



## CR8 MANUAL AND PNEUMATIC VALVES

*Reliable service in corrosive environments  
for ultrapure chemical applications*



# for corrosive environments in ultrapure chemical applications

## Overview

Entegris has added the CR8 to its successful line of corrosion-resistant (CR) valves. This product line offers two-way pneumatic and manual valves for low-to-medium flow applications, with flow factors ( $C_v$ ) ranging from 1.8–3.4. The valves offer reliable performance and easy serviceability – with a footprint that is smaller than most ½" valves.

CR8 series pneumatic valves were tested to over four million cycles to ensure reliability and reduce cost of ownership. This proven design is available with a variety of end connection options including Flaretek®, PureBond® and Pillar® S300. With no exposed metal hardware, the valve is completely sealed and protected from harsh chemical environments. These capabilities allow the CR8 series to solve a variety of critical issues within the fab.

Ideal for wet etch and clean (WEC) and low volume bulk chemical delivery applications, the valve line incorporates a compact modular valve design with increased temperature capabilities and maximized flow. CR8 series manual and

pneumatic valves are also ideal for use with Entegris Dymension® manifolds to minimize footprint in fab equipment.

### Features and Benefits

- Small footprint preserves valuable space on OEM equipment
- Able to withstand corrosive chemical environments
- Unique modular design improves serviceability
- Valve diaphragms successfully tested to over 4 million cycles for increased reliability
- Valves offer a variety of connection options including Flaretek, PureBond and Pillar S300

### Applications

- High-purity, corrosive chemical handling
- Semiconductor wet clean process chemicals
- Chemical line sizes in ¼" and ½" pipe, ½" and ¾" tube

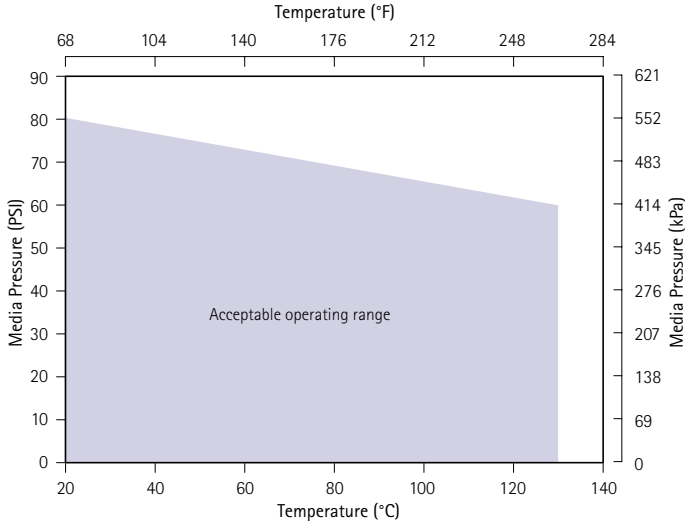
## Specifications

|   |  |                               |                      |  |
|---|--|-------------------------------|----------------------|--|
| Materials:                                      | All wetted parts                             | PFA, PTFE                     |                      |  |
|   | Exterior actuator parts                      | PVDF, Viton®                  |                      |  |
|   | Interior actuator parts                      | PVDF, SST, Viton              |                      |  |
|   | Mounting base                                | PVDF                          |                      |  |
| Operating conditions:                           | Media pressure at                            | 21°C (70°F)                   | Inlet/outlet         | 913 mbar (27" Hg) vacuum to 552 kPa (80 PSIG)* |
|   |  | 130°C (266°F)                 | Inlet/outlet         | 414 kPa (60 PSIG)*                             |
|   | Actuation pressure (pneumatic version only)  | 414 – 552 kPa (60 – 80 PSIG)* |                      |  |
|   | Temperature range                            | Ambient                       | 21°–50°C (70°–122°F) |  |
| Fluid   |  | 21°–130°C (70°–266°F)         |                      |  |
| Pneumatic supply port: (pneumatic version only) | ¼" tube stub or molded female Luer lug style |                               |                      |  |
| Environmental compliance:                       | RoHs, WEEE                                   |                               |                      |  |

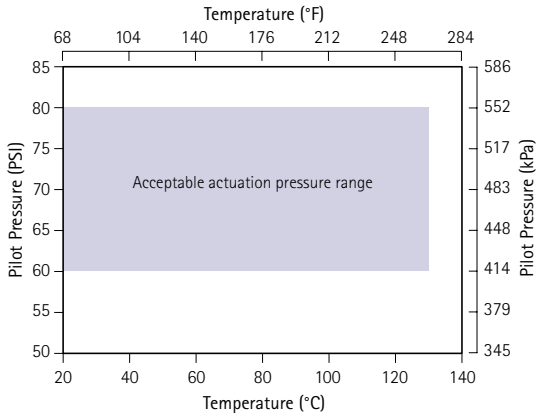
\*Actual valve performance varies with pressure and temperature; refer to actual ratings in performance data.

