

Needle Valve

Medium Pressure Cone & Thread 20,000 psi (1380 bar)

15SM and 20SM Series



Principle of Operation:

SM Series Valves are designed specifically for use with matching orifice Medium Pressure Cone & Thread Fittings and Tubing for the most efficient flow path possible using Cone & Thread style connections. Designed for a maximum of 20,000 psi MAWP using high tensile strength UNS S31600 cold worked 316 Stainless Steel material as standard, we include larger ID tubing rated to 15,000 psi (15SM valves) for even higher flow rate capability.

Medium Pressure Valve Features:

Temperature Rated -423° to 1200°F (-252° to 650°C) with associated packing/material options

- Designed for use with Medium Pressure cold worked 316/316L stainless steel tubing as standard
- 15SM Series Hi-Flow valves available in sizes from 9/16" to 1-1/2" (See matched-bore tubing)
- 20SM Series valves available in sizes from 1/4" to 1" (See matched-bore tubing)
- UNS S31600, CW 316 Stainless Steel body construction as standard. See Technical brochure for additional material options
- Non-rotating stem prevents stem/seat galling
- Metal-to-Metal seating achieves bubble-tight shut-off, longer stem/seat life, greater durability for repeated on/off cycles and excellent corrosion resistance. These valves can be used with liquid or gas.
- PTFE packing below stem threads provides dependable stem and body sealing. Optional packing materials available.
- Choice of Vee (shutoff) or Regulating (Flow Control) stem tips
- Replaceable Seat Option available with Right Angle 2-way body style
- Optional N-Dura Stem and Seat coating or Stellite material option for severe service available
- Pneumatic and Electric Actuator Options available - see page 8 for more details

Traceability is ensured by use of heat and purchase order codes etched on valve body that also includes model number, MAWP rating, and material type references. All valves include connection collar and gland nut unless requested otherwise. Parker Autoclave Engineers' valves are complemented by a complete line of Medium Pressure Cone & Thread fittings, tubing, check valves, relief valves, and line filters.

Note: SM Series fully replaces 20SC, 20SV, and 15SV Series. 15SM Series replaces 10SM Series. 20SM and 15SM repair kits are used to repair these valve types.

All Parker Autoclave Engineers products are designed in accordance with ASME B31.3 Chapter IX High Pressure Piping standards.



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SM Series Needle Valve: Pressures to 20,000 psi (1379 bar)

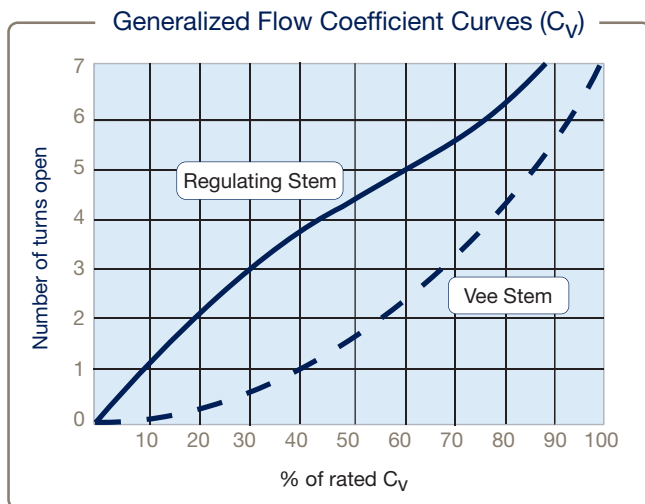


| Tube Outside Diameter Size (inches) | Connection Type | Orifice Size Inches (mm) | Rated C_v^* | Pressure Rating psi (bar) @Room Temperature** |
|-------------------------------------|-----------------|--------------------------|---------------|---|
| 1/4 (20SM4) | SF250CX20 | 0.125 (3.18) | 0.31 | 20,000 (1379) |
| 3/8 (20SM6) | SF375CX20 | 0.219 (5.56) | 0.75 | 20,000 (1379) |
| 9/16 (20SM9) | SF562CX20 | 0.312 (7.92) | 1.30 | 20,000 (1379) |
| 3/4 (20SM12) | SF750CX20 | 0.438 (11.13) | 2.50 | 20,000 (1379) |
| 1 (20SM16) | SF1000CX20 | 0.562 (14.27) | 4.40 | 20,000 (1379) |
| 9/16 (15SM9) | SF562CX10 | 0.359 (9.12) | 1.75 | 15,000 (1034) |
| 3/4 (15SM12) | SF750CX10 | 0.516 (13.10) | 2.80 | 15,000 (1034) |
| 1 (15SM16) | SF1000CX10 | 0.688 (17.48) | 5.20 | 15,000 (1034) |
| 1 1/2 (15SM24) | SF1500CX | 0.937 (23.80) | 14 | 15,000 (1034) |

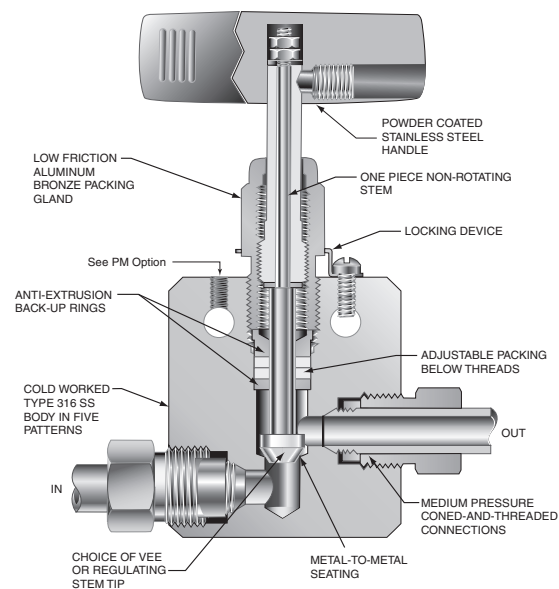
Notes

* C_v values shown are for 2-way straight valve pattern. For 2-way angle patterns, increase C_v value 50%. (Based on water). Formula for converting C_v to volumetric flow can be found in Technical Information section.

** Maximum Allowable Working Pressures decrease as temperatures increase - see pressure/temperature rating guide in Technical Information section.



