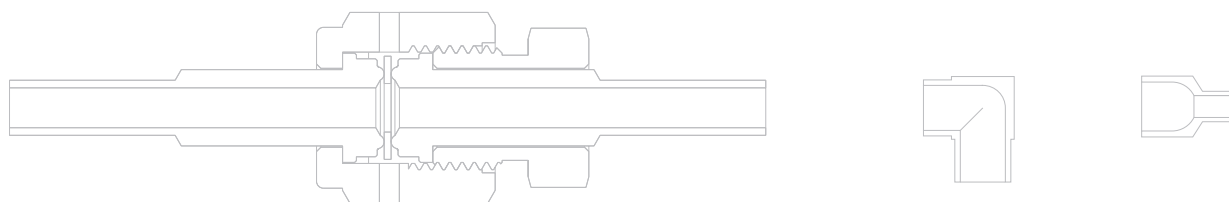


# FITOK

Full Technical Catalog for  
Ultra High Purity Products



FITOK Full Technical Catalog  
For Ultra High Purity Products

# Weld Fittings



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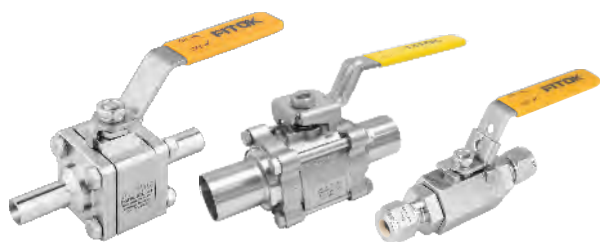
# Face Seal Fittings



## Diaphragm Valves



## High Purity Ball Valves



## Bellows-Sealed Valves



## Bellows-Sealed Metering Valves



## Check Valves



## Regulators



## Vacuum Generators



# Ultra High Purity Pressure Gauges



# Canister Assemblies



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# Integrated Gas Systems



# Fittings

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| <b>Diaphragm Valves</b>                             | V-01 |
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|----------------------------------------------------------|-------|
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|                                             |      |
|---------------------------------------------|------|
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|---------------------------------------------|------|

# I ntegrated Systems and Others

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| Diaphragm Valves DI Series     | I-04 |
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|                                         |      |
|-----------------------------------------|------|
| <b>Process Comparison</b>               | P-02 |
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| Special Cleaning and Packaging (FC-02)  | P-04 |
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# Weld Fittings

## M Series



## L Series



## T Series



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Weld Fittings

## Features

- ⦿ Radius junction design with elbows to provide smooth flow path
- ⦿ Precision machined diameter to match tube diameter
- ⦿ Square, burr-free tube weld ends to enhance alignment
- ⦿ Manual or automatic welding equipment applicable
- ⦿ Tube wall uniformity to promote weld repeatability
- ⦿ M and L series mechanically polished surface roughness finished to an average of Ra 10 µin. (0.25 µm) or electropolished to Ra 5 µin. (0.13 µm) optional.  
T series mechanically polished surface roughness finished to an average of Ra 15 µin. (0.38 µm) or electropolished to Ra 10 µin. (0.25 µm) optional.
- ⦿ Each fitting marked with brand, material and heat number

## Technical Data

- ⦿ Materials:

| Material        | Bar Stock <sup>①</sup> | Forging <sup>②</sup> | Designator |
|-----------------|------------------------|----------------------|------------|
| 316 SS          | ASTM A479              | ASTM A182            | SS         |
| 316L SS         | SEMI F20               | SEMI F20             | 6L         |
| 316L VAR SS     |                        |                      | 6LV        |
| 316L VIM-VAR SS |                        |                      | 6LW        |

① Only for straight configurations and all M Series weld fittings.

② Includes all elbows, crosses and tees, excluding M series and T series fittings.

- ⦿ Working Pressure:

- a. Working pressures shown in the Catalog are calculated according to ASME B31.3 and B31.1 at ambient temperature.
- b. To get the allowable working pressure at elevated temperature, use the allowable working pressure at ambient temperature to multiply the elevated temperature factors. Please refer to Table 22 - Elevated Temperature Factors in the FITOK Catalog **Tubing** for the elevated temperature factors.

- ⦿ Weld End Tube O.D. and Wall Thickness

| Fractional       |                       | Metric          |                      |
|------------------|-----------------------|-----------------|----------------------|
| Tube O.D.<br>in. | Wall Thickness<br>in. | Tube O.D.<br>mm | Wall Thickness<br>mm |
| 1/8              | 0.028                 | 6               | 1.0                  |
| 1/4              | 0.035                 | 8               | 1.0                  |
| 3/8              | 0.035                 | 10              | 1.0                  |
| 1/2              | 0.049                 | 12              | 1.0                  |
| 3/4              | 0.049/0.065           | 18              | 1.5                  |
| 1                | 0.065                 |                 |                      |
| 1 1/2            | 0.065                 |                 |                      |
| 2                | 0.065                 |                 |                      |

For other sizes or wall thicknesses of welded ports, please contact FITOK Group or our authorized distributors.

③ O.D. 3/4" x wall Thickness 0.065" tubing is for T Series tubular fittings.

- ⦿ Working Temperature:

| Material        | Minimum Temperature | Maximum Temperature |
|-----------------|---------------------|---------------------|
| 316 SS          | -325 °F (-198 °C)   | 1000 °F (538 °C)    |
| 316L SS         |                     |                     |
| 316L VAR SS     |                     |                     |
| 316L VIM-VAR SS |                     |                     |

## Ordering Information

- ⦿ Add the material designator as a prefix, process specification as a suffix to the basic ordering number to get the complete ordering number.
  - ⦿ Cleaning and Packaging
    - a. FC-01 Standard Cleaning and Packaging. No suffix is needed.
    - b. FC-02 Special Cleaning and Packaging. Add "-F2" as a suffix when needed.
    - c. FC-03 Ultra High Purity Process Specification. Add "-F3" as a suffix when needed.
- Example: For 1/2" 316L VAR SS Union Tee with FC-03 Ultra High Purity Process Specification, the ordering number is 6LV-WT1-TB8-F3.

## Cautions

- ⦿ Dimensions are for reference only and are subject to change.
- ⦿ Welding of the same material is more advisable considering the same coefficient of expansion, lower possibility of poor weld such as out-of-roundness or dimensional changes.

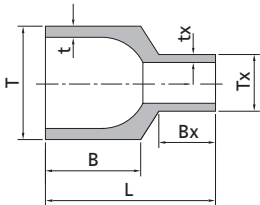
# M Series Micro Weld Fittings

## Features

- ⦿ Compact design
- ⦿ Sizes range from 1/8" to 1/2" and 6 mm to 12 mm
- ⦿ Applicable to miniaturized tubing system

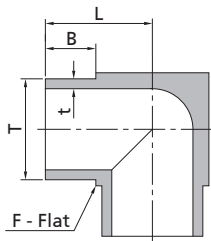


## Reducing Unions



| Fractional        |                        |                    |                         |                       |                      |             |            |                             |
|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------|-------------|------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Tx-Tube O.D. (in.) | tx-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            | Working Pressure psig (bar) |
|                   |                        |                    |                         |                       | L                    | B           | Bx         |                             |
| 1/4               | 0.035                  | 1/8                | 0.028                   | -WU1-TB4-TB2          | 0.75 (19.1)          | 0.42 (10.7) | 0.25 (6.4) | 5100 (351)                  |
| 3/8               | 0.035                  | 1/4                | 0.035                   | -WU1-TB6-TB4          | 0.75 (19.1)          | 0.42 (10.7) | 0.25 (6.4) | 3300 (227)                  |
| 1/2               | 0.049                  | 1/4                | 0.035                   | -WU1-TB8-TB4          | 0.75 (19.1)          | 0.42 (10.7) | 0.25 (6.4) | 3700 (254)                  |
| 1/2               | 0.049                  | 3/8                | 0.035                   | -WU1-TB8-TB6          | 0.75 (19.1)          | 0.42 (10.7) | 0.25 (6.4) | 3300 (227)                  |

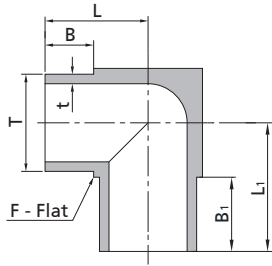
## 90° Union Elbows



| Fractional        |                        |                       |                      |            |             |                             |  |
|-------------------|------------------------|-----------------------|----------------------|------------|-------------|-----------------------------|--|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |             | Working Pressure psig (bar) |  |
|                   |                        |                       | L                    | B          | F           |                             |  |
| 1/8               | 0.028                  | -WL1-TB2              | 0.41 (10.4)          | 0.25 (6.4) | 5/16 (7.9)  | 8500 (585)                  |  |
| 1/4               | 0.035                  | -WL1-TB4              | 0.41 (10.3)          | 0.25 (6.4) | 5/16 (7.9)  | 5100 (351)                  |  |
| 3/8               | 0.035                  | -WL1-TB6              | 0.47 (11.9)          | 0.25 (6.4) | 7/16 (11.1) | 3300 (227)                  |  |
| 1/2               | 0.049                  | -WL1-TB8              | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3) | 3700 (254)                  |  |

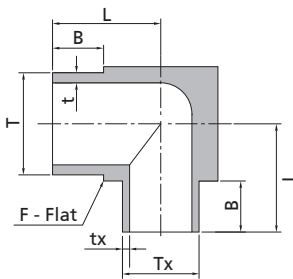
| Metric           |                       |                       |                      |            |             |                             |  |
|------------------|-----------------------|-----------------------|----------------------|------------|-------------|-----------------------------|--|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |            |             | Working Pressure bar (psig) |  |
|                  |                       |                       | L                    | B          | F           |                             |  |
| 6                | 1.0                   | -WL1-MTB6             | 10.4 (0.41)          | 6.4 (0.25) | 7.9 (5/16)  | 420 (6095)                  |  |
| 8                | 1.0                   | -WL1-MTB8             | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16) | 310 (4499)                  |  |
| 10               | 1.0                   | -WL1-MTB10            | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16) | 240 (3483)                  |  |
| 12               | 1.0                   | -WL1-MTB12            | 13.5 (0.53)          | 6.4 (0.25) | 14.3 (9/16) | 200 (2902)                  |  |

## Extended Leg 90° Union Elbows



| Fractional        |                        |                       |                      |             |            |             | Working Pressure<br>psig (bar) |            |
|-------------------|------------------------|-----------------------|----------------------|-------------|------------|-------------|--------------------------------|------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            | L1          |                                |            |
| 1/4               | 0.035                  | -WL1-TB4-1            | 0.25 (6.4)           | 0.45 (11.4) | 5/16 (7.9) | 0.41 (10.4) | 0.61 (15.5)                    | 5100 (351) |
| 1/4               | 0.035                  | -WL1-TB4-2            | 0.25 (6.4)           | 0.50 (12.7) | 5/16 (7.9) | 0.41 (10.4) | 0.66 (16.8)                    | 5100 (351) |
| 1/4               | 0.035                  | -WL1-TB4-3            | 0.45 (11.4)          | 0.45 (11.4) | 5/16 (7.9) | 0.61 (15.5) | 0.61 (15.5)                    | 5100 (351) |
| 1/4               | 0.035                  | -WL1-TB4-4            | 0.50 (12.7)          | 0.50 (12.7) | 5/16 (7.9) | 0.66 (16.8) | 0.66 (16.8)                    | 5100 (351) |

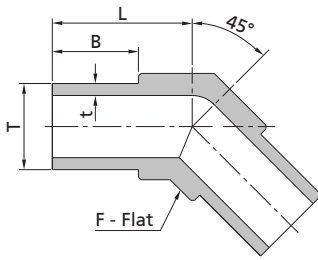
## Reducing 90° Union Elbows



| Fractional        |                        |                    |                         |                       |                      |            | Working Pressure<br>psig (bar) |            |
|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------|------------|--------------------------------|------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Tx-Tube O.D. (in.) | tx-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |                                |            |
| 3/8               | 0.035                  | 1/4                | 0.035                   | -WL1-TB6-TB4          | 0.47 (11.9)          | 0.25 (6.4) | 7/16 (11.1)                    | 3300 (227) |
| 1/2               | 0.049                  | 1/4                | 0.035                   | -WL1-TB8-TB4          | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3)                    | 3700 (254) |
| 1/2               | 0.049                  | 3/8                | 0.035                   | -WL1-TB8-TB6          | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3)                    | 3300 (227) |

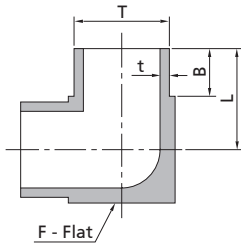
| Metric           |                       |                   |                        |                       |                      |            | Working Pressure<br>bar (psig) |            |
|------------------|-----------------------|-------------------|------------------------|-----------------------|----------------------|------------|--------------------------------|------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Tx-Tube O.D. (mm) | tx-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |            |                                |            |
| 8                | 1.0                   | 6                 | 1.0                    | -WL1-MTB8-MTB6        | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16)                    | 310 (4499) |
| 10               | 1.0                   | 6                 | 1.0                    | -WL1-MTB10-MTB6       | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16)                    | 240 (3483) |
| 12               | 1.0                   | 6                 | 1.0                    | -WL1-MTB12-MTB6       | 13.5 (0.53)          | 6.4 (0.25) | 14.3 (9/16)                    | 200 (2902) |
| 12               | 1.0                   | 8                 | 1.0                    | -WL1-MTB12-MTB8       | 13.5 (0.53)          | 6.4 (0.25) | 14.3 (9/16)                    | 200 (2902) |

## 45° Union Elbows

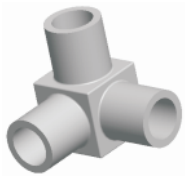


| Fractional        |                        |                       |                      |            |             |                             |
|-------------------|------------------------|-----------------------|----------------------|------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |             | Working Pressure psig (bar) |
|                   |                        |                       | L                    | B          | F           |                             |
| 1/4               | 0.035                  | -WV1-TB4              | 0.41 (10.4)          | 0.25 (6.4) | 5/16 (7.9)  | 5100 (351)                  |
| 3/8               | 0.035                  | -WV1-TB6              | 0.47 (11.9)          | 0.25 (6.4) | 7/16 (11.1) | 3300 (227)                  |
| 1/2               | 0.049                  | -WV1-TB8              | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3) | 3700 (254)                  |

## Tribows

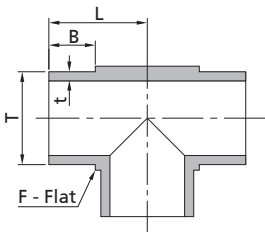


| Fractional        |                        |                       |                      |            |             |                             |
|-------------------|------------------------|-----------------------|----------------------|------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |             | Working Pressure psig (bar) |
|                   |                        |                       | L                    | B          | F           |                             |
| 1/4               | 0.035                  | -WB1-TB4              | 0.41 (10.3)          | 0.25 (6.4) | 5/16 (7.9)  | 5100 (351)                  |
| 3/8               | 0.035                  | -WB1-TB6              | 0.47 (11.9)          | 0.25 (6.4) | 7/16 (11.1) | 3300 (227)                  |
| 1/2               | 0.049                  | -WB1-TB8              | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3) | 3700 (254)                  |



| Metric           |                       |                       |                      |            |            |                             |
|------------------|-----------------------|-----------------------|----------------------|------------|------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |            |            | Working Pressure bar (psig) |
|                  |                       |                       | L                    | B          | F          |                             |
| 6                | 1.0                   | -WB1-MTB6             | 10.4 (0.41)          | 6.4 (0.25) | 7.9 (5/16) | 420 (6095)                  |

## Union Tees



| Fractional        |                        |                       |                      |            |             |                             |
|-------------------|------------------------|-----------------------|----------------------|------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |             | Working Pressure psig (bar) |
|                   |                        |                       | L                    | B          | F           |                             |
| 1/8               | 0.028                  | -WT1-TB2              | 0.41 (10.4)          | 0.25 (6.4) | 5/16 (7.9)  | 8500 (585)                  |
| 1/4               | 0.035                  | -WT1-TB4              | 0.41 (10.3)          | 0.25 (6.4) | 5/16 (7.9)  | 5100 (351)                  |
| 3/8               | 0.035                  | -WT1-TB6              | 0.47 (11.9)          | 0.25 (6.4) | 7/16 (11.1) | 3300 (227)                  |
| 1/2               | 0.049                  | -WT1-TB8              | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3) | 3700 (254)                  |

| Metric           |                       |                       |                      |            |             |                             |
|------------------|-----------------------|-----------------------|----------------------|------------|-------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |            |             | Working Pressure bar (psig) |
|                  |                       |                       | L                    | B          | F           |                             |
| 6                | 1.0                   | -WT1-MTB6             | 10.4 (0.41)          | 6.4 (0.25) | 7.9 (5/16)  | 420 (6095)                  |
| 8                | 1.0                   | -WT1-MTB8             | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16) | 310 (4499)                  |
| 10               | 1.0                   | -WT1-MTB10            | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16) | 240 (3483)                  |
| 12               | 1.0                   | -WT1-MTB12            | 13.5 (0.53)          | 6.4 (0.25) | 14.3 (9/16) | 200 (2902)                  |

Fittings

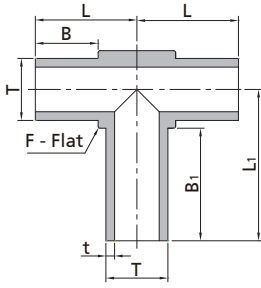
Valves

Pressure Gauges

Integrated Systems and Others

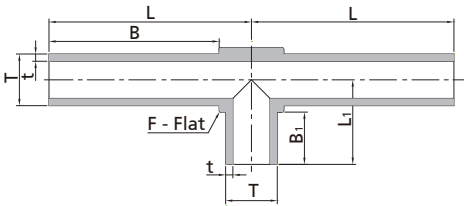
Process Specification

## Extended Branch Leg Union Tees



| Fractional              |                              |                             |                      |                |            |                | Working Pressure<br>psig (bar) |            |
|-------------------------|------------------------------|-----------------------------|----------------------|----------------|------------|----------------|--------------------------------|------------|
| T-Tube<br>O.D.<br>(in.) | t-Wall<br>Thickness<br>(in.) | Basic<br>Ordering<br>Number | Dimensions, in. (mm) |                |            |                |                                |            |
|                         |                              |                             | L                    | L <sub>1</sub> | B          | B <sub>1</sub> | F                              |            |
| 1/4                     | 0.035                        | -WT1-TB4-45                 | 0.41 (10.4)          | 0.61 (15.5)    | 0.25 (6.4) | 0.45 (11.4)    | 5/16 (7.9)                     | 5100 (351) |

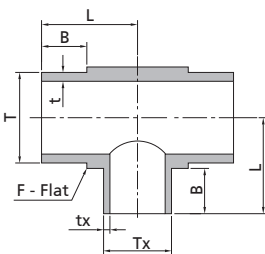
## Extended Run Leg Union Tees



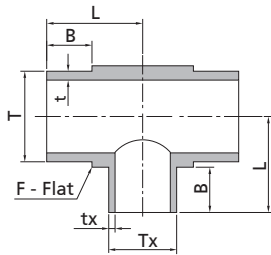
There may be a minor step between run ends at drill intersection.

| Fractional              |                              |                             |                      |                |             |                | Working Pressure<br>psig (bar) |            |
|-------------------------|------------------------------|-----------------------------|----------------------|----------------|-------------|----------------|--------------------------------|------------|
| T-Tube<br>O.D.<br>(in.) | t-Wall<br>Thickness<br>(in.) | Basic<br>Ordering<br>Number | Dimensions, in. (mm) |                |             |                |                                |            |
|                         |                              |                             | L                    | L <sub>1</sub> | B           | B <sub>1</sub> | F                              |            |
| 1/4                     | 0.035                        | -WT1-TB4-98                 | 0.98 (24.9)          | 0.41 (10.4)    | 0.83 (21.1) | 0.25 (6.4)     | 5/16 (7.9)                     | 5100 (351) |

## Reducing Tees

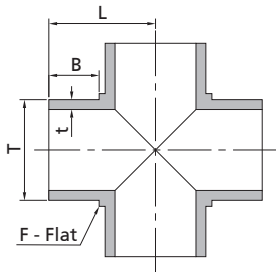


| Fractional              |                              |                          |                               |                             |                      |            |             | Working Pressure<br>psig (bar) |
|-------------------------|------------------------------|--------------------------|-------------------------------|-----------------------------|----------------------|------------|-------------|--------------------------------|
| T-Tube<br>O.D.<br>(in.) | t-Wall<br>Thickness<br>(in.) | Tx-Tube<br>O.D.<br>(in.) | tx-Wall<br>Thickness<br>(in.) | Basic<br>Ordering<br>Number | Dimensions, in. (mm) |            |             |                                |
|                         |                              |                          |                               |                             | L                    | B          | F           |                                |
| 3/8                     | 0.035                        | 1/4                      | 0.035                         | -WT1-TB6-TB6-TB4            | 0.47 (11.9)          | 0.25 (6.4) | 7/16 (11.1) | 3300 (227)                     |
| 1/2                     | 0.049                        | 1/4                      | 0.035                         | -WT1-TB8-TB8-TB4            | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3) | 3700 (254)                     |
| 1/2                     | 0.049                        | 3/8                      | 0.035                         | -WT1-TB8-TB8-TB6            | 0.53 (13.5)          | 0.25 (6.4) | 9/16 (14.3) | 3300 (227)                     |



| Metric           |                       |                   |                        | Basic Ordering Number | Dimensions, mm (in.) |            |             | Working Pressure bar (psig) |
|------------------|-----------------------|-------------------|------------------------|-----------------------|----------------------|------------|-------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Tx-Tube O.D. (mm) | tx-Wall Thickness (mm) |                       | L                    | B          | F           |                             |
| 10               | 1.0                   | 6                 | 1.0                    | -WT1-MTB10-MTB10-MTB6 | 11.9 (0.47)          | 6.4 (0.25) | 11.1 (7/16) | 240 (3483)                  |
| 12               | 1.0                   | 6                 | 1.0                    | -WT1-MTB12-MTB12-MTB6 | 0.53 (13.5)          | 6.4 (0.25) | 14.3 (9/16) | 200 (2902)                  |
| 12               | 1.0                   | 8                 | 1.0                    | -WT1-MTB12-MTB12-MTB8 | 0.53 (13.5)          | 6.4 (0.25) | 14.3 (9/16) | 200 (2902)                  |

## Union Crosses



| Fractional        |                        |                       |             | Dimensions, in. (mm) |             |            | Working Pressure psig (bar) |
|-------------------|------------------------|-----------------------|-------------|----------------------|-------------|------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | L           | B                    | F           |            |                             |
| 1/8               | 0.028                  | -WC1-TB2              | 0.41 (10.4) | 0.25 (6.4)           | 5/16 (7.9)  | 8500 (585) |                             |
| 1/4               | 0.035                  | -WC1-TB4              | 0.41 (10.3) | 0.25 (6.4)           | 5/16 (7.9)  | 5100 (351) |                             |
| 3/8               | 0.035                  | -WC1-TB6              | 0.47 (11.9) | 0.25 (6.4)           | 7/16 (11.1) | 3300 (227) |                             |
| 1/2               | 0.049                  | -WC1-TB8              | 0.53 (13.5) | 0.25 (6.4)           | 9/16 (14.3) | 3700 (254) |                             |

| Metric           |                       |                       |             | Dimensions, mm (in.) |             |            | Working Pressure bar (psig) |
|------------------|-----------------------|-----------------------|-------------|----------------------|-------------|------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | L           | B                    | F           |            |                             |
| 6                | 1.0                   | -WC1-MTB6             | 10.4 (0.41) | 6.4 (0.25)           | 7.9 (5/16)  | 420 (6095) |                             |
| 8                | 1.0                   | -WC1-MTB8             | 11.9 (0.47) | 6.4 (0.25)           | 11.1 (7/16) | 310 (4499) |                             |
| 10               | 1.0                   | -WC1-MTB10            | 11.9 (0.47) | 6.4 (0.25)           | 11.1 (7/16) | 240 (3483) |                             |
| 12               | 1.0                   | -WC1-MTB12            | 13.5 (0.53) | 6.4 (0.25)           | 14.3 (9/16) | 200 (2902) |                             |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



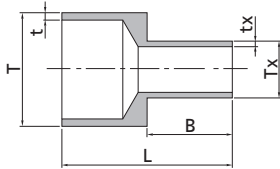
# L Series Tube Butt Weld Fittings

## Features

- Extended tube design
- Machined from forging blanks except for straight configurations
- Sizes range from 1/4" to 1" and 6 mm to 18 mm



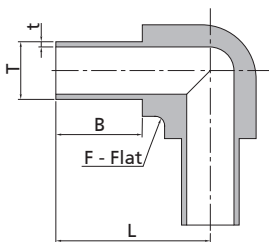
## Reducing Unions



| Fractional        |                        |                    |                         |                       |                      |             |                             |
|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Tx-Tube O.D. (in.) | tx-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             | Working Pressure psig (bar) |
|                   |                        |                    |                         |                       | L                    | B           |                             |
| 3/8               | 0.035                  | 1/4                | 0.035                   | -WU2-TB6-TB4          | 1.50 (38.1)          | 0.75 (19.1) | 3300 (227)                  |
| 1/2               | 0.049                  | 1/4                | 0.035                   | -WU2-TB8-TB4          | 1.50 (38.1)          | 0.75 (19.1) | 3700 (254)                  |
| 1/2               | 0.049                  | 3/8                | 0.035                   | -WU2-TB8-TB6          | 1.50 (38.1)          | 0.75 (19.1) | 3300 (227)                  |
| 3/4               | 0.049                  | 1/2                | 0.049                   | -WU2-TB12-TB8         | 1.50 (38.1)          | 0.75 (19.1) | 2400 (165)                  |
| 1                 | 0.065                  | 1/2                | 0.049                   | -WU2-TB16-TB8         | 1.50 (38.1)          | 0.75 (19.1) | 2400 (165)                  |
| 1                 | 0.065                  | 3/4                | 0.049                   | -WU2-TB16-TB12        | 1.50 (38.1)          | 0.75 (19.1) | 2400 (165)                  |

| Metric           |                       |                   |                        |                       |                      |             |                             |
|------------------|-----------------------|-------------------|------------------------|-----------------------|----------------------|-------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Tx-Tube O.D. (mm) | tx-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             | Working Pressure bar (psig) |
|                  |                       |                   |                        |                       | L                    | B           |                             |
| 10               | 1.0                   | 6                 | 1.0                    | -WU2-MTB10-MTB6       | 38.1 (1.50)          | 19.1 (0.75) | 240 (3483)                  |
| 10               | 1.0                   | 8                 | 1.0                    | -WU2-MTB10-MTB8       | 38.1 (1.50)          | 19.1 (0.75) | 240 (3483)                  |
| 12               | 1.0                   | 6                 | 1.0                    | -WU2-MTB12-MTB6       | 38.1 (1.50)          | 19.1 (0.75) | 200 (2902)                  |
| 12               | 1.0                   | 8                 | 1.0                    | -WU2-MTB12-MTB8       | 38.1 (1.50)          | 19.1 (0.75) | 200 (2902)                  |
| 12               | 1.0                   | 10                | 1.0                    | -WU2-MTB12-MTB10      | 38.1 (1.50)          | 19.1 (0.75) | 200 (2902)                  |
| 18               | 1.5                   | 6                 | 1.5                    | -WU2-MTB18-MTB6       | 38.1 (1.50)          | 19.1 (0.75) | 200 (2902)                  |
| 18               | 1.5                   | 12                | 1.5                    | -WU2-MTB18-MTB12      | 38.1 (1.50)          | 19.1 (0.75) | 200 (2902)                  |

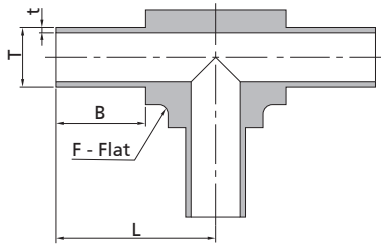
## 90° Union Elbows



| Fractional        |                        |                       |                      |             |              |                             |  |
|-------------------|------------------------|-----------------------|----------------------|-------------|--------------|-----------------------------|--|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |              | Working Pressure psig (bar) |  |
|                   |                        |                       | L                    | B           | F            |                             |  |
| 1/4               | 0.035                  | -WL2-TB4              | 1.23 (31.2)          | 0.75 (19.1) | 7/16 (11.1)  | 5100 (351)                  |  |
| 3/8               | 0.035                  | -WL2-TB6              | 1.20 (30.5)          | 0.75 (19.1) | 7/16 (11.1)  | 3300 (227)                  |  |
| 1/2               | 0.049                  | -WL2-TB8              | 1.34 (34.0)          | 0.75 (19.1) | 11/16 (17.5) | 3700 (254)                  |  |
| 3/4               | 0.049                  | -WL2-TB12             | 1.46 (37.1)          | 0.75 (19.1) | 15/16 (23.8) | 2400 (165)                  |  |

| Metric           |                       |                       |                      |             |              |                             |  |
|------------------|-----------------------|-----------------------|----------------------|-------------|--------------|-----------------------------|--|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |              | Working Pressure bar (psig) |  |
|                  |                       |                       | L                    | B           | F            |                             |  |
| 6                | 1.0                   | -WL2-MTB6             | 31.2 (1.23)          | 19.1 (0.75) | 11.1 (7/16)  | 420 (6095)                  |  |
| 8                | 1.0                   | -WL2-MTB8             | 31.2 (1.23)          | 19.1 (0.75) | 11.1 (7/16)  | 310 (4499)                  |  |
| 10               | 1.0                   | -WL2-MTB10            | 34.0 (1.34)          | 19.1 (0.75) | 17.5 (11/16) | 240 (3483)                  |  |
| 12               | 1.0                   | -WL2-MTB12            | 34.0 (1.34)          | 19.1 (0.75) | 17.5 (11/16) | 200 (2902)                  |  |
| 18               | 1.5                   | -WL2-MTB18            | 37.6 (1.48)          | 19.1 (0.75) | 23.8 (15/16) | 200 (2902)                  |  |

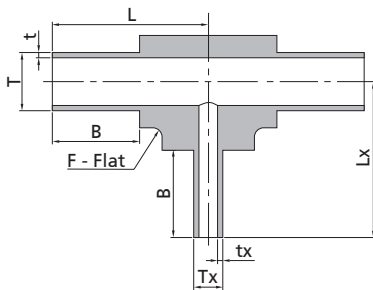
## Union Tees



| Fractional        |                        |                       |                      |             |              |                             |
|-------------------|------------------------|-----------------------|----------------------|-------------|--------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |              | Working Pressure psig (bar) |
|                   |                        |                       | L                    | B           | F            |                             |
| 1/4               | 0.035                  | -WT2-TB4              | 1.23 (31.2)          | 0.75 (19.1) | 7/16 (11.1)  | 5100 (351)                  |
| 3/8               | 0.035                  | -WT2-TB6              | 1.20 (30.5)          | 0.75 (19.1) | 7/16 (11.1)  | 3300 (227)                  |
| 1/2               | 0.049                  | -WT2-TB8              | 1.34 (34.0)          | 0.75 (19.1) | 11/16 (17.5) | 3700 (254)                  |
| 3/4               | 0.049                  | -WT2-TB12             | 1.46 (37.1)          | 0.75 (19.1) | 15/16 (23.8) | 2400 (165)                  |

| Metric           |                       |                       |                      |             |              |                             |
|------------------|-----------------------|-----------------------|----------------------|-------------|--------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |              | Working Pressure bar (psig) |
|                  |                       |                       | L                    | B           | F            |                             |
| 6                | 1.0                   | -WT2-MTB6             | 31.2 (1.23)          | 19.1 (0.75) | 11.1 (7/16)  | 420 (6095)                  |
| 8                | 1.0                   | -WT2-MTB8             | 31.2 (1.23)          | 19.1 (0.75) | 11.1 (7/16)  | 310 (4499)                  |
| 10               | 1.0                   | -WT2-MTB10            | 34.0 (1.34)          | 19.1 (0.75) | 17.5 (11/16) | 240 (3483)                  |
| 12               | 1.0                   | -WT2-MTB12            | 34.0 (1.34)          | 19.1 (0.75) | 17.5 (11/16) | 200 (2902)                  |
| 18               | 1.5                   | -WT2-MTB18            | 37.6 (1.48)          | 19.1 (0.75) | 23.8 (15/16) | 200 (2902)                  |

## Reducing Tees



| Fractional        |                        |                    |                         |                       |                      |             |             |                             |            |
|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------|-------------|-------------|-----------------------------|------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Tx-Tube O.D. (in.) | tx-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             | Working Pressure psig (bar) |            |
|                   |                        |                    |                         |                       | L                    | Lx          | B           |                             | F          |
| 3/8               | 0.035                  | 1/4                | 0.035                   | -WT2-TB6-TB6-TB4      | 1.20 (30.5)          | 1.23 (31.2) | 0.75 (19.1) | 7/16 (11.1)                 | 3300 (227) |
| 1/2               | 0.049                  | 1/4                | 0.035                   | -WT2-TB8-TB8-TB4      | 1.34 (34.0)          | 1.34 (34.0) | 0.75 (19.1) | 11/16 (17.5)                | 3700 (254) |
| 1/2               | 0.049                  | 3/8                | 0.035                   | -WT2-TB8-TB8-TB6      | 1.34 (34.0)          | 1.35 (34.3) | 0.75 (19.1) | 11/16 (17.5)                | 3700 (254) |
| 3/4               | 0.049                  | 1/4                | 0.035                   | -WT2-TB12-TB12-TB4    | 1.46 (37.1)          | 1.48 (37.6) | 0.75 (19.1) | 15/16 (23.8)                | 2400 (165) |
| 3/4               | 0.049                  | 3/8                | 0.035                   | -WT2-TB12-TB12-TB6    | 1.46 (37.1)          | 1.35 (34.3) | 0.75 (19.1) | 15/16 (23.8)                | 2400 (165) |

| Metric           |                       |                   |                        |                       |                      |             |             |                             |            |
|------------------|-----------------------|-------------------|------------------------|-----------------------|----------------------|-------------|-------------|-----------------------------|------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Tx-Tube O.D. (mm) | tx-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |             | Working Pressure bar (psig) |            |
|                  |                       |                   |                        |                       | L                    | Lx          | B           |                             | F          |
| 8                | 1.0                   | 6                 | 1.0                    | -WT2-MTB8-MTB8-MTB6   | 31.3 (1.23)          | 31.3 (1.23) | 19.1 (0.75) | 11.1 (7/16)                 | 310 (4499) |
| 10               | 1.0                   | 6                 | 1.0                    | -WT2-MTB10-MTB10-MTB6 | 34.0 (1.34)          | 34.0 (1.34) | 19.1 (0.75) | 17.5 (11/16)                | 240 (3483) |
| 10               | 1.0                   | 8                 | 1.0                    | -WT2-MTB10-MTB10-MTB8 | 34.0 (1.34)          | 34.0 (1.34) | 19.1 (0.75) | 17.5 (11/16)                | 240 (3483) |
| 12               | 1.0                   | 6                 | 1.0                    | -WT2-MTB12-MTB12-MTB6 | 34.0 (1.34)          | 34.0 (1.34) | 19.1 (0.75) | 17.5 (11/16)                | 200 (2902) |
| 12               | 1.0                   | 8                 | 1.0                    | -WT2-MTB12-MTB12-MTB8 | 34.0 (1.34)          | 34.0 (1.34) | 19.1 (0.75) | 17.5 (11/16)                | 200 (2902) |

Fittings

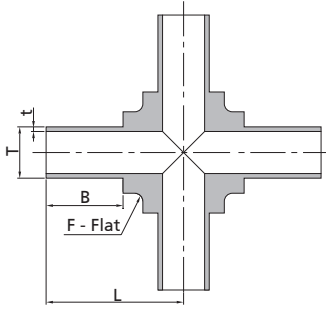
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

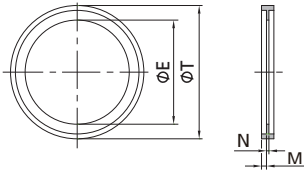
## Union Crosses



| Fractional        |                        |                       |                      |             |              |                             |
|-------------------|------------------------|-----------------------|----------------------|-------------|--------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |              | Working Pressure psig (bar) |
|                   |                        |                       | L                    | B           | F            |                             |
| 1/4               | 0.035                  | -WC2-TB4              | 1.23 (31.2)          | 0.75 (19.1) | 7/16 (11.1)  | 5100 (351)                  |
| 3/8               | 0.035                  | -WC2-TB6              | 1.20 (30.5)          | 0.75 (19.1) | 7/16 (11.1)  | 3300 (227)                  |
| 1/2               | 0.049                  | -WC2-TB8              | 1.34 (34.0)          | 0.75 (19.1) | 11/16 (17.5) | 3700 (254)                  |

| Metric           |                       |                       |                      |             |             |                             |
|------------------|-----------------------|-----------------------|----------------------|-------------|-------------|-----------------------------|
| T-Tube O.D. (mm) | t-Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |             | Working Pressure bar (psig) |
|                  |                       |                       | L                    | B           | F           |                             |
| 6                | 1.0                   | -WC2-MTB6             | 31.2 (1.23)          | 19.1 (0.75) | 11.1 (7/16) | 420 (6095)                  |
| 8                | 1.0                   | -WC2-MTB8             | 31.2 (1.23)          | 19.1 (0.75) | 11.1 (7/16) | 310 (4499)                  |
| 10               | 1.0                   | -WC2-MTB10            | 34.0 (1.34)          | 19.1 (0.75) | 15.9 (5/8)  | 240 (3483)                  |
| 12               | 1.0                   | -WC2-MTB12            | 34.0 (1.34)          | 19.1 (0.75) | 15.9 (5/8)  | 200 (2902)                  |

## Weld Rings



| Fractional        |                       |                      |             |             |             |
|-------------------|-----------------------|----------------------|-------------|-------------|-------------|
| T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |             |
|                   |                       | E                    | M           | N           | T           |
| 1/4               | -WR-4                 | 0.20 (5.1)           | 0.02 (0.51) | 0.01 (0.25) | 0.28 (7.1)  |
| 3/8               | -WR-6                 | 0.32 (8.1)           | 0.02 (0.51) | 0.01 (0.25) | 0.41 (10.4) |
| 1/2               | -WR-8                 | 0.42 (10.7)          | 0.02 (0.51) | 0.01 (0.25) | 0.54 (13.7) |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

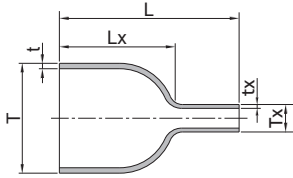
# T Series Tubular Fittings

## Features

- ◎ 316L stainless steel
- ◎ Sizes range from 1/4" to 2"
- ◎ Available in a variety of configurations
- ◎ All seamless tubing

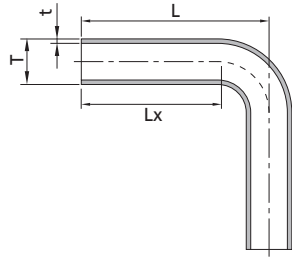


## Concentric Reducings



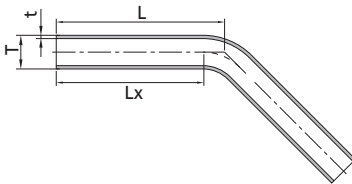
| Fractional        |                        |                    |                         |                  |                      |             |                             |
|-------------------|------------------------|--------------------|-------------------------|------------------|----------------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Tx-Tube O.D. (in.) | tx-Wall Thickness (in.) | Ordering Number  | Dimensions, in. (mm) |             | Working Pressure psig (bar) |
|                   |                        |                    |                         |                  | L                    | Lx          |                             |
| 3/4               | 0.065                  | 1/4                | 0.035                   | 6L-WU3-TB12-TB4  | 2.13 (54.0)          | 0.75 (19.1) | 3330 (230)                  |
| 3/4               | 0.065                  | 3/8                | 0.035                   | 6L-WU3-TB12-TB6  | 2.13 (54.0)          | 0.75 (19.1) | 3330 (230)                  |
| 3/4               | 0.065                  | 1/2                | 0.049                   | 6L-WU3-TB12-TB8  | 2.13 (54.0)          | 0.75 (19.1) | 3330 (230)                  |
| 1                 | 0.065                  | 1/4                | 0.035                   | 6L-WU3-TB16-TB4  | 2.36 (60.0)          | 1.00 (25.4) | 2420 (167)                  |
| 1                 | 0.065                  | 3/8                | 0.035                   | 6L-WU3-TB16-TB6  | 2.36 (60.0)          | 1.00 (25.4) | 2420 (167)                  |
| 1                 | 0.065                  | 1/2                | 0.049                   | 6L-WU3-TB16-TB8  | 2.36 (60.0)          | 1.00 (25.4) | 2420 (167)                  |
| 1                 | 0.065                  | 3/4                | 0.065                   | 6L-WU3-TB16-TB12 | 2.64 (67.0)          | 1.00 (25.4) | 2420 (167)                  |
| 1 1/2             | 0.065                  | 1/4                | 0.035                   | 6L-WU3-TB24-TB4  | 2.87 (73.0)          | 1.50 (38.1) | 1550 (107)                  |
| 1 1/2             | 0.065                  | 3/8                | 0.035                   | 6L-WU3-TB24-TB6  | 2.87 (73.0)          | 1.50 (38.1) | 1550 (107)                  |
| 1 1/2             | 0.065                  | 1/2                | 0.049                   | 6L-WU3-TB24-TB8  | 2.87 (73.0)          | 1.50 (38.1) | 1550 (107)                  |
| 1 1/2             | 0.065                  | 3/4                | 0.065                   | 6L-WU3-TB24-TB12 | 3.15 (80.0)          | 1.50 (38.1) | 1550 (107)                  |
| 1 1/2             | 0.065                  | 1                  | 0.065                   | 6L-WU3-TB24-TB16 | 3.15 (80.0)          | 1.50 (38.1) | 1160 (80)                   |
| 2                 | 0.065                  | 1/4                | 0.035                   | 6L-WU3-TB32-TB4  | 2.87 (73.0)          | 1.50 (38.1) | 1160 (80)                   |
| 2                 | 0.065                  | 3/8                | 0.035                   | 6L-WU3-TB32-TB6  | 2.87 (73.0)          | 1.50 (38.1) | 1160 (80)                   |
| 2                 | 0.065                  | 1/2                | 0.049                   | 6L-WU3-TB32-TB8  | 2.87 (73.0)          | 1.50 (38.1) | 1160 (80)                   |
| 2                 | 0.065                  | 3/4                | 0.065                   | 6L-WU3-TB32-TB12 | 3.15 (80.0)          | 1.50 (38.1) | 1160 (80)                   |
| 2                 | 0.065                  | 1                  | 0.065                   | 6L-WU3-TB32-TB16 | 3.15 (80.0)          | 1.50 (38.1) | 1160 (80)                   |
| 2                 | 0.065                  | 1 1/2              | 0.065                   | 6L-WU3-TB32-TB24 | 3.54 (90.0)          | 1.50 (38.1) | 1160 (80)                   |

### 90° Elbows



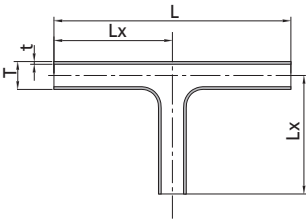
| Fractional        |                        |                 |                      |             |                             |
|-------------------|------------------------|-----------------|----------------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Ordering Number | Dimensions, in. (mm) |             | Working Pressure psig (bar) |
|                   |                        |                 | L                    | Lx          |                             |
| 1/4               | 0.035                  | 6L-WL3-TB4      | 1.93 (49.0)          | 1.14 (29.0) | 5150 (355)                  |
| 3/8               | 0.035                  | 6L-WL3-TB6      | 2.05 (52.0)          | 1.14 (29.0) | 3330 (230)                  |
| 1/2               | 0.049                  | 6L-WL3-TB8      | 2.13 (54.0)          | 1.14 (29.0) | 3530 (243)                  |
| 3/4               | 0.065                  | 6L-WL3-TB12     | 2.60 (66.0)          | 1.42 (36.0) | 3330 (230)                  |
| 1                 | 0.065                  | 6L-WL3-TB16     | 2.72 (69.0)          | 1.42 (36.0) | 2420 (167)                  |
| 1 1/2             | 0.065                  | 6L-WL3-TB24     | 4.09 (104.0)         | 1.81 (46.0) | 1550 (107)                  |
| 2                 | 0.065                  | 6L-WL3-TB32     | 4.84 (123.0)         | 1.81 (46.0) | 1160 (80)                   |

### 45° Elbows



| Fractional        |                        |                 |                      |             |                             |
|-------------------|------------------------|-----------------|----------------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Ordering Number | Dimensions, in. (mm) |             | Working Pressure psig (bar) |
|                   |                        |                 | L                    | Lx          |                             |
| 1/4               | 0.035                  | 6L-WV3-TB4      | 1.50 (38.0)          | 1.14 (29.0) | 5150 (355)                  |
| 3/8               | 0.035                  | 6L-WV3-TB6      | 1.54 (39.0)          | 1.14 (29.0) | 3330 (230)                  |
| 1/2               | 0.049                  | 6L-WV3-TB8      | 1.57 (40.0)          | 1.14 (29.0) | 3530 (243)                  |
| 3/4               | 0.065                  | 6L-WV3-TB12     | 1.93 (49.0)          | 1.42 (36.0) | 3330 (230)                  |
| 1                 | 0.065                  | 6L-WV3-TB16     | 1.97 (50.0)          | 1.42 (36.0) | 2420 (167)                  |
| 1 1/2             | 0.065                  | 6L-WV3-TB24     | 2.76 (70.0)          | 1.81 (46.0) | 1550 (107)                  |
| 2                 | 0.065                  | 6L-WV3-TB32     | 3.07 (78.0)          | 1.81 (46.0) | 1160 (80)                   |

### Tees



| Fractional        |                        |                 |                      |             |                             |
|-------------------|------------------------|-----------------|----------------------|-------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Ordering Number | Dimensions, in. (mm) |             | Working Pressure psig (bar) |
|                   |                        |                 | L                    | Lx          |                             |
| 1/4               | 0.035                  | 6L-WT3-TB4      | 2.76 (70.0)          | 1.38 (35.0) | 5150 (355)                  |
| 3/8               | 0.035                  | 6L-WT3-TB6      | 2.91 (74.0)          | 1.46 (37.0) | 3330 (230)                  |
| 1/2               | 0.049                  | 6L-WT3-TB8      | 3.07 (78.0)          | 1.54 (39.0) | 3530 (243)                  |
| 3/4               | 0.065                  | 6L-WT3-TB12     | 4.09 (104.0)         | 2.05 (52.0) | 3330 (230)                  |
| 1                 | 0.065                  | 6L-WT3-TB16     | 4.33 (110.0)         | 2.17 (55.0) | 2420 (167)                  |
| 1 1/2             | 0.065                  | 6L-WT3-TB24     | 5.83 (148.0)         | 2.91 (74.0) | 1550 (107)                  |
| 2                 | 0.065                  | 6L-WT3-TB32     | 6.06 (154.0)         | 3.03 (77.0) | 1160 (80)                   |

Fittings

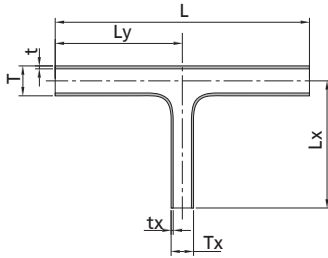
Valves

Pressure Gauges

Integrated Systems and Others

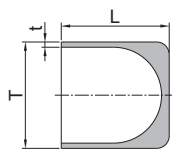
Process Specification

## Reducing Tees



| Fractional        |                        |                    |                         |                       |                      |             |             |                             |  |
|-------------------|------------------------|--------------------|-------------------------|-----------------------|----------------------|-------------|-------------|-----------------------------|--|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Tx-Tube O.D. (in.) | tx-Wall Thickness (in.) | Ordering Number       | Dimensions, in. (mm) |             |             | Working Pressure psig (bar) |  |
|                   |                        |                    |                         |                       | L                    | Lx          | Ly          |                             |  |
| 3/8               | 0.035                  | 1/4                | 0.035                   | 6L-WT3-TB6-TB6-TB4    | 2.91 (74.0)          | 1.46 (37.0) | 1.46 (37.0) | 3330 (230)                  |  |
| 1/2               | 0.049                  | 1/4                | 0.035                   | 6L-WT3-TB8-TB8-TB4    | 3.07 (78.0)          | 1.54 (39.0) | 1.54 (39.0) | 3530 (243)                  |  |
| 1/2               | 0.049                  | 3/8                | 0.035                   | 6L-WT3-TB8-TB8-TB6    | 3.07 (78.0)          | 1.54 (39.0) | 1.54 (39.0) | 3330 (230)                  |  |
| 3/4               | 0.065                  | 1/4                | 0.035                   | 6L-WT3-TB12-TB12-TB4  | 3.70 (94.0)          | 1.73 (44.0) | 1.85 (47.0) | 3330 (230)                  |  |
| 3/4               | 0.065                  | 3/8                | 0.035                   | 6L-WT3-TB12-TB12-TB6  | 3.70 (94.0)          | 1.73 (44.0) | 1.85 (47.0) | 3330 (230)                  |  |
| 3/4               | 0.065                  | 1/2                | 0.049                   | 6L-WT3-TB12-TB12-TB8  | 3.70 (94.0)          | 1.73 (44.0) | 1.85 (47.0) | 3330 (230)                  |  |
| 1                 | 0.065                  | 1/4                | 0.035                   | 6L-WT3-TB16-TB16-TB4  | 3.70 (94.0)          | 1.85 (47.0) | 1.85 (47.0) | 2420 (167)                  |  |
| 1                 | 0.065                  | 3/8                | 0.035                   | 6L-WT3-TB16-TB16-TB6  | 3.70 (94.0)          | 1.85 (47.0) | 1.85 (47.0) | 2420 (167)                  |  |
| 1                 | 0.065                  | 1/2                | 0.049                   | 6L-WT3-TB16-TB16-TB8  | 3.70 (94.0)          | 1.85 (47.0) | 1.85 (47.0) | 2420 (167)                  |  |
| 1                 | 0.065                  | 3/4                | 0.065                   | 6L-WT3-TB16-TB16-TB12 | 4.33 (110.0)         | 2.17 (55.0) | 2.17 (55.0) | 2420 (167)                  |  |
| 1 1/2             | 0.065                  | 1/4                | 0.035                   | 6L-WT3-TB24-TB24-TB4  | 4.49 (114.0)         | 2.13 (54.0) | 2.24 (57.0) | 1550 (107)                  |  |
| 1 1/2             | 0.065                  | 3/8                | 0.035                   | 6L-WT3-TB24-TB24-TB6  | 4.49 (114.0)         | 2.13 (54.0) | 2.24 (57.0) | 1550 (107)                  |  |
| 1 1/2             | 0.065                  | 1/2                | 0.049                   | 6L-WT3-TB24-TB24-TB8  | 4.49 (114.0)         | 2.13 (54.0) | 2.24 (57.0) | 1550 (107)                  |  |
| 1 1/2             | 0.065                  | 3/4                | 0.065                   | 6L-WT3-TB24-TB24-TB12 | 5.35 (136.0)         | 2.44 (62.0) | 2.68 (68.0) | 1550 (107)                  |  |
| 1 1/2             | 0.065                  | 1                  | 0.065                   | 6L-WT3-TB24-TB24-TB16 | 5.35 (136.0)         | 2.44 (62.0) | 2.68 (68.0) | 1550 (107)                  |  |
| 2                 | 0.065                  | 1/4                | 0.035                   | 6L-WT3-TB32-TB32-TB4  | 4.49 (114.0)         | 2.24 (57.0) | 2.24 (57.0) | 1160 (80)                   |  |
| 2                 | 0.065                  | 3/8                | 0.035                   | 6L-WT3-TB32-TB32-TB6  | 4.49 (114.0)         | 2.24 (57.0) | 2.24 (57.0) | 1160 (80)                   |  |
| 2                 | 0.065                  | 1/2                | 0.049                   | 6L-WT3-TB32-TB32-TB8  | 4.49 (114.0)         | 2.24 (57.0) | 2.24 (57.0) | 1160 (80)                   |  |
| 2                 | 0.065                  | 3/4                | 0.065                   | 6L-WT3-TB32-TB32-TB12 | 5.35 (136.0)         | 2.56 (65.0) | 2.68 (68.0) | 1160 (80)                   |  |
| 2                 | 0.065                  | 1                  | 0.065                   | 6L-WT3-TB32-TB32-TB16 | 5.35 (136.0)         | 2.56 (65.0) | 2.68 (68.0) | 1160 (80)                   |  |
| 2                 | 0.065                  | 1 1/2              | 0.065                   | 6L-WT3-TB32-TB32-TB24 | 6.06 (154.0)         | 3.03 (77.0) | 3.03 (77.0) | 1160 (80)                   |  |

## End Caps



| Fractional        |                        |                 |                     |                             |
|-------------------|------------------------|-----------------|---------------------|-----------------------------|
| T-Tube O.D. (in.) | t-Wall Thickness (in.) | Ordering Number | Dimension, in. (mm) | Working Pressure psig (bar) |
|                   |                        |                 | L                   |                             |
| 1/4               | 0.035                  | 6L-CW3-TB4      | 0.50 (12.7)         | 5150 (355)                  |
| 3/8               | 0.035                  | 6L-CW3-TB6      | 0.50 (12.7)         | 3330 (230)                  |
| 1/2               | 0.049                  | 6L-CW3-TB8      | 0.50 (12.7)         | 3530 (243)                  |
| 3/4               | 0.065                  | 6L-CW3-TB12     | 0.75 (19.1)         | 3330 (230)                  |
| 1                 | 0.065                  | 6L-CW3-TB16     | 1.00 (25.4)         | 2420 (167)                  |
| 1 1/2             | 0.065                  | 6L-CW3-TB24     | 1.50 (38.1)         | 1550 (107)                  |
| 2                 | 0.065                  | 6L-CW3-TB32     | 1.50 (38.1)         | 1160 (80)                   |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Face Seal Fittings

## FR Series



## TFO Series



## FO Series



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

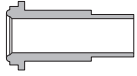
Process Specification

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## FR Series Metal Gasket Face Seal

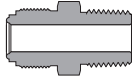
### Fittings

Glands - G



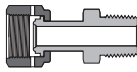
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Bodies - CM, CMB, CF, U, UB, BU,  
BW, RU, RA, RB, LM, LU, TTT, C



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Welded Glands - WG



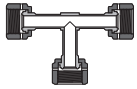
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Female Elbows - LWG



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Female Tees - TWG



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Nuts - N, MN, BC



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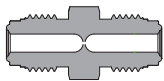
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Caps - CP



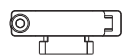
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Flow Restrictors



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Locking Device



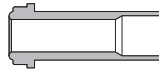
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Gaskets - GT



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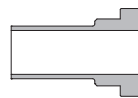
High-Flow Connections - "H" Type FR



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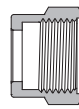
## TFO Series L-Ring Face Seal Fittings

Glands - G



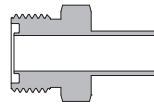
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Nuts - N



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Tube Butt Weld Bodies - CW



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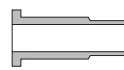
L-Ring Seal - GT



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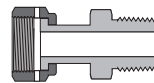
## FO Series O-Ring Face Seal Fittings

Glands - G



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Welded Glands - WG



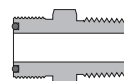
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Nuts - N



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Bodies - CM, CF, U, UB, BY, BU,  
CW, LM, LU, LP, LU, TTT



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O-Rings



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Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



# Face Seal Fittings

## FR Series Metal Gasket Face Seal Fittings

### Features

- ⦿ Metal-to-metal seal to provide perfect leak-tight service for working conditions from critical vacuum to high pressure
- ⦿ Precision manufactured gasket to ensure best performance
- ⦿ Test port at nut for easy leak testing
- ⦿ Silver-plated female threads
- ⦿ Mechanically polished surface roughness finished to an average of Ra 10 µin. (0.25 µm) or electropolished to Ra 5 µin. (0.13 µm) optional
- ⦿ All seal faces and male threads protected with plastic caps
- ⦿ Sizes range from 1/16" to 1" and 6 mm to 18 mm
- ⦿ Every gland and body marked with size, material and heat number



### Technical Data

- ⦿ Thread Specifications

| Thread Type   | Specification             |
|---------------|---------------------------|
| NPT           | ASME B1.20.1, SAE AS71051 |
| Unified (SAE) | ASME B1.1, SAE J475       |

- ⦿ Materials

| Material                | Bar Stock | Forging   | Designator |
|-------------------------|-----------|-----------|------------|
| <b>Fitting Material</b> |           |           |            |
| 316 SS                  | ASTM A479 | ASTM A182 | SS         |
| 316L SS                 | SEMI F20  | SEMI F20  | 6L         |
| 316L VAR SS             |           |           | 6LV        |
| 316L VIM-VAR SS         |           |           | 6LW        |
| <b>Gasket Material</b>  |           |           |            |
| 316L SS                 | ASTM A240 |           | 6L         |
| Copper                  | ASTM B152 |           | CU         |
| Nickel                  | ASTM B162 |           | NI         |

- ⦿ Weld End Tube O.D. and Wall Thickness

| Fractional    |                    | Metric       |                   |
|---------------|--------------------|--------------|-------------------|
| Tube O.D. in. | Wall Thickness in. | Tube O.D. mm | Wall Thickness mm |
| 1/8           | 0.028              | 6            | 1.0               |
| 1/4           | 0.035              | 8            | 1.0               |
| 3/8           | 0.035              | 10           | 1.0               |
| 1/2           | 0.049              | 12           | 1.0               |
| 3/4           | 0.049              | 18           | 1.5               |
| 1             | 0.065              |              |                   |
| 1 1/2         | 0.065              |              |                   |
| 2             | 0.065              |              |                   |

For other sizes or wall thicknesses of welded ports, please contact FITOK Group or our authorized distributors.

⦿ Working Pressure

Working pressures shown in the Catalog are calculated according to ASME B31.3 and B31.1 at ambient temperature.

⦿ Working Temperature

| Component | Material        | Max. Temperature |
|-----------|-----------------|------------------|
| Fittings  | 316 SS          | 1000 °F (538 °C) |
|           | 316L SS         |                  |
|           | 316L VAR SS     |                  |
|           | 316L VIM-VAR SS |                  |
| Gaskets   | 316L SS         | 400 °F (204 °C)  |
|           | Copper          |                  |
|           | Nickel          |                  |

## Testing

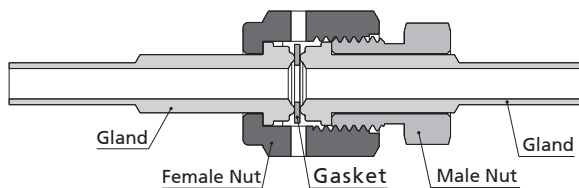
FR fittings are rated to a maximum helium leak rate of  $4 \times 10^{-11}$  std cm<sup>3</sup>/s.

## Ordering Information

- ⦿ Each component can be ordered separately.
  - ⦿ Add the material designator as a prefix, cleaning and packaging designator as a suffix to the basic ordering number to get the complete ordering number.
  - ⦿ Cleaning and Packaging
    - a. FC-01 Standard Cleaning and Packaging for general industrial procedures. No suffix is needed.
    - b. FC-02 Special Cleaning and Packaging, to ensure compliance with product cleanliness requirement as stated in ASTM G93 Level C. Add "-F2" as a suffix when needed.
    - c. FC-03 Ultra High Purity Process Specification is applied to products with wetted surface roughness finished to an average of Ra 5 μin. (0.13 μm). Add "-F3" as a suffix when needed.
- Example: For 1/2" 316L VAR SS gland with FC-03 Ultra High Purity Process Specification, the complete ordering number is 6LV-G-FR8-TB8-6-F3.

## Installation Instructions

1. Assemble the gland, nut, gasket and male nut as below. Finger tight the nut.

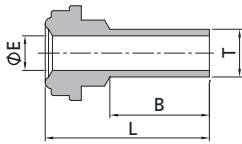


2. For fittings with 316L SS and nickel gaskets, tighten the nut 1/8 turn with a wrench while holding the male nut or the fitting body steady. Tighten the nut 1/4 turn for those with copper gaskets.

## Cautions

- ⦿ Dimensions are for reference only and are subject to change.
- ⦿ Over-tightening will damage the sealing beads and lead to possible leak.
- ⦿ Utilize a new gasket for each assembly.
- ⦿ Tungsten Inert Gas Welding (TIG) is recommended.
- ⦿ Always apply sealing materials compatible with the fluid on tapered pipe threads.
- ⦿ Do not loosen or tighten fittings when the system is pressurized.

## Glands



**FR Gland to Short Fractional Tube Butt Weld**

| FR Size (in.) | T-Tube O.D. (in.) | Nominal Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|------------------------------|-----------------------|----------------------|-------------|-------------|------------------------------|------------|------------|
|               |                   |                              |                       | L                    | B           | E           | 6L                           | CU         | NI         |
| 1/8           | 1/8               | 0.028                        | -G-FR2-TB2-12S        | 1.08 (27.4)          | 0.75 (19.1) | 0.07 (1.8)  | 8500 (586)                   | 6800 (468) | 8500 (586) |
| 1/4           | 1/8               | 0.028                        | -G-FR4-TB2-12S        | 1.10 (27.9)          | 0.75 (19.1) | 0.07 (1.8)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-4S         | 0.60 (15.2)          | 0.25 (6.4)  | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-6S         | 0.72 (18.3)          | 0.38 (9.6)  | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-12S        | 1.10 (27.9)          | 0.75 (19.1) | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/2           | 1/4               | 0.035                        | -G-FR8-TB4-12S        | 1.12 (28.4)          | 0.75 (19.1) | 0.18 (4.6)  | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 3/8               | 0.035                        | -G-FR8-TB6-4S         | 0.62 (15.7)          | 0.25 (6.4)  | 0.31 (7.9)  | 3300 (227)                   | 2600 (179) | 3300 (227) |
| 1/2           | 3/8               | 0.035                        | -G-FR8-TB6-12S        | 1.12 (28.4)          | 0.75 (19.1) | 0.31 (7.9)  | 3300 (227)                   | 2600 (179) | 3300 (227) |
| 1/2           | 1/2               | 0.049                        | -G-FR8-TB8-4S         | 0.62 (15.7)          | 0.25 (6.4)  | 0.40 (10.2) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | 0.049                        | -G-FR8-TB8-6S         | 0.74 (18.8)          | 0.38 (9.6)  | 0.40 (10.2) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | 0.049                        | -G-FR8-TB8-12S        | 1.12 (28.4)          | 0.75 (19.1) | 0.40 (10.2) | 3500 (241)                   | 2800 (192) | 3500 (241) |

**FR Gland to Short Metric Tube Butt Weld**

| FR Size (in.) | T-Tube O.D. (mm) | Nominal Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |             | Working Pressure, bar (psig) |            |            |
|---------------|------------------|-----------------------------|-----------------------|----------------------|-------------|-------------|------------------------------|------------|------------|
|               |                  |                             |                       | L                    | B           | E           | 6L                           | CU         | NI         |
| 1/4           | 6                | 1.0                         | -G-FR4-MTB6-12S       | 29.5 (1.16)          | 19.1 (0.75) | 4.0 (0.16)  | 468 (6800)                   | 372 (5400) | 468 (6800) |
| 1/4           | 8                | 1.0                         | -G-FR4-MTB8-12S       | 29.5 (1.16)          | 19.1 (0.75) | 6.0 (0.24)  | 337 (4900)                   | 337 (4900) | 337 (4900) |
| 1/2           | 10               | 1.0                         | -G-FR8-MTB10-12S      | 29.5 (1.16)          | 19.1 (0.75) | 8.0 (0.31)  | 241 (3500)                   | 192 (2800) | 241 (3500) |
| 1/2           | 12               | 1.0                         | -G-FR8-MTB12-12S      | 29.5 (1.16)          | 19.1 (0.75) | 10.0 (0.39) | 213 (3100)                   | 165 (2400) | 213 (3100) |
| 3/4           | 18               | 1.5                         | -G-FR12-MTB18-12S     | 31.0 (1.22)          | 19.1 (0.75) | 15.0 (0.59) | 206 (3000)                   | 165 (2400) | 206 (3000) |

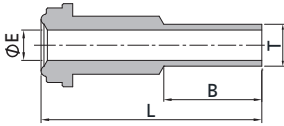
Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



## FR Gland to Long Fractional Tube Butt Weld

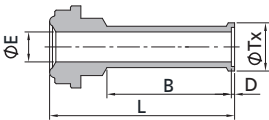
| FR Size (in.) | T-Tube O.D. (in.) | Nominal Wall Thickness (in.) | Basic Ordering Number        | Dimensions, in. (mm) |             |             | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|------------------------------|------------------------------|----------------------|-------------|-------------|------------------------------|------------|------------|
|               |                   |                              |                              | L                    | B           | E           | 6L                           | CU         | NI         |
| 1/8           | 1/8               | 0.028                        | -G-FR2-TB2-12                | 1.42 (36.1)          | 0.75 (19.1) | 0.07 (1.8)  | 8500 (586)                   | 6800 (468) | 8500 (586) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-4                 | 1.20 (30.5)          | 0.25 (6.4)  | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-1.31 <sup>①</sup> | 1.31 (33.3)          | 0.36 (9.1)  | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-6                 | 1.32 (33.5)          | 0.38 (9.6)  | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | 0.035                        | -G-FR4-TB4-12                | 1.70 (43.2)          | 0.75 (19.1) | 0.18 (4.6)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/2           | 1/4               | 0.035                        | -G-FR8-TB4-12                | 1.80 (45.7)          | 0.75 (19.1) | 0.18 (4.6)  | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 3/8               | 0.035                        | -G-FR8-TB6-4                 | 1.29 (32.8)          | 0.25 (6.4)  | 0.31 (7.9)  | 3300 (227)                   | 2600 (179) | 3300 (227) |
| 1/2           | 3/8               | 0.035                        | -G-FR8-TB6-12                | 1.79 (45.5)          | 0.75 (19.1) | 0.31 (7.9)  | 3300 (227)                   | 2600 (179) | 3300 (227) |
| 1/2           | 1/2               | 0.049                        | -G-FR8-TB8-4                 | 1.29 (32.8)          | 0.25 (6.4)  | 0.40 (10.2) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | 0.049                        | -G-FR8-TB8-6                 | 1.41 (35.8)          | 0.38 (9.6)  | 0.40 (10.2) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | 0.049                        | -G-FR8-TB8-12                | 1.79 (45.5)          | 0.75 (19.1) | 0.40 (10.2) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 3/4           | 3/4               | 0.049                        | -G-FR12-TB12-12              | 2.03 (51.6)          | 0.75 (19.1) | 0.65 (16.5) | 2400 (165)                   | 1900 (130) | 2400 (165) |
| 1             | 1                 | 0.065                        | -G-FR16-TB16-12              | 2.32 (58.9)          | 0.75 (19.1) | 0.87 (22.1) | 2400 (165)                   | 1900 (130) | 2400 (165) |

## FR Gland to Long Metric Tube Butt Weld

| FR Size (in.) | T-Tube O.D. (mm) | Nominal Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |             | Working Pressure, bar (psig) |            |            |
|---------------|------------------|-----------------------------|-----------------------|----------------------|-------------|-------------|------------------------------|------------|------------|
|               |                  |                             |                       | L                    | B           | E           | 6L                           | CU         | NI         |
| 1/4           | 6                | 1.0                         | -G-FR4-MTB6-12        | 43.2 (1.7)           | 19.1 (0.75) | 4.0 (0.16)  | 468 (6800)                   | 372 (5400) | 468 (6800) |
| 1/4           | 8                | 1.0                         | -G-FR4-MTB8-12        | 43.2 (1.7)           | 19.1 (0.75) | 6.0 (0.24)  | 337 (4900)                   | 337 (4900) | 337 (4900) |
| 1/2           | 10               | 1.0                         | -G-FR8-MTB10-12       | 45.5 (1.79)          | 19.1 (0.75) | 8.0 (0.31)  | 241 (3500)                   | 192 (2800) | 241 (3500) |
| 1/2           | 12               | 1.0                         | -G-FR8-MTB12-12       | 45.5 (1.79)          | 19.1 (0.75) | 10.0 (0.39) | 213 (3100)                   | 165 (2400) | 213 (3100) |
| 3/4           | 18               | 1.5                         | -G-FR12-MTB18-12      | 51.6 (2.03)          | 19.1 (0.75) | 15.0 (0.59) | 206 (3000)                   | 165 (2400) | 206 (3000) |

Suffix -4, -6, -12 indicates that Dimension B equals to the specific suffix value times 1/16. Example: With suffix "12", Dimension B = 12/16 = 3/4" or 19.1 mm.

① -1.31 means the length of Dimension L.



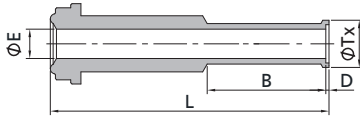
## FR Gland to Short Fractional Automatic Tube Butt Weld

| FR Size (in.) | Tube O.D. (in.) | Nominal Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            |             |             | Working Pressure, psig (bar) |            |            |
|---------------|-----------------|------------------------------|-----------------------|----------------------|-------------|------------|-------------|-------------|------------------------------|------------|------------|
|               |                 |                              |                       | L                    | B           | D          | E           | Tx          | 6L                           | CU         | NI         |
| 1/4           | 1/4             | 0.035                        | -AG-FR4-TB4-12S       | 1.12 (28.4)          | 0.75 (19.1) | 0.02 (0.5) | 0.18 (4.6)  | 0.29 (7.4)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/2           | 3/8             | 0.035                        | -AG-FR8-TB6-12S       | 1.15 (29.2)          | 0.75 (19.1) | 0.03 (0.8) | 0.31 (7.9)  | 0.41 (10.4) | 3300 (227)                   | 2600 (179) | 3300 (227) |
| 1/2           | 1/2             | 0.049                        | -AG-FR8-TB8-12S       | 1.16 (29.5)          | 0.75 (19.1) | 0.04 (1.0) | 0.40 (10.2) | 0.55 (14.0) | 3500 (241)                   | 2800 (192) | 3500 (241) |

## FR Gland to Short Metric Automatic Tube Butt Weld

| FR Size (in.) | Tube O.D. (mm) | Nominal Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |            |             |             | Working Pressure, bar (psig) |            |            |
|---------------|----------------|-----------------------------|-----------------------|----------------------|-------------|------------|-------------|-------------|------------------------------|------------|------------|
|               |                |                             |                       | L                    | B           | D          | E           | Tx          | 6L                           | CU         | NI         |
| 1/4           | 6              | 1.0                         | -AG-FR4-MTB6-12S      | 30.0 (1.18)          | 19.1 (0.75) | 0.5 (0.02) | 4.0 (0.16)  | 6.8 (0.27)  | 468 (6800)                   | 372 (5400) | 468 (6800) |
| 1/4           | 8              | 1.0                         | -AG-FR4-MTB8-12S      | 30.2 (1.19)          | 19.1 (0.75) | 0.8 (0.03) | 6.0 (0.24)  | 8.9 (0.35)  | 337 (4900)                   | 337 (4900) | 337 (4900) |
| 1/2           | 10             | 1.0                         | -AG-FR8-MTB10-12S     | 31.0 (1.22)          | 19.1 (0.75) | 0.8 (0.03) | 8.0 (0.31)  | 10.9 (0.43) | 241 (3500)                   | 192 (2800) | 241 (3500) |
| 1/2           | 12             | 1.0                         | -AG-FR8-MTB12-12S     | 30.5 (1.20)          | 19.1 (0.75) | 1.0 (0.04) | 10.0 (0.39) | 13.2 (0.52) | 213 (3100)                   | 165 (2400) | 213 (3100) |

## F-21 Face Seal Fittings

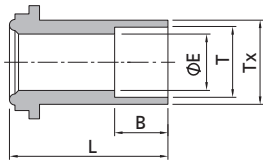


### FR Gland to Long Fractional Automatic Tube Butt Weld

| FR Size (in.) | Tube O.D. (in.) | Nominal Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            |             |             | Working Pressure, psig (bar) |            |            |
|---------------|-----------------|------------------------------|-----------------------|----------------------|-------------|------------|-------------|-------------|------------------------------|------------|------------|
|               |                 |                              |                       | L                    | B           | D          | E           | Tx          | 6L                           | CU         | NI         |
| 1/4           | 1/4             | 0.035                        | -AG-FR4-TB4-12        | 1.72 (43.7)          | 0.75 (19.1) | 0.02 (0.5) | 0.18 (4.6)  | 0.29 (7.4)  | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/2           | 1/4             | 0.035                        | -AG-FR8-TB4-12        | 1.82 (46.2)          | 0.75 (19.1) | 0.02 (0.5) | 0.18 (4.6)  | 0.29 (7.4)  | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 1/2           | 3/8             | 0.035                        | -AG-FR8-TB6-12        | 1.82 (46.2)          | 0.75 (19.1) | 0.03 (0.8) | 0.31 (7.9)  | 0.41 (10.4) | 3300 (227)                   | 2600 (179) | 3300 (227) |
| 1/2           | 1/2             | 0.049                        | -AG-FR8-TB8-12        | 1.83 (46.5)          | 0.75 (19.1) | 0.04 (1.0) | 0.40 (10.2) | 0.55 (14.0) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 3/4           | 3/4             | 0.049                        | -AG-FR12-TB12-12      | 2.07 (52.6)          | 0.75 (19.1) | 0.04 (1.0) | 0.65 (16.5) | 0.80 (20.3) | 2400 (165)                   | 2400 (165) | 2400 (165) |
| 1             | 1               | 0.065                        | -AG-FR16-TB16-16      | 2.57 (65.3)          | 0.96 (24.4) | 0.04 (1.0) | 0.87 (22.1) | 1.06 (26.9) | 2400 (165)                   | 1900 (130) | 2400 (165) |

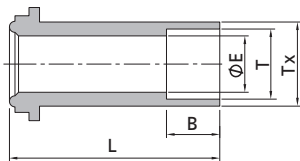
### FR Gland to Long Metric Automatic Tube Butt Weld

| FR Size (in.) | Tube O.D. (mm) | Nominal Wall Thickness (mm) | Basic Ordering Number | Dimensions, mm (in.) |             |            |             |             | Working Pressure, bar (psig) |            |            |
|---------------|----------------|-----------------------------|-----------------------|----------------------|-------------|------------|-------------|-------------|------------------------------|------------|------------|
|               |                |                             |                       | L                    | B           | D          | E           | Tx          | 6L                           | CU         | NI         |
| 1/4           | 6              | 1.0                         | -AG-FR4-MTB6-12       | 43.7 (1.72)          | 19.1 (0.75) | 0.5 (0.02) | 4.0 (0.16)  | 6.8 (0.27)  | 468 (6800)                   | 372 (5400) | 468 (6800) |
| 1/2           | 12             | 1.0                         | -AG-FR8-MTB12-12      | 46.5 (1.83)          | 19.1 (0.75) | 1.0 (0.04) | 10.0 (0.39) | 13.2 (0.52) | 213 (3100)                   | 165 (2400) | 213 (3100) |
| 3/4           | 18             | 1.5                         | -AG-FR12-MTB18-12     | 52.6 (2.07)          | 19.1 (0.75) | 1.0 (0.04) | 15.0 (0.59) | 19.3 (0.76) | 206 (3000)                   | 165 (2400) | 206 (3000) |



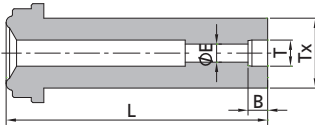
### FR Gland to Short Tube Socket Weld

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |            |            | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|------------|------------|------------|------------------------------|------------|------------|
|               |                   |                       | L                    | B          | E          | Tx         | 6L                           | CU         | NI         |
| 1/4           | 1/4               | -G-FR4-TS4-0.50       | 0.50 (12.7)          | 0.28 (7.1) | 0.18 (4.6) | 0.35 (8.9) | 5500 (378)                   | 5500 (378) | 5500 (378) |
| 1/4           | 1/4               | -G-FR4-TS4-0.75       | 0.75 (19.1)          | 0.28 (7.1) | 0.18 (4.6) | 0.35 (8.9) | 5500 (378)                   | 5500 (378) | 5500 (378) |



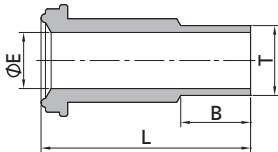
### FR Gland to Tube Socket Weld

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |             | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|-------------|------------------------------|------------|------------|
|               |                   |                       | L                    | B           | E           | Tx          | 6L                           | CU         | NI         |
| 1/8           | 1/16              | -G-FR2-TS1            | 0.70 (17.8)          | 0.10 (2.5)  | 0.05 (1.3)  | 0.13 (3.3)  | 9000 (620)                   | 7200 (496) | 9000 (620) |
| 1/8           | 1/8               | -G-FR2-TS2            | 0.70 (17.8)          | 0.10 (2.5)  | 0.09 (2.3)  | 0.20 (5.1)  | 7100 (489)                   | 7100 (489) | 7100 (489) |
| 1/4           | 1/4               | -G-FR4-TS4            | 1.31 (33.3)          | 0.28 (7.1)  | 0.18 (4.6)  | 0.35 (8.9)  | 5500 (378)                   | 5500 (378) | 5500 (378) |
| 1/2           | 3/8               | -G-FR8-TS6            | 1.50 (38.1)          | 0.31 (7.9)  | 0.28 (7.1)  | 0.60 (15.2) | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | -G-FR8-TS8            | 1.50 (38.1)          | 0.38 (9.7)  | 0.40 (10.2) | 0.60 (15.2) | 3000 (206)                   | 2400 (165) | 3000 (206) |
| 5/8           | 5/8               | -G-FR10-TS10          | 1.56 (39.6)          | 0.41 (10.4) | 0.50 (12.7) | 0.72 (18.3) | 2800 (192)                   | 2200 (151) | 2800 (192) |
| 3/4           | 3/4               | -G-FR12-TS12          | 2.00 (50.8)          | 0.44 (11.2) | 0.62 (15.7) | 0.88 (22.4) | 2800 (192)                   | 2200 (151) | 2800 (192) |
| 1             | 1                 | -G-FR16-TS16          | 2.22 (56.4)          | 0.62 (15.7) | 0.87 (22.1) | 1.19 (30.2) | 3000 (206)                   | 1900 (130) | 2400 (165) |



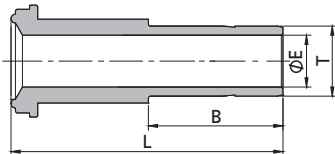
**Reducing Socket Weld**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |            |             | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|------------|------------|-------------|------------------------------|------------|------------|
|               |                   |                       | L                    | B          | E          | Tx          | 6L                           | CU         | NI         |
| 1/4           | 1/8               | -G-FR4-RTS2           | 1.31 (33.3)          | 0.10 (2.5) | 0.09 (2.3) | 0.35 (8.9)  | 8000 (551)                   | 8000 (551) | 8000 (551) |
| 1/2           | 1/4               | -G-FR8-RTS4           | 1.50 (38.1)          | 0.28 (7.1) | 0.18 (4.6) | 0.60 (15.2) | 3500 (241)                   | 3500 (241) | 3500 (241) |



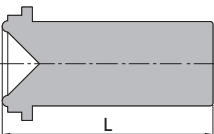
**FR Gland to Male Weld**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|------------------------------|------------|------------|
|               |                   |                       | L                    | B           | E           | 6L                           | CU         | NI         |
| 1/8           | 1/8               | -G-FR2-TB2            | 0.70 (17.8)          | 0.28 (7.1)  | 0.07 (1.8)  | 11200 (772)                  | 7200 (496) | 9000 (620) |
| 1/4           | 1/8               | -G-FR4-TB2            | 1.31 (33.3)          | 0.28 (7.1)  | 0.07 (1.8)  | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/4           | 1/4               | -G-FR4-TB4            | 1.31 (33.3)          | 0.41 (10.4) | 0.12 (3.0)  | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/4               | -G-FR8-TB4            | 1.50 (38.1)          | 0.41 (10.4) | 0.12 (3.0)  | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 3/8               | -G-FR8-TB6            | 1.50 (38.1)          | 0.41 (10.4) | 0.28 (7.1)  | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | -G-FR8-TB8            | 1.50 (38.1)          | 0.50 (12.7) | 0.40 (10.2) | 3500 (241)                   | 3500 (241) | 3500 (241) |
| 3/4           | 3/4               | -G-FR12-TB12          | 2.00 (50.8)          | 0.62 (15.7) | 0.53 (13.5) | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1             | 1                 | -G-FR16-TB16          | 2.22 (56.4)          | 0.81 (20.6) | 0.75 (19.1) | 3000 (206)                   | 1900 (130) | 2400 (165) |



**FR Gland to Tube Port**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|------------|------------------------------|------------|------------|
|               |                   |                       | L                    | B           | E          | 6L                           | CU         | NI         |
| 1/4           | 1/4               | -G-FR4-FT4            | 1.62 (41.0)          | 0.64 (16.2) | 0.17 (4.3) | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 3/8               | -G-FR8-FT6            | 1.81 (46.0)          | 0.70 (17.8) | 0.27 (6.9) | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | -G-FR8-FT8            | 1.94 (49.3)          | 0.96 (24.4) | 0.37 (9.4) | 4300 (296)                   | 2800 (192) | 3500 (241) |



**Blind Gland**

| FR Size (in.) | Basic Ordering Number | Dimension, in. (mm) |
|---------------|-----------------------|---------------------|
|               |                       | L                   |
| 1/8           | -G-FR2-B              | 0.70 (17.8)         |
| 1/4           | -G-FR4-B              | 1.31 (33.3)         |
| 1/2           | -G-FR8-B              | 1.50 (38.1)         |
| 3/4           | -G-FR12-B             | 2.00 (50.8)         |
| 1             | -G-FR16-B             | 2.22 (56.4)         |

Fittings

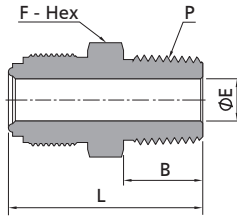
Valves

Pressure Gauges

Integrated Systems and Others

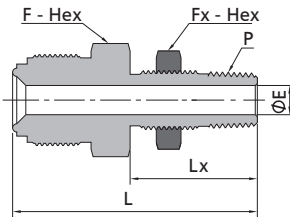
Process Specification

## Bodies



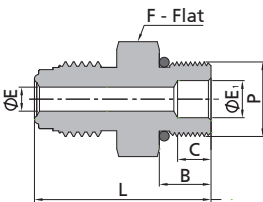
### FR Body to Male NPT

| FR Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |                | Working Pressure, psig (bar) |            |            |
|---------------|------------|-----------------------|----------------------|-------------|-------------|----------------|------------------------------|------------|------------|
|               |            |                       | L                    | B           | E           | F              | 6L                           | CU         | NI         |
| 1/8           | 1/16       | -CM-FR2-NS1           | 1.07 (27.2)          | 0.38 (9.7)  | 0.09 (2.3)  | 3/8 (9.5)      | 9000 (620)                   | 7200 (496) | 9000 (620) |
| 1/8           | 1/8        | -CM-FR2-NS2           | 1.07 (27.2)          | 0.38 (9.7)  | 0.09 (2.3)  | 7/16 (11.1)    | 9000 (620)                   | 7200 (496) | 9000 (620) |
| 1/4           | 1/8        | -CM-FR4-NS2           | 1.31 (33.3)          | 0.38 (9.7)  | 0.18 (4.6)  | 5/8 (15.9)     | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/4           | 1/4        | -CM-FR4-NS4           | 1.49 (37.8)          | 0.56 (14.2) | 0.18 (4.6)  | 5/8 (15.9)     | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/4        | -CM-FR8-NS4           | 1.65 (41.9)          | 0.56 (14.2) | 0.28 (7.1)  | 15/16 (23.8)   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 3/8        | -CM-FR8-NS6           | 1.65 (41.9)          | 0.56 (14.2) | 0.38 (9.7)  | 15/16 (23.8)   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2        | -CM-FR8-NS8           | 1.84 (46.7)          | 0.75 (19.1) | 0.40 (10.2) | 15/16 (23.8)   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 3/4           | 3/4        | -CM-FR12-NS12         | 2.19 (55.6)          | 0.75 (19.1) | 0.62 (15.7) | 1 15/16 (33.3) | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1             | 1          | -CM-FR16-NS16         | 2.47 (62.7)          | 0.94 (23.9) | 0.87 (22.1) | 1 5/8 (41.3)   | 3000 (206)                   | 1900 (130) | 3000 (206) |



### FR Body to Bulkhead Male Connector

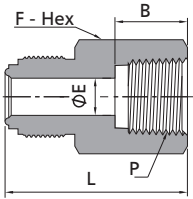
| FR Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |            |              |              | Panel Hole Size in. (mm) | Max. Panel Thickness in. (mm) | Working Pressure, psig (bar) |            |            |
|---------------|------------|-----------------------|----------------------|-------------|------------|--------------|--------------|--------------------------|-------------------------------|------------------------------|------------|------------|
|               |            |                       | L                    | Lx          | E          | F            | Fx           |                          |                               | 6L                           | CU         | NI         |
| 1/4           | 1/4        | -CMB-FR4-NS4          | 2.21 (56.1)          | 1.24 (31.5) | 0.28 (7.1) | 13/16 (20.6) | 13/16 (20.6) | 21/32 (16.7)             | 0.38 (9.7)                    | 8000 (551)                   | 6400 (440) | 8000 (551) |
| 1/2           | 1/4        | -CMB-FR8-NS4          | 2.34 (59.4)          | 1.24 (31.5) | 0.28 (7.1) | 15/16 (23.8) | 13/16 (20.6) | 21/32 (16.7)             | 0.38 (9.7)                    | 4370 (301)                   | 2800 (192) | 3500 (241) |



### FR Body to SAE/MS Thread

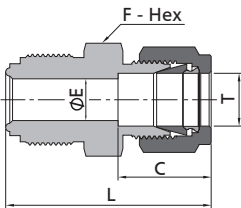
| FR Size (in.) | P-SAE/MS Thread Size | Uniform O-Ring <sup>①</sup> Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |            |                |              | Working Pressure, psig (bar) |            |            |
|---------------|----------------------|----------------------------------|-----------------------|----------------------|-------------|-------------|------------|----------------|--------------|------------------------------|------------|------------|
|               |                      |                                  |                       | L                    | B           | C           | E          | E <sub>1</sub> | F            | 6L                           | CU         | NI         |
| 1/4           | 9/16-18              | 906                              | -CM-FR4-ST9           | 1.33 (33.8)          | 0.39 (9.9)  | 0.25 (6.4)  | 0.18 (4.6) | 0.28 (7.1)     | 3/4 (19.1)   | 4500 (310)                   | 4500 (310) | 4500 (310) |
| 1/2           | 9/16-18              | 906                              | -CM-FR8-ST9           | 1.48 (37.6)          | 0.39 (9.9)  | -           | 0.28 (7.1) | 0.28 (7.1)     | 15/16 (23.8) | 3500 (241)                   | 2800 (192) | 3500 (241) |
| 1/2           | 7/8-14               | 910                              | -CM-FR8-ST14          | 1.66 (42.2)          | 0.50 (12.7) | 0.40 (10.2) | 0.28 (7.1) | 0.59 (15.0)    | 1 (25.4)     | 3500 (241)                   | 2800 (192) | 3500 (241) |

① The bodies are supplied with O-rings. Fluorocarbon FKM is standard O-ring material, contact FITOK Group for other materials. Fluorocarbon FKM O-rings are internally lubricated, no external lubricants are required.



