.00     | 1,073.00   | 1,534.00   |
| 3    | Spool Piece  | 111.00     | 172.00     | 204.00     | 406.00     |
| 4    | Materials for fabricating two pipe supports  | 14.00      | 17.00      | 24.00      | 38.00      |
| 5    | Time for locating and welding two pipe supports; positioning and bolting two pump accessories. | 1.9 hrs.   | 2.1 hrs.   | 2.6 hrs.   | 2.8 hrs.   |
| 6    | Labor @ \$45.00 per hr   | 85.00      | 95.00      | 117.00     | 126.00     |
| 7    | Additional floor space cost  | 131.00     | 286.00     | 976.00     | 774.00     |
| 8    | Total estimated additional installed cost over B&G VSC Pump                                    | \$1,008.00 | \$1,564.00 | \$3,147.00 | \$3,840.00 |

| PUMP SIZE | AREA FOR VERTICAL IN-LINE PUMP | AREA FOR VSC PUMP | PERCENT AREA SAVED WITH VSC PUMPS | FLOOR SPACE COST SAVINGS WITH VSC PUMPS \$119 PER SQ. FT. |
|-----------|--------------------------------|-------------------|-----------------------------------|---|
| 4"        | 8.1 sq. ft.                    | 7.0 sq. ft.       | 14%                               | \$ 131.00   |
| 6"        | 13.8 sq. ft.                   | 11.4 sq. ft.      | 17%                               | \$ 286.00   |
| 8"        | 20.7 sq. ft.                   | 12.5 sq. ft.      | 40%                               | \$ 976.00   |
| 10"       | 26.2 sq. ft.                   | 19.7 sq. ft.      | 25%                               | \$ 774.00   |

\* Based on average construction costs per sq. ft. of various buildings as supplied by Dodge Construction Statistic for 2005. The above estimated additional installed costs for vertical in-line pumps are conservative. Actual cost differentials will depend upon locale and piping practices employed.

# VSX-VSC Series

Floor space savings for a VSX-VSC pump as compared to a horizontal split case pump.



## ESTIMATED ADDITIONAL INSTALLED COSTS FOR HORIZONTAL SPLIT CASE SINGLE-STAGE DOUBLE-SUCTION PUMPS

| ITEM | DESCRIPTION   | 4" PIPE   | 6" PIPE   | 8" PIPE    | 10" PIPE   |
|------|---|-----------|-----------|------------|------------|
| 1    | Two 90° long radius butt weld elbows  | \$ 24.00  | \$ 62.00  | \$ 115.00  | \$ 207.00  |
| 2    | Four welding neck flanges   | 71.00     | 107.00    | 199.00     | 311.00     |
| 3    | Materials for fabricating two pipe supports   | 14.00     | 17.00     | 24.00      | 38.00      |
| 4    | Time for welding four flanges to elbows, gapping and setting flange                           | 8 hrs     | 9.6 hrs   | 12.6 hrs   | 15.8 hrs   |
| 5    | Time for locating and welding two pipe supports; positioning and bolting two elbow assemblies | 1.9 hrs   | 2.1 hrs   | 2.6 hrs    | 2.8 hrs    |
| 6    | Four welding neck flanges   | 10 hrs    | 11.7 hrs  | 15.2 hrs   | 18.6 hrs   |
| 7    | Labor @ \$45.00 per hr  | 450.00    | 527.00    | 684.00     | 837.00     |
| 8    | Total estimated additional installed cost over B&G VSC Pump                                   | \$ 559.00 | \$ 713.00 | \$1,022.00 | \$1,393.00 |

## FLOOR SPACE SAVED WITH B&G VSC PUMPS

| PIPE SIZE | AREA FOR CONVENTIONAL PUMPS | AREA FOR VSC PUMPS | AREA SAVED WITH VSC PUMPS |
|-----------|-----------------------------|--------------------|---------------------------|
| 4"        | 16 sq. ft.                  | 10 sq. ft.         | 6 sq. ft.                 |
| 6"        | 19 sq. ft.                  | 12 sq. ft.         | 7 sq. ft.                 |
| 8"        | 24 sq. ft.                  | 15 sq. ft.         | 9 sq. ft.                 |
| 10"       | 32 sq. ft.                  | 20 sq. ft.         | 12 sq. ft.                |