# Performance Data

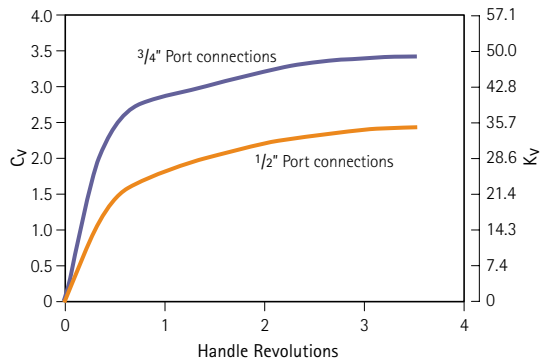
**Media Temperature vs. Media Pressure**



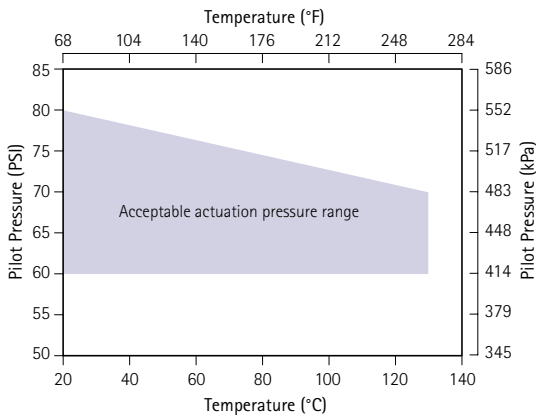
**Media Temperature vs. Actuator Pilot Pressure – Normally Closed Valve**



**CR8 Manual Multi-turn Valve  
C<sub>v</sub>/K<sub>v</sub> vs. Number of Handle Revolutions**



**Media Temperature vs. Actuator Pilot Pressure – Normally Open Valve**



## Valve Reliability Test Results

### Valve Qualification Testing

| Test Type                | Test Conditions   | Acceptance Criteria  | Test Results  |
|--------------------------|---|--|---|
| Burst pressure           | Hydraulic oil pressure increased until leakage detected                         | Burst pressure must be >2 times rated pressure   | PASS  |
| Accelerated life testing | 37% HCl acid at 552 kPa (80 PSIG) @ 22°C for 2 million cycles                   | No leakage in functional performance up to 2 million cycles  | PASS<br>No external or port-to-port leakage <0.05 cc H <sub>2</sub> O/hr  |
|                          | Cabot Semi-Sperse® 12 slurry at 241 kPa (35 PSIG) @ 22°C for 1.5 million cycles | No leakage in functional performance for up to 1.5 million cycles  | PASS<br>No external or port-to-port leakage <20 mL/hr                     |
| Pressure envelope        | 827 kPa (120 PSIG) water @ 23°C (73°F)  | No external leakage failures for 1 million cycles @ 1.5 times rated pressure   | PASS<br>No external leakage   |
|                          | 621 kPa (90 PSIG) hydraulic oil @ 130°C (266°F)                                 | No external leakage failures for 1 million cycles @ 1.5 times rated pressure   | PASS<br>No external leakage   |
| Actuation cycle testing  | 552 kPa (80 PSIG) water @ 23°C (73°F) for 4 million cycles                      | No leakage in functional performance for:<br>– Pneumatic up to 4 million cycles<br>– Manual up to 5,000 cycles                           | PASS<br>No external or port-to-port leakage <0.050 cc H <sub>2</sub> O/hr |
|                          | 414 kPa (60 PSIG) hydraulic oil @ 130°C (266°F) for 1 million cycles            | No leakage in functional performance for up to 500K cycles in normally open valves   | PASS<br>No external or port-to-port leakage <0.050 cc H <sub>2</sub> O/hr |
|                          | 414 kPa (60 PSIG) hydraulic oil @ 130°C (266°F) for 1 million cycles            | No leakage in functional performance in normally closed valves for:<br>– Pneumatic up to 1 million cycles<br>– Manual up to 5,000 cycles | PASS<br>No external or port-to-port leakage <0.050 cc H <sub>2</sub> O/hr |