**FR Body to Female NPT**

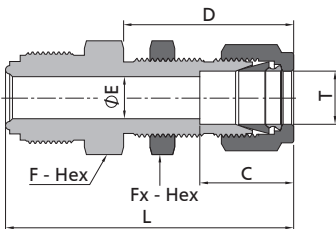
| FR Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |               | Working Pressure, psig (bar) |            |            |
|---------------|------------|-----------------------|----------------------|-------------|-------------|---------------|------------------------------|------------|------------|
|               |            |                       | L                    | B           | E           | F             | 6L                           | CU         | NI         |
| 1/8           | 1/16       | -CF-FR2-NS1           | 1.10 (27.9)          | 0.39 (9.9)  | 0.09 (2.3)  | 7/16 (11.1)   | 6700 (461)                   | 6700 (461) | 6700 (461) |
| 1/8           | 1/8        | -CF-FR2-NS2           | 1.19 (30.2)          | 0.41 (10.4) | 0.09 (2.3)  | 9/16 (14.3)   | 6500 (447)                   | 6500 (447) | 6500 (447) |
| 1/4           | 1/8        | -CF-FR4-NS2           | 1.41 (35.8)          | 0.41 (10.4) | 0.18 (4.6)  | 5/8 (15.9)    | 8000 (551)                   | 6400 (440) | 8000 (551) |
| 1/4           | 1/4        | -CF-FR4-NS4           | 1.54 (39.1)          | 0.59 (15.0) | 0.18 (4.6)  | 3/4 (19.1)    | 6600 (454)                   | 5200 (358) | 6600 (454) |
| 1/2           | 3/8        | -CF-FR8-NS6           | 1.76 (44.7)          | 0.59 (15.0) | 0.40 (10.2) | 15/16 (23.8)  | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2        | -CF-FR8-NS8           | 1.99 (50.5)          | 0.78 (19.8) | 0.40 (10.2) | 1 1/16 (27.0) | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 3/4           | 3/4        | -CF-FR12-NS12         | 2.36 (59.9)          | 0.81 (20.6) | 0.62 (15.7) | 1 5/16 (33.3) | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1             | 1          | -CF-FR16-NS16         | 2.51 (63.8)          | 1.00 (25.4) | 0.87 (22.1) | 1 5/8 (41.3)  | 3000 (206)                   | 1900 (130) | 2400 (165) |



**FR Body to Tube Fitting**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |              | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|--------------|------------------------------|------------|------------|
|               |                   |                       | L <sup>①</sup>       | C           | E           | F            | 6L                           | CU         | NI         |
| 1/4           | 1/8               | -U-FR4-FL2            | 1.53 (38.9)          | 0.50 (12.7) | 0.09 (2.3)  | 5/8 (15.9)   | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/4           | 1/4               | -U-FR4-FL4            | 1.62 (41.1)          | 0.60 (15.2) | 0.18 (4.6)  | 5/8 (15.9)   | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 3/8               | -U-FR8-FL6            | 1.84 (46.7)          | 0.66 (16.8) | 0.28 (7.1)  | 15/16 (23.8) | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | -U-FR8-FL8            | 1.95 (49.5)          | 0.90 (22.9) | 0.40 (10.2) | 15/16 (23.8) | 4300 (296)                   | 2800 (192) | 3500 (241) |

① Dimension L is with FITOK nuts finger-tight.



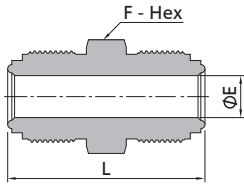
**FR Body to Bulkhead Tube Fitting Union**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |             |              |              | Panel Hole Size in. (mm) | Max. Panel Thickness in. (mm) | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|-------------|--------------|--------------|--------------------------|-------------------------------|------------------------------|------------|------------|
|               |                   |                       | L <sup>①</sup>       | C           | D           | E           | F            | Fx           |                          |                               | 6L                           | CU         | NI         |
| 1/4           | 1/4               | -UB-FR4-FL4           | 2.25 (57.2)          | 0.60 (15.2) | 1.32 (33.5) | 0.18 (4.6)  | 5/8 (15.9)   | 5/8 (15.9)   | 15/32 (11.9)             | 0.40 (10.2)                   | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/4           | 1/4               | -UB-FR4-FL4-1.88      | 1.88 (47.8)          | 0.60 (15.2) | 1.05 (26.7) | 0.18 (4.6)  | 5/8 (15.9)   | 5/8 (15.9)   | 15/32 (11.9)             | 0.13 (3.3)                    | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 3/8               | -UB-FR8-FL6           | 2.54 (64.5)          | 0.66 (16.8) | 1.45 (36.8) | 0.28 (7.1)  | 15/16 (23.8) | 3/4 (19.1)   | 19/32 (15.0)             | 0.44 (11.2)                   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2               | -UB-FR8-FL8           | 2.74 (69.6)          | 0.90 (22.9) | 1.65 (41.9) | 0.40 (10.2) | 15/16 (23.8) | 15/16 (23.8) | 25/32 (19.8)             | 0.50 (12.7)                   | 4300 (296)                   | 2800 (192) | 3500 (241) |

① Dimension L is with FITOK nuts finger-tight.

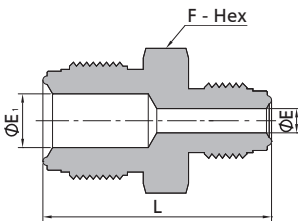


# F-25 Face Seal Fittings



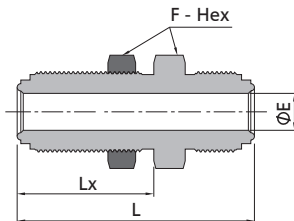
## Union Body

| FR Size (in.) | FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |               | Working Pressure, psig (bar) |            |            |
|---------------|---------------|-----------------------|----------------------|-------------|---------------|------------------------------|------------|------------|
|               |               |                       | L                    | E           | F             | 6L                           | CU         | NI         |
| 1/8           | 1/8           | -U-FR2                | 1.13 (28.7)          | 0.09 (2.3)  | 3/8 (9.5)     | 11200 (772)                  | 7200 (496) | 9000 (620) |
| 1/4           | 1/4           | -U-FR4                | 1.55 (39.4)          | 0.18 (4.6)  | 5/8 (15.9)    | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/2           | -U-FR8                | 1.84 (46.7)          | 0.40 (10.2) | 15/16 (23.8)  | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 3/4           | 3/4           | -U-FR12               | 2.44 (62.0)          | 0.62 (15.7) | 1 5/16 (33.3) | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1             | 1             | -U-FR16               | 2.59 (65.8)          | 0.87 (22.1) | 1 5/8 (41.3)  | 3000 (206)                   | 1900 (130) | 2400 (165) |



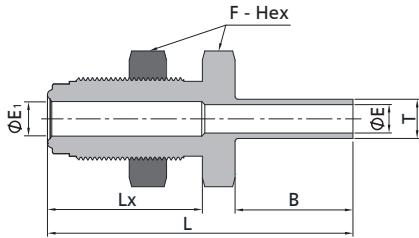
## Reducing Union

| FR Size (in.) | FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |                |             | Working Pressure, psig (bar) |            |            |
|---------------|---------------|-----------------------|----------------------|------------|----------------|-------------|------------------------------|------------|------------|
|               |               |                       | L                    | E          | E <sub>1</sub> | F           | 6L                           | CU         | NI         |
| 1/4           | 1/8           | -U-FR4-FR2            | 1.37 (34.8)          | 0.09 (2.3) | 0.18 (4.6)     | 5/8 (15.9)  | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/4           | -U-FR8-FR4            | 1.71 (43.4)          | 0.18 (4.6) | 0.40 (10.2)    | 5/16 (23.8) | 4300 (296)                   | 2800 (192) | 3500 (241) |



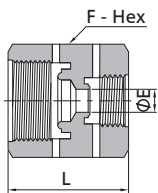
## Bulkhead Union Body

| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |               | Panel Hole Drill Size in. (mm) | Max. Panel Thickness in. (mm) | Working Pressure, psig (bar) |            |            |
|---------------|-----------------------|----------------------|-------------|-------------|---------------|--------------------------------|-------------------------------|------------------------------|------------|------------|
|               |                       | L                    | Lx          | E           | F             |                                |                               | 6L                           | CU         | NI         |
| 1/4           | -BU-FR4-1.82          | 1.82 (46.2)          | 0.99 (25.1) | 0.18 (4.6)  | 3/4 (19.1)    | 19/32 (15.0)                   | 0.13 (3.3)                    | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/4           | -BU-FR4               | 2.23 (56.6)          | 1.30 (33.3) | 0.18 (4.6)  | 3/4 (19.1)    | 19/32 (15.0)                   | 0.44 (11.2)                   | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | -BU-FR8-2.14          | 2.14 (54.4)          | 1.11 (28.2) | 0.40 (10.2) | 1 1/16 (27.0) | 29/32 (23.1)                   | 0.13 (3.3)                    | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | -BU-FR8               | 2.57 (65.3)          | 1.48 (37.6) | 0.40 (10.2) | 1 1/16 (27.0) | 29/32 (23.1)                   | 0.50 (12.7)                   | 4300 (296)                   | 2800 (192) | 3500 (241) |



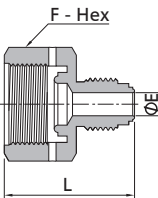
**FR Bulkhead Body to Tube Butt Weld**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |            |                |             | Panel Hole Drill Size in. (mm) | Max. Panel Thickness in. (mm) | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|------------|----------------|-------------|--------------------------------|-------------------------------|------------------------------|------------|------------|
|               |                   |                       | L                    | Lx          | B           | E          | E <sub>1</sub> | F           |                                |                               | 6L                           | CU         | NI         |
| 1/4           | 1/4               | -BW-FR4-TB4-1.95      | 1.95 (49.5)          | 0.99 (25.1) | 0.75 (19.1) | 0.18 (4.6) | 0.22 (5.6)     | 0.75 (19.1) | 19/32 (15.1)                   | 0.13 (3.3)                    | 5100 (351)                   | 5100 (351) | 5100 (351) |
| 1/4           | 1/4               | -BW-FR4-TB4           | 2.36 (59.9)          | 1.30 (33.0) | 0.75 (19.1) | 0.18 (4.6) | 0.22 (5.6)     | 0.75 (19.1) | 19/32 (15.1)                   | 0.44 (11.2)                   | 5100 (351)                   | 5100 (351) | 5100 (351) |



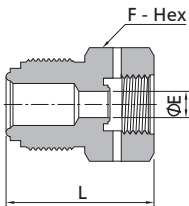
**Female Reducing Union**

| FR Size (in.) | FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |               | Working Pressure, psig (bar) |            |            |
|---------------|---------------|-----------------------|----------------------|------------|---------------|------------------------------|------------|------------|
|               |               |                       | L                    | E          | F             | 6L                           | CU         | NI         |
| 1/4           | 1/8           | -RU-FR4-FR2           | 1.16 (29.5)          | 0.13 (3.3) | 3/4 (19.1)    | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/4           | -RU-FR8-FR4           | 1.41 (35.8)          | 0.25 (6.4) | 1 1/16 (27.0) | 4300 (296)                   | 2800 (192) | 3500 (241) |



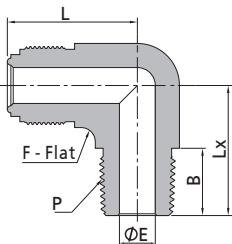
**Reducing Adapter**

| FR Size (in.) | FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |               | Working Pressure, psig (bar) |            |            |
|---------------|---------------|-----------------------|----------------------|------------|---------------|------------------------------|------------|------------|
|               |               |                       | L                    | E          | F             | 6L                           | CU         | NI         |
| 1/4           | 1/8           | -RA-FR4-FR2           | 1.19 (30.2)          | 0.09 (2.3) | 3/4 (19.1)    | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/4           | -RA-FR8-FR4           | 1.41 (35.8)          | 0.18 (4.6) | 1 1/16 (27.0) | 4300 (296)                   | 2800 (192) | 3500 (241) |



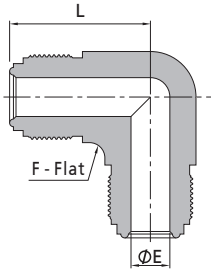
**Reducing Bushing**

| FR Size (in.) | FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |              | Working Pressure, psig (bar) |            |            |
|---------------|---------------|-----------------------|----------------------|------------|--------------|------------------------------|------------|------------|
|               |               |                       | L                    | E          | F            | 6L                           | CU         | NI         |
| 1/4           | 1/8           | -RB-FR4-FR2           | 1.06 (26.9)          | 0.13 (3.3) | 5/8 (15.9)   | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2           | 1/4           | -RB-FR8-FR4           | 1.41 (35.8)          | 0.25 (6.4) | 15/16 (23.8) | 4300 (296)                   | 2800 (192) | 3500 (241) |

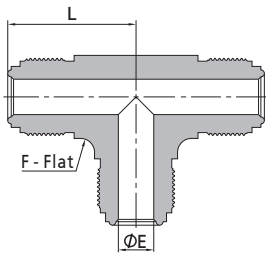


**FR Body to Male NPT Elbow**

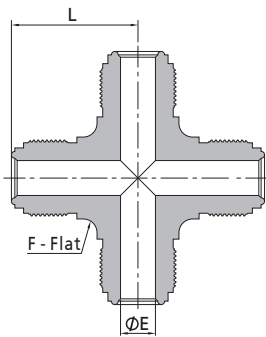
| FR Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |             |              | Working Pressure, psig (bar) |            |            |
|---------------|------------|-----------------------|----------------------|-------------|-------------|-------------|--------------|------------------------------|------------|------------|
|               |            |                       | L                    | Lx          | B           | E           | F            | 6L                           | CU         | NI         |
| 1/4           | 1/8        | -LM-FR4-NS2           | 1.07 (27.2)          | 0.87 (22.1) | 0.38 (9.6)  | 0.18 (4.6)  | 1/2 (12.7)   | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/4           | 1/4        | -LM-FR4-NS4           | 1.07 (27.2)          | 1.05 (26.7) | 0.56 (14.2) | 0.18 (4.6)  | 1/2 (12.7)   | 8000 (551)                   | 8000 (551) | 8000 (551) |
| 1/2           | 3/8        | -LM-FR8-NS6           | 1.45 (36.8)          | 1.26 (32.0) | 0.56 (14.2) | 0.40 (10.2) | 13/16 (20.6) | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2        | -LM-FR8-NS8           | 1.45 (36.8)          | 1.45 (36.8) | 0.75 (19.1) | 0.40 (10.2) | 13/16 (20.6) | 4300 (296)                   | 2800 (192) | 3500 (241) |



| FR Body Union Elbow |                       |                      |             |                |                              |            |            |
|---------------------|-----------------------|----------------------|-------------|----------------|------------------------------|------------|------------|
| FR Size (in.)       | Basic Ordering Number | Dimensions, in. (mm) |             |                | Working Pressure, psig (bar) |            |            |
|                     |                       | L                    | E           | F              | 6L                           | CU         | NI         |
| 1/8                 | -LU-FR2               | 0.89 (22.6)          | 0.09 (2.3)  | 7/16 (11.1)    | 11200 (772)                  | 7200 (496) | 9000 (620) |
| 1/4                 | -LU-FR4               | 1.07 (27.2)          | 0.18 (4.6)  | 1/2 (12.7)     | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2                 | -LU-FR8               | 1.45 (36.8)          | 0.40 (10.2) | 13/16 (20.6)   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 3/4                 | -LU-FR12              | 1.92 (48.8)          | 0.62 (15.7) | 1 1/4 (31.8)   | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1                   | -LU-FR16              | 2.00 (50.8)          | 0.87 (22.1) | 1 11/16 (42.9) | 3000 (206)                   | 1900 (130) | 2400 (165) |



| FR Body Union Tee |                       |                      |             |                |                              |            |            |
|-------------------|-----------------------|----------------------|-------------|----------------|------------------------------|------------|------------|
| FR Size (in.)     | Basic Ordering Number | Dimensions, in. (mm) |             |                | Working Pressure, psig (bar) |            |            |
|                   |                       | L                    | E           | F              | 6L                           | CU         | NI         |
| 1/8               | -TTT-FR2              | 0.89 (22.6)          | 0.09 (2.3)  | 7/16 (11.1)    | 11200 (772)                  | 7200 (496) | 9000 (620) |
| 1/4               | -TTT-FR4              | 1.07 (27.2)          | 0.18 (4.6)  | 1/2 (12.7)     | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2               | -TTT-FR8              | 1.45 (36.8)          | 0.40 (10.2) | 13/16 (20.6)   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 3/4               | -TTT-FR12             | 1.92 (48.8)          | 0.62 (15.7) | 1 1/4 (31.8)   | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1                 | -TTT-FR16             | 2.00 (50.8)          | 0.87 (22.1) | 1 11/16 (42.9) | 3000 (206)                   | 1900 (130) | 2400 (165) |



| FR Body Union Cross |                       |                      |             |                |                              |            |            |
|---------------------|-----------------------|----------------------|-------------|----------------|------------------------------|------------|------------|
| FR Size (in.)       | Basic Ordering Number | Dimensions, in. (mm) |             |                | Working Pressure, psig (bar) |            |            |
|                     |                       | L                    | E           | F              | 6L                           | CU         | NI         |
| 1/8                 | -C-FR2                | 0.89 (22.6)          | 0.09 (2.3)  | 7/16 (11.1)    | 11200 (772)                  | 7200 (496) | 9000 (620) |
| 1/4                 | -C-FR4                | 1.07 (27.2)          | 0.18 (4.6)  | 1/2 (12.7)     | 10000 (690)                  | 6400 (440) | 8000 (551) |
| 1/2                 | -C-FR8                | 1.45 (36.8)          | 0.40 (10.2) | 13/16 (20.6)   | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 3/4                 | -C-FR12               | 1.92 (48.8)          | 0.62 (15.7) | 1 1/4 (31.8)   | 3700 (254)                   | 2400 (165) | 3000 (206) |
| 1                   | -C-FR16               | 2.00 (50.8)          | 0.87 (22.1) | 1 11/16 (42.9) | 3000 (206)                   | 1900 (130) | 2400 (165) |

Fittings

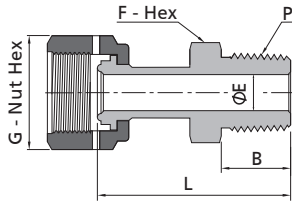
Valves

Pressure Gauges

Integrated Systems and Others

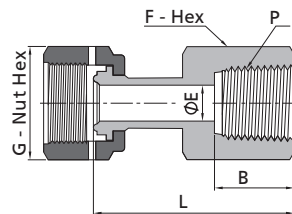
Process Specification

## Welded Glands



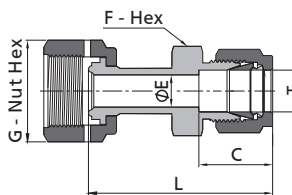
### FR Welded Gland to Male NPT

| FR Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |               |              | Working Pressure, psig (bar) |            |            |
|---------------|------------|-----------------------|----------------------|-------------|-------------|---------------|--------------|------------------------------|------------|------------|
|               |            |                       | L                    | B           | E           | G             | F            | 6L                           | CU         | NI         |
| 1/4           | 1/8        | -WG-FR4-NS2           | 1.58 (40.1)          | 0.38 (9.7)  | 0.18 (4.6)  | 3/4 (19.1)    | 7/16 (11.1)  | 8000 (551)                   | 6400 (446) | 8000 (551) |
| 1/4           | 1/4        | -WG-FR4-NS4           | 1.79 (45.5)          | 0.56 (14.2) | 0.18 (4.6)  | 3/4 (19.1)    | 9/16 (14.3)  | 8000 (551)                   | 6400 (446) | 8000 (551) |
| 1/2           | 3/8        | -WG-FR8-NS6           | 1.89 (48.0)          | 0.56 (14.2) | 0.40 (10.2) | 1 1/16 (27.0) | 11/16 (17.5) | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2        | -WG-FR8-NS8           | 2.09 (53.1)          | 0.75 (19.1) | 0.40 (10.2) | 1 1/16 (27.0) | 7/8 (22.2)   | 4300 (296)                   | 2800 (192) | 3500 (241) |



### FR Welded Gland to Female NPT

| FR Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |               |               | Working Pressure, psig (bar) |            |            |
|---------------|------------|-----------------------|----------------------|-------------|-------------|---------------|---------------|------------------------------|------------|------------|
|               |            |                       | L                    | B           | E           | G             | F             | 6L                           | CU         | NI         |
| 1/4           | 1/4        | -WG-FR4-FNS4          | 1.77 (45.0)          | 0.59 (15.0) | 0.18 (4.6)  | 3/4 (19.1)    | 3/4 (19.1)    | 6600 (454)                   | 5200 (458) | 6600 (454) |
| 1/2           | 3/8        | -WG-FR8-FNS6          | 1.95 (49.5)          | 0.59 (15.0) | 0.40 (10.2) | 1 1/16 (27.0) | 7/8 (22.2)    | 4300 (296)                   | 2800 (192) | 3500 (241) |
| 1/2           | 1/2        | -WG-FR8-FNS8          | 2.18 (55.4)          | 0.78 (19.8) | 0.40 (10.2) | 1 1/16 (27.0) | 1 1/16 (27.0) | 4300 (296)                   | 2800 (192) | 3500 (241) |



### FR Welded Gland to Tube Fitting

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |               |              | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|---------------|--------------|------------------------------|------------|------------|
|               |                   |                       | L <sup>①</sup>       | C           | E           | G             | F            | 6L                           | CU         | NI         |
| 1/4           | 1/4               | -WG-FR4-FL4           | 1.94 (49.3)          | 0.60 (15.2) | 0.18 (4.6)  | 3/4 (19.1)    | 1/2 (12.7)   | 8000 (551)                   | 6400 (440) | 8000 (551) |
| 1/4           | 3/8               | -WG-FR4-FL6           | 1.97 (50.0)          | 0.66 (16.8) | 0.18 (4.6)  | 3/4 (19.1)    | 5/8 (15.9)   | 6500 (447)                   | 5200 (358) | 6500 (447) |
| 1/2           | 1/2               | -WG-FR8-FL8           | 2.23 (56.6)          | 0.90 (22.9) | 0.40 (10.2) | 1 1/16 (27.0) | 13/16 (20.6) | 4300 (296)                   | 2800 (192) | 3500 (241) |

① Dimension L is with FITOK nuts finger-tight.

Fittings

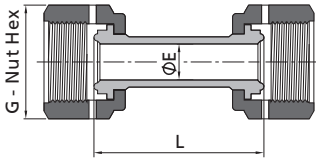
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

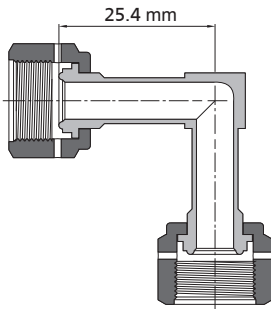
# F-29 Face Seal Fittings



| FR Welded Gland Union |                       |                      |             |               |                              |            |            |
|-----------------------|-----------------------|----------------------|-------------|---------------|------------------------------|------------|------------|
| FR Size (in.)         | Basic Ordering Number | Dimensions, in. (mm) |             |               | Working Pressure, psig (bar) |            |            |
|                       |                       | L                    | E           | G             | 6L                           | CU         | NI         |
| 1/4                   | -WG-FR4               | 1.71 (43.4)          | 0.18 (4.6)  | 3/4 (19.1)    | 8000 (551)                   | 6400 (440) | 8000 (551) |
| 1/2                   | -WG-FR8               | 1.84 (46.7)          | 0.40 (10.2) | 1 1/16 (27.0) | 4300 (296)                   | 2800 (192) | 3500 (241) |

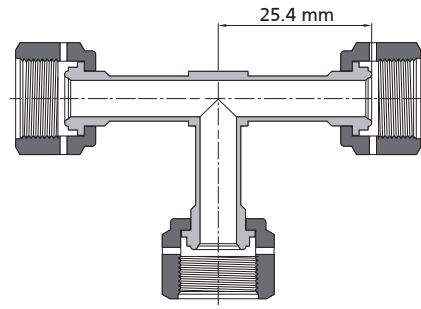
## Female Elbows

Basic ordering number: -LWG-FR4

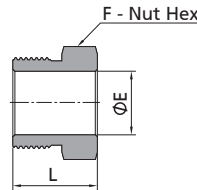
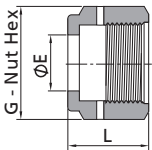


## Female Tees

Basic ordering number: -TWG-FR4

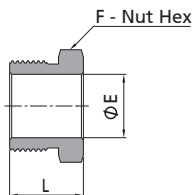


## Nuts



| Female Nut    |                       |                      |             |               |
|---------------|-----------------------|----------------------|-------------|---------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |               |
|               |                       | L                    | E           | G             |
| 1/8           | -N-FR2                | 0.53 (13.5)          | 0.21 (5.3)  | 7/16 (11.1)   |
| 1/4           | -N-FR4                | 0.81 (20.6)          | 0.36 (9.1)  | 3/4 (19.1)    |
| 1/2           | -N-FR8                | 0.88 (22.4)          | 0.61 (15.5) | 1 1/16 (27.0) |
| 5/8           | -N-FR10               | 0.88 (22.4)          | 0.74 (18.8) | 1 3/16 (30.2) |
| 3/4           | -N-FR12               | 1.12 (28.4)          | 0.89 (22.6) | 1 1/2 (38.1)  |
| 1             | -N-FR16               | 1.34 (34.0)          | 1.20 (30.5) | 1 3/4 (44.5)  |

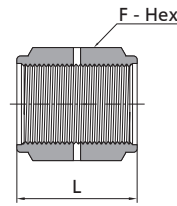
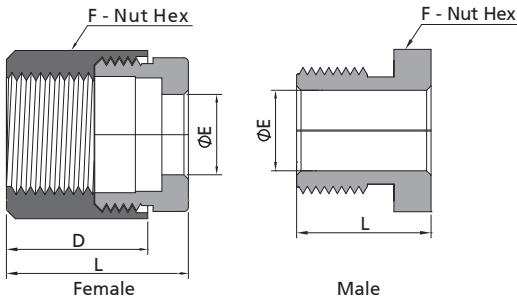
| Male Nut      |                       |                      |             |               |
|---------------|-----------------------|----------------------|-------------|---------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |               |
|               |                       | L                    | E           | F             |
| 1/8           | -MN-FR2               | 0.50 (12.7)          | 0.21 (5.3)  | 3/8 (9.5)     |
| 1/4           | -MN-FR4               | 0.71 (18.0)          | 0.36 (9.1)  | 5/8 (15.9)    |
| 1/2           | -MN-FR8               | 0.81 (20.6)          | 0.61 (15.5) | 15/16 (23.8)  |
| 5/8           | -MN-FR10              | 0.81 (20.6)          | 0.74 (18.8) | 1 1/16 (27.0) |
| 3/4           | -MN-FR12              | 1.00 (25.4)          | 0.89 (22.6) | 1 5/16 (33.3) |
| 1             | -MN-FR16              | 1.19 (30.2)          | 1.20 (30.5) | 1 5/8 (41.3)  |



| Short Male Nut |                       |                      |            |            |
|----------------|-----------------------|----------------------|------------|------------|
| FR Size (in.)  | Basic Ordering Number | Dimensions, in. (mm) |            |            |
|                |                       | L                    | E          | F          |
| 1/4            | -MN-FR4-0.54          | 0.54 (13.7)          | 0.36 (9.1) | 5/8 (15.9) |
| 1/4            | -MN-FR4-0.65          | 0.65 (16.5)          | 0.36 (9.1) | 5/8 (15.9) |

For use with Gland to Short Tube Butt Weld

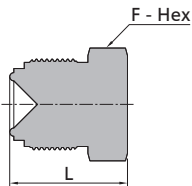
### Split-Nut Assemblies



| Split-Nut Assemblies |                |                       |                      |            |            |             |  |
|----------------------|----------------|-----------------------|----------------------|------------|------------|-------------|--|
| FR Size (in.)        | Split Nut Type | Basic Ordering Number | Dimensions, in. (mm) |            |            |             |  |
|                      |                |                       | L                    | E          | F          | D           |  |
| 1/4                  | Female         | -N-FR4-SN             | 0.81 (20.6)          | 0.36 (9.1) | 3/4 (19.1) | 0.63 (16.0) |  |
| 1/4                  | Male           | -MN-FR4-SN            | 0.60 (15.2)          | 0.36 (9.1) | 5/8 (15.9) | -           |  |

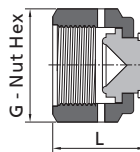
| Coupling      |                       |                      |               |
|---------------|-----------------------|----------------------|---------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |
|               |                       | L                    | F             |
| 1/8           | -BC-FR2               | 0.66 (16.8)          | 7/16 (11.1)   |
| 1/4           | -BC-FR4               | 1.19 (30.2)          | 3/4 (19.1)    |
| 1/2           | -BC-FR8               | 1.31 (33.3)          | 1 1/16 (27.0) |
| 3/4           | -BC-FR12              | 1.68 (42.7)          | 1 1/2 (38.1)  |
| 1             | -BC-FR16              | 2.04 (51.8)          | 1 3/4 (44.5)  |

### Plugs



| Plug          |                       |                      |               |
|---------------|-----------------------|----------------------|---------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |
|               |                       | L                    | F             |
| 1/8           | -PG-FR2               | 0.68 (17.3)          | 3/8 (9.5)     |
| 1/4           | -PG-FR4               | 0.92 (23.4)          | 5/8 (15.9)    |
| 1/2           | -PG-FR8               | 1.08 (27.4)          | 15/16 (23.8)  |
| 3/4           | -PG-FR12              | 1.43 (36.3)          | 1 5/16 (33.3) |
| 1             | -PG-FR16              | 1.52 (38.6)          | 1 5/8 (41.3)  |

### Caps



| Cap           |                       |                      |               |
|---------------|-----------------------|----------------------|---------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |
|               |                       | L                    | G             |
| 1/8           | -CP-FR2               | 0.63 (16.0)          | 7/16 (11.1)   |
| 1/4           | -CP-FR4               | 0.94 (23.9)          | 3/4 (19.1)    |
| 1/2           | -CP-FR8               | 1.01 (25.6)          | 1 1/16 (27.0) |
| 3/4           | -CP-FR12              | 1.29 (32.8)          | 1 1/2 (38.1)  |
| 1             | -CP-FR16              | 1.54 (39.1)          | 1 3/4 (44.5)  |

### Plugs with Lanyard

- ⦿ Lanyard material: 304 SS.
- ⦿ Lanyard length: 15.2 cm.



| Plug with Lanyard |                       |                      |              |
|-------------------|-----------------------|----------------------|--------------|
| FR Size (in.)     | Basic Ordering Number | Dimensions, in. (mm) |              |
|                   |                       | L                    | F            |
| 1/4               | -PG-FR4-BP            | 0.92 (23.4)          | 5/8 (15.9)   |
| 1/2               | -PG-FR8-BP            | 1.08 (27.4)          | 15/16 (23.8) |

### Caps with Lanyard

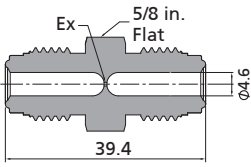
- ⦿ Lanyard material: 304 SS.
- ⦿ Lanyard length: 15.2 cm.



| Cap with Lanyard |                       |                      |               |
|------------------|-----------------------|----------------------|---------------|
| FR Size (in.)    | Basic Ordering Number | Dimensions, in. (mm) |               |
|                  |                       | L                    | G             |
| 1/4              | -CP-FR4-BP            | 0.94 (23.9)          | 3/4 (19.1)    |
| 1/2              | -CP-FR8-BP            | 1.01 (25.6)          | 1 1/16 (27.0) |

## Flow Restrictors

Working pressure up to: 10,000 psig (690 bar)



| FR Body to Male FR |                 |
|--------------------|-----------------|
| Ex, in. (mm)       | Ordering Number |
| 0.015 (0.381)      | 6LV-R-FR4-015   |
| 0.017 (0.432)      | 6LV-R-FR4-017   |
| 0.020 (0.508)      | 6LV-R-FR4-020   |
| 0.023 (0.584)      | 6LV-R-FR4-023   |
| 0.025 (0.635)      | 6LV-R-FR4-025   |
| 0.026 (0.660)      | 6LV-R-FR4-026   |
| 0.027 (0.686)      | 6LV-R-FR4-027   |
| 0.030 (0.762)      | 6LV-R-FR4-030   |
| 0.035 (0.889)      | 6LV-R-FR4-035   |
| 0.040 (1.016)      | 6LV-R-FR4-040   |
| 0.045 (1.143)      | 6LV-R-FR4-045   |
| 0.050 (1.270)      | 6LV-R-FR4-050   |
| 0.055 (1.397)      | 6LV-R-FR4-055   |
| 0.060 (1.529)      | 6LV-R-FR4-060   |
| 0.065 (1.651)      | 6LV-R-FR4-065   |
| 0.070 (1.778)      | 6LV-R-FR4-070   |
| 0.075 (1.905)      | 6LV-R-FR4-075   |
| 0.080 (2.032)      | 6LV-R-FR4-080   |
| 0.085 (2.159)      | 6LV-R-FR4-085   |
| 0.090 (2.286)      | 6LV-R-FR4-090   |
| 0.093 (2.362)      | 6LV-R-FR4-093   |
| 0.095 (2.413)      | 6LV-R-FR4-095   |
| 0.100 (2.540)      | 6LV-R-FR4-100   |

## Locking Device

- To help prevent unintentional disassembly of FR connections.
- Used for FITOK FR metal gasket face seal assemblies with standard male and female nuts.



| Locking Device |                 |
|----------------|-----------------|
| FR Size (in.)  | Ordering Number |
| 1/4            | S4-FR4-LD       |
| 1/2            | S4-FR8-LD       |

Fittings

Valves

Pressure Gauges

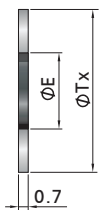
Integrated Systems and Others

Process Specification

## Gaskets

- Copper gaskets are unplated and with FC-02 Special Cleaning and Packaging.
- Unplated SS gaskets and nickel gaskets are electropolished and with FC-03 Ultra High Purity Process Specification.
- For silver-plated 316 SS or nickel gaskets, delete the suffix "-UP" from the ordering number, and the products are processed with FC-02 Special Cleaning and Packaging.
- For 316L SS, nickel EP gaskets, the maximum allowable leak rate is  $4 \times 10^{-11}$  std  $\text{cm}^3/\text{s}$ .
- For silver-plated 316L SS, silver-plated nickel and copper gaskets, the maximum allowable leak rate is  $4 \times 10^{-9}$  std  $\text{cm}^3/\text{s}$ .

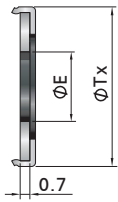
## Nonretained



| Unplated (UP) |                       |                      |             |
|---------------|-----------------------|----------------------|-------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |
|               |                       | Tx                   | E           |
| 1/8           | -GT-FR2-UP            | 0.26 (6.6)           | 0.09 (2.3)  |
| 1/4           | -GT-FR4-UP            | 0.47 (11.9)          | 0.22 (5.6)  |
| 1/2           | -GT-FR8-UP            | 0.78 (19.8)          | 0.44 (11.2) |
| 5/8           | -GT-FR10-UP           | 0.91 (23.1)          | 0.58 (14.7) |
| 3/4           | -GT-FR12-UP           | 1.14 (29.0)          | 0.66 (16.8) |
| 1             | -GT-FR16-UP           | 1.40 (35.6)          | 0.89 (22.6) |

Gaskets are used without retainers.

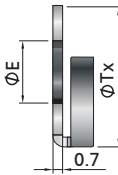
## Gasket Retainer Assemblies



| Unplated (UP) |                       |                |             |
|---------------|-----------------------|----------------|-------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, mm |             |
|               |                       | Tx             | E           |
| 1/4           | -GT-FR4-A-UP          | 0.50 (12.7)    | 0.24 (6.1)  |
| 1/2           | -GT-FR8-A-UP          | 0.79 (20.1)    | 0.44 (11.2) |
| 3/4           | -GT-FR12-A-UP         | 1.14 (29.0)    | 0.66 (16.8) |
| 1             | -GT-FR16-A-UP         | 1.40 (35.6)    | 0.89 (22.6) |

1. Gaskets are used with retainers.
2. Retainer material is 316L SS.
3. Retainers are available in different colors, please contact FITOK Group for more details.

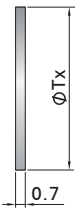
## Side-Load Retainer



| Unplated (UP) |                       |                      |             |
|---------------|-----------------------|----------------------|-------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |
|               |                       | Tx                   | E           |
| 1/4           | -GT-FR4-AS-UP         | 0.45 (11.4)          | 0.24 (6.1)  |
| 1/2           | -GT-FR8-AS-UP         | 0.75 (19.1)          | 0.43 (11.0) |

1. Gaskets are only available in 316L SS and nickel.
2. Silver-plated gaskets are not available.

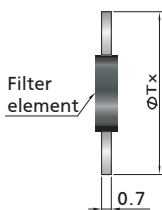
## Blind Gaskets



| Unplated (UP) |                       |                      |
|---------------|-----------------------|----------------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |
|               |                       | Tx                   |
| 1/8           | -GT-FR2-B-UP          | 0.26 (6.6)           |
| 1/4           | -GT-FR4-B-UP          | 0.47 (11.9)          |
| 1/2           | -GT-FR8-B-UP          | 0.78 (19.8)          |
| 5/8           | -GT-FR10-B-UP         | 0.91 (23.1)          |
| 3/4           | -GT-FR12-B-UP         | 1.14 (29.0)          |
| 1             | -GT-FR16-B-UP         | 1.40 (35.6)          |

Blind gasket retainer assemblies are available, please contact FITOK Group for more details.

## Snubber Gaskets

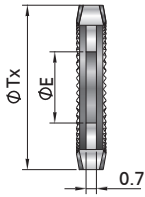


| Unplated (UP) |                       |                |
|---------------|-----------------------|----------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, mm |
|               |                       | Tx             |
| 1/4           | -GT-FR4-UP-**M        | 0.47 (11.9)    |
| 1/2           | -GT-FR8-UP-**M        | 0.78 (19.8)    |
| 3/4           | -GT-FR12-UP-**M       | 1.14 (29.0)    |
| 1             | -GT-FR16-UP-**M       | 1.40 (35.6)    |

1. Add the designator of filtration accuracy as a suffix to the basic ordering number to get the complete ordering number.  
Example: For 1/4" 316L SS snubber gaskets with filtration accuracy of 0.5  $\mu$ m, the ordering number is 6L-GT-FR4-UP-05M.
2. Snubber gaskets with filtration accuracy of 0.5 to 60  $\mu$ m for 1/4 through 1 in. FR fittings are available.



**Knurled**

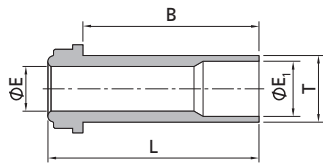


| Unplated (UP) |                       |                     |           |  |
|---------------|-----------------------|---------------------|-----------|--|
| FR Size (in.) | Basic Ordering Number | Dimensions, in.(mm) |           |  |
|               |                       | Tx                  | E         |  |
| 1/4           | -GT-FR4-KN-A-UP       | 0.5(12.7)           | 0.22(5.5) |  |

- Used to prevent nuts from loosening from vibration.
- General 316L SS or Nickle gaskets are tightened with 1/8 turn, while knurled gaskets are assembled by 3/8 turn.

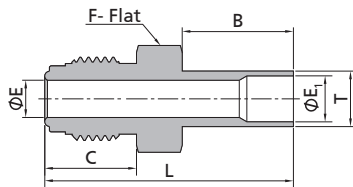
**High-Flow Connections - "H" Type FR**

"H" type FR connections with high flow capacity are compatible with regular FR connections. Gasket retainer assemblies are recommended to minimize flow resistance.



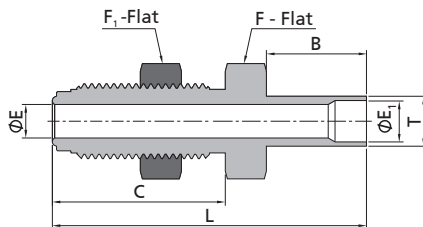
**HFR Gland to Tube Butt Weld**

| FR Size (in.) | T-Tube O.D. (in.) | Nominal Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            |                | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|------------------------------|-----------------------|----------------------|-------------|------------|----------------|------------------------------|------------|------------|
|               |                   |                              |                       | L                    | B           | E          | E <sub>1</sub> | 6L                           | CU         | NI         |
| 1/4           | 3/8               | 0.035                        | -G-HFR4-TB6-0.60      | 0.60 (15.2)          | 0.41 (10.4) | 0.25 (6.4) | 0.31 (7.9)     | 3300 (227)                   | 3300 (227) | 3300 (227) |
| 1/4           | 3/8               | 0.035                        | -G-HFR4-TB6-1.19      | 1.19 (30.2)          | 1.00 (25.4) | 0.25 (6.4) | 0.31 (7.9)     | 3300 (227)                   | 3300 (227) | 3300 (227) |
| 1/4           | 3/8               | 0.035                        | -G-HFR4-TB6-1.31      | 1.31 (33.3)          | 1.12 (28.4) | 0.25 (6.4) | 0.31 (7.9)     | 3300 (227)                   | 3300 (227) | 3300 (227) |



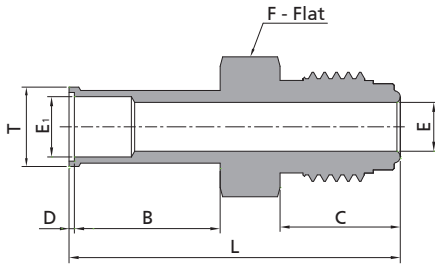
**HFR Body to Tube Butt Weld**

| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |            |                |            | Working Pressure, psig (bar) |            |            |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|------------|----------------|------------|------------------------------|------------|------------|
|               |                   |                       | L                    | B           | C           | E          | E <sub>1</sub> | F          | 6L                           | CU         | NI         |
| 1/4           | 3/8               | -CW-HFR4-TB6          | 1.68 (42.7)          | 0.75 (19.1) | 0.62 (15.7) | 0.25 (6.4) | 0.31 (7.9)     | 5/8 (15.9) | 3300 (227)                   | 3300 (227) | 3300 (227) |

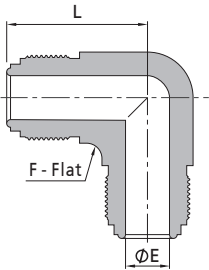


**HFR Bulkhead Body to Tube Butt Weld**

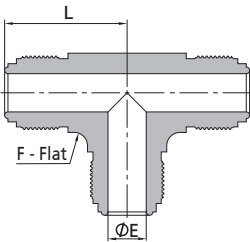
| FR Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |            |                |            |                |              | Panel Hole Dia | Max. Panel Thickness | Working Pressure, psig (bar) |            |  |
|---------------|-------------------|-----------------------|----------------------|-------------|-------------|------------|----------------|------------|----------------|--------------|----------------|----------------------|------------------------------|------------|--|
|               |                   |                       | L                    | B           | C           | E          | E <sub>1</sub> | F          | F <sub>1</sub> | 6L           |                |                      | CU                           | NI         |  |
| 1/4           | 3/8               | -BW-HFR4-TB6          | 2.36 (59.9)          | 0.75 (19.1) | 1.30 (33.0) | 0.31 (7.9) | 0.25 (6.4)     | 3/4 (19.1) | 3/4 (19.1)     | 19/32 (15.0) | 0.44 (11.2)    | 3300 (227)           | 3300 (227)                   | 3300 (227) |  |



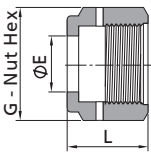
| HFR Body to Automatic Tube Weld |                 |                       |                      |             |             |            |            |                |            |             |            |            |                              |  |  |
|---------------------------------|-----------------|-----------------------|----------------------|-------------|-------------|------------|------------|----------------|------------|-------------|------------|------------|------------------------------|--|--|
| FR Size (in.)                   | Tube Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |            |            |                |            |             |            |            | Working Pressure, psig (bar) |  |  |
|                                 |                 |                       | L                    | B           | C           | D          | E          | E <sub>1</sub> | F          | T           | 6L         | CU         | NI                           |  |  |
| 1/4                             | 3/8             | -AW-HFR4-TB6          | 1.71 (43.4)          | 0.75 (19.1) | 0.62 (15.7) | 0.03 (0.8) | 0.25 (6.4) | 0.31 (7.9)     | 5/8 (15.9) | 0.41 (10.4) | 3300 (227) | 3300 (227) | 3300 (227)                   |  |  |



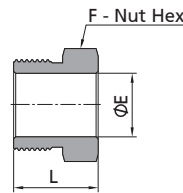
| HFR Body Union Elbow |                       |                      |            |            |                              |            |            |
|----------------------|-----------------------|----------------------|------------|------------|------------------------------|------------|------------|
| FR Size (in.)        | Basic Ordering Number | Dimensions, in. (mm) |            |            | Working Pressure, psig (bar) |            |            |
|                      |                       | L                    | E          | F          | 6L                           | CU         | NI         |
| 1/4                  | -LU-HFR4              | 1.07 (27.2)          | 0.25 (6.4) | 1/2 (12.7) | 10000 (690)                  | 6400 (440) | 8000 (551) |



| HFR Body Union Tee |                       |                      |            |            |                              |            |            |
|--------------------|-----------------------|----------------------|------------|------------|------------------------------|------------|------------|
| FR Size (in.)      | Basic Ordering Number | Dimensions, in. (mm) |            |            | Working Pressure, psig (bar) |            |            |
|                    |                       | L                    | E          | F          | 6L                           | CU         | NI         |
| 1/4                | -TTT-HFR4             | 1.07 (27.2)          | 0.25 (6.4) | 1/2 (12.7) | 10000 (690)                  | 6400 (440) | 8000 (551) |



| HFR Female Nut |                       |                      |             |            |
|----------------|-----------------------|----------------------|-------------|------------|
| FR Size (in.)  | Basic Ordering Number | Dimensions, in. (mm) |             |            |
|                |                       | L                    | E           | G          |
| 1/4            | -N-HFR4-9.9           | 0.81 (20.6)          | 0.39 (9.9)  | 3/4 (19.1) |
| 1/4            | -N-HFR4-11.7          | 0.81 (20.6)          | 0.46 (11.7) | 3/4 (19.1) |



| HFR Male Nut  |                       |                      |            |            |
|---------------|-----------------------|----------------------|------------|------------|
| FR Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |            |
|               |                       | L                    | E          | F          |
| 1/4           | -MN-HFR4              | 0.71 (18.0)          | 0.39 (9.9) | 5/8 (15.9) |

# Face Seal Fittings

## TFO Series L-Ring Face Seal Fittings

### Features

- ⦿ Reduced internal entrapment
- ⦿ Lubricant-free L-ring seal
- ⦿ Controlled L-ring extrusion to prevent over-tightening
- ⦿ Butt weld connection to ensure the system unhindered
- ⦿ Mechanically polished surface roughness finished to an average of Ra 20  $\mu\text{in.}$  (0.51  $\mu\text{m}$ )
- ⦿ Sizes range from 1/4" to 1"
- ⦿ Each fitting marked with size, material and heat number



### Technical Data

- ⦿ Materials

| Material | Bar Stock | Designator |
|----------|-----------|------------|
| 316 SS   | ASTM A479 | SS         |
| 316L SS  |           | 6L         |

- ⦿ Working Pressure @ 100°F (37°C)

| Tube O.D. | Working Pressure<br>psig (bar) |
|-----------|--------------------------------|
| 1/4 in.   | 2500 (172)                     |
| 1/2 in.   | 2000 (137)                     |
| 3/4 in.   | 1500 (103)                     |
| 1 in.     |                                |
| 12 mm     | 2000 (137)                     |

- ⦿ Weld End Tube O.D. and Wall Thickness

| Fractional       |                       | Metric          |                      |
|------------------|-----------------------|-----------------|----------------------|
| Tube O.D.<br>in. | Wall Thickness<br>in. | Tube O.D.<br>mm | Wall Thickness<br>mm |
| 1/8              | 0.028                 | 6               | 1.0                  |
| 1/4              | 0.035                 | 8               | 1.0                  |
| 3/8              | 0.035                 | 10              | 1.0                  |
| 1/2              | 0.049                 | 12              | 1.0                  |
| 3/4              | 0.065                 | 18              | 1.5                  |
| 1                | 0.065                 |                 |                      |
| 1 1/2            | 0.065                 |                 |                      |
| 2                | 0.065                 |                 |                      |

For other sizes or wall thicknesses of welded ports, please contact FITOK Group or our authorized distributors.

⦿ Working Temperature

Temperature ranges for TFO fittings are restricted by the L-ring materials.

| Material | Designator | Working Temperature               |
|----------|------------|-----------------------------------|
| PTFE     | T          | - 50°F to 450°F (- 45°C to 232°C) |

## Testing

Every TFO fitting is helium leak tested to a maximum allowable leak rate of  $4 \times 10^{-9}$  std cm<sup>3</sup>/s.

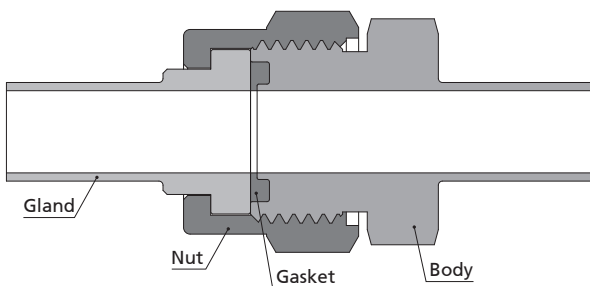
## Ordering Information

- ⦿ Each component can be ordered separately.
- ⦿ Add the material designator as a prefix, cleaning and packaging designator as a suffix to the basic ordering number to get the complete ordering number.
- ⦿ Cleaning and Packaging
  - a. FC-01 Standard Cleaning and Packaging for general industrial procedures. No suffix is needed.
  - b. FC-02 Special Cleaning and Packaging, to ensure compliance with product cleanliness requirement as stated in ASTM G93 Level C. Add "-F2" as a suffix when needed.

Example: For 316L SS standard 1/4" gland with FC-02 Special Cleaning and Packaging, the ordering number is 6L-G-TFO4-TB4-F2.

## Installation Instructions

1. Assemble the gland, nut and gasket as below. Finger tight the nut.

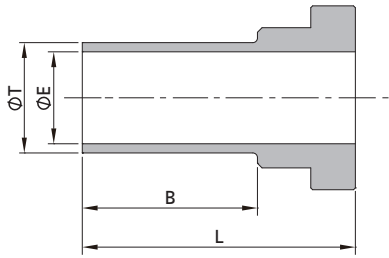


2. Tighten the nut 1/8 turn with a wrench while holding the fitting body steady.

## Cautions

- ⦿ Dimensions are for reference only and are subject to change.
- ⦿ Inspect the L-ring each time the groove housing is dismantled.
- ⦿ Before welding the body, the L-ring should be removed to prevent possible damages.
- ⦿ Tungsten Inert Gas Welding (TIG) is recommended.
- ⦿ Do not loosen or tighten fittings when system is pressurized.

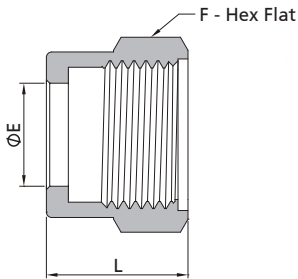
## Glands



| Fractional        |                      |                       | Dimensions, in. (mm) |             |             |
|-------------------|----------------------|-----------------------|----------------------|-------------|-------------|
| T-Tube O.D. (in.) | Wall Thickness (in.) | Basic Ordering Number | L                    | B           | E           |
| 1/4               | 0.035                | -G-TFO4-TB4           | 0.67 (17.0)          | 0.25 (6.4)  | 0.18 (4.6)  |
| 1/4               | 0.035                | -G-TFO4-TB4-12        | 1.17 (29.7)          | 0.75 (19.1) | 0.18 (4.6)  |
| 1/2               | 0.049                | -G-TFO8-TB8           | 1.17 (29.7)          | 0.75 (19.1) | 0.40 (10.2) |
| 1/2               | 0.065                | -G-TFO8-TB8x065       | 1.17 (29.7)          | 0.75 (19.1) | 0.37 (9.4)  |
| 3/4               | 0.065                | -G-TFO12-TB12         | 1.24 (31.5)          | 0.75 (19.1) | 0.62 (15.7) |
| 1                 | 0.065                | -G-TFO16-TB16         | 1.45 (36.8)          | 0.96 (24.4) | 0.87 (22.1) |

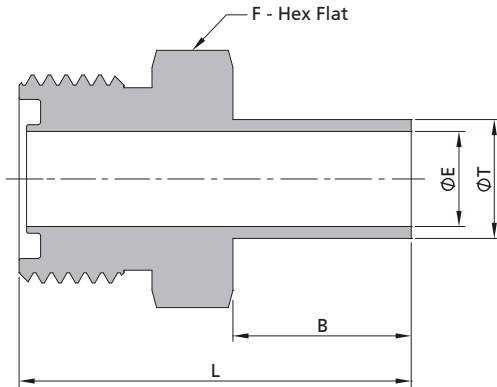
| Metric           |                     |                       | Dimensions, in. (mm) |             |             |
|------------------|---------------------|-----------------------|----------------------|-------------|-------------|
| T-Tube O.D. (mm) | Wall Thickness (mm) | Basic Ordering Number | L                    | B           | E           |
| 12               | 1                   | -G-TFO8-MTB12         | 1.17 (29.7)          | 0.75 (19.1) | 0.39 (10.0) |

## Nuts



| Basic Ordering Number | Dimensions, in. (mm) |             |              |
|-----------------------|----------------------|-------------|--------------|
|                       | L                    | E           | F            |
| -N-TFO4               | 0.75 (19.1)          | 0.39 (9.9)  | 11/16 (17.5) |
| -N-TFO8               | 0.84 (21.3)          | 0.61 (15.5) | 1 (25.4)     |
| -N-TFO12              | 0.90 (22.9)          | 0.94 (23.9) | 1 1/2 (38.1) |
| -N-TFO16              | 0.90 (22.9)          | 1.25 (31.8) | 1 3/4 (44.5) |

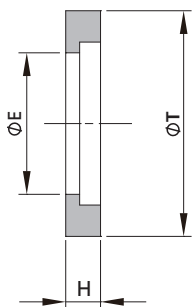
## Tube Butt Weld Bodies



| Fractional       |                      |                       |                      |             |             |               |
|------------------|----------------------|-----------------------|----------------------|-------------|-------------|---------------|
| T-Tube OD. (in.) | Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |               |
|                  |                      |                       | L                    | B           | E           | F             |
| 1/4              | 0.035                | -CW-TFO4-TB4          | 1.03 (26.2)          | 0.25 (6.4)  | 0.18 (4.6)  | 5/8 (15.9)    |
| 1/4              | 0.035                | -CW-TFO4-TB4-12       | 1.53 (38.9)          | 0.75 (19.1) | 0.18 (4.6)  | 5/8 (15.9)    |
| 1/2              | 0.049                | -CW-TFO8-TB8          | 1.65 (41.9)          | 0.75 (19.1) | 0.40 (10.2) | 15/16 (23.8)  |
| 1/2              | 0.065                | -CW-TFO8-TB8x065      | 1.65 (41.9)          | 0.75 (19.1) | 0.37 (9.4)  | 15/16 (23.8)  |
| 3/4              | 0.065                | -CW-TFO12-TB12        | 1.75 (44.4)          | 0.75 (19.1) | 0.62 (15.7) | 1 5/16 (33.3) |
| 1                | 0.065                | -CW-TFO16-TB16        | 1.99 (50.5)          | 0.96 (24.4) | 0.87 (22.1) | 1 5/8 (41.3)  |

| Metric          |                     |                       |                      |             |             |              |
|-----------------|---------------------|-----------------------|----------------------|-------------|-------------|--------------|
| T-Tube OD. (mm) | Wall Thickness (mm) | Basic Ordering Number | Dimensions, in. (mm) |             |             |              |
|                 |                     |                       | L                    | B           | E           | F            |
| 12              | 1                   | -CW-TFO8-MTB12        | 1.65 (41.9)          | 0.75 (19.1) | 0.39 (10.0) | 15/16 (23.8) |

## L-Ring Seal



| Fractional            |                      |             |            |
|-----------------------|----------------------|-------------|------------|
| Basic Ordering Number | Dimensions, in. (mm) |             |            |
|                       | T                    | E           | H          |
| -GT-TFO4              | 0.38 (9.6)           | 0.18 (4.6)  | 0.07 (1.8) |
| -GT-TFO8              | 0.64 (16.2)          | 0.40 (10.2) | 0.10 (2.5) |
| -GT-TFO12             | 0.92 (23.4)          | 0.62 (15.7) | 0.10 (2.5) |
| -GT-TFO16             | 1.30 (33.0)          | 0.87 (22.1) | 0.14 (3.6) |

Add the designator of L-ring material in page F-38 as a prefix to the basic ordering number to get the complete ordering number.

Example: T-GT-TFO4

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Face Seal Fittings

## FO Series O-Ring Face Seal Fittings

### Features

- ⊙ O-ring seal to provide perfect leak-tight service for working conditions from critical vacuum to high pressure
- ⊙ O-ring contained completely for maximum efficiency
- ⊙ Mechanically polished surface roughness finished to an average of Ra 20  $\mu\text{in.}$  (0.51  $\mu\text{m}$ )
- ⊙ Test ports at nut for easy leak testing
- ⊙ Easy installation and maintenance
- ⊙ Silver-plated female threads
- ⊙ Sizes range from 1/8" to 1"
- ⊙ Every gland and body marked with size, material and heat number



### Technical Data

- ⊙ Thread Specifications

| Thread Type   | Specification             |
|---------------|---------------------------|
| NPT           | ASME B1.20.1, SAE AS71051 |
| Unified (SAE) | ASME B1.1, SAE J475       |

- ⊙ Materials

| Material | Bar Stock | Forging   | Designator |
|----------|-----------|-----------|------------|
| 316 SS   | ASTM A479 | ASTM A182 | SS         |
| 316L SS  |           |           | 6L         |

- ⊙ Weld End Tube O.D. and Wall Thickness

| Fractional    |                    | Metric       |                   |
|---------------|--------------------|--------------|-------------------|
| Tube O.D. in. | Wall Thickness in. | Tube O.D. mm | Wall Thickness mm |
| 1/8           | 0.028              | 6            | 1.0               |
| 1/4           | 0.035              | 8            | 1.0               |
| 3/8           | 0.035              | 10           | 1.0               |
| 1/2           | 0.049              | 12           | 1.0               |
| 3/4           | 0.049              | 18           | 1.5               |
| 1             | 0.065              |              |                   |
| 1 1/2         | 0.065              |              |                   |
| 2             | 0.065              |              |                   |

For other sizes or wall thicknesses of welded ports, please contact FITOK Group or our authorized distributors.

⦿ Working Pressure

Working pressures shown in the Catalog are calculated according to ASME B31.3 and B31.1 at ambient temperature.

⦿ Working Temperature

Temperature ranges for FO fittings are restricted by the O-ring materials.

| Material                        | Designator | Working Temperature             |
|---------------------------------|------------|---------------------------------|
| Fluorocarbon FKM (70 durometer) | VI7        | -10°F to 400°F (-23°C to 204°C) |
| Fluorocarbon FKM (90 durometer) | VI9        | -10°F to 400°F (-23°C to 204°C) |
| PTFE                            | T          | -50°F to 450°F (-45°C to 232°C) |
| Buna N (70 durometer)           | BN7        | -10°F to 250°F (-23°C to 121°C) |
| Perfluoroelastomer              | Z          | -10°F to 550°F (-23°C to 287°C) |
| Ethylene Propylene              | E          | -50°F to 300°F (-45°C to 148°C) |

Fluorocarbon FKM of 90 durometer is used for SAE/MS threads end.

## Testing

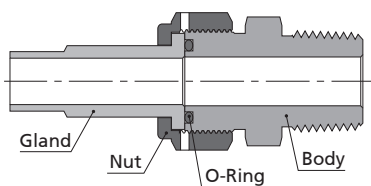
Every FO fitting is helium leak tested to a maximum allowable leak rate of  $4 \times 10^{-9}$  std cm<sup>3</sup>/s.

## Ordering Information

- ⦿ Each component can be ordered separately.
  - ⦿ The FO body is supplied with O-rings of fluorocarbon FKM (70 durometer). For O-rings of other materials, add O-ring material designator between basic ordering number and cleaning grade designator, for example: 6L-CM-FO8-RS6-E-F2
  - ⦿ Add the material designator as a prefix, cleaning and packaging designator as a suffix to the basic ordering number to get the complete ordering number.
  - ⦿ Cleaning and Packaging
    - a. FC-01 Standard Cleaning and Packaging for general industrial procedures. No suffix is needed.
    - b. FC-02 Special Cleaning and Packaging, to ensure compliance with product cleanliness requirement as stated in ASTM G93 Level C. Add "-F2" as a suffix when needed.
- Example: For 316L SS standard 1/4" gland with FC-02 Special Cleaning and Packaging, the ordering number is 6L-G-FO4-TB4-F2.

## Installation Instructions

1. Assemble the gland, nut, O-ring and body as below. Finger tight the nut.



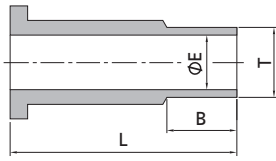
2. Tighten the nut 1/8 - 1/4 turn with a wrench while holding the fitting body steady, until there is a sharp rise in torque.

## Cautions

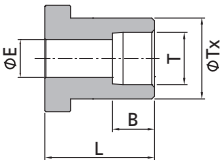
- ⦿ Dimensions are for reference only and are subject to change.
- ⦿ Check the O-ring every time the fitting is disassembled and replace the O-ring if there is any damage.
- ⦿ Before welding the body, the O-ring should be removed to prevent possible damages.
- ⦿ Tungsten Inert Gas Welding (TIG) is recommended.
- ⦿ Do not loosen or tighten fittings when system is pressurized.



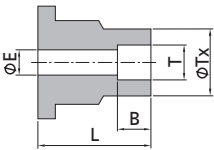
## Glands



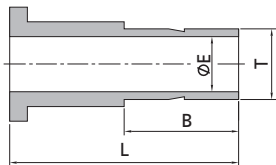
| FO Gland to Tube Butt Weld |                   |                       |                      |             |            |                             |  |
|----------------------------|-------------------|-----------------------|----------------------|-------------|------------|-----------------------------|--|
| FO Size (in.)              | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            | Working Pressure psig (bar) |  |
|                            |                   |                       | L                    | B           | E          |                             |  |
| 1/4                        | 1/8               | -G-FO4-TB2            | 0.77 (19.6)          | 0.28 (7.1)  | 0.07 (1.8) | 11200 (771)                 |  |
| 1/4                        | 1/4               | -G-FO4-TB4            | 1.12 (28.4)          | 0.41 (10.4) | 0.12 (3.0) | 11200 (771)                 |  |
| 1/2                        | 1/4               | -G-FO8-TB4            | 0.91 (23.1)          | 0.41 (10.4) | 0.12 (3.0) | 11200 (771)                 |  |
| 1/2                        | 3/8               | -G-FO8-TB6            | 0.84 (21.3)          | 0.41 (10.4) | 0.23 (5.8) | 8200 (564)                  |  |
| 1/2                        | 1/2               | -G-FO8-TB8            | 1.06 (26.9)          | 0.50 (12.7) | 0.33 (8.4) | 7500 (516)                  |  |



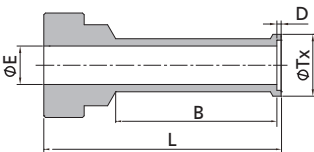
| FO Gland to Tube Socket Weld |                   |                       |                      |             |             |             |                             |
|------------------------------|-------------------|-----------------------|----------------------|-------------|-------------|-------------|-----------------------------|
| FO Size (in.)                | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |             | Working Pressure psig (bar) |
|                              |                   |                       | L                    | B           | E           | Tx          |                             |
| 1/8                          | 1/8               | -G-FO2-TS2            | 0.77 (19.6)          | 0.10 (2.5)  | 0.09 (2.3)  | 0.38 (9.7)  | 15400 (1061)                |
| 1/4                          | 1/4               | -G-FO4-TS4            | 0.77 (19.6)          | 0.28 (7.1)  | 0.18 (4.6)  | 0.38 (9.7)  | 6800 (468)                  |
| 3/8                          | 3/8               | -G-FO6-TS6            | 0.81 (20.6)          | 0.31 (7.9)  | 0.28 (7.1)  | 0.60 (15.2) | 8100 (558)                  |
| 1/2                          | 1/2               | -G-FO8-TS8            | 0.81 (20.6)          | 0.38 (9.7)  | 0.40 (10.2) | 0.60 (15.2) | 3000 (206)                  |
| 3/4                          | 3/4               | -G-FO12-TS12          | 0.94 (23.9)          | 0.44 (11.2) | 0.62 (15.7) | 0.92 (23.4) | 3700 (255)                  |
| 1                            | 1                 | -G-FO16-TS16          | 0.98 (24.9)          | 0.62 (15.7) | 0.87 (22.1) | 1.19 (30.2) | 3000 (206)                  |



| FO Gland to Tube Socket Weld Reducing |                   |                       |                      |            |            |             |                             |
|---------------------------------------|-------------------|-----------------------|----------------------|------------|------------|-------------|-----------------------------|
| FO Size (in.)                         | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |            |            |             | Working Pressure psig (bar) |
|                                       |                   |                       | L                    | B          | E          | Tx          |                             |
| 1/4                                   | 1/8               | -G-FO4-TS2            | 0.77 (19.6)          | 0.10 (2.5) | 0.09 (2.3) | 0.29 (7.4)  | 12600 (868)                 |
| 1/2                                   | 1/4               | -G-FO8-TS4            | 0.81 (20.6)          | 0.28 (7.1) | 0.18 (4.6) | 0.48 (12.2) | 10700 (737)                 |

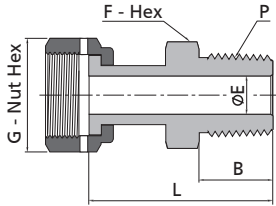


| FO Gland to Tube Port |                   |                       |                      |             |             |                             |  |
|-----------------------|-------------------|-----------------------|----------------------|-------------|-------------|-----------------------------|--|
| FO Size (in.)         | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             | Working Pressure psig (bar) |  |
|                       |                   |                       | L                    | B           | E           |                             |  |
| 1/4                   | 1/4               | -G-FO4-FT4            | 1.31 (33.3)          | 0.64 (16.3) | 0.18 (4.6)  | 10200 (702)                 |  |
| 1/2                   | 3/8               | -G-FO8-FT6            | 1.38 (35.1)          | 0.70 (17.8) | 0.27 (6.8)  | 6500 (447)                  |  |
| 1/2                   | 1/2               | -G-FO8-FT8            | 1.62 (41.1)          | 0.96 (24.4) | 0.37 (9.3)  | 6700 (461)                  |  |
| 3/4                   | 3/4               | -G-FO12-FT12          | 1.80 (45.7)          | 1.02 (25.9) | 0.58 (14.7) | 5800 (399)                  |  |
| 1                     | 1                 | -G-FO16-FT16          | 2.05 (52.1)          | 1.30 (33.0) | 0.80 (20.3) | 4700 (323)                  |  |

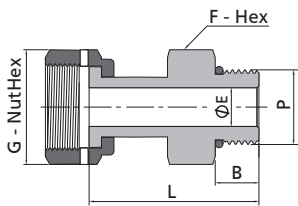


| FO Gland to Automatic Tube Weld |                 |                      |                       |                      |             |            |             |             |                             |
|---------------------------------|-----------------|----------------------|-----------------------|----------------------|-------------|------------|-------------|-------------|-----------------------------|
| FO Size (in.)                   | Tube O.D. (in.) | Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            |             |             | Working Pressure psig (bar) |
|                                 |                 |                      |                       | L                    | B           | D          | E           | Tx          |                             |
| 1/4                             | 1/4             | 0.035                | -G-FO4-TB4A           | 1.12 (28.4)          | 0.78 (19.8) | 0.02 (0.5) | 0.18 (4.6)  | 0.29 (7.4)  | 5100 (351)                  |
| 1/2                             | 3/8             | 0.035                | -G-FO8-TB6A           | 1.13 (28.7)          | 0.79 (20.0) | 0.03 (0.8) | 0.31 (7.9)  | 0.41 (10.4) | 3300 (227)                  |
| 1/2                             | 1/2             | 0.049                | -G-FO8-TB8A           | 1.14 (29.0)          | 0.80 (20.3) | 0.04 (1.0) | 0.40 (10.2) | 0.55 (14.0) | 3500 (241)                  |
| 3/4                             | 3/4             | 0.049                | -G-FO12-TB12A         | 1.20 (30.5)          | 0.80 (20.3) | 0.04 (1.0) | 0.65 (16.5) | 0.80 (20.3) | 2200 (151)                  |
| 1                               | 1               | 0.065                | -G-FO16-TB16A         | 1.41 (35.8)          | 1.00 (25.4) | 0.04 (1.0) | 0.87 (22.1) | 1.06 (26.9) | 2200 (151)                  |

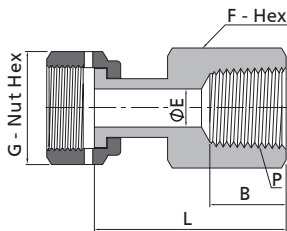
## Welded Glands



| FO Welded Gland to Male NPT |            |                       |                      |             |             |              |               |                             |
|-----------------------------|------------|-----------------------|----------------------|-------------|-------------|--------------|---------------|-----------------------------|
| FO Size (in.)               | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |              |               | Working Pressure psig (bar) |
|                             |            |                       | L                    | B           | E           | G            | F             |                             |
| 1/4                         | 1/4        | -WG-FO4-NS4           | 1.59 (40.4)          | 0.56 (14.2) | 0.18 (4.6)  | 11/16 (17.5) | 5/8 (15.9)    | 9800 (675)                  |
| 1/2                         | 3/8        | -WG-FO8-NS6           | 1.67 (42.4)          | 0.56 (14.2) | 0.40 (10.2) | 1 (25.4)     | 15/16 (23.8)  | 5600 (385)                  |
| 1/2                         | 1/2        | -WG-FO8-NS8           | 1.87 (47.5)          | 0.75 (19.1) | 0.40 (10.2) | 1 (25.4)     | 15/16 (23.8)  | 5600 (385)                  |
| 3/4                         | 3/4        | -WG-FO12-NS12         | 2.03 (51.6)          | 0.75 (19.1) | 0.62 (15.7) | 1 1/2 (38.1) | 1 1/16 (27.0) | 3900 (268)                  |
| 1                           | 1          | -WG-FO16-NS16         | 2.36 (59.9)          | 0.94 (23.9) | 0.87 (22.1) | 1 3/4 (44.5) | 1 5/8 (41.3)  | 2900 (199)                  |

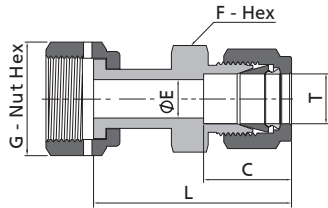


| FO Welded Gland to SAE/MS Thread |                      |                       |                      |             |             |              |              |                             |
|----------------------------------|----------------------|-----------------------|----------------------|-------------|-------------|--------------|--------------|-----------------------------|
| FO Size (in.)                    | P-SAE/MS Thread Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |              |              | Working Pressure psig (bar) |
|                                  |                      |                       | L                    | B           | E           | G            | F            |                             |
| 1/4                              | 7/16-20              | -WG-FO4-ST7           | 1.54 (39.1)          | 0.36 (9.1)  | 0.18 (4.6)  | 11/16 (17.5) | 9/16 (14.3)  | 4500 (310)                  |
| 1/2                              | 9/16-18              | -WG-FO8-ST9           | 1.64 (41.7)          | 0.39 (9.9)  | 0.40 (10.2) | 1 (25.4)     | 11/16 (17.5) | 4500 (310)                  |
| 1/2                              | 3/4-16               | -WG-FO8-ST12          | 1.71 (43.4)          | 0.45 (11.2) | 0.40 (10.2) | 1 (25.4)     | 7/8 (22.2)   | 4500 (310)                  |
| 3/4                              | 1 1/16-12            | -WG-FO12-ST17         | 2.07 (52.6)          | 0.59 (15.0) | 0.62 (15.7) | 1 1/2 (38.1) | 1 1/4 (31.8) | 3600 (248)                  |
| 1                                | 1 5/16-12            | -WG-FO16-ST21         | 2.17 (55.1)          | 0.59 (15.0) | 0.87 (22.1) | 1 3/4 (44.5) | 1 1/2 (38.1) | 2900 (199)                  |

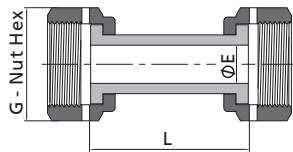


| FO Welded Gland to Female NPT |            |                       |                      |             |             |              |               |                             |
|-------------------------------|------------|-----------------------|----------------------|-------------|-------------|--------------|---------------|-----------------------------|
| FO Size (in.)                 | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |             |             |              |               | Working Pressure psig (bar) |
|                               |            |                       | L                    | B           | E           | G            | F             |                             |
| 1/4                           | 1/4        | -WG-FO4-FNS4          | 1.57 (39.9)          | 0.59 (15.0) | 0.18 (4.6)  | 11/16 (17.5) | 3/4 (19.1)    | 6600 (454)                  |
| 1/2                           | 3/8        | -WG-FO8-FNS6          | 1.73 (43.9)          | 0.59 (15.0) | 0.40 (10.2) | 1 (25.4)     | 7/8 (22.2)    | 5300 (365)                  |
| 1/2                           | 1/2        | -WG-FO8-FNS8          | 1.96 (49.8)          | 0.78 (19.8) | 0.40 (10.2) | 1 (25.4)     | 1 1/16 (27.0) | 4900 (337)                  |
| 3/4                           | 3/4        | -WG-FO12-FNS12        | 2.12 (53.8)          | 0.81 (20.6) | 0.62 (15.7) | 1 1/2 (38.1) | 1 5/16 (33.3) | 4000 (275)                  |
| 1                             | 1          | -WG-FO16-FNS16        | 2.29 (58.2)          | 1.00 (25.4) | 0.87 (22.1) | 1 3/4 (44.5) | 1 5/8 (41.3)  | 3000 (206)                  |

# F-43 Face Seal Fittings

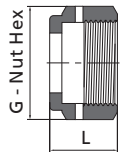


| FO Welded Gland to Tube Fitting |                   |                       |                      |             |             |              |               |                             |
|---------------------------------|-------------------|-----------------------|----------------------|-------------|-------------|--------------|---------------|-----------------------------|
| FO Size (in.)                   | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |             |              |               | Working Pressure psig (bar) |
|                                 |                   |                       | L                    | C           | E           | G            | F             |                             |
| 1/4                             | 1/4               | -WG-FO4-FL4           | 1.74 (44.2)          | 0.60 (15.2) | 0.18 (4.6)  | 11/16 (17.5) | 1/2 (12.7)    | 10200 (702)                 |
| 1/2                             | 3/8               | -WG-FO8-FL6           | 1.87 (47.5)          | 0.66 (16.8) | 0.28 (7.1)  | 1 (25.4)     | 5/8 (15.9)    | 5800 (399)                  |
| 1/2                             | 1/2               | -WG-FO8-FL8           | 2.01 (51.1)          | 0.90 (22.9) | 0.40 (10.2) | 1 (25.4)     | 13/16 (20.6)  | 5800 (399)                  |
| 3/4                             | 3/4               | -WG-FO12-FL12         | 2.14 (54.4)          | 0.96 (24.4) | 0.62 (15.7) | 1 1/2 (38.1) | 1 1/16 (27.0) | 4000 (275)                  |
| 1                               | 1                 | -WG-FO16-FL16         | 2.45 (62.2)          | 1.23 (31.2) | 0.87 (22.1) | 1 3/4 (44.5) | 1 3/8 (34.9)  | 3000 (206)                  |

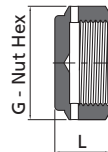


| FO Welded Gland Union |                       |                      |             |              |                             |
|-----------------------|-----------------------|----------------------|-------------|--------------|-----------------------------|
| FO Size (in.)         | Basic Ordering Number | Dimensions, in. (mm) |             |              | Working Pressure psig (bar) |
|                       |                       | L                    | E           | G            |                             |
| 1/4                   | -WG-FO4               | 1.42 (36.1)          | 0.18 (4.6)  | 11/16 (17.5) | 10200 (702)                 |
| 1/2                   | -WG-FO8               | 1.61 (40.9)          | 0.40 (10.2) | 1 (25.4)     | 5800 (399)                  |

## Nuts

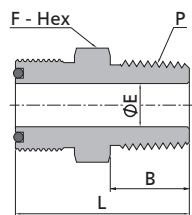


| Female        |                       |                      |              |  |
|---------------|-----------------------|----------------------|--------------|--|
| FO Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |              |  |
|               |                       | L                    | G            |  |
| 1/8-1/4       | -N-FO4                | 0.66 (16.8)          | 11/16 (17.5) |  |
| 3/8-1/2       | -N-FO8                | 0.69 (17.5)          | 1 (25.4)     |  |
| 3/4           | -N-FO12               | 0.81 (20.6)          | 1 1/2 (38.1) |  |
| 1             | -N-FO16               | 0.81 (20.6)          | 1 3/4 (44.5) |  |

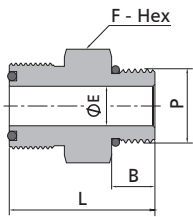


| Blind         |                       |                      |              |  |
|---------------|-----------------------|----------------------|--------------|--|
| FO Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |              |  |
|               |                       | L                    | G            |  |
| 1/8-1/4       | -N-FO4-B              | 0.44 (11.2)          | 11/16 (17.5) |  |
| 3/8-1/2       | -N-FO8-B              | 0.56 (14.2)          | 1 (25.4)     |  |
| 3/4           | -N-FO12-B             | 0.75 (19.1)          | 1 1/2 (38.1) |  |
| 1             | -N-FO16-B             | 0.81 (20.6)          | 1 3/4 (44.5) |  |

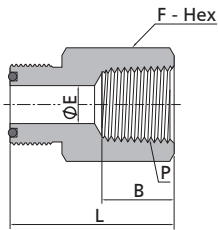
## Bodies



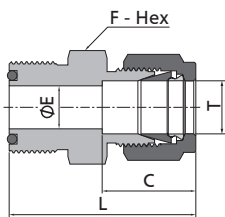
| FO Body to Male NPT |            |                       |                      |               |             |             |                             |
|---------------------|------------|-----------------------|----------------------|---------------|-------------|-------------|-----------------------------|
| FO Size (in.)       | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |               |             |             | Working Pressure psig (bar) |
|                     |            |                       | L                    | F             | B           | E           |                             |
| 1/4                 | 1/8        | -CM-FO4-NS2           | 1.16 (29.5)          | 5/8 (15.9)    | 0.38 (9.7)  | 0.18 (4.6)  | 10000 (689)                 |
| 1/4                 | 1/4        | -CM-FO4-NS4           | 1.34 (34.0)          | 5/8 (15.9)    | 0.56 (14.2) | 0.18 (4.6)  | 13400 (923)                 |
| 1/2                 | 3/8        | -CM-FO8-NS6           | 1.46 (37.1)          | 15/16 (23.8)  | 0.56 (14.2) | 0.38 (9.7)  | 7800 (537)                  |
| 1/2                 | 1/2        | -CM-FO8-NS8           | 1.65 (41.9)          | 15/16 (23.8)  | 0.75 (19.1) | 0.40 (10.2) | 10000 (689)                 |
| 3/4                 | 3/4        | -CM-FO12-NS12         | 1.75 (44.5)          | 1 5/16 (33.3) | 0.75 (19.1) | 0.62 (15.7) | 7300 (502)                  |
| 1                   | 1          | -CM-FO16-NS16         | 1.97 (50.0)          | 1 5/8 (41.3)  | 0.94 (23.9) | 0.87 (22.1) | 5300 (365)                  |



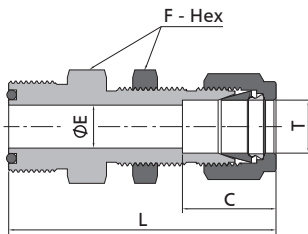
| FO Body to SAE/MS Thread |                      |                       |                      |              |             |             |                             |
|--------------------------|----------------------|-----------------------|----------------------|--------------|-------------|-------------|-----------------------------|
| FO Size (in.)            | P-SAE/MS Thread Size | Basic Ordering Number | Dimensions, in. (mm) |              |             |             | Working Pressure psig (bar) |
|                          |                      |                       | L                    | F            | B           | E           |                             |
| 1/4                      | 7/16-20              | -CM-FO4-ST7           | 1.24 (31.5)          | 11/16 (17.5) | 0.36 (9.1)  | 0.18 (4.6)  | 4500 (310)                  |
| 1/4                      | 9/16-18              | -CM-FO4-ST9           | 1.17 (29.7)          | 11/16 (17.5) | 0.39 (9.9)  | 0.18 (4.6)  | 4500 (310)                  |
| 1/2                      | 7/16-20              | -CM-FO8-ST7           | 1.36 (34.5)          | 15/16 (23.8) | 0.36 (9.1)  | 0.18 (4.6)  | 4500 (310)                  |
| 1/2                      | 9/16-18              | -CM-FO8-ST9           | 1.39 (35.3)          | 15/16 (23.8) | 0.39 (9.9)  | 0.30 (7.6)  | 4500 (310)                  |
| 1/2                      | 3/4-16               | -CM-FO8-ST12          | 1.47 (37.3)          | 1 (25.4)     | 0.44 (11.2) | 0.40 (10.2) | 4500 (310)                  |
| 3/4                      | 1 1/16-12            | -CM-FO12-ST17         | 1.73 (43.9)          | 1 3/8 (34.9) | 0.59 (15.0) | 0.62 (15.7) | 3600 (248)                  |
| 1                        | 1 5/16-12            | -CM-FO16-ST21         | 1.79 (45.5)          | 1 5/8 (41.3) | 0.59 (15.0) | 0.85 (21.6) | 2900 (199)                  |



| FO Body to Female NPT |            |                       |                      |               |             |             |                             |
|-----------------------|------------|-----------------------|----------------------|---------------|-------------|-------------|-----------------------------|
| FO Size (in.)         | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |               |             |             | Working Pressure psig (bar) |
|                       |            |                       | L                    | F             | B           | E           |                             |
| 1/4                   | 1/8        | -CF-FO4-NS2           | 1.25 (31.8)          | 5/8 (15.9)    | 0.41 (10.4) | 0.18 (4.6)  | 8400 (578)                  |
| 1/4                   | 1/4        | -CF-FO4-NS4           | 1.39 (35.3)          | 3/4 (19.1)    | 0.59 (15.0) | 0.18 (4.6)  | 6600 (454)                  |
| 1/2                   | 3/8        | -CF-FO8-NS6           | 1.57 (39.9)          | 15/16 (23.8)  | 0.59 (15.0) | 0.40 (10.2) | 6600 (454)                  |
| 1/2                   | 1/2        | -CF-FO8-NS8           | 1.77 (45.0)          | 1 1/16 (27.0) | 0.78 (19.8) | 0.40 (10.2) | 4900 (337)                  |
| 3/4                   | 3/4        | -CF-FO12-NS12         | 1.93 (49.0)          | 1 5/16 (33.3) | 0.81 (20.6) | 0.62 (15.7) | 4600 (316)                  |
| 1                     | 1          | -CF-FO16-NS16         | 2.02 (51.3)          | 1 5/8 (41.3)  | 1.00 (25.4) | 0.87 (22.1) | 4400 (303)                  |



| FO Body to Tube Fitting |                   |                       |                      |               |             |             |                             |
|-------------------------|-------------------|-----------------------|----------------------|---------------|-------------|-------------|-----------------------------|
| FO Size (in.)           | T-tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |             |             | Working Pressure psig (bar) |
|                         |                   |                       | L                    | F             | C           | E           |                             |
| 1/4                     | 1/8               | -U-FO4-FL2            | 1.38 (35.1)          | 5/8 (15.9)    | 0.51 (13.0) | 0.09 (2.3)  | 10900 (751)                 |
| 1/4                     | 1/4               | -U-FO4-FL4            | 1.47 (37.3)          | 5/8 (15.9)    | 0.60 (15.2) | 0.18 (4.6)  | 10200 (702)                 |
| 1/2                     | 3/8               | -U-FO8-FL6            | 1.65 (41.9)          | 15/16 (23.8)  | 0.66 (16.8) | 0.28 (7.1)  | 6500 (447)                  |
| 1/2                     | 1/2               | -U-FO8-FL8            | 1.78 (45.2)          | 15/16 (23.8)  | 0.90 (22.9) | 0.40 (10.2) | 6700 (461)                  |
| 3/4                     | 3/4               | -U-FO12-FL12          | 1.86 (47.2)          | 1 5/16 (33.3) | 0.96 (24.4) | 0.62 (15.7) | 5800 (399)                  |
| 1                       | 1                 | -U-FO16-FL16          | 2.06 (52.3)          | 1 5/8 (41.3)  | 1.23 (31.2) | 0.87 (22.1) | 4700 (323)                  |



| FO Body to Bulkhead Tube Fitting |                   |                       |                      |               |             |             |                                |                               |                             |
|----------------------------------|-------------------|-----------------------|----------------------|---------------|-------------|-------------|--------------------------------|-------------------------------|-----------------------------|
| FO Size (in.)                    | T-tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |             |             | Panel Hole Drill Size in. (mm) | Max. Panel Thickness in. (mm) | Working Pressure psig (bar) |
|                                  |                   |                       | L                    | F             | C           | E           |                                |                               |                             |
| 1/4                              | 1/4               | -UB-FO4-FL4           | 2.10 (53.4)          | 5/8 (15.9)    | 0.60 (15.2) | 0.18 (4.6)  | 0.45 (11.5)                    | 0.40 (10.2)                   | 10200 (702)                 |
| 1/2                              | 3/8               | -UB-FO8-FL6           | 2.34 (59.4)          | 15/16 (23.8)  | 0.66 (16.8) | 0.28 (7.1)  | 0.58 (14.7)                    | 0.44 (11.2)                   | 6500 (447)                  |
| 1/2                              | 1/2               | -UB-FO8-FL8           | 2.55 (64.8)          | 15/16 (23.8)  | 0.90 (22.9) | 0.40 (10.2) | 0.76 (19.4)                    | 0.50 (12.7)                   | 6700 (461)                  |
| 3/4                              | 3/4               | -UB-FO12-FL12         | 2.86 (72.6)          | 1 5/16 (33.3) | 0.96 (24.4) | 0.62 (15.7) | 1.02 (25.8)                    | 0.66 (16.8)                   | 5800 (399)                  |
| 1                                | 1                 | -UB-FO16-FL16         | 3.29 (83.6)          | 1 5/8 (41.3)  | 1.23 (31.2) | 0.87 (22.1) | 1.33 (33.7)                    | 0.75 (19.1)                   | 4700 (323)                  |