## COST SAVINGS IN FLOOR SPACE WITH B&G VSC PUMPS

| PIPE SIZE | AVERAGE FLOOR SPACE SAVED WITH VSC PUMPS | SAVINGS WITH VSC PUMPS \$119 PER SQ. FT. |
|-----------|--|--|
| 4"        | 6 sq. ft.                                | \$ 714.00                                |
| 6"        | 7 sq. ft.                                | \$ 833.00                                |
| 8"        | 9 sq. ft.                                | \$1,071.00                               |
| 10"       | 12 sq. ft.                               | \$1,428.00                               |

The above estimated additional installed costs for conventional single-stage, double-suction pumps are conservative. Actual cost differentials will depend upon locale and piping practices employed.

\* Based on average construction costs per sq. ft. of various buildings as supplied by Dodge Construction Statistic for 2005.

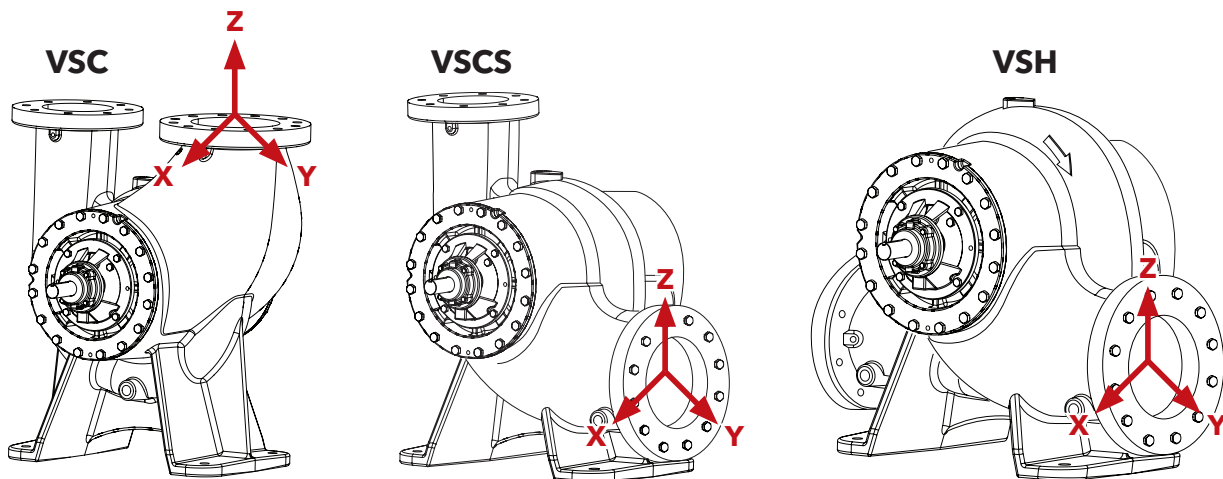
# Allowable Static Flange Loading for VSX Pumps

The vertical split case volute design of the VSX provides optimum nozzle loading capability that others just can't match. VSX pump flanges easily support the weight of heavy piping directly on its nozzles.

