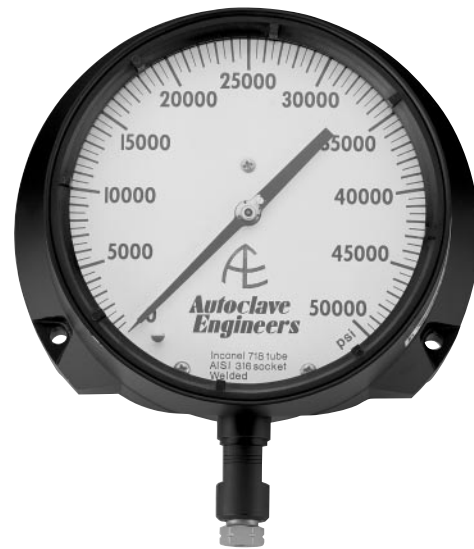


# Metric Series

## High Pressure

*Pressures to 4000 bar (58016 psi)*

Autoclave Engineers offers a complete line of high-pressure Metric valves, fittings, and tubing. This line features the same quality built design and function as our standard 60VM series, in a metric format. As the leader in the high pressure industry, Autoclave has earned a reputation for reliable and efficient product performance while servicing markets in chemical/petrochemical, research, oil and gas, waterjet, and waterblast industries since 1945.



**Autoclave  
Engineers** 

Fluid Components  
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**Metric Series**





# Metric Series - Air Operated Valves

Pressures to 4000 bar (58016 psi)

## Dimensions of the Air Operator

Actuators type: O1S and O2S	Actuators type: C1S and C2S	Dimensions- mm (inches)			
		Actuator type	A	B	Piston stages
		O1S	208.6 (8.21)	144.5 (5.69)	1
		C1S	138.5 (5.45)	144.5 (5.69)	1
		O2S	301.8 (11.88)	144.5 (5.69)	2
		C2S	215.9 (8.50)	144.5 (5.69)	2

## Air Operator materials

Cylinder, piston, cover plates, spring housing: Anodized aluminum (for corrosion and wear resistance) Yoke: Painted Steel

- Technical Data**
- Maximum allowable working pressure: 7 bar (101.5 psi)
  - Allowable piston temperature: -30° to +90°C (-22° to 194.°F)
  - Area of piston: O1S and C1S types: 125 cm<sup>2</sup> (19.37 in<sup>2</sup>)  
O2S and C2S types: 250 cm<sup>2</sup> (38.75 in<sup>2</sup>)
  - Approximate air usage/cycle at 7 bar:  
O1S and C1S types: .0011 SCM (.04 SCF)  
O2S and C2S types: .0025 SCM (.08 SCF)

## Air-to-Close Type (normally open)

Valve Catalog Number	Operator Duty	System pressure - bar (psi)												Maximum Pressure bar (psi)
		600 (8,702)	800 (11,603)	1200 (17,405)	1400 (20,306)	1600 (23,206)	2000 (29,008)	2400 (34,810)	2800 (40,611)	3000 (43,512)	3200 (46,413)	3600 (52,214)	4000 (58,016)	

## Series NM400VM Valves

Valve Catalog Number	Operator Duty	Air Pressure: bar (psi)	System pressure - bar (psi)												Maximum Pressure bar (psi)
			600 (8,702)	800 (11,603)	1200 (17,405)	1400 (20,306)	1600 (23,206)	2000 (29,008)	2400 (34,810)	2800 (40,611)	3000 (43,512)	3200 (46,413)	3600 (52,214)	4000 (58,016)	
NM400VM4071-C1S	Medium Duty C1S Series	2.30	2.70	3.50	3.90	4.30	5.00	5.80	6.60	7.00				3,000 (43,512)	
NM400VM4072-C1S		(33)	(39)	(51)	(57)	(62)	(73)	(84)	(96)	(102)					
NM400VM6071-C1S		6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40					
NM400VM6072-C1S		(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)					
NM400VM9071-C1S	Flow Coefficient Cv	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25					
NM400VM9072-C1S		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25					