Fittings

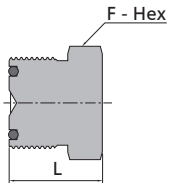
Valves

Pressure Gauges

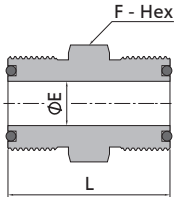
Integrated Systems and Others

Process Specification

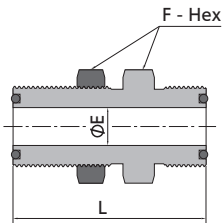
# F-45 Face Seal Fittings



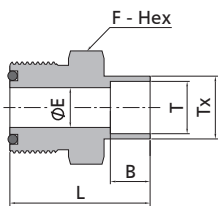
| Blind Body    |                       |                      |               |
|---------------|-----------------------|----------------------|---------------|
| FO Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |
|               |                       | L                    | F             |
| 1/4           | -BY-FO4               | 0.77 (19.6)          | 5/8 (15.9)    |
| 1/2           | -BY-FO8               | 0.89 (22.6)          | 15/16 (23.8)  |
| 3/4           | -BY-FO12              | 0.99 (25.1)          | 1 5/16 (33.3) |
| 1             | -BY-FO16              | 1.02 (25.9)          | 1 5/8 (41.3)  |



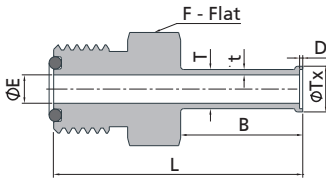
| Union Body    |               |                       |                      |              |             |                             |
|---------------|---------------|-----------------------|----------------------|--------------|-------------|-----------------------------|
| FO Size (in.) | FO Size (in.) | Basic Ordering Number | Dimensions, in. (mm) |              |             | Working Pressure psig (bar) |
|               |               |                       | L                    | F            | E           |                             |
| 1/4           | 1/4           | -U-FO4                | 1.25 (31.8)          | 5/8 (15.9)   | 0.18 (4.6)  | 14300 (985)                 |
| 1/2           | 1/4           | -U-FO8-FO4            | 1.43 (36.3)          | 15/16 (23.8) | 0.18 (4.6)  | 11100 (764)                 |
| 1/2           | 1/2           | -U-FO8                | 1.50 (38.1)          | 15/16 (23.8) | 0.40 (10.2) | 11100 (764)                 |



| Bulkhead Union Body |                       |                      |               |             |                                |                               |                             |
|---------------------|-----------------------|----------------------|---------------|-------------|--------------------------------|-------------------------------|-----------------------------|
| FO Size (in.)       | Basic Ordering Number | Dimensions, in. (mm) |               |             | Panel Hole Drill Size in. (mm) | Max. Panel Thickness in. (mm) | Working Pressure psig (bar) |
|                     |                       | L                    | F             | E           |                                |                               |                             |
| 1/4                 | -BU-FO4               | 1.88 (47.8)          | 3/4 (19.1)    | 0.18 (4.6)  | 0.58 (14.7)                    | 0.36 (9.1)                    | 14300 (985)                 |
| 1/2                 | -BU-FO8               | 2.09 (53.1)          | 1 1/16 (27.0) | 0.40 (10.2) | 0.89 (22.6)                    | 0.40 (10.2)                   | 11100 (764)                 |

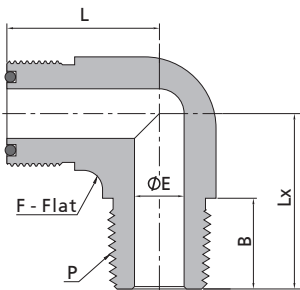


| FO Body to Tube Socket Weld |                   |                       |                      |               |             |             |             |                             |
|-----------------------------|-------------------|-----------------------|----------------------|---------------|-------------|-------------|-------------|-----------------------------|
| FO Size (in.)               | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |               |             |             |             | Working Pressure psig (bar) |
|                             |                   |                       | L                    | F             | E           | B           | Tx          |                             |
| 1/8                         | 1/8               | -CW-FO2-TS2           | 0.88 (22.4)          | 5/8 (15.9)    | 0.09 (2.3)  | 0.10 (2.5)  | 0.29 (7.4)  | 12600 (868)                 |
| 1/4                         | 1/4               | -CW-FO4-TS4           | 1.09 (27.7)          | 5/8 (15.9)    | 0.18 (4.6)  | 0.28 (7.1)  | 0.38 (9.7)  | 6800 (468)                  |
| 3/8                         | 3/8               | -CW-FO6-TS6           | 1.28 (32.5)          | 15/16 (23.8)  | 0.28 (7.1)  | 0.31 (7.9)  | 0.60 (15.2) | 8100 (558)                  |
| 1/2                         | 1/2               | -CW-FO8-TS8           | 1.34 (34.0)          | 15/16 (23.8)  | 0.40 (10.2) | 0.38 (9.7)  | 0.60 (15.2) | 3000 (206)                  |
| 3/4                         | 3/4               | -CW-FO12-TS12         | 1.50 (38.1)          | 1 5/16 (33.3) | 0.62 (15.7) | 0.44 (11.2) | 0.92 (23.4) | 3700 (254)                  |
| 1                           | 1                 | -CW-FO16-TS16         | 1.72 (43.7)          | 1 5/8 (41.3)  | 0.87 (22.1) | 0.62 (15.7) | 1.19 (30.2) | 3000 (206)                  |



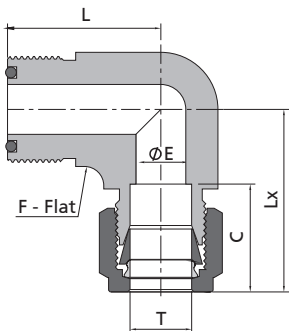
**FO Body to Automatic Tube Weld**

| FO Size (in.) | T-tube O.D. (in.) | t-Wall Thickness (in.) | Basic Ordering Number | Dimensions, in. (mm) |             |            |             |                |               | Working Pressure psig (bar) |
|---------------|-------------------|------------------------|-----------------------|----------------------|-------------|------------|-------------|----------------|---------------|-----------------------------|
|               |                   |                        |                       | L                    | B           | D          | E           | T <sub>x</sub> | F             |                             |
| 1/4           | 1/4               | 0.035                  | -CW-FO4-TB4A          | 1.59 (40.4)          | 0.78 (19.8) | 0.02 (0.5) | 0.18 (4.6)  | 0.29 (7.4)     | 5/8 (15.9)    | 5100 (351)                  |
| 1/2           | 3/8               | 0.035                  | -CW-FO8-TB6A          | 1.74 (44.2)          | 0.79 (20.0) | 0.03 (0.8) | 0.31 (7.9)  | 0.41 (10.4)    | 15/16 (23.8)  | 3300 (227)                  |
| 1/2           | 1/2               | 0.049                  | -CW-FO8-TB8A          | 1.75 (44.4)          | 0.80 (20.3) | 0.04 (1.0) | 0.40 (10.2) | 0.55 (14.0)    | 15/16 (23.8)  | 3500 (241)                  |
| 3/4           | 3/4               | 0.049                  | -CW-FO12-TB12A        | 1.78 (45.2)          | 0.80 (20.3) | 0.04 (1.0) | 0.65 (16.5) | 0.80 (20.3)    | 1 5/16 (33.3) | 2200 (151)                  |
| 1             | 1                 | 0.065                  | -CW-FO16-TB16A        | 2.03 (51.6)          | 1.00 (25.4) | 0.04 (1.0) | 0.87 (22.1) | 1.06 (26.9)    | 1 5/8 (47.6)  | 2200 (151)                  |



**FO Body to Male NPT Elbow**

| FO Size (in.) | P-NPT Size | Basic Ordering Number | Dimensions, in. (mm) |                |             |             |                | Working Pressure psig (bar) |
|---------------|------------|-----------------------|----------------------|----------------|-------------|-------------|----------------|-----------------------------|
|               |            |                       | L                    | F              | B           | E           | L <sub>x</sub> |                             |
| 1/4           | 1/8        | -LM-FO4-NS2           | 0.96 (24.4)          | 9/16 (14.3)    | 0.38 (9.7)  | 0.18 (4.6)  | 0.87 (22.1)    | 10000 (689)                 |
| 1/4           | 1/4        | -LM-FO4-NS4           | 0.96 (24.4)          | 9/16 (14.3)    | 0.56 (14.2) | 0.18 (4.6)  | 1.05 (26.7)    | 8000 (551)                  |
| 1/2           | 3/8        | -LM-FO8-NS6           | 1.26 (32.0)          | 13/16 (20.6)   | 0.56 (14.2) | 0.38 (9.7)  | 1.26 (32.0)    | 7800 (537)                  |
| 1/2           | 1/2        | -LM-FO8-NS8           | 1.26 (32.0)          | 13/16 (20.6)   | 0.75 (19.1) | 0.40 (10.2) | 1.45 (36.8)    | 7700 (530)                  |
| 3/4           | 3/4        | -LM-FO12-NS12         | 1.48 (37.6)          | 1 1/4 (31.8)   | 0.75 (19.1) | 0.62 (15.7) | 1.67 (42.4)    | 7300 (502)                  |
| 1             | 1          | -LM-FO16-NS16         | 1.56 (39.6)          | 1 11/16 (42.9) | 0.94 (23.9) | 0.87 (22.0) | 1.94 (49.3)    | 5300 (365)                  |



**FO Body to Tube Fitting Elbow**

| FO Size (in.) | T-Tube O.D. (in.) | Basic Ordering Number | Dimensions, in. (mm) |                |             |             |                | Working Pressure psig (bar) |
|---------------|-------------------|-----------------------|----------------------|----------------|-------------|-------------|----------------|-----------------------------|
|               |                   |                       | L                    | F              | C           | E           | L <sub>x</sub> |                             |
| 1/4           | 1/4               | -LU-FO4-FL4           | 0.96 (24.4)          | 9/16 (14.3)    | 0.60 (15.2) | 0.18 (4.6)  | 1.19 (30.2)    | 10200 (702)                 |
| 1/2           | 3/8               | -LU-FO8-FL6           | 1.26 (32.0)          | 13/16 (20.6)   | 0.66 (16.8) | 0.28 (7.1)  | 1.39 (35.3)    | 6500 (447)                  |
| 1/2           | 1/2               | -LU-FO8-FL8           | 1.26 (32.0)          | 13/16 (20.6)   | 0.90 (22.9) | 0.40 (10.2) | 1.50 (38.1)    | 6700 (461)                  |
| 3/4           | 3/4               | -LU-FO12-FL12         | 1.48 (37.6)          | 1 1/4 (31.8)   | 0.96 (24.4) | 0.62 (15.7) | 1.80 (45.7)    | 5800 (399)                  |
| 1             | 1                 | -LU-FO16-FL16         | 1.56 (39.6)          | 1 11/16 (42.9) | 1.23 (31.2) | 0.87 (22.1) | 2.04 (51.8)    | 4700 (323)                  |

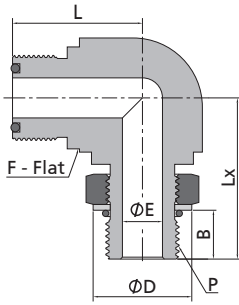
Fittings

Valves

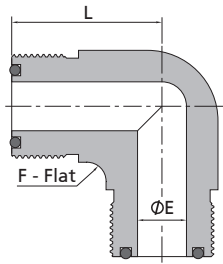
Pressure Gauges

Integrated Systems and Others

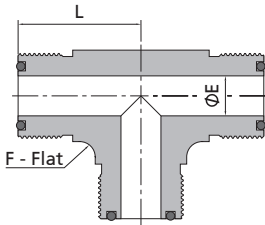
Process Specification



| FO Body to Male SAE/MS Thread Positionable Elbow |                      |                       |                      |                |             |             |             |             |                             |
|--------------------------------------------------|----------------------|-----------------------|----------------------|----------------|-------------|-------------|-------------|-------------|-----------------------------|
| FO Size (in.)                                    | P-SAE/MS Thread Size | Basic Ordering Number | Dimensions, in. (mm) |                |             |             |             |             | Working Pressure psig (bar) |
|                                                  |                      |                       | L                    | F              | B           | E           | D           | Lx          |                             |
| 1/4                                              | 7/16-20              | -LP-FO4-ST7           | 0.96 (24.4)          | 1/2 (12.7)     | 0.39 (9.9)  | 0.18 (4.6)  | 0.65 (16.5) | 1.19 (30.2) | 4500 (310)                  |
| 1/2                                              | 9/16-18              | -LP-FO8-ST9           | 1.33 (33.8)          | 13/16 (20.6)   | 0.44 (11.2) | 0.30 (7.6)  | 0.79 (20.1) | 1.54 (39.1) | 3600 (248)                  |
| 1/2                                              | 3/4-16               | -LP-FO8-ST12          | 1.33 (33.8)          | 13/16 (20.6)   | 0.50 (12.7) | 0.40 (10.2) | 1.01 (25.7) | 1.65 (41.9) | 3600 (248)                  |
| 3/4                                              | 1 1/16-12            | -LP-FO12-ST17         | 1.53 (38.9)          | 1 1/4 (31.8)   | 0.66 (16.8) | 0.62 (15.7) | 1.44 (36.6) | 2.13 (54.1) | 2900 (199)                  |
| 1                                                | 1 5/16-12            | -LP-FO16-ST21         | 1.72 (43.7)          | 1 11/16 (42.9) | 0.66 (16.8) | 0.87 (22.1) | 1.73 (43.9) | 2.31 (58.7) | 2300 (158)                  |

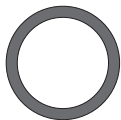


| FO Body Union Elbow |                       |                      |                |             |                             |
|---------------------|-----------------------|----------------------|----------------|-------------|-----------------------------|
| FO Size (in.)       | Basic Ordering Number | Dimensions, in. (mm) |                |             | Working Pressure psig (bar) |
|                     |                       | L                    | F              | E           |                             |
| 1/4                 | -LU-FO4               | 0.96 (24.4)          | 9/16 (14.3)    | 0.18 (4.6)  | 14300 (985)                 |
| 1/2                 | -LU-FO8               | 1.26 (32.0)          | 13/16 (20.6)   | 0.40 (10.2) | 11100 (764)                 |
| 3/4                 | -LU-FO12              | 1.48 (37.6)          | 1 1/4 (31.8)   | 0.62 (15.7) | 10900 (751)                 |
| 1                   | -LU-FO16              | 1.56 (39.6)          | 1 11/16 (42.9) | 0.87 (22.1) | 8800 (606)                  |



| FO Body Union Tee |                       |                      |                |             |                             |
|-------------------|-----------------------|----------------------|----------------|-------------|-----------------------------|
| FO Size (in.)     | Basic Ordering Number | Dimensions, in. (mm) |                |             | Working Pressure psig (bar) |
|                   |                       | L                    | F              | E           |                             |
| 1/4               | -TTT-FO4              | 0.96 (24.4)          | 9/16 (14.3)    | 0.18 (4.6)  | 14300 (985)                 |
| 1/2               | -TTT-FO8              | 1.26 (32.0)          | 13/16 (20.6)   | 0.40 (10.2) | 11100 (764)                 |
| 3/4               | -TTT-FO12             | 1.48 (37.6)          | 1 1/4 (31.8)   | 0.62 (15.7) | 10900 (751)                 |
| 1                 | -TTT-FO16             | 1.56 (39.6)          | 1 11/16 (42.9) | 0.87 (22.1) | 8800 (606)                  |

O-Rings



| FO Size (in.) | Basic Ordering Number |
|---------------|-----------------------|
| 1/8-1/4       | -010                  |
| 3/8-1/2       | -111                  |
| 3/4           | -116                  |
| 1             | -215                  |

Add the designator of O-ring material in page F-42 as a prefix to the basic ordering number to get the complete ordering number.  
 Example: V17-010

# Diaphragm Valves

ALD, DQ, DP, DH, DM, DS, DR, DV, DL, DF, DE  
and DK Series



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



# Contents

Fittings

Atomic Layer Deposition Diaphragm Valves  
ALD Series V-03

---

Low Pressure Manual Diaphragm Valves  
DQ Series V-11

---

Low Pressure Pneumatic Diaphragm Valves  
DP Series V-20

---

High Pressure Springless Diaphragm Valves  
DH Series V-29

---

High Pressure Spring Diaphragm Valves  
DM Series V-34

---

High Pressure Compact Diaphragm Valves  
DS Series V-41

---

Low Pressure/Medium Flow Diaphragm Valves  
DR Series V-47

---

Low Pressure/High Flow Diaphragm Valves  
DV Series V-52

---

Low Pressure/Ultra High Flow Diaphragm Valves  
DL Series V-60

---

High Pressure/High Flow Diaphragm Valves  
DF Series V-65

---

Economic Diaphragm Valves  
DE Series V-69

---

High Temperature Diaphragm Valves  
DK Series V-73

---

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## Atomic Layer Deposition Diaphragm Valves

### ALD Series

#### Features

- ⦿ Long cycle life under high-speed actuation
- ⦿ Quick response capable of valve opening or closing time of less than 5 ms
- ⦿ Cv consistency from valve to valve:  $\pm 3\%$
- ⦿ Thermal model extends actuator life for thermal application
- ⦿ Contained seat to provide excellent resistance to swelling and contamination
- ⦿ Cobalt alloy diaphragm to provide high strength and corrosion resistance to ensure long cycle life
- ⦿ High-purity grade PFA seat with broad range of chemical compatibility
- ⦿ Minimum particle generation and dead space facilitate purging
- ⦿ Suitable for ultra high purity applications

#### Technical Data

| Orifice Size                |          | 0.16 in. (4.1 mm)                                                                   | 0.23 in. (5.9 mm)                              |
|-----------------------------|----------|-------------------------------------------------------------------------------------|------------------------------------------------|
| Port Size                   |          | 1/4" to 3/8",<br>6 mm to 8 mm or<br>1.125" to 1.5"                                  | 3/8" to 1/2",<br>10 mm to 12 mm<br>or 1.5"     |
| Flow Coefficient (Cv)       |          | 0.27                                                                                | 0.62                                           |
| Working Pressure            |          | Vacuum to 145 psig (10 bar)                                                         |                                                |
| Actuator Operating Pressure |          | 50 ~ 90 psig (3.4 ~ 6.2 bar)                                                        |                                                |
| Temperature                 |          | Standard model: 32 ~ 248 °F (0 ~ 120 °C)<br>Thermal model: 32 ~ 392 °F (0 ~ 200 °C) |                                                |
| Leak Rate<br>(Helium)       | Internal | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s                                      | $\leq 1 \times 10^{-8}$ std cm <sup>3</sup> /s |
|                             | External | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s                                      | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |

#### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

| Orifice Size<br>in. (mm) | Pressure Drop<br>to Atmosphere<br>psig (bar) | Air<br>(l/min) | Water<br>(l/min) |
|--------------------------|----------------------------------------------|----------------|------------------|
| 0.16 (4.1)               | 10 (0.68)                                    | 86             | 3.2              |
|                          | 50 (3.4)                                     | 230            | 7.2              |
|                          | 100 (6.8)                                    | 410            | 10.2             |
| 0.23 (5.9)               | 10 (0.68)                                    | 199            | 7.4              |
|                          | 50 (3.4)                                     | 530            | 16.6             |
|                          | 100 (6.8)                                    | 945            | 23.6             |

Fittings

Valves

Pressure Gauges

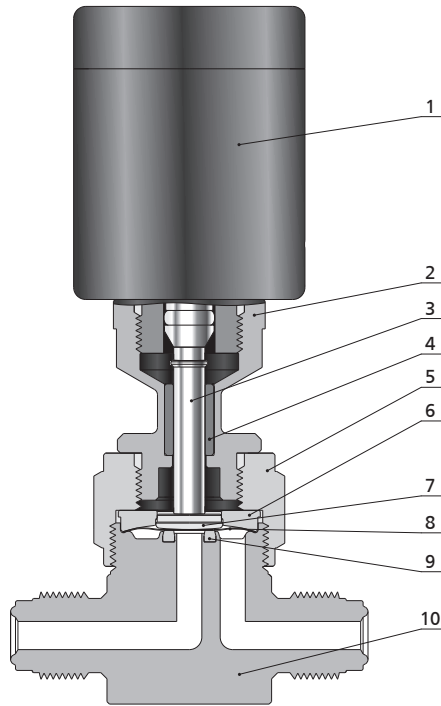
Integrated Systems and Others

Process Specification

## Product Technology Grade

| Technology               | Product Grade | Ultra High Purity (F3)                                                                               |
|--------------------------|---------------|------------------------------------------------------------------------------------------------------|
| Material/Specification   |               | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR /SEMI F20                                      |
| Wetted Surface Roughness |               | Ra 5 µin. (0.13 µm)                                                                                  |
| Polishing Process        |               | Electropolished                                                                                      |
| Cleaning                 |               | Ultra high purity cleaning in continuously monitored ultrasonic cleaning system with deionized water |
| Assembly Environment     |               | In ISO 4/Federal 10 cleanroom                                                                        |
| Packaging                |               | Double bagged in cleanroom                                                                           |

## Standard Materials of Construction



Normally Closed Thermal Actuator

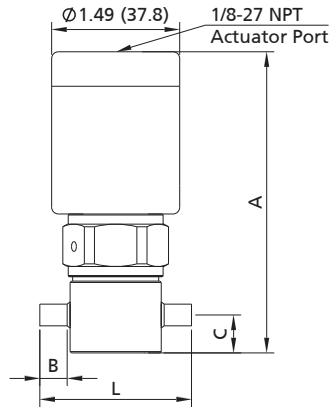
| Item | Component                                               | Material/Specification                                         |
|------|---------------------------------------------------------|----------------------------------------------------------------|
| 1    | Actuator                                                | Aluminum                                                       |
| 2    | Thermal Isolation Coupling Housing (Thermal Model Only) | 316 SS/ASTM A479                                               |
| 3    | Thermal Isolation Coupling Stem (Thermal Model Only)    | S17400/ASTM A564                                               |
| 4    | Guide (Thermal Model Only)                              | PTFE/ASTM D1710                                                |
| 5    | Bonnet Nut                                              | 316 SS/ASTM A479                                               |
| 6    | Bonnet                                                  | S17400/ASTM A564                                               |
| 7    | Button                                                  | 316 SS/ASTM A479                                               |
| 8    | Diaphragm                                               | Cobalt Alloy/AMS 5876                                          |
| 9    | Seat                                                    | PFA/ASTM D3307                                                 |
| 10   | Body                                                    | 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 |

## Dimensions and Ordering Information

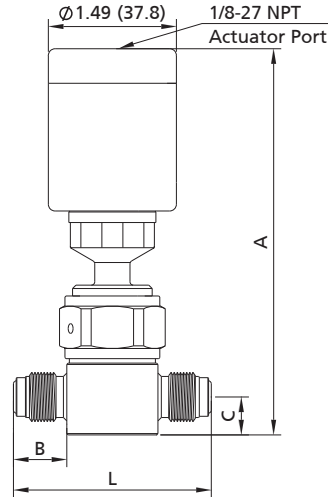
Dimensions, in inches (millimeters), are for reference only.

### 2-Port Valves

**Standard Model**

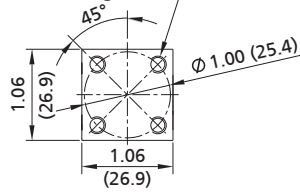


**Thermal Model**



4xM5x0.8-6H thread

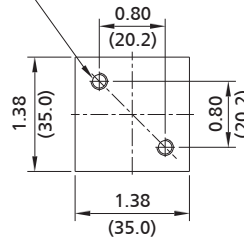
The holes are compatible with 10-32 mounting screws



**Orifice 0.16 in. (4.1 mm) Bottom**

2xM5x0.8-6H thread

The holes are compatible with 10-32 mounting screws



**Orifice 0.23 in. (5.9 mm) Bottom**

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

V-06 Diaphragm Valves

| Orifice Size<br>in. (mm) | Cv   | Valve Type | Basic Ordering Number | Connection Type and Size                                | Dimensions, in. (mm) |             |                |              |             |
|--------------------------|------|------------|-----------------------|---------------------------------------------------------|----------------------|-------------|----------------|--------------|-------------|
|                          |      |            |                       |                                                         | A                    | B           | C              | L            |             |
| 0.16<br>(4.1)            | 0.27 | Standard   | ALD□□-TB4-4-          | 1/4"x0.035" Tube Butt Weld                              | 3.50<br>(88.9)       | 0.30 (7.6)  | 0.44<br>(11.2) | 1.74 (44.2)  |             |
|                          |      |            | ALD□□-TB6-4-          | 3/8"x0.035" Tube Butt Weld                              |                      | 0.26 (6.6)  |                | 2.78 (70.6)  |             |
|                          |      |            | ALD□□-FFR4-4-         | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting |                      | 0.86 (21.8) |                |              |             |
|                          |      |            | ALD□□-RFR4-4-         | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   |                      | 0.62 (15.7) |                |              | 2.30 (58.4) |
|                          |      |            | ALD□□-FR4-4-          | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    |                      |             |                |              |             |
|                          |      | Thermal    | ALD□□-TB4-4-HT-       | 1/4"x0.035" Tube Butt Weld                              | 4.50<br>(114.0)      | 0.30 (7.6)  | 0.44<br>(11.2) | 1.74 (44.2)  |             |
|                          |      |            | ALD□□-TB6-4-HT-       | 3/8"x0.035" Tube Butt Weld                              |                      | 0.26 (6.6)  |                | 2.78 (70.6)  |             |
|                          |      |            | ALD□□-FFR4-4-HT-      | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting |                      | 0.86 (21.8) |                |              |             |
|                          |      |            | ALD□□-RFR4-4-HT-      | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   |                      | 0.62 (15.7) |                |              | 2.30 (58.4) |
|                          |      |            | ALD□□-FR4-4-HT-       | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    |                      |             |                |              |             |
| 0.23<br>(5.9)            | 0.62 | Standard   | ALD□□-TB6-6-          | 3/8"x0.035" Tube Butt Weld                              | 3.55<br>(90.1)       | 0.67 (17.0) | 0.50<br>(12.7) | 2.72 (69.0)  |             |
|                          |      |            | ALD□□-TB8-6-          | 1/2"x0.049" Tube Butt Weld                              |                      | 0.94 (24.0) |                | 3.27 (83.0)  |             |
|                          |      |            | ALD□□-FFR8-6-         | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting |                      |             |                | 0.81 (20.6)  | 3.00 (76.2) |
|                          |      |            | ALD□□-RFR8-6-         | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting   |                      |             |                |              |             |
|                          |      |            | ALD□□-FR8-6-          | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    |                      |             |                |              |             |
|                          |      | Thermal    | ALD□□-TB6-6-HT-       | 3/8"x0.035" Tube Butt Weld                              | 4.65<br>(118.1)      | 0.67 (17.0) | 0.50<br>(12.7) | 2.72 (69.0)  |             |
|                          |      |            | ALD□□-TB8-6-HT-       | 1/2"x0.049" Tube Butt Weld                              |                      | 0.94 (24.0) |                | 3.27 (83.0)  |             |
|                          |      |            | ALD□□-FFR8-6-HT-      | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting |                      |             |                | 4.06 (103.0) |             |
|                          |      |            | ALD□□-RFR8-6-HT-      | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting   |                      |             |                |              |             |
|                          |      |            | ALD□□-FR8-6-HT-       | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    |                      |             |                | 3.00 (76.2)  |             |

Fittings

Valves

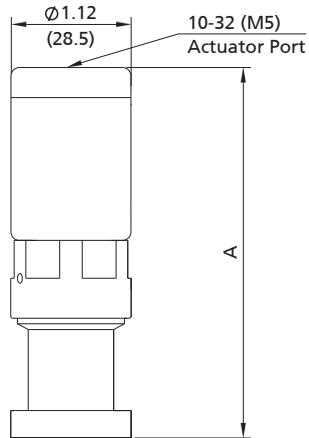
Pressure Gauges

Integrated Systems and Others

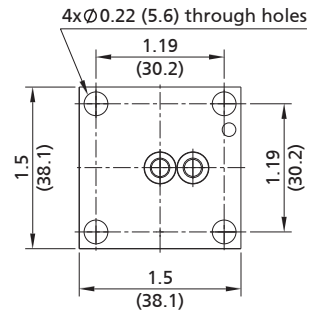
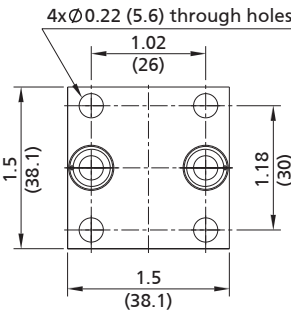
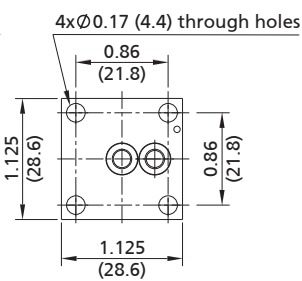
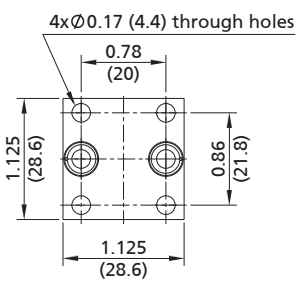
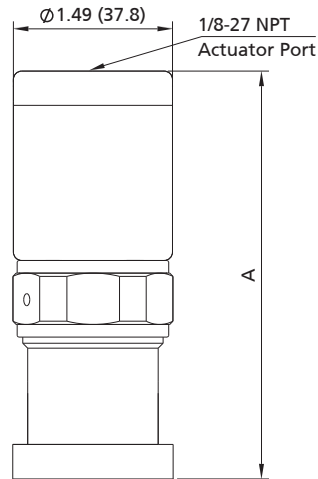
Process Specification

Modular Surface-Mount Valves

1.125" Surface-Mount



1.5" Surface-Mount



1.125" W-Seal Bottom

1.125" C-Seal Bottom

1.5" W-Seal Bottom

1.5" C-Seal Bottom

| Orifice Size<br>in. (mm) | Cv   | Valve<br>Type | Basic Ordering Number | Connection Type<br>and Size | Dimension, in. (mm) |
|--------------------------|------|---------------|-----------------------|-----------------------------|---------------------|
|                          |      |               |                       |                             | A                   |
| 0.16<br>(4.1)            | 0.27 | Standard      | ALD□□-WS11-4-         | 1.125" W-Seal               | 3.40 (86.4)         |
|                          |      |               | ALD□□-CS11-4-         | 1.125" C-Seal               |                     |
|                          |      |               | ALD□□-WS15-4-         | 1.5" W-Seal                 | 3.70 (94.0)         |
|                          |      |               | ALD□□-CS15-4-         | 1.5" C-Seal                 |                     |
|                          |      | Thermal       | ALD□□-WS11-4-HT-      | 1.125" W-Seal               | 4.39 (111.5)        |
|                          |      |               | ALD□□-CS11-4-HT-      | 1.125" C-Seal               |                     |
|                          |      |               | ALD□□-WS15-4-HT-      | 1.5" W-Seal                 | 4.69 (119.1)        |
|                          |      |               | ALD□□-CS15-4-HT-      | 1.5" C-Seal                 |                     |
| 0.23<br>(5.9)            | 0.62 | Standard      | ALD□□-CS15-6-         | 1.5" C-Seal                 | 3.81 (96.9)         |
|                          |      | Thermal       | ALD□□-CS15-6-HT-      | 1.5" C-Seal                 | 4.80 (122.0)        |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

## Options and Accessories

Valves with position sensors, solenoid valve assemblies, heater cartridge and thermocouple holes are available.

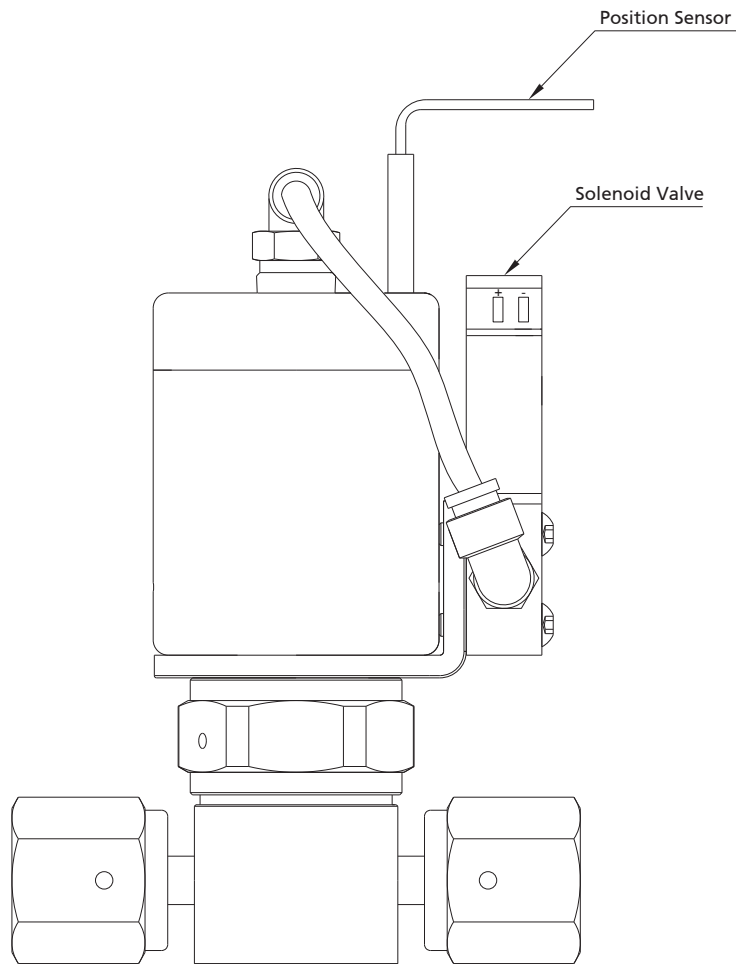
Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



Normally Closed Standard Actuator

### Position Sensors

Transmit a signal to an electrical device indicating the on-off position of pneumatically actuated valves.

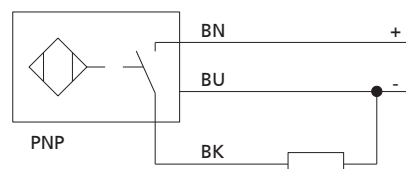
#### Sensor Technical Information

|                              |                                  |
|------------------------------|----------------------------------|
| <b>Output</b>                | 3-wire V (dc), PNP               |
| <b>Output Function</b>       | Normally open or normally closed |
| <b>Voltage</b>               | 10 ~ 30 V (dc)                   |
| <b>Operating Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

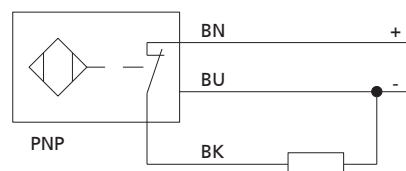
Note: Not applicable to modular surface-mount valves in 1.125".

#### Wiring Diagram

##### Normally Open Position Sensor



##### Normally Closed Position Sensor



**Solenoid Valve Assemblies**

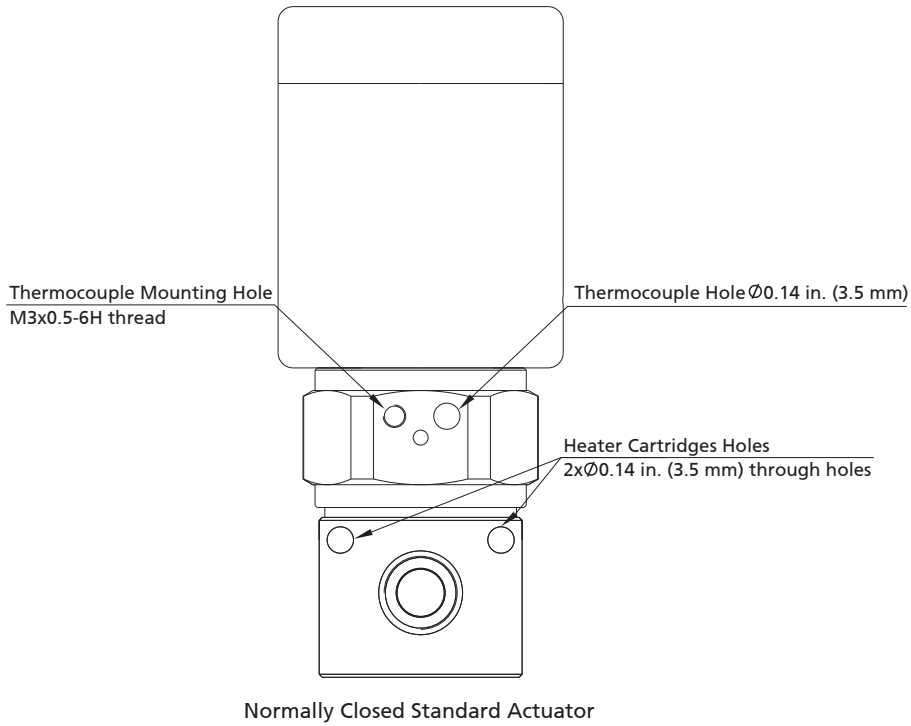
Fast-acting, high-flow solenoid valve enhances ALD series valve response time. Includes tubing, fittings and rotatable mounting bracket for installation versatility.

**Solenoid Valve Technical Information**

|                       |                          |                                                |
|-----------------------|--------------------------|------------------------------------------------|
| <b>Solenoid Valve</b> | <b>Voltage/Power</b>     | 24 V (dc)/4.0 W                                |
|                       | <b>Temperature Range</b> | -0.4 ~ 122 °F (-18 ~ 50 °C)                    |
|                       | <b>Port</b>              | M5×0.8-6H thread, compatible with 10-32 screws |
| <b>Fitting</b>        | <b>Material</b>          | 316 SS                                         |
| <b>Tubing</b>         |                          | Polyurethane                                   |
| <b>Bracket</b>        |                          | 304 SS                                         |
| <b>O-Ring</b>         |                          | Fluorocarbon FKM                               |

**Heater Cartridge and Thermocouple Holes**

Valves are available with holes in the body to accommodate heater cartridges and thermocouple.



Note: Not applicable to modular surface-mount valves.

Fittings

Valves

Pressure Gauges

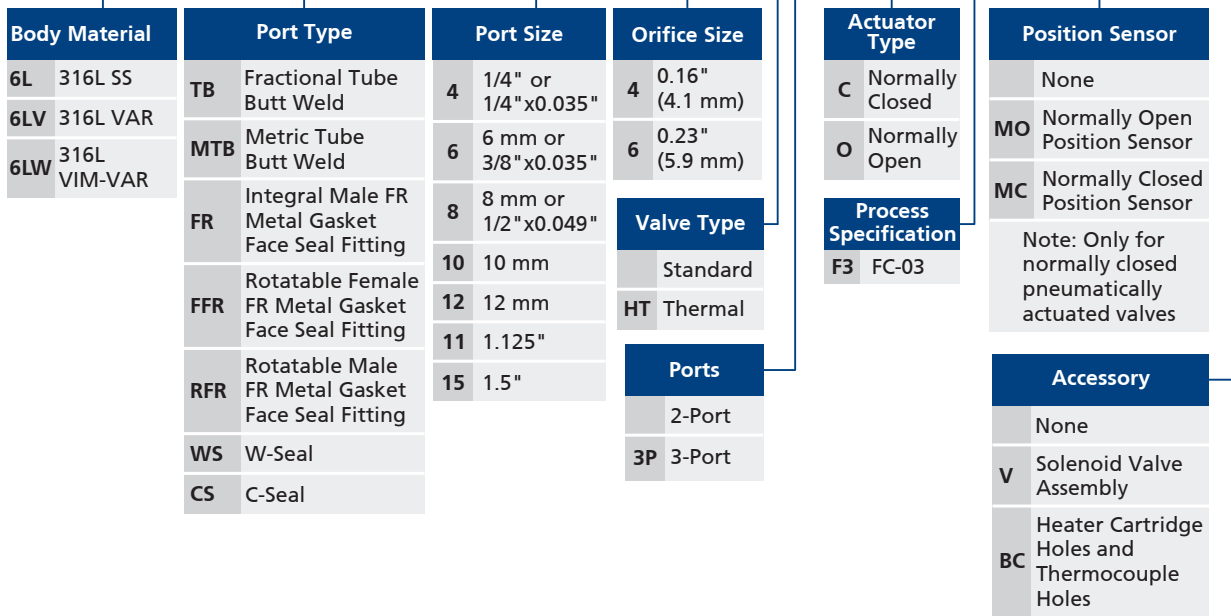
Integrated Systems and Others

Process Specification



## Part Number Description

ALD6LW - FR4 - 4 - HT - 3P - CF3MOVBC



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## Low Pressure Manual Diaphragm Valves

### DQ Series

#### Features

- ⦿ Low internal volume, fully swept flow path
- ⦿ Contained seat to provide excellent resistance to swelling and contamination
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ Different handle types available



#### Technical Data

|                              |                                                                       |                                             |
|------------------------------|-----------------------------------------------------------------------|---------------------------------------------|
| <b>Port Size</b>             | 1/4" to 3/8" or 6 mm to 8 mm                                          |                                             |
| <b>Flow Coefficient (Cv)</b> | 0.27                                                                  |                                             |
| <b>Orifice Size</b>          | 0.16 in. (4.1 mm)                                                     |                                             |
| <b>Max. Working Pressure</b> | 250 psig (17.2 bar)                                                   |                                             |
| <b>Temperature</b>           | PCTFE: -10 ~ 176 °F (-23 ~ 80 °C)<br>PFA: -10 ~ 302 °F (-23 ~ 150 °C) |                                             |
| <b>Leak Rate (Helium)</b>    | <b>Internal</b>                                                       | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s |
|                              | <b>External</b>                                                       | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s |

#### Flow Data

Air @ 70 °F (21 °C)

Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|----------------------------------------|-------------|---------------|
| 10 (0.68)                              | 86          | 3.2           |
| 50 (3.4)                               | 230         | 7.2           |
| 100 (6.8)                              | 410         | 10.2          |

#### Process Specification

| Technology                      | Standard Cleaning and Packaging (FC-01)                        | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|---------------------------------|----------------------------------------------------------------|----------------------------------------|---------------------------|
| <b>Material/Specification</b>   | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20 |                                        |                           |
| <b>Wetted Surface Roughness</b> | Ra 10 μin. (0.25 μm) <sup>①</sup>                              |                                        | Ra 5 μin. (0.13 μm)       |
| <b>Polishing Process</b>        | Machine finished <sup>①</sup>                                  |                                        | Electropolished           |

① For valves with FR connections and tube butt connections, the standard polishing process is electropolishing and the internal surface roughness is finished to an average of Ra 5 μin. (0.13 μm).

Note: Refer to page P-01 for a detailed description of Process Specification.

Fittings

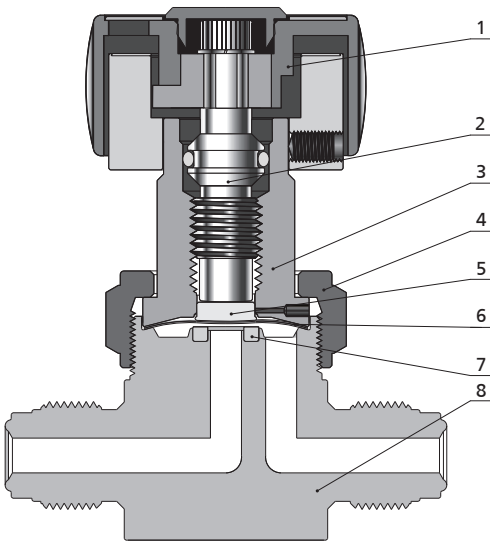
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

## Major Materials of Construction



| Item | Component     |                  | Material/Specification                                         |
|------|---------------|------------------|----------------------------------------------------------------|
| 1    | Handle        | Round            | ABS                                                            |
|      |               | Integral Lockout | Aluminum                                                       |
| 2    | Stem          |                  | 316 SS/ASTM A479                                               |
| 3    | Bonnet        |                  | S17400/ASTM A564                                               |
| 4    | Bonnet Nut    |                  | 316 SS/ASTM A479                                               |
| 5    | Button        |                  | 316 SS/ASTM A479                                               |
| 6    | Diaphragm (2) |                  | Cobalt Alloy/AMS 5876                                          |
| 7    | Seat          |                  | PCTFE/ASTM D1430 or PFA/ASTM D3307                             |
| 8    | Body          |                  | 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 |

Round Handle Model

## Actuators

### Manual-Round Handle

- Quick, quarter-turn actuation
- Handle with window to visually indicate open and closed states

### Manual-Integral Lockout Handle

- Quick, quarter-turn actuation
- Lockable in the closed position for safety



OPEN

CLOSED



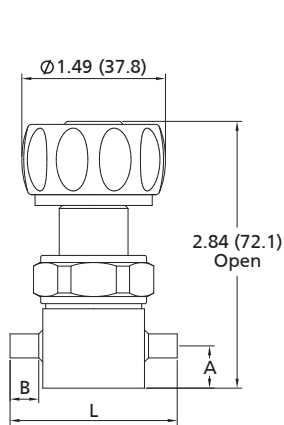
# Dimensions and Ordering Information

## Straight Type

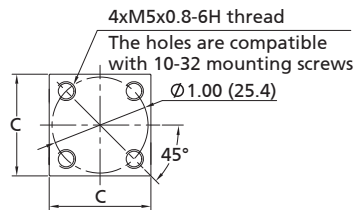
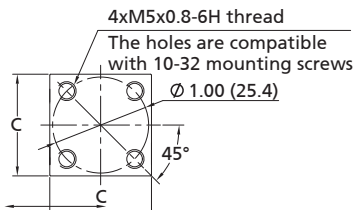
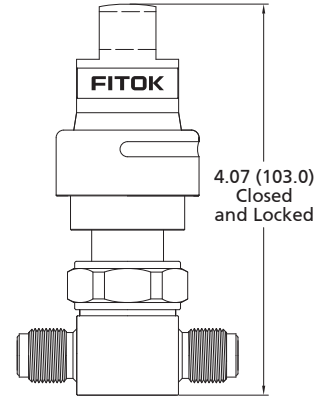
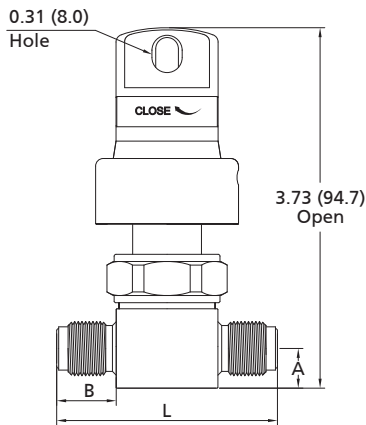
### Dimensions

Dimensions, in inches (millimeters), are for reference only.

Round Handle



Integral Lockout Handle



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DQ□□-TB4-             | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DQ□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DQ□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DQ□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DQ□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 2.30 (58.4) |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

Ordering Number Description

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

DQ6L - TB4 - FR4 - RAF2

| Body Material |              | Inlet Type |                                                    | Inlet Size |                     | Outlet Type   | Outlet Size                        | Actuator Type |                                | Process Specification |       |
|---------------|--------------|------------|----------------------------------------------------|------------|---------------------|---------------|------------------------------------|---------------|--------------------------------|-----------------------|-------|
| 6L            | 316L SS      | TB         | Fractional Tube Butt Weld                          | 4          | 1/4" or 1/4"x0.035" | Same as Inlet | Specified in the same way as Inlet | R             | Manual-Round Handle            | FC-01                 |       |
| 6LV           | 316L VAR     | MTB        | Metric Tube Butt Weld                              | 6          | 6 mm or 3/8"x0.035" |               |                                    | U             | Manual-Integral Lockout Handle | F2                    | FC-02 |
| 6LW           | 316L VIM-VAR | FR         | Integral Male FR Metal Gasket Face Seal Fitting    | 8          | 8 mm                |               |                                    |               |                                | F3                    | FC-03 |
|               |              | FFR        | Rotatable Female FR Metal Gasket Face Seal Fitting |            |                     |               |                                    |               |                                |                       |       |
|               |              | RFR        | Rotatable Male FR Metal Gasket Face Seal Fitting   |            |                     |               |                                    |               |                                |                       |       |
|               |              | FL         | Fractional Tube Fitting                            |            |                     |               |                                    |               |                                |                       |       |
|               |              | ML         | Metric Tube Fitting                                |            |                     |               |                                    |               |                                |                       |       |

| Seat |       |
|------|-------|
|      | PCTFE |
| A    | PFA   |

Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

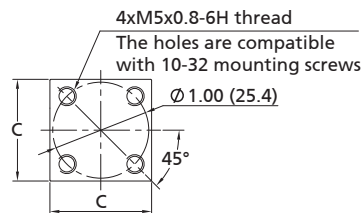
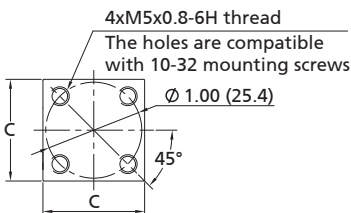
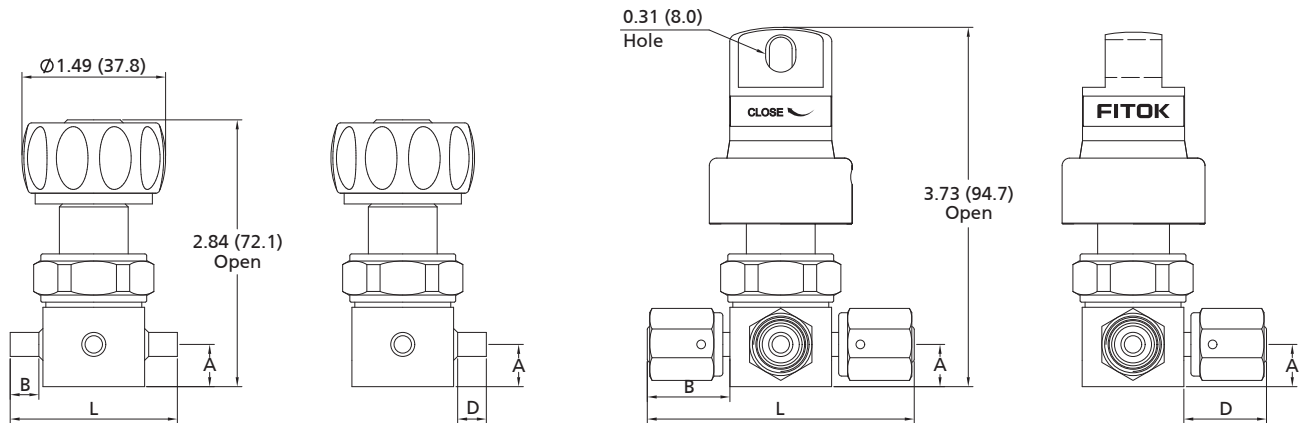
Branch Type

Dimensions

Dimensions, in inches (millimeters), are for reference only.

Round Handle

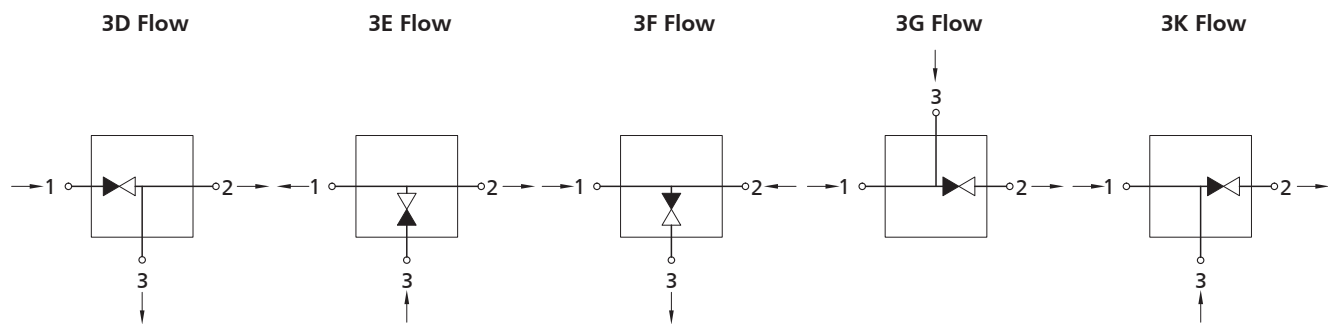
Integral Lockout Handle



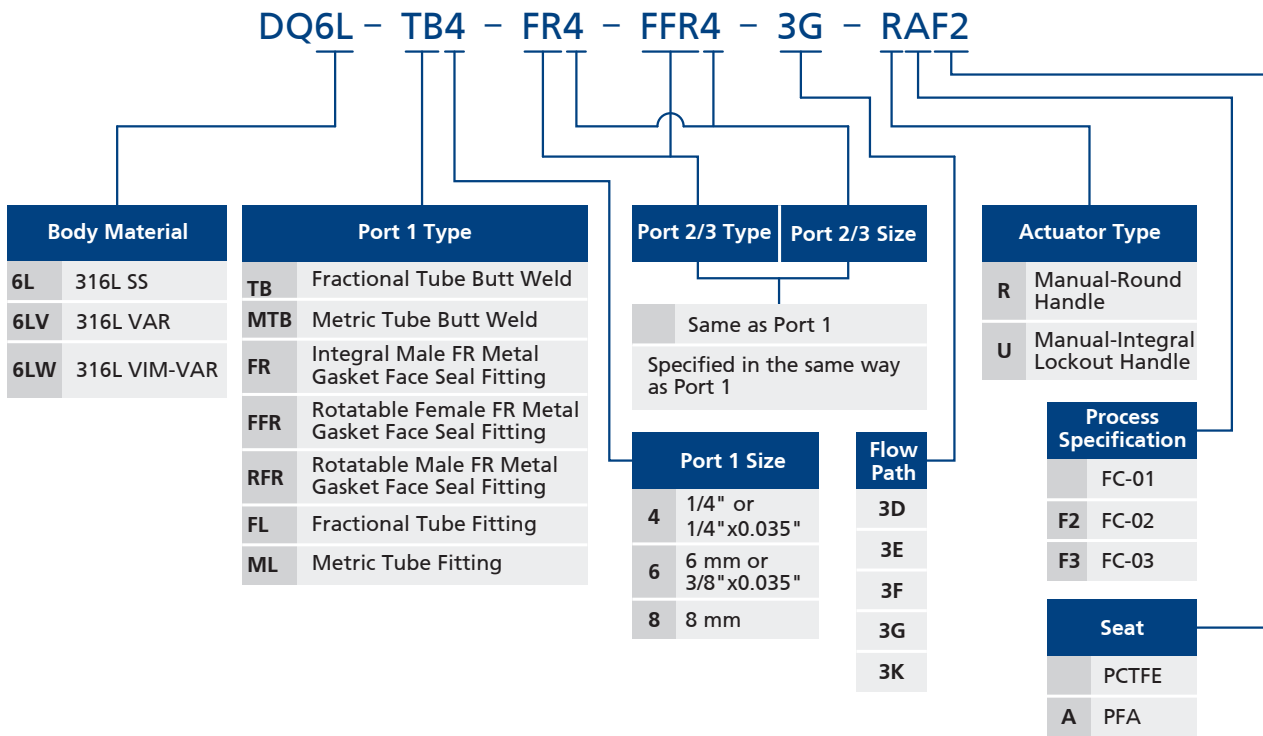
| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | D           | L           |
| DQ□□-TB4-             | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 0.30 (7.6)  | 1.74 (44.2) |
| DQ□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 0.26 (6.6)  | 1.74 (44.2) |
| DQ□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 0.86 (21.8) | 2.78 (70.6) |
| DQ□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 0.86 (21.8) | 2.78 (70.6) |
| DQ□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 0.62 (15.7) | 2.30 (58.4) |

**Flow Paths**

☉ Flow paths as viewed from the top



**Ordering Number Description**

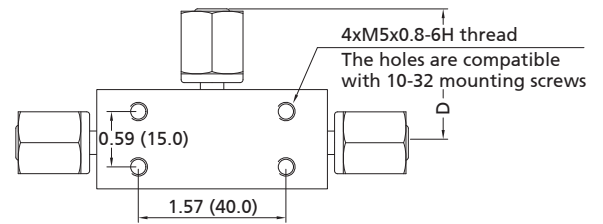
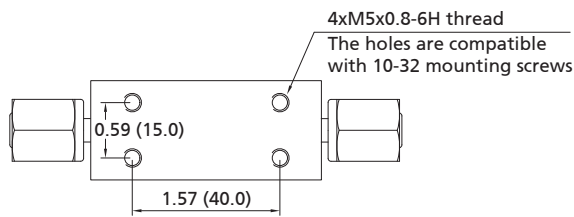
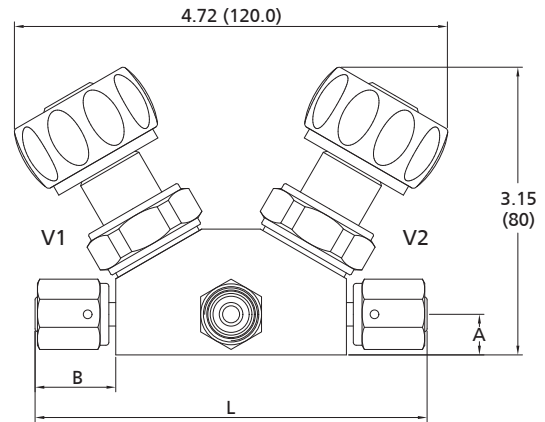
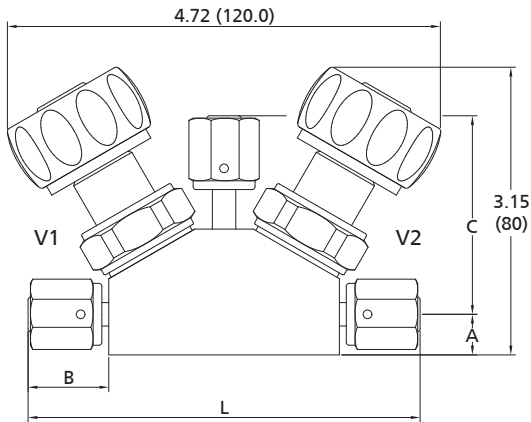


Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

## 2-Valve 3-Way Block Type

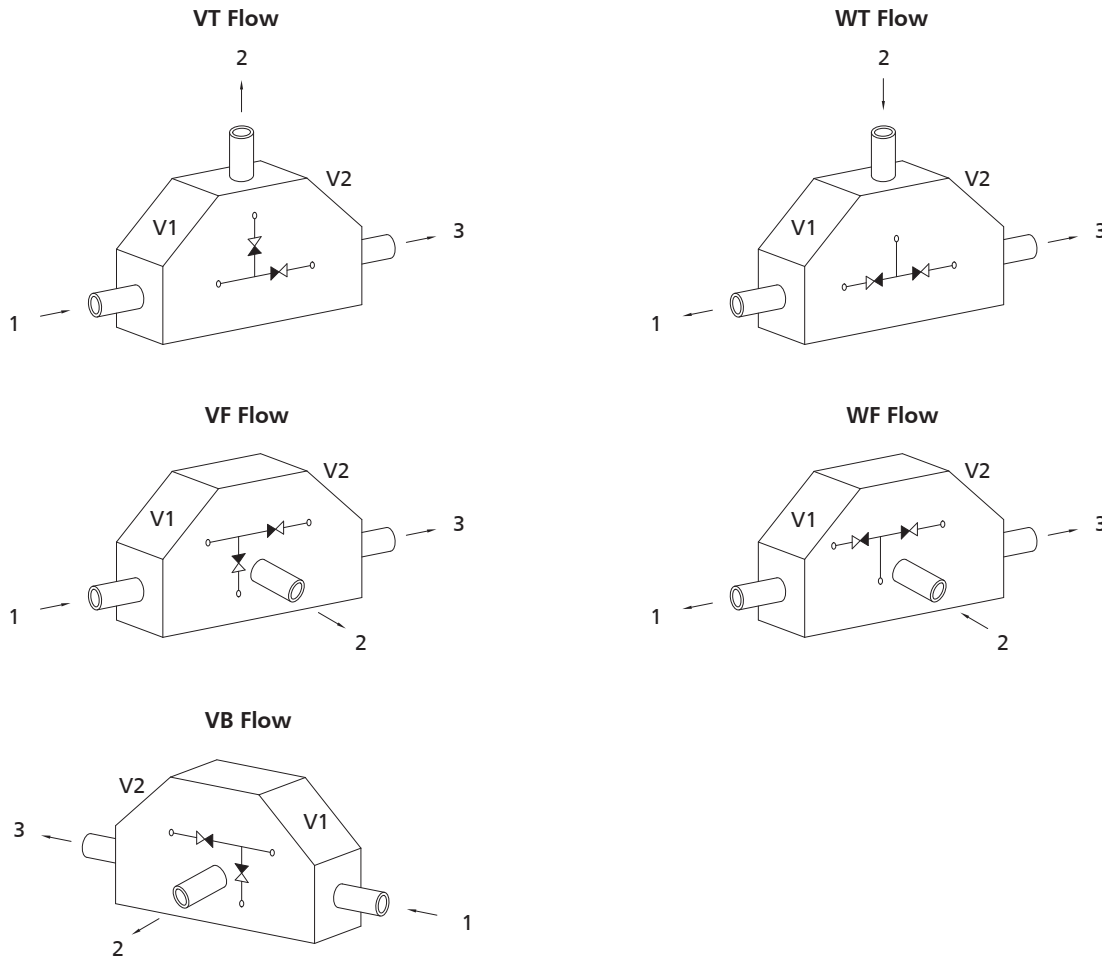
### Dimensions

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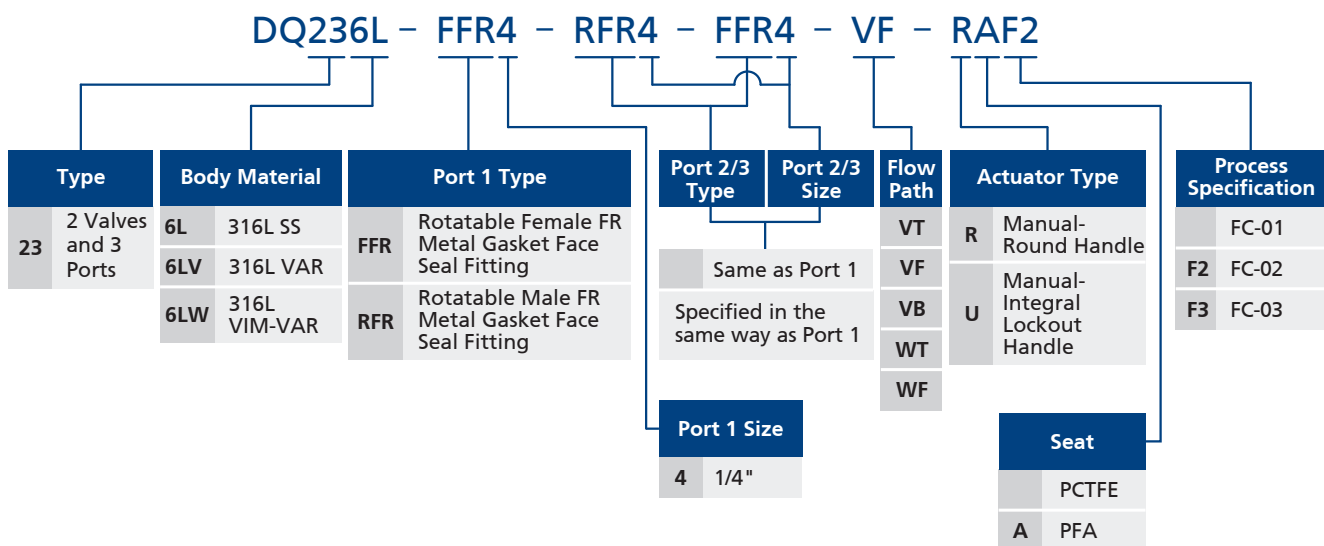


| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |              |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|--------------|
|                       |                                                         | A                   | B           | C           | D           | L            |
| DQ23□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 2.12 (53.8) | —           | 4.24 (107.6) |
| DQ23□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | —           | 1.37 (34.8) | 4.24 (107.6) |
| DQ23□□-RFR4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 2.12 (53.8) | —           | 4.24 (107.6) |
| DQ23□□-RFR4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | —           | 1.37 (34.8) | 4.24 (107.6) |

Flow Paths



Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

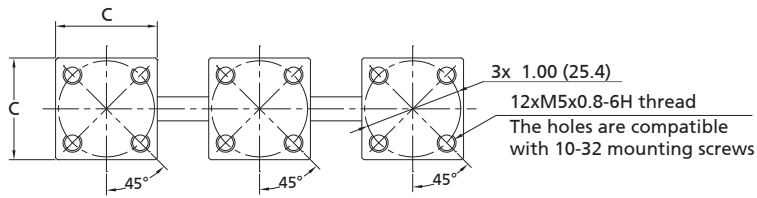
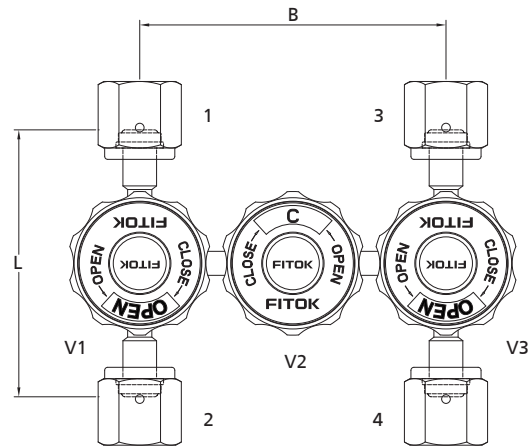
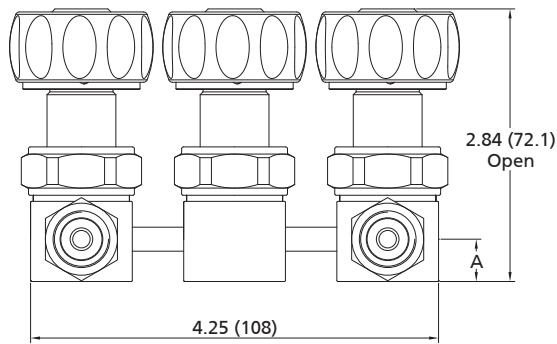
Process Specification



### 3-Valve 4-Way Block Type

#### Dimensions

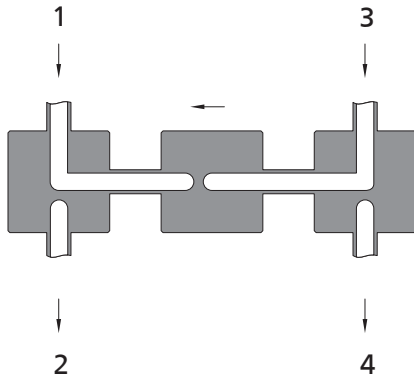
Dimensions, in inches (millimeters), are for reference only.



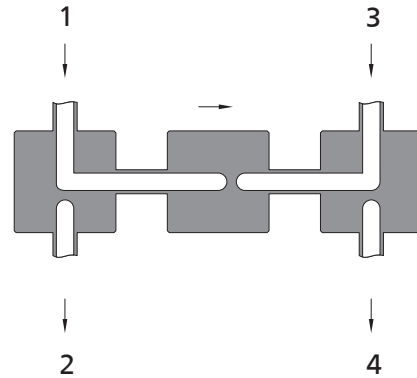
| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DQ34□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 3.19 (81.0) | 1.06 (26.9) | 2.78 (70.6) |
| DQ34□□-RFR4-          | Rotatable Male FR Metal Gasket Face Seal Fitting        | 0.44 (11.2)         | 3.19 (81.0) | 1.06 (26.9) | 2.78 (70.6) |

**Flow Paths**

© Flow paths as viewed from the top



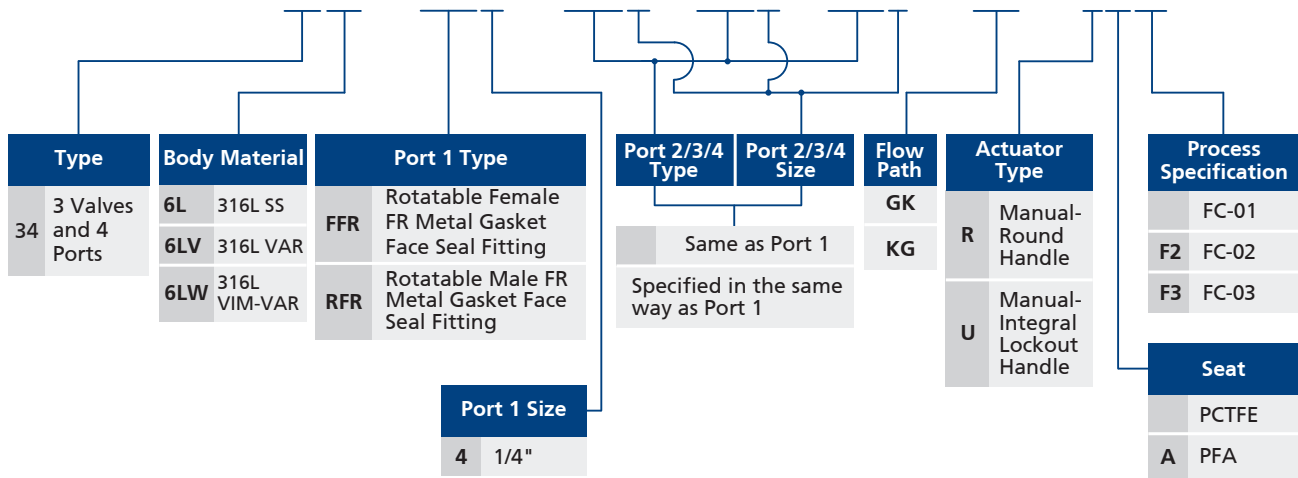
GK Flow



KG Flow

**Ordering Number Description**

**DQ346L - FFR4 - RFR4 - FFR4 - FFR4 - GK - RAF3**



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## Low Pressure Pneumatic Diaphragm Valves DP Series

### Features

- ⦿ Minimum particle generation and dead space
- ⦿ Fully contained seat to provide excellent resistance to swelling and contamination
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ Long cycle life with high speed actuation
- ⦿ Internally threadless and springless
- ⦿ Fully functional under vacuum conditions
- ⦿ Position sensors available assembled on normally closed pneumatically actuated valves



### Technical Data

|                                       |                                                                       |                                                |
|---------------------------------------|-----------------------------------------------------------------------|------------------------------------------------|
| Port Size                             | 1/4" to 3/8" or 6 mm to 8 mm                                          |                                                |
| Flow Coefficient (Cv)                 | 0.27                                                                  |                                                |
| Orifice Size                          | 0.16 in. (4.1 mm)                                                     |                                                |
| Max. Working Pressure                 | 250 psig (17.2 bar)                                                   |                                                |
| Pneumatic Actuator Operating Pressure | 60 to 90 psig (4.2 to 6.2 bar)                                        |                                                |
| Temperature                           | PCTFE: -10 ~ 176 °F (-23 ~ 80 °C)<br>PFA: -10 ~ 302 °F (-23 ~ 150 °C) |                                                |
| Leak Rate (Helium)                    | Internal                                                              | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                                       | External                                                              | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |

### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|----------------------------------------|-------------|---------------|
| 10 (0.68)                              | 86          | 3.2           |
| 50 (3.4)                               | 230         | 7.2           |
| 100 (6.8)                              | 410         | 10.2          |

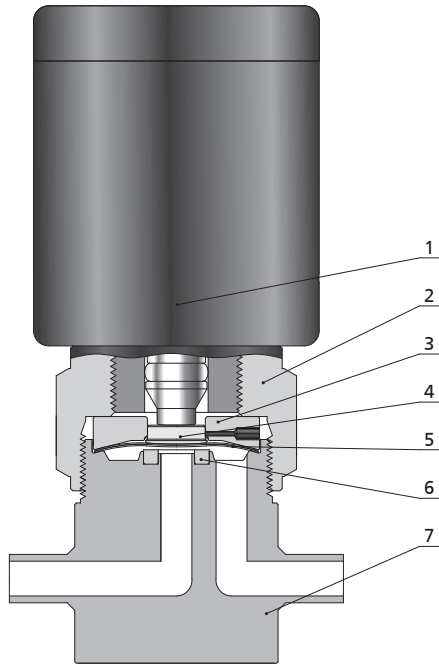
### Process Specification

| Technology               | Standard Cleaning and Packaging (FC-01)                         | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|--------------------------|-----------------------------------------------------------------|----------------------------------------|---------------------------|
| Material/Specification   | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR /SEMI F20 |                                        |                           |
| Wetted Surface Roughness | Ra 10 μin. (0.25 μm) <sup>①</sup>                               |                                        | Ra 5 μin. (0.13 μm)       |
| Polishing Process        | Machine finished <sup>①</sup>                                   |                                        | Electropolished           |

① For valves with FR connections and tube butt connections, the standard polishing process is electropolishing and the internal surface roughness is finished to an average of Ra 5 μin. (0.13 μm)

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



Normally Closed Pneumatic Model

| Item | Component     | Material/Specification                                         |
|------|---------------|----------------------------------------------------------------|
| 1    | Actuator      | Aluminum                                                       |
| 2    | Bonnet Nut    | 316 SS/ASTM A479                                               |
| 3    | Bonnet        | S17400/ASTM A564                                               |
| 4    | Button        | 316 SS/ASTM A479                                               |
| 5    | Diaphragm (2) | Cobalt Alloy/AMS 5876                                          |
| 6    | Seat          | PCTFE/ASTM D1430 or PFA/ASTM D3307                             |
| 7    | Body          | 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 |

## Pneumatic Actuators

- ☉ Normally open, "N.O." marked on the top of the actuator
- ☉ Normally closed, "N.C." marked on the top of the actuator

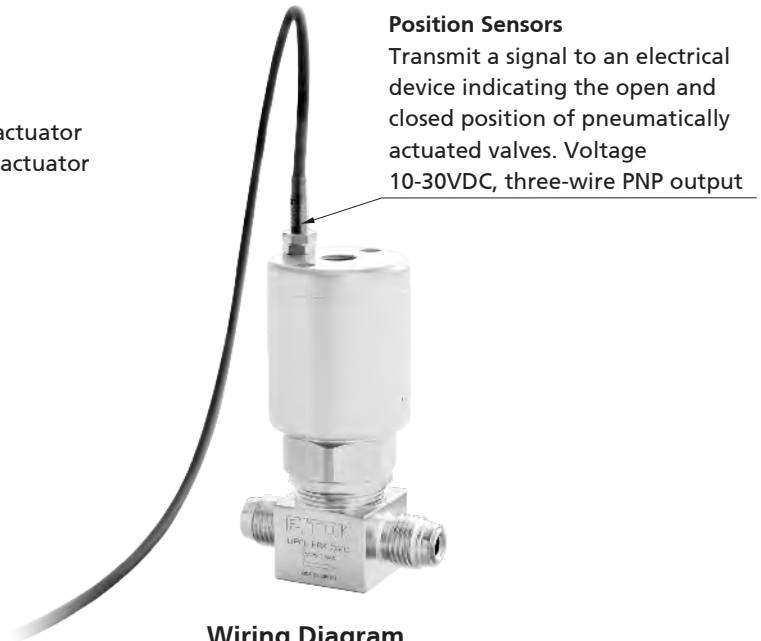


### Position Sensors

Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

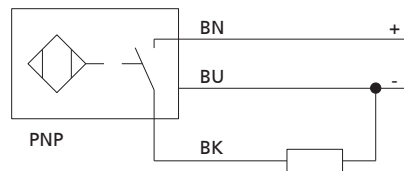
### Sensor Technical Data

|                     |                                  |
|---------------------|----------------------------------|
| Output              | 3-wire V (dc), PNP               |
| Output Function     | Normally open or normally closed |
| Voltage             | 10 ~ 30 V (dc)                   |
| Working Temperature | -13 ~ 158 °F (-25 ~ 70 °C)       |

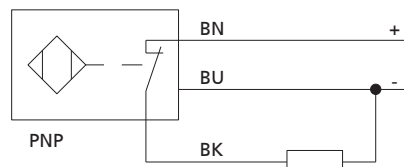


### Wiring Diagram

Normally open position sensors



Normally closed position sensors

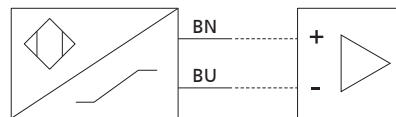


### Explosion-proof Position Sensors

Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

### Wiring Diagram



### Technical Information

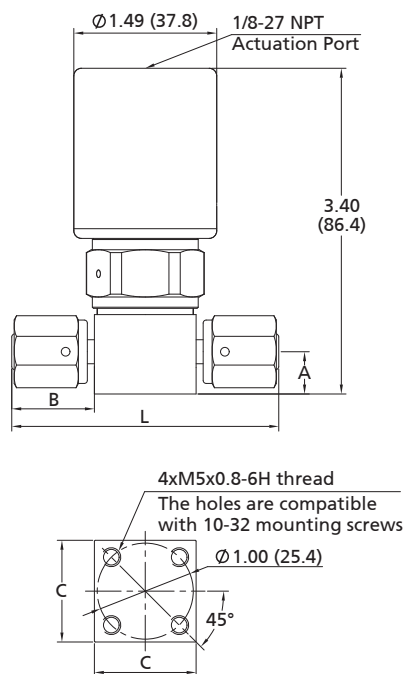
|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

## Dimensions and Ordering Information

### Straight Type

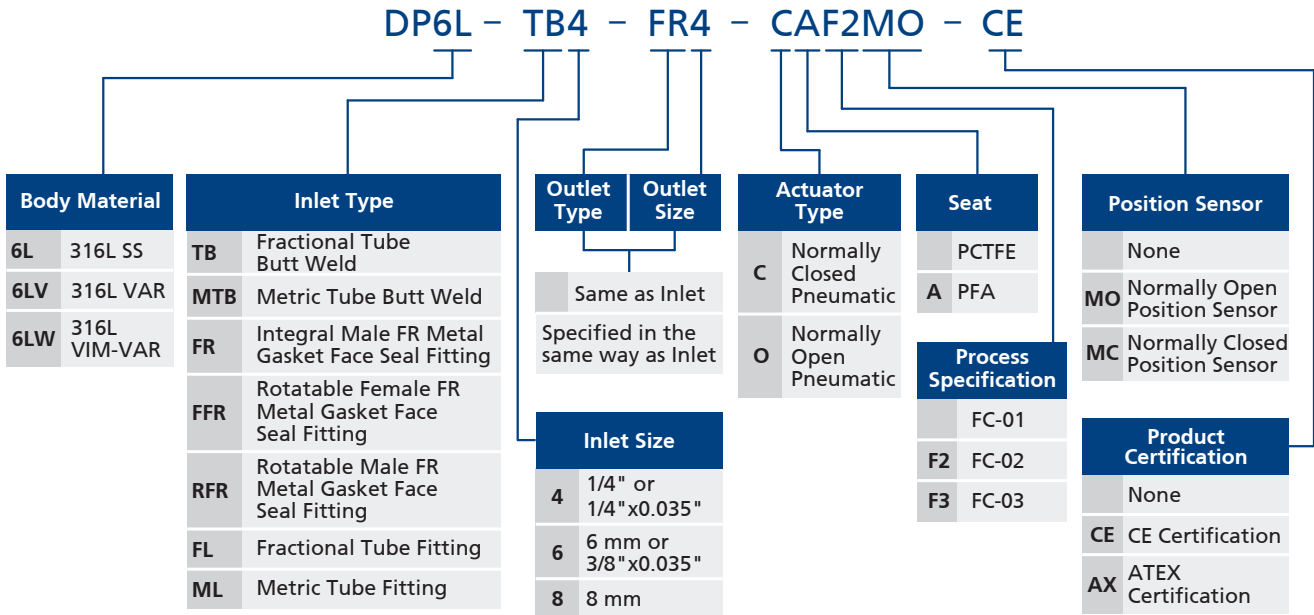
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DP□□-TB4-             | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DP□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DP□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DP□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DP□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 2.30 (58.4) |

Ordering Number Description



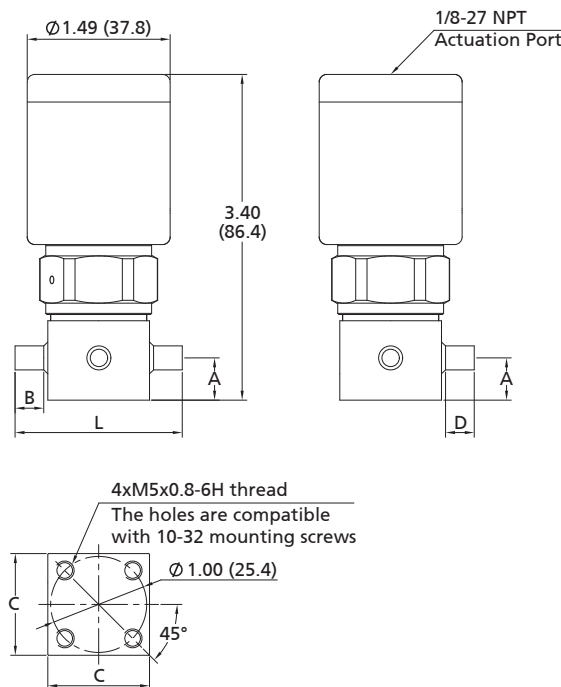
Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Branch Type

Dimensions

Dimensions, in inches (millimeters), are for reference only.