SM Series Flow Curve for
Vee and Regulating Stem Valves



To ensure proper fit use Parker Autoclave tubing

Valve Packing Options:

Standard Parker Autoclave Engineers valves with PTFE packing may be operated from 0°F (-18°C) to 450°F (232°C). High and Cryogenic temperature packing and/or extended stuffing box are available for service from -423°F (-252°C) to 1200°F (650°C) by adding the following suffixes to catalog order number:

- B Cryogenic trim materials and PTFE packing required when below 0°F (-18°C) to -100°F (-73°C)
- LT Extended packing option with PTFE packing and Cryogenic trim materials to -423°F (-252°C)
- TG Standard valve with PTFE-Glass packing -100°F (-73°C) to 600°F (316°C) (See also -B option above when below 0°F (-18°C))
- GY Standard valve with Graphite Yarn packing 32°F (0°C) to 800°F (427°C). Used when selecting HT option. **(Note: 3/4" valve rated 8000 psi (552 bar) and 1" rated 6000 psi (412 bar) max with Graphite Yarn packing.)**
- HT Extended stuffing box valve with Graphite Braided Yarn packing to 1200°F (650°C)

For the effect on max pressure due to High Temperatures, please see "Technical Brochure" in main catalog.

Note: Refer to Tools, Installation & Operation catalog for proper connection, packing, seating & running torques.

Ordering Guide:

For complete information on available stem types, optional connections and additional valve options, see pages 8-9 or contact your Sales Representative. SM Series valves are furnished complete with connection components, unless otherwise specified.

Building a Part Number: Example: 20SM4071

| Example Part Number: | 20SM | 4 | 07 | 1 | XX |
|------------------------------|--------------|----------------------------|----------------|--------------|---------|
| Ordering Parameters/Options: | Valve Series | Outside Diameter Tube Size | Stem/Seat Type | Body Pattern | Options |
| Table Reference: (see below) | A | B | C | D | E |

A - Valve Series

| | |
|------|---|
| 15SM | 15,000 psi Medium Pressure Needle Valve (9/16" thru 1 1/2" sizes) |
| 20SM | 20,000 psi Medium Pressure Needle Valve (1/4 thru 1" sizes) |

B - Outside Diameter Tube Size

| | |
|----|--------------------|
| 4 | 1/4" (20SM only) |
| 6 | 3/8" (20SM only) |
| 9 | 9/16" |
| 12 | 3/4" |
| 16 | 1" |
| 24 | 1-1/2" (15SM only) |

C - Stem/Seal Type (see page 8 for optional stem types)

| | |
|----|---|
| 07 | Non-Rotating Vee Stem (on-off service) |
| 08 | Non-Rotating Regulating Stem (tapered tip for regulating and shutoff) |
| 87 | Vee Stem with Replaceable Seat (angle valve only) |
| 88 | Regulating Stem with Replaceable Seat (angle valve only) |

Notes:

Valve Manuals can be found on our website at www.Autoclave.com. Connection, Running and Seating Torques can be found in the product manual or in our Tools and Installation Catalog Section. Valves that have not been cycled for a substantial period of time may require higher initial actuation torque.

*Replaceable seat option is sold with two (2) seat surfaces 180° apart.

D - Body Pattern

| | |
|---|------------------------------------|
| 1 | Two-Way Straight |
| 2 | Two-Way Angle |
| 3 | Three-Way, Two on Pressure |
| 4 | Three-Way, One on Pressure |
| 5 | Three-Way, Two Stem Manifold Valve |

E - Options (choose as many as necessary)

| | |
|---|---|
| For additional valve options see pages 8 & 9 or contact factory. | |
| B | Low temperature service below 0°F (-18°C) (included in LT code) |
| LT | Low Temperature Extension (to -423°F) (includes PTFE packing) |
| TG | PTFE Glass (25%) Packing (to 600°F) |
| GY4 | Graphite Yarn Packing (to 800°F) |
| HT4 | High Temperature Extension (to 1200°F) (includes GY packing) |
| K | Antivibration Gland replaces standard gland |
| *SOG | NACE Material, Hardness Verification/Certificate |
| HYG | Hydrogen/Helium upgrade/Seat Testing |
| *** 2507 | UNS 32750, 2507 Super Duplex Wetted Materials |
| *** IN625 | UNS N06625 Inconel 625 Wetted Materials |
| *** HC | UNS N10276 Hastelloy C276 Wetted Materials |
| Pneumatic and Electric Actuator Options - see individual brochures for Suffix Codes | |
| Other materials available upon request. | |
| See Technical Brochure for list of common material options. | |

Notes:

316 SS valve bodies are cold worked and not suitable for use in NACE (ISO 15156) applications. If required, contact factory for options.

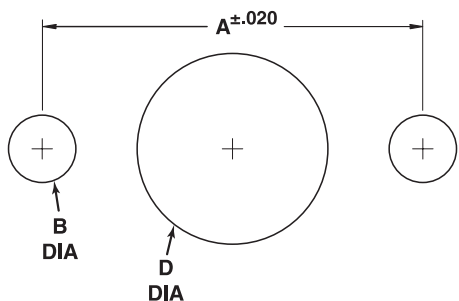
* SOG suffix also changes CW 316 SS Body material to Annealed 316 SS suitable for NACE service, Pressure reduction of 60% possible

*** Special Materials often have reduced MAWP ratings, see Technical brochure for assistance and for additional material options.