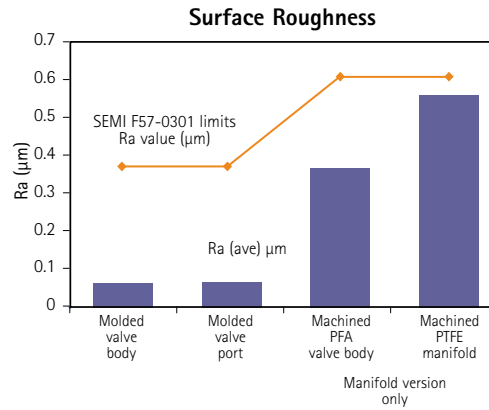
### Valve Test Procedure in Production

| Test Type               | Test Conditions                       | Acceptance Criteria   |
|-------------------------|---------------------------------------|---|
| External media leak     | 552 kPa (80 PSIG) CDA                 | Zero bubbles per minute through 1/32" ID tube immersed in DI water        |
| Port-to-port valve test | 552 kPa (80 PSIG) CDA to valve outlet | Less than 4 bubbles per minute through 1/32" ID tube immersed in DI water |
| Valve actuation         | Pressure decay 552 kPa (80 PSIG) CDA  | Less than 7 kPa (1 PSIG/min) pressure drop                                |

## Surface Roughness Specification

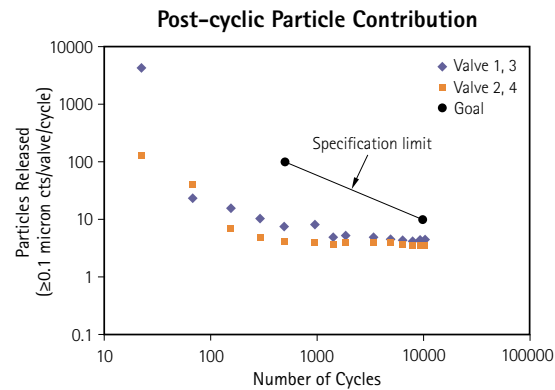
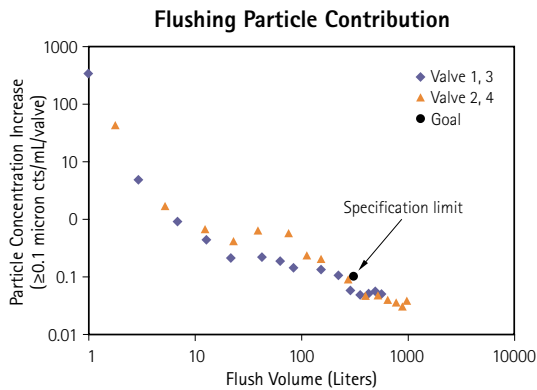
### SURFACE ROUGHNESS SPECIFICATION

| Component Description       | SEMI® F57-0301 Limits Ra Value $\mu\text{m}$ ( $\mu\text{in.}$ ) | Typical Entegris Test Results Ra (ave) $\mu\text{m}$ ( $\mu\text{in.}$ ) |
|-----------------------------|--|--|
| Injection molded valve body | $\leq 0.38$<br>( $\leq 15$ )                                     | 0.07<br>(2.6)  |
| Machined PTFE diaphragm     | $\leq 0.38$<br>( $\leq 15$ )                                     | 0.03<br>(1.3)  |
| Injection molded valve port | $\leq 0.38$<br>( $\leq 15$ )                                     | 0.07<br>(3.0)  |
| Machined PFA valve body     | $\leq 0.62$<br>( $\leq 25$ )                                     | 0.37<br>(14.4)   |
| Machined PTFE manifold body | $\leq 0.62$<br>( $\leq 25$ )                                     | 0.57<br>(22.4)   |



## Particle Contribution Specification

Because the SEMI F57-0301 particle contribution specification is still in development, Entegris has worked with several OEMs to establish a test method and particle contribution limits. Testing has verified the CR8 series valve in both stand-alone and manifolded configurations comply with the following particle contribution specification.



Note: During initial flushing, the device must contribute  $< 0.1$  particle/mL (particle size  $\geq 0.1 \mu\text{m}$ ) within 300 liters of flushing. During operation, the device must release  $< 100$  particles/actuation (particle size  $\geq 0.1 \mu\text{m}$ ) within 500 cycles and  $< 10$  particles/actuation (particle size  $\geq 0.1 \mu\text{m}$ ) within 10000 cycles.

## Surface Extractable Specification

Entegris, Inc. certifies that the CR8 series valves comply with the SEMI F57-0301 specification for Extractable Ionic and Metallic Contamination, Total Organic Carbon Contamination and Surface Roughness. Per SEMI F40 (section 12.1), the following test parameters were used:

a) Test fluid used was ultrapure water and the tests were carried out at 85°C (185°F).