## Series NM200VM Valves

Valve Catalog Number	Operator Duty	Air Pressure: bar (psi)	System pressure - bar (psi)												Maximum Pressure bar (psi)
			600 (8,702)	800 (11,603)	1200 (17,405)	1400 (20,306)	1600 (23,206)	2000 (29,008)	2400 (34,810)	2800 (40,611)	3000 (43,512)	3200 (46,413)	3600 (52,214)	4000 (58,016)	
NM200VM9071-C1S	Medium Duty C1S Series	3.50	4.30	5.80	6.60									1,400 (20,306)	
NM200VM9072-C1S		(51)	(62)	(84)	(96)										
		6.40	6.40	6.40	6.40										
	Flow Coefficient Cv	0.78	0.78	0.78	0.78										
		0.78	0.78	0.78	0.78										

## Series NM400VM Valves

Valve Catalog Number	Operator Duty	Air Pressure: bar (psi)	System pressure - bar (psi)												Maximum Pressure bar (psi)
			600 (8,702)	800 (11,603)	1200 (17,405)	1400 (20,306)	1600 (23,206)	2000 (29,008)	2400 (34,810)	2800 (40,611)	3000 (43,512)	3200 (46,413)	3600 (52,214)	4000 (58,016)	
NM400VM4071-C2S	Heavy Duty C2S Series	1.00	1.10	1.50	1.70	1.90	2.30	2.70	3.10	3.30	3.35	3.80	4.20	4,000 (58,016)	
NM400VM4072-C2S		(15)	(16)	(22)	(25)	(28)	(33)	(39)	(45)	(48)	(51)	(55)	(61)		
NM400VM6071-C2S		6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40		
NM400VM6072-C2S		(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)		
NM400VM9071-C2S	Flow Coefficient Cv	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		
NM400VM9072-C2S		0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		

## Series NM200VM Valves

Valve Catalog Number	Operator Duty	Air Pressure: bar (psi)	System pressure - bar (psi)												Maximum Pressure bar (psi)
			600 (8,702)	800 (11,603)	1200 (17,405)	1400 (20,306)	1600 (23,206)	2000 (29,008)	2400 (34,810)	2800 (40,611)	3000 (43,512)	3200 (46,413)	3600 (52,214)	4000 (58,016)	
NM200VM9071-C2S	Heavy Duty C2S Series	1.50	1.90	2.70	3.10	3.50	4.20							2,000 (29,008)	
NM200VM9072-C2S		(22)	(28)	(39)	(45)	(51)	(61)								
		6.40	6.40	6.40	6.40	6.40	6.40								
	Flow Coefficient Cv	0.78	0.78	0.78	0.78	0.78	0.78								
		0.78	0.78	0.78	0.78	0.78	0.78								

All general terms and conditions of sale, including limitations of our liability, apply to all products and services sold.

## Air-to-Open Type ( normally closed)

Valve Catalog Number	Operator Duty	System pressure - bar (psi)												Maximum Pressure bar (psi)
		600 (8,702)	800 (11,603)	1200 (17,405)	1400 (20,306)	1600 (23,206)	2000 (29,008)	2400 (34,810)	2800 (40,611)	3000 (43,512)	3200 (46,413)	3600 (52,214)	4000 (58,016)	

### Series NM400VM Valves

NM400VM4071-01S	Medium Duty 01S Series	Air Pressure: bar (psi)	3.80	4.20	4.90	5.40	5.70	6.50	6.40	6.40	6.50				4,000 (58,016)
NM400VM4072-01S			(55)	(61)	(71)	(78)	(83)	(94)	(93)	(93)	(94)				
NM400VM6071-01S		String	2.90	3.90	5.80	6.70	7.70	9.60	11.60	13.50	14.50				
NM400VM6072-01S		Pre-Compression: mm (in)	(0.11)	(0.15)	(0.23)	(0.26)	(0.30)	(0.38)	(0.46)	(0.53)	(0.57)				
NM400VM9071-01S		Stem travel: (mm)	6.40	6.40	6.40	6.40	6.40	6.40	4.10	2.30	1.50				
NM400VM9072-01S			(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.16)	(0.09)	(0.06)				
		Flow Coefficient Cv	0.25	0.25	0.25	0.25	0.25	0.25	0.23	0.22	0.21				