4 - GY packing increases friction on stem which can limit max pressure in larger valves (3/4" is limited to 8,000 psi and 1" is limited to 6000 psi)

Note: use of optional material only changes "wetted parts" to selected material. Items like collars and glands remain CW 316/316L SS. Use **-SOG** (includes hardness check for NACE) or **-AP** suffix

Panel Hole Size:



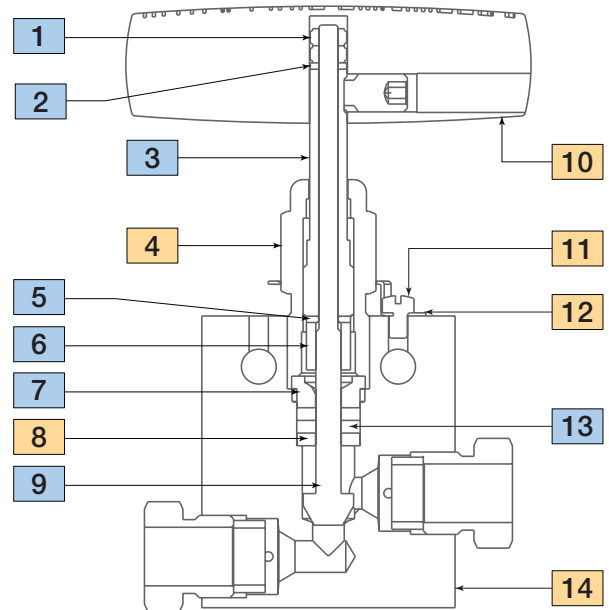
Needle Valve Panel Mount

| Valve Size | Inches | | | |
|--|--------|-----|-------------------|------|
| | A | B | Screw Size/Thread | D |
| 4 & 6 | 1.25 | .22 | 10 - 24 | .75 |
| 9 | 1.375 | .22 | 10 - 24 | 1.00 |
| 12 | 1.75 | .22 | 10 - 24 | 1.12 |
| 16 | 2.50 | .22 | 10 - 24 | 1.62 |
| 24 | N/A | N/A | N/A | N/A |
| Panel Mount Screw Length -1/4" min. (2 each required) (PM option no longer available) | | | | |

Material of Construction:

| Item # | Description | Material |
|--------|------------------------|---------------|
| 1 | Hex Nut | 300 Series SS |
| 2 | Thrust Washer | 17-4 PH |
| 3 | Stem Sleeve | 316 SS |
| 4 | Packing Gland | AMPCO 45 |
| 5 | Thrust Washer | 17-4 PH |
| 6 | Stem Collar | 316 SS |
| 7 | Packing Washer | AMPCO 45 |
| 8 | Bottom Washer | 316 SS |
| 9 | Vee Stem, 9/16" Shown | 316 SS |
| 10 | Handle | 316 SS |
| 11 | HD Screw #10-24 | 18-8 SS |
| 12 | Locking Device | 302 SS |
| 13 | Packing | PTFE |
| 14 | Body, 20SM 9/16" Shown | 316 SS |
| • | Seat Retainer | 316 SS |
| • | Replaceable Seat | 17-4 PH |

Typical spare parts found in Repair Kits (• indicates not shown)



Basic Repair Kits for 316 SS Material:

| Stem Type | | Basic Repair Kit for 316 SS Material | | | | | |
|---|-----|--------------------------------------|---------|-----------|------------|------------|------------|
| | | Outside Diameter Tube: | | | | | |
| | | 1/4" | 3/8" | 9/16" | 3/4" | 1" | 1-1/2" |
| 15SM/20SM Vee Stem (includes body option codes 1, 2, 3, & 4) | VEE | RSM407 | RSM607 | RSM907 | RSM1207 | RSM1607 | R15SM2407 |
| 15SM Regulating Stem (includes body option codes 1, 2, 3, & 4) | REG | RSM408 | RSM608 | R15SM908 | R15SM1208 | R15SM1608 | R15SM2408 |
| 20SM Regulating Stem (includes body option codes 1, 2, 3, & 4) | REG | RSM408 | RSM608 | R20SM908 | R20SM1208 | R20SM1608 | - |
| 15SM 2 Way, Replaceable Seat and Stem | VEE | RSM4872 | RSM6872 | R15SM9872 | R15SM12872 | R15SM16872 | R15SM24872 |
| | REG | RSM4882 | RSM6882 | R15SM9882 | R15SM12882 | R15SM16882 | R15SM24882 |
| 20SM 2 Way, Replaceable Seat and Stem | VEE | RSM4872 | RSM6872 | R20SM9872 | R20SM12872 | R20SM16872 | - |
| | REG | RSM4882 | RSM6882 | R20SM9882 | R20SM12882 | R20SM16882 | - |
| 15SM 3 Way, 2 Stem Manifold | VEE | RSM4075 | RSM6075 | RSM9075 | RSM12075 | RSM16075 | RSM24075 |
| | REG | RSM4085 | RSM6085 | R15SM9085 | R15SM12085 | R15SM16085 | R15SM24085 |
| 20SM 3 Way, 2 Stem Manifold | VEE | RSM4075 | RSM6075 | RSM9075 | RSM12075 | RSM16075 | - |
| | REG | RSM4085 | RSM6085 | R20SM9085 | R20SM12085 | R20SM16085 | - |

When ordering for valves bought with additional suffix options, please include those exact suffix codes when ordering repair kit. (Example: the stem for a manual valve is manufactured differently for a pneumatically actuated valve and the repair kit must include the exact actuator suffix codes)

Valve Manuals can be found on our website at www.Autoclave.com.

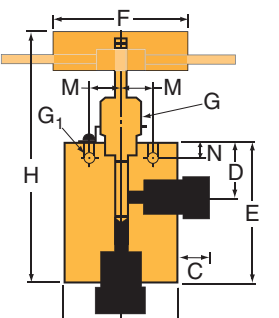
Connection, Running and Seating Torques can be found in the product manual or in our Tools and Installation Catalog Section

SM Series Needle Valve Dimensions:

| 2 Way Straight - 15SM | | | | | | |
|--|----------------------------|----------------------|------------------------|------------------------|------------------------|------------------|
| | | Catalog Number | | | | |
| Stem Type | VEE REG | 15SM9071 15SM9081 | 15SM12071 15SM12081 | 15SM16071 15SM16081 | 15SM24071 15SM24081 | |
| Outside Diameter Tube | | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) | 1.50 (38.10) | |
| Orifice Diameter | | 0.359 (9.12) | 0.516 (13.11) | 0.688 (17.48) | 0.937 (23.80) | |
| | Dimensions: inches (mm) | A | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) | 5.75 (146.05) |
| | B | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) | 2.88 (73.03) | |
| | C | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) | 1.00 (25.40) | |
| | D | 2.38 (60.45) | 3.00 (76.20) | 3.75 (95.25) | 5.25 (133.35) | |
| | D1 | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) | 3.75 (95.25) | |
| | E | 2.88 (73.15) | 3.75 (95.25) | 4.63 (117.60) | 6.44 (163.53) | |
| | F | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) | 23.75 (603.25) | |
| | G | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) | N/A (N/A) | |
| | G1 | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) | 0.75 (19.05) | |
| | H* | 5.93 (150.86) | 7.00 (177.80) | 9.00 (228.84) | 11.04 (280.42) | |
| | M | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) | 1.88 (47.63) | |
| | N | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) | 1.50 (38.10) | |
| Bar handle replaces Blue "T" handle on sizes 3/4" and up | | | | | | |
| Block Thickness | | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) | 2.25 (57.19) | |