# V-24 Diaphragm Valves

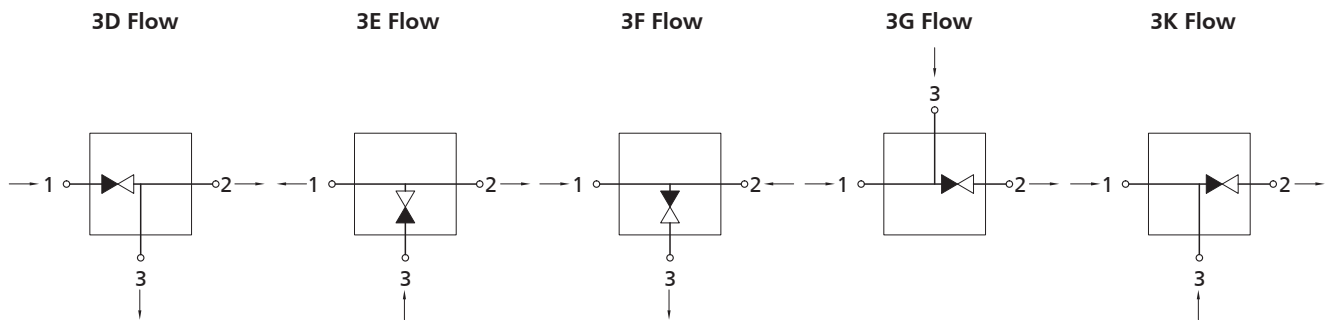
Fittings

| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | D           | L           |
| DP□□-TB4-             | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 0.30 (7.6)  | 1.74 (44.2) |
| DP□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 0.26 (6.6)  | 1.74 (44.2) |
| DP□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 0.86 (21.8) | 2.78 (70.6) |
| DP□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 0.86 (21.8) | 2.78 (70.6) |
| DP□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 0.62 (15.7) | 2.30 (58.4) |

Valves

## Flow Paths

☉ Flow paths as viewed from the top



Pressure Gauges

## Ordering Number Description

**DP6L - TB4 - FR4 - FFR4 - 3G - CAF2MO - CE**

| Body Material |              | Port 1 Type |                                                    | Port 2/3 Type  | Port 2/3 Size                       | Actuator Type |                           | Process Specification |    | Position Sensor               |    | Product Certification           |                    |
|---------------|--------------|-------------|----------------------------------------------------|----------------|-------------------------------------|---------------|---------------------------|-----------------------|----|-------------------------------|----|---------------------------------|--------------------|
| 6L            | 316L SS      | TB          | Fractional Tube Butt Weld                          | Same as Port 1 | Specified in the same way as Port 1 | C             | Normally Closed Pneumatic | FC-01                 | MO | Normally Open Position Sensor | MC | Normally Closed Position Sensor | None               |
| 6LV           | 316L VAR     | MTB         | Metric Tube Butt Weld                              |                |                                     | O             | Normally Open Pneumatic   | F2                    |    |                               |    |                                 | FC-02              |
| 6LW           | 316L VIM-VAR | FR          | Integral Male FR Metal Gasket Face Seal Fitting    | A              | PFA                                 | F3            | FC-03                     | AX                    |    |                               |    |                                 | ATEX Certification |
|               |              | FFR         | Rotatable Female FR Metal Gasket Face Seal Fitting |                |                                     |               |                           |                       |    |                               |    |                                 |                    |
|               |              | RFR         | Rotatable Male FR Metal Gasket Face Seal Fitting   |                |                                     |               |                           |                       |    |                               |    |                                 |                    |
|               |              | FL          | Fractional Tube Fitting                            |                |                                     |               |                           |                       |    |                               |    |                                 |                    |
|               |              | ML          | Metric Tube Fitting                                |                |                                     |               |                           |                       |    |                               |    |                                 |                    |
|               |              |             |                                                    | Port 1 Size    | Flow Path                           |               |                           |                       |    |                               |    |                                 |                    |
|               |              |             |                                                    | 4              | 1/4" or 1/4"x0.035"                 | 3D            |                           |                       |    |                               |    |                                 |                    |
|               |              |             |                                                    | 6              | 6 mm or 3/8"x0.035"                 | 3E            |                           |                       |    |                               |    |                                 |                    |
|               |              |             |                                                    | 8              | 8 mm                                | 3F            |                           |                       |    |                               |    |                                 |                    |
|               |              |             |                                                    |                |                                     | 3G            |                           |                       |    |                               |    |                                 |                    |
|               |              |             |                                                    |                |                                     | 3K            |                           |                       |    |                               |    |                                 |                    |

Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

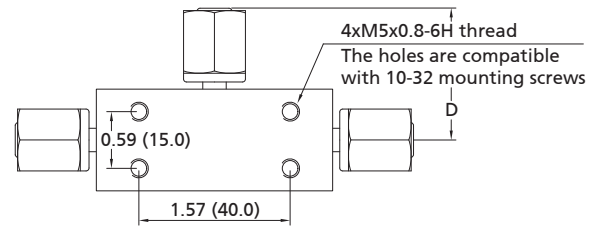
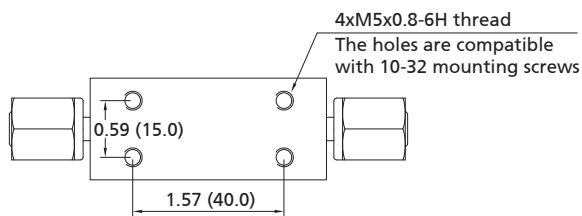
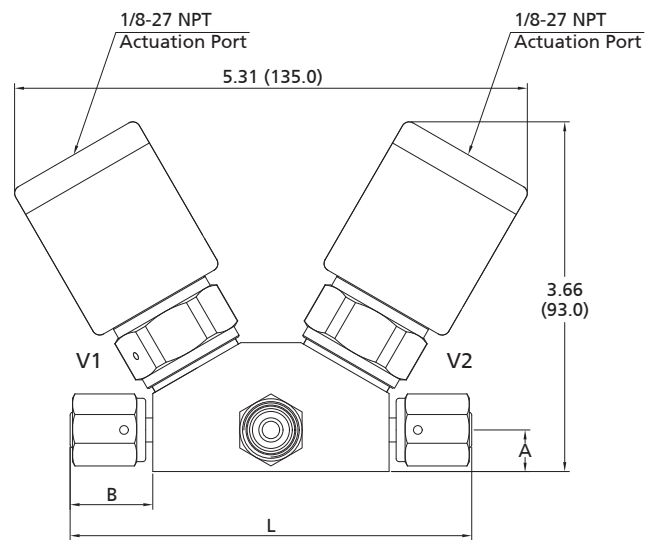
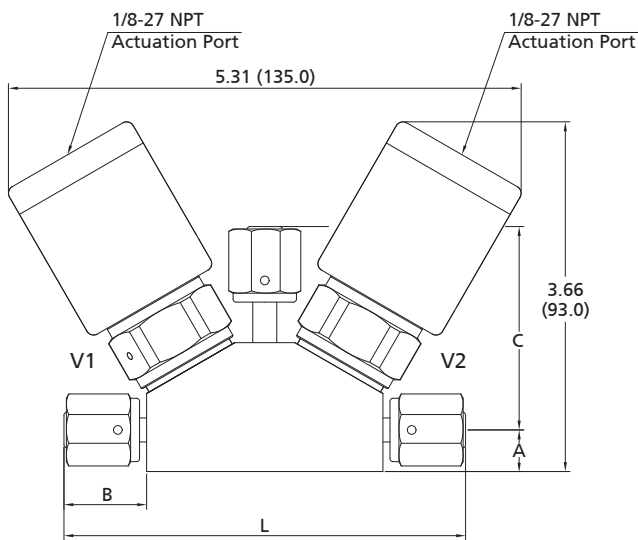
Integrated Systems and Others

Process Specification

## 2-Valve 3-Way Block Type

### Dimensions

Dimensions, in inches (millimeters), are for reference only.

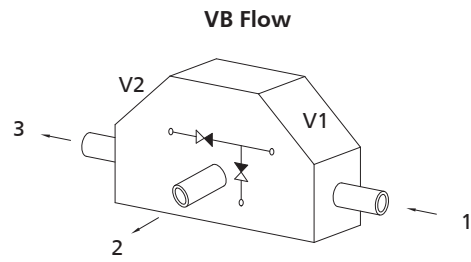
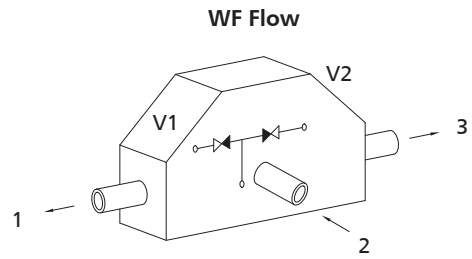
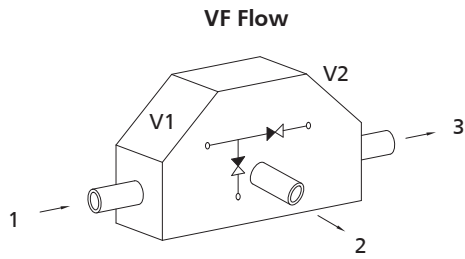
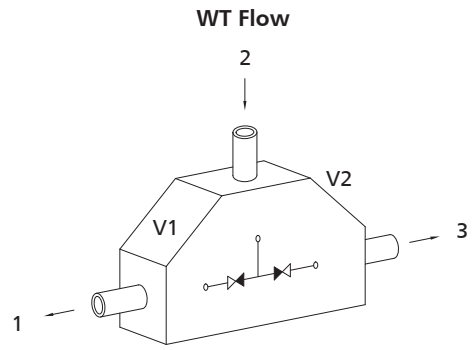
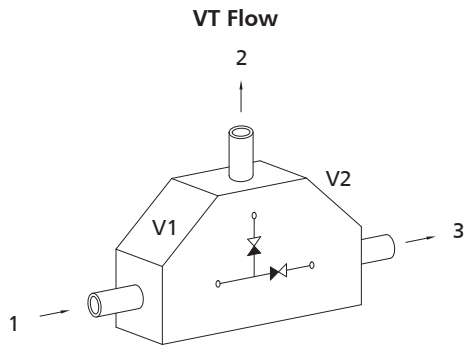


| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |              |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|--------------|
|                       |                                                         | A                   | B           | C           | D           | L            |
| DP23□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 2.12 (53.8) | —           | 4.24 (107.6) |
| DP23□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | —           | 1.37 (34.8) | 4.24 (107.6) |
| DP23□□-RFR4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 2.12 (53.8) | —           | 4.24 (107.6) |
| DP23□□-RFR4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | —           | 1.37 (34.8) | 4.24 (107.6) |



# V-26 Diaphragm Valves

## Flow Paths



Fittings

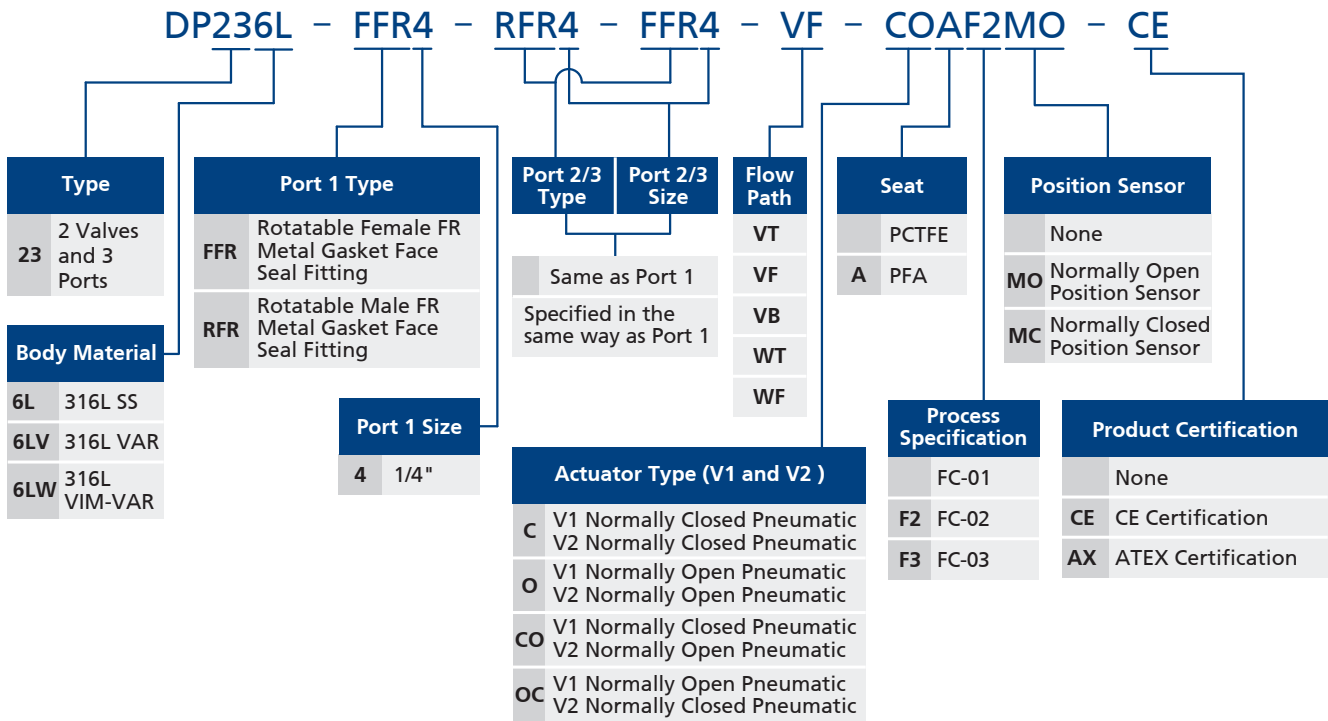
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

Ordering Number Description



Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

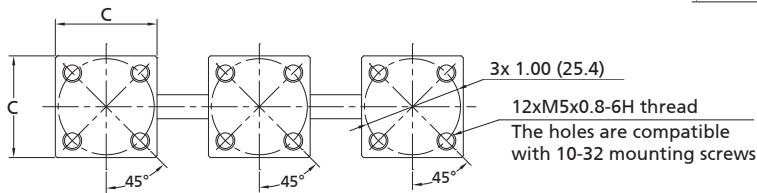
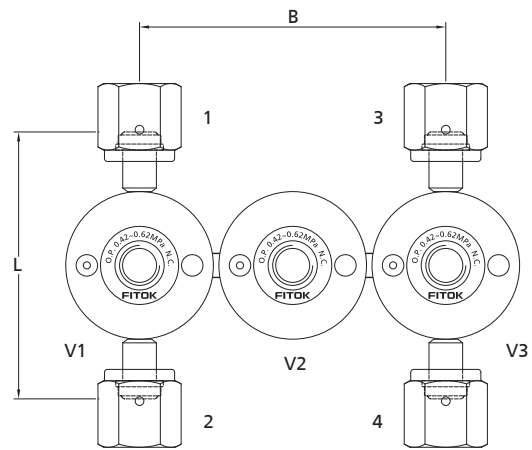
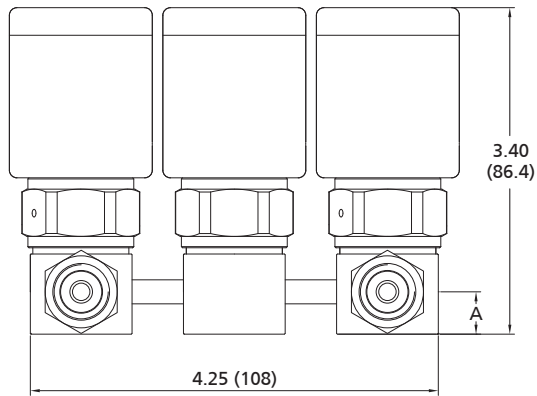
Integrated Systems and Others

Process Specification

### 3-Valve 4-Way Block Type

#### Dimensions

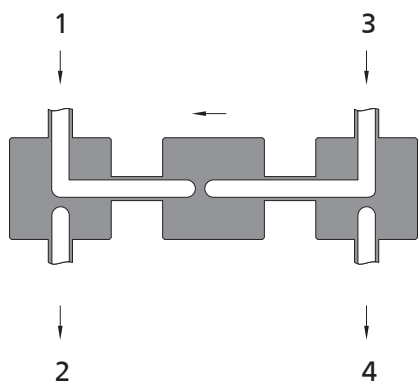
Dimensions, in inches (millimeters), are for reference only.



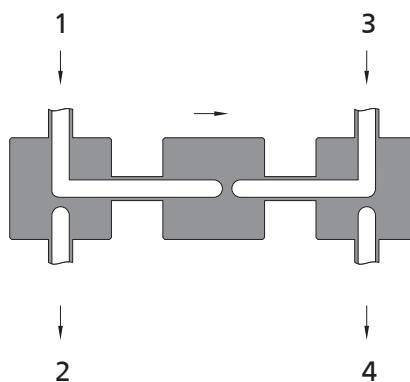
| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DP34□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 3.19 (81.0) | 1.06 (26.9) | 2.78 (70.6) |
| DP34□□-RFR4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 3.19 (81.0) | 1.06 (26.9) | 2.78 (70.6) |

**Flow Paths**

☉ Flow paths as viewed from the top



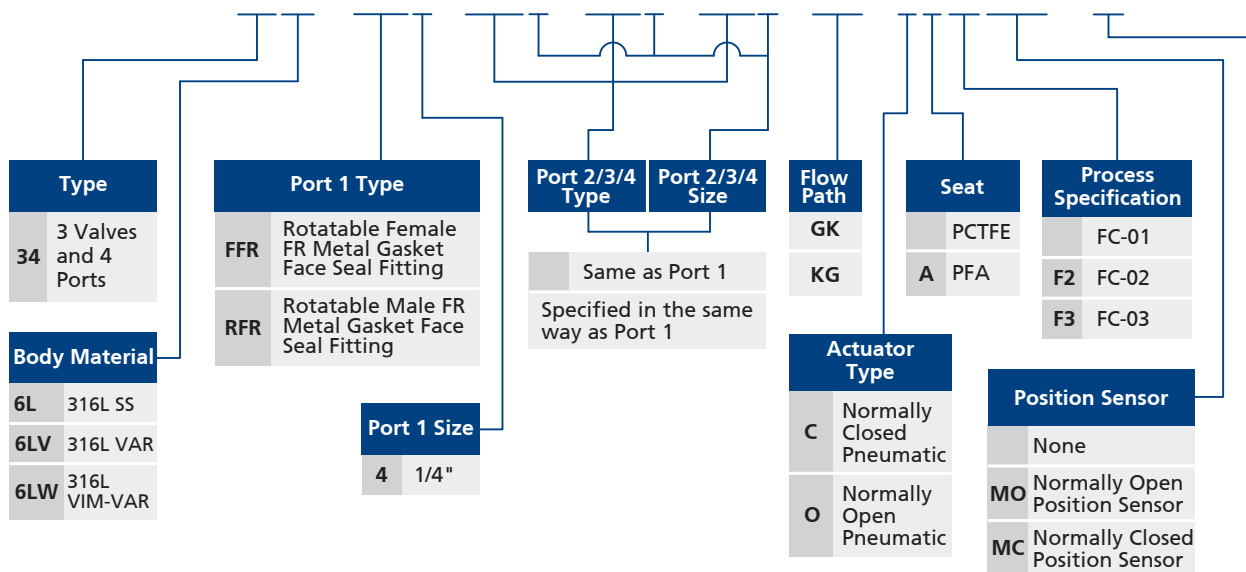
GK Flow



KG Flow

**Ordering Number Description**

**DP346L - FFR4 - RFR4 - FFR4 - FFR4 - GK - CAF3MO - CE**



**Note:**

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
3. For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

| Product Certification |                    |
|-----------------------|--------------------|
|                       | None               |
| CE                    | CE Certification   |
| AX                    | ATEX Certification |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## High Pressure Springless Diaphragm Valves DH Series

### Features

- ⦿ Metal-to-metal diaphragm seal
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ Long cycle life in high pressure applications
- ⦿ Manual and pneumatic actuators available
- ⦿ Position sensors available assembled on pneumatically actuated valves
- ⦿ Normally open and normally closed position sensors optional



### Technical Data

|                                              |                                                                        |                                             |
|----------------------------------------------|------------------------------------------------------------------------|---------------------------------------------|
| <b>Port Size</b>                             | 1/4" to 3/8" or 6 mm to 8 mm                                           |                                             |
| <b>Flow Coefficient (Cv)</b>                 | 0.20                                                                   |                                             |
| <b>Orifice Size</b>                          | 0.16 in. (4.1 mm)                                                      |                                             |
| <b>Max. Working Pressure</b>                 | 3000 psig (206 bar)                                                    |                                             |
| <b>Pneumatic Actuator Operating Pressure</b> | 60 to 90 psig (4.2 to 6.2 bar)                                         |                                             |
| <b>Temperature</b>                           | PCTFE: -10 ~ 150 °F (-23 ~ 65 °C)<br>VESPEL: 50 ~ 300 °F (10 ~ 150 °C) |                                             |
| <b>Leak Rate (Helium)</b>                    | <b>Internal</b>                                                        | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s |
|                                              | <b>External</b>                                                        | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s |

### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere<br>psig (bar) | Air<br>(l/min) | Water<br>(l/min) |
|-------------------------------------------|----------------|------------------|
| 10 (0.68)                                 | 64             | 2.4              |
| 50 (3.4)                                  | 170            | 5.4              |
| 100 (6.8)                                 | 300            | 7.6              |

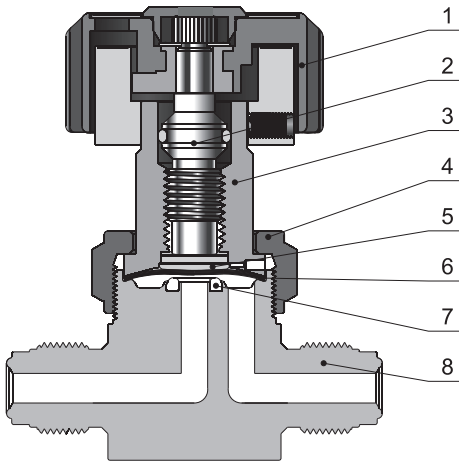
### Process Specification

| Technology                      | Standard Cleaning and Packaging (FC-01)                         | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|---------------------------------|-----------------------------------------------------------------|----------------------------------------|---------------------------|
| <b>Material/Specification</b>   | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR /SEMI F20 |                                        |                           |
| <b>Wetted Surface Roughness</b> | Ra 10 µin. (0.25 µm) <sup>①</sup>                               |                                        | Ra 5 µin. (0.13 µm)       |
| <b>Polishing Process</b>        | Machine finished <sup>①</sup>                                   |                                        | Electropolished           |

① For valves with FR connections and tube butt connections, the standard polishing process is electropolishing and the internal surface roughness is finished to an average of Ra 5 µin. (0.13 µm).

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



Manual Model

| Item | Component     | Material/Specification                                         |
|------|---------------|----------------------------------------------------------------|
| 1    | Handle        | ABS                                                            |
| 2    | Stem          | 316 SS/ASTM A479                                               |
| 3    | Bonnet        | S17400/ASTM A564                                               |
| 4    | Bonnet Nut    | 316 SS/ASTM A479                                               |
| 5    | Button        | 316 SS/ASTM A479                                               |
| 6    | Diaphragm (5) | Cobalt Alloy (3)/AMS 5876 + C17200 (2)/ASTM B194               |
| 7    | Seat          | PCTFE/ASTM D1430 or Vespel                                     |
| 8    | Body          | 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 |

## Actuators

### Manual - Round Handle

- ⦿ Quick, quarter-turn actuation
- ⦿ Handle with window to visually indicate open and closed states



### Pneumatic

- ⦿ Normally open, "N.O." marked on the top of the actuator
- ⦿ Normally closed, "N.C." marked on the top of the actuator



### Position Sensors

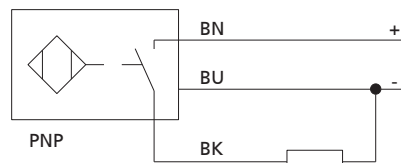
Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

### Sensor Technical Data

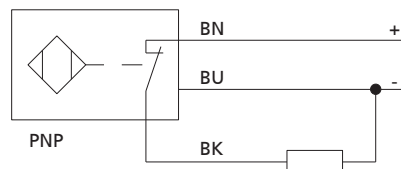
|                            |                                  |
|----------------------------|----------------------------------|
| <b>Output</b>              | 3-wire V (dc), PNP               |
| <b>Output Function</b>     | Normally open or normally closed |
| <b>Voltage</b>             | 10 ~ 30 V (dc)                   |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

### Wiring Diagram

Normally open position sensors



Normally closed position sensors

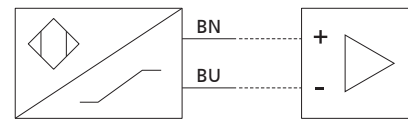


**Explosion-proof Position Sensors**

Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

**Wiring Diagram**



**Technical Information**

|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

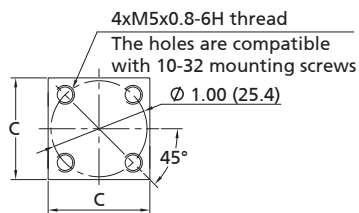
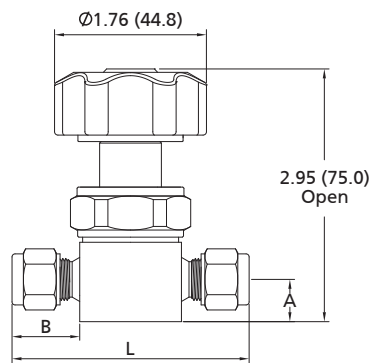
**Dimensions and Ordering Information**

**Straight Type**

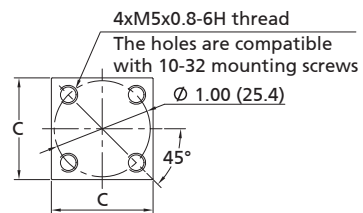
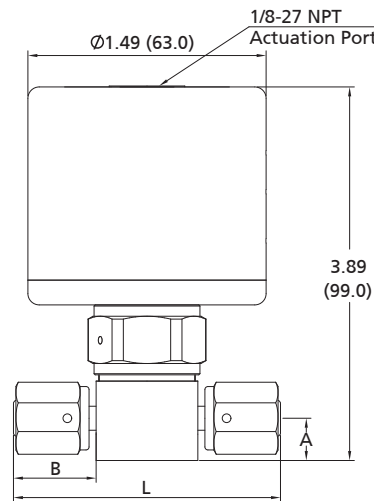
**Dimensions**

Dimensions, in inches (millimeters), are for reference only.

**Manual - Round Handle**



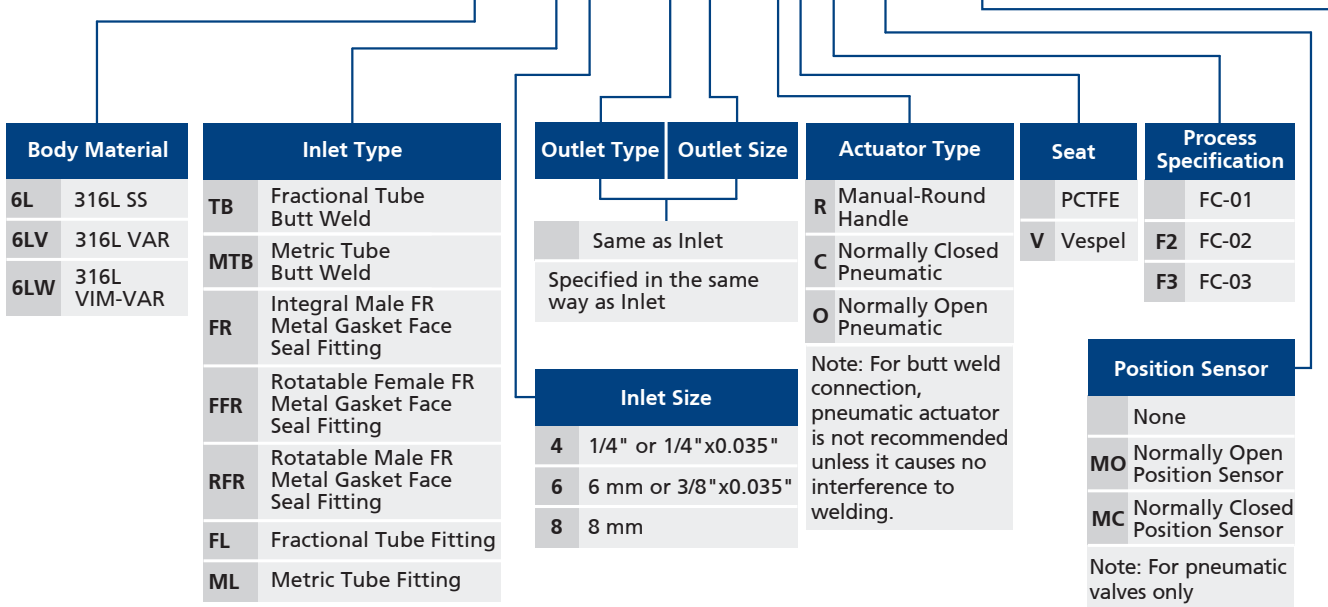
**Pneumatic**



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DH□□-TB4-             | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DH□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DH□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DH□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DH□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 2.30 (58.4) |
| DH□□-ML6-             | 6 mm FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.9) | 1.06 (26.9) | 2.47 (62.7) |

Ordering Number Description

DH6L - FL4 - ML6 - CVF2MO - CE



Note:

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
3. For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

| Product Certification |                                         |
|-----------------------|-----------------------------------------|
|                       | None                                    |
| CE                    | CE Certification (For Pneumatic only)   |
| AX                    | ATEX Certification (For Pneumatic only) |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

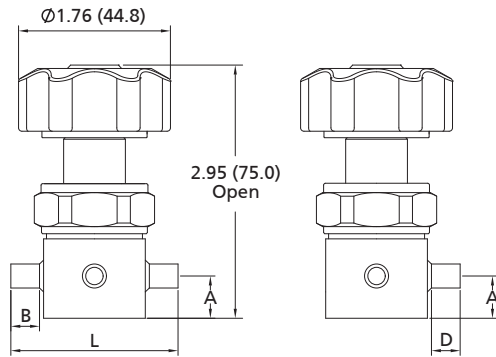


## Branch Type

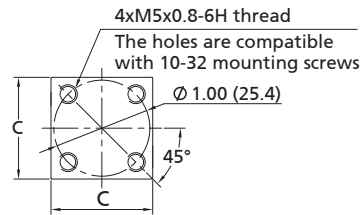
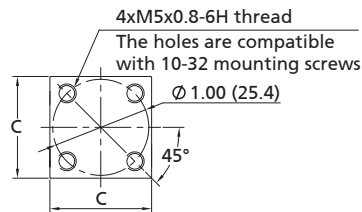
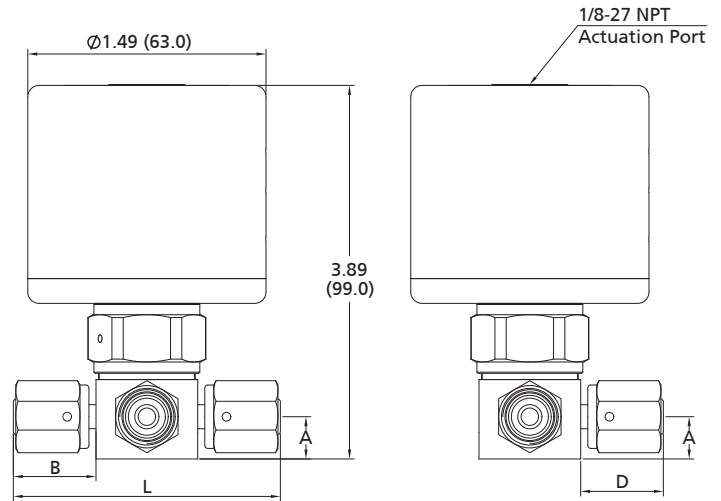
### Dimensions

Dimensions, in inches (millimeters), are for reference only.

Manual - Round Handle



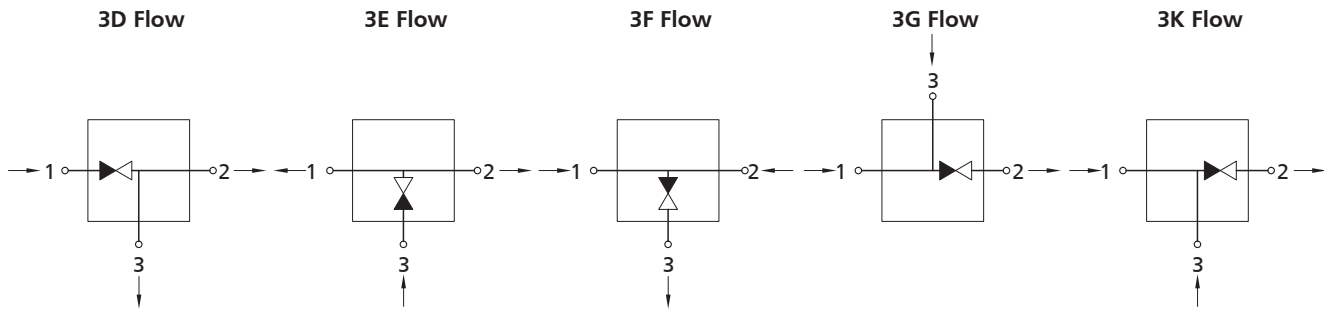
Pneumatic



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | D           | L           |
| DH□□-TB4-             | 1/4" x 0.035" Tube Butt Weld                            | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 0.30 (7.6)  | 1.74 (44.2) |
| DH□□-TB6-             | 3/8" x 0.035" Tube Butt Weld                            | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 0.26 (6.6)  | 1.74 (44.2) |
| DH□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 0.86 (21.8) | 2.78 (70.6) |
| DH□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 0.86 (21.8) | 1.06 (26.9) | 0.86 (21.8) | 2.78 (70.6) |
| DH□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 0.62 (15.7) | 2.30 (58.4) |
| DH□□-FL4-             | 1/4" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.9) | 1.06 (26.9) | 0.70 (17.9) | 2.47 (62.7) |

**Flow Paths**

© Flow paths as viewed from the top



**Ordering Number Description**

DH6L - TB4 - TB4 - FR4 - 3F - CVF2MO - CE

| Body Material |                                                    | Port 1 Size |                     | Port 2/3 Type  | Port 2/3 Size                       | Actuator Type                                                                                                      |                           | Seat                                                          |  | Position Sensor                         |                                 |
|---------------|----------------------------------------------------|-------------|---------------------|----------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------|--|-----------------------------------------|---------------------------------|
| 6L            | 316L SS                                            | 4           | 1/4" or 1/4"x0.035" | Same as Port 1 | Specified in the same way as Port 1 | R                                                                                                                  | Manual-Round Handle       | PCTFE                                                         |  | None                                    |                                 |
| 6LV           | 316L VAR                                           | 6           | 6 mm or 3/8"x0.035" |                |                                     | C                                                                                                                  | Normally Closed Pneumatic | V Vespel                                                      |  | MO                                      | Normally Open Position Sensor   |
| 6LW           | 316L VIM-VAR                                       | 8           | 8 mm                |                |                                     | O                                                                                                                  | Normally Open Pneumatic   | <b>Process Specification</b><br>FC-01<br>F2 FC-02<br>F3 FC-03 |  | MC                                      | Normally Closed Position Sensor |
|               |                                                    |             |                     |                |                                     | Note: For butt weld connection, pneumatic actuator is not recommended unless it causes no interference to welding. |                           |                                                               |  | Note: For pneumatic valves only         |                                 |
| Port 1 Type   |                                                    |             |                     |                |                                     | Flow Path                                                                                                          |                           |                                                               |  | Product Certification                   |                                 |
| TB            | Fractional Tube Butt Weld                          |             |                     |                |                                     | 3D                                                                                                                 |                           |                                                               |  | None                                    |                                 |
| MTB           | Metric Tube Butt Weld                              |             |                     |                |                                     | 3E                                                                                                                 |                           |                                                               |  | CE Certification (For Pneumatic only)   |                                 |
| FR            | Integral Male FR Metal Gasket Face Seal Fitting    |             |                     |                |                                     | 3F                                                                                                                 |                           |                                                               |  | ATEX Certification (For Pneumatic only) |                                 |
| FFR           | Rotatable Female FR Metal Gasket Face Seal Fitting |             |                     |                |                                     | 3G                                                                                                                 |                           |                                                               |  |                                         |                                 |
| RFR           | Rotatable Male FR Metal Gasket Face Seal Fitting   |             |                     |                |                                     | 3K                                                                                                                 |                           |                                                               |  |                                         |                                 |
| FL            | Fractional Tube Fitting                            |             |                     |                |                                     |                                                                                                                    |                           |                                                               |  |                                         |                                 |
| ML            | Metric Tube Fitting                                |             |                     |                |                                     |                                                                                                                    |                           |                                                               |  |                                         |                                 |

Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## High Pressure Spring Diaphragm Valves DM Series

### Features

- ⊙ All-metal containment, packless
- ⊙ Repetitive shutoff with fully contained soft-seat stem tip
- ⊙ Position indicator ring for lever handle indicates open and closed states
- ⊙ Reduced seat volume
- ⊙ Fully functional under vacuum conditions
- ⊙ Different manual and pneumatic actuators available
- ⊙ Position sensors available assembled on pneumatically actuated valves
- ⊙ Normally open and normally closed position sensors optional



### Technical Data

|                                                    |                           |                                                                             |
|----------------------------------------------------|---------------------------|-----------------------------------------------------------------------------|
| <b>Port Size</b>                                   |                           | 1/4" to 3/8" or 6 mm to 8 mm                                                |
| <b>Flow Coefficient (Cv)</b>                       | <b>Lever Handle</b>       | 0.14                                                                        |
|                                                    | <b>Round Handle</b>       | 0.30                                                                        |
|                                                    | <b>Pneumatic Actuator</b> | 0.20                                                                        |
| <b>Orifice Size</b>                                |                           | 0.16 in. (4.1 mm)                                                           |
| <b>Max. Working Pressure</b>                       |                           | 3500 psig (241 bar)                                                         |
| <b>Max. Differential Back Pressure<sup>①</sup></b> |                           | 1500 psig (103 bar)                                                         |
| <b>Pneumatic Actuator Operating Pressure</b>       |                           | 60 to 90 psig (4.2 to 6.2 bar)                                              |
| <b>Temperature</b>                                 |                           | PCTFE: -100 ~ 250 °F (-73 ~ 121 °C)<br>Vespel: -100 ~ 320 °F (-73 ~ 160 °C) |
| <b>Leak Rate (Helium)</b>                          | <b>Internal</b>           | ≤4x10 <sup>-9</sup> std cm <sup>3</sup> /s                                  |
|                                                    | <b>External</b>           | ≤4x10 <sup>-9</sup> std cm <sup>3</sup> /s                                  |

- ① Differential back pressure is equal to the outlet pressure minus the inlet pressure. When the differential back pressure is greater than 1500 psig (103 bar), the valve will not open even being loosen after tightening the handle. As the force of the differential back pressure acting on the valve stem is downward when closing and is greater than the spring force, the valve stem cannot be lifted. A17-7 SS spring can be used to increase the max. differential back pressure to 2500 psig (172 bar). To order, please contact FITOK Group or our authorized distributors.

### Flow Data

Air @ 70 °F (21 °C)

Water @ 60 °F (16 °C)

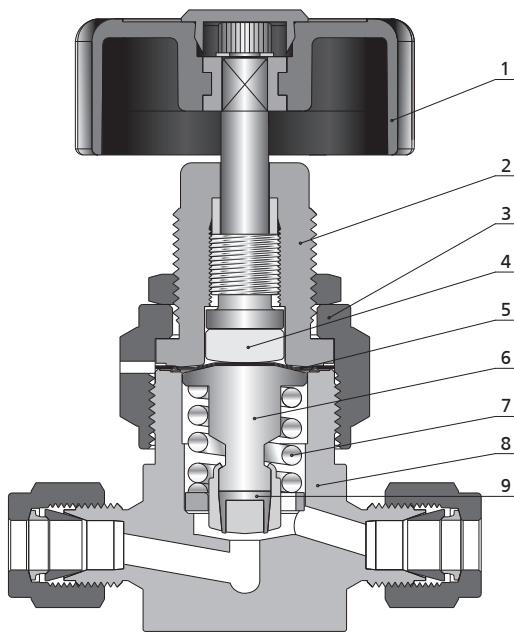
| Pressure Drop to Atmosphere psig (bar) | Lever Handle |               | Round Handle |               | Pneumatic Actuator |               |
|----------------------------------------|--------------|---------------|--------------|---------------|--------------------|---------------|
|                                        | Air (l/min)  | Water (l/min) | Air (l/min)  | Water (l/min) | Air (l/min)        | Water (l/min) |
| 10 (0.68)                              | 49           | 1.6           | 100          | 3.5           | 64                 | 2.4           |
| 50 (3.4)                               | 130          | 3.9           | 270          | 8.0           | 170                | 5.4           |
| 100 (6.8)                              | 240          | 5.4           | 490          | 11.4          | 300                | 7.6           |

## Process Specification

| Technology               | Standard Cleaning and Packaging (FC-01) | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|--------------------------|-----------------------------------------|----------------------------------------|---------------------------|
| Material/Specification   | 316 SS/ASTM A479 or 316L SS/SEMI F20    |                                        | 316L SS/SEMI F20          |
| Wetted Surface Roughness | Ra 20 µin. (0.51 µm)                    |                                        | Ra 10 µin. (0.25 µm)      |
| Polishing Process        | Machine finished                        |                                        | Electropolished           |

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



Round Handle Model

| Item | Component     | Material/Specification               |
|------|---------------|--------------------------------------|
| 1    | Handle        | Aluminum                             |
| 2    | Bonnet        | 316 SS/ASTM A479                     |
| 3    | Bonnet Nut    | 316 SS/ASTM A479                     |
| 4    | Button        | C36000/ASTM B16                      |
| 5    | Diaphragm (3) | Cobalt Alloy/AMS 5876                |
| 6    | Stem          | 316L SS/SEMI F20                     |
| 7    | Spring        | 316 SS/ASTM A313                     |
| 8    | Body          | 316 SS/ASTM A479 or 316L SS/SEMI F20 |
| 9    | Seat          | PCTFE/ASTM D1430 or Vespel           |

## Actuators

### Manual - Lever Handle

- Quick, quarter-turn actuation
- Position indicator ring to visually indicate open and closed states



### Manual - Round Handle

- One and a half turns to operate from fully open to closed



### Pneumatic

- Normally open, "N.O." marked on the top of the actuator
- Normally closed, "N.C." marked on the top of the actuator



### Position Sensors

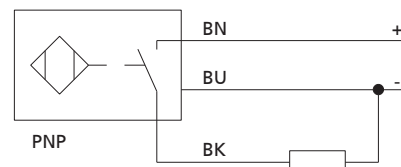
Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

#### Sensor Technical Data

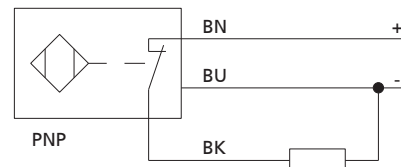
|                            |                                  |
|----------------------------|----------------------------------|
| <b>Output</b>              | 3-wire V (dc), PNP               |
| <b>Output Function</b>     | Normally open or normally closed |
| <b>Voltage</b>             | 10 ~ 30 V (dc)                   |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

#### Wiring Diagram

Normally open position sensors



Normally closed position sensors

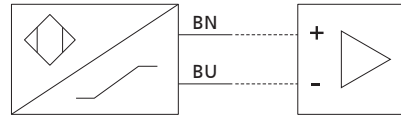


### Explosion-proof Position Sensors

Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

### Wiring Diagram



### Technical Information

|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

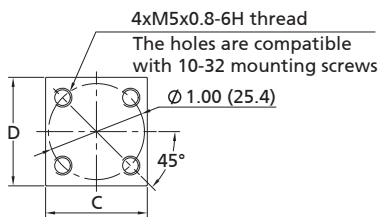
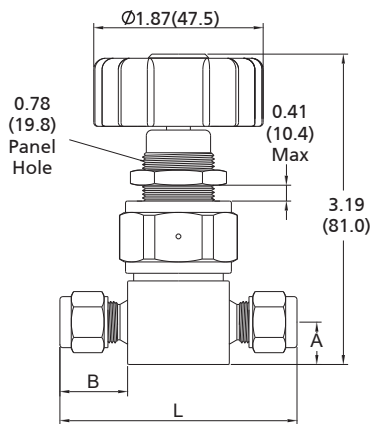
## Dimensions and Ordering Information

### Straight Type

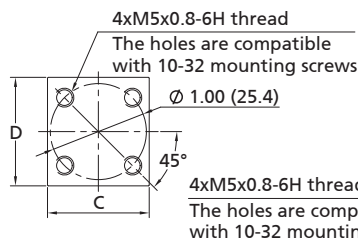
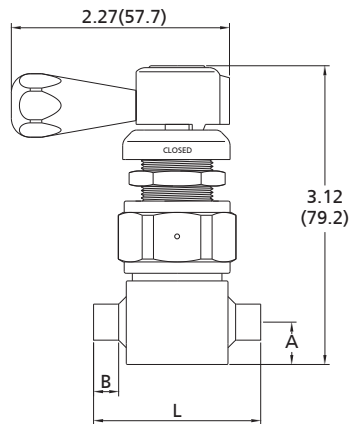
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.

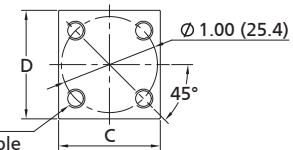
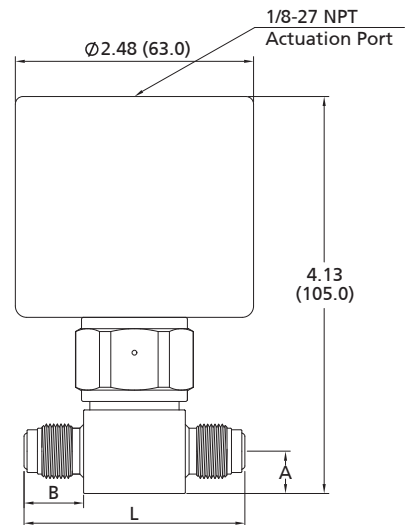
Manual - Round Handle



Manual - Lever Handle



Pneumatic



# V-40 Diaphragm Valves

Fittings

Valves

| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | D           | L           |
| DM□□-FL4-             | 1/4" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.69 (17.6) | 1.06 (26.9) | 1.13 (28.7) | 2.47 (62.1) |
| DM□□-FL6-             | 3/8" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.76 (19.3) | 1.06 (26.9) | 1.13 (28.7) | 2.58 (65.5) |
| DM□□-ML6-             | 6 mm FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.9) | 1.06 (26.9) | 1.13 (28.7) | 2.47 (62.8) |
| DM□□-ML8-             | 8 mm FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.74 (18.7) | 1.06 (26.9) | 1.13 (28.7) | 2.53 (64.3) |
| DM□□-TB4-             | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.30 (7.6)  | 1.06 (26.9) | 1.13 (28.7) | 1.74 (44.2) |
| DM□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.26 (6.6)  | 1.06 (26.9) | 1.13 (28.7) | 1.74 (44.2) |
| DM□□-NS4-             | 1/4" Integral Male FR                                   | 0.44 (11.2)         | —           | 1.06 (26.9) | 1.13 (28.7) | 2.46 (62.5) |
| DM□□-FNS4-            | 1/4" Female NPT                                         | 0.44 (11.2)         | —           | 1.06 (26.9) | 1.13 (28.7) | 2.46 (62.5) |
| DM□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 1.06 (26.9) | 1.13 (28.7) | 2.30 (58.4) |
| DM□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.85 (21.6) | 1.06 (26.9) | 1.13 (28.7) | 2.76 (70.1) |
| DM□□-FO4-             | 1/4" Male FO                                            | 0.44 (11.2)         | 0.47 (11.9) | 1.06 (26.9) | 1.13 (28.7) | 2.00 (50.8) |

## Angle Type

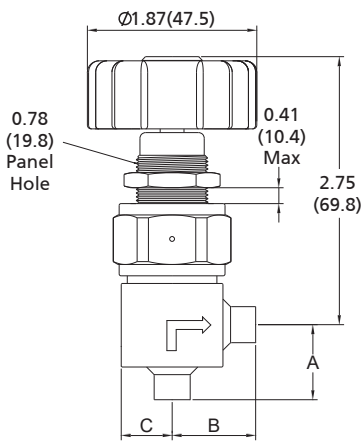
### Dimensions

Dimensions, in inches (millimeters), are for reference only.

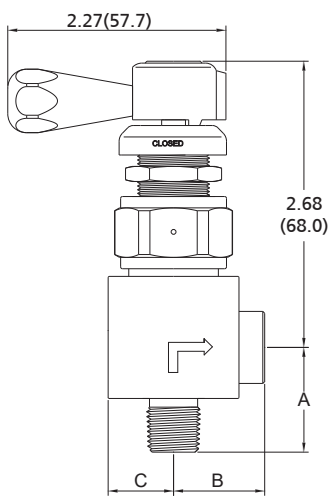
Pressure Gauges

Integrated Systems and Others

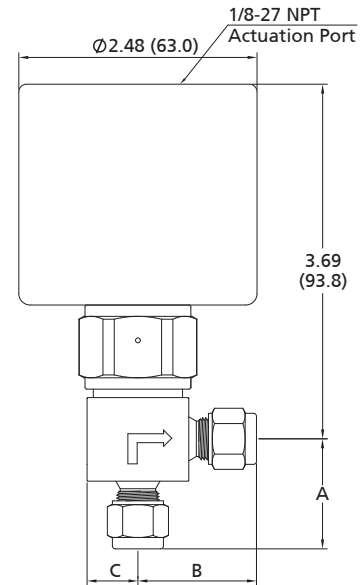
Manual - Round Handlee



Manual - Lever Handle



Pneumatic

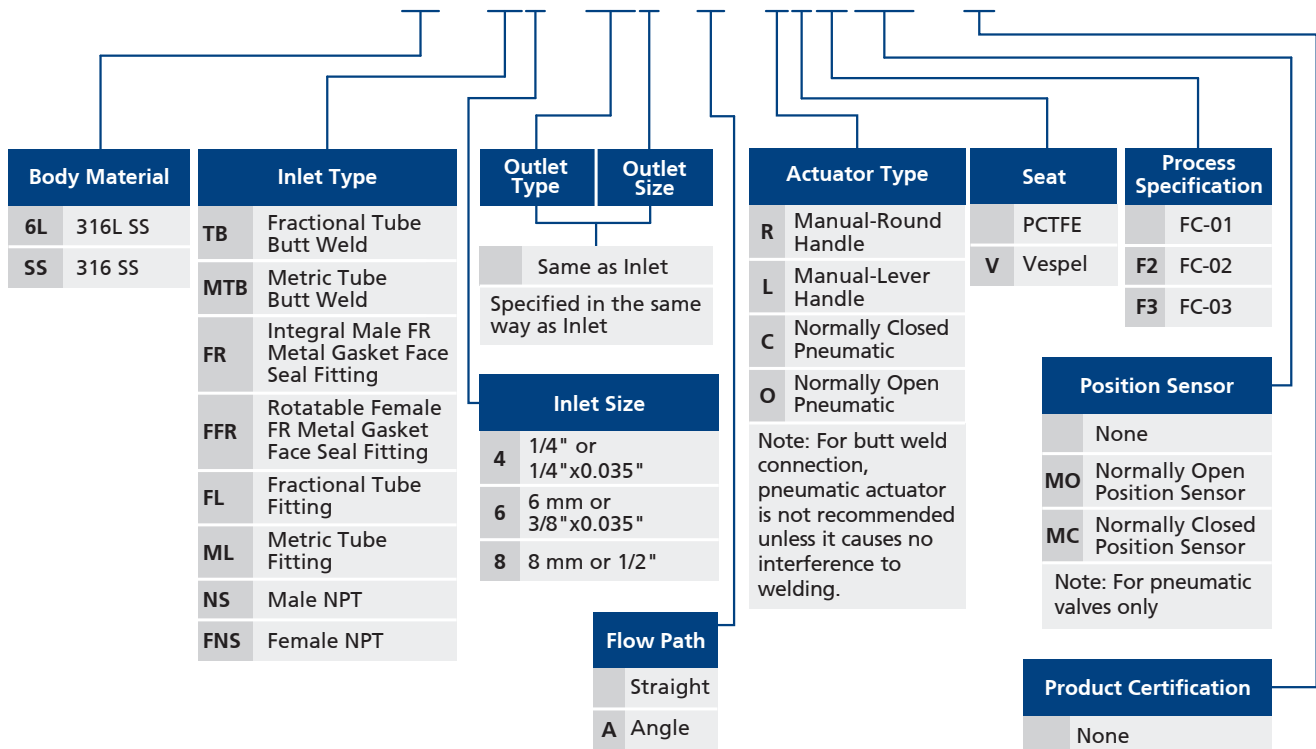


Process Specification

| Basic Ordering Number | Connection Type and Size   | Dimensions in. (mm) |             |             |
|-----------------------|----------------------------|---------------------|-------------|-------------|
|                       |                            | A                   | B           | C           |
| DM□□-FL4-             | 1/4" FITOK Tube Fitting    | 1.14 (29.1)         | 1.23 (31.3) | 0.53 (13.4) |
| DM□□-ML6-             | 6 mm FITOK Tube Fitting    | 1.14 (29.1)         | 1.23 (31.3) | 0.53 (13.4) |
| DM□□-TB6-             | 3/8"x0.035" Tube Butt Weld | 0.78 (19.8)         | 0.87 (22.0) | 0.53 (13.4) |
| DM□□-NS4-FNS4         | Inlet 1/4" Male NPT        | 1.09 (27.7)         | 0.95 (24.1) | 0.68 (17.3) |
|                       | Outlet 1/4" Female NPT     |                     |             |             |

Ordering Number Description

DMSS – FL4 – ML6 – A – CVF2MO – CE



Note:

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
3. For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

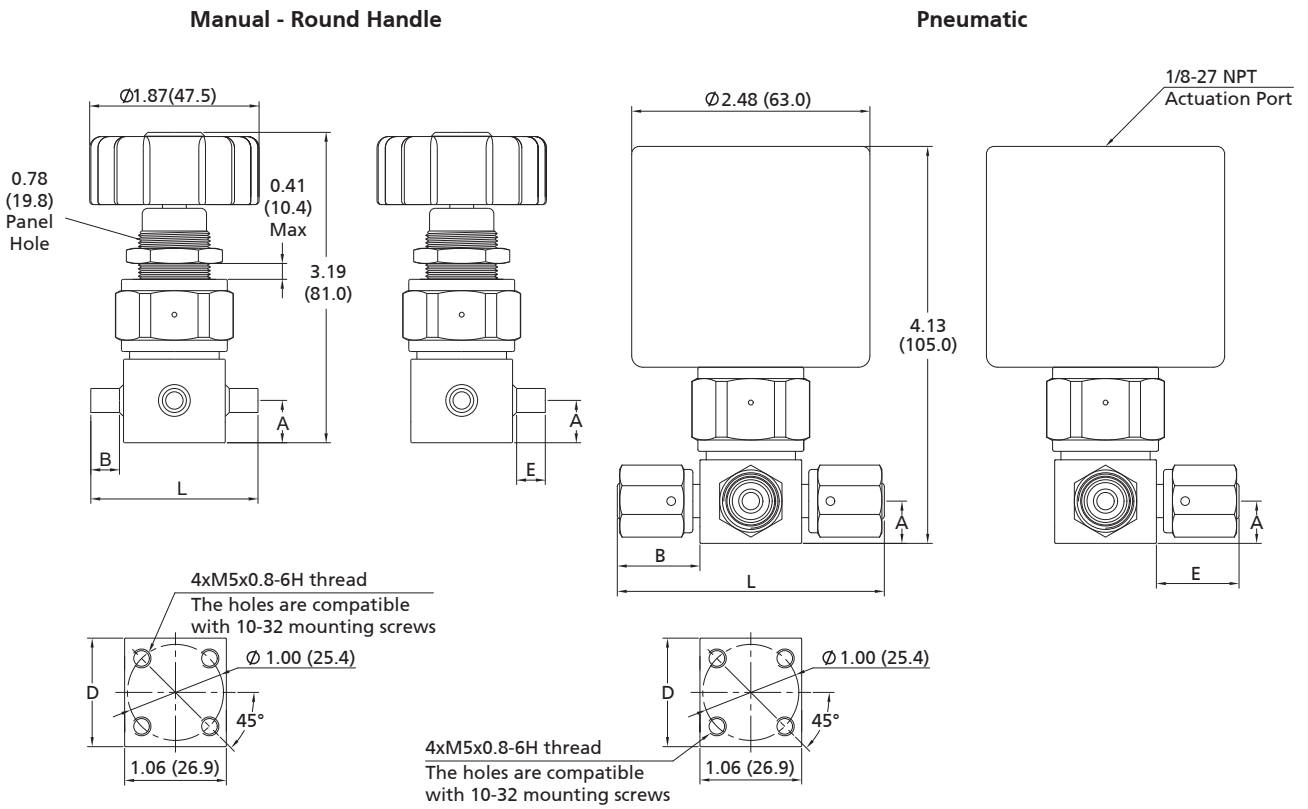
Process Specification



## Branch Type

### Dimensions

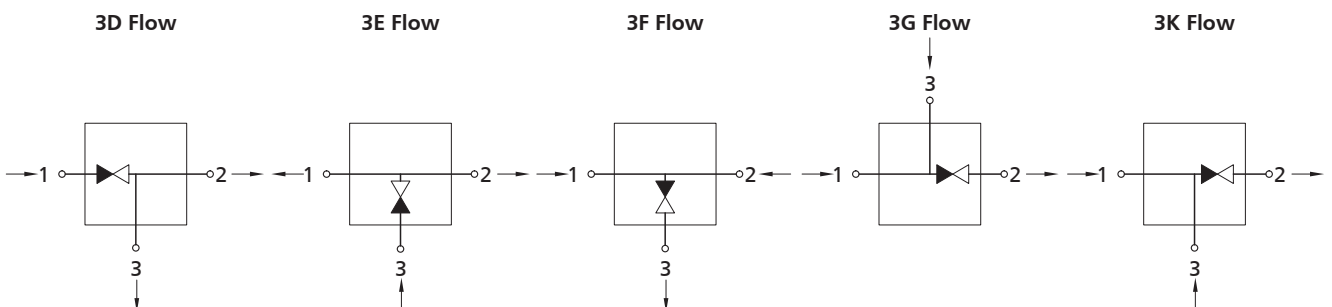
Dimensions, in inches (millimeters), are for reference only.



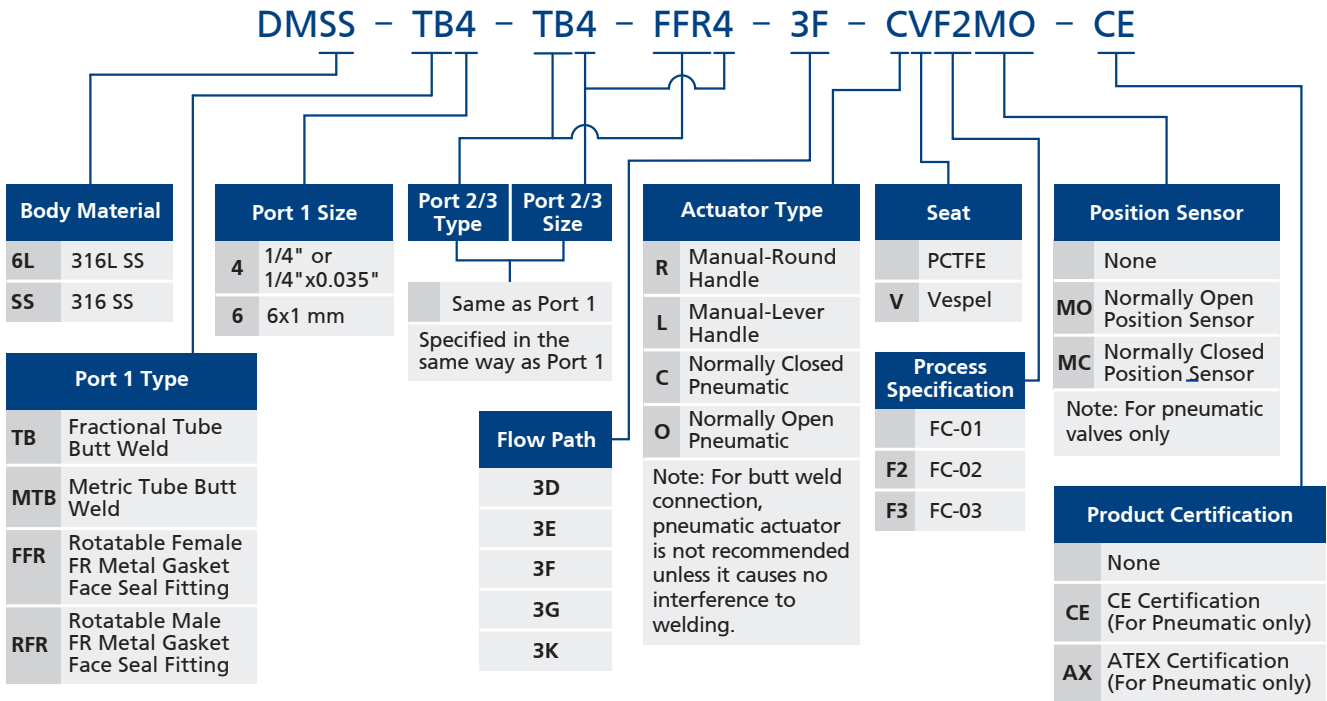
| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | D           | E           | L           |
| DM□□-TB4-             | 1/4" x0.035" Tube Butt Weld                             | 0.44 (11.2)         | 0.30 (7.6)  | 1.13 (28.7) | 0.30 (7.6)  | 1.74 (44.2) |
| DM□□-MTB6-            | 3/8" x0.035" Tube Butt Weld                             | 0.44 (11.2)         | 0.30 (7.6)  | 1.13 (28.7) | 0.30 (7.6)  | 1.74 (44.2) |
| DM□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.85 (21.6) | 1.13 (28.7) | 0.85 (21.6) | 2.76 (70.1) |
| DM□□-RFR4-            | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)         | 1.21 (30.7) | 1.13 (28.7) | 1.21 (30.7) | 3.48 (88.4) |

### Flow Paths

☉ Flow paths as viewed from the top



Ordering Number Description



Note:

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
3. For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## High Pressure Compact Diaphragm Valves DS Series

### Features

- ⦿ Reduced inner volume
- ⦿ Packless diaphragm seal to ensure high purity
- ⦿ Minimized number of components
- ⦿ Manual and pneumatic actuators available
- ⦿ Aluminum piston to increase operation speed



### Technical Data

|                                       |                                                                          |                                                |
|---------------------------------------|--------------------------------------------------------------------------|------------------------------------------------|
| Port Size                             | 1/4" to 3/8" or 6 mm to 8 mm                                             |                                                |
| Flow Coefficient (Cv)                 | 0.17                                                                     |                                                |
| Orifice Size                          | 0.12 in. (3.0 mm)                                                        |                                                |
| Max. Working Pressure                 | Manual                                                                   | 4500 psig (310 bar)                            |
|                                       | Pneumatic                                                                | 3000 psig (206 bar)                            |
| Pneumatic Actuator Operating Pressure | 60 to 90 psig (4.2 to 6.2 bar)                                           |                                                |
| Temperature                           | PCTFE: -10 ~ 150 °F (-23 ~ 65 °C)<br>Vespel: -10 ~ 250 °F (-23 ~ 121 °C) |                                                |
| Leak Rate (Helium)                    | Internal                                                                 | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                                       | External                                                                 | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |

### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

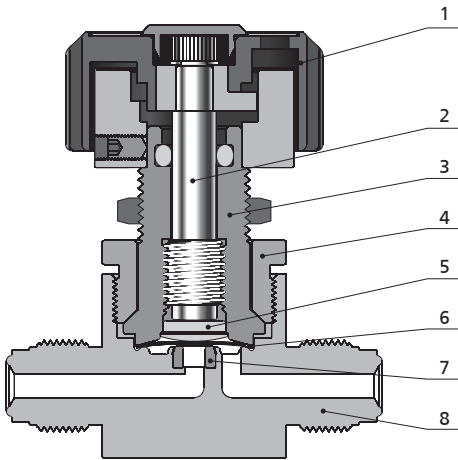
| Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|----------------------------------------|-------------|---------------|
| 10 (0.68)                              | 55          | 1.9           |
| 50 (3.4)                               | 150         | 4.5           |
| 100 (6.8)                              | 260         | 6.4           |

### Process Specification

| Technology               | Standard Cleaning and Packaging (FC-01)                                            | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03)                                       |
|--------------------------|------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------|
| Material/Specification   | 316 SS/ASTM A479<br>316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20 |                                        | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR /SEMI F20 |
| Wetted Surface Roughness | Ra 20 µin. (0.51 µm)                                                               |                                        | Ra 10 µin. (0.25 µm)                                            |
| Polishing Process        | Machine finished                                                                   |                                        | Electropolished                                                 |

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



Manual Model

| Item | Component     | Material/Specification                                                             |
|------|---------------|------------------------------------------------------------------------------------|
| 1    | Handle        | ABS                                                                                |
| 2    | Stem          | 316 SS/ASTM A479                                                                   |
| 3    | Bonnet        | S17400/ASTM A564                                                                   |
| 4    | Bonnet Nut    | 316 SS/ASTM A479                                                                   |
| 5    | Button        | C36000/B16                                                                         |
| 6    | Diaphragm (5) | Cobalt Alloy (3) /AMS 5876 + C17200 (2) /ASTM B194                                 |
| 7    | Seat          | PCTFE/ASTM D1430 or Vespel                                                         |
| 8    | Body          | 316 SS/ASTM A479 or 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 |

## Actuators

### Manual - Round Handle

- ⦿ Quick, quarter-turn actuation
- ⦿ Handle with window to visually indicate open and closed states

### Pneumatic

- ⦿ Normally open, "N.O." marked on the top of the actuator
- ⦿ Normally closed, "N.C." marked on the top of the actuator



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

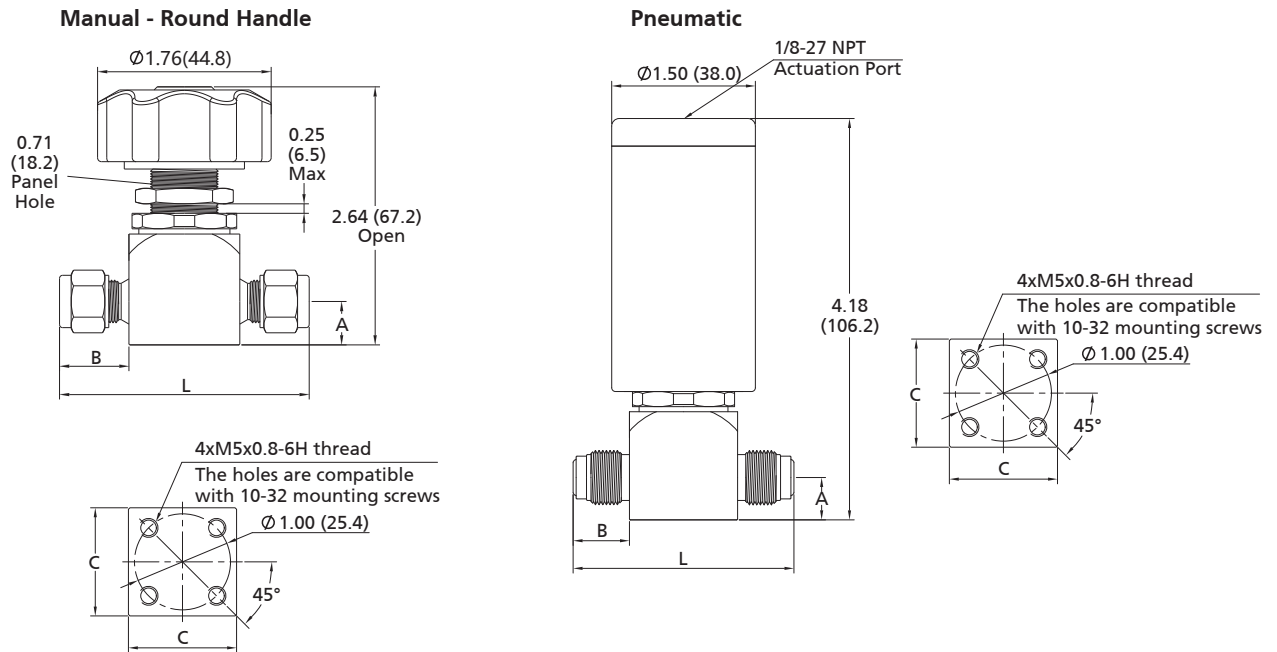
Process Specification

## Dimensions and Ordering Information

### Straight Type

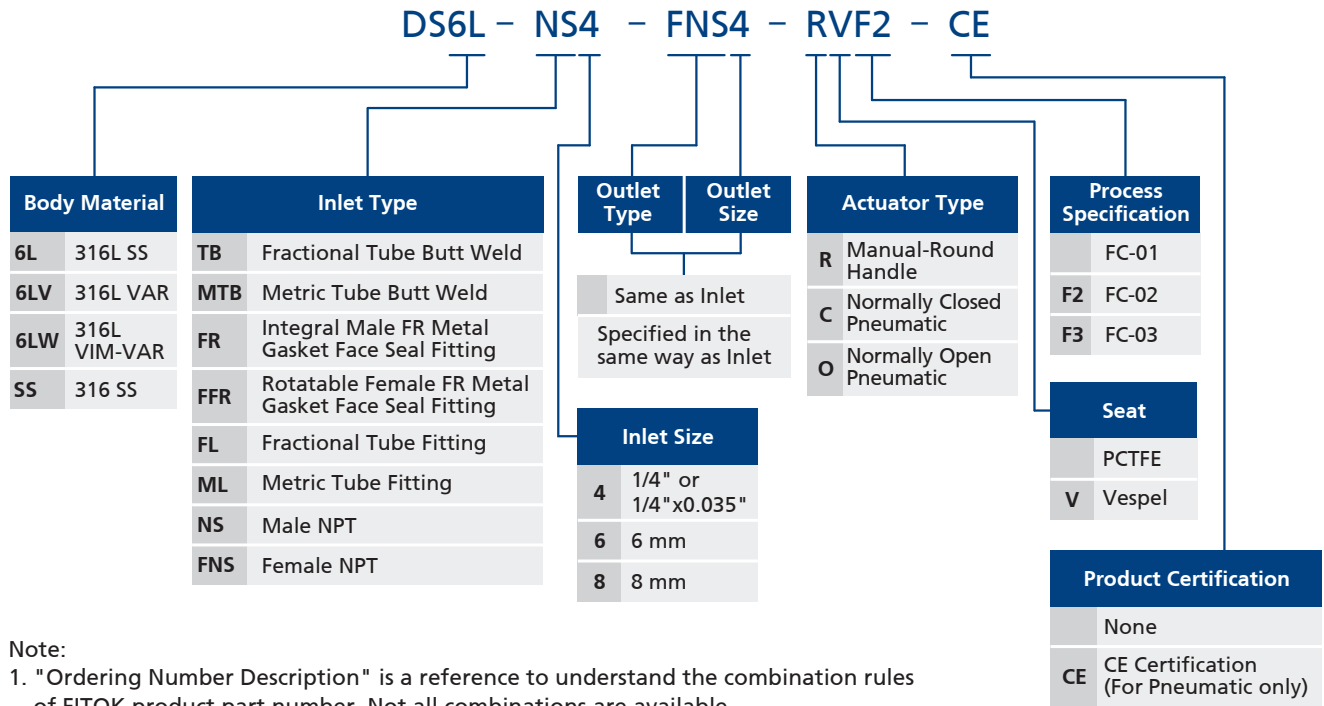
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DS□□-TB4-             | 1/4" x 0.035" Tube Butt Weld                            | 0.44 (11.2)         | 0.34 (8.6)  | 1.12 (28.6) | 1.81 (45.9) |
| DS□□-FFR4-            | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 1.12 (28.6) | 2.85 (72.3) |
| DS□□-FR4-             | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.58 (14.9) | 1.12 (28.6) | 2.30 (58.4) |
| DS□□-FL4-             | 1/4" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.9) | 1.12 (28.6) | 2.54 (64.4) |
| DS□□-NS4-             | 1/4" Male NPT                                           | 0.44 (11.2)         | 0.56 (14.2) | 1.12 (28.6) | 2.24 (57.0) |
| DS□□-FNS4-            | 1/4" Female NPT                                         | 0.44 (11.2)         | —           | 1.12 (28.6) | 2.36 (60.0) |

Ordering Number Description



Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering.

2-Valve 3-Way Block Type

Dimensions

Dimensions, in inches (millimeters), are for reference only.



Fittings

Valves

Pressure Gauges

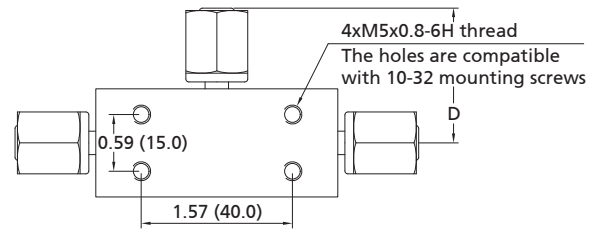
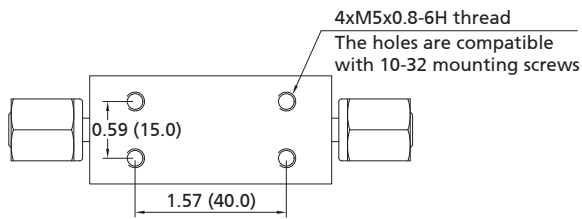
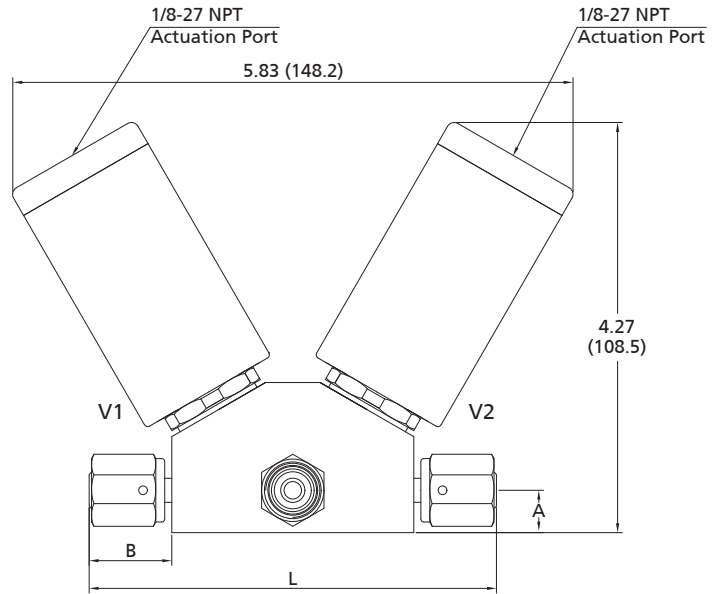
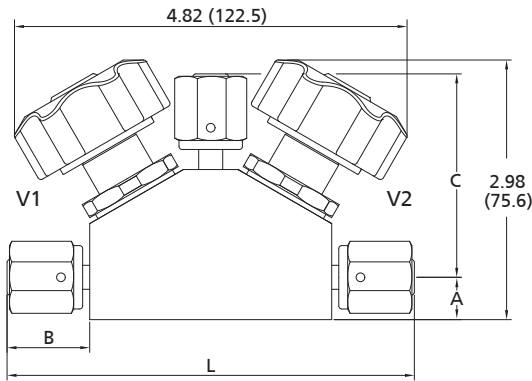
Integrated Systems and Others

Process Specification

# V-48 Diaphragm Valves

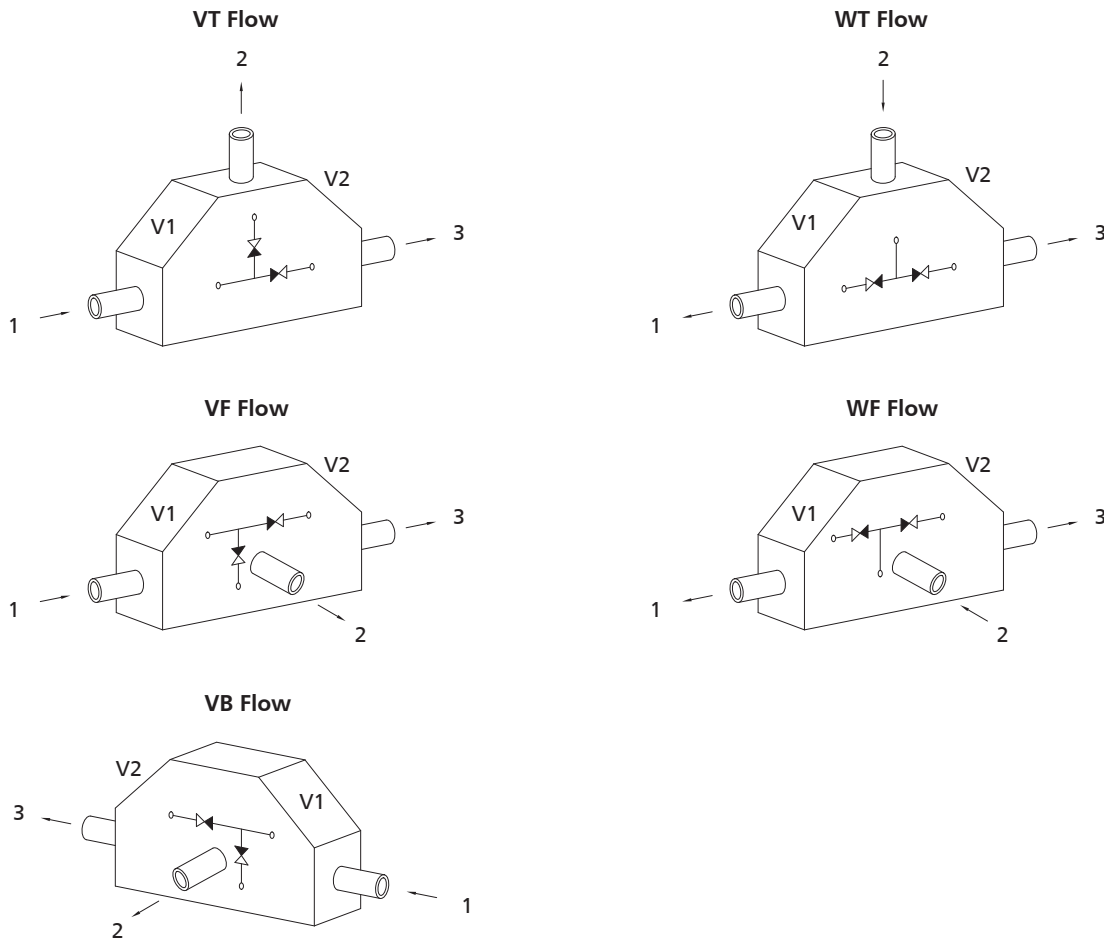
## Manual - Round Handle

## Pneumatic



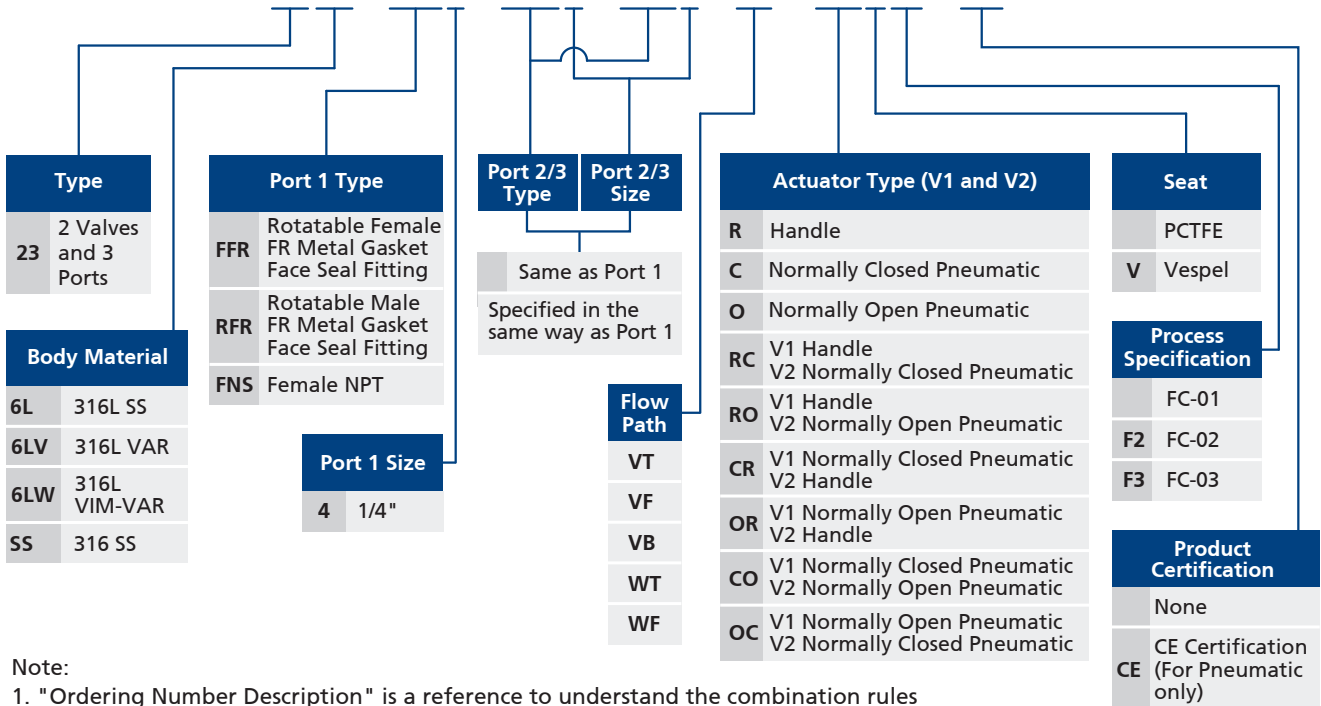
| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |              |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|--------------|
|                       |                                                         | A                   | B           | C           | D           | L            |
| DS23□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | 2.59 (65.7) | —           | 4.24 (107.6) |
| DS23□□-FFR4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.86 (21.8) | —           | 1.54 (39.1) | 4.24 (107.6) |
| DS23□□-FNS4-          | 1/4" Female NPT                                         | 0.44 (11.2)         | —           | —           | 0.68 (17.3) | 3.07 (78.0)  |

Flow Paths



Ordering Number Description

DS236L - FFR4 - RFR4 - FFR4 - VF - COVF2 - CE



Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering.



# Diaphragm Valves

## Low Pressure/Medium Flow Diaphragm Valves

### DR Series

#### Features

- ⦿ For medium flow applications
- ⦿ Minimum particle generation and dead space
- ⦿ Fully contained seat to provide excellent resistance to swelling and contamination
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ Manual and pneumatic actuators available
- ⦿ Position sensors available assembled on normally closed pneumatically actuated valves



#### Technical Data

|                                       |                                                                       |                                                |
|---------------------------------------|-----------------------------------------------------------------------|------------------------------------------------|
| Port Size                             | 3/8" to 1/2" or 10 mm to 12 mm                                        |                                                |
| Flow Coefficient (Cv)                 | 0.70                                                                  |                                                |
| Orifice Size                          | 0.31 in. (7.9 mm)                                                     |                                                |
| Max. Working Pressure                 | 145 psig (10 bar)                                                     |                                                |
| Pneumatic Actuator Operating Pressure | 60 to 90 psig (4.2 to 6.2 bar)                                        |                                                |
| Temperature                           | PCTFE: -10 ~ 176 °F (-23 ~ 80 °C)<br>PFA: -10 ~ 302 °F (-23 ~ 150 °C) |                                                |
| Leak Rate (Helium)                    | Internal                                                              | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                                       | External                                                              | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |

#### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|----------------------------------------|-------------|---------------|
| 10 (0.68)                              | 240         | 8.4           |
| 50 (3.4)                               | 630         | 18.6          |
| 100 (6.8)                              | 1120        | 26.6          |

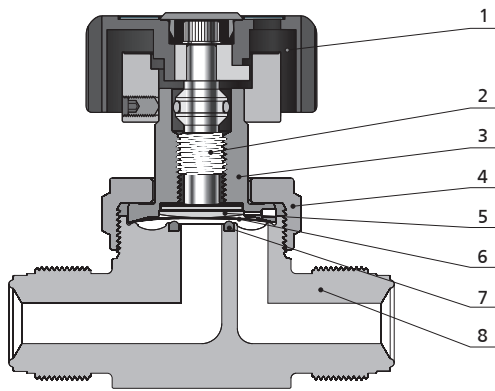
#### Process Specification

| Technology               | Standard Cleaning and Packaging (FC-01)                         | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|--------------------------|-----------------------------------------------------------------|----------------------------------------|---------------------------|
| Material/Specification   | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR /SEMI F20 |                                        |                           |
| Wetted Surface Roughness | Ra 10 μin. (0.25 μm) <sup>①</sup>                               |                                        | Ra 5 μin. (0.13 μm)       |
| Polishing Process        | Machine finished <sup>①</sup>                                   |                                        | Electropolished           |

① For valves with FR connections and tube butt connections, the standard polishing process is electropolishing and the internal surface roughness is finished to an average of Ra 5 μin. (0.13 μm).

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



Manual

| Item | Component     | Material/Specification                                         |
|------|---------------|----------------------------------------------------------------|
| 1    | Handle        | ABS                                                            |
| 2    | Stem          | 316 SS/ASTM A479                                               |
| 3    | Bonnet        | S17400/ASTM A564                                               |
| 4    | Bonnet Nut    | 316 SS/ASTM A479                                               |
| 5    | Button        | 316 SS/ASTM A479                                               |
| 6    | Diaphragm (2) | Cobalt Alloy/AMS 5876                                          |
| 7    | Seat          | PCTFE/ASTM D1430 or PFA/ASTM D3307                             |
| 8    | Body          | 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 |

## Actuators

### Manual - Round Handle

- ⦿ Quick, quarter-turn actuation
- ⦿ Handle with windows to visually indicate open and closed states



### Position Sensors

Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

### Sensor Technical Data

|                            |                                  |
|----------------------------|----------------------------------|
| <b>Output</b>              | 3-wire V (dc), PNP               |
| <b>Output Function</b>     | Normally open or normally closed |
| <b>Voltage</b>             | 10 ~ 30 V (dc)                   |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

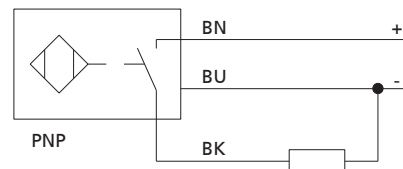
### Pneumatic

- ⦿ Normally open, "N.O." marked on the top of the actuator
- ⦿ Normally closed, "N.C." marked on the top of the actuator

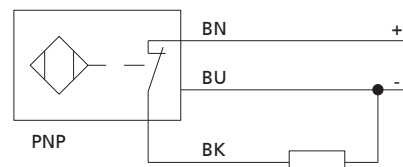


### Wiring Diagram

#### Normally open position sensors



#### Normally closed position sensors

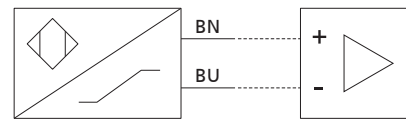


### Explosion-proof Position Sensors

Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

### Wiring Diagram



### Technical Information

|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

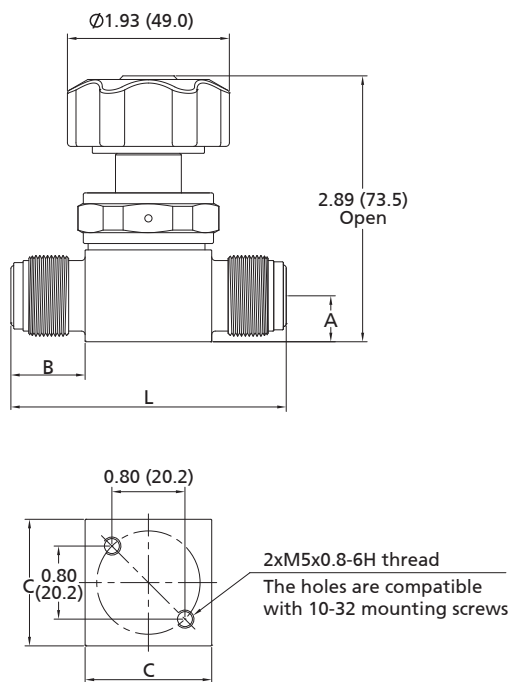
## Dimensions and Ordering Information

### Straight Type

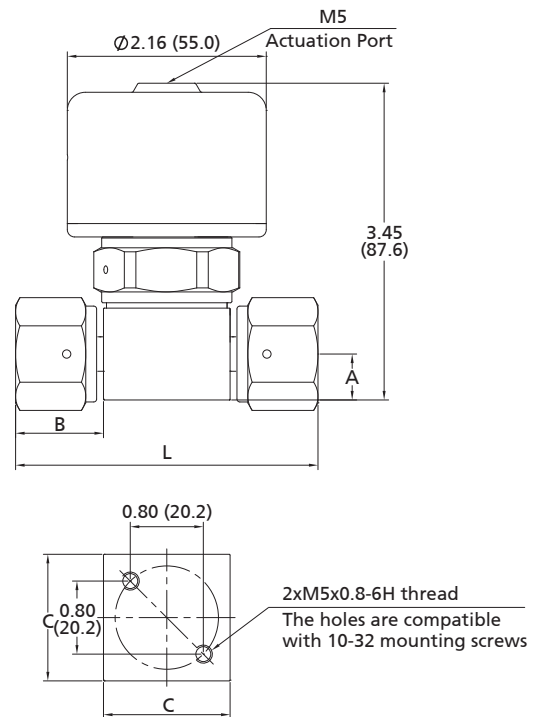
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.