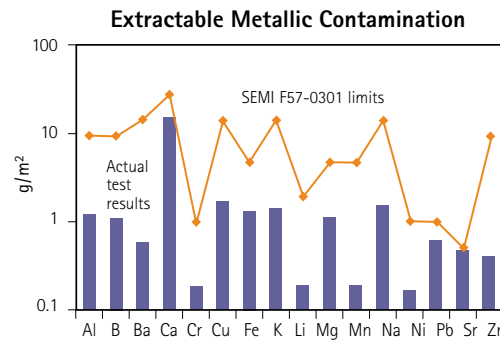
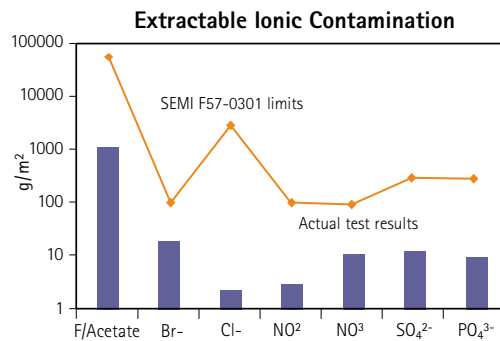
b) Parts were leached after the prescribed rinse pretreatment

c) Volumes of the test fluids used were 16.2 mL (0.54 oz)

d) Soak time was 7 days

e) Calculated wetted surface areas were 0.0077 m<sup>2</sup>

### Surface Extractable Specification



### SURFACE EXTRACTABLE IONIC CONTAMINATION

| Aqueous Leachate Anions (IC)               | SEMI F57-0301 Limits Static Value at 85 ±5°C for 7 days (µg/m <sup>2</sup> ) | Actual Test Results Molded PFA CR8 Valves (µg/m <sup>2</sup> ) |
|--|--|--|
| Fluoride (F-/Acetate)                      | ≤ 60000  | 1550.0   |
| Bromide (Br-)                              | ≤ 100  | 38.0   |
| Chloride (Cl-)                             | ≤ 3000   | 4.2  |
| Nitrate (NO <sub>2</sub> -)                | ≤ 100  | 5.4  |
| Nitrate (NO <sub>3</sub> -)                | ≤ 100  | 13.5   |
| Sulphate (SO <sub>4</sub> <sup>2-</sup> )  | ≤ 300  | <21.0*   |
| Phosphate (PO <sub>4</sub> <sup>3-</sup> ) | ≤ 300  | <10.0*   |

\*Below detection limit

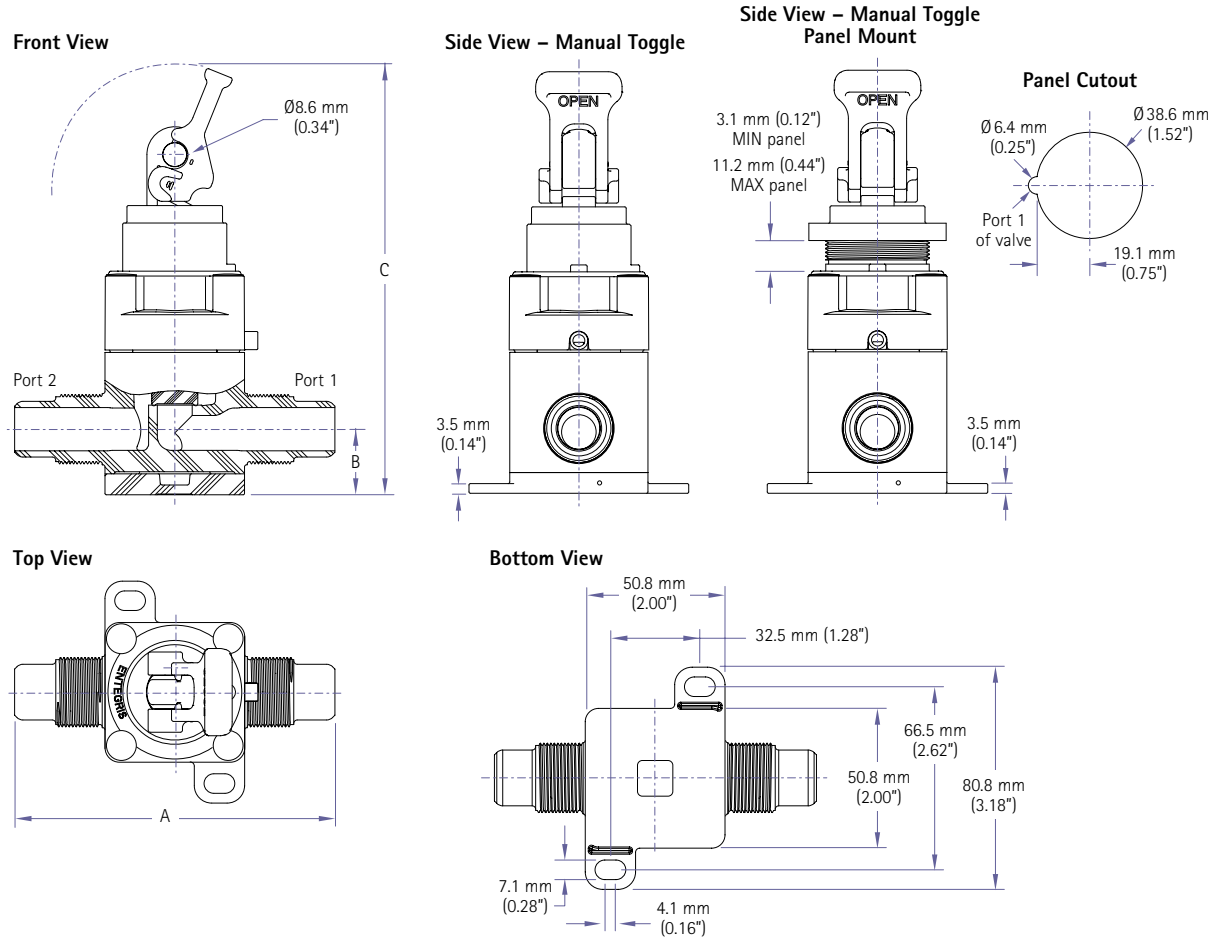
### SURFACE EXTRACTABLE METALLIC CONTAMINATION