### Series NM200VM Valves

	Medium Duty 01S Series	Air Pressure: bar (psi)	5	5.7	6.0	6.4									1,400 (20,306)
			(73)	(83)	(87)	(93)									
NM200VM9071-01S		String	5.80	7.70	11.60	13.50									
NM200VM9072-01S		Pre-Compression: mm (in)	(0.23)	(0.30)	(0.46)	(0.53)									
		Stem travel: (mm)	6.40	6.40	3.00	2.30									
			(0.25)	(0.25)	(0.12)	(0.09)									
		Flow Coefficient Cv	0.78	0.78	0.74	0.70									

### Series NM400VM Valves

NM400VM4071-02S	Heavy Duty 02S Series	Air Pressure: bar (psi)	2.50	2.90	3.30	3.50	3.60	4.00	4.40	4.80	5.00	5.30	5.20	5.20	4,000 (58,016)
NM400VM4072-02S			(36)	(42)	(48)	(51)	(52)	(58)	(64)	(70)	(73)	(77)	(75)	(75)	
NM400VM6071-02S		String	2.30	2.40	3.60	4.20	4.80	6.00	7.20	8.40	9.00	9.60	10.06	12.00	
NM400VM6072-02S		Pre-Compression: mm (in)	(0.09)	(0.09)	(0.14)	(0.17)	(0.19)	(0.24)	(0.28)	(0.33)	(0.35)	(0.38)	(0.42)	(0.47)	
NM400VM9071-02S		Stem travel: (mm)	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	6.40	5.10	4.10	
NM400VM9072-02S			(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.20)	(0.16)	
		Flow Coefficient Cv	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25		

### Series NM200VM Valves

	Heavy Duty 02S Series	Air Pressure: bar (psi)	3.30	3.60	4.40	4.80	5.20	5.20							2,000 (29,008)
			(48)	(52)	(64)	(70)	(75)	(75)							
NM200VM9071-02S		String	3.60	4.80	7.20	8.40	9.60	12.0							
NM200VM9072-02S		Pre-Compression: mm (in)	(0.14)	(0.19)	(0.28)	(0.33)	(0.38)	(0.47)							
		Stem travel: (mm)	6.40	6.40	6.40	6.40	6.40	4.00							
			(0.25)	(0.25)	(0.25)	(0.25)	(0.16)								
		Flow Coefficient Cv	0.78	0.78	0.78	0.78	0.78	0.73							

**Caution:** While testing has shown O-rings to provide satisfactory service life, both cyclic and shelf life may vary widely with differing service conditions, properties of reactants, pressure and temperature cycling and age of the O-ring. FREQUENT INSPECTIONS SHOULD BE MADE to detect any deterioration, and O-rings replaced as required.

\*Maximum pressure rating is based on the lowest rating of any component. Actual working pressure may be determined by tubing pressure rating, if lower.

All dimensions for reference only and subject to change.

For prompt service, Autoclave stocks select products. Consult your local representative.









# Metric Tubing

## Pressures to 4000 bar (58016 psi)

Autoclave Engineers offers a complete selection of austenetic, cold drawn stainless steel tubing designed to match the performance standards of Autoclave valves and fittings. Autoclave high pressure tubing is manufactured specifically for high pressure applications requiring both strength and corrosion resistance. The tubing is furnished in random lengths between 6 meters (20 feet) and 8.2 meters (27 feet). The average is 7.3 meters (24 feet). High pressure tubing is available in five sizes and a variety of materials. Special longer lengths are available. Consult factory.

### Inspection and Testing

Autoclave Engineer's high pressure tubing is inspected to assure freedom from seams, laps, fissures or other flaws, as well as carburization or intergranular carbide precipitation. The outside and inside diameters of the tubing are controlled within close tolerances. Sample pieces of tubing for each lot are tested to confirm mechanical properties. Hydrostatic testing is also performed on a statistical basis and is conducted at the working pressure of the tube. Autoclave will perform 100% hydrostatic testing at additional cost if desired.

### Special Materials

In addition to the type 316 and 304 stainless steel tubing listed in this section, Autoclave has limited stock of hard-to-obtain shorter lengths of the following tubing materials in some sizes:

*Monel 400\**, *Inconel 600\**, *Titanium Grade 2\**, *Nickel 200\**, *Hastelloy C276\** - (\* Trademark names)

Please consult factory for stock availability.