Manual - Round Handle



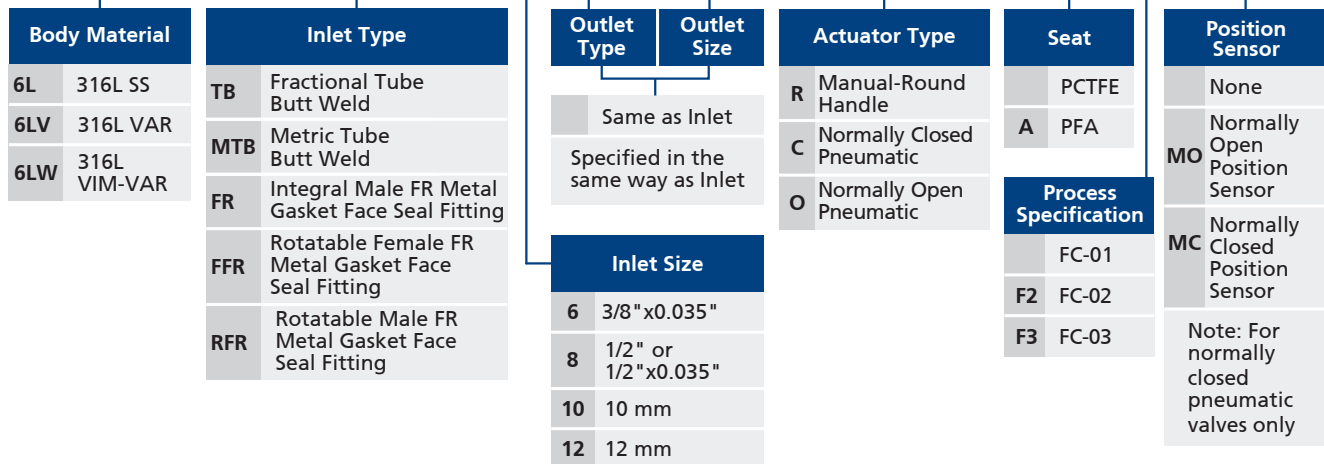
Pneumatic



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| DR□□-TB6-             | 3/8" x 0.035" Tube Butt Weld                            | 0.50 (12.7)         | 0.67 (17.0) | 1.38 (35.0) | 2.72 (69.0) |
| DR□□-TB8-             | 1/2" x 0.049" Tube Butt Weld                            | 0.50 (12.7)         | 0.67 (17.0) | 1.38 (35.0) | 2.72 (69.0) |
| DR□□-FFR8-            | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.50 (12.7)         | 0.94 (24.0) | 1.38 (35.0) | 3.27 (83.0) |
| DR□□-FR8-             | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    | 0.50 (12.7)         | 0.81 (20.6) | 1.38 (35.0) | 3.00 (76.2) |

Ordering Number Description

DR6L - FFR8 - RFR8 - CAF3MO - CE



Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

| Product Certification |                                         |
|-----------------------|-----------------------------------------|
|                       | None                                    |
| CE                    | CE Certification (For Pneumatic only)   |
| AX                    | ATEX Certification (For Pneumatic only) |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

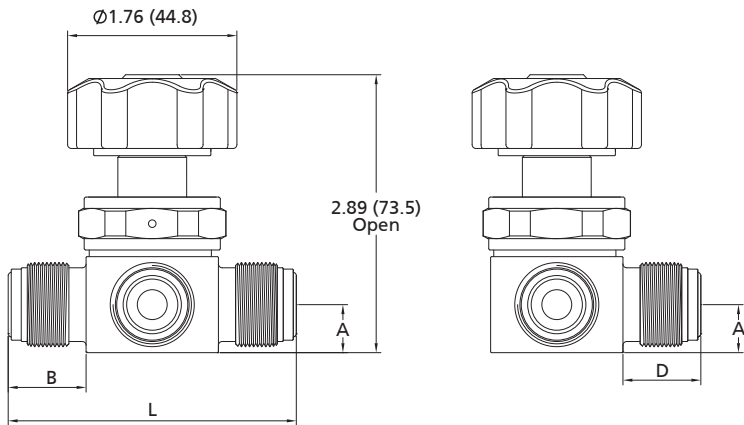
Process Specification

## Branch Type

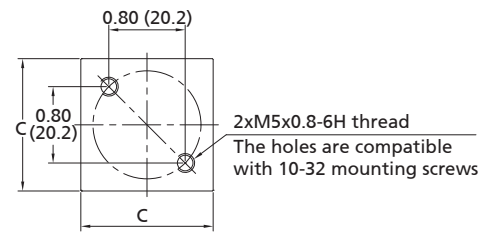
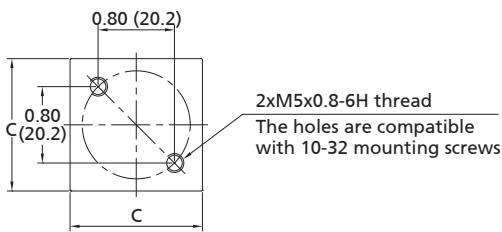
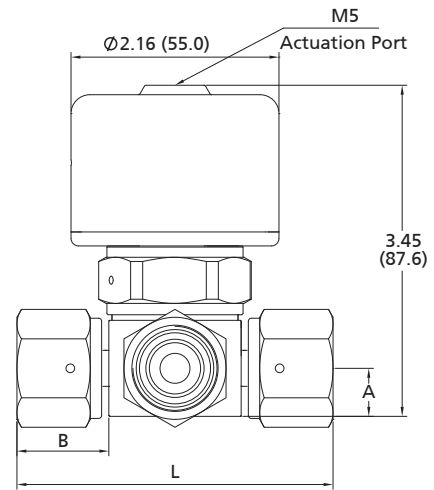
### Dimensions

Dimensions, in inches (millimeters), are for reference only.

Manual - Round Handle



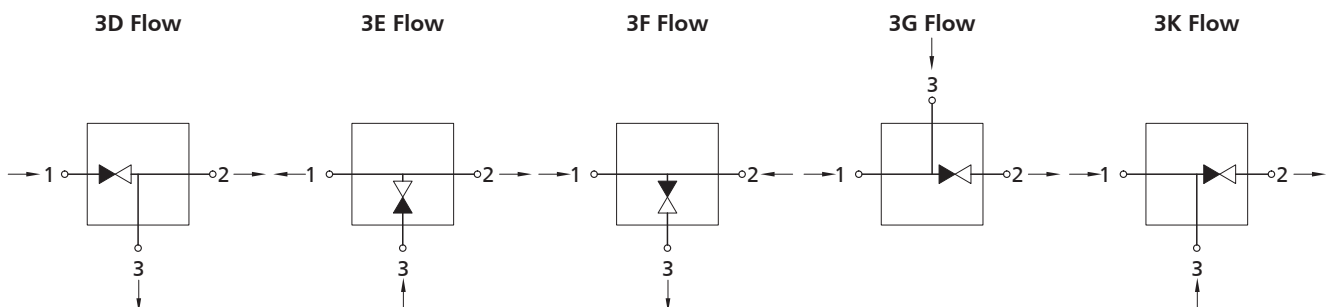
Pneumatic



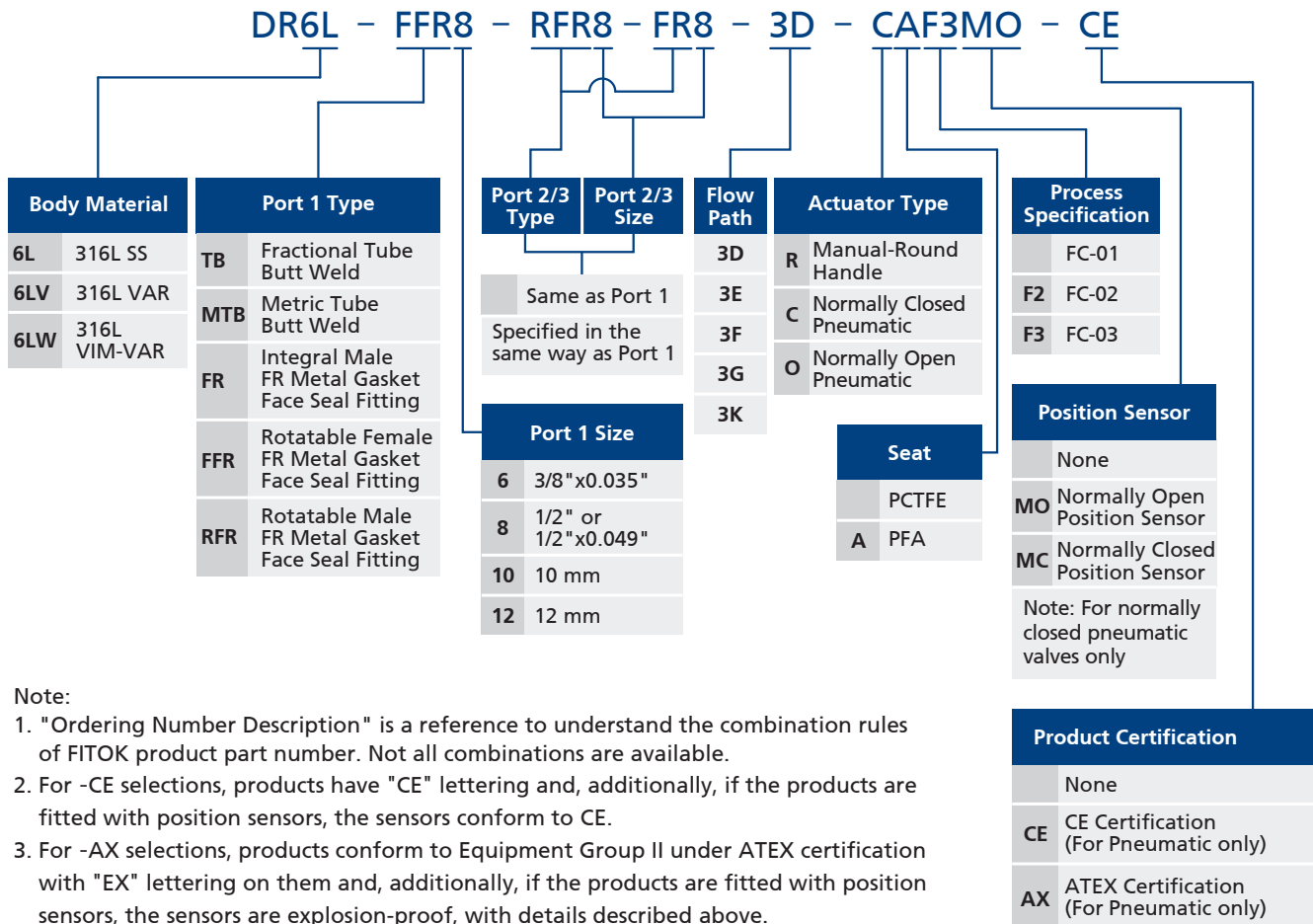
| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |              |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|--------------|
|                       |                                                         | A                   | B           | C           | D           | L            |
| DR□□-TB6-             | 3/8"x0.035" Tube Butt Weld                              | 0.50 (12.7)         | 0.67 (17.0) | 1.38 (35.0) | 0.67 (17.0) | 2.72 (69.0)  |
| DR□□-TB8-             | 1/2"x0.049" Tube Butt Weld                              | 0.50 (12.7)         | 0.67 (17.0) | 1.38 (35.0) | 0.67 (17.0) | 2.72 (69.0)  |
| DR□□-FFR8-            | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.50 (12.7)         | 0.94 (24.0) | 1.38 (35.0) | 0.94 (24.0) | 3.27 (83.0)  |
| DR□□-RFR8-            | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.50 (12.7)         | 1.34 (34.0) | 1.38 (35.0) | 1.34 (34.0) | 4.06 (103.0) |
| DR□□-FR8-             | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    | 0.50 (12.7)         | 0.81 (20.6) | 1.38 (35.0) | 0.81 (20.6) | 3.00 (76.2)  |

### Flow Paths

☉ Flow paths as viewed from the top



Ordering Number Description



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## Low Pressure/High Flow Diaphragm Valves

### DV Series

#### Features

- ⦿ Ideal for high flow applications
- ⦿ Metal-to-metal seal
- ⦿ Tied-diaphragm design to provide positive stem retraction
- ⦿ No springs or threads in wetted areas to ensure clean operation
- ⦿ Manual and pneumatic actuators available
- ⦿ Position sensors available assembled on normally closed valves



#### Technical Data

|                                       |           |                                                                        |
|---------------------------------------|-----------|------------------------------------------------------------------------|
| Port Size                             |           | 1/2" to 1" or 12 mm to 18 mm                                           |
| Flow Coefficient (Cv)                 | Manual    | 2.8                                                                    |
|                                       | Pneumatic | 2.4                                                                    |
| Orifice Size                          |           | 0.5 in. (12.7 mm)                                                      |
| Max. Working Pressure                 | Manual    | 300 psig (20.6 bar)                                                    |
|                                       | Pneumatic | 145 psig (10 bar)                                                      |
| Pneumatic Actuator Operating Pressure |           | 60 to 90 psig (4.2 to 6.2 bar)                                         |
| Temperature                           |           | PCTFE -10 ~ 150 °F (-23 ~ 65 °C)<br>Vespel -10 ~ 250 °F (-23 ~ 121 °C) |
| Leak Rate (Helium)                    | Internal  | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s                            |
|                                       | External  | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s                            |

#### Flow Data

Air @ 70 °F (21 °C)

Water @ 60 °F (16 °C)

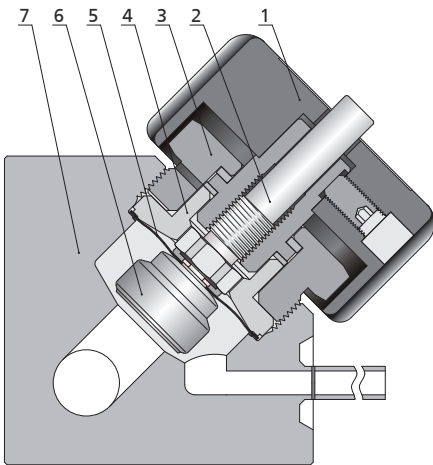
| Pressure Drop to Atmosphere psig (bar) | Manual      |               | Pneumatic   |               |
|----------------------------------------|-------------|---------------|-------------|---------------|
|                                        | Air (l/min) | Water (l/min) | Air (l/min) | Water (l/min) |
| 10 (0.68)                              | 870         | 34            | 780         | 29            |
| 50 (3.4)                               | 2300        | 75            | 2050        | 64            |
| 100 (6.8)                              | 4100        | 100           | 3650        | 91            |

#### Process Specification

| Technology               | Standard Cleaning and Packaging (FC-01)                                                               | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03)                                                         |
|--------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------|
| Material/Specification   | 316 SS/ASTM A479<br>316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20<br>F316L/ASTM A182 |                                        | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20<br>F316L/ASTM A182 |
| Wetted Surface Roughness | Ra 10 μin. (0.25 μm)                                                                                  |                                        | Ra 5 μin. (0.13 μm)                                                               |
| Polishing Process        | Machine finished                                                                                      |                                        | Electropolished                                                                   |

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



| Item | Component        | Material/Specification                                                                                |
|------|------------------|-------------------------------------------------------------------------------------------------------|
| 1    | Handle           | Aluminum                                                                                              |
| 2    | Upper Stem       | S17400/ASTM A564                                                                                      |
| 3    | Bonnet Nut       | 316 SS/ASTM A479                                                                                      |
| 4    | Bonnet           | S17400/ASTM A564                                                                                      |
| 5    | Diaphragm (3)    | Cobalt Alloy/AMS 5876                                                                                 |
| 6    | Stem Subassembly | 316L SS/SEMI F20 and PCTFE/ASTM D1430 or Vespel                                                       |
| 7    | Body             | 316 SS/ASTM A479 or 316L SS/SEMI F20 or 316L VAR/SEMI F20 or 316L VIM-VAR/SEMI F20 or F316L/ASTM A182 |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

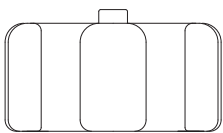
Process Specification

Manual Actuation - Branch Type

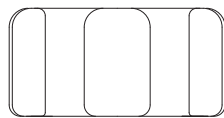
## Actuators

### Manual - Round Handle

- Upper stem position to indicate open and closed states



OPEN



CLOSED

Notes: The upper stem protruding from the handle indicates open state.  
The upper stem paralleling to or sinking into the handle indicates closed state.

### Pneumatic

- Normally open, "N.O." marked on the top of the actuator
- Normally closed, "N.C." marked on the top of the actuator





### Position Sensors

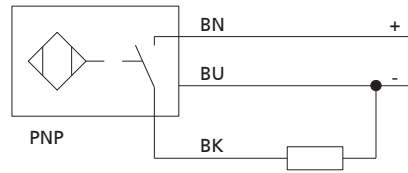
Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

#### Sensor Technical Data

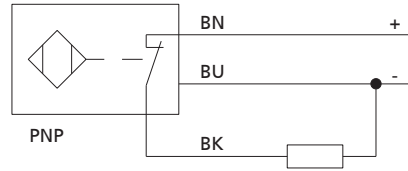
|                            |                                  |
|----------------------------|----------------------------------|
| <b>Output</b>              | 3-wire V (dc), PNP               |
| <b>Output Function</b>     | Normally open or normally closed |
| <b>Voltage</b>             | 10 ~ 30 V (dc)                   |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

### Wiring Diagram

Normally open position sensors



Normally closed position sensors



### Explosion-proof Position Sensors

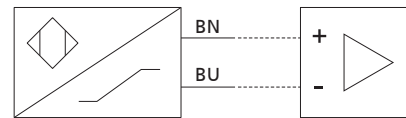
Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

#### Technical Information

|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

### Wiring Diagram



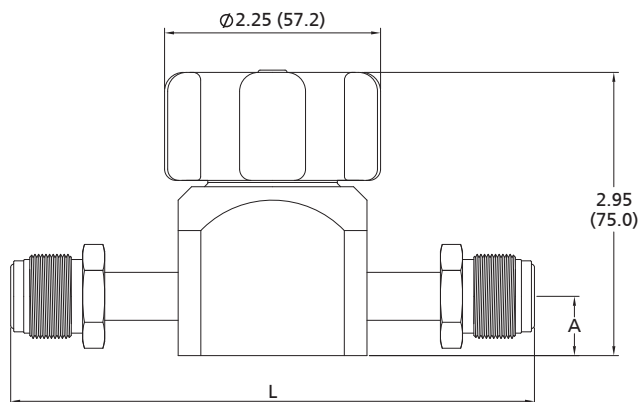
## Dimensions and Ordering Information

### Straight Type

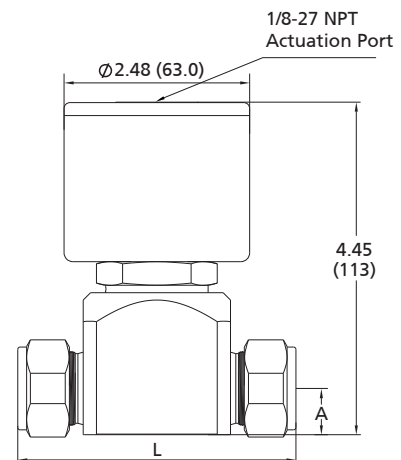
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.

#### Manual - Round Handle



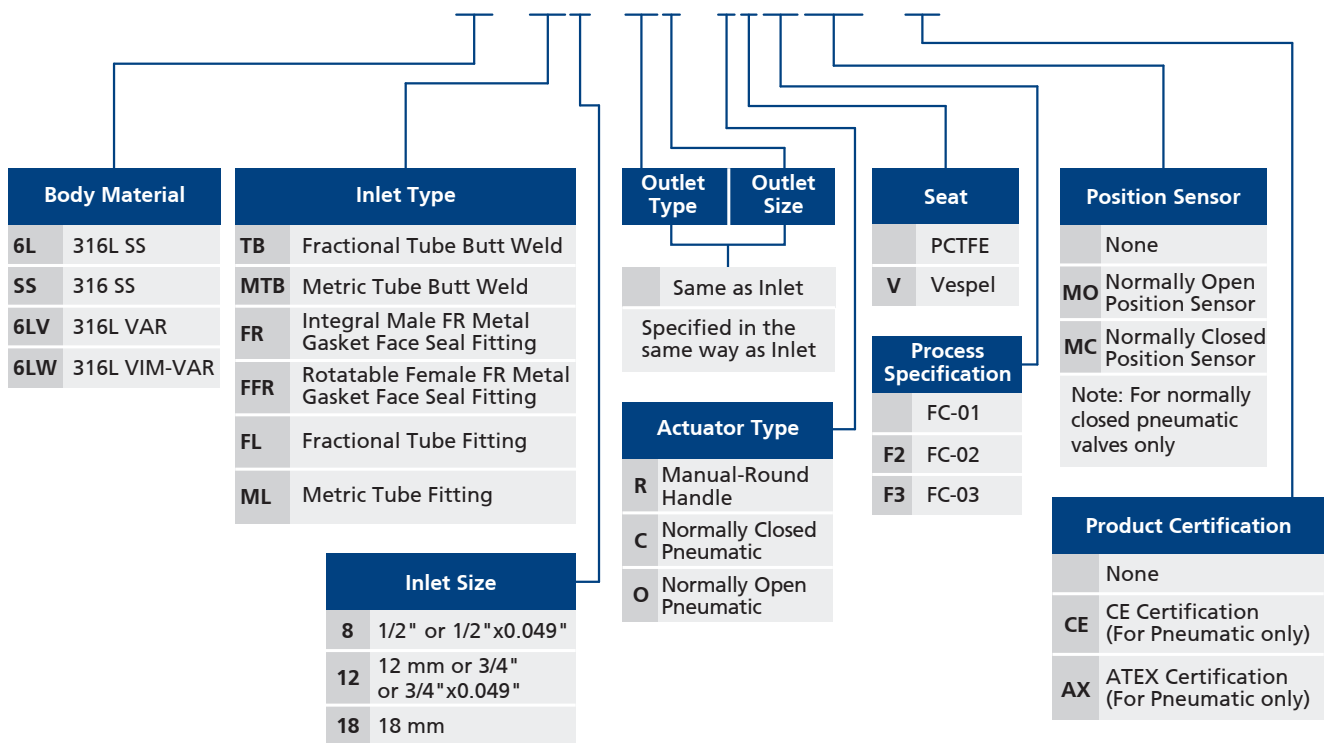
#### Pneumatic



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |              |
|-----------------------|---------------------------------------------------------|---------------------|--------------|
|                       |                                                         | A                   | L            |
| DV□□-TB8-             | 1/2"x0.049" Tube Butt Weld                              | 0.62 (15.7)         | 5.91 (150.0) |
| DV□□-TB12-            | 3/4"x0.049" Tube Butt Weld                              | 0.62 (15.7)         | 5.91 (150.0) |
| DV□□-FR8-             | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    | 0.62 (15.7)         | 5.47 (138.9) |
| DV□□-FFR8-            | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 5.47 (138.9) |
| DV□□-FL8-             | 1/2" FITOK Tube Fitting                                 | 0.62 (15.7)         | 3.71 (94.2)  |
| DV□□-FL12-            | 3/4" FITOK Tube Fitting                                 | 0.62 (15.7)         | 3.72 (94.4)  |

Ordering Number Description

DV6L - FR8 - FL8 - CVF2MO - CE



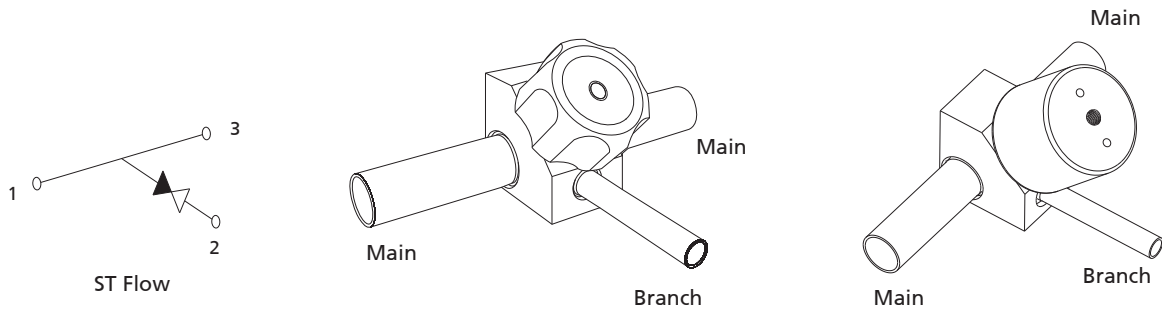
Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

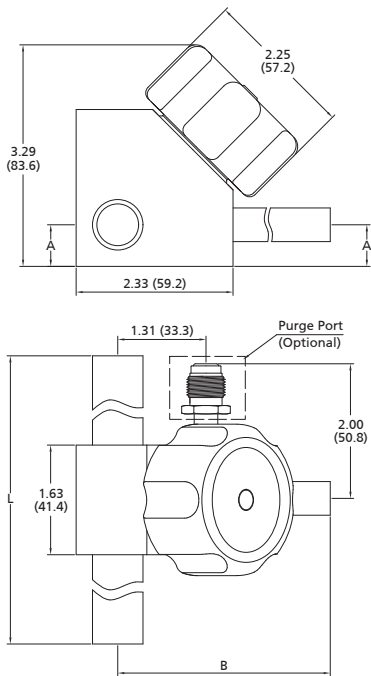
## Branch Type

### Dimensions

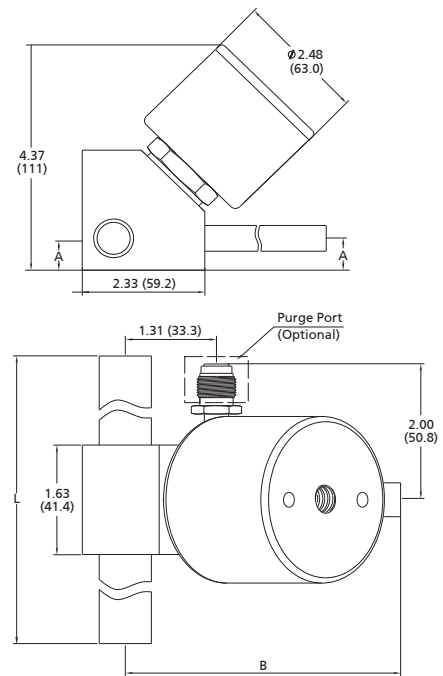
Dimensions, in inches (millimeters), are for reference only.



### Manual-Round Handle



### Pneumatic

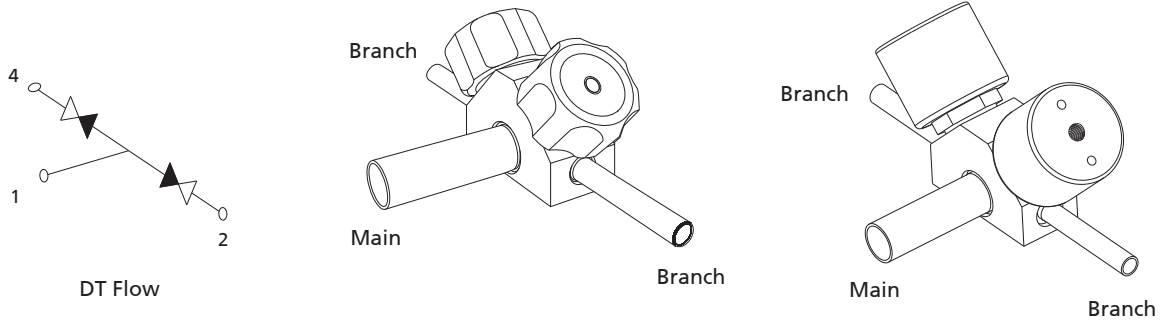


| Basic Ordering Number | Connection Type and Size     |                                                       | Dimensions in. (mm) |              |              |
|-----------------------|------------------------------|-------------------------------------------------------|---------------------|--------------|--------------|
|                       | Main                         | Branch                                                | A                   | B            | L            |
| DV□□-TB8-TB4-         | 1/2" x 0.049" Tube Butt Weld | 1/4" x 0.035" Tube Butt Weld                          | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB8-TB8-         | 1/2" x 0.049" Tube Butt Weld | 1/2" x 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB8-RFR4-        | 1/2" x 0.049" Tube Butt Weld | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB8-RFR8-        | 1/2" x 0.049" Tube Butt Weld | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB12-TB8-        | 3/4" x 0.049" Tube Butt Weld | 1/2" x 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB12-RFR8-       | 3/4" x 0.049" Tube Butt Weld | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB16-TB8-        | 1" x 0.065" Tube Butt Weld   | 1/2" x 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |
| DV□□-TB16-RFR8-       | 1" x 0.065" Tube Butt Weld   | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 4.69 (119.0) | 7.58 (193.0) |

## Branch Type

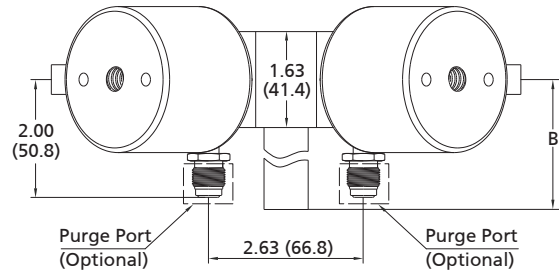
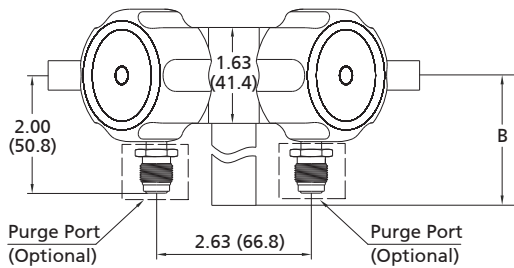
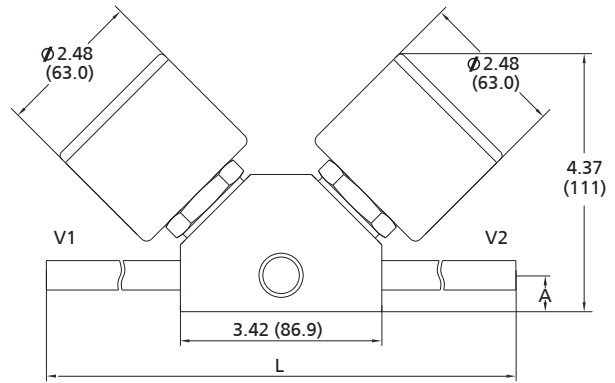
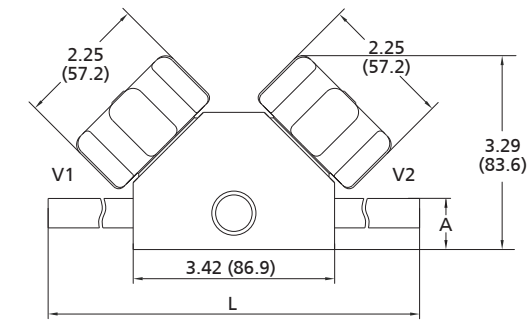
### Dimensions

Dimensions, in inches (millimeters), are for reference only.



### Manual-Round Handle

### Pneumatic

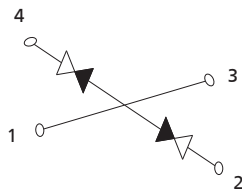


| Basic Ordering Number | Connection Type and Size   |                                                       | Dimensions in. (mm) |             |              |
|-----------------------|----------------------------|-------------------------------------------------------|---------------------|-------------|--------------|
|                       | Main                       | Branch                                                | A                   | B           | L            |
| DV□□-TB12-TB8-        | 3/4"×0.049" Tube Butt Weld | 1/2"×0.049" Tube Butt Weld                            | 0.62 (15.7)         | 3.79 (96.3) | 9.38 (238.0) |
| DV□□-TB12-RFR8-       | 3/4"×0.049" Tube Butt Weld | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 3.79 (96.3) | 9.38 (238.0) |
| DV□□-TB16-TB8-        | 1"×0.065" Tube Butt Weld   | 1/2" × 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 3.79 (96.3) | 9.38 (238.0) |
| DV□□-TB16-RFR8-       | 1" × 0.065" Tube Butt Weld | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 3.79 (96.3) | 9.38 (238.0) |

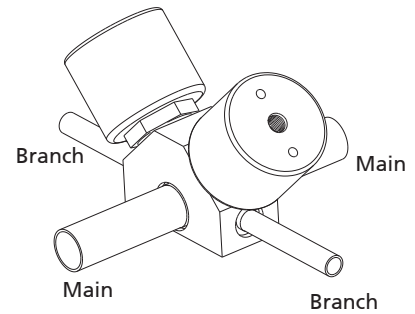
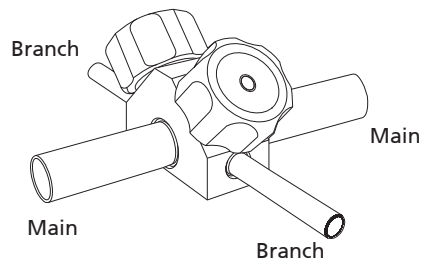
## Branch Type

### Dimensions

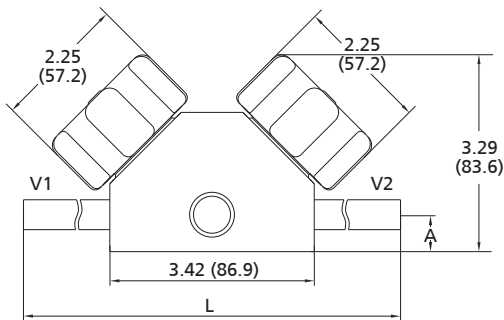
Dimensions, in inches (millimeters), are for reference only.



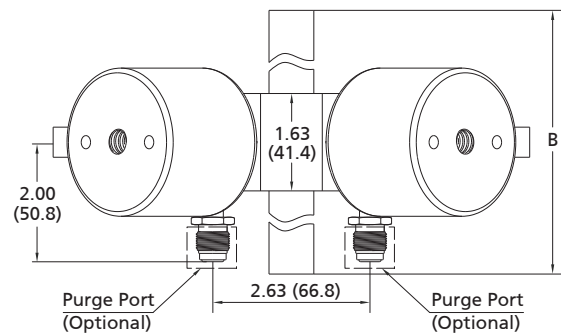
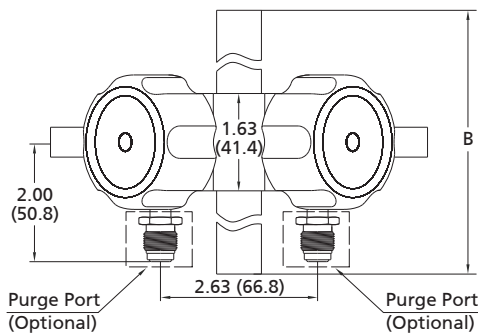
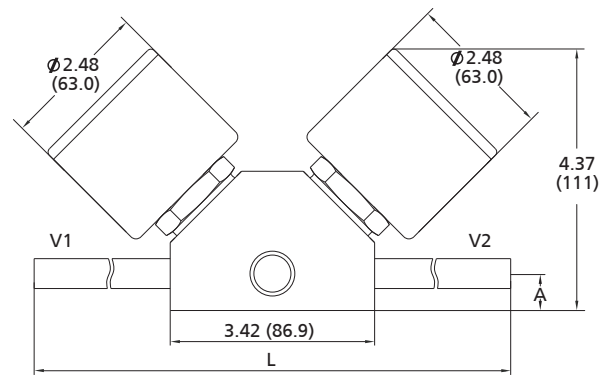
DC Flow



### Manual-Round Handle



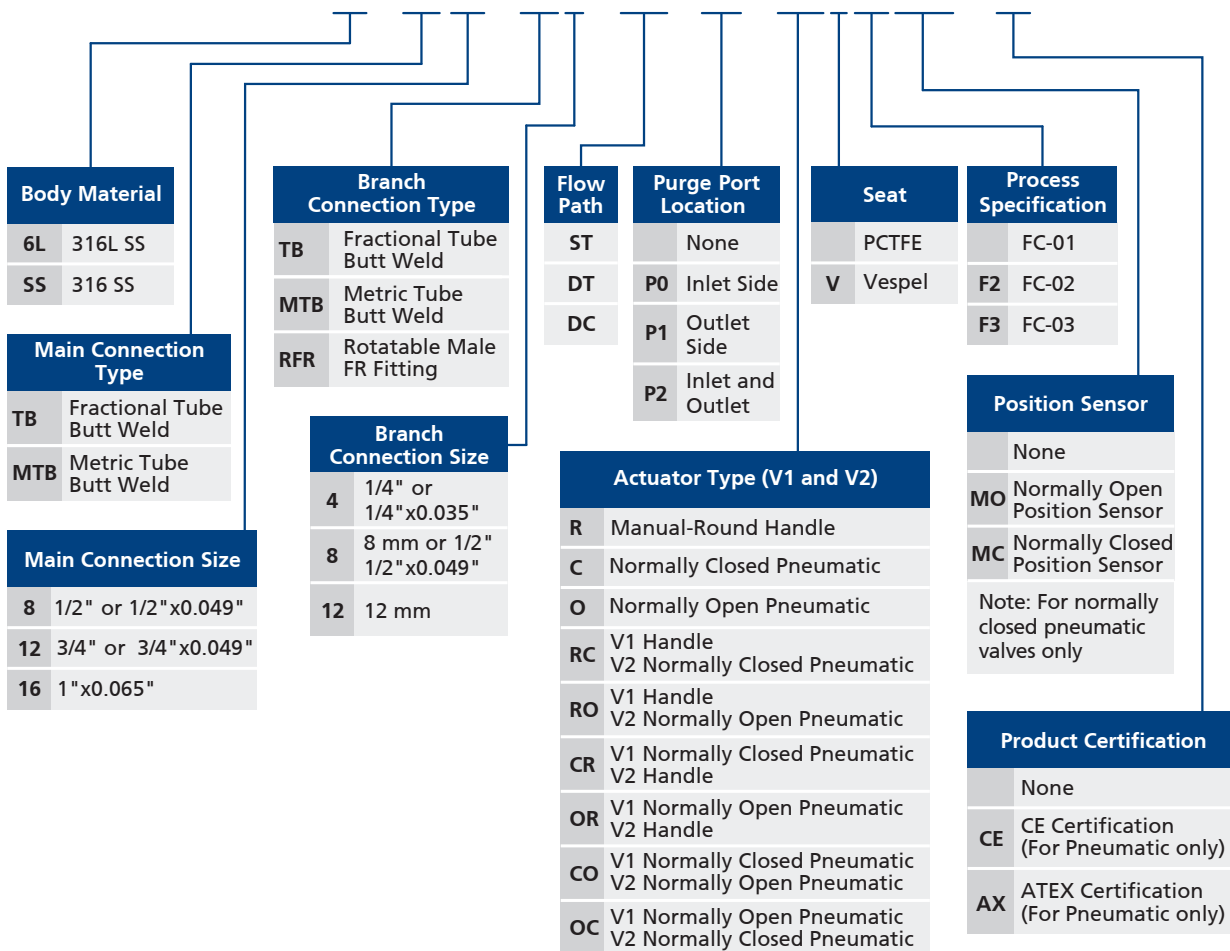
### Pneumatic



| Basic Ordering Number | Connection Type and Size     |                                                       | Dimensions in. (mm) |              |              |
|-----------------------|------------------------------|-------------------------------------------------------|---------------------|--------------|--------------|
|                       | Main                         | Branch                                                | A                   | B            | L            |
| DV□□-TB8-TB8-         | 1/2" x 0.049" Tube Butt Weld | 1/2" x 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 7.58 (193.0) | 9.38 (238.0) |
| DV□□-TB8-RFR8-        | 1/2" x 0.049" Tube Butt Weld | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 7.58 (193.0) | 9.38 (238.0) |
| DV□□-TB12-TB8-        | 3/4" x 0.049" Tube Butt Weld | 1/2" x 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 7.58 (193.0) | 9.38 (238.0) |
| DV□□-TB12-RFR8-       | 3/4" x 0.049" Tube Butt Weld | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 7.58 (193.0) | 9.38 (238.0) |
| DV□□-TB16-TB8-        | 1" x 0.065" Tube Butt Weld   | 1/2" x 0.049" Tube Butt Weld                          | 0.62 (15.7)         | 7.58 (193.0) | 9.38 (238.0) |
| DV□□-TB16-RFR8-       | 1" x 0.065" Tube Butt Weld   | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting | 0.62 (15.7)         | 7.58 (193.0) | 9.38 (238.0) |

Ordering Number Description

DV6L - TB12 - TB8 - DC - P2 - COVF2MO - CE



Note:

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
3. For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## Low Pressure/Ultra High Flow Diaphragm Valves DL Series

### Features

- ⦿ Ideal for ultra high flow applications
- ⦿ Internally threadless and springless
- ⦿ PCTFE stem tip insert for leak-tight shutoff



### Technical Data

| Technical Data        |                                                                          |                                                |
|-----------------------|--------------------------------------------------------------------------|------------------------------------------------|
| Port Size             | 3/4" to 1" or 23 mm to 25 mm                                             |                                                |
| Flow Coefficient (Cv) | Manual                                                                   | 13                                             |
|                       | Pneumatic                                                                | 6.5                                            |
| Orifice Size          | 1.125 in. (28.6 mm)                                                      |                                                |
| Max. Working Pressure | 300 psig (20.6 bar)                                                      |                                                |
| Temperature           | PCTFE: -10 ~ 150 °F (-23 ~ 65 °C)<br>Vespel: -10 ~ 250 °F (-23 ~ 121 °C) |                                                |
| Leak Rate (Helium)    | Internal                                                                 | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                       | External                                                                 | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |

### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

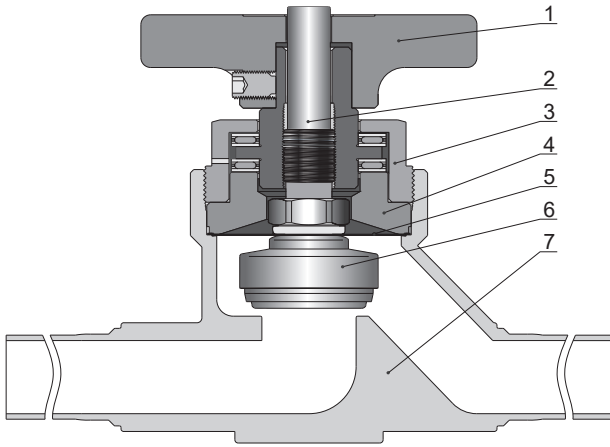
| Pressure Drop to Atmosphere<br>psig (bar) | Air<br>(l/min) | Water<br>(l/min) |
|-------------------------------------------|----------------|------------------|
| 10(0.68)                                  | 3900           | 150              |
| 50(3.4)                                   | 11000          | 340              |
| 100(6.8)                                  | 19500          | 490              |

### Process Specification

| Process Specification<br>Technology | Standard Cleaning<br>and Packaging (FC-01)          | Special Cleaning<br>and Packaging (FC-02) | Ultra High Purity (FC-03)                                           |
|-------------------------------------|-----------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------|
| Material/Specification              | CF8M/ASTM A351<br>CF3M/ASTM A351<br>F316L/ASTM A182 |                                           | CF3M/ASTM A351<br>F316L/ASTM A182                                   |
| Wetted Surface<br>Roughness         | Ra 20 μin. (0.51 μm)                                |                                           | Ra 5 μin. (0.13 μm) (Bar stock)<br>Ra 10 μin. (0.25 μm) (Cast body) |
| Polishing Process                   | Machine finished                                    |                                           | Electropolished                                                     |

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



| Item | Component        | Material/Specification                              |
|------|------------------|-----------------------------------------------------|
| 1    | Handle           | Aluminum                                            |
| 2    | Upper Stem       | 316 SS/ASTM A479                                    |
| 3    | Bonnet Nut       | 316 SS/ASTM A479                                    |
| 4    | Bonnet           | 316 SS/ASTM A479                                    |
| 5    | Diaphragm (3)    | Cobalt Alloy/AMS 5876                               |
| 6    | Stem Subassembly | 316L SS/FSD 130 and PCTFE/ASTM D1430 or Vespel      |
| 7    | Body             | CF8M/ASTM A351 or CF3M/ASTM A351 or F316L/ASTM A182 |

Fittings

Valves

## Actuators

### Handle

- ⦿ Five and a half turns to operate from fully open to closed
- ⦿ Upper stem position to indicate open and closed states

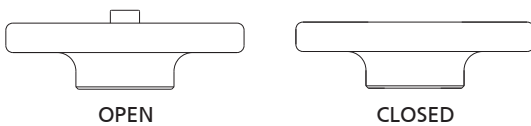
### Pneumatic

- ⦿ Normally closed, "N.C." marked on the side of the actuator
- ⦿ Actuator port 1/8-27 NPT

Pressure Gauges

Integrated Systems and Others

Process Specification



Notes: The upper stem protruding from the handle indicates open state.  
The upper stem paralleling to or sinking into the handle indicates closed state.



**Position Sensors**

Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

**Sensor Technical Data**

|                            |                                  |
|----------------------------|----------------------------------|
| <b>Output</b>              | 3-wire V (dc), PNP               |
| <b>Output Function</b>     | Normally open or normally closed |
| <b>Voltage</b>             | 10 ~ 30 V (dc)                   |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

**Explosion-proof Position Sensors**

Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

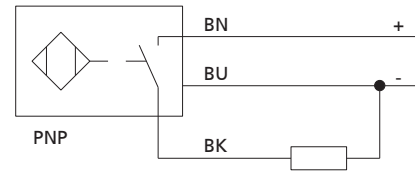
Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

**Technical Information**

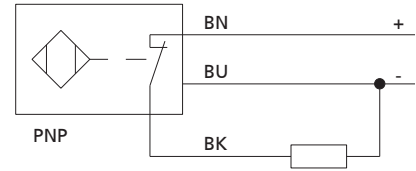
|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

**Wiring Diagram**

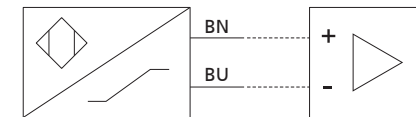
Normally open position sensors



Normally closed position sensors



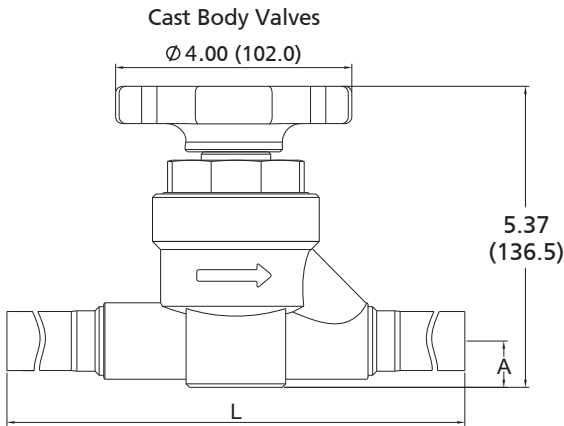
**Wiring Diagram**



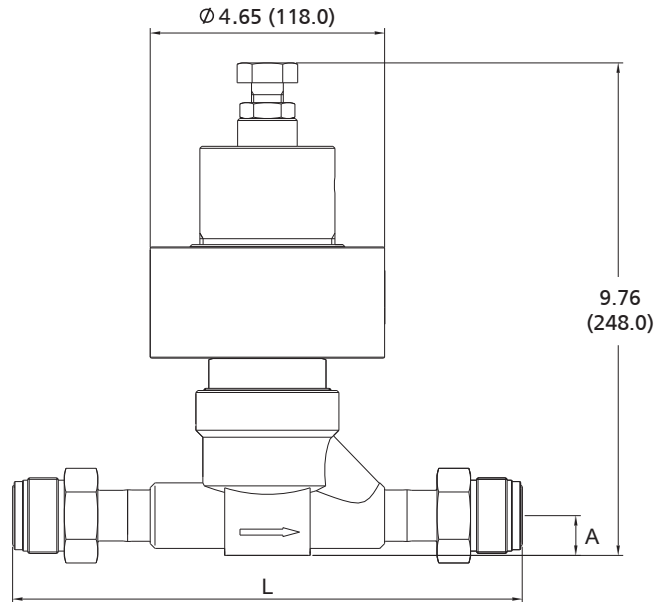
## Dimensions

Dimensions, in inches (millimeters), are for reference only.

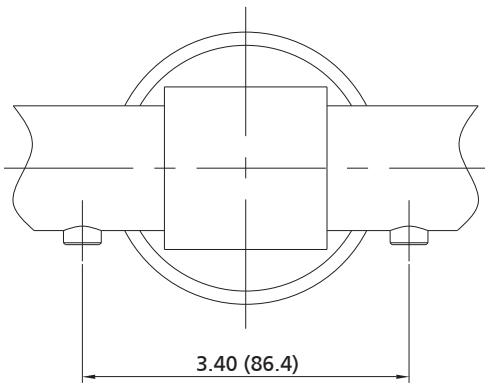
### Manual - Round Handle



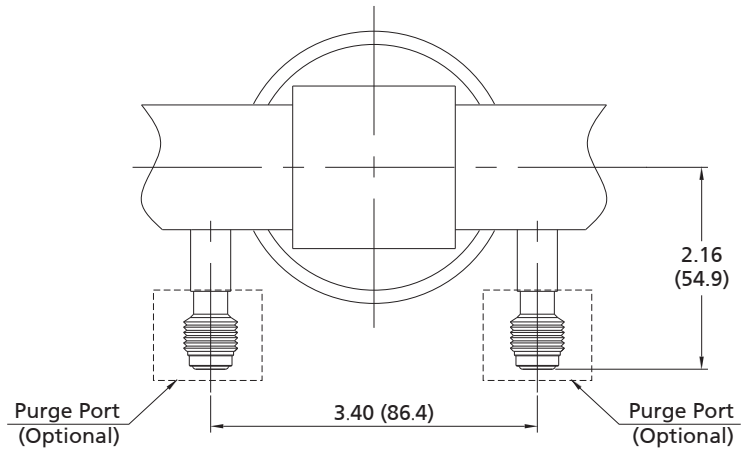
### Pneumatic



### No Purge Ports



### 1/4" Integral Male FR Metal Gasket Face Seal Fitting



| Basic Ordering Number | End Connections                                 |             | Dimensions, in. (mm) |               |
|-----------------------|-------------------------------------------------|-------------|----------------------|---------------|
|                       | Type                                            | Size        | A                    | L             |
| DL□□-FL12-            | FITOK Tube Fitting                              | 3/4"        | 0.79 (20.0)          | 8.27 (210.0)  |
| DL□□-FL16-            |                                                 | 1"          |                      | 8.46 (215.0)  |
| DL□□-ML25-            |                                                 | 25 mm       |                      | 8.63 (219.0)  |
| DL□□-TB16-            | Tube other Series                               | 1" x 0.065" |                      | 10.90 (277.0) |
| DL□□-MTB23-           |                                                 | 23 x 1.5 mm |                      |               |
| DL□□-MTB25-           |                                                 | 25 x 1.5 mm |                      |               |
| DL□□-FR16-            | Integral Male FR Metal Gasket Face Seal Fitting | 1"          | 10.04 (255.0)        |               |

Fittings

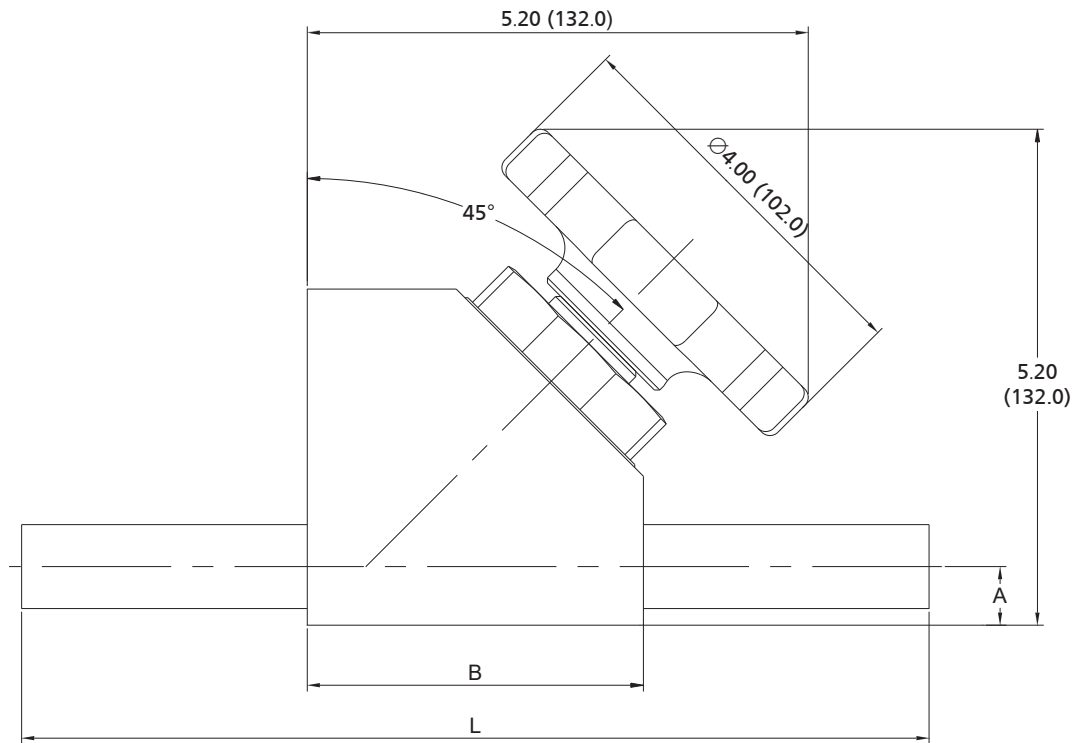
Valves

Pressure Gauges

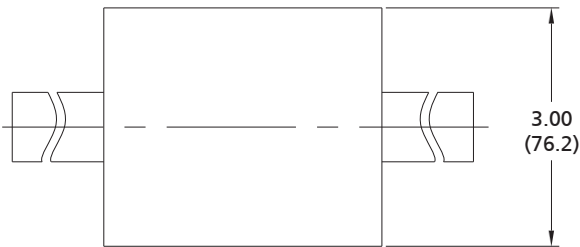
Integrated Systems and Others

Process Specification

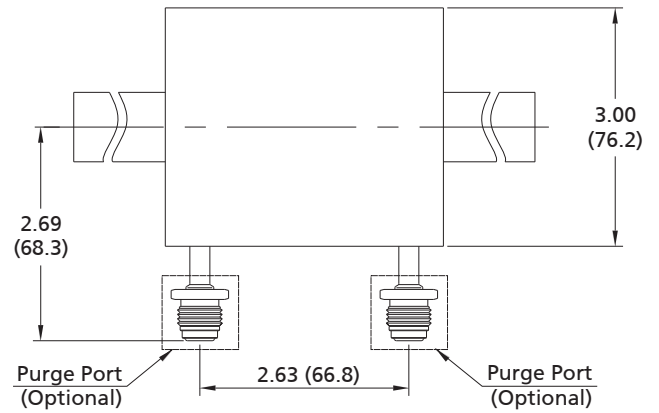
Bar Stock Valves



No purge ports

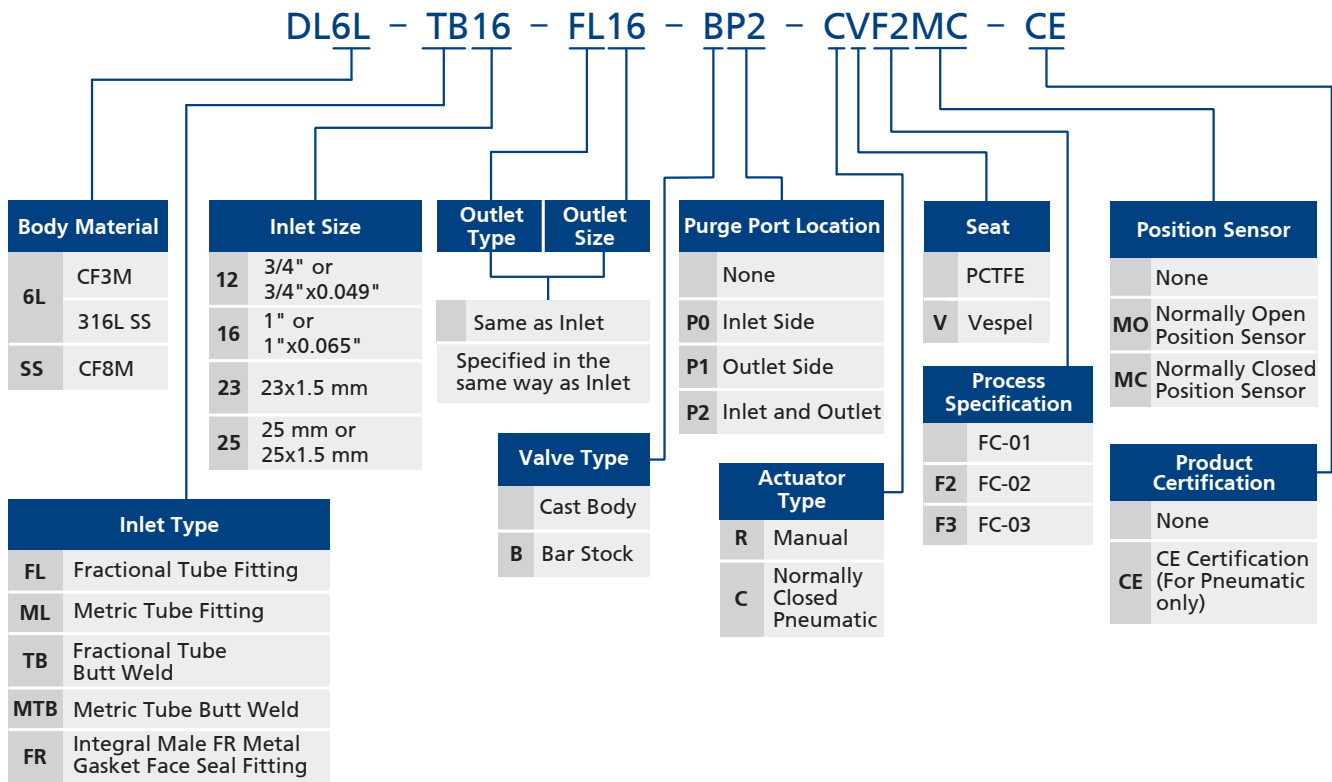


1/4" Rotatable Male FR Metal Gasket Face Seal Fitting



| Basic Ordering Number | End Connections |               | Dimensions, in. (mm) |             |              |
|-----------------------|-----------------|---------------|----------------------|-------------|--------------|
|                       | Type            | Size          | A                    | B           | L            |
| DL□□-TB12-B-          | Tube Butt Weld  | 3/4" x 0.049" | 0.61 (15.5)          | 3.50 (88.9) | 9.46 (240.0) |
| DL□□-TB16-B-          |                 | 1" x 0.065"   |                      |             |              |

## Ordering Number Description



**Note:**

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## High Pressure/High Flow Diaphragm Valves

### DF Series

#### Features

- ⦿ Ideal for high flow applications
- ⦿ Metal-to-metal seal
- ⦿ Spring type design
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ Position sensors available assembled on pneumatically actuated valves
- ⦿ Normally closed and normally open position sensors optional



#### Technical Data

|                                              |           |                                                                          |
|----------------------------------------------|-----------|--------------------------------------------------------------------------|
| Port Size                                    |           | 3/8" to 1/2" or 8 mm to 12 mm                                            |
| Flow Coefficient (Cv)                        |           | 0.80                                                                     |
| Orifice Size                                 |           | 0.31 in. (8.0 mm)                                                        |
| Max. Working Pressure                        | Handle    | 3500 psig (241 bar)                                                      |
|                                              | Pneumatic | 3000 psig (206 bar)                                                      |
| Max. Differential Back Pressure <sup>①</sup> |           | 150 psig (10.3 bar)                                                      |
| Pneumatic Actuator Operating Pressure        |           | 60 to 90 psig (4.2 to 6.2 bar)                                           |
| Temperature                                  |           | PCTFE: -10 ~ 150 °F (-23 ~ 65 °C)<br>Vespel: -10 ~ 250 °F (-23 ~ 121 °C) |
| Leak Rate (Helium)                           | Internal  | ≤4x10 <sup>-9</sup> std cm <sup>3</sup> /s                               |
|                                              | External  | ≤4x10 <sup>-9</sup> std cm <sup>3</sup> /s                               |

① Differential back pressure is equal to the outlet pressure minus the inlet pressure. When the differential back pressure is greater than 150 psig (10.3 bar), the valve will not open even being loosened after tightening the handle. As the force of the differential back pressure acting on the valve stem is downward when closing and is greater than the spring force, the valve stem cannot be lifted.

#### Process Specification

| Technology               | Process Specification | Standard Cleaning and Packaging (FC-01) | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|--------------------------|-----------------------|-----------------------------------------|----------------------------------------|---------------------------|
| Material/Specification   |                       | 316 SS/ASTM A479<br>316L SS/SEMI F20    |                                        | 316L SS/SEMI F20          |
| Wetted Surface Roughness |                       | Ra 20 μin. (0.51 μm)                    |                                        | Ra 10 μin. (0.25 μm)      |
| Polishing Process        |                       | Machine finished                        |                                        | Electropolished           |

Note: Refer to page P-01 for a detailed description of Process Specification.

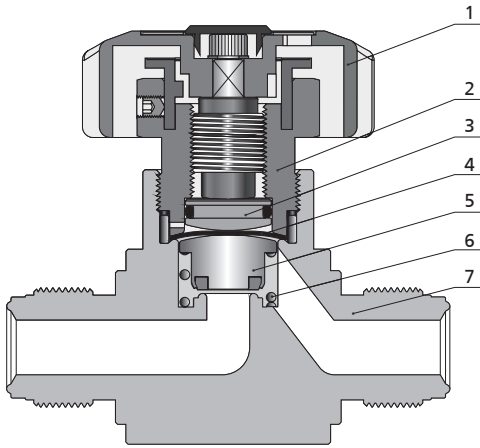
#### Flow Data

Air @ 70 °F (21 °C)

Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|----------------------------------------|-------------|---------------|
| 10 (0.68)                              | 274         | 9.5           |
| 50 (3.4)                               | 733         | 21.5          |
| 100 (6.8)                              | 1300        | 30.3          |

## Major Materials of Construction



Manual Model

| Item | Component        | Material/Specification                             |
|------|------------------|----------------------------------------------------|
| 1    | Handle           | Aluminum                                           |
| 2    | Bonnet Nut       | S17400/ASTM A564                                   |
| 3    | Button           | 316 SS/ASTM A479                                   |
| 4    | Diaphragm (5)    | Cobalt Alloy (3) /AMS 5876 + C17200 (2) /ASTM B194 |
| 5    | Stem Subassembly | 316L SS/SEMI F20 and PCTFE/ASTM D1430 or Vespel    |
| 6    | Spring           | 316 SS/ASTM A313                                   |
| 7    | Body             | 316 SS/ASTM A479 or 316L SS/SEMI F20               |

## Actuators

### Manual - Round Handle

- ⦿ One-half turn to operate from fully open to closed
- ⦿ Handle with window to visually indicate open and closed states



### Pneumatic

- ⦿ Normally open, "N.O." marked on the top of the actuator
- ⦿ Normally closed, "N.C." marked on the top of the actuator



### Position Sensors

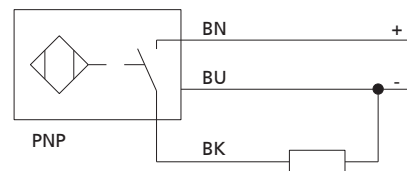
Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

### Sensor Technical Data

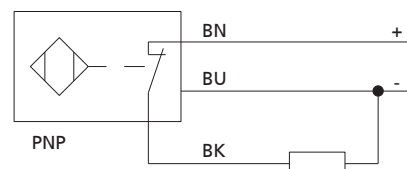
|                     |                                  |
|---------------------|----------------------------------|
| Output              | 3-wire V (dc), PNP               |
| Output Function     | Normally open or normally closed |
| Voltage             | 10 ~ 30 V (dc)                   |
| Working Temperature | -13 ~ 158 °F (-25 ~ 70 °C)       |

### Wiring Diagram

Normally open position sensors



Normally closed position sensors



## V-72 Diaphragm Valves

### Explosion-proof Position Sensors

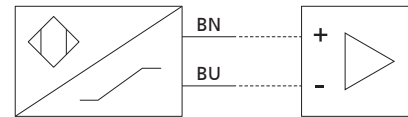
Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

### Technical Information

|                            |                            |
|----------------------------|----------------------------|
| <b>Output</b>              | 2 Wires DC                 |
| <b>Voltage</b>             | 8.2 V (dc)                 |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

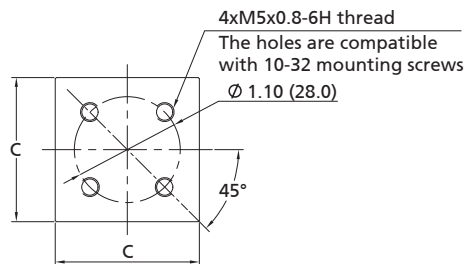
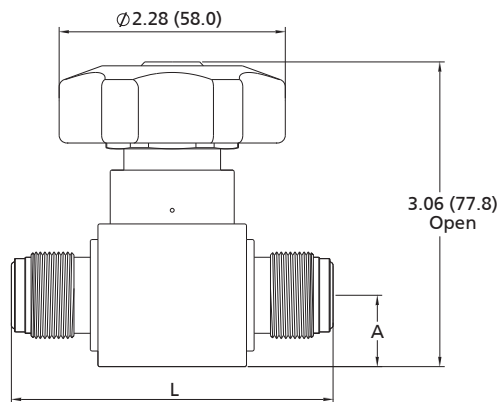
### Wiring Diagram



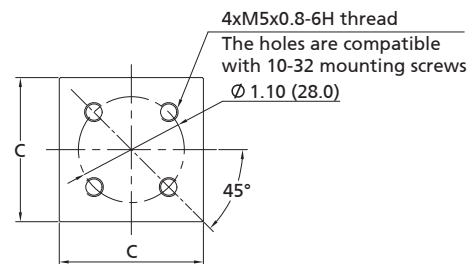
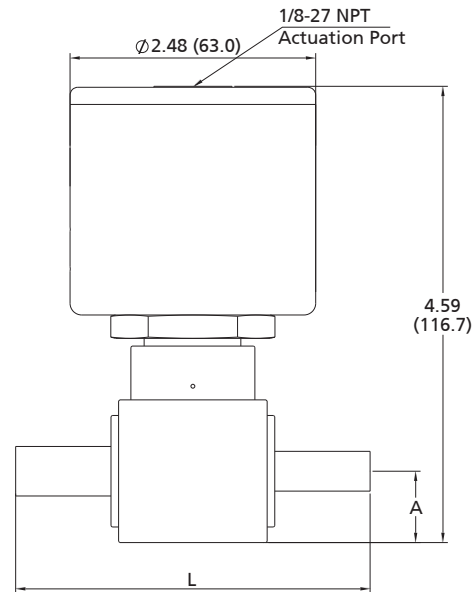
## Dimensions

Dimensions, in inches (millimeters), are for reference only.

#### Manual - Round Handle

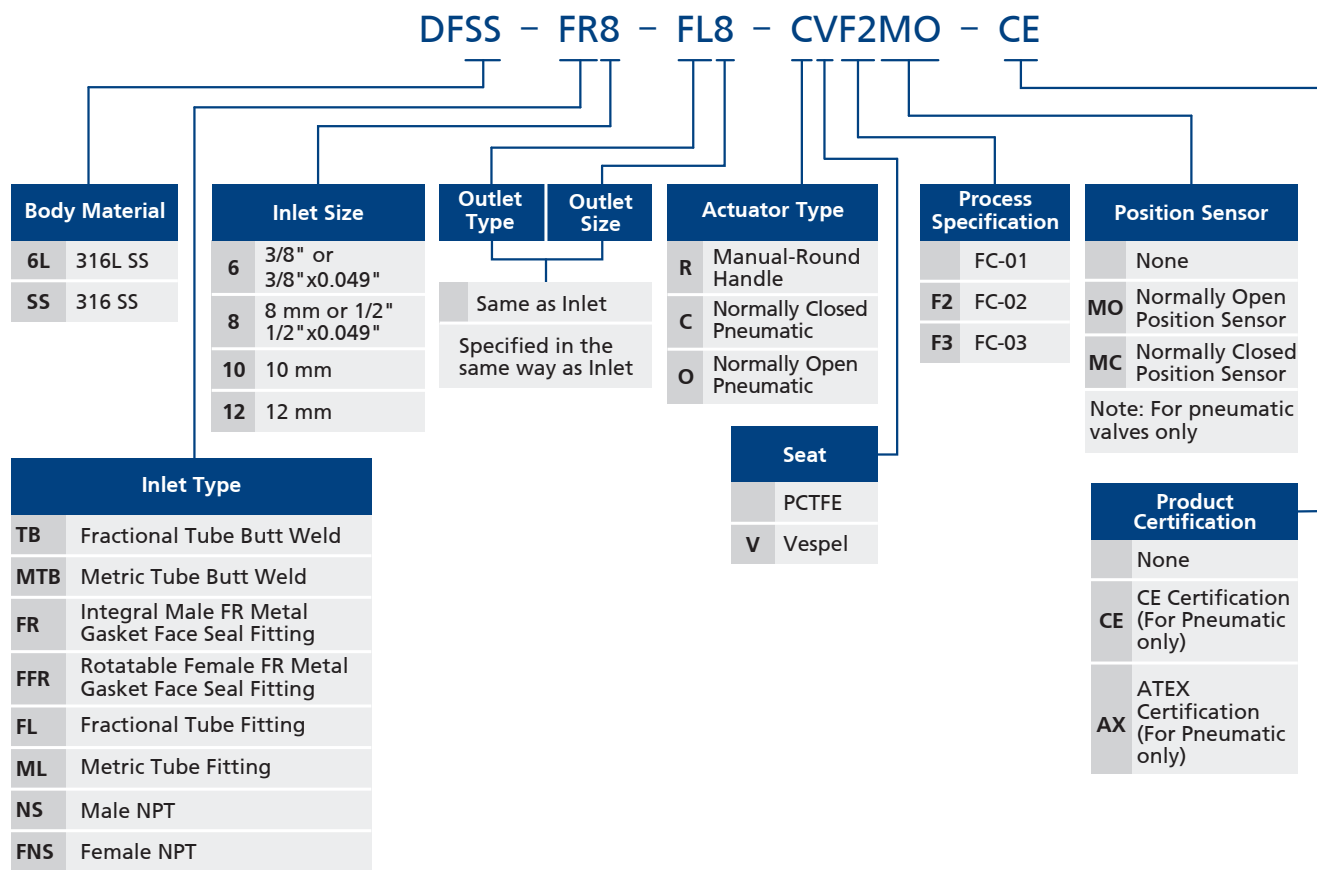


#### Pneumatic



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|
|                       |                                                         | A                   | C           | L           |
| DF□□-TB6-             | 3/8"x0.049" Tube Butt Weld                              | 0.71 (18.0)         | 1.50 (38.1) | 3.58 (90.9) |
| DF□□-TB8-             | 1/2"x0.049" Tube Butt Weld                              | 0.71 (18.0)         | 1.50 (38.1) | 3.58 (90.9) |
| DF□□-FR8-             | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    | 0.71 (18.0)         | 1.50 (38.1) | 3.25 (82.5) |
| DF□□-FFR8-            | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.71 (18.0)         | 1.50 (38.1) | 3.89 (98.8) |
| DF□□-FL6-             | 3/8" FITOK Tube Fitting                                 | 0.71 (18.0)         | 1.50 (38.1) | 3.27 (83.0) |
| DF□□-FL8-             | 1/2" FITOK Tube Fitting                                 | 0.71 (18.0)         | 1.50 (38.1) | 3.47 (88.2) |
| DF□□-FNS8-            | 1/2" Female NPT                                         | 0.71 (18.0)         | 1.50 (38.1) | 3.30 (84.0) |

## Ordering Number Description



**Note:**

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.



# Diaphragm Valves

## Economic Diaphragm Valves

### DE Series

#### Introduction

DE series economic diaphragm valves are typical products for ultra high purity gas fluid systems. Reliability and economy are achieved by reducing the number of components, optimizing machining methods and mass production, while maintaining the same basic performance by using the same materials, cleaning and packaging processes as the other series of FITOK diaphragm valves. FITOK's advance manufacturing processes and stringent quality control ensure the products meet the application needs of ultra high purity gas fluid systems for the semiconductor industry.



#### Features

- ⦿ Minimum particle generation and dead space
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ No springs or threads in wetted areas improves cleanliness

#### Technical Data

|                                              |                 |                                                |
|----------------------------------------------|-----------------|------------------------------------------------|
| <b>Port Size</b>                             |                 | 1/4"                                           |
| <b>Flow Coefficient (Cv)</b>                 |                 | 0.27                                           |
| <b>Orifice Size</b>                          |                 | 0.16 in. (4.1 mm)                              |
| <b>Working Pressure</b>                      |                 | Vacuum to 150 psig (10 bar)                    |
| <b>Pneumatic Actuator Operating Pressure</b> |                 | 60 ~ 90 psig (4.2 ~ 6.2 bar)                   |
| <b>Temperature</b>                           |                 | -10 ~ 176 °F (-23 ~ 80 °C)                     |
| <b>Leak Rate (Helium)</b>                    | <b>Internal</b> | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                                              | <b>External</b> | $\leq 1 \times 10^{-9}$ std cm <sup>3</sup> /s |

#### Flow Data

Air @ 70 °F (21 °C)

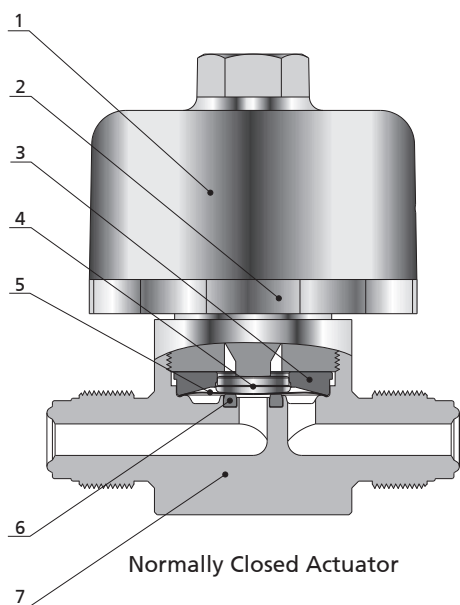
Water @ 60 °F (16 °C)

| Orifice in. (mm) | Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|------------------|----------------------------------------|-------------|---------------|
| 0.16 (4.1)       | 10 (0.68)                              | 86          | 3.2           |
|                  | 50 (3.4)                               | 230         | 7.2           |
|                  | 100 (6.8)                              | 410         | 10.2          |

## Process Specification

| Technology               | Ultra High Purity (F3)        |
|--------------------------|-------------------------------|
| Material/Specification   | 316L SS/SEMI F20              |
| Wetted Surface Roughness | Ra 5 µin. (0.13 µm)           |
| Polishing Process        | Electropolished               |
| Assembly Environment     | In ISO 4/Federal 10 cleanroom |
| Packaging                | Double bagged in cleanroom    |

## Major Materials of Construction



| Item | Component    | Material / Specification |
|------|--------------|--------------------------|
| 1    | Actuator     | Aluminum                 |
| 2    | Actuator Nut | 304 SS/ASTM A479         |
| 3    | Bonnet       | S17400/ASTM A564         |
| 4    | Button       | 316 SS/ASTM A479         |
| 5    | Diaphragm    | Cobalt Alloy/AMS 5876    |
| 6    | Seat         | PCTFE/ASTM D1430         |
| 7    | Body         | 316L SS/SEMI F20         |

## Actuator

### Manual - Round Handle

- Quick, quarter-turn actuation
- Handle with window to visually indicate open and closed states



OPEN



CLOSED

### Normally Closed Pneumatic

- Normally Closed, "N.C." marked on the top of the actuator



## Dimensions and Ordering Information

Dimensions, in inches (millimeters), are for reference only.

Fittings

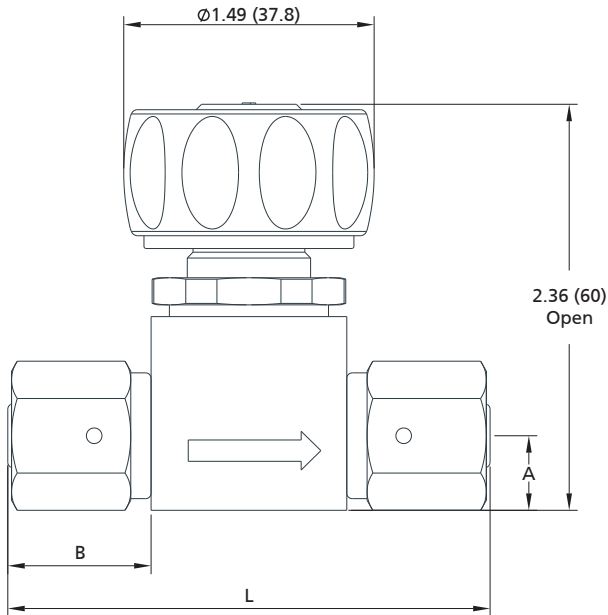
Valves

Pressure Gauges

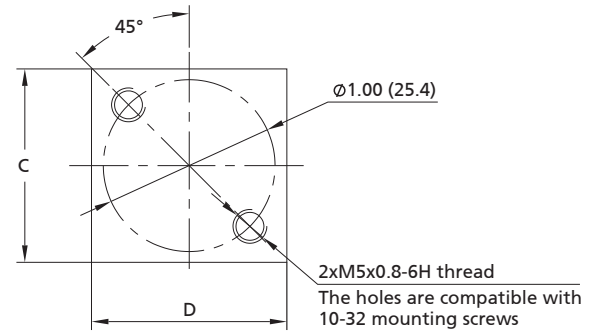
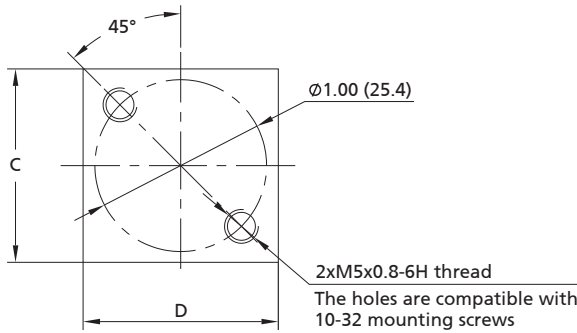
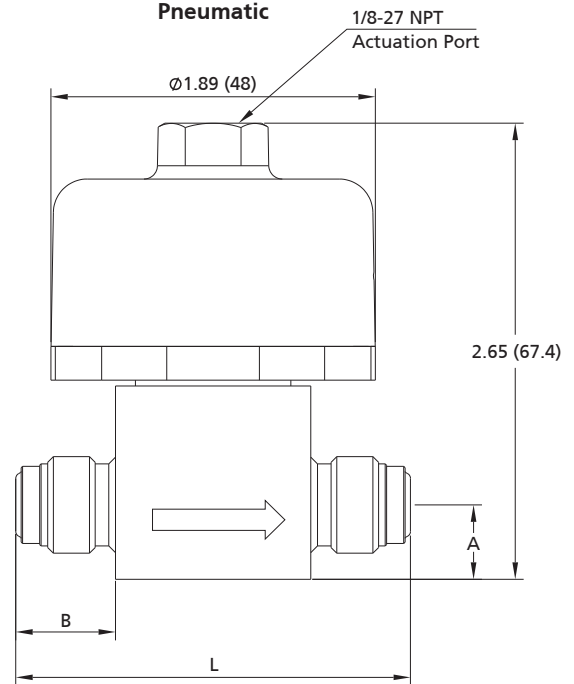
Integrated Systems and Others

Process Specification

**Manual - Round Handle**

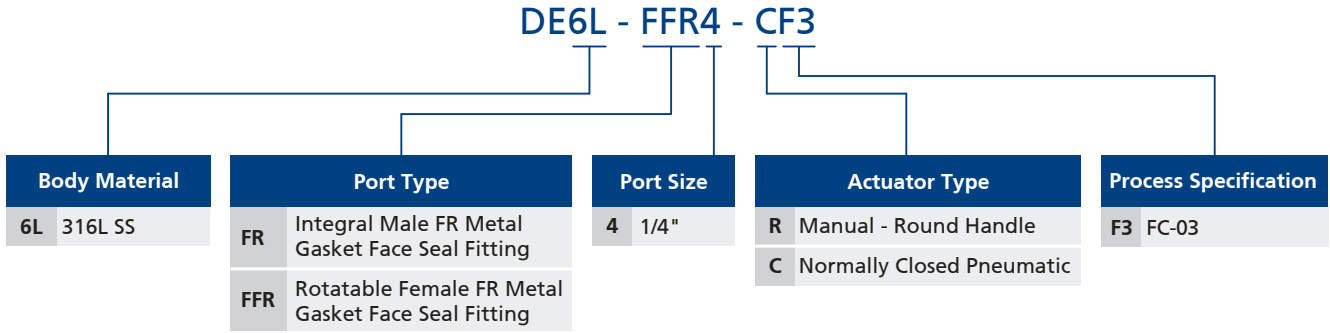


**Pneumatic**



| Ordering Number | Connection Type and Size                                | Dimensions, in. (mm) |             |             |             |             |
|-----------------|---------------------------------------------------------|----------------------|-------------|-------------|-------------|-------------|
|                 |                                                         | A                    | B           | C           | D           | L           |
| DE6L-FFR4-RF3   | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.43 (11)            | 0.82 (20.9) | 1.13 (28.6) | 1.14 (28.9) | 2.78 (70.6) |
| DE6L-FFR4-CF3   |                                                         |                      |             |             |             | 2.30 (58.4) |
| DE6L-FR4-RF3    | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.43 (11)            | 0.58 (14.7) | 1.13 (28.6) | 1.14 (28.9) | 2.78 (70.6) |
| DE6L-FR4-CF3    |                                                         |                      |             |             |             | 2.30 (58.4) |

## Part Number Description



Note: Part Number Description is only for designator meaning explanation, please refer to the Ordering Number for the optional part numbers.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Diaphragm Valves

## High Temperature Diaphragm Valves

### DK Series

#### Features

- ⦿ Thermal immersion design for use in high temperature up to 482 °F (250 °C)
- ⦿ Metal seat to provide excellent resistance to swelling and contamination
- ⦿ Cobalt alloy diaphragm with high strength and corrosion resistance to ensure long cycle life
- ⦿ All-Metal wetted parts with broad chemical compatibility
- ⦿ Minimum particle generation and dead space, easy to purge



#### Technical Data

|                                       |                              |                                                |
|---------------------------------------|------------------------------|------------------------------------------------|
| Port Size                             | 1/4" to 3/8" or 6 mm to 8 mm |                                                |
| Flow Coefficient (Cv)                 | 0.27                         |                                                |
| Orifice Size                          | 0.16 in. (4.1 mm)            |                                                |
| Max. Working Pressure                 | 145 psig (10 bar)            |                                                |
| Pneumatic Actuator Operating Pressure | 72 ~ 101 psig (5 ~ 7 bar)    |                                                |
| Temperature                           | 14 ~ 482 °F (-10 ~ 250 °C)   |                                                |
| Leak Rate (helium)                    | Internal                     | $\leq 3 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                                       | External                     | $\leq 3 \times 10^{-9}$ std cm <sup>3</sup> /s |

#### Flow Data

Air @ 70 °F (21 °C)

Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere<br>psig (bar) | Air<br>(l/min) | Water<br>(l/min) |
|-------------------------------------------|----------------|------------------|
| 10 (0.68)                                 | 86             | 3.2              |
| 50 (3.4)                                  | 230            | 7.2              |
| 100 (6.8)                                 | 410            | 10.2             |

#### Process Specification

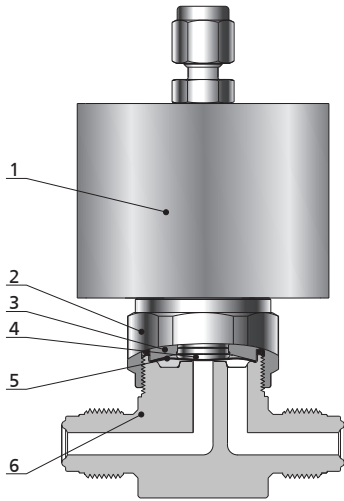
| Technology               | Standard Cleaning and Packaging (FC-01) | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03)                   |
|--------------------------|-----------------------------------------|----------------------------------------|---------------------------------------------|
| Material/Specification   | 316L SS/ASTM A479                       |                                        | 316L VAR/SEMI F20<br>316L VIM-VAR /SEMI F20 |
| Wetted Surface Roughness | Ra 10 μin. (0.25 μm) <sup>①</sup>       |                                        | Ra 5 μin. (0.13 μm)                         |
| Polishing Process        | Machine finished <sup>①</sup>           |                                        | Electropolished                             |

① For valves with FR connections and tube butt connections, the standard polishing process is electropolishing and the internal surface roughness is finished to an average of Ra 5 μin. (0.13 μm).