The unique design of the VSX allows for a significantly higher load level of combined forces versus traditional split case pumps that can only accept singular forces acting upon the pump.

| Flg Dia<br>(in) | Fx Max<br>(lb) | Fy Max<br>(lb) | Fz Max<br>(lb) | Mx Max<br>(ft-lb) | My Max<br>(ft-lb) | Mz Max<br>(ft-lb) |
|-----------------|----------------|----------------|----------------|-------------------|-------------------|-------------------|
| 4               | 1615           | 1215           | 1615           | 716               | 532               | 716               |
| 5               | 2016           | 1322           | 2016           | 1024              | 578               | 1024              |
| 6               | 2417           | 1428           | 2417           | 1332              | 625               | 1332              |
| 8               | 3219           | 1642           | 3219           | 1948              | 718               | 1948              |
| 10              | 4021           | 1856           | 4021           | 2564              | 812               | 2564              |
| 12              | 4824           | 2069           | 4824           | 3180              | 905               | 3180              |
| 14              | 5626           | 2283           | 5626           | 3796              | 998               | 3796              |
| 16              | 6428           | 2497           | 6428           | 4412              | 1091              | 4412              |
| 18              | 7230           | 2711           | 7230           | 5028              | 1185              | 5028              |
| 20              | 8032           | 2924           | 8032           | 5645              | 1278              | 5645              |

System piping can place both forces ( $F_x$ ,  $F_y$ ,  $F_z$ ) and twisting ( $M_x$ ,  $M_y$ ,  $M_z$ ) moments on a pump casing. Only pump casings and base plates of sufficient robustness can endure these types of forces.



## A Robust Pump Starts with Heavy Duty Flanges

Other split-case pumps are provided with flat face, 125# ANSI drilled flanges for 175# working pressure design. When 300# working pressure becomes necessary, a heavier casing becomes necessary - at a heavy price.

VSX pumps provide as standard a higher level of capability. Every VSX pump is available as standard with 125# ANSI flange drilling coupled with the same heavy duty 300# volute that is provided in applications requiring 175# working pressure.

The table to the right demonstrates this difference. A typical flange on a six-inch diameter pump is 1" thick. The six-inch flange on a VSX pump is 1.69" thick - 69% thicker than older traditional pump flanges found in the market today.

| Flange Diameter | Typical Split-Case Flange Thickness (in) | VSX Split-Case Flange Thickness (in) |
|-----------------|--|--------------------------------------|
|                 | 125#ANSI                                 | 125 & 250# ANSI                      |
| 4"              | 0.938"                                   | 1.50"                                |
| 5"              | 0.938"                                   | 1.62"                                |
| 6"              | 1.000"                                   | 1.69"                                |
| 8"              | 1.125"                                   | 1.88"                                |
| 10"             | 1.188"                                   | 2.12"                                |
| 12"             | 1.250"                                   | 2.25"                                |
| 14"             | 1.375"                                   | 2.38"                                |
| 16"             | 1.438"                                   | 2.50"                                |
| 18"             | 1.562"                                   | 2.57"                                |
| 20"             | 1.687"                                   | 2.69"                                |