Bar handle replaces Blue "T" handle on sizes 3/4" and up

| 2 Way Straight - 20SM | | | | |
|-----------------------|----------------------|----------------------|------------------------|------------------------|
| Catalog Number | | | | |
| 20SM4071 20SM4081 | 20SM6071 20SM6081 | 20SM9071 20SM9081 | 20SM12071 20SM12081 | 20SM16071 20SM16081 |
| 1/4 (6.35) | 3/8 (9.53) | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) |
| 0.125 (3.18) | 0.219 (5.56) | 0.312 (7.92) | 0.438 (11.13) | 0.562 (14.27) |
| 2.00 (50.80) | 2.00 (50.80) | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) |
| 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) |
| 0.38 (9.65) | 0.47 (11.94) | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) |
| 1.62 (41.15) | 1.62 (41.15) | 2.38 (60.45) | 3.00 (76.20) | 3.75 (95.25) |
| 1.19 (30.23) | 1.19 (30.23) | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) |
| 2.00 (50.80) | 2.00 (50.80) | 2.88 (73.15) | 3.75 (95.25) | 4.63 (117.60) |
| 3.00 (76.20) | 3.00 (76.20) | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) |
| 0.22 (5.59) | 0.22 (5.59) | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) |
| 4.69 (119.13) | 4.63 (117.48) | 5.93 (150.86) | 7.00 (177.80) | 9.00 (228.84) |
| 0.62 (15.75) | 0.62 (15.75) | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) |
| 0.38 (9.65) | 0.38 (9.65) | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

| 2 Way Angle - 15SM | | | | | | |
|---|----------------------------|----------------------|------------------------|------------------------|------------------------|------------------|
| | | Catalog Number | | | | |
| Stem Type | VEE REG | 15SM9072 15SM9082 | 15SM12072 15SM12082 | 15SM16072 15SM16082 | 15SM24072 15SM24082 | |
| Outside Diameter Tube | | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) | 1.50 (38.10) | |
| Orifice Diameter | | 0.359 (9.12) | 0.516 (13.11) | 0.688 (17.48) | 0.937 (23.80) | |
|  | Dimensions: inches (mm) | A | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) | 5.75 (146.05) |
| | B | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) | 2.88 (73.03) | |
| | C | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) | 1.00 (25.40) | |
| | D | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) | 3.75 (95.25) | |
| | D1 | - | - | - | - | |
| | E | 3.38 (85.85) | 4.25 (107.95) | 5.12 (130.05) | 6.75 (171.45) | |
| | F | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) | 23.75 (603.25) | |
| | G | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) | N/A (N/A) | |
| | G1 | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) | 0.75 (19.05) | |
| | H* | 6.43 (163.56) | 7.50 (190.50) | 9.00 (228.84) | 11.35 (288.32) | |
| | M | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) | 1.88 (47.63) | |
| | N | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) | 1.50 (38.10) | |
| Bar handle replaces Blue "T" handle on sizes 3/4" and up | | | | | | |
| Block Thickness | | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) | 2.25 (57.19) | |

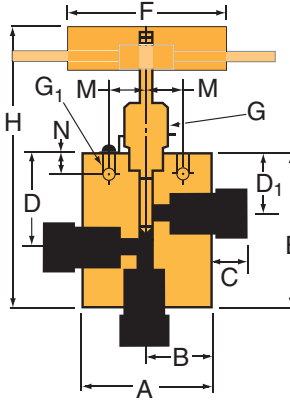
Bar handle replaces Blue "T" handle on sizes 3/4" and up

| 2 Way Angle - 20SM | | | | |
|----------------------|----------------------|----------------------|------------------------|------------------------|
| Catalog Number | | | | |
| 20SM4072 20SM4082 | 20SM6072 20SM6082 | 20SM9072 20SM9082 | 20SM12072 20SM12082 | 20SM16072 20SM16082 |
| 1/4 (6.35) | 3/8 (9.53) | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) |
| 0.125 (3.18) | 0.219 (5.56) | 0.312 (7.92) | 0.438 (11.13) | 0.562 (14.27) |
| 2.00 (50.80) | 2.00 (50.80) | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) |
| 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) |
| 0.38 (9.65) | 0.47 (11.94) | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) |
| 1.19 (30.23) | 1.19 (30.23) | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) |
| - | - | - | - | - |
| 2.44 (61.90) | 2.44 (61.90) | 3.38 (85.85) | 4.25 (107.95) | 5.12 (130.05) |
| 3.00 (76.20) | 3.00 (76.20) | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) |
| 0.22 (5.59) | 0.22 (5.59) | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) |
| 4.81 (122.25) | 4.81 (122.25) | 6.43 (163.56) | 7.50 (190.50) | 9.00 (228.84) |
| 0.62 (15.75) | 0.62 (15.75) | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) |
| 0.38 (9.65) | 0.38 (9.65) | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

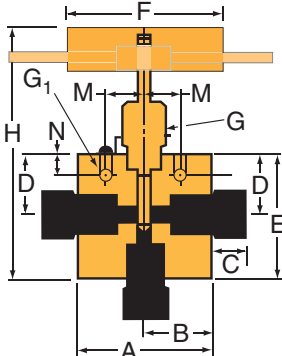
H* - Dimension is with stem in closed position

All dimensions for reference only and subject to change • For prompt service, Parker Autoclave stocks select products. Consult factory.