Note: Please see Process Specification on page P-01 for details.

**FITOK**

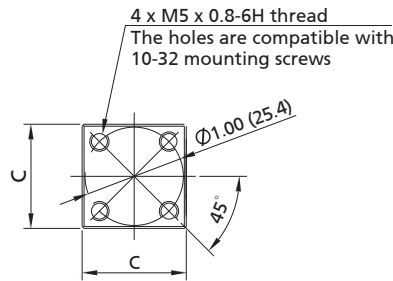
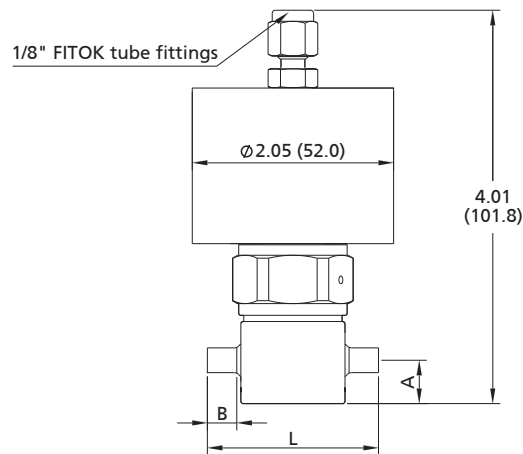
## Major Materials of Construction



| Item | Component     | Material/Specification                                                |
|------|---------------|-----------------------------------------------------------------------|
| 1    | Actuator      | 316 SS/ASTM A479                                                      |
| 2    | Bonnet Nut    | 316 SS/ASTM A479                                                      |
| 3    | Bonnet        | S17400/ASTM A564                                                      |
| 4    | Button        | 316 SS/ASTM A479                                                      |
| 5    | Diaphragm (2) | Cobalt Alloy/AMS 5876                                                 |
| 6    | Body          | 316L SS/ASTM A479<br>or 316L VAR/SEMI F20<br>or 316L VIM-VAR/SEMI F20 |

## Dimensions and Ordering Information

Dimensions, in inches (millimeters), are for reference only.



| Basic Ordering Number | Connection Type and Size                                | Dimensions, in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|----------------------|-------------|-------------|-------------|
|                       |                                                         | A                    | B           | C           | L           |
| DK□□-TB4-4-           | 1/4" Tube Butt Weld                                     | 0.44 (11.2)          | 0.30 (7.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DK□□-TB6-4-           | 3/8" Tube Butt Weld                                     | 0.44 (11.2)          | 0.26 (6.6)  | 1.06 (26.9) | 1.74 (44.2) |
| DK□□-FFR4-4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)          | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DK□□-RFR4-4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 0.44 (11.2)          | 0.86 (21.8) | 1.06 (26.9) | 2.78 (70.6) |
| DK□□-FR4-4-           | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)          | 0.62 (15.7) | 1.06 (26.9) | 2.30 (58.4) |

## Ordering Number Description

DK6L - TB4 - FR4 - 4 - CF3



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings

Valves

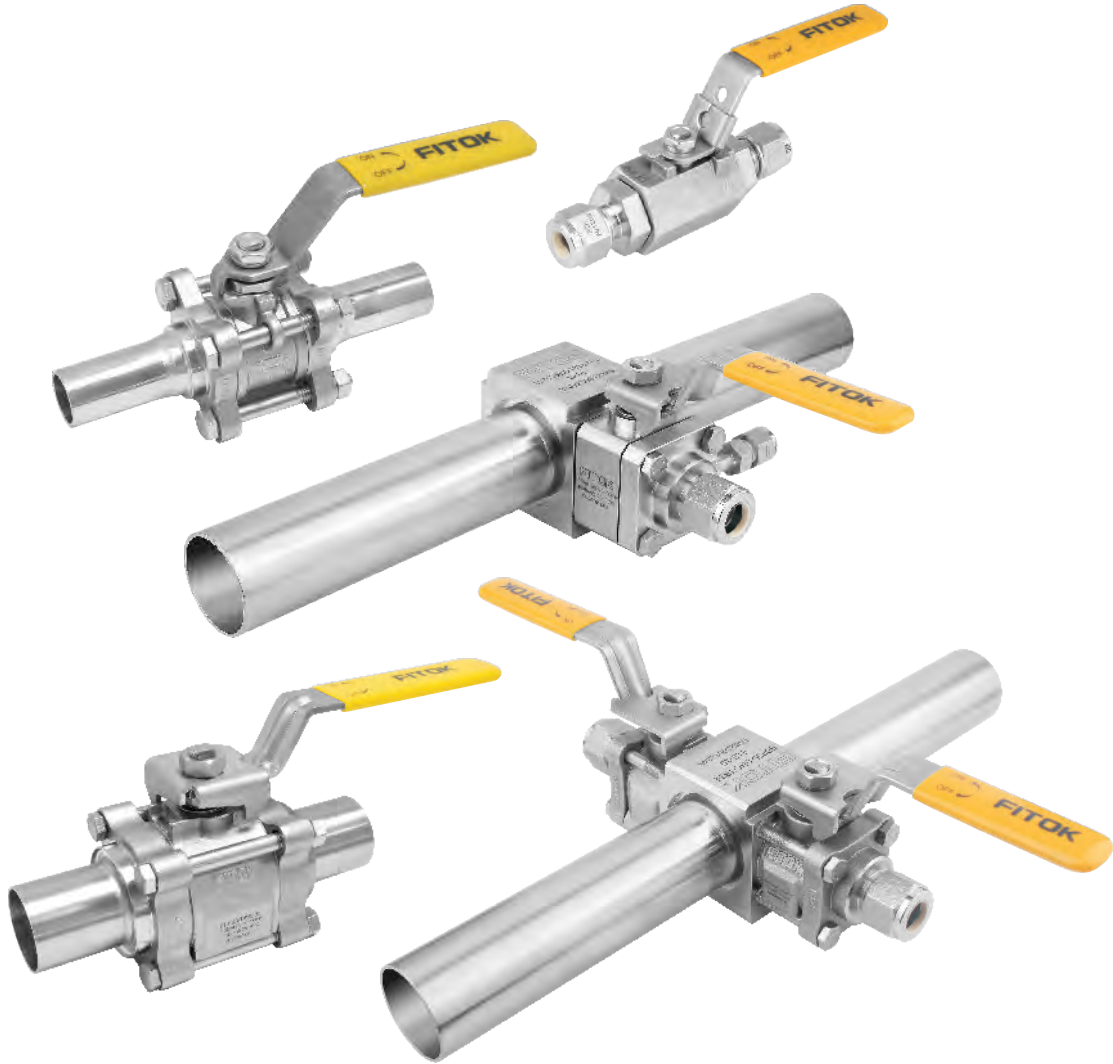
Pressure Gauges

Integrated Systems and Others

Process Specification

# High Purity Ball Valves

BGP, BHP, BDP, BRP Series



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



# High Purity Ball Valves

## 3-Piece High Purity Ball Valves

### BGP Series

#### Introduction

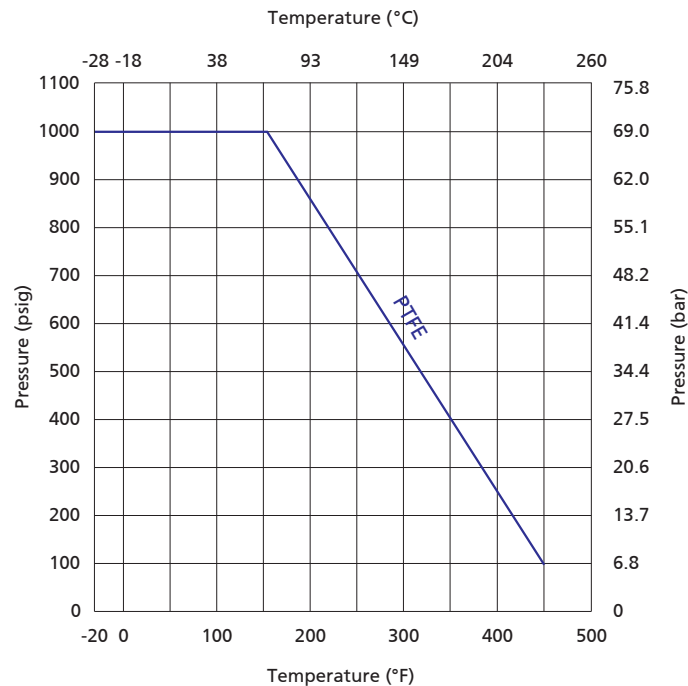
FITOK BGP series 3-piece high purity ball valves are designed to meet the requirements of degreasing, low working pressure, high flow rate and bi-directional flow for the clean dry air (CDA) and bulk gas distribution line, which are widely used in specialty gas, semiconductor and chemical industries.



#### Features

- ⦿ Working pressure up to: 1000 psig (69.0 bar)
- ⦿ Working temperature: -20 °F to 450 °F (-28 °C to 232 °C)
- ⦿ Orifice sizes: 0.18" (4.6 mm) to 0.79" (20.0 mm)
- ⦿ Standard average internal surface roughness Ra 15 μin. (0.38 μm)
- ⦿ Helium leak rate  $\leq 1 \times 10^{-8}$  std cm<sup>3</sup>/s
- ⦿ Connection tube in customized length available

#### Pressure vs. Temperature



Note: The temperature and pressure rating is based on valves of standard materials.

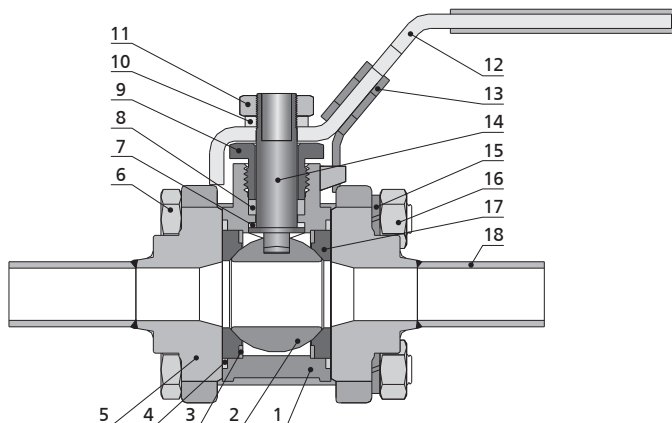
## Process Specification

| Technology                 | Process Specification | Special Cleaning and Packaging (FC-02)                                                                                   | Special Cleaning and Packaging (FOG)                 |
|----------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Material/Specification     |                       | CF8M/A351<br>316 SS/ASTM A479<br>316L SS/A269                                                                            |                                                      |
| Internal Surface Roughness |                       | Ra 15 µin. (0.38 µm)                                                                                                     |                                                      |
| Polishing Process          |                       | Mechanical Polishing                                                                                                     |                                                      |
| Lubrication                |                       | Special lubricant compatible with oxygen is applied to components in contact with the media, for example, DuPont GPL 227 | No lubricant on components in contact with the media |

### Notes:

1. For a detailed description of the process specification, please refer to the process specification catalog.
2. The pressure ratings of valves with FOG drop to 34.4 bar (500 psig).
3. The starting torque of valves with FOG is greater than that of valves with FC-02.

## Standard Materials of Construction

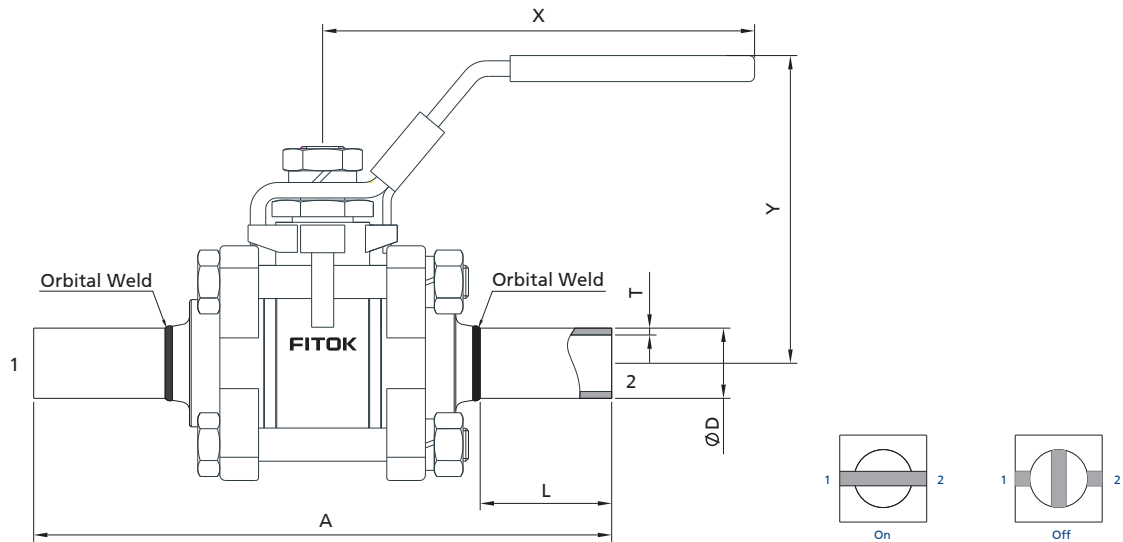


| Item | Component              | Material                      |
|------|------------------------|-------------------------------|
| 1    | <i>Body</i>            | <i>CF8M/A351</i>              |
| 2    | <i>Ball</i>            | <i>316 SS/A479</i>            |
| 3    | <i>Support Ring</i>    | <i>316 SS/A240</i>            |
| 4    | <i>Side Seal</i>       | <i>PTFE/D1710</i>             |
| 5    | <i>End Cap</i>         | <i>CF8M/A351</i>              |
| 6    | Body Bolt              | Stainless Steel               |
| 7    | <i>Stem Bearing</i>    | <i>PTFE/D1710</i>             |
| 8    | <i>Stem Packing</i>    | <i>PTFE/D1710</i>             |
| 9    | <i>Packing Gland</i>   | <i>304 SS/A479</i>            |
| 10   | Gasket                 | Stainless Steel               |
| 11   | Stem Nut               | Stainless Steel               |
| 12   | Handle                 | 304 SS/A240 (with PVC Sleeve) |
| 13   | Lock Block             | 304 SS/A240                   |
| 14   | <i>Stem</i>            | <i>316 SS/A479</i>            |
| 15   | Standard Spring Gasket | Stainless Steel               |
| 16   | Hex Nut                | Stainless Steel               |
| 17   | <i>Seat</i>            | <i>PTFE/D1710</i>             |
| 18   | <i>Welded Tube</i>     | <i>316L SS/A269</i>           |

Note: Components in contact with the media are listed in italics. For other materials, please contact FITOK Group or our authorized distributors.

## Dimensions

Dimensions in in. (mm) are for reference only and subject to change.



| Basic Ordering Number | Connection Type and Size                               | Orifice in. (mm) | Cv   | Dimensions, in. (mm) |             |              |              |              |             |
|-----------------------|--------------------------------------------------------|------------------|------|----------------------|-------------|--------------|--------------|--------------|-------------|
|                       |                                                        |                  |      | A                    | L           | D            | T            | X            | Y           |
| BGP□□-TB4-05          | 1/4" x 0.035" Fractional Extended Tube Plain Butt Weld | 0.18 (4.6)       | 1.1  | 3.30 (83.3)          | 0.81 (20.5) | 0.25 (6.35)  | 0.035 (0.89) | 2.69 (68.3)  | 1.46 (37.0) |
| BGP□□-FL4-05          | 1/4" FITOK Tube Fittings                               | 0.19 (4.8)       | 1.2  | 2.63 (66.8)          | —           | —            | —            |              |             |
| BGP□□-ML6-05          | 6 mm FITOK Tube Fittings                               |                  |      |                      |             |              |              |              |             |
| BGP□□-ML8-05          | 8 mm FITOK Tube Fittings                               |                  |      |                      |             |              |              |              |             |
| BGP□□-TB6-07          | 3/8" x 0.035" Fractional Extended Tube Plain Butt Weld | 0.28 (7.1)       | 3.8  | 3.30 (83.3)          | 0.81 (20.5) | 0.375 (9.53) | 0.035 (0.89) |              |             |
| BGP□□-FL6-07          | 3/8" FITOK Tube Fittings                               |                  |      |                      |             |              |              |              |             |
| BGP□□-ML10-07         | 10 mm FITOK Tube Fittings                              |                  |      |                      |             |              |              |              |             |
| BGP□□-TB8-11          | 1/2" x 0.049" Fractional Extended Tube Plain Butt Weld | 0.40 (10.21)     | 7.2  | 4.12 (104.6)         | 0.93 (23.5) | 0.50 (12.7)  | 0.049 (1.24) | 3.94 (100.0) | 2.19 (55.7) |
| BGP□□-FL8-11          | 1/2" FITOK Tube Fittings                               | 0.42 (10.6)      | 7.5  | 4.04 (103.0)         | —           | —            | —            |              |             |
| BGP□□-ML12-11         | 12 mm FITOK Tube Fittings                              |                  |      |                      |             |              |              |              |             |
| BGP□□-ML14-11         | 14 mm FITOK Tube Fittings                              |                  |      |                      |             |              |              |              |             |
| BGP□□-FL10-13         | 5/8" FITOK Tube Fittings                               | 0.5 (12.7)       | 11.3 | 5.12 (130.0)         | 1.26 (32)   | 0.75 (19.05) | 0.065 (1.65) |              |             |
| BGP□□-TB12-15         | 3/4" x 0.065" Fractional Extended Tube Plain Butt Weld | 0.55 (14.0)      | 13   |                      |             |              |              |              |             |
| BGP□□-FL12-15         | 3/4" FITOK Tube Fittings                               |                  |      |                      |             |              |              |              |             |
| BGP□□-ML18-15         | 18 mm FITOK Tube Fittings                              |                  |      |                      |             |              |              |              |             |
| BGP□□-TB16-20         | 1" x 0.065" Fractional Extended Tube Plain Butt Weld   | 0.79 (20.0)      | 34   | 6.3 (160.0)          | 1.67 (42.5) | 1.00 (25.4)  | 0.065 (1.65) | 5.18 (131.5) | 2.66 (67.5) |
| BGP□□-FL16-20         | 1" FITOK Tube Fittings                                 |                  |      |                      |             |              |              |              |             |
| BGP□□-ML22-20         | 22 mm FITOK Tube Fittings                              |                  |      |                      |             |              |              |              |             |
| BGP□□-ML25-20         | 25 mm FITOK Tube Fittings                              |                  |      |                      |             |              |              |              |             |

- Sizes and types listed are standard. Other sizes and types are available upon request, please contact FITOK Group or our authorized distributors.
- Connection tube length can be specified, such as BGP□□-TB4-05, if L=30 mm is required, the part number should be changed to BGP□□-TB4 x L30-05.
- For BGP□□-TB4-05, if no weld seam is allowed at connection, the part number should be changed to BGP□□-TB4-05-SL.

## Locking Device

- ⦿ Lock BGP series valves, locking hole diameters of:  
 valves with orifice 05 or 07 are 0.19 in. (4.8 mm);  
 valves with orifice 11, 13, 15, or 20 are 0.22 in. (5.7 mm);
- ⦿ To order a ball valve with locking device, please refer to the "Ordering Number Description" and add -L to the valve ordering number.  
 Example: BGPSS-FL8-11-L

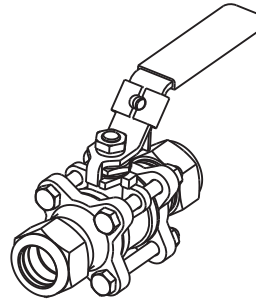
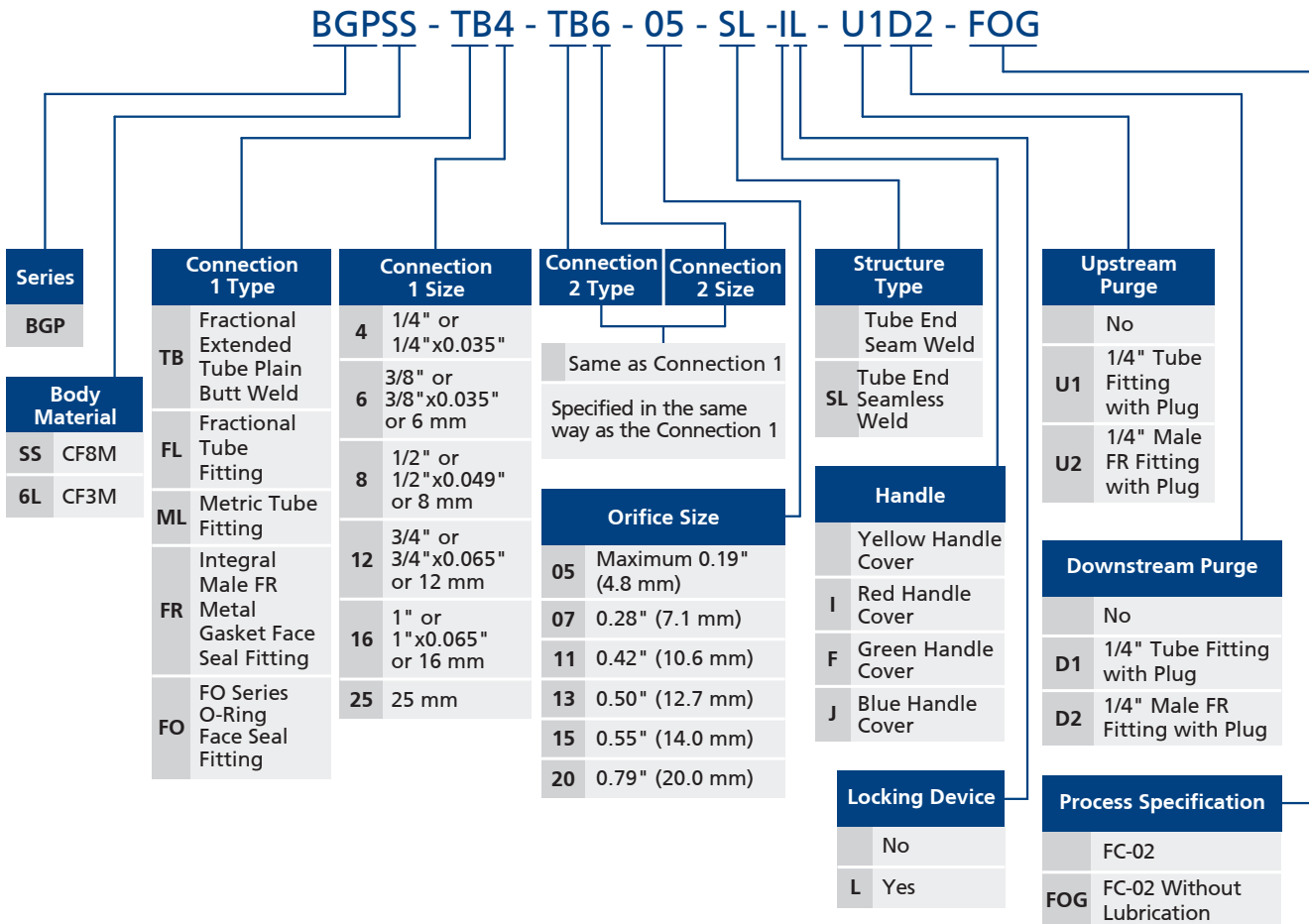


Diagram of Ball Valves with Locking Device and Orifice 05, 07, 11, 13, 15, or 20

## Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

# High Purity Ball Valves

## 3-Piece High Purity Ball Valves

### BHP Series

#### Introduction

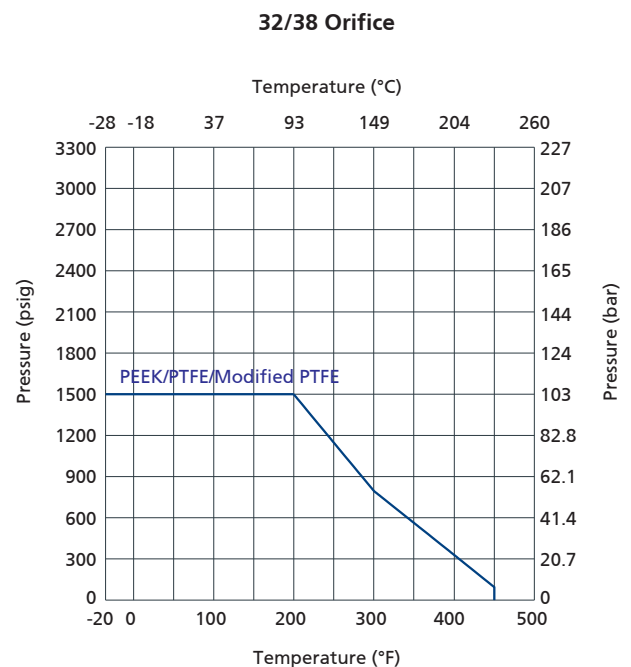
FITOK BHP Series 3-piece high purity ball valves are designed to meet the requirements of degreasing, high working pressure, high flow rate and bi-directional flow for the clean dry air (CDA) and bulk gas distribution line, which are widely used in specialty gas, semiconductor and chemical industries.



#### Features

- Working pressure up to: 3000 psig (207 bar)
- Working temperature: -20 °F to 450 °F (-28 °C to 232 °C)
- Orifice sizes: 0.18" (4.6 mm) to 1.5" (38.1 mm)
- Standard average internal surface roughness Ra 15 µin. (0.38 µm)
- Helium leak rate  $\leq 1 \times 10^{-8}$  std cm<sup>3</sup>/s
- End connection welded tube in customized length available
- Pneumatic and electric actuator available

#### Pressure vs. Temperature



#### Notes:

- The temperature and pressure rating is based on valves of standard materials.
- Modified PTFE is a modified second generation polytetrafluoroethylene (TFM 1600), which is a PFA and PTFE composite. It has comparable chemical compatibility with PTFE, lower deformation rate than PTFE, and higher pressure and temperature tolerance than PTFE.

## Working Pressure of the Weld End at -28 °C to 38 °C

| Valve Material | End Code | Size           | Working Pressure psig |
|----------------|----------|----------------|-----------------------|
| 316 SS         | TB4      | 1/4" x0.035"   | 5100                  |
|                | TB6      | 3/8" x0.035"   | 3300                  |
|                | TB8      | 1/2" x0.049"   | 3700                  |
|                | TB12     | 3/4" x0.065"   | 3300                  |
|                | TB16     | 1" x0.065"     | 2400                  |
|                | TB24     | 1 1/2" x0.065" | 1600                  |
|                | TB32     | 2" x0.065"     | 1200                  |

Notes: BHP series high purity ball valves have a maximum working pressure of 3000 psig, which is also limited by the end connection.

## Process Specification

| Technology                 | Process Specification                                                                                                    |                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
|                            | Special Cleaning and Packaging (FC-02)                                                                                   | Special Cleaning and Packaging (FOG)                 |
| Material/Specification     | CF8M/A351<br>316 SS/ASTM A479<br>316L SS/A269                                                                            |                                                      |
| Internal Surface Roughness | Ra 15 µin. (0.38 µm)                                                                                                     |                                                      |
| Polishing Process          | Mechanical Polishing                                                                                                     |                                                      |
| Lubrication                | Special lubricant compatible with oxygen is applied to components in contact with the media, for example, DuPont GPL 227 | No lubricant on components in contact with the media |

Notes:

1. For a detailed description of the process specification, please refer to the process specification catalog.
2. The pressure ratings of valves with FOG drop to 34.4 bar (500 psig).
3. The starting torque of valves with FOG is greater than that of valves with FC-02.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

## Standard Materials of Construction

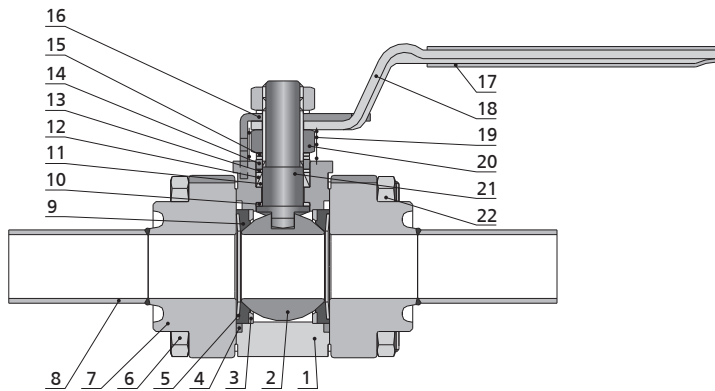
Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



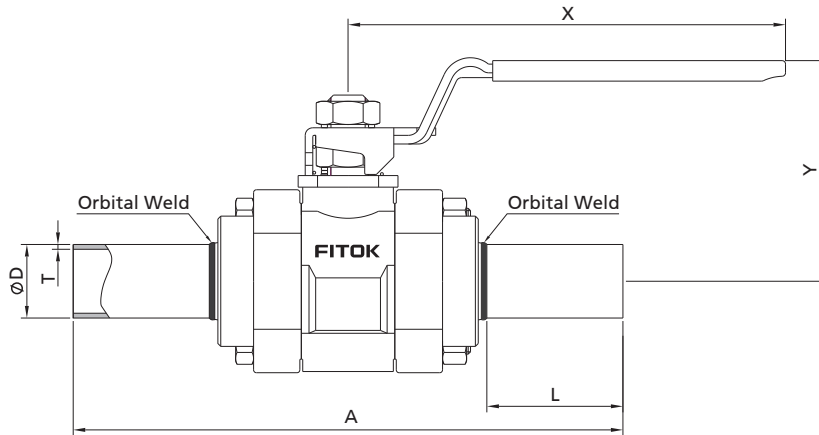
| Item | Component               | Material                           |
|------|-------------------------|------------------------------------|
| 1    | <i>Body</i>             | <i>CF8M/A351</i>                   |
| 2    | <i>Ball</i>             | <i>316 SS/A479</i>                 |
| 3    | <i>Support Ring</i>     | <i>316 SS/A240</i>                 |
| 4    | <i>Side Seal</i>        | <i>PTFE/D1710</i>                  |
| 5    | <i>Butterfly Spring</i> | <i>Strain Hardened 316 SS/A240</i> |
| 6    | Body Bolt               | Gr.88M/A193                        |
| 7    | End Cap                 | CF8M/A351                          |
| 8    | Welded Tube             | 316L/A269                          |
| 9    | Valve Seat              | PTFE/Modified PTFE/PEEK            |
| 10   | Stem Bearing            | PEEK                               |
| 11   | Lower Packing           | PTFE/D1710                         |
| 12   | Upper Packing           | PTFE/D1710                         |
| 13   | Packing Support         | PEEK                               |
| 14   | Seal Gland              | PTFE-coated 316 SS/A479            |
| 15   | Stem Spring             | Strain Hardened 316 SS/A240        |
| 16   | Stop Plate              | 304 SS/240                         |
| 17   | Handle Cover            | Vinyl Plastic                      |
| 18   | Handle                  | 304 SS/A240                        |
| 19   | Grounding Spring        | 302 SS/A313                        |
| 20   | Stem Nut                | Gr.8M/A194                         |
| 21   | Stem                    | <i>316 SS/A479</i>                 |
| 22   | Body Nut                | Gr.8M/A194                         |

**Note:**

Components in contact with the media are listed in italics, for other materials of the valve please contact FITOK Group or authorized agent.

## Dimensions

Dimensions in in. (mm) are for reference only and subject to change.



| Basic Ordering Number | Connection Type and Size                                 | Orifice in. (mm) | Cv   | Dimensions, in. (mm) |             |              |              |             |             |             |              |
|-----------------------|----------------------------------------------------------|------------------|------|----------------------|-------------|--------------|--------------|-------------|-------------|-------------|--------------|
|                       |                                                          |                  |      | A                    | L           | D            | T            | X           | Y           |             |              |
| BHP□□-TB4-05          | 1/4" x 0.035" Fractional Extended Tube Plain Butt Weld   | 0.18 (4.6)       | 1.1  | 3.54 (90)            | 0.79 (20)   | 0.25 (6.35)  | 0.035 (0.89) | 2.37 (60.2) | 1.66 (42.2) |             |              |
| BHP□□-FL4-05          | 1/4" FITOK Tube Fittings                                 | 0.19 (4.8)       | 1.2  | 3.17 (80.5)          | —           | —            | —            |             |             |             |              |
| BHP□□-ML6-05          | 6 mm FITOK Tube Fittings                                 |                  | 2.5  | —                    | —           | —            | —            |             |             |             |              |
| BHP□□-ML8-05          | 8 mm FITOK Tube Fittings                                 | 0.28 (7.1)       | 3.8  | 3.54 (90)            | 0.79 (20)   | 0.375 (9.53) | 0.035 (0.89) | 2.37 (60.2) | 1.66 (42.2) |             |              |
| BHP□□-TB6-07          | 3/8" x 0.035" Fractional Extended Tube Plain Butt Weld   |                  |      | 3.17 (80.5)          | —           | —            | —            |             |             |             |              |
| BHP□□-FL6-07          | 3/8" FITOK Tube Fittings                                 |                  |      | 3.20 (81.3)          | —           | —            | —            |             |             |             |              |
| BHP□□-ML10-07         | 10 mm FITOK Tube Fittings                                | 0.40 (10.2)      | 7.2  | 4.72 (120)           | 1.18 (30)   | 0.50 (12.7)  | 0.049 (1.24) | 4.50 (114)  | 2.35 (59.7) |             |              |
| BHP□□-TB8-10          | 1/2" x 0.049" Fractional Extended Tube Plain Butt Weld   |                  |      | 4.04 (103.0)         | —           | —            | —            |             |             |             |              |
| BHP□□-FL8-10          | 1/2" FITOK Tube Fittings                                 |                  |      | —                    | —           | —            | —            |             |             |             |              |
| BHP□□-ML12-10         | 12 mm FITOK Tube Fittings                                | 0.52 (13.1)      | 13.6 | 4.04 (103)           | —           | —            | —            | 4.50 (114)  | 2.35 (59.7) |             |              |
| BHP□□-FL12-13         | 3/4" FITOK Tube Fittings                                 |                  |      | —                    | —           | —            | —            |             |             |             |              |
| BHP□□-ML16-13         | 16 mm FITOK Tube Fittings                                |                  |      | —                    | —           | —            | —            |             |             |             |              |
| BHP□□-ML18-13         | 18 mm FITOK Tube Fittings                                | 0.62 (15.7)      | 18   | 5.12 (170)           | 1.42 (40)   | 0.75 (19.05) | 0.065 (1.65) | 6.00 (152)  | 2.94 (74.7) |             |              |
| BHP□□-TB12-22         | 3/4" x 0.065" Fractional Extended Tube Plain Butt Weld   |                  |      | 0.87 (22.1)          | 36          | 6.3 (190)    | 1.97 (50)    |             |             | 1.00 (25.4) | 0.065 (1.65) |
| BHP□□-TB16-22         | 1" x 0.065" Fractional Extended Tube Plain Butt Weld     |                  |      | 0.88 (22.2)          | 40          | 5.36 (136)   | —            |             |             | —           | —            |
| BHP□□-FL16-22         | 1" FITOK Tube Fittings                                   | 6.34 (161)       | —    |                      |             | —            | —            |             |             |             |              |
| BHP□□-FL20-22         | 1 1/4" FITOK Tube Fittings                               | 5.36 (136)       | —    |                      |             | —            | —            |             |             |             |              |
| BHP□□-ML25-22         | 25 mm FITOK Tube Fittings                                | 6.14 (156)       | —    |                      |             | —            | —            |             |             |             |              |
| BHP□□-ML28-22         | 28 mm FITOK Tube Fittings                                | 1.25 (31.8)      | 100  | 8.59 (218.2)         | 2.07 (52.6) | 1.50 (38.1)  | 0.065 (1.65) | 9.14 (232)  | 4.03 (102)  |             |              |
| BHP□□-TB24-32         | 1 1/2" x 0.065" Fractional Extended Tube Plain Butt Weld |                  |      | 1.50 (38.1)          | 130         | 9.03 (229.3) | 2.04 (51.8)  |             |             | 2.00 (50.8) | 0.065 (1.65) |
| BHP□□-TB32-38         | 2" x 0.065" Fractional Extended Tube Plain Butt Weld     |                  |      | —                    | —           | —            | —            |             |             | —           | —            |

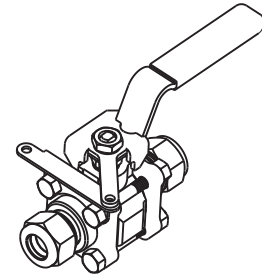
1. Sizes and types listed are standard. Other sizes and types are available upon request, please contact FITOK Group or our authorized distributors.

2. Connection tube length can be specified, such as BHP□□-TB4-05, if L=30 mm is required, the part number should be changed to BHP□□-TB4 x L30-05.

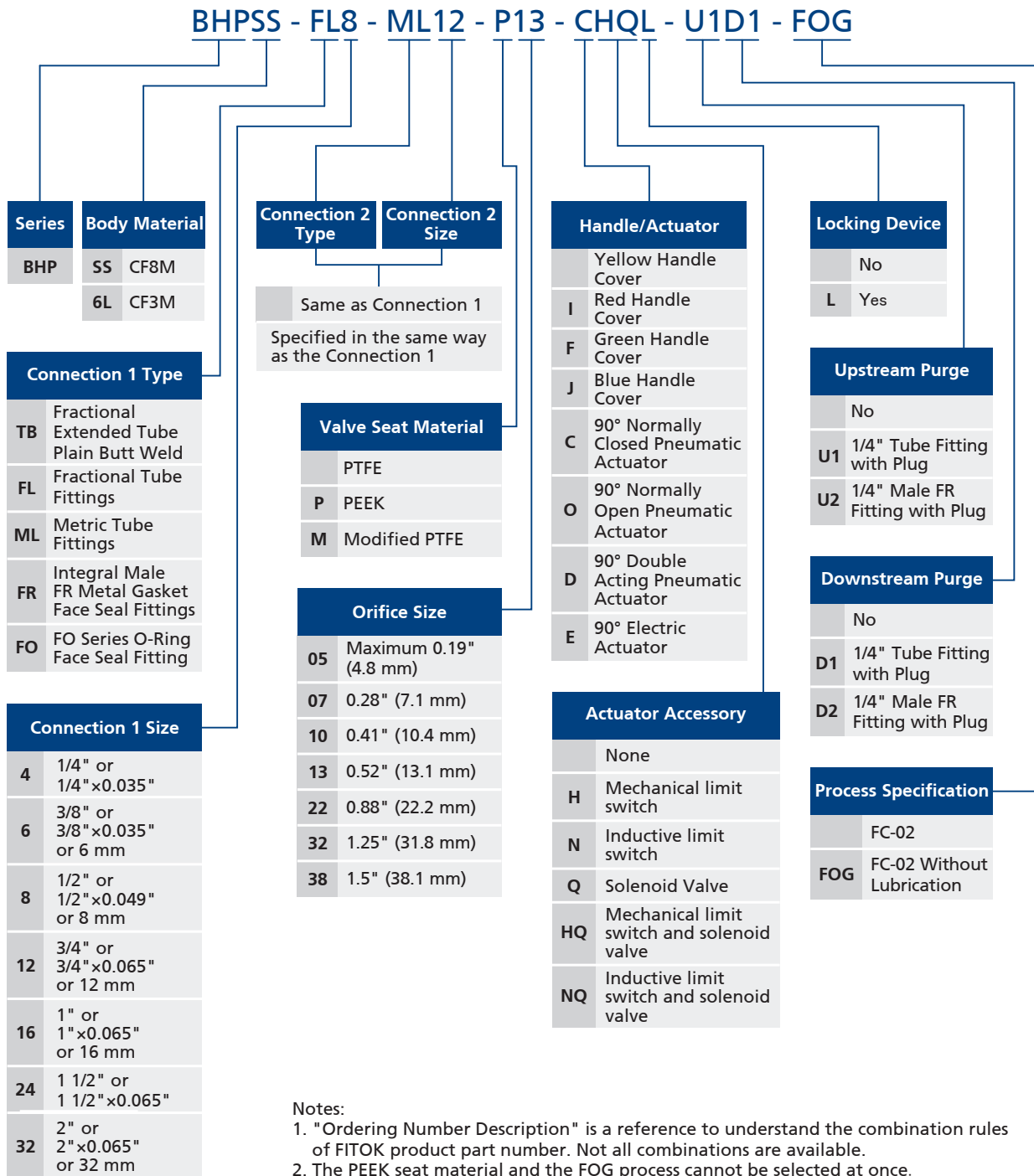


## Locking Device

- Lock BHP series valves, locking hole diameters of the whole series of valves are 0.20 in. (5 mm).
- To order a ball valve with locking device, please refer to the "Ordering Number Description" and add -L to the valve ordering number.  
Example: BHPSS-FL16-22-L



## Ordering Number Description



**Notes:**

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- The PEEK seat material and the FOG process cannot be selected at once.

# High Purity Ball Valves

## Distribution Block Valves

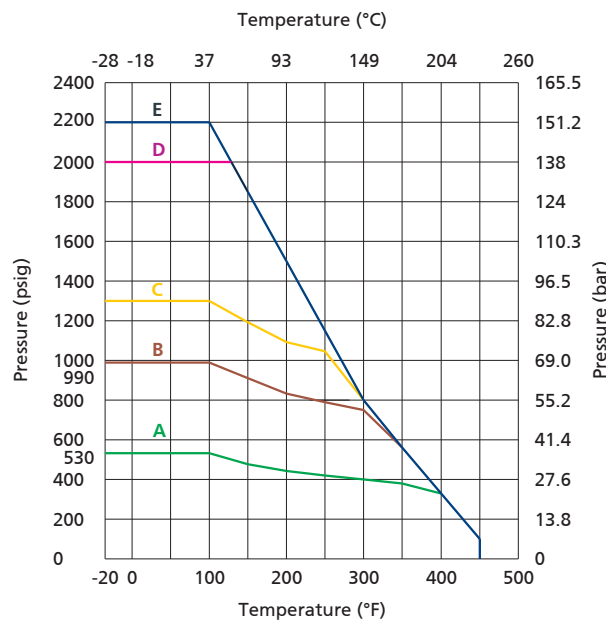
### BDP Series

#### Features

- ⦿ Working temperature: -20 °F to 450 °F (-28 °C to 232 °C)
- ⦿ Main line tube is full bore
- ⦿ Main line Tube with orbital welding
- ⦿ Branch ball valves are BHP series 3-piece high purity ball valves
- ⦿ Standard average internal surface roughness Ra 15 µin. (0.38 µm)
- ⦿ Main line tube and branch line ball valves available in different sizes



#### Pressure vs. Temperature



| Main Line Tube Size in (mm)    | 4x0.083 | 2x0.065 | 1 1/2x0.065 | 1x0.065    | 3/4x0.065<br>1/2x0.049 |
|--------------------------------|---------|---------|-------------|------------|------------------------|
| Orifice Code                   | 38 32   | 13, 10  | 13, 10, 07  | 13, 10, 07 | 05, 07                 |
| Temperature and Pressure Curve | A ———   | B ———   | C ———       | D ———      | E ———                  |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

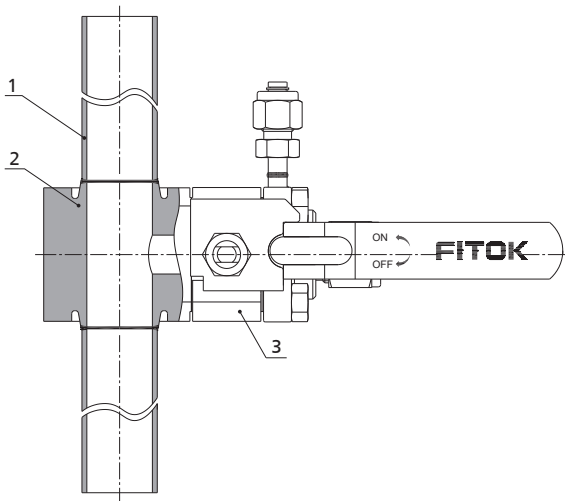
## Process Specification

| Technology                 | Process Specification                                                                                                    | Special Cleaning and Packaging (FC-02)                | Special Cleaning and Packaging (FOG) |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------|
| Material/Specification     |                                                                                                                          | 316L SS/A269<br>316 SS/ASTM A479<br>F316 SS/ASTM A182 |                                      |
| Internal Surface Roughness |                                                                                                                          | Ra 15 µin. (0.38 µm)                                  |                                      |
| Lubrication                | Special lubricant compatible with oxygen is applied to components in contact with the media, for example, DuPont GPL 227 | No lubricant on components in contact with the media  |                                      |

Notes:

1. For a detailed description of the process specification, please refer to the process specification catalog.
2. The pressure ratings of valves with FOG drop to 34.4 bar (500 psig).
3. The starting torque of valves with FOG is greater than that of valves with FC-02.

## Materials of Construction



| Item | Component                | Material                                                      |
|------|--------------------------|---------------------------------------------------------------|
| 1    | <i>Main Line Tube</i>    | <i>316 L SS/A269</i>                                          |
| 2    | <i>Valve block</i>       | <i>316 L SS/A479</i>                                          |
| 3    | <i>Branch Ball Valve</i> | <i>Body</i><br><i>F316 SS/A182</i><br><i>or F316L SS/A182</i> |
|      |                          | <i>Seat</i><br><i>Modified PTFE</i>                           |

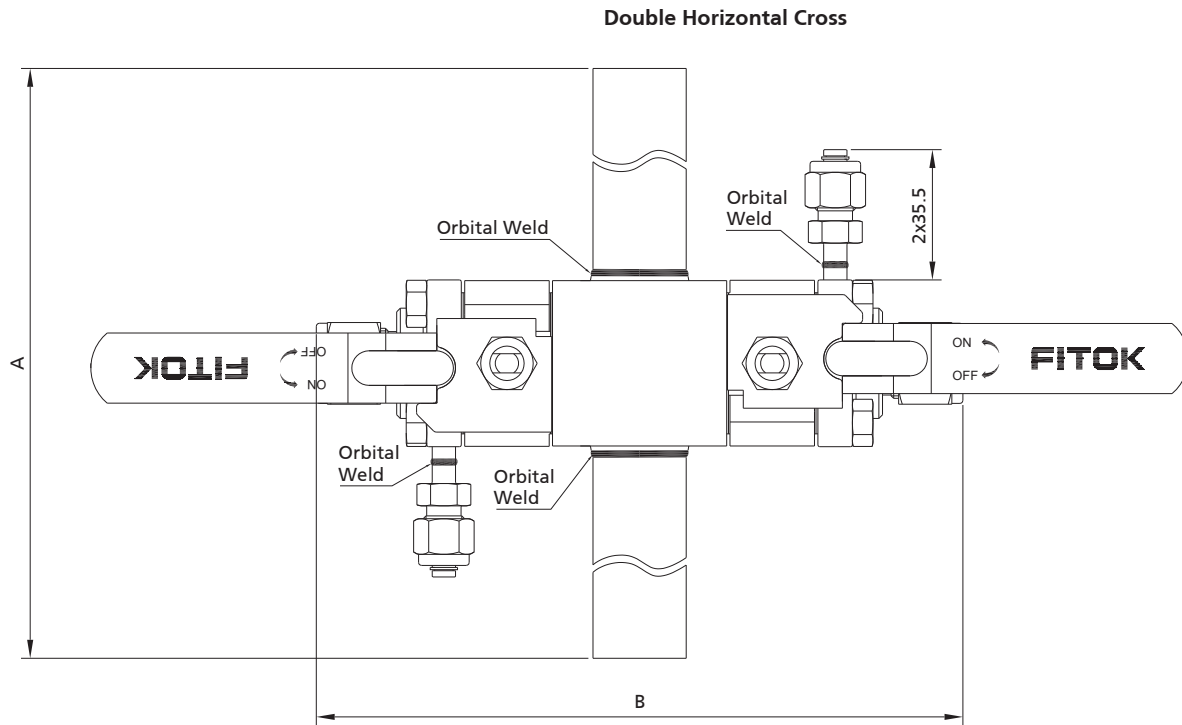
Notes:

Components in contact with the media are listed in italics. Branch ball valves are BHP series, and other parts not listed are the same materials as BHP series standard valve parts.

## Ordering information and dimensions

Please refer to BHP series for the dimensions of branch ball valves.

Dimensions are indicated in in. (mm), only for reference and subject to change.



| Ordering information      | Main line tube size<br>in. (mm) | Branch line<br>tube end size | Orifice<br>in. (mm) | Dimensions, in. (mm) |            |
|---------------------------|---------------------------------|------------------------------|---------------------|----------------------|------------|
|                           |                                 |                              |                     | A                    | B          |
| BDPSS-DHC-TB8-FL4-05-D1   | 1/2x0.049                       | 1/4 in.                      | 0.187 (4.8)         | 7.00 (178)           | 5.19 (132) |
| BDPSS-DHC-TB8-FL6-07-D1   |                                 | 3/8 in.                      | 0.281 (7.1)         |                      |            |
| BDPSS-DHC-TB12-FL4-05-D1  | 3/4x0.065                       | 1/4 in.                      | 0.187 (4.8)         | 9.00 (229)           | 5.19 (132) |
| BDPSS-DHC-TB12-FL6-07-D1  |                                 | 3/8 in.                      | 0.281 (7.1)         |                      |            |
| BDPSS-DHC-TB16-FL6-07-D1  | 1x0.065                         | 3/8 in.                      | 0.281 (7.1)         | 13.0 (330)           | 6.69 (170) |
| BDPSS-DHC-TB16-FL8-10-D1  |                                 | 1/2 in.                      | 0.411 (10.4)        |                      | 6.88 (175) |
| BDPSS-DHC-TB16-FL12-13-D1 |                                 | 3/4 in.                      | 0.516 (13.1)        |                      |            |
| BDPSS-DHC-TB24-FL6-07-D1  | 1 1/2x0.065                     | 3/8 in.                      | 0.281 (7.1)         | 13.0 (330)           | 6.94 (176) |
| BDPSS-DHC-TB24-FL8-10-D1  |                                 | 1/2 in.                      | 0.411 (10.4)        |                      | 7.13 (181) |
| BDPSS-DHC-TB24-FL12-13-D1 |                                 | 3/4 in.                      | 0.516 (13.1)        |                      |            |
| BDPSS-DHC-TB32-FL8-10-D1  | 2x0.065                         | 1/2 in.                      | 0.411 (10.4)        | 13.0 (330)           | 8.19 (208) |
| BDPSS-DHC-TB32-FL12-13-D1 |                                 | 3/4 in.                      | 0.516 (13.1)        |                      |            |
| BDPSS-DHC-TB64-FL24-32-D1 | 4x0.083                         | 1 1/2 in.                    | 1.250 (31.8)        | 23.0 (584)           | 14.4 (365) |
| BDPSS-DHC-TB64-FL32-38-D1 |                                 | 2 in.                        | 1.500 (38.1)        |                      | 17.2 (437) |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

Fittings

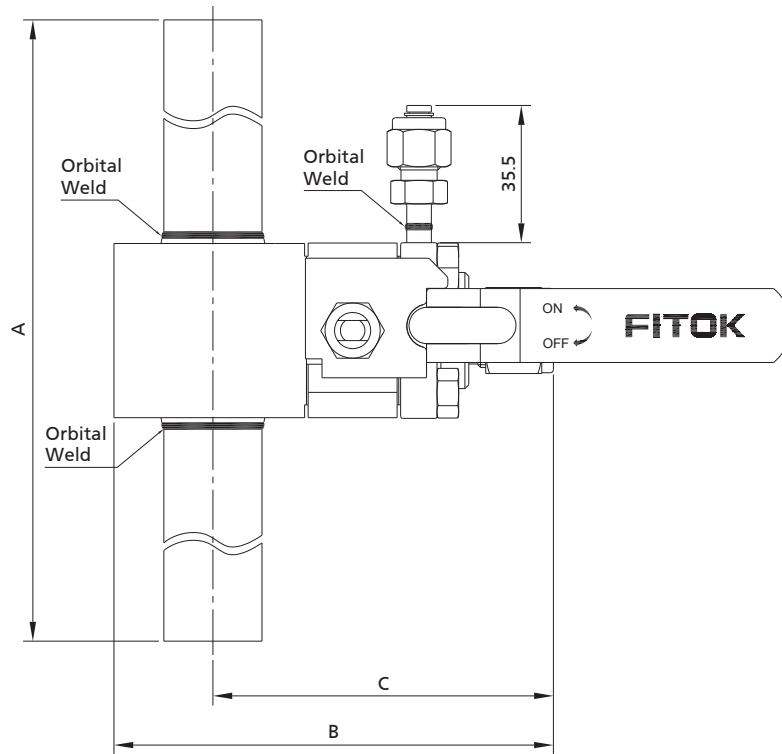
Valves

Pressure Gauges

Integrated Systems and Others

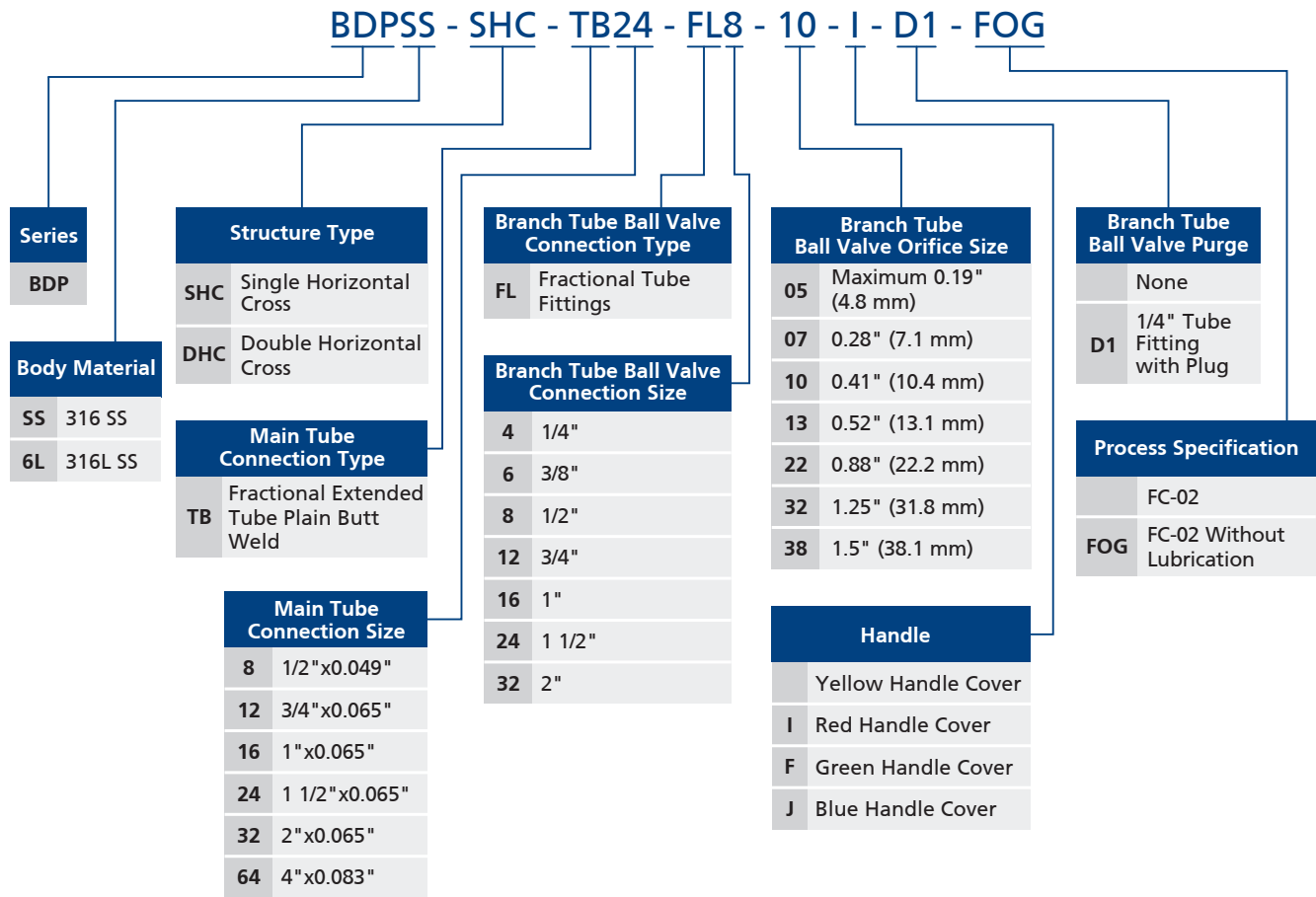
Process Specification

Single Horizontal Cross



| Ordering information      | Main line tube size<br>in. (mm) | Branch line<br>tube end size | Orifice<br>in. (mm) | Dimensions, in. (mm) |             |             |
|---------------------------|---------------------------------|------------------------------|---------------------|----------------------|-------------|-------------|
|                           |                                 |                              |                     | A                    | B           | C           |
| BDPSS-SHC-TB8-FL4-05-D1   | 1/2x0.049                       | 1/4 in.                      | 0.187 (4.8)         | 7.00 (178)           | 3.31 (84.1) | 2.56 (65.0) |
| BDPSS-SHC-TB8-FL6-07-D1   |                                 | 3/8 in.                      | 0.281 (7.1)         |                      |             |             |
| BDPSS-SHC-TB12-FL4-05-D1  | 3/4x0.065                       | 1/4 in.                      | 0.187 (4.8)         | 9.00 (229)           | 3.31 (84.1) | 2.56 (65.0) |
| BDPSS-SHC-TB12-FL6-07-D1  |                                 | 3/8 in.                      | 0.281 (7.1)         |                      |             |             |
| BDPSS-SHC-TB16-FL6-07-D1  | 1x0.065                         | 3/8 in.                      | 0.281 (7.1)         | 13.0 (330)           | 4.31 (109)  | 3.31 (84.1) |
| BDPSS-SHC-TB16-FL8-10-D1  |                                 | 1/2 in.                      | 0.411 (10.4)        |                      | 4.44 (113)  | 3.44 (87.4) |
| BDPSS-SHC-TB16-FL12-13-D1 |                                 | 3/4 in.                      | 0.516 (13.1)        |                      |             |             |
| BDPSS-SHC-TB24-FL6-07-D1  | 1 1/2x0.065                     | 3/8 in.                      | 0.281 (7.1)         | 13.0 (330)           | 4.56 (116)  | 3.44 (87.4) |
| BDPSS-SHC-TB24-FL8-10-D1  |                                 | 1/2 in.                      | 0.411 (10.4)        |                      | 4.69 (119)  | 6.56 (90.4) |
| BDPSS-SHC-TB24-FL12-13-D1 |                                 | 3/4 in.                      | 0.516 (13.1)        |                      |             |             |
| BDPSS-SHC-TB32-FL8-10-D1  | 2x0.065                         | 1/2 in.                      | 0.411 (10.4)        | 13.0 (330)           | 5.97 (152)  | 4.06 (103)  |
| BDPSS-SHC-TB32-FL12-13-D1 |                                 | 3/4 in.                      | 0.516 (13.1)        |                      |             |             |
| BDPSS-SHC-TB64-FL24-32-D1 | 4x0.083                         | 1 1/2 in.                    | 1.250 (31.8)        | 23.0 (584)           | 10.2 (259)  | 7.19 (183)  |
| BDPSS-SHC-TB64-FL32-38-D1 |                                 | 2 in.                        | 1.500 (38.1)        |                      | 11.6 (295)  | 8.63 (219)  |

## Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# High Purity Ball Valves

## Hex Bar Stock High Purity Ball Valves BRP Series

### Introduction

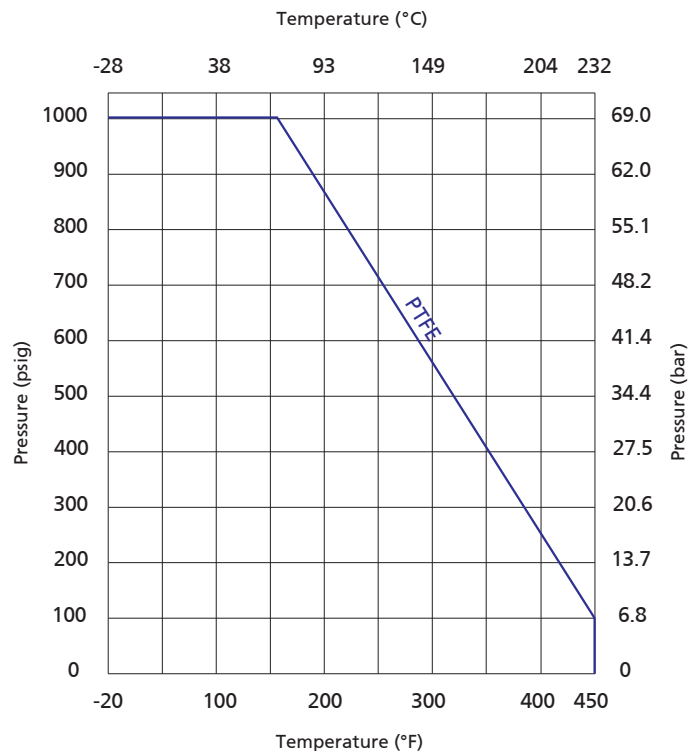
FITOK BRP series hex bar high purity ball valves are designed to meet the requirements of degreasing, low working pressure and bi-directional flow for the clean dry air (CDA) and bulk gas distribution line, which are widely used in specialty gas, semiconductor and chemical industries.



### Features

- Working pressure up to: 1000 psig (69.0 bar)
- Working temperature: -20 °F to 450 °F (-28 °C to 232 °C)
- Orifice sizes: 0.19" (4.8 mm) to 0.35" (8.9 mm)
- Standard average internal surface roughness Ra 15 μin. (0.38 μm)
- Helium leak rate  $\leq 1 \times 10^{-8}$  std cm<sup>3</sup>/s

### Pressure vs. Temperature



Note: The temperature and pressure rating is based on valves of standard materials.

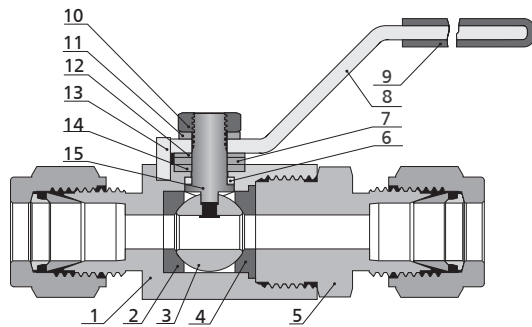
## Process Specification

| Technology                 | Process Specification | Special Cleaning and Packaging (FC-02)                                                                                   | Special Cleaning and Packaging (FOG)                 |
|----------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Material/Specification     |                       | 316 SS/ASTM A479                                                                                                         |                                                      |
| Internal Surface Roughness |                       | Ra 15 µin. (0.38 µm)                                                                                                     |                                                      |
| Polishing Process          |                       | Mechanical Polishing                                                                                                     |                                                      |
| Lubrication                |                       | Special lubricant compatible with oxygen is applied to components in contact with the media, for example, DuPont GPL 227 | No lubricant on components in contact with the media |

### Notes:

1. For a detailed description of the process specification, please refer to the process specification catalog.
2. The pressure ratings of valves with FOG drop to 34.4 bar (500 psig).
3. The starting torque of valves with FOG is greater than that of valves with FC-02.

## Standard Materials of Construction



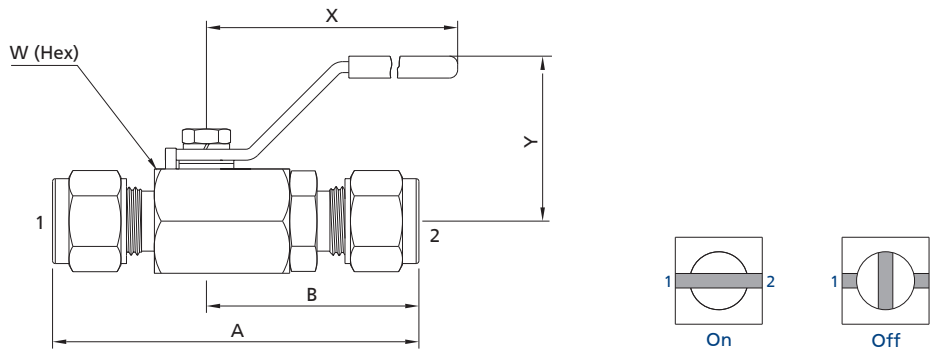
| Item | Component             | Material        |
|------|-----------------------|-----------------|
| 1    | <i>Body</i>           | 316 SS/A479     |
| 2    | <i>Front Seat</i>     | PTFE/D1710      |
| 3    | <i>Ball</i>           | 316 SS/A479     |
| 4    | <i>Back Seat</i>      | PTFE/D1710      |
| 5    | <i>End Connection</i> | 316 SS/A479     |
| 6    | <i>Lower Packing</i>  | PTFE/D1710      |
| 7    | Washer                | 316 SS/A479     |
| 8    | Handle                | 304 SS/A240     |
| 9    | Sleeve                | Vinyl           |
| 10   | Stem Nut              | Stainless Steel |
| 11   | Gasket                | Stainless Steel |
| 12   | Coned-Disc Spring     | 304 SS/A240     |
| 13   | Stop Pin              | Stainless Steel |
| 14   | <i>Upper Packing</i>  | PTFE/D1710      |
| 15   | <i>Stem</i>           | 316 SS/A479     |

Notes: Components in contact with the media are listed in italics. For other materials, please contact FITOK Group or our authorized distributors.



## Dimensions

Dimensions in in. (mm) are for reference only and subject to change.

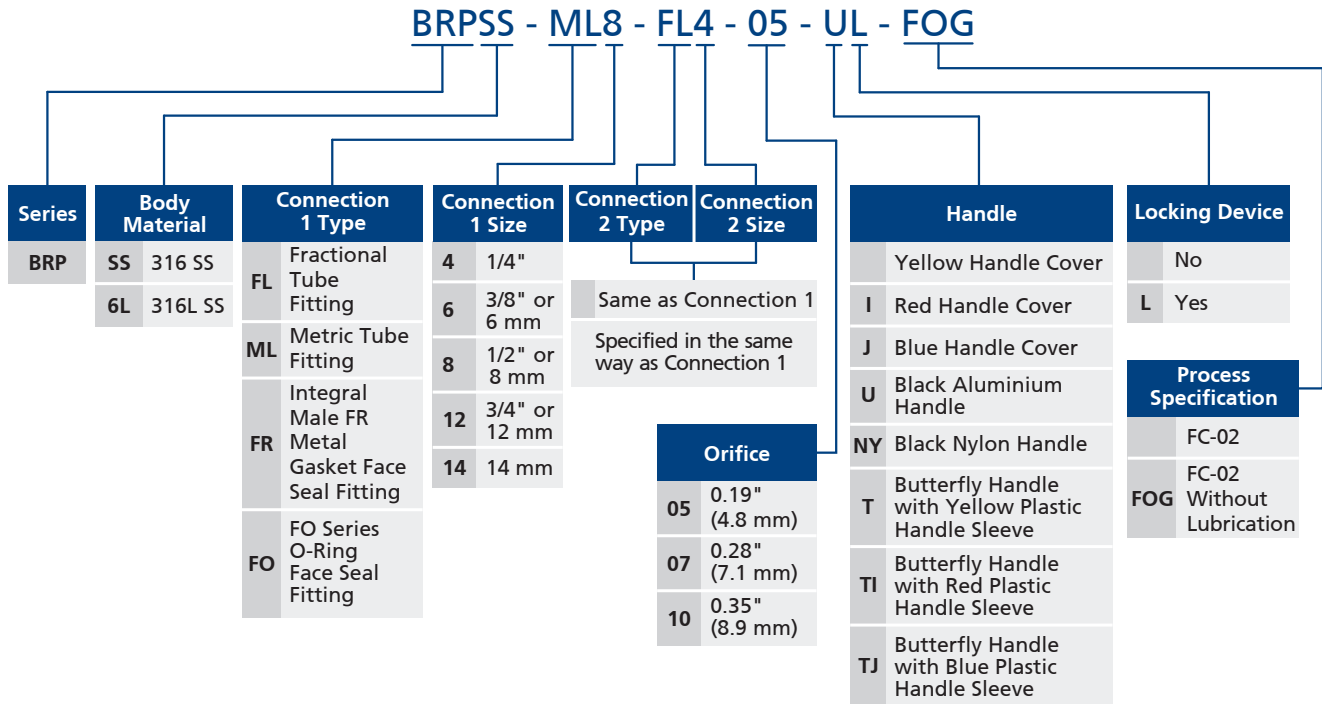


| Basic Ordering Number | Connection Type and Size |              | Orifice in. (mm) | Cv   | Dimensions, in. (mm) |                |                  |                |                |
|-----------------------|--------------------------|--------------|------------------|------|----------------------|----------------|------------------|----------------|----------------|
|                       | Connection 1             | Connection 2 |                  |      | A                    | B              | W                | X              | Y              |
| BRP□□-ML6-05          | 6 mm FITOK               |              | 0.19<br>(4.8)    | 1.25 | 2.75<br>(65.2)       | 1.50<br>(38.1) | 3/4<br>(38.1)    | 2.36<br>(60.0) | 1.18<br>(30.0) |
| BRP□□-ML8-05          | 8 mm FITOK               |              |                  |      | 2.63<br>(66.8)       | 1.53<br>(38.8) |                  |                |                |
| BRP□□-FL4-05          | 1/4" FITOK               |              |                  |      | 2.57<br>(65.2)       | 1.50<br>(38.1) |                  |                |                |
| BRP□□-ML10-07         | 10 mm FITOK              |              | 0.28<br>(7.1)    | 2.50 | 2.78<br>(72.9)       | 1.68<br>(42.7) | 7/8<br>(22.23)   |                | 1.26<br>(32.0) |
| BRP□□-FL6-07          | 3/8" FITOK               |              |                  |      | 2.78<br>(72.9)       | 1.68<br>(42.7) |                  |                |                |
| BRP□□-ML12-10         | 12 mm FITOK              |              | 0.35<br>(8.9)    | 9.25 | 3.15<br>(80.0)       | 1.83<br>(46.5) | 1 1/16<br>(27.0) | 3.15<br>(80.0) | 1.54<br>(39.0) |
| BRP□□-ML14-10         | 14 mm FITOK              |              |                  |      | 3.24<br>(82.2)       | 1.87<br>(47.5) |                  |                |                |
| BRP□□-FL8-10          | 1/2" FITOK               |              |                  |      | 3.15<br>(80.0)       | 1.83<br>(46.5) |                  |                |                |
| BRP□□-FL10-10         | 5/8" FITOK               |              |                  |      | 3.24<br>(82.2)       | 1.87<br>(47.5) |                  |                |                |

1. FITOK refers to FITOK double ferrule tube fittings.

2. Sizes and types listed are standard. Other sizes and types are available upon request, please contact FITOK Group or our authorized distributors.

## Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Bellows-Sealed Valves

SM and SVH Series

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



# Bellows-Sealed Valves

## Low Pressure Bellows-Sealed Valves

### SM Series

#### Features

- ⦿ Metal-to-metal gasket seal without external leakage
- ⦿ Precision-formed metal bellows to ensure reliability
- ⦿ Non-rotating stem tip to increase shutoff cycle life
- ⦿ Manual and pneumatic actuator available
- ⦿ Pneumatic actuator to rotate 360° for ease of installation
- ⦿ Panel mounting and bottom mounting available
- ⦿ Position sensors available assembled on normally closed pneumatically actuated valves



#### Technical Data

|                                              |                  |                                                                                                              |                                   |
|----------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------|
| <b>Ports Size</b>                            |                  | 1/4" to 3/8"<br>or 6 mm to 8 mm                                                                              | 3/8" to 1/2"<br>or 10 mm to 12 mm |
| <b>Flow Coefficient (Cv)</b>                 |                  | 0.30                                                                                                         | 0.80                              |
| <b>Orifice Size</b>                          |                  | 0.16 in. (4.1mm)                                                                                             | 0.31 in. (8.0 mm)                 |
| <b>Max. Working Pressure</b>                 | <b>Manual</b>    | 500 psig (34.4 bar)                                                                                          |                                   |
|                                              | <b>Pneumatic</b> | 145 psig (10 bar)                                                                                            |                                   |
| <b>Pneumatic Actuator Operating Pressure</b> |                  | 60 to 90 psig (4.2 to 6.2 bar)                                                                               |                                   |
| <b>Temperature</b>                           |                  | PCTFE: -10 ~ 200 °F (-23 ~ 93 °C)<br>PFA: -10 ~ 302 °F (-23 ~ 150 °C)<br>Vespel: -10 ~ 400 °F (-23 ~ 204 °C) |                                   |
| <b>Leak Rate (Helium)</b>                    | <b>Internal</b>  | ≤ 4x10 <sup>-9</sup> std cm <sup>3</sup> /s                                                                  |                                   |
|                                              | <b>External</b>  | ≤ 4x10 <sup>-9</sup> std cm <sup>3</sup> /s                                                                  |                                   |

#### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

| Orifice<br>in. (mm) | Pressure Drop<br>to Atmosphere<br>psig (bar) | Air<br>(l/min) | Water<br>(l/min) |
|---------------------|----------------------------------------------|----------------|------------------|
| 0.16 (4.1)          | 10 (0.68)                                    | 96             | 3.6              |
|                     | 50 (3.4)                                     | 250            | 7.9              |
|                     | 100 (6.8)                                    | 450            | 11.0             |
| 0.31 (8.0)          | 10 (0.68)                                    | 270            | 9.6              |
|                     | 50 (3.4)                                     | 730            | 21.6             |
|                     | 100 (6.8)                                    | 1280           | 30.0             |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

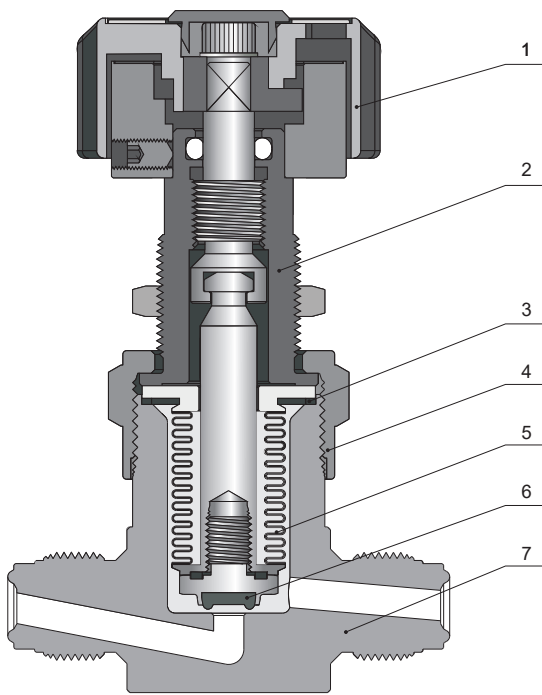
Process Specification

## Process Specification

| Technology               | Process Specification | Standard Cleaning and Packaging (FC-01)                   | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03)             |
|--------------------------|-----------------------|-----------------------------------------------------------|----------------------------------------|---------------------------------------|
| Material/Specification   |                       | 316 SS/ASTM A479<br>316L SS/SEMI F20<br>316L VAR/SEMI F20 |                                        | 316L SS/SEMI F20<br>316L VAR/SEMI F20 |
| Wetted Surface Roughness |                       | Ra 20 µin. (0.51 µm)                                      |                                        | Ra 8 µin. (0.20 µm)                   |
| Polishing Process        |                       | Machine finished                                          |                                        | Electropolished                       |

Note: Refer to page P-01 for a detailed description of Process Specification.

## Major Materials of Construction



Manual Model

| Item | Component     | Material/Specification                                    |
|------|---------------|-----------------------------------------------------------|
| 1    | Handle        | ABS                                                       |
| 2    | Bonnet        | 316 SS/ASTM A479                                          |
| 3    | Bonnet Gasket | 316L SS/ASTM A269                                         |
| 4    | Bonnet Nut    | 316 SS/ASTM A479                                          |
| 5    | Bellows       | 316L SS/ASTM A269                                         |
| 6    | Seat          | PCTFE/ASTM D1430 or PFA/ASTM D3307 or Vespel              |
| 7    | Body          | 316 SS/ASTM A479 or 316L SS/SEMI F20 or 316L VAR/SEMI F20 |

## Actuators

### Manual - Round Handle

- ⦿ One-half turn to operate from fully open to closed
- ⦿ Handle with window to visually indicate open and closed states



### Pneumatic

- ⦿ Normally open, "N.O." marked on the top of the actuator
- ⦿ Normally closed, "N.C." marked on the top of the actuator



### Position Sensors

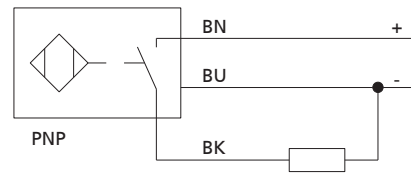
Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

#### Sensor Technical Information

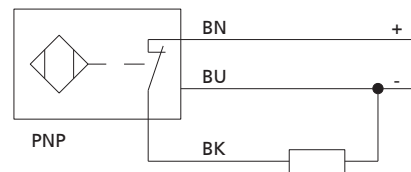
|                            |                                  |
|----------------------------|----------------------------------|
| <b>Output</b>              | 3-wire V (dc), PNP               |
| <b>Output Function</b>     | Normally open or normally closed |
| <b>Voltage</b>             | 10 ~ 30 V (dc)                   |
| <b>Working Temperature</b> | -13 ~ 158 °F (-25 ~ 70 °C)       |

#### Wiring Diagram

##### Normally Open Position Sensor



##### Normally Closed Position Sensor



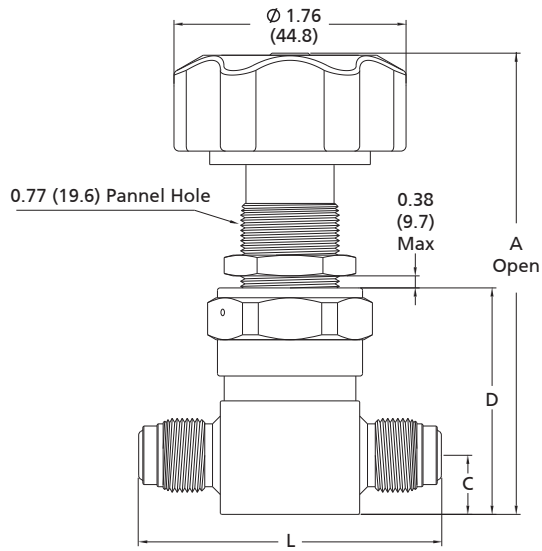
## Dimensions and Ordering Information

### Straight Type

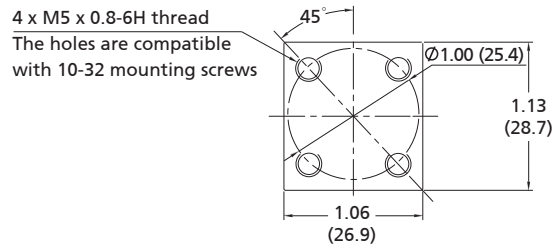
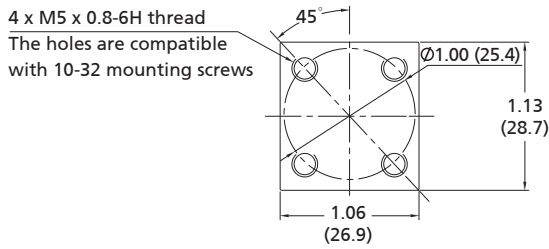
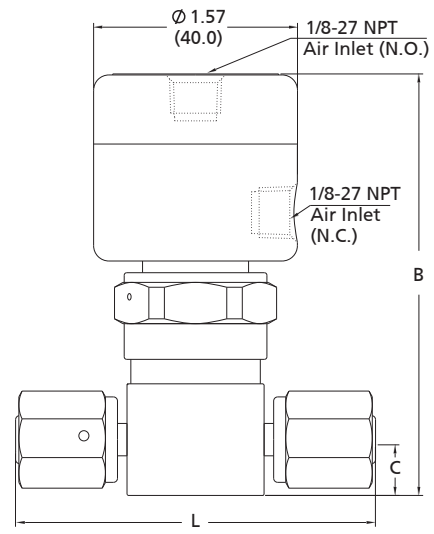
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.