| Aqueous Leachate Trace Metals (ICP-MS) | SEMI F57-0301 Limits Static Value at 85 ±5°C for 7 days (µg/m <sup>2</sup> ) | Actual Test Results Molded PFA CR8 Valves (µg/m <sup>2</sup> ) |
|--|--|--|
| Al                                     | ≤ 10.0   | 1.80   |
| B                                      | ≤ 10.0   | <1.40*   |
| Ba                                     | ≤ 15.0   | <0.79*   |
| Ca                                     | ≤ 30.0   | 26.50  |
| Cr                                     | ≤ 1.0  | <0.34*   |
| Cu                                     | ≤ 15.0   | 3.10   |
| Fe                                     | ≤ 5.0  | 2.15   |
| K                                      | ≤ 15.0   | 2.27   |
| Li                                     | ≤ 2.0  | <0.36*   |
| Mg                                     | ≤ 5.0  | 1.40   |
| Mn                                     | ≤ 5.0  | <0.36*   |
| Na                                     | ≤ 15.0   | 2.70   |
| Ni                                     | ≤ 1.0  | <0.30*   |
| Pb                                     | ≤ 1.0  | <0.81*   |
| Sr                                     | ≤ 0.5  | <0.71*   |
| Zn                                     | ≤ 10.0   | <0.65*   |