**Typical Split-Case 125# Flange Thickness**



**Standard VSX 125# Flange Thickness**



# Groutless Structural-Steel Base Plate

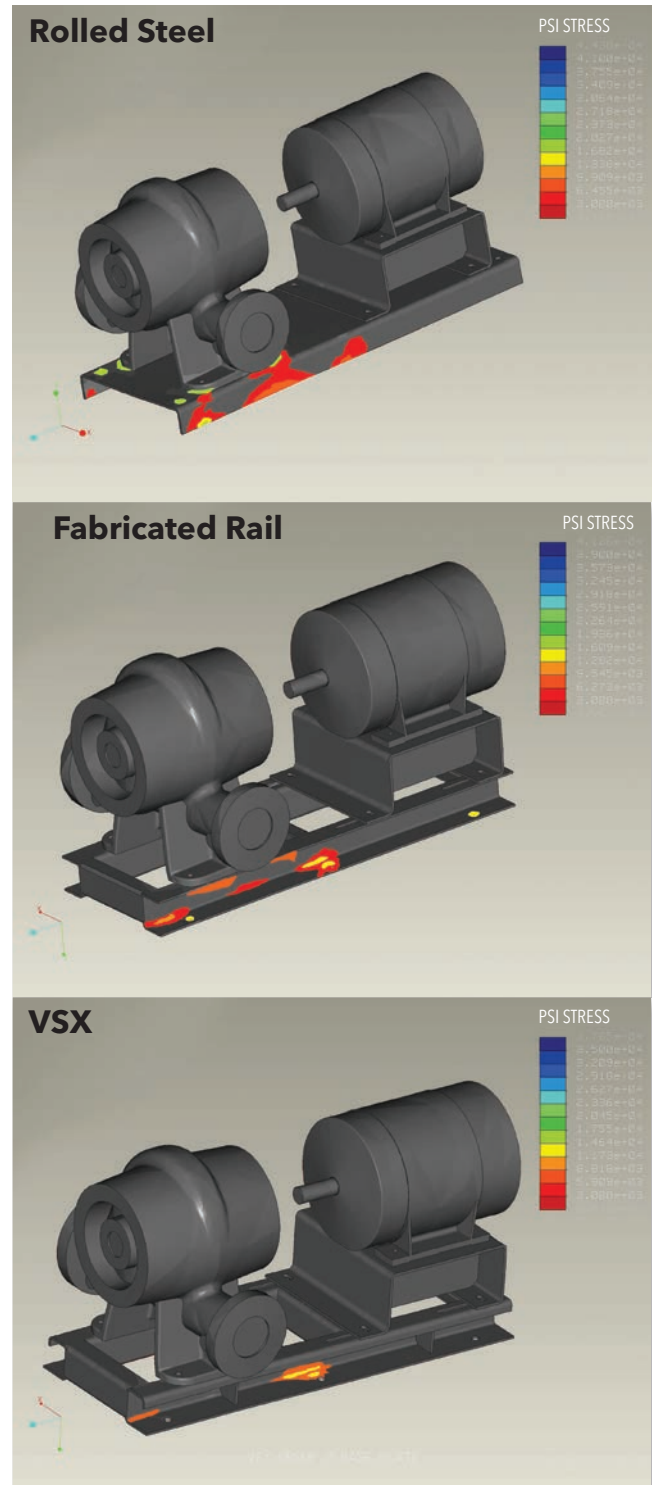
Base plates must be designed with sufficient rigidity to allow the pump and motor shafts to accept the loads without resulting in undue stress, deflection or vibration. This avoids premature wear on the coupling, bearings and mechanical seals and avoids early failure of the equipment. By utilizing advanced Finite Element Analysis and design, a modern state of the art base plate can be provided.

When compared against other styles of base plates commonly found on the market today, the VSX welded-steel baseplate provides superior base stress and frequency capabilities, designed in accordance to ANSI/H.I. 1.3-2000.

- Typical rolled-channel base: the maximum amount of base plate stress reaches 41600 PSI.
- Typical fabricated-rail base: the maximum amount of base plate design stress reaches 28700 PSI.
- VSX structural-steel base plate: the maximum amount of base stress reaches 22900 PSI.

## Stresses on a rolled-steel base plate are over 41000 PSI, or 180% worse than a VSX

Two common base plate designs utilized on double suction pumps were evaluated against the new VSX welded-steel base plate. Utilizing Finite Element Analysis a rolled steel ("C" channel) and a fabricated-rail design base plate were analyzed against the VSX base plate. The accompanying pictures display the maximum amount of stress anywhere on the base plate given the identical amount of loading across all three designs. The color indicates the degree of stress and its location on the base plate. In these examples, the amount of stress exposed on the VSX base plate will be no more than 22900 PSI whereas the maximum stress reached on a rolled-steel base plate will be over 41000 PSI, or 180% worse.