SM Series Needle Valve Dimensions:

| 3 Way, 2 On Pressure - 15SM | | | | | | |
|---|------------|----------------------|------------------------|------------------------|------------------------|-------------------|
| | | Catalog Number | | | | |
| Stem Type | VEE REG | 15SM9073 15SM9083 | 15SM12073 15SM12083 | 15SM16073 15SM16083 | 15SM24073 15SM24083 | |
| Outside Diameter Tube | | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) | 1.50 (38.10) | |
| Orifice Diameter | | 0.359 (9.12) | 0.516 (13.11) | 0.688 (17.48) | 0.937 (23.80) | |
| Dimensions: inches (mm) | | A | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) | 5.75 (146.05) |
|  | | B | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) | 2.88 (73.03) |
| | | C | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) | 1.00 (25.40) |
| | | D | 2.38 (60.45) | 3.00 (76.20) | 3.75 (95.25) | 5.25 (133.35) |
| | | D1 | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) | 3.75 (95.25) |
| | | E | 3.63 (92.08) | 4.63 (117.48) | 5.88 (149.50) | 8.13 (206.38) |
| | | F | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) | 23.75 (603.25) |
| | | G | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) | N/A (N/A) |
| | | G1 | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) | 0.75 (19.05) |
| | | H* | 6.52 (165.59) | 7.88 (200.03) | 9.75 (247.89) | 12.73 (323.22) |
| | | M | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) | 1.88 (47.63) |
| | | N | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) | 1.50 (38.10) |
| | | Block Thickness | | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

| 3 Way, 2 On Pressure - 20SM | | | | |
|-----------------------------|----------------------|----------------------|------------------------|------------------------|
| Catalog Number | | | | |
| 20SM4073 20SM4083 | 20SM6073 20SM6083 | 20SM9073 20SM9083 | 20SM12073 20SM12083 | 20SM16073 20SM16083 |
| 1/4 (6.35) | 3/8 (9.53) | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) |
| 0.125 (3.18) | 0.219 (5.56) | 0.312 (7.92) | 0.438 (11.13) | 0.562 (14.27) |
| 2.00 (50.80) | 2.00 (50.80) | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) |
| 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) |
| 0.38 (9.65) | 0.47 (11.94) | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) |
| 1.63 (41.28) | 1.63 (41.28) | 2.38 (60.45) | 3.00 (76.20) | 3.75 (95.25) |
| 1.19 (30.23) | 1.19 (30.23) | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) |
| 2.63 (66.68) | 2.63 (66.68) | 3.63 (92.08) | 4.63 (117.48) | 5.88 (149.35) |
| 3.00 (76.20) | 3.00 (76.20) | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) |
| 0.22 (5.59) | 0.22 (5.59) | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) |
| 5.00 (127.00) | 5.00 (127.00) | 6.51 (165.59) | 7.88 (200.03) | 9.75 (247.89) |
| 0.62 (15.75) | 0.62 (15.75) | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) |
| 0.38 (9.65) | 0.38 (9.65) | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

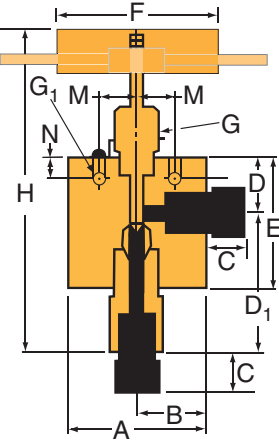
| 3 Way, 1 On Pressure - 15SM | | | | | | |
|---|------------|----------------------|------------------------|------------------------|------------------------|-------------------|
| | | Catalog Number | | | | |
| Stem Type | VEE REG | 15SM9074 15SM9084 | 15SM12074 15SM12084 | 15SM16074 15SM16084 | 15SM24074 15SM24084 | |
| Outside Diameter Tube | | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) | 1.50 (38.10) | |
| Orifice Diameter | | 0.359 (9.12) | 0.516 (13.11) | 0.688 (17.48) | 0.937 (23.80) | |
| Dimensions: inches (mm) | | A | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) | 5.75 (146.05) |
|  | | B | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) | 2.88 (73.03) |
| | | C | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) | 1.00 (25.40) |
| | | D | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) | 3.75 (95.25) |
| | | D1 | - | - | - | - |
| | | E | 3.38 (85.85) | 4.25 (107.95) | 5.12 (130.05) | 6.63 (168.28) |
| | | F | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) | 23.75 (603.25) |
| | | G | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) | N/A (N/A) |
| | | G1 | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) | 0.75 (19.05) |
| | | H* | 6.31 (160.56) | 7.50 (190.50) | 9.09 (231.13) | 11.23 (285.06) |
| | | M | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) | 1.88 (47.63) |
| | | N | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) | 1.50 (38.10) |
| | | Block Thickness | | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

| 3 Way, 1 On Pressure - 20SM | | | | |
|-----------------------------|----------------------|----------------------|------------------------|------------------------|
| Catalog Number | | | | |
| 20SM4074 20SM4084 | 20SM6074 20SM6084 | 20SM9074 20SM9084 | 20SM12074 20SM12084 | 20SM16074 20SM16084 |
| 1/4 (6.35) | 3/8 (9.53) | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) |
| 0.125 (3.18) | 0.219 (5.56) | 0.312 (7.92) | 0.438 (11.13) | 0.562 (14.27) |
| 2.00 (50.80) | 2.00 (50.80) | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) |
| 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) |
| 0.38 (9.65) | 0.47 (11.94) | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) |
| 1.19 (30.23) | 1.19 (30.23) | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) |
| - | - | - | - | - |
| 2.44 (61.90) | 2.44 (61.90) | 3.38 (85.85) | 4.25 (107.95) | 5.12 (130.05) |
| 3.00 (76.20) | 3.00 (76.20) | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) |
| 0.22 (5.59) | 0.22 (5.59) | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) |
| 4.81 (122.25) | 4.81 (122.25) | 6.31 (160.65) | 7.50 (190.50) | 9.00 (228.84) |
| 0.62 (15.75) | 0.62 (15.75) | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) |
| 0.38 (9.65) | 0.38 (9.65) | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

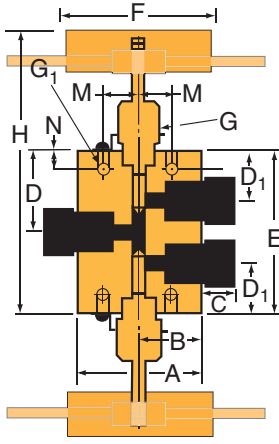
H* - Dimension is with stem in closed position

All dimensions for reference only and subject to change • For prompt service, Parker Autoclave stocks select products. Consult factory.