\*Below detection limit

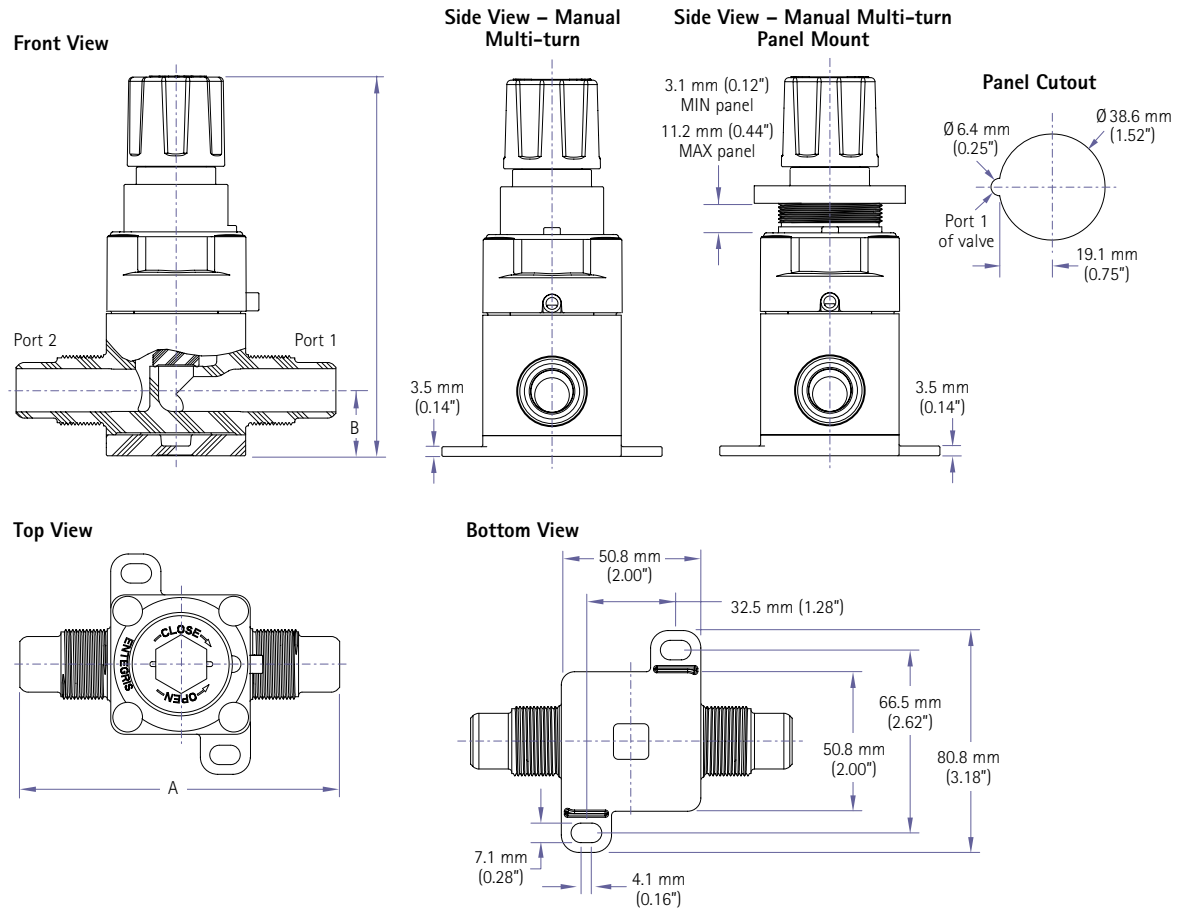
# Dimensions

## Manual Toggle and Manual Toggle Panel Mount



| Port Connection  | Flow Factor $C_v$ | Dimensions       |                 |                  |
|------------------|-------------------|------------------|-----------------|------------------|
|                  |                   | A                | B               | C                |
| 1/4" PureBond    | 1.8               | 120.9 mm (4.76") | 17.5 mm (0.69") | 151.1 mm (5.95") |
| 1/2" Flaretek    | 2.4               | 110.5 mm (4.35") | 17.5 mm (0.69") | 151.1 mm (5.95") |
| 1/2" PureBond    | 3.2               | 120.9 mm (4.76") | 23.9 mm (0.94") | 157.5 mm (6.20") |
| 1/2" Pillar S300 | 2.4               | 103.1 mm (4.06") | 17.5 mm (0.69") | 151.1 mm (5.95") |
| 3/4" Flaretek    | 3.4               | 116.6 mm (4.59") | 23.9 mm (0.94") | 157.5 mm (6.20") |
| 3/4" Pillar S300 | 3.4               | 112.8 mm (4.44") | 23.9 mm (0.94") | 157.5 mm (6.20") |

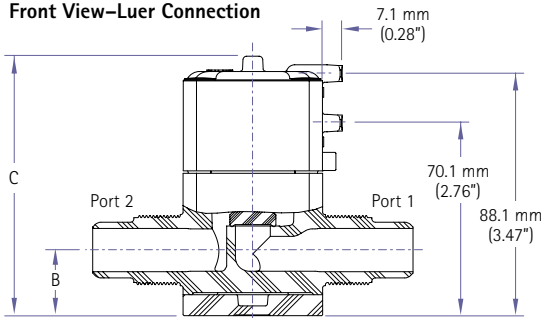
**Manual Multi-turn and Manual Multi-turn Panel Mount**