**Manual - Handle**



**Pneumatic**



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

| Orifice<br>in. (mm) | Basic Ordering<br>Number | Connection Type and Size                                | Dimensions, in. (mm) |                |                |                |            |
|---------------------|--------------------------|---------------------------------------------------------|----------------------|----------------|----------------|----------------|------------|
|                     |                          |                                                         | A                    | B              | C              | D              | L          |
| 0.16<br>(4.1)       | SM□□-FL4-4-              | 1/4" FITOK Tube Fitting                                 | 3.51<br>(89.4)       | 3.31<br>(84.0) | 0.45<br>(11.4) | 1.78<br>(45.2) | 2.44(62.1) |
|                     | SM□□-FL6-4-              | 3/8" FITOK Tube Fitting                                 |                      |                |                |                | 2.58(65.5) |
|                     | SM□□-ML6-4-              | 6 mm FITOK Tube Fitting                                 |                      |                |                |                | 2.47(62.8) |
|                     | SM□□-ML8-4-              | 8 mm FITOK Tube Fitting                                 |                      |                |                |                | 2.53(64.3) |
|                     | SM□□-TB4-4-              | 1/4"x0.035" Tube Butt Weld                              |                      |                |                |                | 1.74(44.2) |
|                     | SM□□-TB6-4-              | 3/8"x0.035" Tube Butt Weld                              |                      |                |                |                |            |
|                     | SM□□-MTB6-4-             | 6x1 mm Tube Butt Weld                                   |                      |                |                |                | 1.75(44.4) |
|                     | SM□□-TS4-4-              | 1/4" Tube Socket Weld                                   |                      |                |                |                |            |
|                     | SM□□-FR4-4-              | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    |                      |                |                |                | 2.30(58.4) |
|                     | SM□□-FFR4-4-             | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting |                      |                |                |                | 2.76(70.1) |
|                     | SM□□-FO4-4-              | 1/4" Male FO                                            |                      |                |                |                | 2.00(50.8) |
| 0.31<br>(8.0)       | SM□□-FL6-8-              | 3/8" FITOK Tube Fitting                                 | 3.77<br>(95.7)       | 3.76<br>(95.5) | 0.53<br>(13.5) | 2.02<br>(51.3) | 2.58(65.5) |
|                     | SM□□-FL8-8-              | 1/2" FITOK Tube Fitting                                 |                      |                |                |                | 2.80(71.1) |
|                     | SM□□-ML10-8-             | 10 mm FITOK Tube Fitting                                |                      |                |                |                | 2.60(66.0) |
|                     | SM□□-ML12-8-             | 12 mm FITOK Tube Fitting                                |                      |                |                |                | 2.80(71.1) |
|                     | SM□□-TB6-8-              | 3/8"x0.035" Tube Butt Weld                              |                      |                |                |                | 1.74(44.2) |
|                     | SM□□-TB8-8-              | 1/2"x0.049" Tube Butt Weld                              |                      |                |                |                |            |
|                     | SM□□-FR8-8-              | 1/2" Integral Male FR Metal Gasket Face Seal Fitting    |                      |                |                |                | 2.58(65.5) |
|                     | SM□□-FFR8-8-             | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting |                      |                |                |                | 3.15(80.0) |

Fittings

Valves

Pressure Gauges

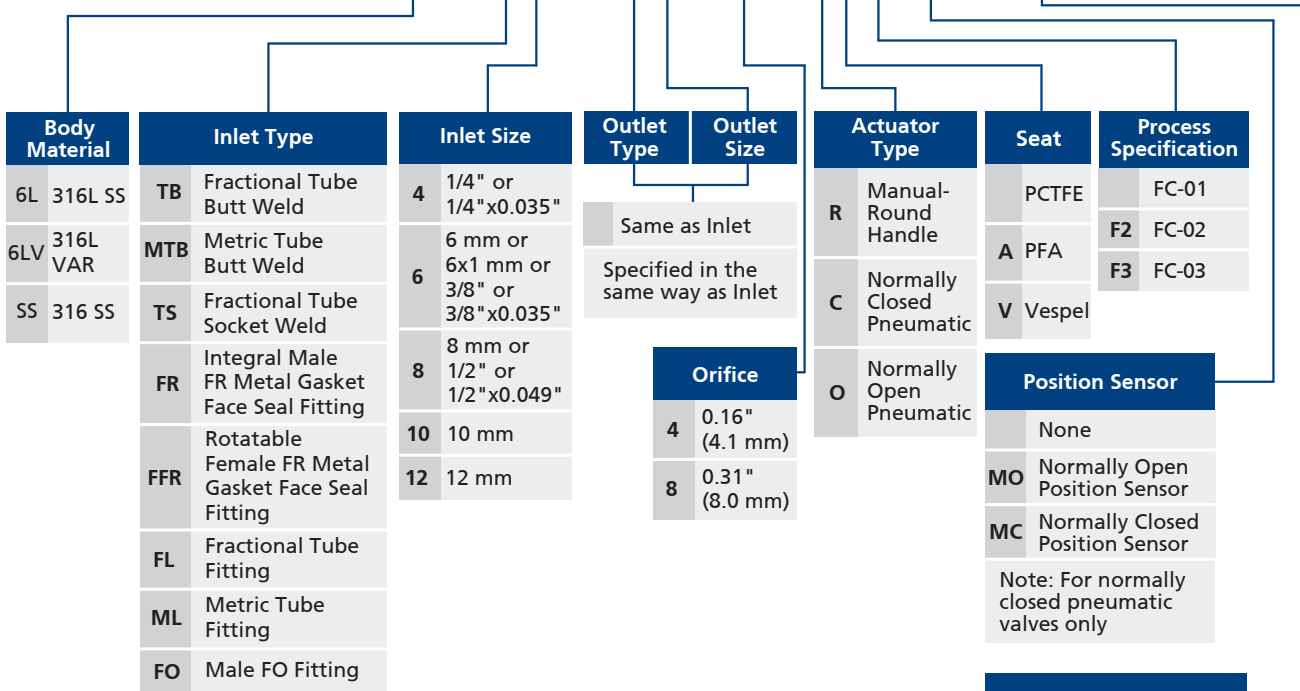
Integrated Systems and Others

Process Specification



Ordering Number Description

SMSS - FL4 - ML6 - 4 - RAF2MO - CE



| Body Material |          | Inlet Type |                                                    | Inlet Size |                                       | Outlet Type   | Outlet Size                        | Actuator Type |                           | Seat                                            |       | Process Specification                   |       |
|---------------|----------|------------|----------------------------------------------------|------------|---------------------------------------|---------------|------------------------------------|---------------|---------------------------|-------------------------------------------------|-------|-----------------------------------------|-------|
| 6L            | 316L SS  | TB         | Fractional Tube Butt Weld                          | 4          | 1/4" or 1/4"x0.035"                   | Same as Inlet | Specified in the same way as Inlet | R             | Manual-Round Handle       | PCTFE                                           | FC-01 | F2                                      | FC-02 |
| 6LV           | 316L VAR | MTB        | Metric Tube Butt Weld                              | 6          | 6 mm or 6x1 mm or 3/8" or 3/8"x0.035" |               |                                    | C             | Normally Closed Pneumatic | A                                               | PFA   |                                         |       |
| SS            | 316 SS   | TS         | Fractional Tube Socket Weld                        | 8          | 8 mm or 1/2" or 1/2"x0.049"           | O             | Normally Open Pneumatic            | V             | VespeI                    |                                                 |       |                                         |       |
|               |          | FR         | Integral Male FR Metal Gasket Face Seal Fitting    | 10         | 10 mm                                 |               |                                    |               |                           | <b>Position Sensor</b>                          |       |                                         |       |
|               |          | FFR        | Rotatable Female FR Metal Gasket Face Seal Fitting | 12         | 12 mm                                 |               |                                    |               |                           | None                                            |       |                                         |       |
|               |          | FL         | Fractional Tube Fitting                            |            |                                       |               |                                    |               |                           | MO                                              |       |                                         |       |
|               |          | ML         | Metric Tube Fitting                                |            |                                       |               |                                    |               |                           | Normally Open Position Sensor                   |       |                                         |       |
|               |          | FO         | Male FO Fitting                                    |            |                                       |               |                                    |               |                           | MC                                              |       |                                         |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           | Normally Closed Position Sensor                 |       |                                         |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           | Note: For normally closed pneumatic valves only |       |                                         |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           |                                                 |       | <b>Product Certification</b>            |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           |                                                 |       | None                                    |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           |                                                 |       | CE                                      |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           |                                                 |       | CE Certification (For Pneumatic only)   |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           |                                                 |       | AX                                      |       |
|               |          |            |                                                    |            |                                       |               |                                    |               |                           |                                                 |       | ATEX Certification (For Pneumatic only) |       |

Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

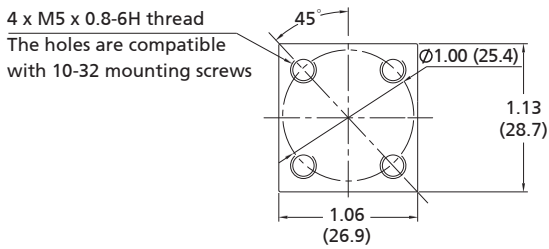
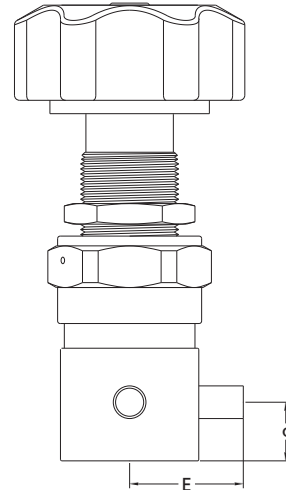
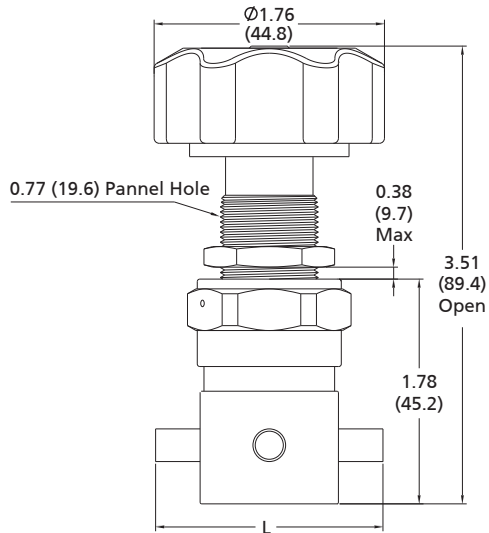
Process Specification

## Branch Type

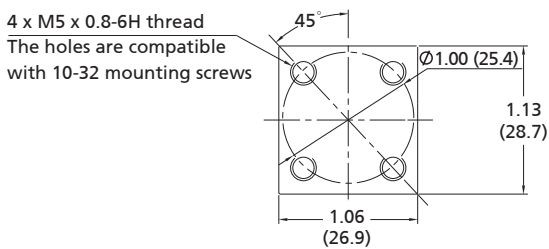
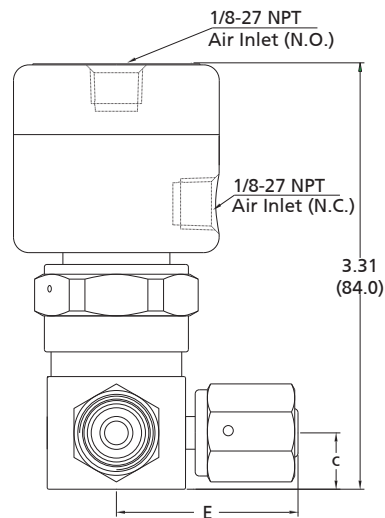
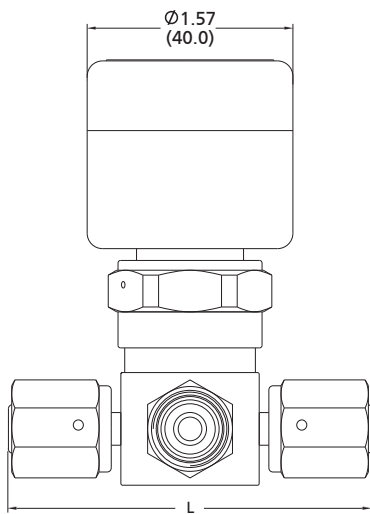
### Dimensions

Dimensions, in inches (millimeters), are for reference only.

#### Manual - Round Handle



#### Pneumatic



Fittings

Valves

Pressure Gauges

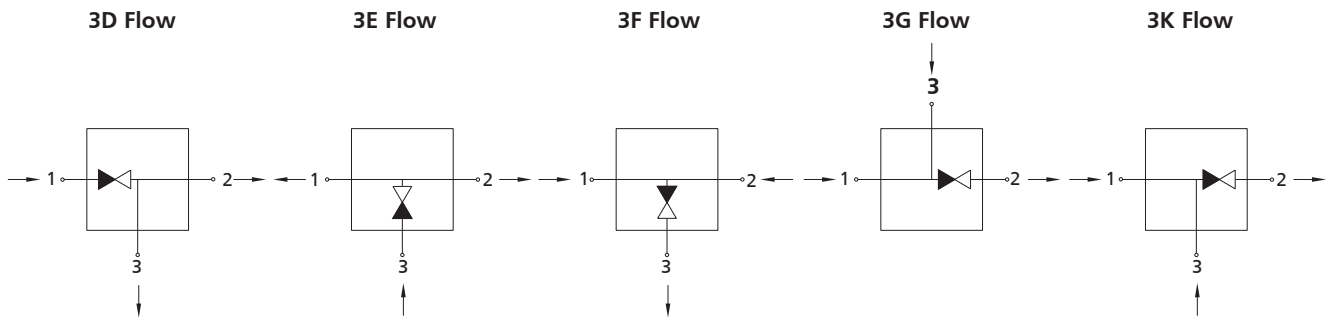
Integrated Systems and Others

Process Specification

| Basic Ordering Number | Connection Type and Size                                | Dimensions, in. (mm) |             |             |
|-----------------------|---------------------------------------------------------|----------------------|-------------|-------------|
|                       |                                                         | C                    | E           | L           |
| SM□□-TB4-4-           | 1/4"x0.035" Tube Butt Weld                              | 0.45 (11.4)          | 0.87 (22.1) | 1.74 (44.2) |
| SM□□-MTB6-4-          | 6x1 mm Tube Butt Weld                                   |                      |             |             |
| SM□□-FFR4-4-          | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting |                      | 1.38 (35.1) | 2.76 (70.1) |
| SM□□-RFR4-4-          | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   |                      | 1.74 (44.2) | 3.48 (88.4) |

Flow Paths

⦿ Flow paths as viewed from the top



Ordering Number Description

**SMSS - TB4 - FR4 - FFR4 - 4 - 3G - RAF2MO - CE**

| Body Material | Port 1 Type                                            | Port 2/3 Type  | Port 2/3 Size                       | Flow Path        | Actuator Type               | Seat                               | Process Specification |                           |          |                        |  |
|---------------|--------------------------------------------------------|----------------|-------------------------------------|------------------|-----------------------------|------------------------------------|-----------------------|---------------------------|----------|------------------------|--|
| 6L 316L SS    | TB Fractional Tube Butt Weld                           | Same as Port 1 | Specified in the same way as Port 1 | 3D               | R Manual-Round Handle       | PCTFE                              | FC-01                 |                           |          |                        |  |
| 6LV 316L VAR  | MTB Metric Tube Butt Weld                              |                |                                     | F2 FC-02         |                             |                                    |                       |                           |          |                        |  |
| SS 316 SS     | TS Fractional Tube Socket Weld                         | Port 1 Size    | 4 1/4" or 1/4"x0.035"               | 3F               | C Normally Closed Pneumatic | A PFA                              | F3 FC-03              |                           |          |                        |  |
|               | FR Integral Male FR Metal Gasket Face Seal Fitting     |                |                                     | 6 6x1 mm or 3/8" |                             |                                    | 3G                    | O Normally Open Pneumatic | V Vespel | <b>Position Sensor</b> |  |
|               | FFR Rotatable Female FR Metal Gasket Face Seal Fitting |                |                                     | 8 8 mm           |                             |                                    | 3K                    |                           |          | None                   |  |
|               | FL Fractional Tube Fitting                             |                |                                     | <b>Orifice</b>   |                             |                                    |                       |                           |          |                        |  |
|               | ML Metric Tube Fitting                                 |                |                                     | 4 0.16" (4.1 mm) |                             | MO Normally Open Position Sensor   |                       |                           |          |                        |  |
|               | FO Male FO Fitting                                     |                |                                     |                  |                             | MC Normally Closed Position Sensor |                       |                           |          |                        |  |

Note: For normally closed pneumatic valves only

Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
- For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

| Product Certification |                                         |
|-----------------------|-----------------------------------------|
|                       | None                                    |
| CE                    | CE Certification (For Pneumatic only)   |
| AX                    | ATEX Certification (For Pneumatic only) |

# Bellows-Sealed Valves

## High Pressure Pneumatic Bellows-Sealed Valves

### SVH Series

#### Features

- ⦿ Packless valves with all-metal seal to atmosphere
- ⦿ Compact designed body with minimal dead space
- ⦿ 316L SS precision-formed bellows for long cycle life
- ⦿ PCTFE stem tip material with remarkable chemical and thermal resistance
- ⦿ Normally closed and normally open pneumatic actuator optional
- ⦿ Bottom mounting
- ⦿ Normally open and normally closed position sensors optional



#### Technical Data

|                                       |                                                                          |                                                |
|---------------------------------------|--------------------------------------------------------------------------|------------------------------------------------|
| Ports Size                            | 1/4" to 3/8" or 6 mm to 8 mm                                             |                                                |
| Flow Coefficient (Cv)                 | 0.30                                                                     |                                                |
| Orifice Size                          | 0.15 in. (3.8 mm)                                                        |                                                |
| Max. Working Pressure                 | 3500 psig (241 bar)                                                      |                                                |
| Pneumatic Actuator Operating Pressure | 60 to 90 psig (4.2 to 6.2 bar)                                           |                                                |
| Temperature                           | PCTFE: -40 ~ 150 °F (-40 ~ 65 °C)<br>VespeI: -40 ~ 400 °F (-40 ~ 204 °C) |                                                |
| Leak Rate (Helium)                    | Internal                                                                 | $\leq 4 \times 10^{-9}$ std cm <sup>3</sup> /s |
|                                       | External                                                                 | $\leq 4 \times 10^{-9}$ std cm <sup>3</sup> /s |

#### Flow Data

Air @ 70 °F (21 °C)  
Water @ 60 °F (16 °C)

| Pressure Drop to Atmosphere psig (bar) | Air (l/min) | Water (l/min) |
|----------------------------------------|-------------|---------------|
| 10 (0.68)                              | 96          | 3.6           |
| 50 (3.4)                               | 250         | 7.9           |
| 100 (6.8)                              | 450         | 11.0          |

#### Process Specification

| Technology               | Standard Cleaning and Packaging (FC-01) | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|--------------------------|-----------------------------------------|----------------------------------------|---------------------------|
| Material/Specification   | 316 SS/ASTM A479<br>316L SS/SEMI F20    |                                        | 316L SS/SEMI F20          |
| Wetted Surface Roughness | Ra 20 μin. (0.51 μm)                    |                                        | Ra 10 μin. (0.25 μm)      |
| Polishing Process        | Machine finished                        |                                        | Electropolished           |

Note: Refer to page P-01 for a detailed description of Process Specification.

Fittings

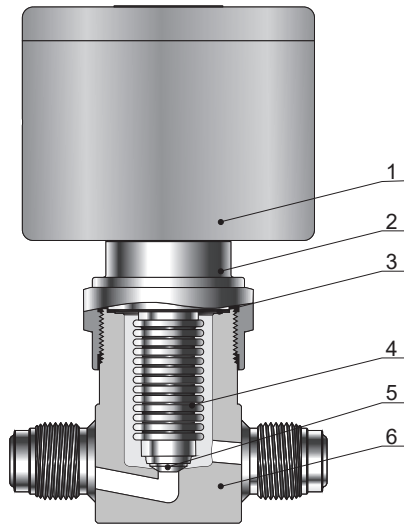
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

## Major Materials of Construction



Normally Closed Model

| Item | Component          | Material/Specification               |
|------|--------------------|--------------------------------------|
| 1    | Pneumatic Actuator | Aluminum                             |
| 2    | Bonnet Nut         | 304 SS/ASTM A479                     |
| 3    | Gasket             | PTFE-Coated 316L SS/A240             |
| 4    | Bellows            | 316L SS/ASTM A269                    |
| 5    | Seat               | PCTFE/ASTM D1430 or Vsepel           |
| 6    | Body               | 316 SS/ASTM A479 or 316L SS/SEMI F20 |

## Pneumatic Actuators

- ☉ Normally open, "N.O." marked on the top of the actuator
- ☉ Normally closed, "N.C." marked on the top of the actuator



## Position Sensors

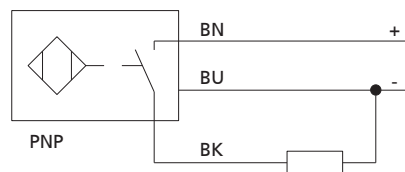
Transmit a signal to an electrical device indicating the open and closed position of pneumatically actuated valves

### Sensor Technical Information

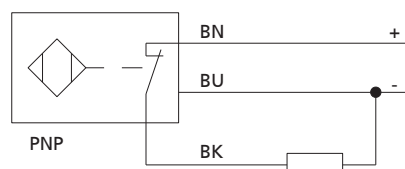
|                     |                                  |
|---------------------|----------------------------------|
| Output              | 3-wire V (dc), PNP               |
| Output Function     | Normally open or normally closed |
| Voltage             | 10 ~ 30 V (dc)                   |
| Working Temperature | -13 ~ 158 °F (-25 ~ 70 °C)       |

### Wiring Diagram

#### Normally Open Position Sensor



#### Normally Closed Position Sensor



### Explosion-proof Position Sensors

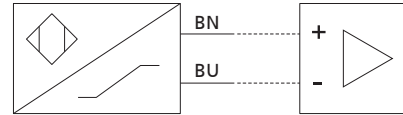
Transmit a signal to an electrical device, indicating the open and closed positions of pneumatically actuated valves.

Equipment Group II under ATEX Certification. The output complies with DIN EN 6094 7-5-6 (NAMUR) and the sensor should be used with an isolation amplifier.

### Technical Information

|                           |                            |
|---------------------------|----------------------------|
| <b>Output</b>             | 2 Wires DC                 |
| <b>Voltage</b>            | 8.2 V (dc)                 |
| <b>Working Temperatre</b> | -13 ~ 158 °F (-25 ~ 70 °C) |

### Wiring Diagram



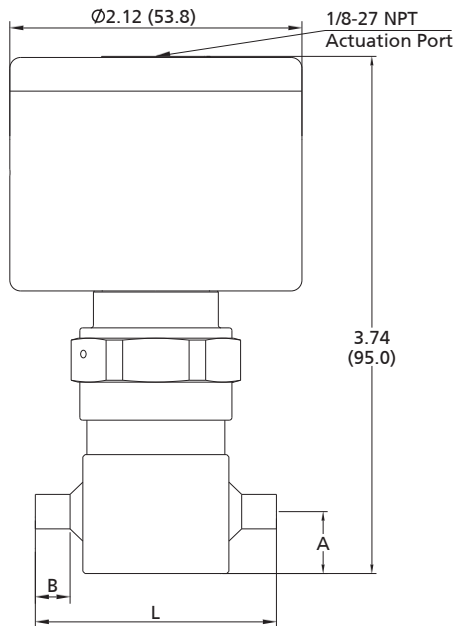
## Dimensions and Ordering Information

### Straight Type

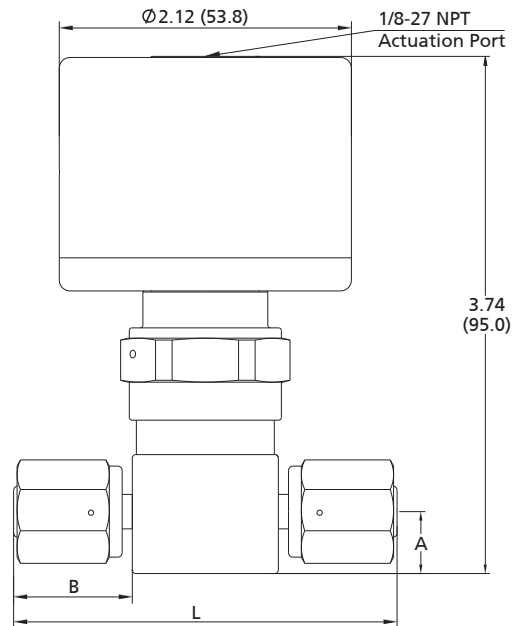
#### Dimensions

Dimensions, in inches (millimeters), are for reference only.

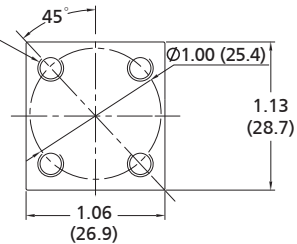
**Normally Closed**



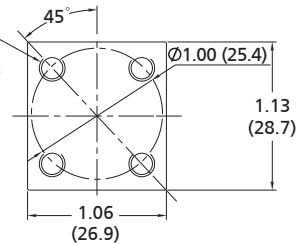
**Normally Open**



4 x M5 x 0.8-6H thread  
The holes are compatible with 10-32 mounting screws



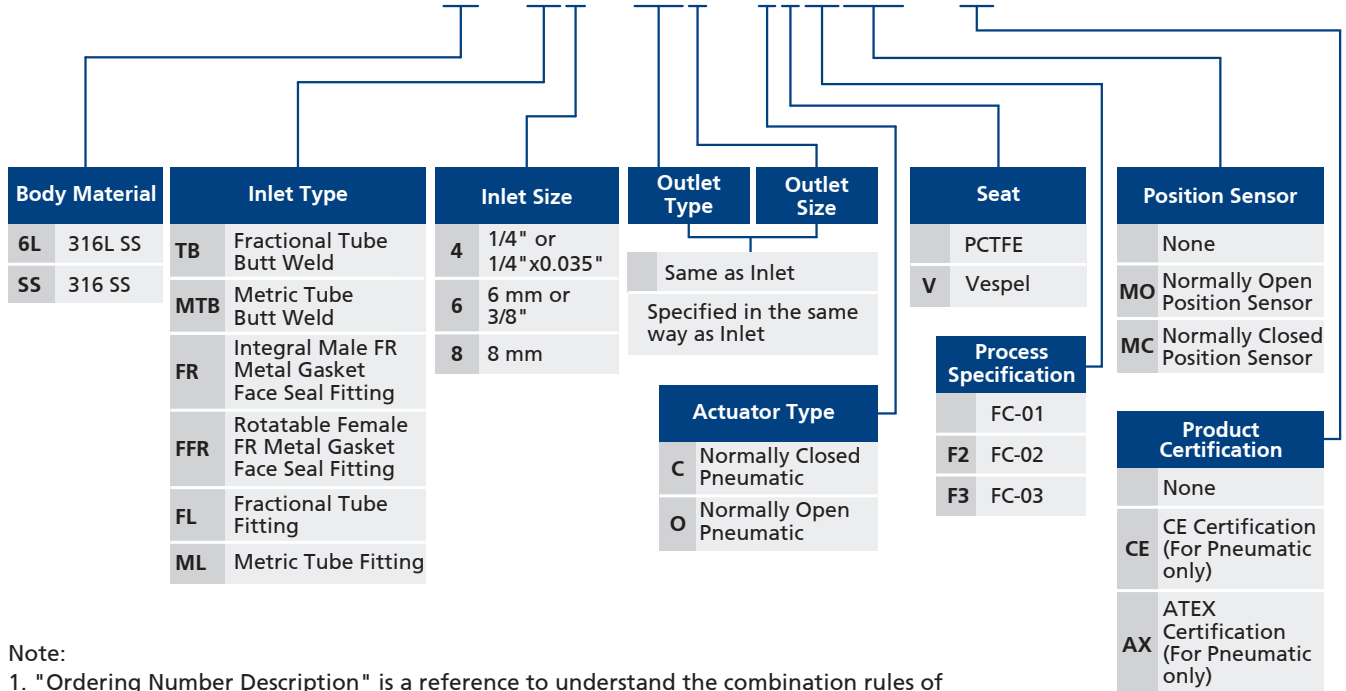
4 x M5 x 0.8-6H thread  
The holes are compatible with 10-32 mounting screws



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|
|                       |                                                         | A                   | B           | L           |
| SVH□□-TB4-            | 1/4"x0.035" Tube Butt Weld                              | 0.44 (11.2)         | 0.25 (6.4)  | 1.75 (44.4) |
| SVH□□-FFR4-           | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.85 (21.6) | 2.76 (70.1) |
| SVH□□-FR4-            | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 2.30 (58.4) |
| SVH□□-FL4-            | 1/4" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.8) | 2.46 (62.5) |
| SVH□□-FL6-            | 3/8" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.76 (19.3) | 2.58 (65.5) |
| SVH□□-ML6-            | 6 mm FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.9) | 2.47 (62.8) |

Ordering Number Description

SVHSS - FL4 - ML6 - CVF2MO - CE



Note:

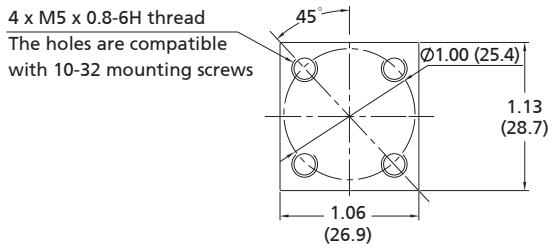
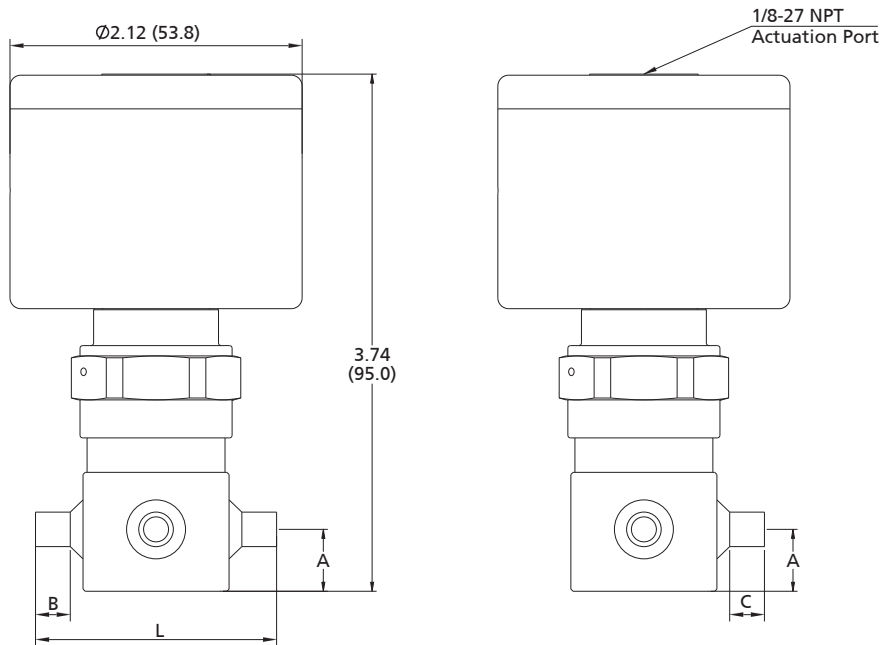
1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. For -CE selections, products have "CE" lettering and, additionally, if the products are fitted with position sensors, the sensors conform to CE.
3. For -AX selections, products conform to Equipment Group II under ATEX certification with "EX" lettering on them and, additionally, if the products are fitted with position sensors, the sensors are explosion-proof, with details described above.

## Branch Type

### Dimensions

Dimensions, in inches (millimeters), are for reference only.

#### Normally Closed



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



# V-114 Bellows-Sealed Valves

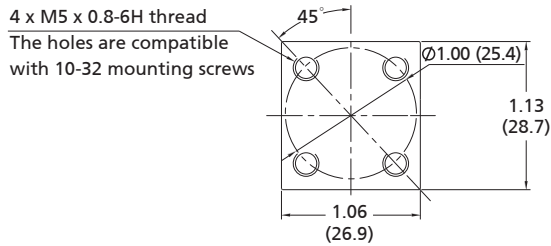
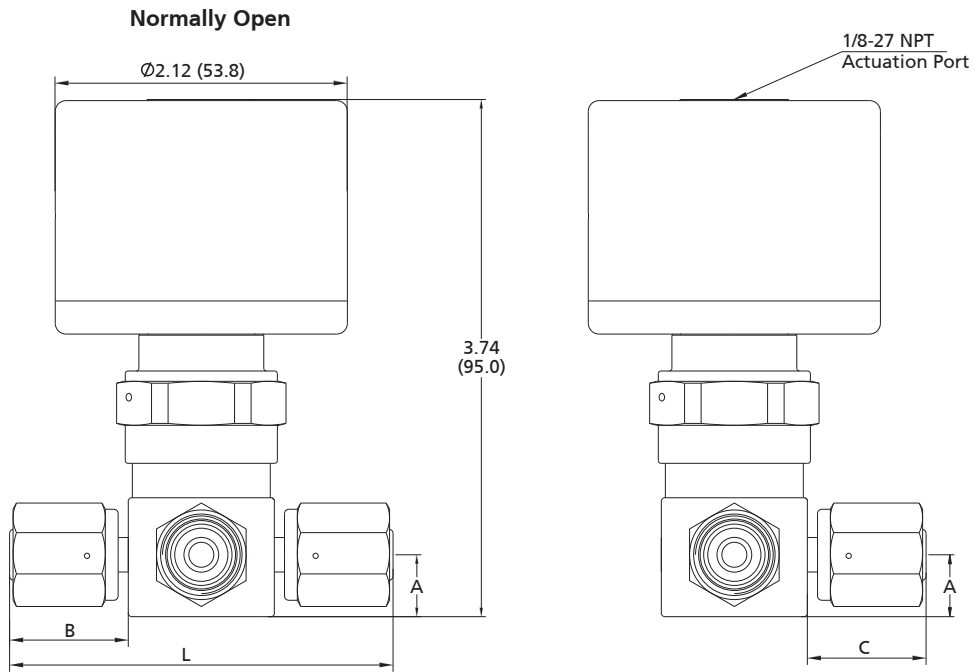
Fittings

Valves

Pressure Gauges

Integrated Systems and Others

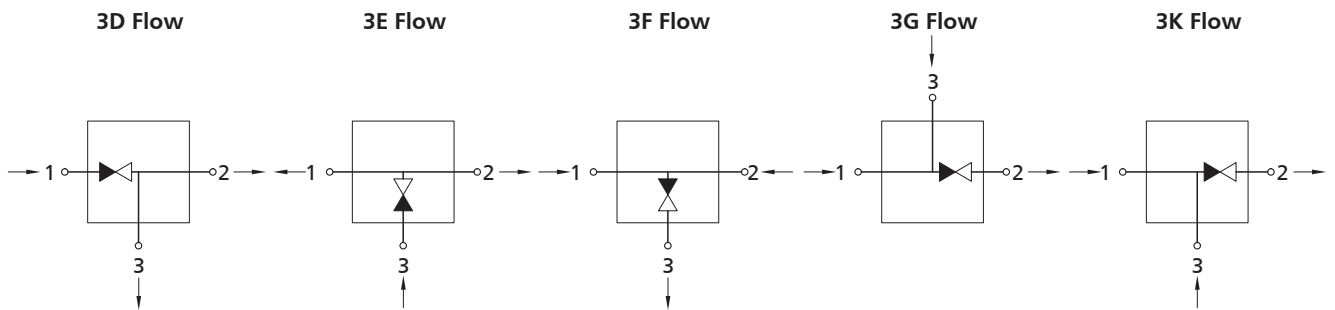
Process Specification



| Basic Ordering Number | Connection Type and Size                                | Dimensions in. (mm) |             |             |             |
|-----------------------|---------------------------------------------------------|---------------------|-------------|-------------|-------------|
|                       |                                                         | A                   | B           | C           | L           |
| SVH□□-TB4-            | 1/4" x 0.035" Tube Butt Weld                            | 0.44 (11.2)         | 0.25 (6.4)  | 0.25 (6.4)  | 1.75 (44.4) |
| SVH□□-FFR4-           | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.44 (11.2)         | 0.85 (21.6) | 0.85 (21.6) | 2.76 (70.1) |
| SVH□□-FR4-            | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.44 (11.2)         | 0.62 (15.7) | 0.62 (15.7) | 2.30 (58.4) |
| SVH□□-FL4-            | 1/4" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.8) | 0.70 (17.8) | 2.46 (62.5) |
| SVH□□-FL6-            | 3/8" FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.76 (19.3) | 0.76 (19.3) | 2.58 (65.5) |
| SVH□□-ML6-            | 6 mm FITOK Tube Fitting                                 | 0.44 (11.2)         | 0.70 (17.8) | 0.70 (17.9) | 2.47 (62.8) |

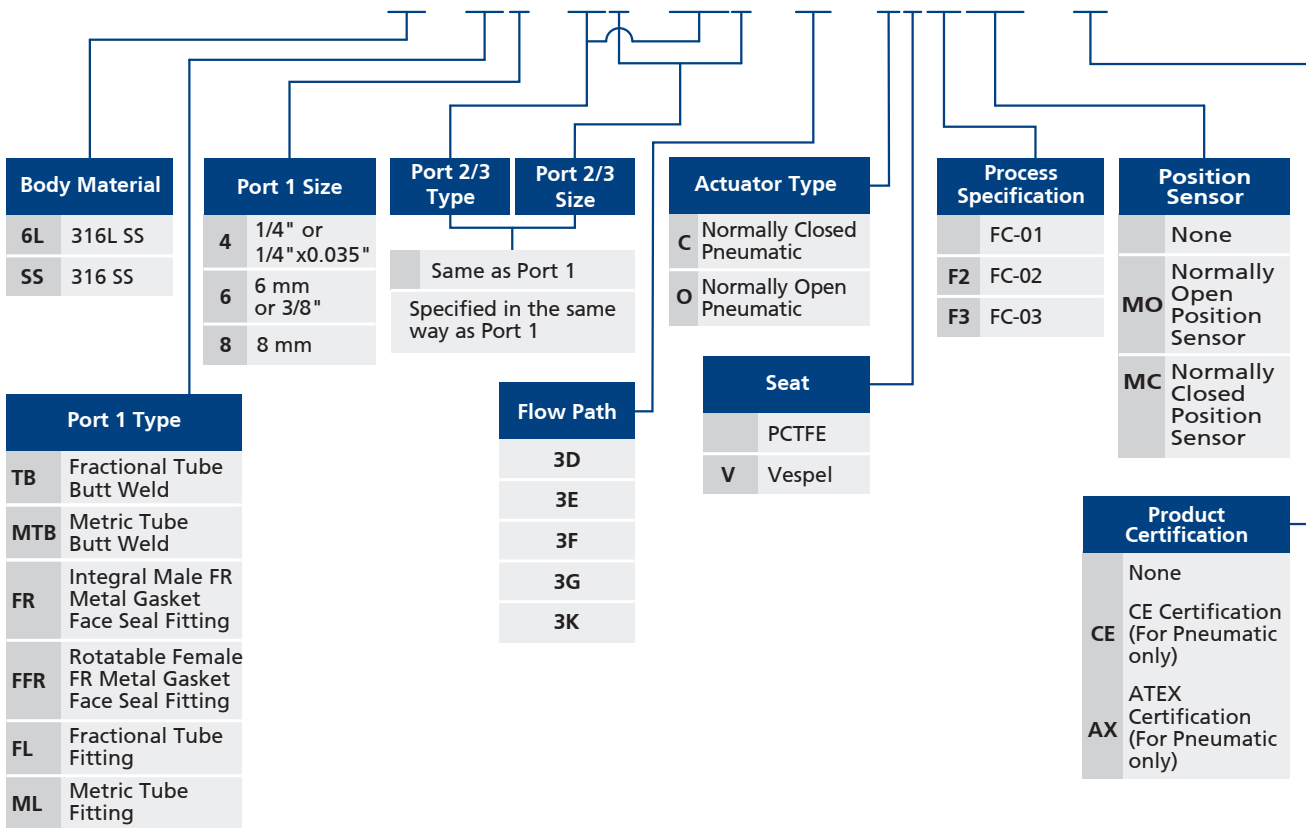
## Flow Paths

☉ Flow paths as viewed from the top



Ordering Number Description

SVHSS – TB4 – FR4 – FFR4 – 3G – CVF2MO – CE



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

Note:

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# Bellows-Sealed Metering Valves

## MU Series

### Features

- ⦿ Reset spring design with no backlash for precise, repeatable flow settings
- ⦿ Micrometer handle measures stem position in 0.0008 in. (0.02 mm) increments
- ⦿ Valves open to maximum flow in six turns
- ⦿ Metering and regulating stem tips available
- ⦿ Modular design to reduce maintenance cost
- ⦿ Slotted handle tops enable adjustment with a screwdriver
- ⦿ Lock screw secures flow settings



### Technical Data

| Stem Type                |          | Metering                                         | Regulating                                       |
|--------------------------|----------|--------------------------------------------------|--------------------------------------------------|
| Flow Coefficient (Cv)    |          | 0.019                                            | 0.30                                             |
| Max. Working Pressure    |          | 700 psig (48.2 bar)                              |                                                  |
| Max. Working Temperature |          | 900 °F (482 °C)                                  |                                                  |
| Leak Rate (Helium)       | Internal | -                                                | $\leq 7.0 \times 10^{-7}$ std cm <sup>3</sup> /s |
|                          | External | $\leq 4.0 \times 10^{-9}$ std cm <sup>3</sup> /s | $\leq 4.0 \times 10^{-9}$ std cm <sup>3</sup> /s |

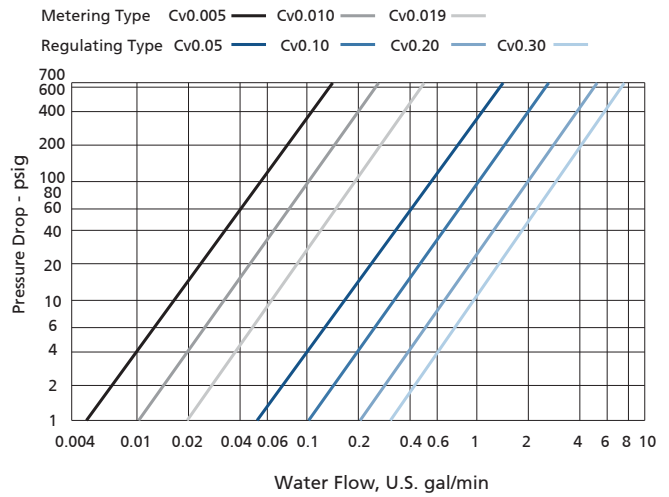
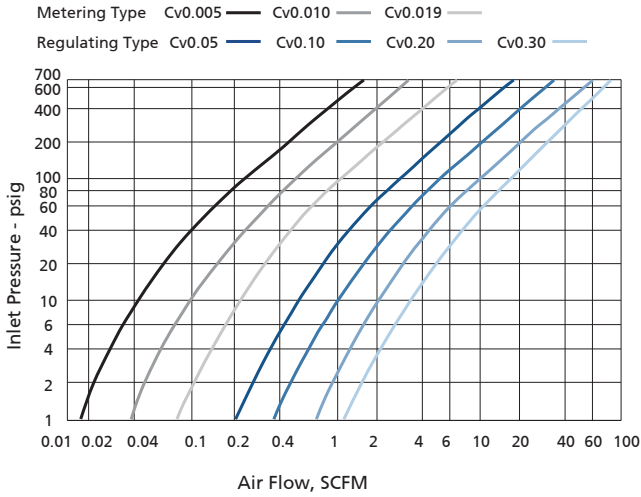
### Pressure-Temperature Ratings

| Material              | 316 SS                       |            |
|-----------------------|------------------------------|------------|
|                       | Gasket                       | Welded     |
| Body-to-Bellows Seal  | Working Pressure, psig (bar) |            |
| Temperature °F (°C)   |                              |            |
| -20 (-28) to 100 (38) | 700 (48.2)                   | 700 (48.2) |
| 200 (93)              | 610 (42.0)                   | 610 (42.0) |
| 300 (148)             | 530 (36.5)                   | 530 (36.5) |
| 400 (204)             | 450 (31.0)                   | 450 (31.0) |
| 500 (260)             | 375 (25.8)                   | 375 (25.8) |
| 600 (315)             | 300 (20.6)                   | 300 (20.6) |
| 650 (343)             | -                            | 260 (17.9) |
| 700 (371)             | -                            | 230 (15.8) |
| 750 (398)             | -                            | 200 (13.7) |
| 800 (426)             | -                            | 160 (11.0) |
| 850 (354)             | -                            | 130 (8.9)  |
| 900 (482)             | -                            | 100 (6.8)  |

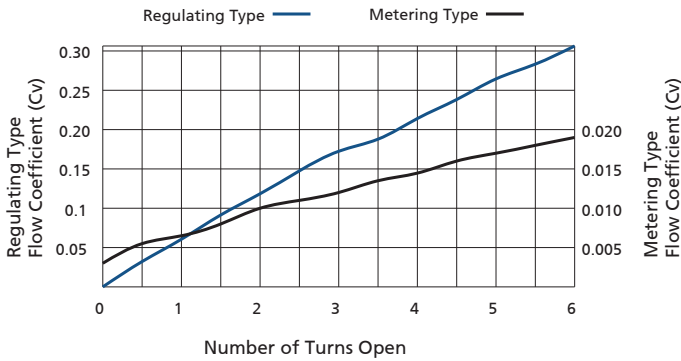
### Handle Temperature Gradient

| Stem Tip Temperature °F (°C) | Handle Temperature °F (°C) |
|------------------------------|----------------------------|
| 600 (315)                    | 217 (103)                  |
| 900 (482)                    | 316 (158)                  |

## Flow Data



Flow Coefficient at Turns Open



### Factory Flow Settings

For valves with metering stem tips, with 10 psig (0.68 bar) inlet pressure and the flow rate from 10 to 15 ml/min, the handle is set at 0 and the valves are not intended for shut-off service.

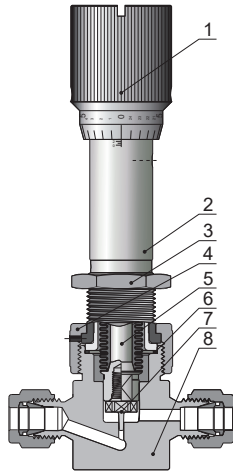
For valves with regulating stem tips, when valves are closed, after helium leak tested to a maximum allowable leak rate of  $7 \times 10^{-7}$  std  $\text{cm}^3/\text{s}$ , the handle is set at 0.

Note: Valves with regulating stem tips and welded seal are not recommended for shut-off service above 600°F (315°C).

## Process Specification

| Technology               | Process Specification                       |                                                     |
|--------------------------|---------------------------------------------|-----------------------------------------------------|
|                          | Standard Cleaning and Packaging (FC-01)     | Special Cleaning and Packaging (FC-02)              |
| Material/Specification   | 316 SS/ASTM A479                            |                                                     |
| Wetted Surface Roughness | Ra 15 $\mu\text{in.}$ (0.38 $\mu\text{m}$ ) |                                                     |
| Polishing                | Machine finished                            |                                                     |
| Cleaning                 | Thrice degreasing ultrasonic cleaning       | Special cleaning with non-ozone-depleting chemicals |
| Assembly Environment     | At atmosphere                               | In specially cleaned areas                          |
| Packaging                | Individually bagged                         | Double bagged                                       |

## Major Materials of Construction

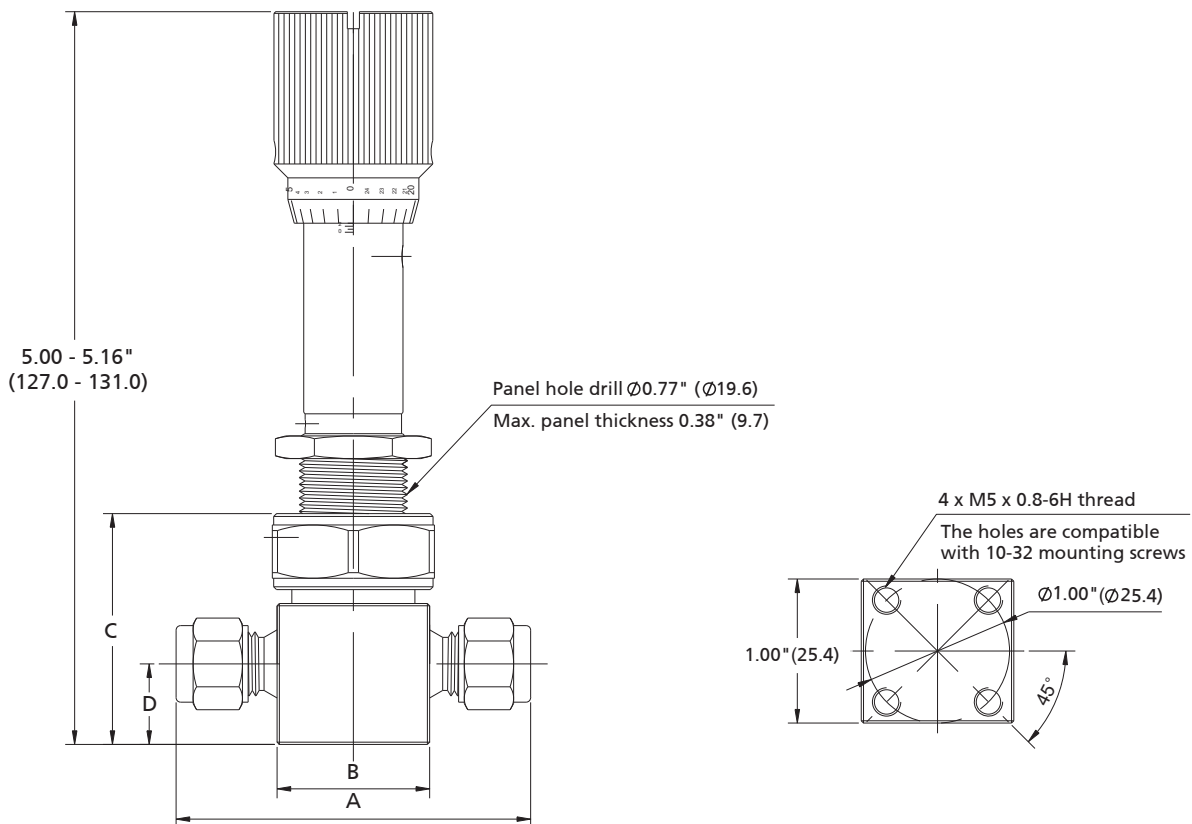


| Item | Component        | Material/Specification          |
|------|------------------|---------------------------------|
| 1    | Handle           | 6061/ASTM B211                  |
| 2    | Bonnet           | 304 SS/ASTM A479                |
| 3    | Panel Nut        | 304 SS/ASTM A479                |
| 4    | Nut              | 304 SS/ASTM A479                |
| 5    | Bellows Assembly | 316 SS/ASTM A240/ASTM A479      |
| 6    | Gasket           | Silver-Plated 316L SS/ASTM A269 |
| 7    | Stem Tip         | 316 SS/ASTM A479                |
| 8    | Body             | 316 SS/ASTM A479                |

## Ordering Information and Dimensions

### Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

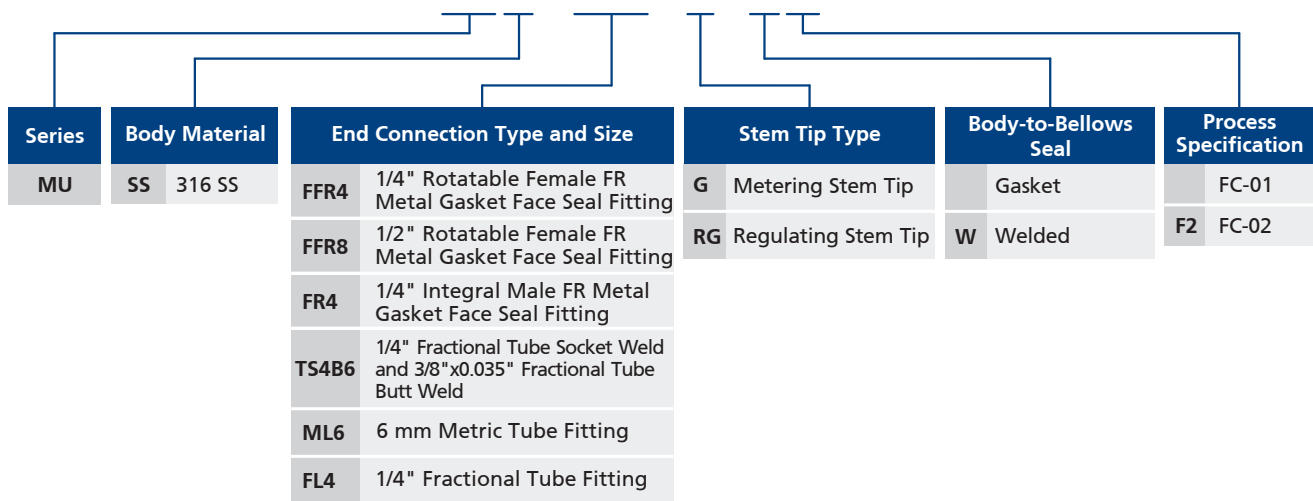


| Ordering Information | End Connection Type and Size                            | Cv    | Dimensions, in. (mm) |             |             |             |
|----------------------|---------------------------------------------------------|-------|----------------------|-------------|-------------|-------------|
|                      |                                                         |       | A                    | B           | C           | D           |
| MUSS-FFR4-G-F2       | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.019 | 2.76 (70.1)          | 1.00 (25.4) | 1.60 (40.7) | 0.56 (14.2) |
| MUSS-FFR8-G-F2       | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting |       | 4.61 (117.0)         | 1.00 (25.4) |             |             |
| MUSS-FFR4-RG-F2      | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting | 0.3   | 2.76 (70.1)          | 1.00 (25.4) |             |             |
| MUSS-FFR8-RG-F2      | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting |       | 4.61 (117.0)         | 1.00 (25.4) |             |             |
| MUSS-FL4-G           | 1/4" Tube Fitting                                       | 0.019 | 2.46 (62.5)          | 1.06 (26.9) |             | 0.56 (14.2) |
| MUSS-ML6-G           | 6 mm Tube Fitting                                       | 0.3   | 2.46 (62.5)          | 1.06 (26.9) |             |             |
| MUSS-FL4-RG          | 1/4" Tube Fitting                                       |       |                      |             |             |             |
| MUSS-ML6-RG          | 6 mm Tube Fitting                                       |       |                      |             |             |             |
| MUSS-FR4-G-F2        | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.019 | 2.24 (56.9)          | 1.00 (25.4) |             | 0.44 (11.2) |
| MUSS-FR4-RG-F2       | 1/4" Integral Male FR Metal Gasket Face Seal Fitting    | 0.3   |                      |             |             |             |
| MUSS-TS4B6-G         | 1/4" Tube Socket Weld and 3/8"x0.035" Tube Butt Weld    | 0.019 | 1.68 (42.7)          | 1.00 (25.4) |             | 0.56 (14.2) |
| MUSS-TS4B6-RG        |                                                         | 0.3   |                      |             |             |             |

Note: For valves with welded body-to-bellows seal (add -W as a suffix), the dimension C will be changed to 1.57 (40.0).

### Ordering Number Description

#### MUSS - FFR4 - G - WF2



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

Fittings  
Valves  
Pressure Gauges  
Integrated Systems and Others  
Process Specification

# All-Welded Check Valves

## CW Series

### Features

- Internally threadless and all-welded design
- Forward flow starts at less than 2 psig (0.14 bar) pressure differential
- Standard surface roughness finished to an average of Ra 20  $\mu\text{in.}$  (0.51  $\mu\text{m}$ ) or electropolished to Ra 10  $\mu\text{in.}$  (0.25  $\mu\text{m}$ ) optional
- Variety of end connections available



### Technical Data

|                                |                               |
|--------------------------------|-------------------------------|
| Ports Size                     | 1/4" to 1/2" or 6 mm to 12 mm |
| Flow Coefficient (Cv)          | 0.55 or 0.70                  |
| Cracking Pressure <sup>①</sup> | Less than 2 psig (0.14 bar)   |
| Max. Working Pressure          | 3000 psig (206 bar)           |
| Max. Pressure Drop             | 145 psig (10 bar)             |
| Working Temperature            | -10 ~ 400 °F (-23 ~ 204 °C)   |

① For valves not actuated for a period of time, initial cracking pressure may be higher than the set cracking pressure.

### Flow Data

Air @ 70 °F (21 °C)

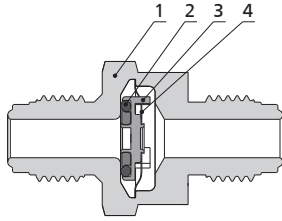
| Pressure Drop to Atmosphere psig (bar) | Cv 0.55 (l/min) | Cv 0.70 (l/min) |
|----------------------------------------|-----------------|-----------------|
| 10 (0.68)                              | 170             | 220             |
| 50 (3.4)                               | 450             | 590             |
| 100 (6.8)                              | 820             | 1040            |

### Process Specification

| Process Specification Technology | Standard Cleaning and Packaging (FC-01)     | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03)                   |
|----------------------------------|---------------------------------------------|----------------------------------------|---------------------------------------------|
| Material/Specification           | 316L SS/SEMI F20<br>316L VAR/SEMI F20       |                                        |                                             |
| Wetted Surface Roughness         | Ra 20 $\mu\text{in.}$ (0.51 $\mu\text{m}$ ) |                                        | Ra 10 $\mu\text{in.}$ (0.25 $\mu\text{m}$ ) |
| Polishing Process                | Machine finished                            |                                        | Electropolished                             |

Note: Refer to page P-01 for a detailed description of Process Specification.

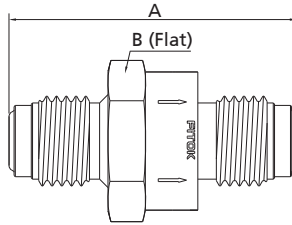
## Major Materials of Construction



| Item |                   | Material Grade/ASTM Specification     |
|------|-------------------|---------------------------------------|
| 1    | Body              | 316L SS/SEMI F20 or 316L VAR/SEMI F20 |
| 2    | Seal              | Fluorocarbon FKM                      |
| 3    | Poppet            | 316L SS/SEMI F20 or 316L VAR/SEMI F20 |
| 4    | Belleville Spring | Hastelloy                             |

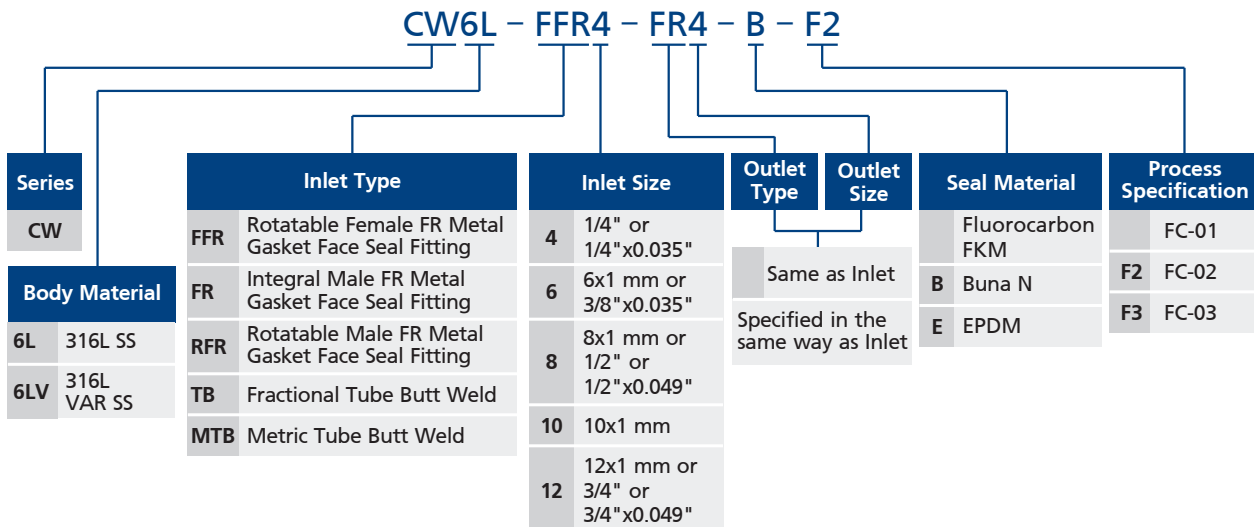
Note: Check valves are designed for directional flow control only and should never be used as code safety relief devices.

## Dimensions



| Basic Ordering Number | Connection Type and Size                             |                                                      | Cv   | Dimensions, in. (mm) |             |
|-----------------------|------------------------------------------------------|------------------------------------------------------|------|----------------------|-------------|
|                       | Inlet                                                | Outlet                                               |      | A                    | B           |
| CW□□-TB4              | 1/4"x0.035" Tube Butt Weld                           | 1/4"x0.035" Tube Butt Weld                           | 0.55 | 1.24 (31.5)          | 7/8 (22.22) |
| CW□□-TB6              | 3/8"x0.035" Tube Butt Weld                           | 3/8"x0.035" Tube Butt Weld                           | 0.70 |                      |             |
| CW□□-TB8              | 1/2"x0.049" Tube Butt Weld                           | 1/2"x0.049" Tube Butt Weld                           | 0.55 |                      |             |
| CW□□-MTB6             | 6x1 mm Tube Butt Weld                                | 6x1 mm Tube Butt Weld                                | 0.55 | 1.80 (45.7)          | 1 (25.4)    |
| CW□□-FR4              | 1/4" Integral Male FR Metal Gasket Face Seal Fitting | 1/4" Integral Male FR Metal Gasket Face Seal Fitting | 0.70 |                      |             |
| CW□□-FR8              | 1/2" Integral Male FR Metal Gasket Face Seal Fitting | 1/2" Integral Male FR Metal Gasket Face Seal Fitting | 0.70 | 2.06 (52.3)          | 1 (25.4)    |

## Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.



# Regulators

## High Performance High Purity Regulators

### FHR-1 Series

#### Features

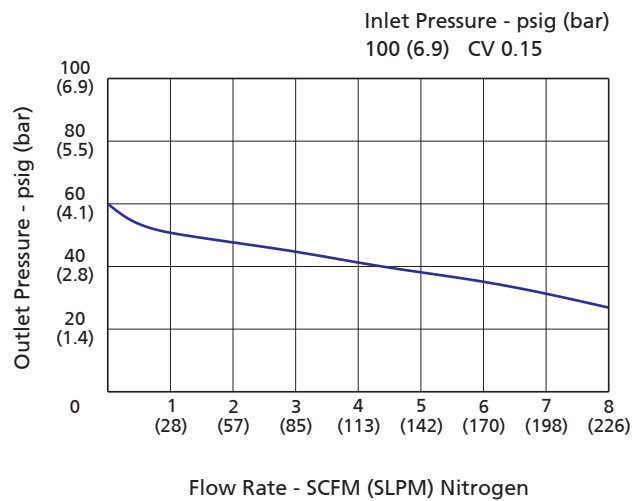
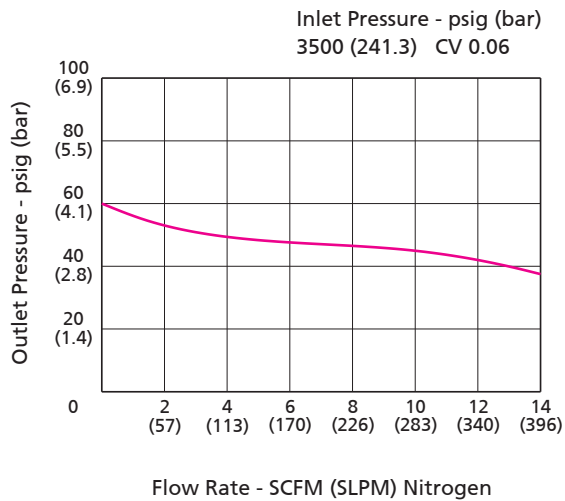
- 316L, 316L VAR, 316L VIM-VAR stainless steel body
- Standard Hastelloy poppet and diaphragm
- Tied diaphragm for added safety
- No springs or threads are exposed to the wetted area
- Internal surface roughness is finished to an average of Ra 10 µin. (0.25 µm) or Ra 5 µin. (0.13 µm) to ensure minimal particle generation
- With special cleaning and packaging, applicable to oxygen-enriched environments
- Ultra high purity service available



#### Technical Data

|                                |                 |                                                                          |
|--------------------------------|-----------------|--------------------------------------------------------------------------|
| <b>Port Size</b>               |                 | 1/4", 3/8" or 1/2"                                                       |
| <b>Max. Working Pressure</b>   |                 | 3500 psig (241 bar)                                                      |
| <b>Outlet Pressure Range</b>   |                 | 0 ~ 30, 0 ~ 60, 0 ~ 100, 0 ~ 150 psig                                    |
| <b>Flow Coefficient (Cv)</b>   |                 | 3500 psig Inlet: 0.06<br>600, 1000 psig Inlet: 0.15                      |
| <b>Temperature</b>             |                 | PCTFE: -40 ~ 149 °F (-40 ~ 65 °C)<br>Vespel: -15 ~ 302 °F (-26 ~ 150 °C) |
| <b>Leak Rate (Helium)</b>      | <b>Internal</b> | ≤ 5x10 <sup>-8</sup> std cm <sup>3</sup> /s                              |
|                                | <b>External</b> | ≤ 1x10 <sup>-9</sup> std cm <sup>3</sup> /s                              |
| <b>Weight (Regulator Only)</b> |                 | ≈ 1.5 lbs (0.7 kg)                                                       |

#### Flow Data

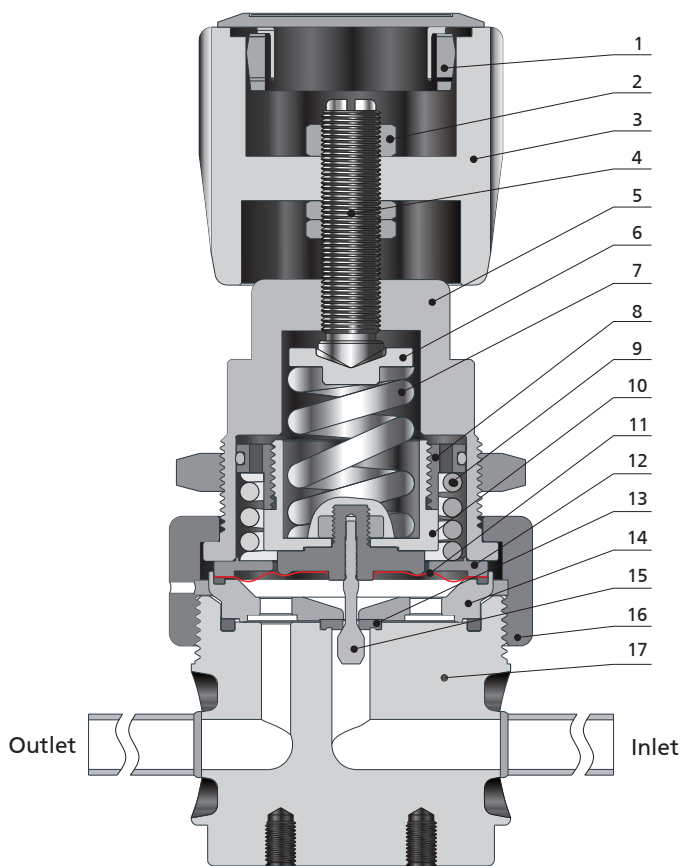


## Process Specification

| Technology               | Special Cleaning and Packaging (FC-02)                         | Ultra High Purity (FC-03)                  |
|--------------------------|----------------------------------------------------------------|--------------------------------------------|
| Material/Specification   | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20 |                                            |
| Wetted Surface Roughness | Ra 10 $\mu\text{in.}$ (0.25 $\mu\text{m}$ ) <sup>①</sup>       | Ra 5 $\mu\text{in.}$ (0.13 $\mu\text{m}$ ) |
| Polishing Process        | Machine finished <sup>①</sup>                                  | Electropolished                            |

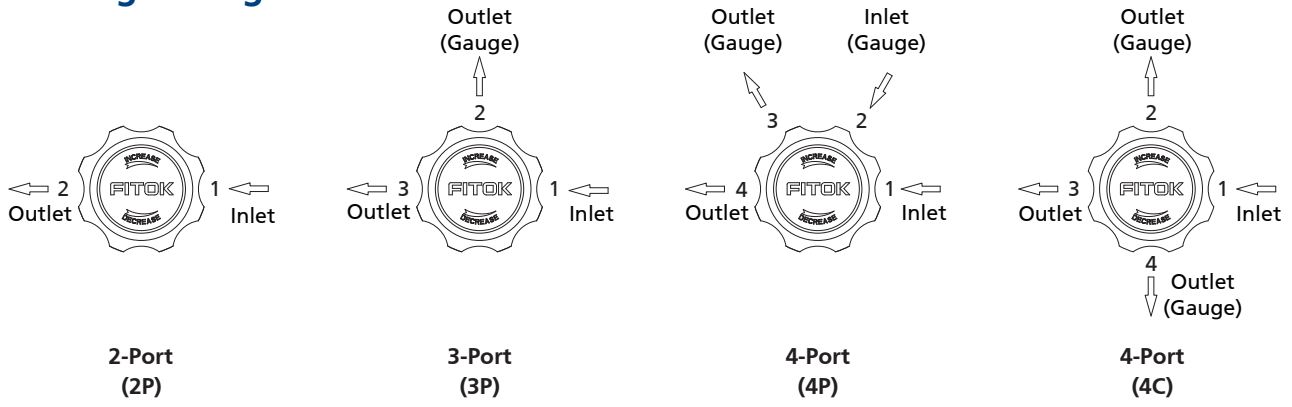
① For valves with FR connections and tube butt connections, the standard polishing process is electropolishing and the internal surface roughness is finished to an average of Ra 5  $\mu\text{in.}$  (0.13  $\mu\text{m}$ ).

## Major Materials of Construction



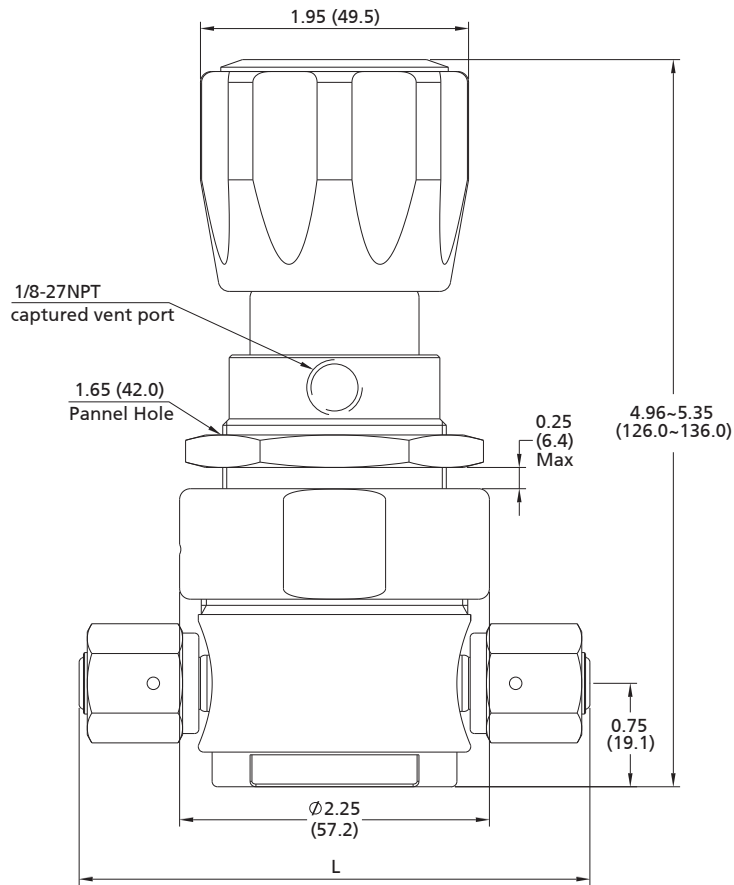
| Item | Component      | Material/Specification                                                 |
|------|----------------|------------------------------------------------------------------------|
| 1    | Hole Plug      | ABS                                                                    |
| 2    | Stem Nut       | Brass                                                                  |
| 3    | Konb Handle    | Aluminium                                                              |
| 4    | Stem           | Brass                                                                  |
| 5    | Bonnet         | 304 SS/ASTM A479                                                       |
| 6    | Spring Button  | 304 SS/ASTM A479                                                       |
| 7    | Range Spring   | Alloy                                                                  |
| 8    | Adjustment Nut | Aluminium                                                              |
| 9    | Return Spring  | 302 SS/ASTM A313                                                       |
| 10   | Spring Shield  | Aluminium                                                              |
| 11   | Diaphragm      | Hastelloy                                                              |
| 12   | Gland          | 630/ASTM A564                                                          |
| 13   | Seat           | PCTFE/ASTM D1430 or Vespel                                             |
| 14   | Support        | 316L SS/SEMI F20 or<br>316L VAR/SEMI F20 or<br>316L VIM-VAR /SEMI F20  |
| 15   | Lift Poppet    | Alloy C-22/ASTM B574                                                   |
| 16   | Bonnet Nut     | 304 SS/ASTM A479                                                       |
| 17   | Body           | 316L SS/SEMI F20 or<br>316L VAR /SEMI F20 or<br>316L VIM-VAR /SEMI F20 |

## Porting Configurations

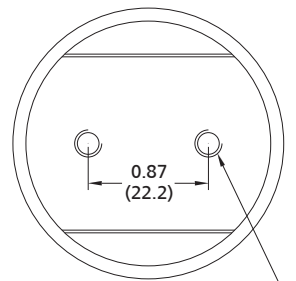


## Dimensions

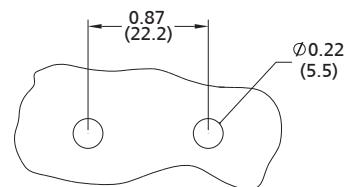
Dimensions, in inches (millimeters), are for reference only.



Bottom Panel Cut-Outs



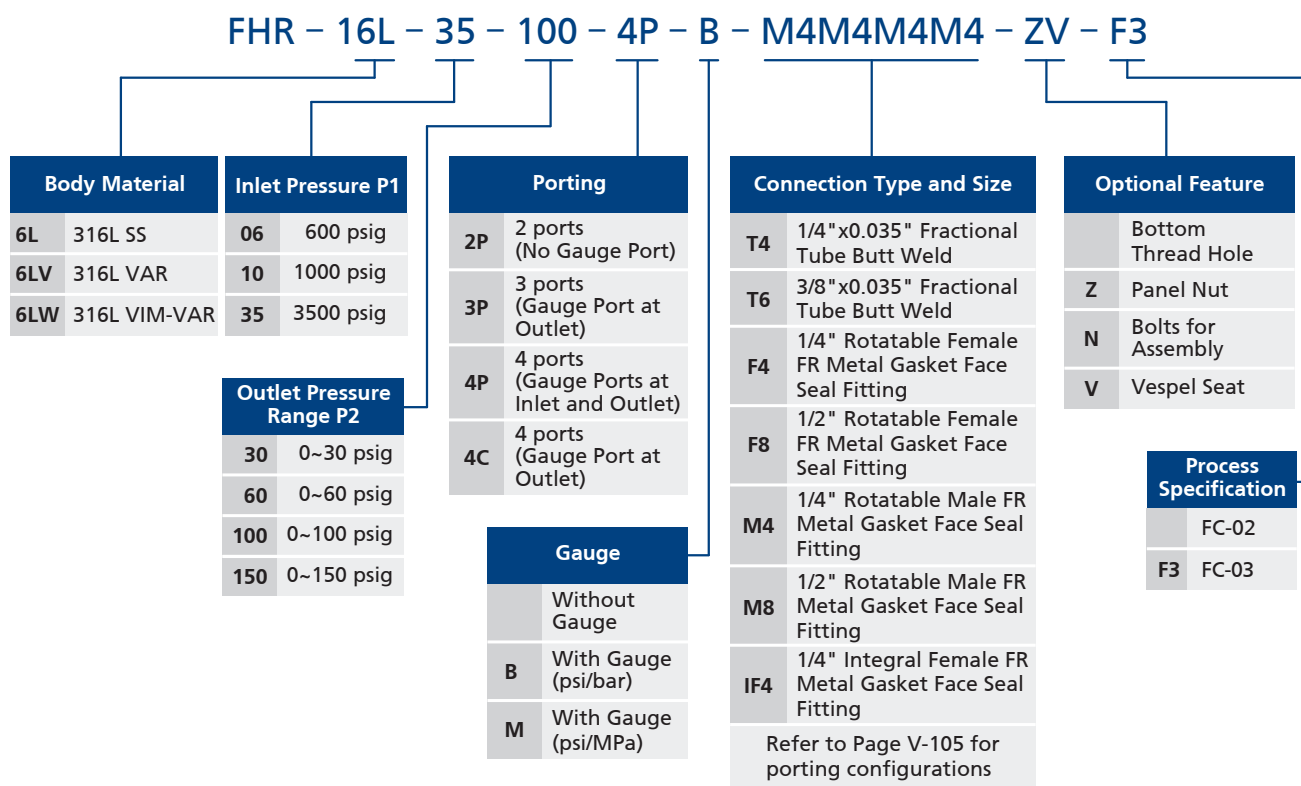
2xM5x0.8-6H thread  
The holes are compatible with 10-32 mounting screws



Note: Vent port (1/8-27NPT) points to 12 o'clock direction from top view.

| Connection Designator | Connection Type and Size                                | Dimension, in. (mm) |
|-----------------------|---------------------------------------------------------|---------------------|
|                       |                                                         | L                   |
| T4                    | 1/4" x 0.035" Fractional Tube Butt Weld                 | 3.70 (94.0)         |
| T6                    | 3/8" x 0.035" Fractional Tube Butt Weld                 |                     |
| F4                    | 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting |                     |
| F8                    | 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting | 4.75 (120.6)        |
| M4                    | 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting   | 3.70 (94.0)         |
| M8                    | 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting   | 4.75 (120.6)        |
| IF4                   | 1/4" Integral Female FR Metal Gasket Face Seal Fitting  | 1.06 (26.8)         |

## Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

# Vacuum Generators

## VG Series

### Features

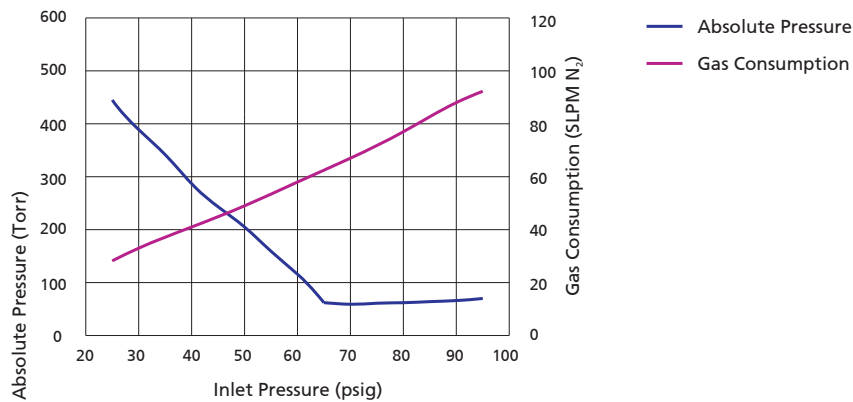
- ⦿ Designed for use in gas delivery system to improve purging efficiency
- ⦿ All-welded design
- ⦿ Vacuum pressure 60 Torr (-93.3 kPa) Max.
- ⦿ Internal surface roughness of Ra 20  $\mu\text{in}$ . (0.51  $\mu\text{m}$ )
- ⦿ 100% helium leak tested
- ⦿ Variety of end connections



### Technical Data

|                          |                          |
|--------------------------|--------------------------|
| Ultimate Vacuum Pressure | 60 Torr (-93.3 kPa)      |
| Gas Pressure at Ultimate | 70 psig (4.8 bar)        |
| Gas Flow at Ultimate     | 67 l/min                 |
| Max. Working Pressure    | 145 psig (10 bar)        |
| Working Temperature      | 32 ~ 302 °F (0 ~ 150 °C) |

### Vacuum and Flow Specification

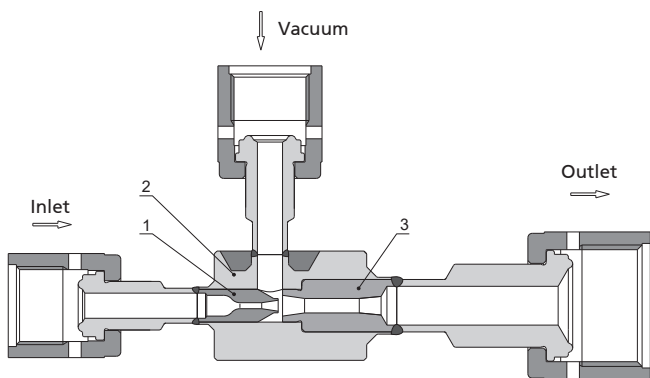


## Process Specification

| Process Specification    | Standard Cleaning and Packaging (FC-01) | Special Cleaning and Packaging (FC-02) | Ultra High Purity (FC-03) |
|--------------------------|-----------------------------------------|----------------------------------------|---------------------------|
| Technology               |                                         |                                        |                           |
| Material/Specification   | 316L SS/SEMI F20                        |                                        |                           |
| Wetted Surface Roughness | Ra 20 μin. (0.51 μm)                    |                                        |                           |
| Polishing Process        | Machine finished                        |                                        |                           |

Note: For details about process specifications , see Cleaning and Packaging Process Specifications on page P-01.

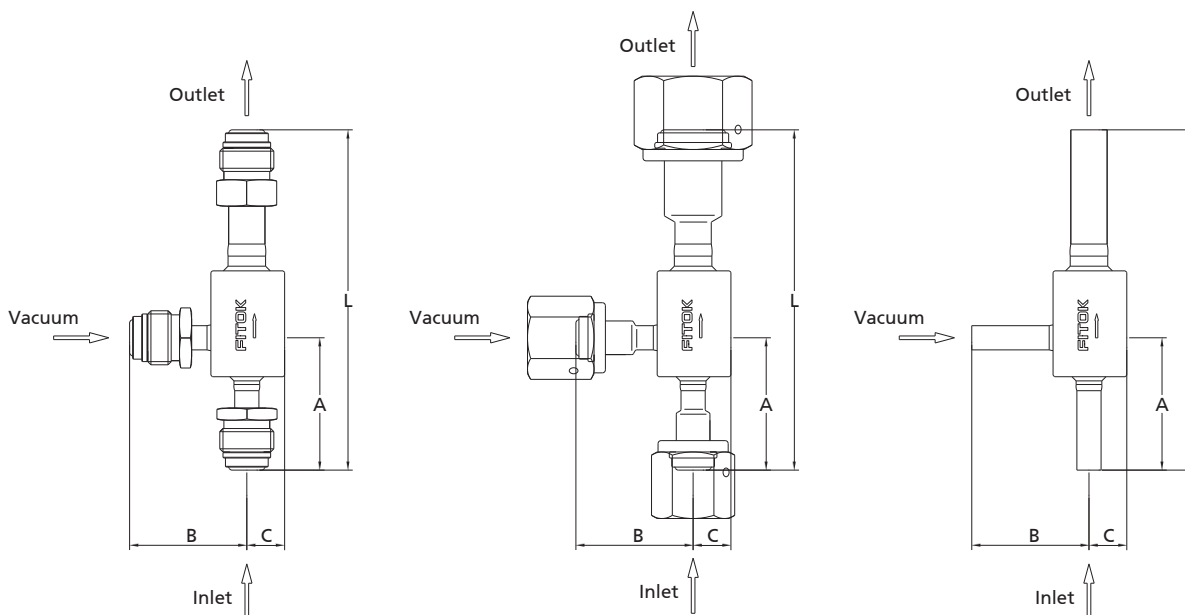
## Major Materials of Construction



| Item | Component | Material/Specification |
|------|-----------|------------------------|
| 1    | Nozzle    | 316L SS/SEMI F20       |
| 2    | Body      |                        |
| 3    | Diffuser  |                        |

## Ordering Information and Dimensions

Dimensions, in inches (millimeters), are for reference only.



Fittings

Valves

| Basic Ordering Number | Connection Type and Size                                                                                                                     | Dimensions, in. (mm) |             |             |             |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|-------------|-------------|
|                       |                                                                                                                                              | L                    | A           | B           | C           |
| VG□□-FFR4-            | Inlet, Outlet and Vacuum: 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting                                                            | 3.54 (90.0)          | 1.38 (35.0) | 1.22 (31.0) | 0.39 (10.0) |
| VG□□-RFR4-            | Inlet, Outlet and Vacuum: 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting                                                              |                      |             |             |             |
| VG□□-FFR4-FFR8-FFR4-  | Inlet and Vacuum: 1/4" Rotatable Female FR Metal Gasket Face Seal Fitting<br>Outlet: 1/2" Rotatable Female FR Metal Gasket Face Seal Fitting |                      |             |             |             |
| VG□□-RFR4-RFR8-RFR4-  | Inlet and Vacuum: 1/4" Rotatable Male FR Metal Gasket Face Seal Fitting<br>Outlet: 1/2" Rotatable Male FR Metal Gasket Face Seal Fitting     |                      |             |             |             |
| VG□□-TB4-TB6-TB4-     | Inlet and Vacuum: 1/4"x0.035" Fractional Tube Butt Weld<br>Outlet: 3/8"x0.035" Fractional Tube Butt Weld                                     |                      |             |             |             |

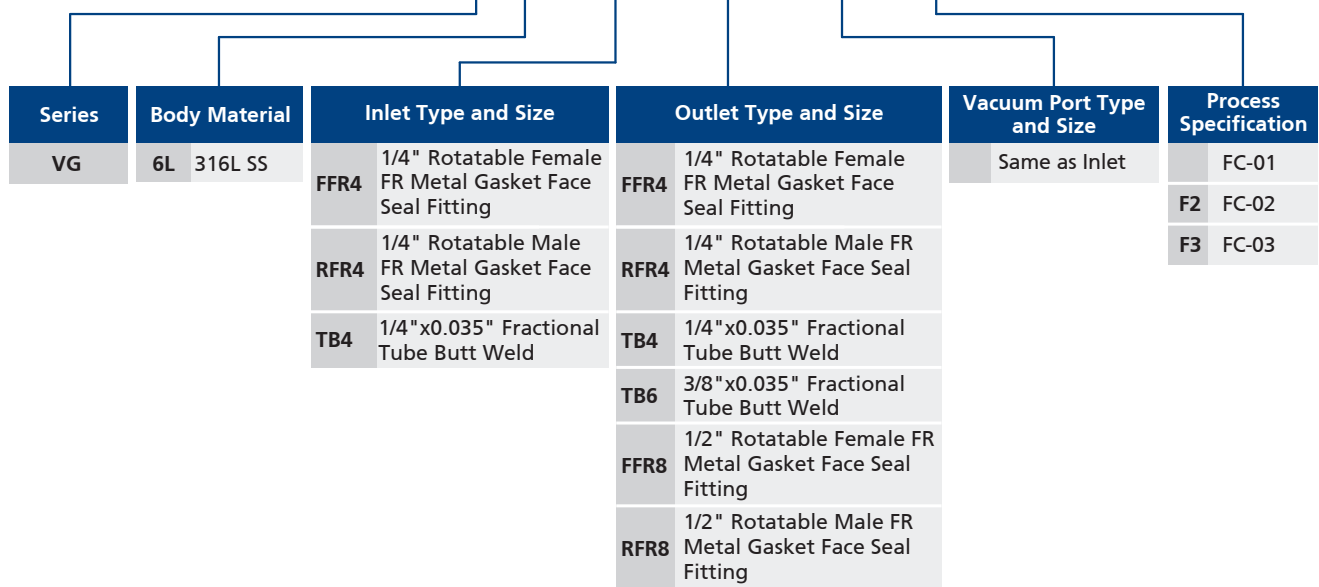
### Ordering Number Description

Pressure Gauges

Integrated Systems and Others

Process Specification

#### VG6L - FFR4 - FFR8 - FFR4 - F2



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

# Ultra High Purity Pressure Gauges

## GP Series

GP series pressure gauges are designed for ultra high purity gas distribution systems used in semiconductor, electronic and medical industries, etc. They are applicable for gases, liquids and corrosive media in high purity conditions, and also in corrosive environments.



## Features

- ⦿ 2 in. (50 mm), 2 1/2 in. (63 mm) dial sizes
- ⦿ Up to 6000 psi measurement range
- ⦿ Internal surface electropolished to a roughness  $Ra \leq 10 \mu\text{in.}$  (0.25  $\mu\text{m}$ )
- ⦿ Leak rate (helium):  $\leq 1 \times 10^{-9}$  std  $\text{cm}^3/\text{s}$
- ⦿ Lower or center-back mount optional
- ⦿ For ultra high purity application

## Technical Data

| Accuracy              |                          | ASME B40.1 Grade A                     |
|-----------------------|--------------------------|----------------------------------------|
| Dial Ranges           | Compound Gauges          | Vacuum to 15 psig ~ Vacuum to 300 psig |
|                       | Positive Pressure Gauges | 0 to 15 psig ~ 0 to 6000 psig          |
| Working Pressures     | Static Pressure          | 75% of the dial range                  |
|                       | Dynamic Pressure         | 67% of the dial range                  |
|                       | Instantaneous Pressure   | 100% of the dial range                 |
| Operating Temperature | Ambient Temperature      | -40 ~ 140 °F (-40 ~ 60 °C)             |
|                       | Media Temperature        | Up to 212 °F (100 °C)                  |
| Protection Class      |                          | IP 54                                  |

## Materials of Construction

| Component      | Material        |
|----------------|-----------------|
| End Connection | 316L SS         |
| Bourdon Tube   | 316L SS         |
| Case           | Stainless Steel |
| Lens           | Safety Glass    |
| Dial           | Aluminum        |
| Pointer        | Aluminum        |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

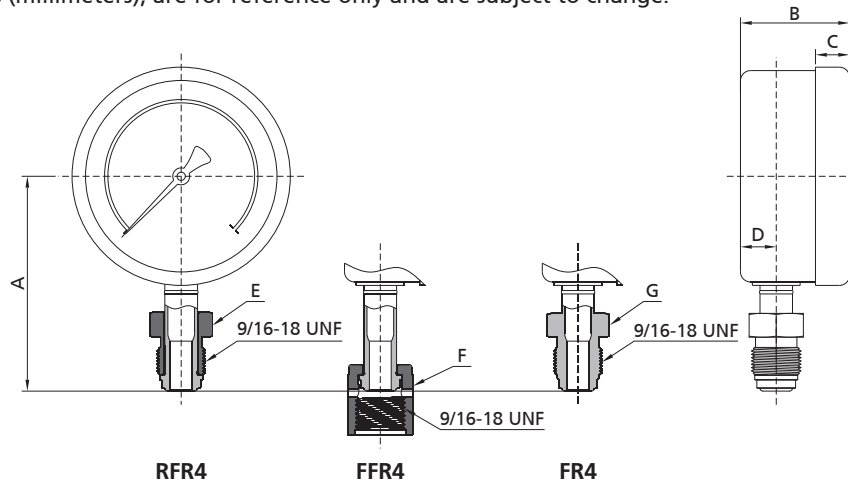


## Connection Types and Mount Dimensions

### Lower Mount

#### Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.