### Tubing Tolerance

Nominal Tubing Size  
mm (inches)

Tolerance/Outside Diameter  
mm (inches)

6.35 (1/4)

6.30/6.17 (.248/.243)

9.53 (3/8)

9.40/9.27 (.370/.365)

14.29 (9/16)

14.15/14.02 (.557/.552)

Catalog Number	Tube Material	Fits Connection Type	Tube Size Inches (mm)			Flow Area in. <sup>2</sup> (mm <sup>2</sup> )	Working Pressure psi (bar)*				
			Outside Diameter	Inside Diameter	Wall Thickness		-325 to 100°F -198 - 37.8°C	200°F 93°C	400°F 204°C	600°F 316°C	800°F 427°C

### 2000 BAR

MS15-089	316SS	MF250C	<b>6.35</b> (1/4)	<b>2.77</b> (0.109)	<b>1.78</b> (0.070)	<b>5.89</b> (0.009)	2,070	2,070	1,990	1,890	1,750
							<b>(30,023)</b>	<b>(30,023)</b>	<b>(28,863)</b>	<b>(27,413)</b>	<b>(25,382)</b>
MS15-191	304SS					2,070	1,950	1,780	1,750	1,670	
						<b>(30,023)</b>	<b>(28,283)</b>	<b>(25,817)</b>	<b>(25,382)</b>	<b>(24,222)</b>	
MS15-088	316SS	MF375C	<b>9.52</b> (3/8)	<b>5.16</b> (0.203)	<b>2.18</b> (0.086)	<b>20.93</b> (0.032)	2,070	2,070	1,990	1,890	1,750
							<b>(30,023)</b>	<b>(30,023)</b>	<b>(28,863)</b>	<b>(27,413)</b>	<b>(25,382)</b>
MS15-190	304SS					2,070	1,950	1,780	1,750	1,670	
						<b>(30,023)</b>	<b>(28,283)</b>	<b>(25,817)</b>	<b>(25,382)</b>	<b>(24,222)</b>	
MS15-086	316SS	MF562C200	<b>14.28</b> (9/16)	<b>7.92</b> (0.312)	<b>3.18</b> (0.125)	<b>49.72</b> (0.076)	2,070	2,070	1,990	1,890	1,750
							<b>(30,023)</b>	<b>(30,023)</b>	<b>(28,863)</b>	<b>(27,413)</b>	<b>(25,382)</b>
MS15-188	304SS					2,070	1,950	1,780	1,750	1,670	
						<b>(30,023)</b>	<b>(28,283)</b>	<b>(25,817)</b>	<b>(25,382)</b>	<b>(24,222)</b>	

### 4000 BAR

MS15-081	316SS	MF250C	<b>6.35</b> (1/4)	<b>2.11</b> (0.083)	<b>2.11</b> (0.083)	<b>3.27</b> (0.005)	4,140	4,140	3,980	3,780	3,500
							<b>(60,047)</b>	<b>(60,047)</b>	<b>(57,726)</b>	<b>(54,825)</b>	<b>(50,764)</b>
MS15-192	304SS					4,140	3,900	3,560	3,500	3,340	
						<b>(60,047)</b>	<b>(56,556)</b>	<b>(51,634)</b>	<b>(50,764)</b>	<b>(48,443)</b>	
MS15-087	316SS	MF375C	<b>9.52</b> (3/8)	<b>3.18</b> (0.125)	<b>3.18</b> (0.125)	<b>7.85</b> (0.012)	4,140	4,140	3,980	3,780	3,500
							<b>(60,047)</b>	<b>(60,047)</b>	<b>(57,726)</b>	<b>(54,825)</b>	<b>(50,764)</b>
MS15-183	304SS					4,140	3,900	3,560	3,500	3,340	
						<b>(60,047)</b>	<b>(56,556)</b>	<b>(51,634)</b>	<b>(50,764)</b>	<b>(48,443)</b>	
MS15-083	316SS	MF562C400	<b>14.28</b> (9/16)	<b>4.75</b> (0.187)	<b>4.75</b> (0.187)	<b>17.66</b> (0.027)	4,140	4,140	3,980	3,780	3,500
							<b>(60,047)</b>	<b>(60,047)</b>	<b>(57,726)</b>	<b>(54,825)</b>	<b>(50,764)</b>
MS15-185	304SS					4,140	3,900	3,560	3,500	3,340	
						<b>(60,047)</b>	<b>(56,556)</b>	<b>(51,634)</b>	<b>(50,764)</b>	<b>(48,443)</b>	

Note:

- Autofretted tubing available (see technical information section: Pressure Cycling for Autofretting information)
- For HighPressure, High Cycle (HPHC) tubing, MS15-201 and MS15-202 are available. (See Technical Information section: Pressure Cycling for additional information)

\* Maximum pressure rating is based on the lowest rating of any component. Actual working pressure may be determined by tubing pressure rating, if lower.