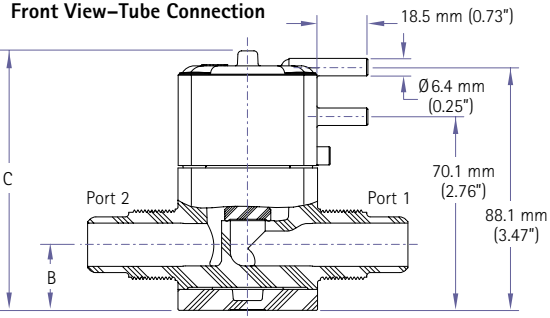
| Port Connection  | Flow Factor Cv | Dimensions       |                 |                  |
|------------------|----------------|------------------|-----------------|------------------|
|                  |                | A                | B               | C                |
| 1/4" PureBond    | 1.8            | 120.9 mm (4.76") | 17.5 mm (0.69") | 135.9 mm (5.35") |
| 1/2" Flaretek    | 2.4            | 110.5 mm (4.35") | 17.5 mm (0.69") | 135.9 mm (5.35") |
| 1/2" PureBond    | 3.2            | 120.9 mm (4.76") | 23.9 mm (0.94") | 142.2 mm (5.60") |
| 1/2" Pillar S300 | 2.4            | 103.1 mm (4.06") | 17.5 mm (0.69") | 135.9 mm (5.35") |
| 3/4" Flaretek    | 3.4            | 116.6 mm (4.59") | 23.9 mm (0.94") | 142.2 mm (5.60") |
| 3/4" Pillar S300 | 3.4            | 112.8 mm (4.44") | 23.9 mm (0.94") | 142.2 mm (5.60") |

**Pneumatic**

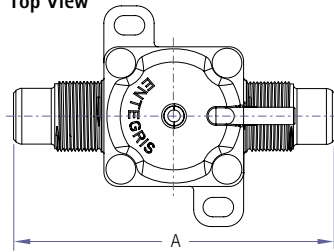
**Front View—Luer Connection**



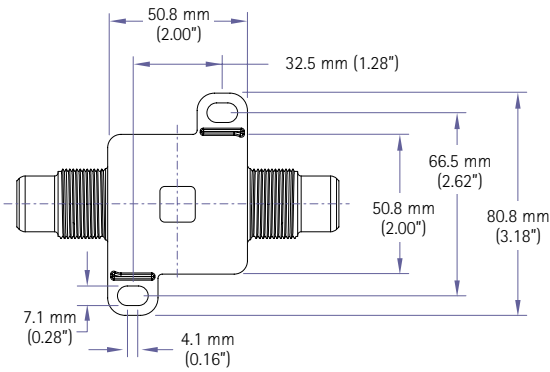
**Front View—Tube Connection**



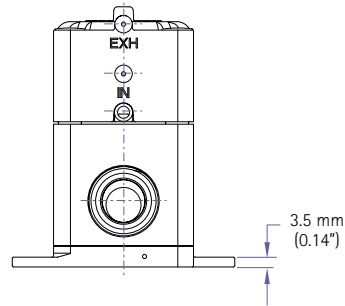
**Top View**



**Bottom View**



**Side View**



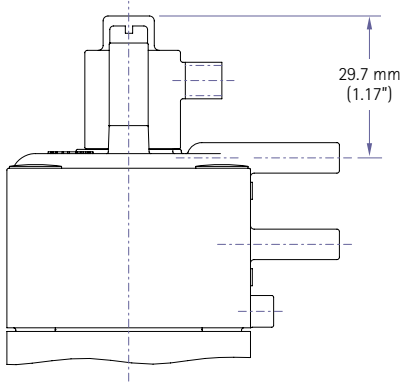
| Port Connection  | Flow Factor $C_v$ | Dimensions       |                 |                 |
|------------------|-------------------|------------------|-----------------|-----------------|
|                  |                   | A                | B               | C               |
| 1/4" PureBond    | 1.8               | 120.9 mm (4.76") | 17.5 mm (0.69") | 88.1 mm (3.47") |
| 1/2" Flaretek    | 2.4               | 110.5 mm (4.35") | 17.5 mm (0.69") | 88.1 mm (3.47") |
| 1/2" PureBond    | 3.2               | 120.9 mm (4.76") | 23.9 mm (0.94") | 94.5 mm (3.72") |
| 1/2" Pillar S300 | 2.4               | 103.1 mm (4.06") | 17.5 mm (0.69") | 88.1 mm (3.47") |
| 3/4" Flaretek    | 3.4               | 116.6 mm (4.59") | 23.9 mm (0.94") | 94.5 mm (3.72") |
| 3/4" Pillar S300 | 3.4               | 112.8 mm (4.44") | 23.9 mm (0.94") | 94.5 mm (3.72") |

## Sensing Option Dimensional Information

### Remote Position Indication Option:

Electronic valve position sensing for monitoring valve open and closed positions.