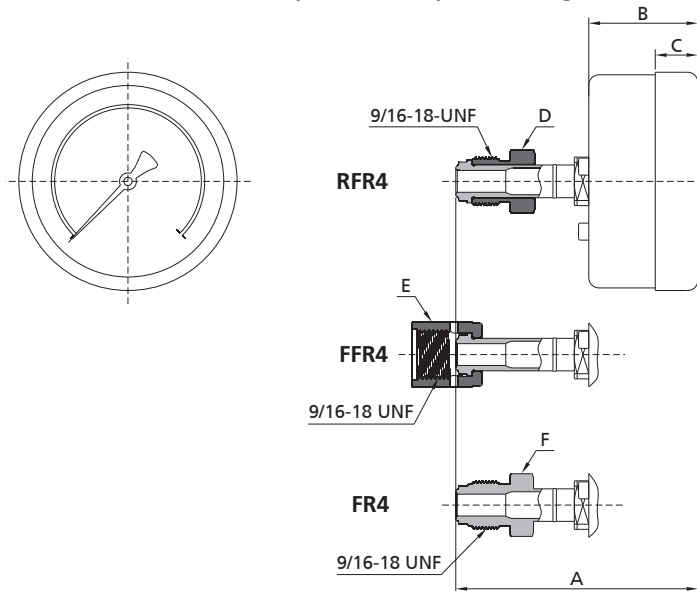


| Dial Size<br>in. (mm) | Dimensions, in. (mm) |             |             |             |             |             |             |
|-----------------------|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                       | A                    | B           | C           | D           | E           | F           | G           |
| 2 (50)                | 2.32 (58.9)          | 1.04 (26.5) | 0.41 (10.5) | 0.41 (10.5) | 0.63 (16.0) | 0.75 (19.0) | 0.63 (16.0) |
| 2 1/2 (63)            | 2.56 (65.0)          | 1.26 (32.0) | 0.47 (12.0) | 0.43 (11.0) | 0.63 (16.0) | 0.75 (19.0) | 0.63 (16.0) |

### Center-Back Mount

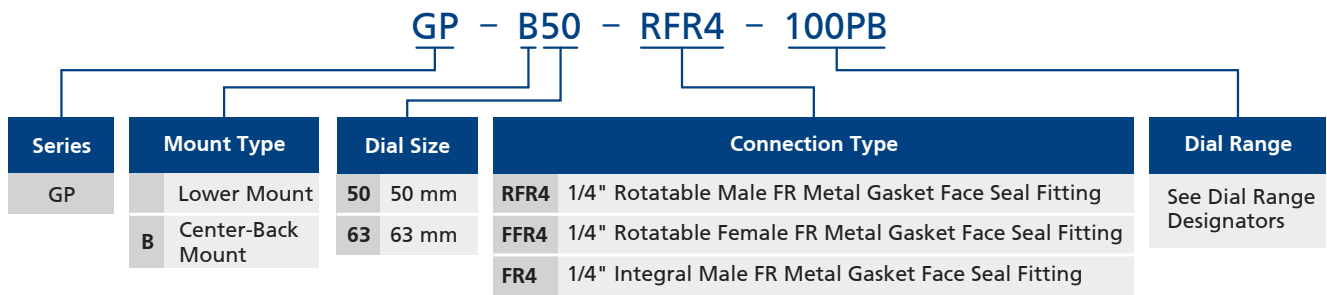
#### Dimensions

Dimensions, in inches (millimeters), are for reference only and are subject to change.



| Dial Size<br>in. (mm) | Dimensions, in. (mm) |             |             |             |             |             |
|-----------------------|----------------------|-------------|-------------|-------------|-------------|-------------|
|                       | A                    | B           | C           | D           | E           | F           |
| 2 (50)                | 2.60 (66.0)          | 1.04 (26.5) | 0.41 (10.5) | 0.63 (16.0) | 0.75 (19.0) | 0.63 (16.0) |
| 2 1/2 (63)            | 2.80 (71.0)          | 1.30 (33.0) | 0.49 (12.5) | 0.63 (16.0) | 0.75 (19.0) | 0.63 (16.0) |

## Ordering Number Description



Note: "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.

## Dial Range Designators

| Minimum Scale        | Maximum Scale |                 |                 | Designator                     |                                |
|----------------------|---------------|-----------------|-----------------|--------------------------------|--------------------------------|
|                      | Unit          |                 |                 | Dual Scale                     |                                |
|                      | Psi (Primary) | MPa (Secondary) | Bar (Secondary) | Psi (Primary), MPa (Secondary) | Psi (Primary), Bar (Secondary) |
| Vacuum<br>-30 in. Hg | 15            | 0.1             | 1               | V15PM                          | V15PB                          |
|                      | 30            | 0.2             | 2               | V30PM                          | V30PB                          |
|                      | 60            | 0.4             | 4               | V60PM                          | V60PB                          |
|                      | 100           | 0.7             | 7               | V100PM                         | V100PB                         |
|                      | 160           | 1.0             | 10              | V160PM                         | V160PB                         |
|                      | 200           | 1.3             | 13              | V200PM                         | V200PB                         |
|                      | 300           | 2.0             | 20              | V300PM                         | V300PB                         |
| 0                    | 15            | 0.1             | 1               | 15PM                           | 15PB                           |
|                      | 30            | 0.2             | 2               | 30PM                           | 30PB                           |
|                      | 60            | 0.4             | 4               | 60PM                           | 60PB                           |
|                      | 100           | 0.7             | 7               | 100PM                          | 100PB                          |
|                      | 160           | 1.0             | 10              | 160PM                          | 160PB                          |
|                      | 200           | 1.3             | 13              | 200PM                          | 200PB                          |
|                      | 300           | 2.0             | 20              | 300PM                          | 300PB                          |
|                      | 400           | 2.5             | 25              | 400PM                          | 400PB                          |
|                      | 600           | 4.0             | 40              | 600PM                          | 600PB                          |
|                      | 800           | 5.0             | 50              | 800PM                          | 800PB                          |
|                      | 1000          | 7.0             | 70              | 1000PM                         | 1000PB                         |
|                      | 1500          | 10.0            | 100             | 1500PM                         | 1500PB                         |
|                      | 2000          | 13.0            | 130             | 2000PM                         | 2000PB                         |
|                      | 3000          | 20.0            | 200             | 3000PM                         | 3000PB                         |
| 4000                 | 25.0          | 250             | 4000PM          | 4000PB                         |                                |
| 5000                 | 35.0          | 350             | 5000PM          | 5000PB                         |                                |
| 6000                 | 40.0          | 400             | 6000PM          | 6000PB                         |                                |

**Notes:**

1. The selected dial range should be approximately two times the system working pressure, and the system working pressure should be in the 25 to 75 % of the dial range.
2. Not all dial ranges and connections are available for all part numbers.
3. The maximum scale value of the dual scale gauge is based on the primary unit, the maximum value of the secondary unit is for reference only. For example, when the maximum range is 200 Psi and the maximum value of the primary unit (Psi) of the dial is 200, the maximum value of the secondary unit (MPa) may be 1.3 or 1.4.

# Canister Assemblies

## CSR Series

### Introduction

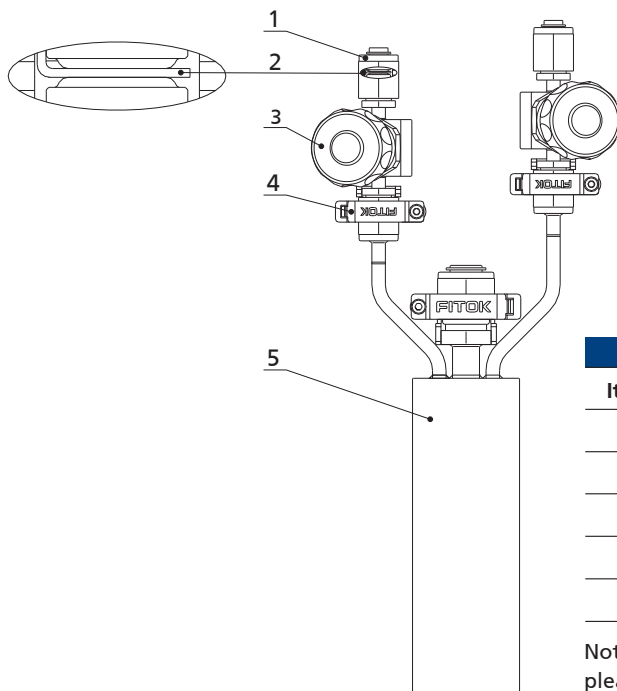
In atomic layer deposition (ALD) process, selecting the right precursor is critical for process control and film performance, etc. Meanwhile, based on the precursor properties such as volatility and reactivity, matching the right canister will have a synergistic effect on the process. Through high quality control of the material selection to the molding process, CSR Series Canister Assemblies can accommodate the packaging and storage of most precursors and provide excellent safety and cleanliness for the entire deposition process.



### Features

- ⦿ Ultra high purity processes for ultra high purity applications
- ⦿ Wetted metal parts are 316L stainless steel for broad chemical compatibility
- ⦿ External surface mechanical mirror polished and internal surface electropolished to roughness  $Ra \leq 10 \mu\text{in.}$  ( $0.25 \mu\text{m}$ )
- ⦿ Leak rate (helium):  $\leq 1.0 \times 10^{-9}$  std  $\text{cm}^3/\text{s}$
- ⦿ Connection size: 1/4" to 1/2"
- ⦿ Connection type: metal gasket face seal fittings
- ⦿ Customized volumes available upon request

### Major Materials of Construction



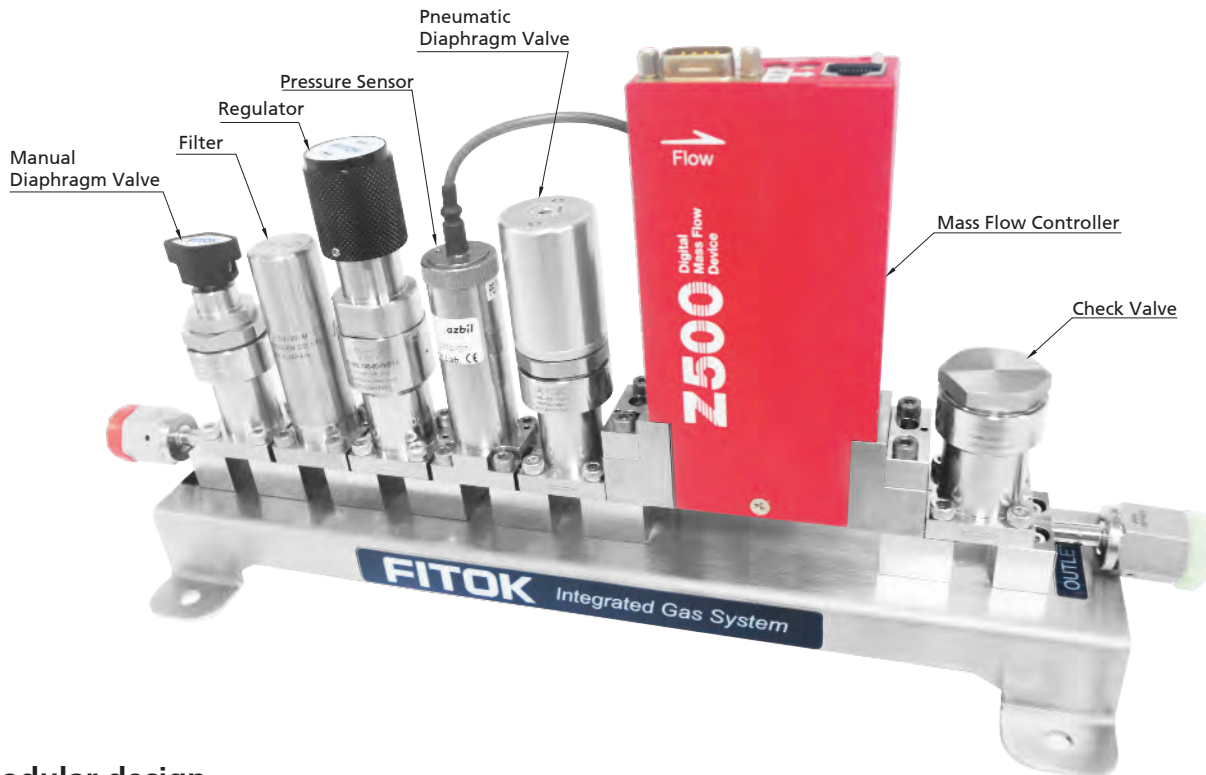
| Item | Component       | Part Number Example | Material |
|------|-----------------|---------------------|----------|
| 1    | Cap             | 6L-CP-FR4           | 316L SS  |
| 2    | Gasket          | 6L-GT-FR4-AS-UP     | 316L SS  |
| 3    | Diaphragm Valve | DQ6L-RFR4-RF3       | 316L SS  |
| 4    | Locking Device  | S4-FR4-LD           | 304 SS   |
| 5    | Canister        | CSR6L-50-ALD        | 316L SS  |

Note: Figure above shows the typical product type. For other types, please contact FITOK Group or our authorized distributors.

# Integrated Gas Systems

## Features

FITOK Integrated Gas System is a device used for gas control in the semiconductor industry. As semiconductor manufacturing processes become more advanced, the requirements for gas control device are also increasing. FITOK Integrated Gas System uses SEMI compliant surface-mounted components and is modularly designed. While reducing the size of the device, installation and maintenance become easier.



## Modular design

According to the customer's Piping & Instrumentation Diagram, the design can be completed by installing standard substrate, valves (diaphragm valves, check valves, regulators), flowmeters, filters, pressure sensors and other components on the panel.

## Surface mounting

All components are surface mounted in accordance with SEMI standard, and installation with silver-plated screws and later maintenance can be completed with simple tools.

## Miniaturization

The size is about 1/3 the traditional panel, and the corresponding flow path size is also reduced for better contamination control.

## SEMI standard material, electropolishing process and orbital welding

The wetted components are all SEMI standard stainless steel, the flow paths are all electropolished ( $Ra\ 5\ \mu\text{m}$  /  $Ra\ 0.13\ \mu\text{m}$ ) and the fittings are all orbital welded.

## W-seal / C-seal

W-seal / C-seal between the components and the substrate, the sealing faces are independent of components receiving external forces, thus achieving the optimal sealing effect.

Fittings

Valves

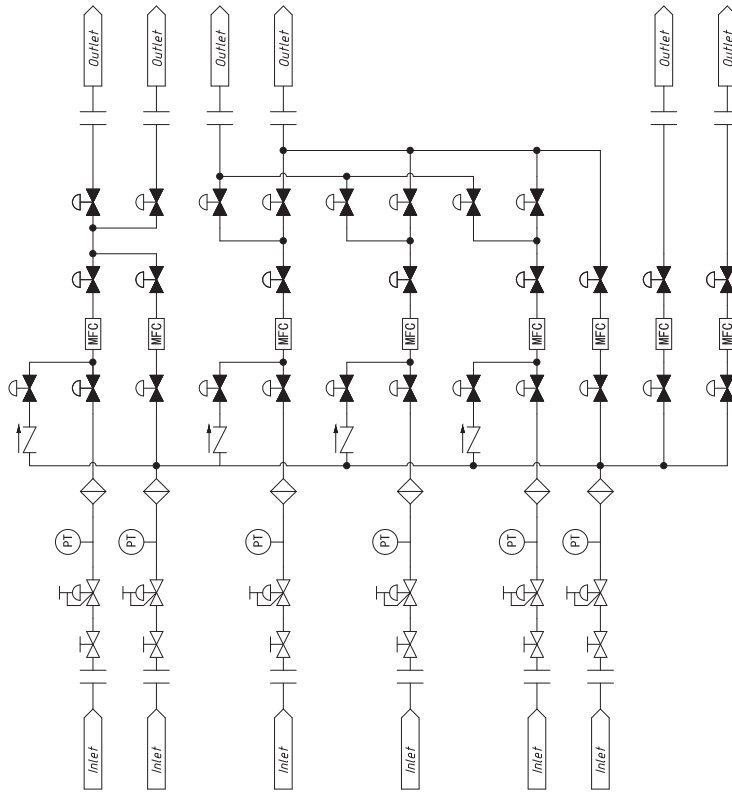
Pressure Gauges

Integrated Systems and Others

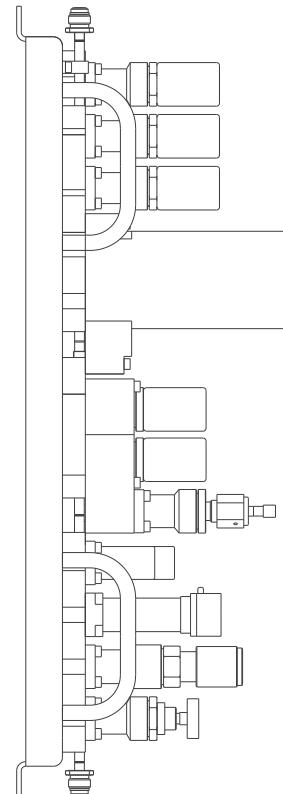
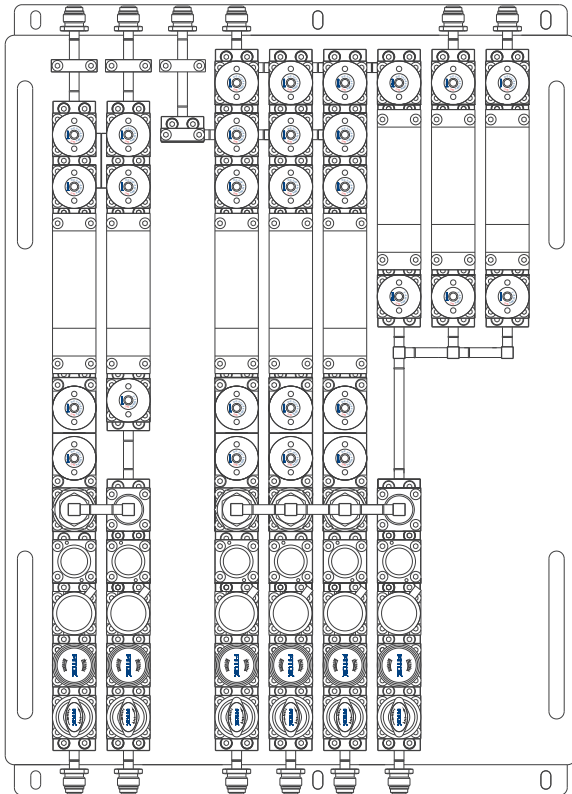
Process Specification

# Configuration

## P & ID



## GA



Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

## Product Technology Grade

| Technology               | Process Specification                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------------|
|                          | Ultra High Purity (F3)                                                                               |
| Material / Specification | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20                                       |
| Wetted Surface Roughness | Ra 5 µin. (0.13 µm)                                                                                  |
| Polishing Process        | Electropolished                                                                                      |
| Process Specification    | FC-03 Ultra High Purity Process Specification                                                        |
| Cleaning                 | Ultra high purity cleaning in continuously monitored ultrasonic cleaning system with deionized water |
| Assembly Environment     | In ISO 4/Federal 10 cleanroom                                                                        |
| Packaging                | Double bagged in cleanroom                                                                           |

## Diaphragm Valves

### DI Series

#### Features

- ⦿ Elgiloy diaphragm improves strength and corrosion resistance
- ⦿ W-seal and C-seal optional
- ⦿ No packing diaphragm seal ensures high purity
- ⦿ No dead zone for easy purging
- ⦿ Pneumatic actuator optional
- ⦿ Wetted components electropolished to a surface finish of 5 µin. (0.13 µm) Ra max.

#### Technical Data

|                                     |                                                         |                                                                         |
|-------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------|
| Max. Working Pressure               | Manual                                                  | 145 psig (10 bar)                                                       |
|                                     | Pneumatic                                               |                                                                         |
| Working Temperature                 | PCTFE: 14~176°F (-10~80°C)<br>PFA: 14~302°F (-10~150°C) |                                                                         |
| Flow Coefficient (Cv)               | 0.2                                                     |                                                                         |
| Pneumatic Actuator Working Pressure | 60~90 psig (4.2~6.2 bar)                                |                                                                         |
| Leakage Rate (Helium)               | Internal                                                | ≤1x10 <sup>-9</sup> mbar·l/s (1x10 <sup>-10</sup> Pa·m <sup>3</sup> /s) |
|                                     | External                                                | ≤1x10 <sup>-9</sup> mbar·l/s (1x10 <sup>-10</sup> Pa·m <sup>3</sup> /s) |
| Wetted Surface Roughness            | Ra 5 µin. (0.13 µm)                                     |                                                                         |



Fittings

Valves

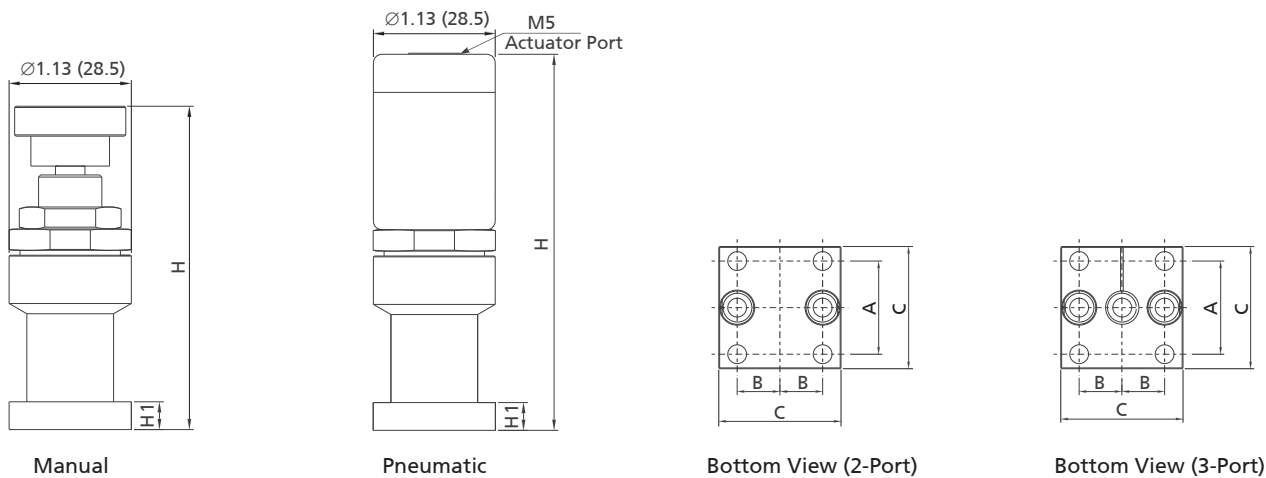
Pressure Gauges

Integrated Systems and Others

Process Specification

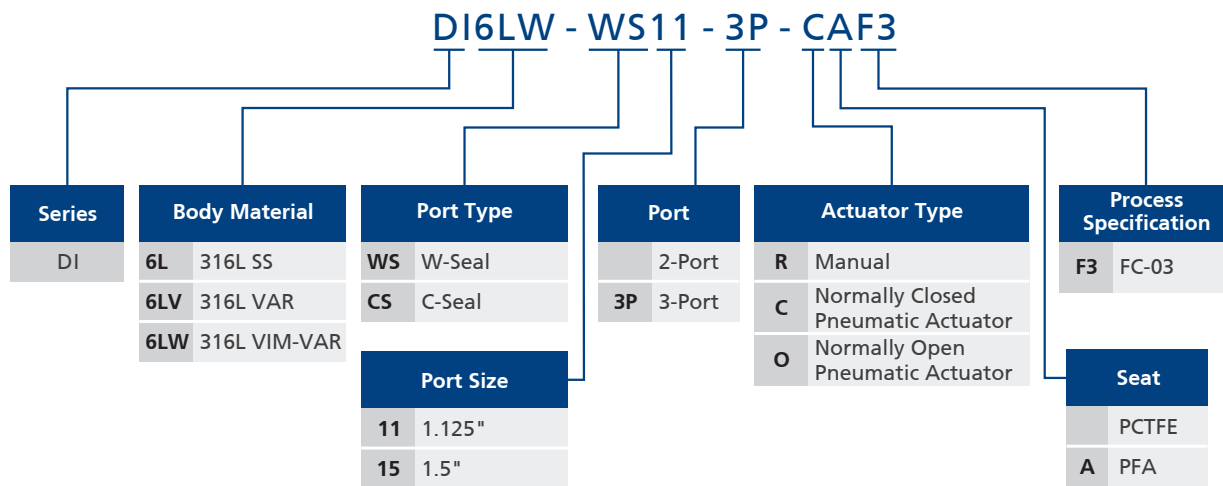
## Dimensions and Ordering Information

Dimensions, in inches (millimeters), are for reference only.



| Basic Ordering Number | Port Type and Size | Dimensions, in. (mm) |             |             |             |            |
|-----------------------|--------------------|----------------------|-------------|-------------|-------------|------------|
|                       |                    | A                    | B           | C           | H           | H1         |
| DI□□-WS11-RF3         | 1.125" W-Seal      | 0.86 (21.8)          | 0.39 (10.0) | 1.13 (28.6) | 2.99 (76.0) | 0.26 (6.5) |
| DI□□-WS11-CF3         | 1.125" W-Seal      | 0.86 (21.8)          | 0.39 (10.0) | 1.13 (28.6) | 3.46 (88.0) | 0.26 (6.5) |
| DI□□-WS11-OF3         |                    |                      |             |             |             |            |
| DI□□-WS11-3P-CF3      |                    |                      |             |             |             |            |
| DI□□-WS11-3P-OF3      |                    |                      |             |             |             |            |

## Ordering Number Description



Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- Mounting screws and gasket are not included, please contact FITOK Group or our authorized distributors if you have any requests.

# Check Valves

## CI Series

### Features

- W-seal and C-seal optional
- Wetted components electropolished to a surface finish of 5  $\mu\text{in.}$  (0.13  $\mu\text{m}$ ) Ra max.



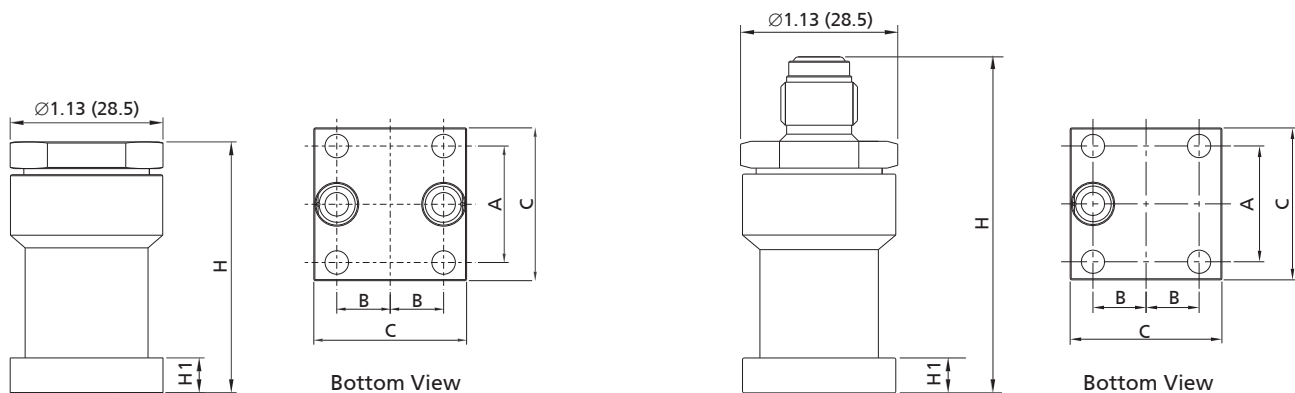
### Technical Data

|                                    |                                            |                                                                              |
|------------------------------------|--------------------------------------------|------------------------------------------------------------------------------|
| <b>Max. Working Pressure</b>       | 145 psig (10 bar)                          |                                                                              |
| <b>Working Temperature</b>         | 14~176°F (-10~80°C)                        |                                                                              |
| <b>Flow Coefficient (Cv)</b>       | 0.2                                        |                                                                              |
| <b>Nominal Cracking Pressure</b> ① | 0.33 psig (2.26 kPa)                       |                                                                              |
| <b>Leakage Rate (Helium)</b>       | <b>Internal</b>                            | $\leq 1 \times 10^{-9}$ mbar-l/s ( $1 \times 10^{-10}$ Pa-m <sup>3</sup> /s) |
|                                    | <b>External</b>                            | $\leq 1 \times 10^{-9}$ mbar-l/s ( $1 \times 10^{-10}$ Pa-m <sup>3</sup> /s) |
| <b>Wetted Surface Roughness</b>    | Ra 5 $\mu\text{in.}$ (0.13 $\mu\text{m}$ ) |                                                                              |

① If the check valve is not actuated for a period of time, its initial cracking pressure may be higher than set cracking pressure.

### Dimensions and Ordering Information

Dimensions, in inches (millimeters), are for reference only.



| Basic Ordering Number | Inlet Type and Size    | Outlet Type and Size   | Dimension, in. (mm) |             |             |             |            |
|-----------------------|------------------------|------------------------|---------------------|-------------|-------------|-------------|------------|
|                       |                        |                        | A                   | B           | C           | H           | H1         |
| CI□□-WS11-F3          | 1.125" W-Seal          | 1.125" W-Seal          | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 1.85 (47.0) | 0.26 (6.5) |
| CI□□-FR4-WS11-F3      | 1/4" Integral Male FR  | 1.125" W-Seal          | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 2.47 (62.7) | 0.26 (6.5) |
| CI□□-WS11-FR4-F3      | 1.125" W-Seal          | 1/4" Integral Male FR  | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 3.28 (83.4) | 0.26 (6.5) |
| CI□□-FFR4-WS11-F3     | 1/4" Female FR         | 1.125" W-Seal          | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 3.31 (84.2) | 0.26 (6.5) |
| CI□□-WS11-FFR4-F3     | 1.125" W-Seal          | 1/4" Female FR         | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 3.31 (84.2) | 0.26 (6.5) |
| CI□□-RFR4-WS11-F3     | 1/4" Rotatable Male FR | 1.125" W-Seal          | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 3.31 (84.2) | 0.26 (6.5) |
| CI□□-WS11-RFR4-F3     | 1.125" W-Seal          | 1/4" Rotatable Male FR | 0.86 (21.8)         | 0.39 (10.0) | 1.13 (28.6) | 3.31 (84.2) | 0.26 (6.5) |



## Ordering Number Description

Fittings

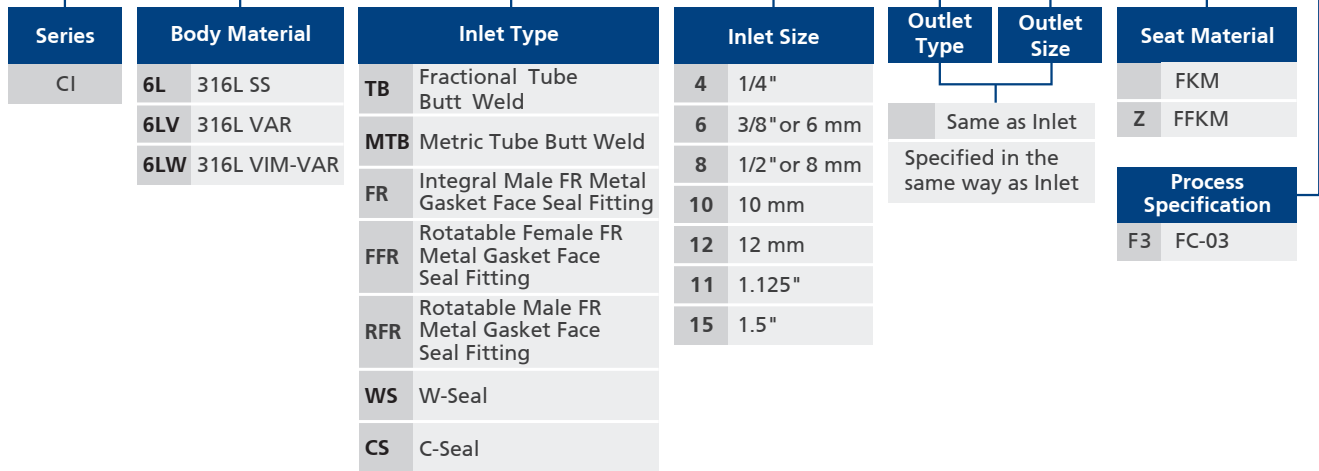
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

CI6LW - WS11 - FR4 - ZF3



Note:

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. Mounting screws and gasket are not included, please contact FITOK Group or our authorized distributors if you have any requests.

# Regulators

## RTC Series

### Features

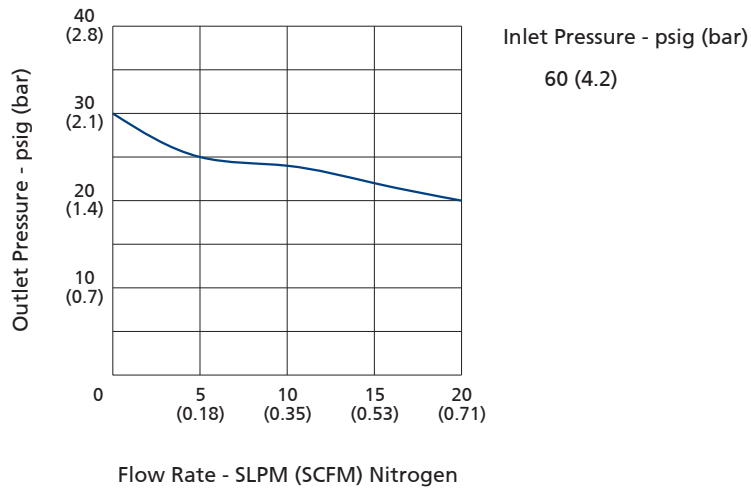
- ⦿ Hastelloy poppet and diaphragm
- ⦿ Metal-to-metal diaphragm seal design
- ⦿ FR metal gasket face seal, W-seal and C-seal optional
- ⦿ Reinforced diaphragm design improves sealing performance and service life
- ⦿ Internally springless for easy purging
- ⦿ Wetted components electropolished to a surface finish of 5 μin. (0.13 μm) Ra max.



### Technical Data

|                                 |                 |                                            |
|---------------------------------|-----------------|--------------------------------------------|
| <b>Max. Working Pressure</b>    |                 | 145 psig (10 bar)                          |
| <b>Working Temperature</b>      |                 | PCTFE: -40~160 °F (-40~71 °C)              |
| <b>Outlet Pressure Range</b>    |                 | 0~100 psig (0~6.9 bar)                     |
| <b>Flow Coefficient (Cv)</b>    |                 | 0.08                                       |
| <b>Leak Rate (Helium)</b>       | <b>Internal</b> | ≤2x10 <sup>-9</sup> std cm <sup>3</sup> /s |
|                                 | <b>External</b> | ≤1x10 <sup>-9</sup> std cm <sup>3</sup> /s |
| <b>Wetted Surface Roughness</b> |                 | Ra 5 μin (0.13 μm)                         |

### Flow Data



Fittings

Valves

Pressure Gauges

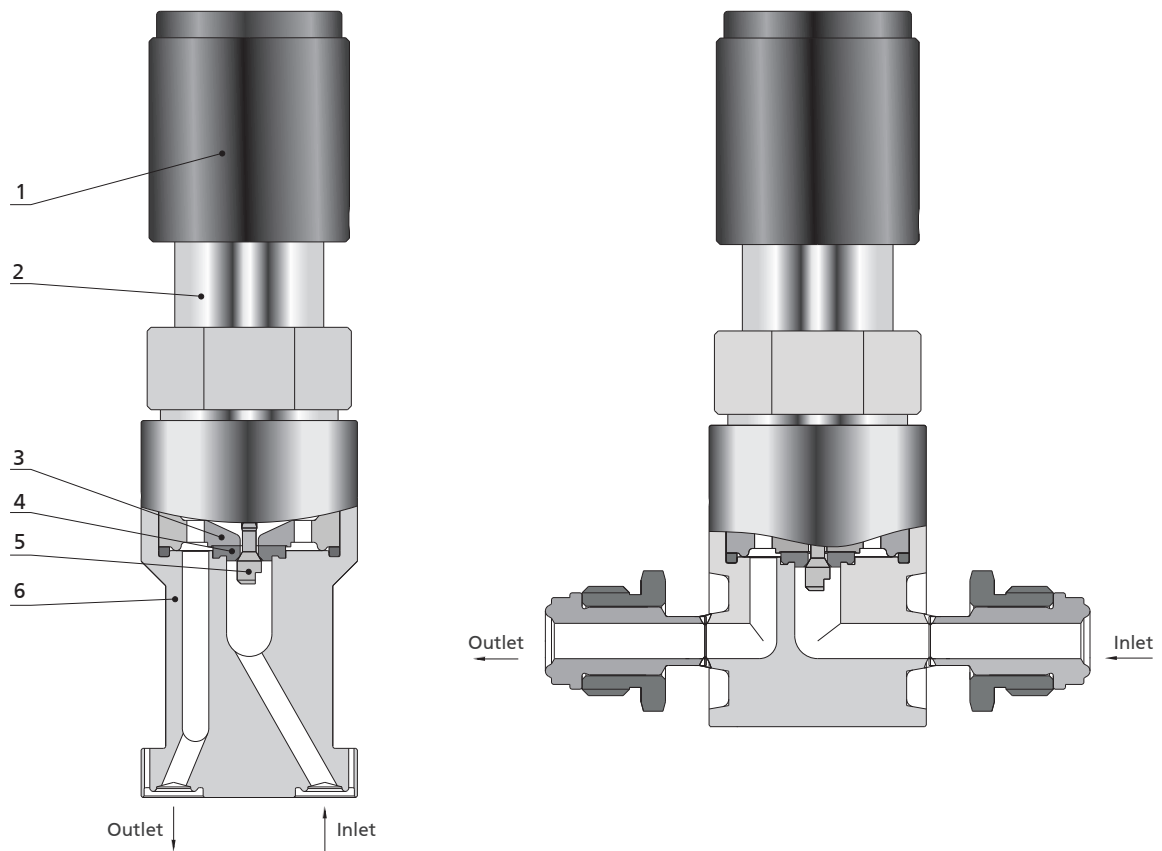
Integrated Systems and Others

Process Specification

## Process Specification

| Process Specification    |  | Ultra High Purity (F3)                                         |
|--------------------------|--|----------------------------------------------------------------|
| Technology               |  |                                                                |
| Material/Specification   |  | 316L SS/SEMI F20<br>316L VAR/SEMI F20<br>316L VIM-VAR/SEMI F20 |
| Wetted Surface Roughness |  | Ra 5 µin. (0.13 µm)                                            |
| Polishing Process        |  | Electropolished                                                |
| Assembly Environment     |  | ISO 4 / Federal 10 Clean Room                                  |
| Packaging                |  | Double bagged, inner bag packing in the cleanroom              |

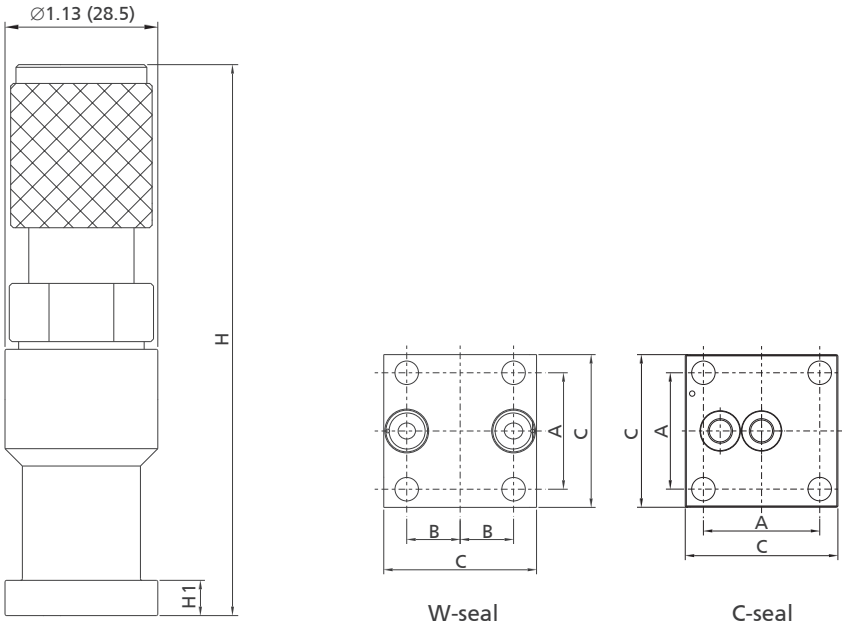
## Major Materials of Construction



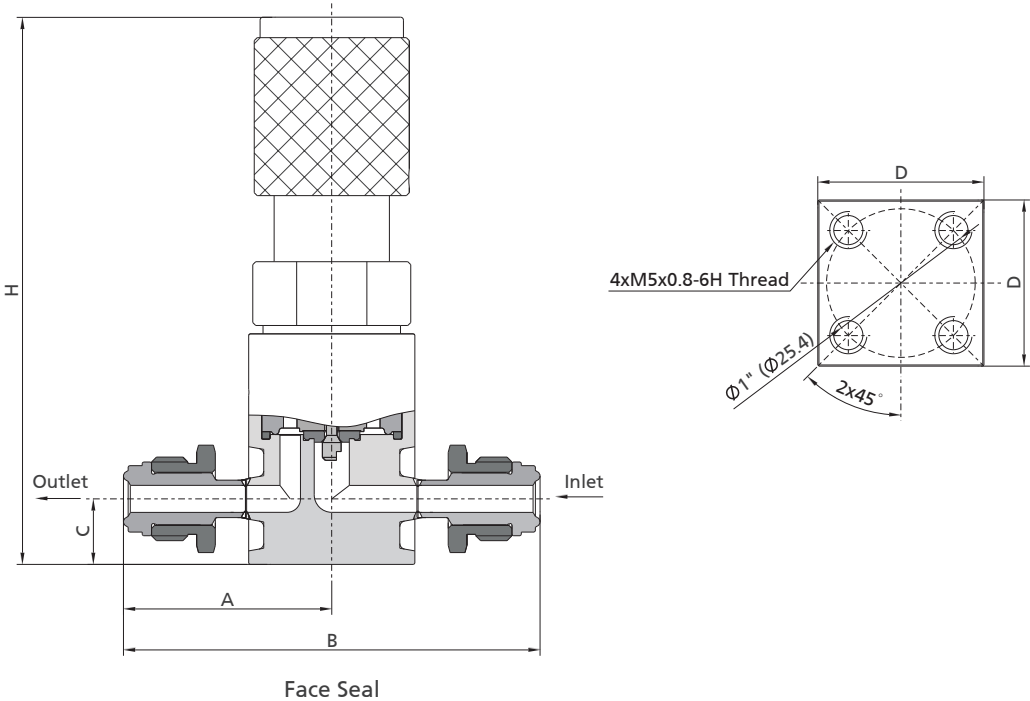
| Item | Component   | Material / Specification                                          |
|------|-------------|-------------------------------------------------------------------|
| 1    | Handle      | Aluminum                                                          |
| 2    | Bonnet      | 316 SS/ASTM A479                                                  |
| 3    | Support     | 316L SS/SEMI F20 or 316L VAR/SEMI F20<br>or 316L VIM-VAR/SEMI F20 |
| 4    | Seat        | PCTFE/ASTM D1430                                                  |
| 5    | Lift Poppet | Alloy C-22/ASTM B574                                              |
| 6    | Body        | 316L SS/SEMI F20 or 316L VAR/SEMI F20<br>or 316L VIM-VAR/SEMI F20 |

# Dimensions and Ordering Information

Dimensions, in inches (millimeters), are for reference only.



| Basic Ordering Number | Port Type and Size | Dimensions, in. (mm) |             |             |              |            |
|-----------------------|--------------------|----------------------|-------------|-------------|--------------|------------|
|                       |                    | A                    | B           | C           | H            | H1         |
| RTC□□-145-60-WS11-F3  | 1.125" W-Seal      | 0.86 (21.8)          | 0.39 (10.0) | 1.13 (28.6) | 4.10 (104.0) | 0.26 (6.5) |



| Basic Ordering Number   | Port Type and Size             | Dimensions, in. (mm) |             |             |             |             |
|-------------------------|--------------------------------|----------------------|-------------|-------------|-------------|-------------|
|                         |                                | A                    | B           | C           | D           | H           |
| RTC□□-145-60-RF4-RF4-F3 | 1/4" FR Metal Gasket Face Seal | 1.39 (35.3)          | 2.78 (70.6) | 0.44 (11.2) | 1.12 (28.4) | 3.68 (93.5) |

Fittings

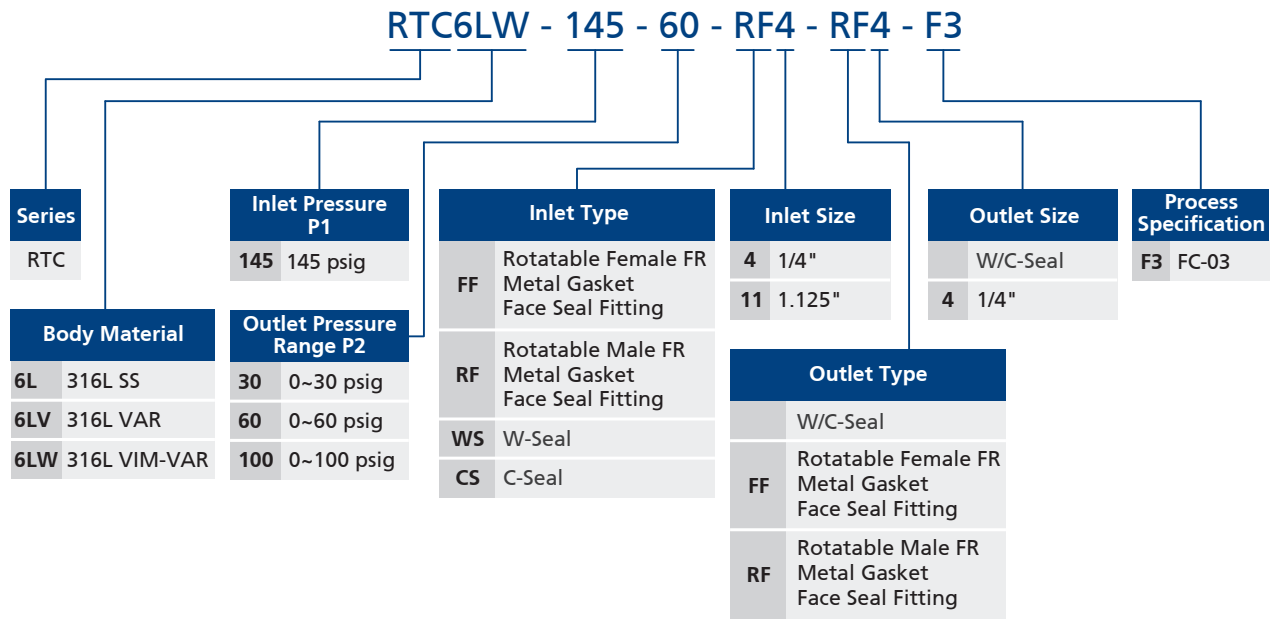
Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

## Ordering Number Description



Note:

1. "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
2. Mounting screws and gasket are not included, please contact FITOK Group or our authorized distributors if you have any requests.

# Substrates ISW Series

## Features

- ⦿ Materials compliant with SEMI F20 standard
- ⦿ Non-fixed installation to ensure the sealing effect
- ⦿ Final assembly and packaging performed in ISO 10 cleanroom



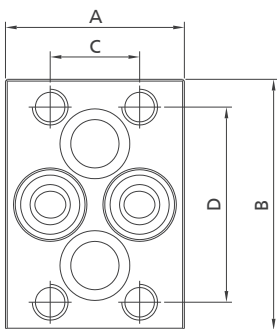
## Technical Data

- ⦿ 1.125" W-Seal
- ⦿ Helium Leakage Rate  $\leq 1 \times 10^{-9}$  std cm<sup>3</sup>/s
- ⦿ FC-03 Ultra-high Purity Process Specification,
- ⦿ Wetted Surface Roughness Less than Ra 5  $\mu$ in. (0.13 $\mu$ m)

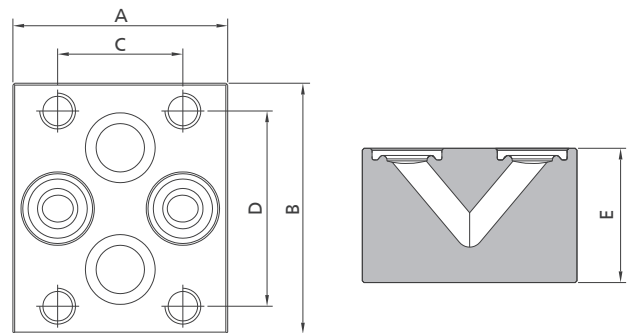
## Dimensions and Ordering Information

### Substrates

| Basic Ordering Number | Substrate Type          | Port Type and Size | Dimensions, in. (mm) |             |             |             |             |
|-----------------------|-------------------------|--------------------|----------------------|-------------|-------------|-------------|-------------|
|                       |                         |                    | A                    | B           | C           | D           | E           |
| -IVB-WS11-10-F3       | Standard Substrate      | 1.125"W-Seal       | 0.79 (20.0)          | 1.10 (28.0) | 0.39 (10.0) | 0.86 (21.8) | 0.59 (15.0) |
| -IVB-WS11-14-F3       | Standard Substrate      |                    | 0.94 (24.0)          | 1.10 (28.0) | 0.55 (14.0) | 0.86 (21.8) | 0.59 (15.0) |
| -IEB-WS11-F3          | End Substrate           |                    | 0.93 (23.5)          | 1.10 (28.0) | /           | 0.86 (21.8) | 0.59 (15.0) |
| -ISB-LR-WS11-F3       | 1-Path Bypass Substrate |                    | 0.67 (17.0)          | 1.40 (35.6) | /           | 0.86 (21.8) | 0.59 (15.0) |
| -IDB-LR-WS11-14-F3    | 2-Path Bypass Substrate |                    | 0.94 (24.0)          | 1.40 (35.6) | 0.55 (14.0) | 0.86 (21.8) | 0.59 (15.0) |
| -ITB-LR-WS11-14-F3    | 3-Path Bypass Substrate |                    | 1.34 (34.0)          | 1.40 (35.6) | 0.55 (14.0) | 0.86 (21.8) | 0.59 (15.0) |
| -ITC-WS11-F3          | Transition Substrate    |                    | 1.13 (28.6)          | 1.13 (28.6) | 0.79 (20.0) | 0.86 (21.8) | 0.71 (18.0) |
| -IEC-WS11-F3          | Plug                    |                    | 0.34 (8.6)           | 1.13 (28.6) | /           | 0.86 (21.8) | 0.26 (6.5)  |



Standard Substrate



Standard Substrate

Fittings

Valves

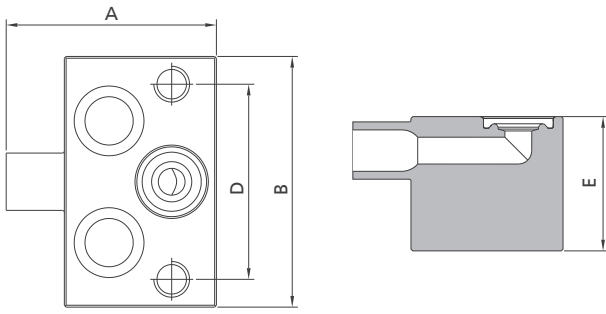
Pressure Gauges

Integrated Systems and Others

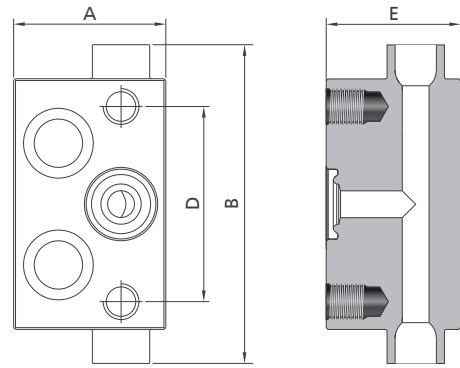
Process Specification

I-13 Integrated Gas Systems

Fittings

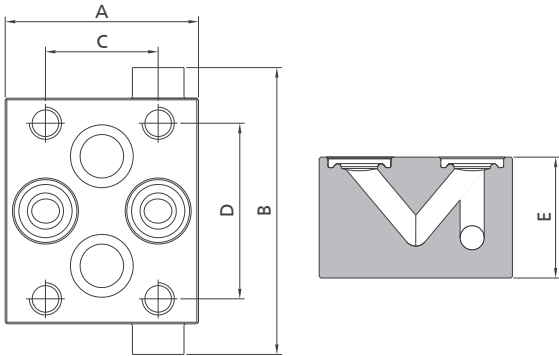


End Substrate

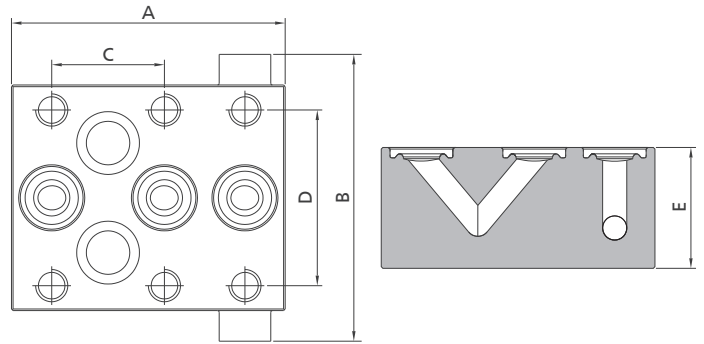


1-Path Bypass Substrate

Valves

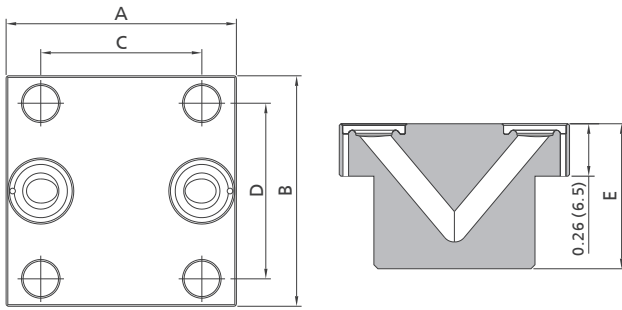


2-Path Bypass Substrate

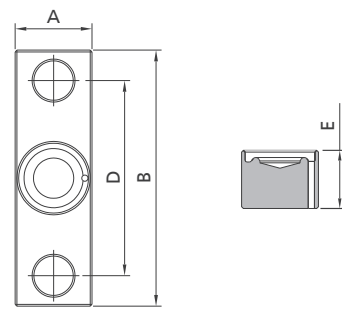


3-Path Bypass Substrate

Pressure Gauges



Transition Substrate



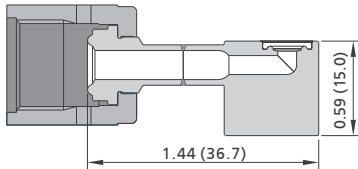
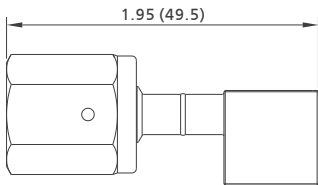
Plug

Integrated Systems and Others

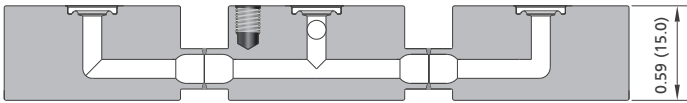
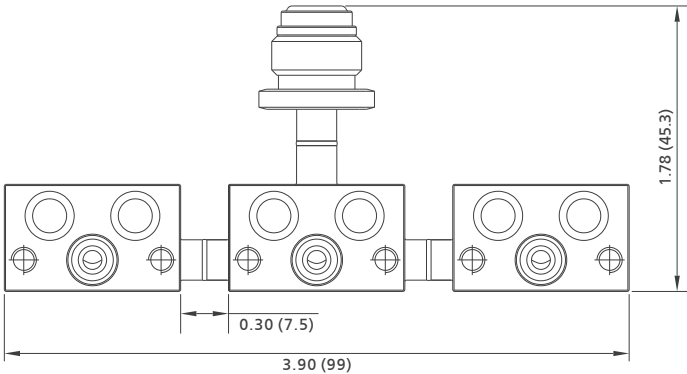
Process Specification

### Substrate Assemblies

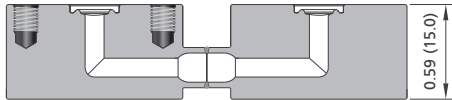
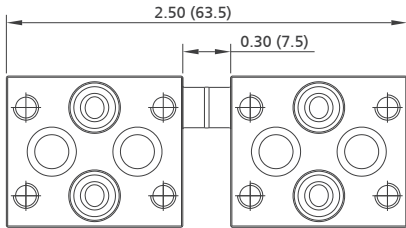
- 1. Views and dimensions are for reference only. Please contact FITOK Group or our authorized distributors for specific part numbers and specifications.
- 2. Dimensions, in inches (millimeters), are for reference only.



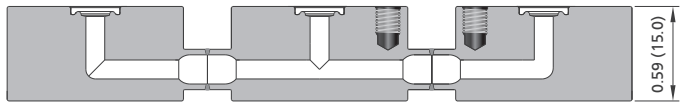
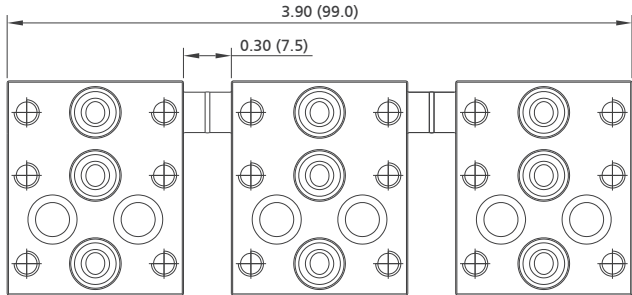
End Substrate Assembly



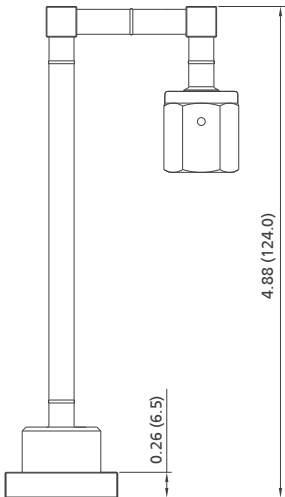
1-Path Bypass Substrate Assembly



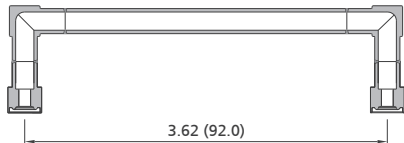
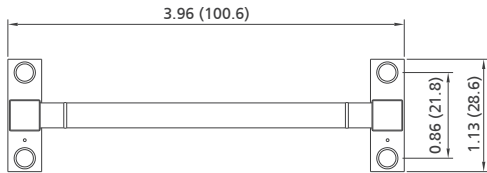
2-Path Bypass Substrate Assembly



3-Path Bypass Substrate Assembly



Transition Substrate Assembly



Plug Substrate Assembly

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



## Ordering Number Description

6LW - IDB - LR - WS11 - 14 - F3

| Body Material |              | Substrate Type |                         | Bypass Type |                          |  | Port Type                                |        | Port Distance                            |                                     |
|---------------|--------------|----------------|-------------------------|-------------|--------------------------|--|------------------------------------------|--------|------------------------------------------|-------------------------------------|
| 6L            | 316L SS      | IVB            | Standard Substrate      | None        |                          |  | WS                                       | W-Seal | None                                     |                                     |
| 6LV           | 316L VAR     | IEB            | End Substrate           | L           | Left Bypass              |  | <b>Port Size</b><br>11 1.125"<br>15 1.5" |        | 10                                       | 10 mm (Only for Standard Substrate) |
| 6LW           | 316L VIM-VAR | ISB            | 1-Path Bypass Substrate | R           | Right Bypass             |  |                                          |        | 14                                       | 14 mm                               |
|               |              | IDB            | 2-Path Bypass Substrate | M           | Middle Bypass            |  |                                          |        | <b>Process Specification</b><br>F3 FC-03 |                                     |
|               |              | ITB            | 3-Path Bypass Substrate | LR          | Left-Right Bypass        |  |                                          |        |                                          |                                     |
|               |              | ITC            | Transition Substrate    | LM          | Left-Middle Bypass       |  |                                          |        |                                          |                                     |
|               |              | IEC            | Plug                    | RM          | Right-Middle Bypass      |  |                                          |        |                                          |                                     |
|               |              |                |                         | LMR         | Left-Middle-Right Bypass |  |                                          |        |                                          |                                     |

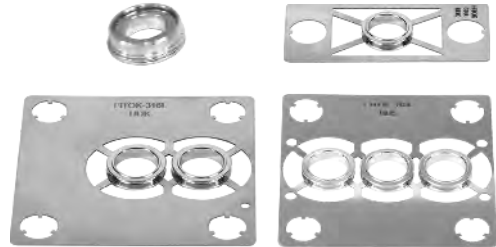
Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- Mounting screws and gasket are not included, please contact FITOK Group or our authorized distributors if you have any requests.

## Gasket

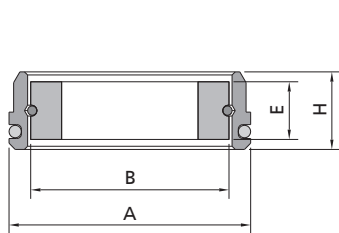
### Features

- W-seal and C-seal optional
- Sealing faces independent of components receiving external forces
- Electropolished to a surface finish of Ra 5 µin. (0.13 µm) max

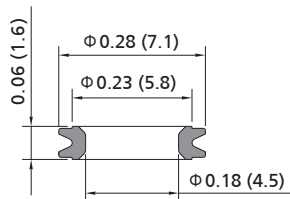


### Dimensions and Ordering Information

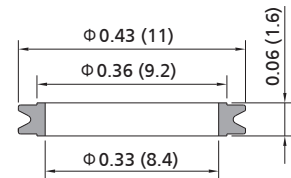
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- Dimensions, in inches (millimeters), are for reference only.



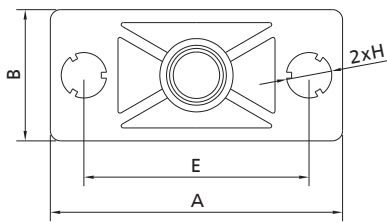
W-Seal Gasket



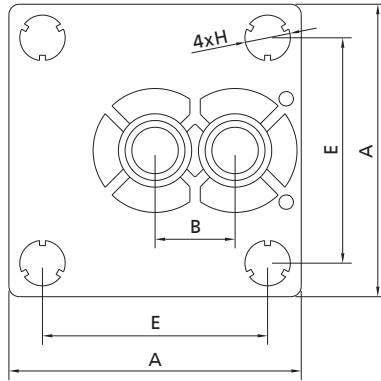
C-Seal Gasket Standard Flow



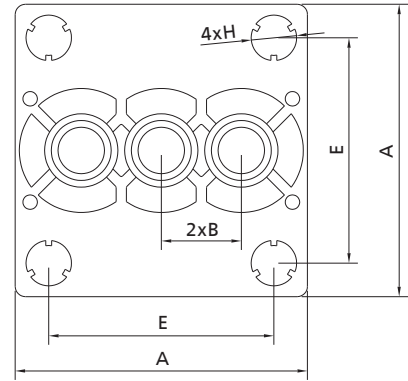
C-Seal Gasket High Flow



C-Seal Gasket 1P



C-Seal Gasket 2P



C-Seal Gasket 3P

| Basic Ordering Number | Port Type and Size            | Dimensions, in. (mm) |             |             |            |
|-----------------------|-------------------------------|----------------------|-------------|-------------|------------|
|                       |                               | A                    | B           | E           | H          |
| -IWG-WS11-F3          | 1.125" W-Seal                 | 0.31 (7.8)           | 0.25 (6.4)  | 0.07 (1.86) | 0.10 (2.5) |
| -IWG-WS15-F3          | 1.5" W-Seal                   | 0.39 (10)            | 0.29 (7.45) | 0.07 (1.9)  | 0.15 (3.8) |
| -ICG-CS11-1P-F3       | 1.125" C-Seal (Standard Flow) | 1.11 (28.3)          | 0.5 (12.7)  | 0.86 (21.8) | 0.17 (4.4) |
| -ICG-CS11-2P-F3       | 1.125" C-Seal (Standard Flow) | 1.11 (28.3)          | 0.31 (7.75) | 0.86 (21.8) | 0.17 (4.4) |
| -ICG-CS11-3P-F3       | 1.125" C-Seal (Standard Flow) | 1.11 (28.3)          | 0.31 (7.75) | 0.86 (21.8) | 0.17 (4.4) |
| -ICG-CS15-1P-F3       | 1.5" C-Seal (Standard Flow)   | 1.48 (37.6)          | 0.5 (12.7)  | 1.18 (30.2) | 0.2 (5.2)  |
| -ICG-CS15-2P-F3       | 1.5" C-Seal (Standard Flow)   | 1.48 (37.6)          | 0.31 (7.75) | 1.18 (30.2) | 0.2 (5.2)  |
| -ICG-CS15-3P-F3       | 1.5" C-Seal (Standard Flow)   | 1.48 (37.6)          | 0.31 (7.75) | 1.18 (30.2) | 0.2 (5.2)  |
| -ICG-CS15-1P-HF-F3    | 1.5" C-Seal (High Flow)       | 1.48 (37.6)          | 0.5 (12.7)  | 1.18 (30.2) | 0.2 (5.2)  |
| -ICG-CS15-2P-HF-F3    | 1.5" C-Seal (High Flow)       | 1.48 (37.6)          | 0.46 (11.6) | 1.18 (30.2) | 0.2 (5.2)  |
| -ICG-CS15-3P-HF-F3    | 1.5" C-Seal (High Flow)       | 1.48 (37.6)          | 0.46 (11.6) | 1.18 (30.2) | 0.2 (5.2)  |

Ordering Number Description

6LW - ICG - CS11 - 2P - ID0.2 - F3

| Body Material |              | Structure |               | Port Type |        | Port Size |        | Port Quantity |                              | Flow Requirement |                                  |
|---------------|--------------|-----------|---------------|-----------|--------|-----------|--------|---------------|------------------------------|------------------|----------------------------------|
| 6L            | 316L SS      | IWG       | W-Seal Gasket | WS        | W-Seal | 11        | 1.125" |               | W-Seal Gasket                |                  | Standard Flow                    |
| 6LV           | 316L VAR     | ICG       | C-Seal Gasket | CS        | C-Seal | 15        | 1.5"   | 1P            | 1-Port C-Seal Gasket Bracket | HF               | High Flow (For C-Seal 1.5" Only) |
| 6LW           | 316L VIM-VAR |           |               |           |        |           |        | 2P            | 2-Port C-Seal Gasket Bracket | ID0.1            | Restriction Orifice 0.1 mm       |
|               |              |           |               |           |        |           |        | 3P            | 3-Port C-Seal Gasket Bracket | ID0.2            | Restriction Orifice 0.2 mm       |
|               |              |           |               |           |        |           |        |               |                              | ID0.3            | Restriction Orifice 0.3 mm       |
|               |              |           |               |           |        |           |        |               |                              | ID※              | Restriction Orifice ※ mm         |

Note:

- "Ordering Number Description" is a reference to understand the combination rules of FITOK product part number. Not all combinations are available.
- The restriction orifice can be customized with any diameter. For orifice diameter ≤ 1.0 mm, the tolerance is ± 10%; for orifice diameter > 1.0 mm, the tolerance is ± 5%.

| Process Specification |       |
|-----------------------|-------|
| F3                    | FC-03 |

# Process Specification

Fittings

- Ⓒ Standard Cleaning and Packaging (FC-01)
- Ⓒ Special Cleaning and Packaging (FC-02)
- Ⓒ Ultra High Purity (FC-03)

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Process Comparison

| Process Specification<br>Item | Standard Cleaning and Packaging (FC-01)                                                                                                                           | Special Cleaning and Packaging (FC-02)                                                                                                                                      | Ultra High Purity (FC-03)                                                                                                                                                   |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application</b>            | This specification specifies the standard cleaning, lubrication, assembly and packaging methods to meet the requirements of the general industry for cleanliness. | This specification is designed to adapt to the application of rich oxidation environment, and has been developed to meet the cleaning process of ASTM G93 Class C standard. | This specification is a process designed to meet the ultra high cleanliness requirements of the semiconductor industry. Suitable for 316L stainless steel and nickel alloy. |
| <b>Cleaning</b>               | Three times degreasing ultrasonic cleaning                                                                                                                        | Seven times degreasing ultrasonic cleaning, deionized water.                                                                                                                | Nine times degreasing ultrasonic cleaning, deionized water, and finally cleaning in the cleanroom.                                                                          |
| <b>Assembly Environment</b>   | At atmosphere                                                                                                                                                     | In specially cleaned areas                                                                                                                                                  | Federal 10 cleanroom                                                                                                                                                        |
| <b>Lubrication</b>            | No restrictions on the use of lubricants for components in contact with the medium.                                                                               | Components in contact with the medium shall be applied with special lubricants compatible with oxygen, such as DuPont GPL 227 (standard) DuPont 240 AC (optional)           | No lubricants for the components in contact with the medium                                                                                                                 |
| <b>Testing</b>                | Air, nitrogen or helium, bubble method, or helium leak detection.                                                                                                 | Nitrogen or helium, bubble method, or helium leak detection.                                                                                                                | Nitrogen or helium.<br>Helium leak detection                                                                                                                                |
| <b>Packaging</b>              | Individually bagged                                                                                                                                               | Double bagged                                                                                                                                                               | Double bagged in cleanroom                                                                                                                                                  |

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Standard Cleaning and Packaging Process (FC-01)

- ⦿ This Specification applies to the standard cleaning, lubrication, assembly and packaging of FITOK products.
- ⦿ Please read this Specification carefully before using the product to make sure it is up to the cleanliness requirements of your system.

## Process Requirements

- ⦿ Particles and oil contamination on products from the manufacturing process should be eliminated according to the process requirements.
- ⦿ Components to be assembled should be lubricated according to the requirements of the products.
- ⦿ Finished products should be properly packaged to avoid damages during storage and shipment.
- ⦿ Each product should be marked for easy identification.

## Cleaning and Inspection

- ⦿ Carry out continuous ultrasonic cleaning to eliminate the smudges on the products from the manufacturing process, such as: cutting oils, polishing waxes and other dust particles.
- ⦿ Carbon steel products are protected from atmospheric corrosion by plating, conversion coating or with a light oil film.
- ⦿ Carry out visual inspection under bright lighting or violet lighting conditions, or use clean cloth to wipe for inspection.

## Lubrication, Assembly and Testing

- ⦿ Greases should be applied to threads, mating surfaces, O-rings, and seals to form a lubricating film to prevent galling, to reduce friction and to enhance sealing effect. These greases are generally hydrocarbons, halogen contained hydrocarbon or silicon oil containing inorganic additives.
- ⦿ Cleaned products should be assembled in clean and well-lighted environment.
- ⦿ Use clean and dry air, nitrogen or helium to test according to the requirements of the products. Use clean tap water for hydrostatic pressure test. Dry the internal and external surfaces after passing the test.

## Packaging and Labeling

- ⦿ Finished products should be packaged well to prevent them from damage or contamination during shipment and storage.
- ⦿ The functional ports of the product, such as: male thread, sealing surface should be protected with cap and proper plug.
- ⦿ Protected products should be packaged in the boxes with standard quantity according to the requirements.
- ⦿ Boxes should be labeled with part number, quantity and packaging date.
- ⦿ Nuclear grade products should be packaged in accordance with the requirements of ASME NQA-1.

## Reference

*ASME Standard  
NQA-1 Quality Assurance Requirements for Nuclear Facility Applications*

# Special Cleaning and Packaging Process (FC-02)

- ⦿ This Specification applies to the cleaning, lubrication, assembly and packaging in oxygen-enriched environments of FITOK products.
- ⦿ The cleanliness of the product wetted parts is in accordance with ASTM G93, Level C.
- ⦿ Please read this Specification carefully before using the product to make sure it is up to the cleanliness requirements of your system.

## Process Requirements

- ⦿ Products should have fulfilled the requirements of FITOK Standard Cleaning and Packaging Process (FC-01) before proceeding according to this Specification.
- ⦿ According to the requirements of ASTM G93, Level C, non-volatile residues should not exceed 6 milligrams per square foot (66 mg/m<sup>2</sup>).
- ⦿ All lubricants applied for assembly of the products should be non-hydrocarbon lubricants which are in harmony with oxygen environments, such as KrytoxGPL227 (standard), Krytox240AC (optional).
- ⦿ Products are double packaged with polyethylene bags, with the outer packing bags labeled with process identification.

## Cleaning and Inspection

- ⦿ The product should go through continuous ultrasonic cleaning, the procedures of which should be monitored in accordance with the requirements of ASTM G144. The inspection methods shall conform to the requirements of ASTM G121 and G122.
- ⦿ Carry out ultrasonic cleaning in accordance with the requirements of ASTM G131 with the cleaning agent complying with ASTM G127.
- ⦿ Use DI Water to proceed ultrasonic rinsing and spray washing according to the requirement of ASTM G313.
- ⦿ Eliminate cleaning fluid through non-combustive drying to ensure there is no residue deposit.
- ⦿ Carry out visual inspection under bright lighting or ultraviolet lighting conditions. Inspect the surface cleanliness of products with a dyne pen.

## Lubrication, Assembly and Testing

- ⦿ Cleaned parts should be protected to avoid damage or contamination.
- ⦿ All proceedings of the cleaned parts shall be carried out in the clean room in accordance with a rational workflow to keep the parts away from contamination.
- ⦿ During assembly, lubricate the parts where needed with non-hydrocarbon grease to reduce friction, improve sealing and to ensure product cleanliness.
- ⦿ Factory testing of products is carried out with clean, dry nitrogen or helium.

## Packaging and Labeling

- ⦿ Finished products are packaged in clean environment to protect them from contamination.
- ⦿ The ports of products are sealed with caps, plugs or other means to protect the important positions and at the same time to prevent the contamination getting inside the products.
- ⦿ Each product is packaged individually with a sealed clean plastic bag.
- ⦿ Bagged products are packed in boxes for protection.
- ⦿ Part number, quantity, and packing date are labeled on the boxes.

## References

*Standard Cleaning and Packaging Process (FC-01)*

*ASTM standards*

ASTM G93 Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments

ASTM G121 Standard Practice for Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents

ASTM G122 Standard Test Method for Evaluating the Effectiveness of Cleaning Agents

ASTM G127 Standard Guide for the Selection of Cleaning Agents for Oxygen Systems

ASTM G131 Standard Practice for Cleaning of Materials and Components by Ultrasonic Techniques

ASTM G144 Standard Test Method for Determination of Residual Contamination of Materials and Components by Total Carbon Analysis Using a High Temperature Combustion Analyzer

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification

# Ultra High Purity Process Specification (FC-03)

- ⦿ This Specification is enacted for FITOK Ultra High Purity Products.
- ⦿ This Specification stipulates the requirements for raw material, machining, electropolishing, cleaning, welding, assembly, testing and packaging.

## Process Requirements

- ⦿ Only high purity stainless steel materials could be utilized. The wetted internal surface contacted with media should be electro-polished.
- ⦿ Ultra High Purity cleaning in Federal Class 100 cleanroom, and welding, assembly, testing and packaging should be performed in Federal 10 cleanroom to prevent products from contamination.
- ⦿ Products are double packaged with polyethylene bags, with the outer packing bags labeled with process identification.

## Raw Materials

- ⦿ AISI 316L (UNS S31603) Stainless Steel is commonly used for High Purity (HP) and Ultra High Purity (UHP) Products, which has excellent corrosion resistance and oxidation resistance.
- ⦿ By Argon Oxygen Decarburization (AOD) or Vacuum Oxygen Decarburization (VOD), stainless steel material could be refined. The detrimental chemicals including C, Mn, Si, P, S and etc. could be controlled at low level. Subsequently, Vacuum Arc Remelting (VAR) would be able to further purify the material and to give full play to its excellent characteristics. The stainless steel material that has been through VOD, VIM and VAR processes to minimize its content of C, Mn, Si, P, S, is named 316L VIM-VAR.
- ⦿ Please refer to Table 1 below for the key compositions of the stainless steel material FITOK utilizes for our products for Ultra High Purity applications.

Table 1

| Material     | Composition, % |        |      |
|--------------|----------------|--------|------|
|              | C              | S      | Mn   |
| 316L         | ≤0.03          | ≤0.012 | ≤2.0 |
| 316L VAR     | ≤0.03          | ≤0.010 | ≤1.5 |
| 316L VIM-VAR | ≤0.03          | ≤0.010 | ≤1.5 |

- ⦿ Stainless Steel Material Standards:
  - ⦿ ASTM A479, Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
  - ⦿ ASTM A484, Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings
  - ⦿ ASTM A276, Standard Specification for Stainless Steel Bars and Shapes
  - ⦿ SEMI F20, Specification for 316L Stainless Steel Bar, Forgings, Extruded Shapes, Plate, and Tubing for Components Used in General Purpose, High Purity and Ultra-High Purity Semiconductor Manufacturing Applications
- ⦿ Material Inspection Standards:
  - ⦿ Intergranular Corrosion Test: ASTM A262, Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
  - ⦿ Chemical Composition Analysis: ASTM A751, Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
  - ⦿ Ultrasonic Test of Material Interior Defects: ASTM E214, Standard Practice for Immersed Ultrasonic Examination by the Reflection Method Using Pulsed Longitudinal Waves
  - ⦿ Materials Inclusion Content Analysis: ASTM E45, Standard Test Methods for Determining the Inclusion Content of Steel, with rating according to Plate III.

## Machining

- ⦿ During the machining process, dimensions and surface finish of the products should be strictly controlled to ensure fine finish of each machined surface, smooth chamfer, flow pass and weld to eliminate any risk of defect and particles.
- ⦿ Surface Roughness:
  - ⦿ SEMI F19, Specification for the Surface Condition of the Wetted Surfaces of Stainless Steel Components
  - ⦿ SEMI F37, Method for Determination of Surface Roughness Parameters for Gas Distribution System Components
- ⦿ Flow path surface roughness of FITOK Ultra High Purity Products could be controlled to less than Ra 5 μin. (0.13 μm).

## Electropolishing

- ⊙ Internal surface of FITOK Ultra High Purity Products should be electropolished to improve the smoothness of flow path and corrosion resistance by forming chromium-rich layer on the metal surface. The electropolished products should be passivated to remove free iron ions.
- ⊙ Electropolishing and Passivation Standards:
  - ⊙ ASTM E1558, Standard Guide for Electrolytic Polishing of Metallographic Specimens
  - ⊙ ASTM A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
- ⊙ Please refer to Table 2 below for the specification of the electropolished FITOK products for Ultra High Purity applications.

Table 2

| Parameter                              |                                           | Specification        | Test Method |
|----------------------------------------|-------------------------------------------|----------------------|-------------|
| Oxide Thickness                        |                                           | ≥15Å                 | SEMI F72    |
| Surface Defect Analysis                | Over 5 Sample Areas, Maximum of Each Area | ≤40pcs               | SEMI F73    |
| Chromium-to-Iron (Cr/Fe)               |                                           | ≥1.5:1               | SEMI F60    |
| Chromium Oxide-to-Iron Oxide (CrO/FeO) |                                           | ≥2:1                 |             |
| Surface Roughness (Ra)                 |                                           | ≤Ra 0.13 μm (5 μin.) | SEMI F37    |

## Cleaning and Inspection

- ⊙ Products should have fulfilled the requirements of FITOK Special Cleaning and Packaging Process (FC-02) before cleaning according to this Specification.
- ⊙ Carry out ultrasonic washing with DI water in the clean room.
- ⊙ After cleaning, dry the products by the closed oven in the clean room.
- ⊙ DI Water Standards:
  - ⊙ SEMI E49.6, Guide for Subsystem Assembly and Testing Procedures – Stainless Steel Systems

Table 3 Parameters of DI Water

| Characteristic             | Capabilities                    |
|----------------------------|---------------------------------|
| Resistivity                | ≥17.5 MΩ·cm (25°C/77°F)         |
| Total Organic Carbon (TOC) | 20ppb                           |
| Silica                     | 5ppb                            |
| Bacteria                   | 10 colonies per 100 milliliters |
| Hot DI Water Temperature   | 176°F (80°C) minimum            |

## Welding, Assembly and Testing

- ⊙ To prevent the cleaned products polluted by the particles and dusts in the air, the cleaned products shall be sent in the clean room directly to finish welding, assembly and testing.
- ⊙ The clean room is up to the requirement of ISO 14644-1 Class 5, which is equivalent to Federal Standard 209E Class 100.
- ⊙ High purity nitrogen or helium is used for the factory test of the products.

## Packaging and Labeling

- ⊙ During storage and transportation, the products should be protected from damage and contamination as below:
  - ⊙ The functional parts of the product, such as: male threads, sealing surfaces, should be protected with clean protective films and proper caps.
  - ⊙ Finished products should be double packaged, the inner layer uses the plastic bag in polyethylene and free-dust for vacuum sealing, and the outer layer is sealed by polyethylene plastic bag.
  - ⊙ Finished products in the bags should be packed in the boxes for protection.
  - ⊙ Finished products' packaging markings and traceable information should be clear and visible before removing the packing.
- ⊙ Product Packaging Standard:
  - ⊙ SEMI E49.6, Guide for Subsystem Assembly and Testing Procedures - Stainless Steel Systems

Fittings

Valves

Pressure Gauges

Integrated Systems and Others

Process Specification



## References

### ASTM

- STM A262, Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels*
- ASTM A276, Standard Specification for Stainless Steel Bars and Shapes*
- ASTM A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems*
- ASTM A479, Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels*
- ASTM A484, Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings*
- ASTM A751, Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products*
- ASTM E45, Standard Test Methods for Determining the Inclusion Content of Steel*
- ASTM E214, Standard Practice for Immersed Ultrasonic Examination by the Reflection Method Using Pulsed Longitudinal Waves*
- ASTM E1558, Standard Guide for Electrolytic Polishing of Metallographic Specimens*
- ASTM F1397, Standard Test Method for Determination of Moisture Contribution by Gas Distribution System Components*

### SEMI

- SEMI F19, Specification for the Surface Condition of the Wetted Surfaces of Stainless Steel Components*
- SEMI F20, Specification for 316L Stainless Steel Bar, Forgings, Extruded Shapes, Plate, and Tubing for Components Used in General Purpose, High Purity and Ultra-High Purity Semiconductor Manufacturing Applications*
- SEMI F37, Method for Determination of Surface Roughness Parameters for Gas Distribution System Components*
- SEMI E49.6, Guide for Subsystem Assembly and Testing Procedures–Stainless Steel Systems*
- SEMI F60, Test Method for ESCA Evaluation of Surface Composition of Wetted Surfaces of Passivated 316L Stainless Steel Components*
- SEMI F72, Test Method for Auger Electron Spectroscopy (AES) Evaluation of Oxide Layer of Wetted Surfaces of Passivated 316L Stainless Steel Components”*
- SEMI F73, Test Method for Scanning Electron Microscopy (SEM) Evaluation of Wetted Surface Condition of Stainless Steel Components*

### ISO

- ISO 14644-1, Cleanrooms and Associated Controlled Environments*

Fittings

Valves

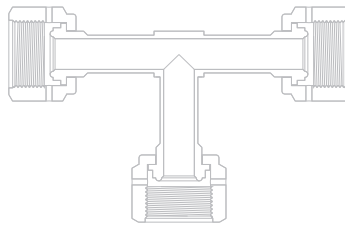
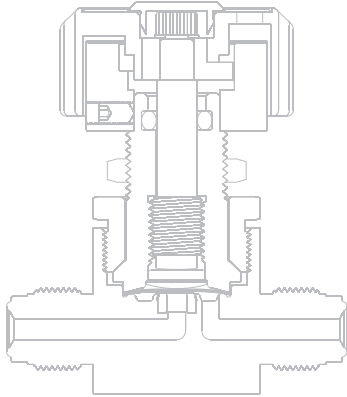
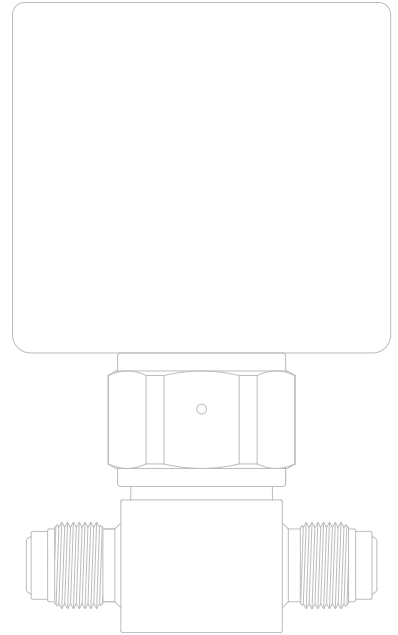
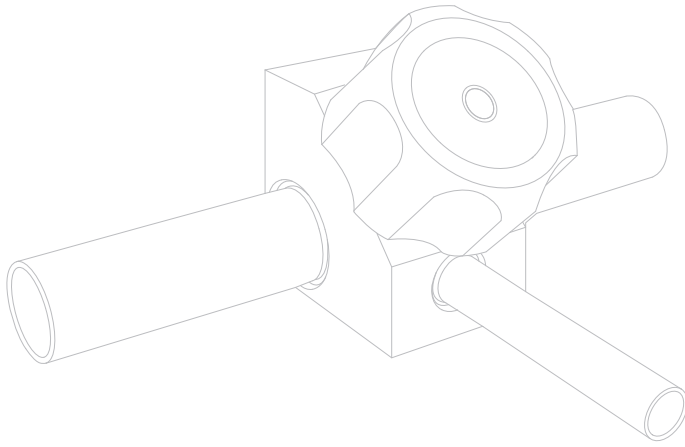
Pressure Gauges

Integrated Systems and Others

Process Specification

## **Warranty Information**

FITOK products are backed by the FITOK Limited Lifetime Warranty. For a copy, contact FITOK Group or our authorized distributors.



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