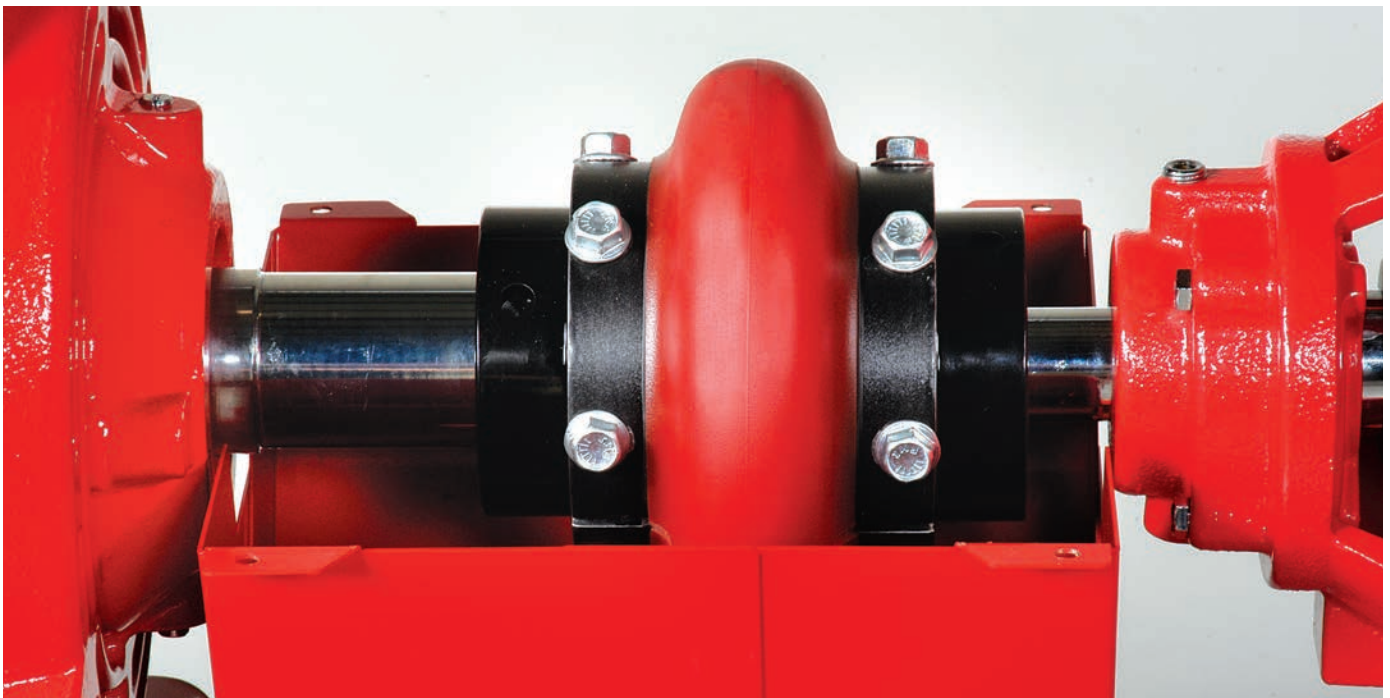


## Alignment Friendly Coupling

Elastomeric couplings are specifically designed to accommodate angular shaft misalignment, as well as parallel offset of the pump and motor shafts. However, the amount of the offset and/or misalignment is dependent on the type and style of flexible coupling applied. Left unchecked, coupling misalignment has a significant impact on the overall life of the mechanical seals and bearings of the pump. Laser alignment and even infrared thermal imaging is sometimes necessary on couplings with very tight operating tolerances to insure that the proper alignment has been locked down. This process can be both time consuming as well as expensive.

Compared to the VSX coupling, typical elastomeric inserts consist of either an EPDM, Neoprene, Polyurethane or Hytrel material and are available in dropout or jaw type configuration with the following typical tolerances:

| <b>Coupling Type</b>  | <b>VSX Non-Spacer Coupling<br/>up to 1000 HP</b> | <b>Jaw Type</b>  | <b>EPDM or<br/>Neoprene</b> | <b>Hytrel</b> |
|-----------------------|--|------------------|-----------------------------|---------------|
| Angular Misalignment  | 2 - 4 Degrees                                    | .9 - 1.3 Degrees | 1 Degree                    | .25 Degrees   |
| Parallel Misalignment | 1/16" - 1/8"                                     | .008" - .027"    | .01" - .062"                | .01" - .035"  |



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