SM Series Needle Valve Dimensions:

| 2 Way Angle Replaceable Seat - 15SM | | | | | |
|---|---------|----------------------|------------------------|------------------------|------------------------|
| | | Catalog Number | | | |
| Stem Type | VEE REG | 15SM9872 15SM9882 | 15SM12872 15SM12882 | 15SM16872 15SM16882 | 15SM24872 15SM24882 |
| Outside Diameter Tube | | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) | 1.50 (38.10) |
| Orifice Diameter | | 0.359 (9.12) | 0.516 (13.11) | 0.688 (17.48) | 0.937 (23.80) |
| Dimensions: inches (mm) | | | | | |
|  | A | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) | 5.75 (146.05) |
| | B | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) | 2.88 (73.03) |
| | C | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) | 1.00 (25.40) |
| | D | 1.75 (44.45) | 2.25 (57.15) | 2.69 (68.33) | 3.75 (95.25) |
| | D1 | 2.50 (63.50) | 3.44 (87.38) | 4.38 (111.13) | 5.22 (132.59) |
| | E | 3.38 (85.85) | 4.25 (107.95) | 5.25 (133.35) | 6.75 (171.45) |
| | F | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) | 23.75 (603.25) |
| | G | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) | N/A (N/A) |
| | G1 | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) | 0.75 (19.05) |
| | H* | 7.34 (186.68) | 9.00 (228.60) | 11.00 (279.64) | 13.57 (344.68) |
| | M | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) | 1.88 (47.63) |
| | N | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) | 1.50 (38.10) |
| Block Thickness | | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) | 2.25 (57.19) |

| 2 Way Angle Replaceable Seat - 20SM | | | | |
|-------------------------------------|----------------------|----------------------|------------------------|------------------------|
| Catalog Number | | | | |
| 20SM4872 20SM4882 | 20SM6872 20SM6882 | 20SM9872 20SM9882 | 20SM12872 20SM12882 | 20SM16872 20SM16882 |
| 1/4 (6.35) | 3/8 (9.53) | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) |
| 0.125 (3.18) | 0.219 (5.56) | 0.312 (7.92) | 0.438 (11.13) | 0.562 (14.27) |
| 2.00 (50.80) | 2.00 (50.80) | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) |
| 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) |
| 0.38 (9.65) | 0.47 (11.94) | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) |
| 1.19 (30.23) | 1.19 (30.23) | 1.75 (44.45) | 2.25 (57.15) | 2.69 (68.33) |
| 2.13 (53.98) | 2.13 (53.98) | 2.50 (63.50) | 3.44 (87.38) | 4.38 (111.13) |
| 2.25 (57.15) | 2.25 (57.15) | 3.13 (79.38) | 4.25 (107.95) | 5.25 (133.35) |
| 3.00 (76.20) | 3.00 (76.20) | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) |
| 0.22 (5.59) | 0.22 (5.59) | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) |
| 5.75 (146.05) | 5.75 (146.05) | 7.34 (186.68) | 9.00 (228.60) | 11.00 (279.64) |
| 0.62 (15.75) | 0.62 (15.75) | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) |
| 0.38 (9.65) | 0.38 (9.65) | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

| 3 Way, 2 On Pressure - 15SM | | | | | |
|---|---------|----------------------|------------------------|------------------------|------------------------|
| | | Catalog Number | | | |
| Stem Type | VEE REG | 15SM9075 15SM9085 | 15SM12075 15SM12085 | 15SM16075 15SM16085 | 15SM24075 15SM24085 |
| Outside Diameter Tube | | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) | 1.50 (38.10) |
| Orifice Diameter | | 0.359 (9.12) | 0.516 (13.11) | 0.688 (17.48) | 0.937 (23.80) |
| Dimensions: inches (mm) | | | | | |
|  | A | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) | 5.75 (146.05) |
| | B | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) | 2.88 (73.03) |
| | C | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) | 1.00 (25.40) |
| | D | 2.56 (65.07) | 3.25 (82.55) | 3.75 (95.25) | 5.25 (133.35) |
| | D1 | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) | 3.75 (95.25) |
| | E | 5.13 (130.18) | 6.50 (165.10) | 7.50 (190.50) | 10.50 (266.70) |
| | F | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) | 23.75 (603.25) |
| | G | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) | N/A (N/A) |
| | G1 | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) | 0.75 (19.05) |
| | H* | 8.13 (206.50) | 9.75 (247.65) | 12.18 (309.40) | 15.10 (383.54) |
| | M | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) | 1.88 (47.63) |
| | N | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) | 1.50 (38.10) |
| Block Thickness | | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) | 2.25 (57.19) |

| 3 Way, 2 On Pressure - 20SM | | | | |
|-----------------------------|----------------------|----------------------|------------------------|------------------------|
| Catalog Number | | | | |
| 20SM4075 20SM4085 | 20SM6075 20SM6085 | 20SM9075 20SM9085 | 20SM12075 20SM12085 | 20SM16075 20SM16085 |
| 1/4 (6.35) | 3/8 (9.53) | 9/16 (14.29) | 3/4 (19.05) | 1 (25.40) |
| 0.125 (3.18) | 0.219 (5.56) | 0.312 (7.92) | 0.438 (11.13) | 0.562 (14.27) |
| 2.00 (50.80) | 2.00 (50.80) | 2.50 (63.50) | 3.00 (76.20) | 4.12 (104.65) |
| 1.00 (25.40) | 1.00 (25.40) | 1.25 (31.75) | 1.50 (38.10) | 2.06 (53.32) |
| 0.38 (9.65) | 0.47 (11.94) | 0.53 (13.46) | 0.62 (15.75) | 0.63 (16.00) |
| 1.69 (42.85) | 1.69 (42.85) | 2.56 (65.07) | 3.25 (82.55) | 3.75 (95.25) |
| 1.19 (30.15) | 1.19 (30.15) | 1.75 (44.45) | 2.25 (57.15) | 2.81 (71.37) |
| 3.38 (85.73) | 3.38 (85.73) | 5.13 (130.18) | 6.50 (165.10) | 7.50 (190.50) |
| 3.00 (76.20) | 3.00 (76.20) | 4.00 (101.60) | 10.25 (260.35) | 10.25 (260.35) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.12 (28.45) | 1.62 (41.15) |
| 0.22 (5.59) | 0.22 (5.59) | 0.34 (8.64) | 0.44 (11.18) | 0.56 (14.22) |
| 5.69 (144.50) | 5.69 (144.50) | 8.13 (206.50) | 9.75 (247.65) | 12.18 (309.40) |
| 0.62 (15.75) | 0.62 (15.75) | 0.69 (17.53) | 0.88 (22.35) | 1.25 (31.75) |
| 0.38 (9.65) | 0.38 (9.65) | 0.50 (12.70) | 0.63 (16.00) | 1.13 (28.70) |
| 0.75 (19.05) | 0.75 (19.05) | 1.00 (25.40) | 1.38 (35.05) | 1.75 (44.45) |