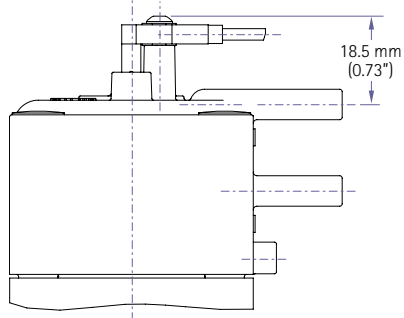
#### CR8 with Espy® Sensor\*



Entegris Espy part number ES-IN-01

\*Sensor sold separately

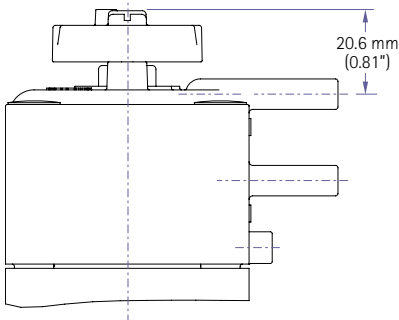
#### CR8 with Omron® Sensor\*



Omron part number EE-SX771R or EE-SX771A

### Restricted Open/Closed Dimensional Information:

#### CR8 with Restricted Open or Restricted Closed



Note: Height dimension includes stem in open position.

- Restricted open option allows for a manual variable limit control on the open travel of a pneumatically controlled valve
- Restricted closed option allows for a manual variable limit control on the closed travel of a pneumatically controlled valve
- Both options are offered in a normally closed and normally open pneumatic actuators

## Ordering Information

### CR8 Manual and Pneumatic Valves

#### Part Number

CR8 - 2 - - - - -

#### Port Configuration

- 4P8F = Port 1 (1/4" PureBond), Port 2 (1/2" Flaretek)
- 4P8W = Port 1 (1/4" PureBond), Port 2 (1/2" Pillar S300)
- 4PP = Port 1/Port 2 (1/4" PureBond)
- 8FF = Port 1/Port 2 (1/2" Flaretek)
- 8FS = Port 1 (1/2" Flaretek), Port 2 (1/2" Flaretek "SpaceSaver")
- 8SF = Port 1 (1/2" Flaretek "SpaceSaver"), Port 2 (1/2" Flaretek)
- 8F4P = Port 1 (1/2" Flaretek), Port 2 (1/4" PureBond)
- 8FP = Port 1 (1/2" Flaretek), Port 2 (1/2" PureBond)
- 8TT = Port 1/Port 2 (1/2" tube stub, no nuts)
- 8TW = Port 1 (1/2" tube stub), Port 2 (1/2" Pillar S300)
- 8WT = Port 1 (1/2" Pillar S300), Port 2 (1/2" tube stub)
- 8WW = Port 1/Port 2 (1/2" Pillar S300)
- 8W4P = Port 1 (1/2" Pillar S300), Port 2 (1/4" PureBond)
- 8WP = Port 1 (1/2" Pillar S300), Port 2 (1/2" PureBond)
- 8PF = Port 1 (1/2" PureBond), Port 2 (1/2" Flaretek)
- 8PP = Port 1/Port 2 (1/2" PureBond)
- 8P12F = Port 1 (1/2" PureBond), Port 2 (3/4" Flaretek)
- 8PW = Port 1 (1/2" PureBond), Port 2 (1/2" Pillar S300)
- 8P12W = Port 1 (1/2" PureBond), Port 2 (3/4" Pillar S300)
- 12FF = Port 1/Port 2 (3/4" Flaretek)
- 12FS = Port 1 (3/4" Flaretek), Port 2 (3/4" Flaretek "SpaceSaver")
- 12F8P = Port 1 (3/4" Flaretek), Port 2 (1/2" PureBond)
- 12SF = Port 1 (3/4" Flaretek "SpaceSaver"), Port 2 (3/4" Flaretek)
- 12TT = Port 1/Port 2 (3/4" tube stub, no nuts)
- 12TW = Port 1 (3/4" tube stub), Port 2 (3/4" Pillar S300)
- 12WT = Port 1 (3/4" Pillar S300), Port 2 (3/4" tube stub)
- 12WW = Port 1/Port 2 (3/4" Pillar S300)
- 12W8P = Port 1 (3/4" Pillar S300), Port 2 (1/2" PureBond)

#### Actuator

- T = 2-way manual toggle
- M = 2-way manual multi-turn
- CT = 2-way normally closed tube pilot port
- UT = 2-way normally open tube pilot port
- CL = 2-way normally closed Luer pilot port
- UL = 2-way normally open Luer pilot port

#### Special Order

- 3 = PFA Flaretek nut
- 6 = CPFA Flaretek nut
- II = FlareLock® II
- N = Pillar nuts, inserts and gauge rings included
- P1 = Rotated actuator positions
- BY1 = Bypass options
- L = LOTO options
- PM = Panel-mount options
- RO = Restricted open
- RC = Restricted closed
- ES = Espy sensor
- OM = Omron sensor

Note: Not all configurations are permitted. Consult Entegris if multiple special order features are required.

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