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# Metric Coned-and-Threaded Nipples

## Pressures to 4000 bar (58016 psi)

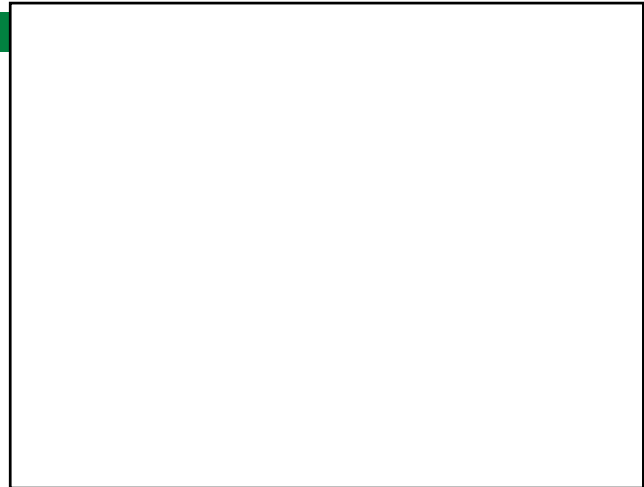
For rapid system make-up, Autoclave Engineers supplies pre-cut, coned-and-threaded nipples in various sizes and lengths for Autoclave high pressure valves and fittings.

### Special lengths

In addition to the standard lengths listed in the table below, nipples are available in any custom length. Consult factory.

### Materials\*\*

Catalog numbers in table refer to Type 316 Stainless steel.



Catalog Number							2000 bar			
Nipple Length mm (In)							Fits Connection Type	Tube Size mm (in)		Working Pressure at 37.8°C (100°F) bar (psi) *
69.85 (2.75)	76.20 (3.00)	101.60 (4.00)	152.40 (6.00)	203.20 (8.00)	254.00 (10.00)	304.80 (12.00)		O.D.	I.D.	
MCN4402-316	MCN4403-316	MCN4404-316	MCN4406-316	MCN4408-316	MCN44010-316	MCN44012-316	MF250C	6.35 (1/4)	2.77 (0.019)	2,000 (29,008)
	MCN6603-316	MCN6604-316	MCN6606-316	MCN6608-316	MCN66010-316	MCN66012-316	MF375C	9.53 (3/8)	5.16 (0.203)	2,000 (29,008)
		MCN9904-316	MCN9906-316	MCN9908-316	MCN99010-316	MCN99012-316	MF562C200	14.29 (9/16)	7.92 (0.312)	2,000 (29,008)

Catalog Number							4000 bar			
Nipple Length mm (In)							Fits Connection Type	Tube Size mm (in)		Working Pressure at 37.8°C (100°F) bar (psi) *
69.85 (2.75)	76.20 (3.00)	101.60 (4.00)	152.40 (6.00)	203.20 (8.00)	254.00 (10.00)	304.80 (12.00)		O.D.	I.D.	
CN4402-316	CN4403-316	CN4404-316	CN4406-316	CN4408-316	CN44010-316	CN44012-316	MF250C	6.35 (1/4)	2.11 (0.083)	4,000 (58,016)
	CN6603-316	CN6604-316	CN6606-316	CN6608-316	CN66010-316	CN66012-316	MF375C	9.53 (3/8)	3.18 (0.203)	4,000 (58,016)
		CN9904-316	CN9906-316	CN9908-316	CN99010-316	CN99012-316	MF562C200	14.29 (9/16)	4.75 (0.187)	4,000 (58,016)

Note:

\*See High pressure tubing section for pressure ratings at various temperatures.

\*\*Type 304 stainless steel nipples available.

\*Maximum pressure rating is based on the lowest rating of any component. Actual working pressure may be determined by tubing pressure rating, if lower.

All dimensions for reference only and subject to change.

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