H* - Dimension is with stem in closed position

All dimensions for reference only and subject to change • For prompt service, Parker Autoclave stocks select products. Consult factory.

Valve Options:

Pneumatic Valve Actuators:

The need to control process and vent valves from a remote location makes air operated valves a vital component to many processing operations. All Parker Autoclave Engineers' valves are available with piston type actuators. Five sizes of air actuators (light, mini-light, medium, heavy duty or extra heavy, single and double stage) are offered to meet the service requirements of Parker Autoclave Engineers' Low, Medium and High Pressure needle valves. Both air-to-open (normally closed) and air-to-close (normally open) designs are included in the product line. Optional air to open AND close actuators available upon request. Please see our Pneumatic Valve Actuator Brochure to help size the proper actuator for your application.

Electric Valve Actuators:

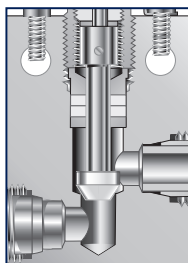
Remotely controlling process flow at high pressure enhances safety and lowers labor costs. Parker Autoclave Engineers developed a flow control valve available in several models including weatherproof and explosionproof options.

The Electrically Actuated Shut-off/Flow Regulating Actuator (FRC Series) is available for most of our SM Series Valves through 9/16" tubing size and full working pressure. Explosion proof version is rated for hydrogen service and can withstand wide process temperature ranges.

Stem Options:

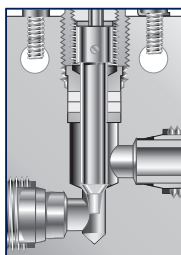
Most Parker Autoclave Engineers' valves are available with either Vee (on-off) or Regulating (Flow Control) Stems in our standard valve body seat or with our optional replaceable seat as shown below. For severe service stem (and replaceable seat if ordered) can be offered with N-Dura Diamond-Like coating (-CS suffix or -CSS (coated stem & seat)) or made from Stellite (-SS or -SSRS (Stellite stem, replaceable seat)).:

VEE Stem



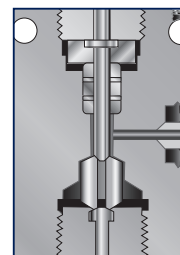
The Vee stem is used for direct on-off, metal-to-metal shut-off with quick-opening flow characteristics.

Regulating Stem



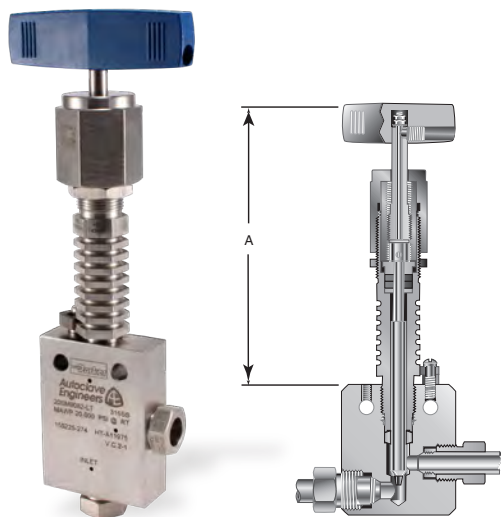
In some applications, more precise flow control is required than is possible with a Vee stem. For these cases, Autoclave offers a non-rotating, two-piece regulating stem which can be used for both control and shut-off. While it is not as precise as the control associated with the MicroMetering stem, especially with smaller flows, it does offer substantially better control than the Vee stem.

Replaceable Seat (with Vee Stem)



Replaceable seat option is only available with Right-Angle Style body. Replaceable seat is supplied as standard with an additional seat - rotate to use second side. Can be used with either stem type. Options include Stellite material or N-Dura coating to increase service life.

Valve Options:



High/Low Temperature Extension:

Used in extreme temperature applications to move packing from flow stream with heatsink to moderate temperature.

- HT High Temperature (over 800°F (427°C))
- LT Low Temperature (under -100°F (-73°C))

| Valve Series | Outside Diameter Tube Size (inches) | Dimensions "A" inches (mm) |
|----------------------|-------------------------------------|----------------------------|
| 15SM and 20SM | 1/4" | 5.50 (140) |
| | 3/8" | 5.50 (140) |
| | 9/16" | 6.31 (160) |
| | 3/4" | 6.31 (160) |
| | 1" | 6.31 (160) |
| | 1-1/2" | 13.1 (333) |

HT option code includes Graphite (-GY) packing
LT option code includes 316 SS Trim material and PTFE packing



ES Stem Extender:

Stem extenders are offered for High and Low temperature operation or to extend through panel or barricade.

To order valve with Stem Extender, add "ES-" and length (6", 12", 18", 24") to beginning of valve part number e.g. ES12-20SM6071. Other lengths to special order.

To order Stem Extender only, provide valve model prefix e.g. ES12-20SM6. Handle not included – use same provided with original valve.



Needle Valve Clam Shell Handle Lockout:

(order separately using part numbers shown below, padlock not included)

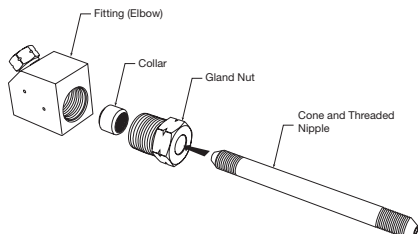
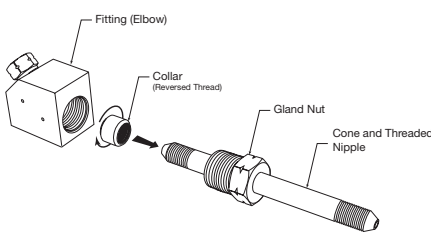
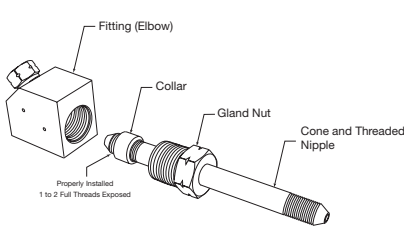
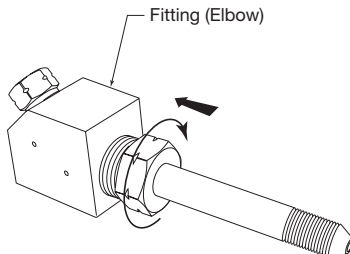
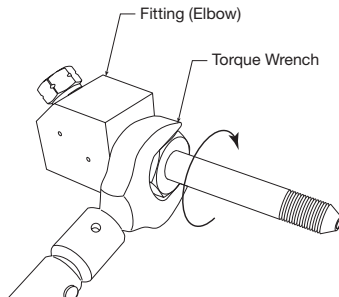
Clam Shell Handle locks are provided to lockout valves in open or closed position preventing unauthorized personnel from actuating valve during shutdown or emergency situations. This clamshell design is available in four (4) sizes dependent on handle length:

- P/N AE004855 – 1" to 2.5" handle length
- P/N 90088 – 2.5" to 5.0" handle length
- P/N 90194 – 6.5" to 10" handle length
- P/N AE004350 – 8" to 13" handle length

Assembly Instructions

SM Series Medium Pressure Needle Valve - Pressures to 20,000 psi (1379 bar)

SM Medium Pressure Connection: Step by Step Assembly Instructions

| Step 1 | Step 2 | Step 3 | | | | | | | | | | | | | | | | | | | | |
|---|---|--|--------------|-----------------------------|---------------|---------|---------------|---------|----------------|---------|----------------|---------|---------------|----------|---------------|----------|-------------|-----------|-------------|-----------|-----------------|-----------|
|  |  |  | | | | | | | | | | | | | | | | | | | | |
| <p>Insert Coned and Threaded Nipple through Gland</p> <p>(Typical Tee Fitting Assembly consisting of Fitting Body, Collar, Gland, and Coned and Threaded Nipple or Tube End.)</p> | <p>Thread Collar turning (Reverse Threaded to prevent rotation during torque process) onto Coned and Threaded Nipple end.</p> | <p>For proper Collar placement, thread Collar onto Nipple leaving 1 to 2 full threads exposed on Fitting side of Collar. Lubricate Gland Threads with anti-seize compound and tube tip with process compatible lubricant (do not use metal-flake type)</p> | | | | | | | | | | | | | | | | | | | | |
| Step 4 | Step 5 | SM Medium Pressure Gland Torque | | | | | | | | | | | | | | | | | | | | |
|  |  | <p>For 316/316L SS, 2507 Super Duplex Tubing & Adapters</p> <table><tr><th>Fitting Size</th><th>Required Torque ft-lb (N.m)</th></tr><tr><td>1/4" MP-20Ksi</td><td>20 (27)</td></tr><tr><td>3/8" MP-20Ksi</td><td>30 (75)</td></tr><tr><td>9/16" MP-15Ksi</td><td>55 (75)</td></tr><tr><td>9/16" MP-20Ksi</td><td>55 (75)</td></tr><tr><td>3/4" MP-15Ksi</td><td>75 (102)</td></tr><tr><td>3/4" MP-20Ksi</td><td>90 (122)</td></tr><tr><td>1" MP-15Ksi</td><td>135 (187)</td></tr><tr><td>1" MP-20Ksi</td><td>135 (187)</td></tr><tr><td>1-1/2" MP-15Ksi</td><td>200 (272)</td></tr></table> <p>For torques and optional materials (lower pressures), see Tools and Installation Catalog 02-0149SE</p> | Fitting Size | Required Torque ft-lb (N.m) | 1/4" MP-20Ksi | 20 (27) | 3/8" MP-20Ksi | 30 (75) | 9/16" MP-15Ksi | 55 (75) | 9/16" MP-20Ksi | 55 (75) | 3/4" MP-15Ksi | 75 (102) | 3/4" MP-20Ksi | 90 (122) | 1" MP-15Ksi | 135 (187) | 1" MP-20Ksi | 135 (187) | 1-1/2" MP-15Ksi | 200 (272) |
| Fitting Size | Required Torque ft-lb (N.m) | | | | | | | | | | | | | | | | | | | | | |
| 1/4" MP-20Ksi | 20 (27) | | | | | | | | | | | | | | | | | | | | | |
| 3/8" MP-20Ksi | 30 (75) | | | | | | | | | | | | | | | | | | | | | |
| 9/16" MP-15Ksi | 55 (75) | | | | | | | | | | | | | | | | | | | | | |
| 9/16" MP-20Ksi | 55 (75) | | | | | | | | | | | | | | | | | | | | | |
| 3/4" MP-15Ksi | 75 (102) | | | | | | | | | | | | | | | | | | | | | |
| 3/4" MP-20Ksi | 90 (122) | | | | | | | | | | | | | | | | | | | | | |
| 1" MP-15Ksi | 135 (187) | | | | | | | | | | | | | | | | | | | | | |
| 1" MP-20Ksi | 135 (187) | | | | | | | | | | | | | | | | | | | | | |
| 1-1/2" MP-15Ksi | 200 (272) | | | | | | | | | | | | | | | | | | | | | |
| <p>Insert Tube/Gland assembly into Fitting body, turning clockwise approximately 4-5 threads (if unable to turn full distance by hand, look for misalignment issues with tubing and correct for proper seal).</p> | <p>Use Torque Wrench to properly set (see chart in next frame) Cone & Thread Connections. (Available with wrench adapters in Tools and Installation brochure)</p> | | | | | | | | | | | | | | | | | | | | | |