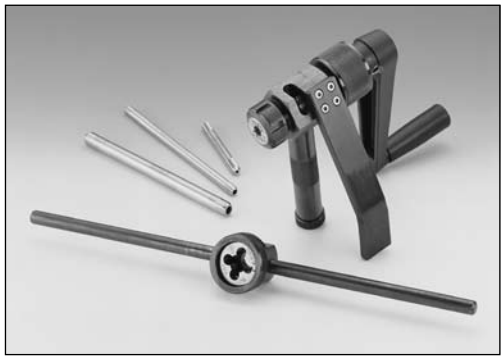
Metric Series

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
Division of Snap-tite, Inc.
www.autoclave.com

Metric Series - Needle Valves

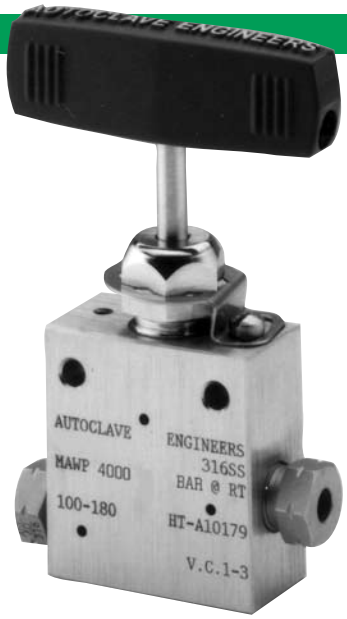
Pressures to 4,000 bar (58016 psi)

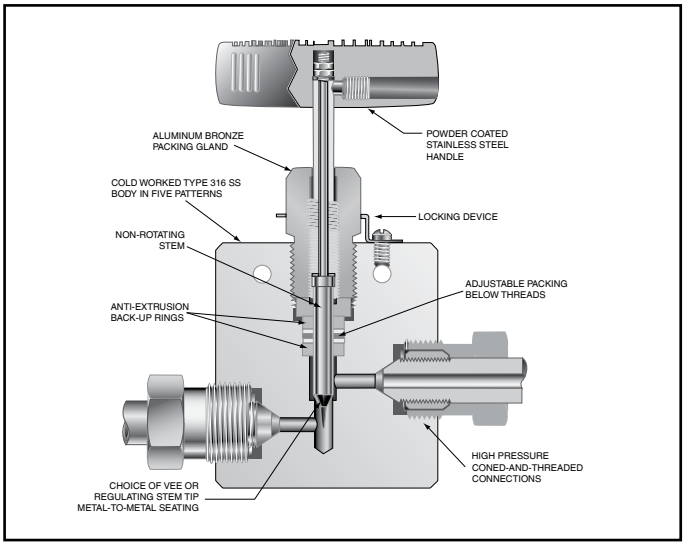
Tube Outside Diameter Size Inches	Connection Type	Orifice Size mm (inches)	Rated C_V*	Pressure/ Temperature Rating psi (bar) @ Room Temperature**
1/4	MF250C	3 (.118)	0.25	4,000 (58016)
3/8	MF375C	3 (.118)	0.25	4,000 (58016)
9/16	MF562C400	3 (.118)	0.32	4,000 (58016)
9/16	MF562C200	5 (.196)	0.80	2,000 (29008)

Notes:

* *C_V values shown are for 2-way straight valve pattern. For 2-way angle patterns, increase C_V value 50%.*

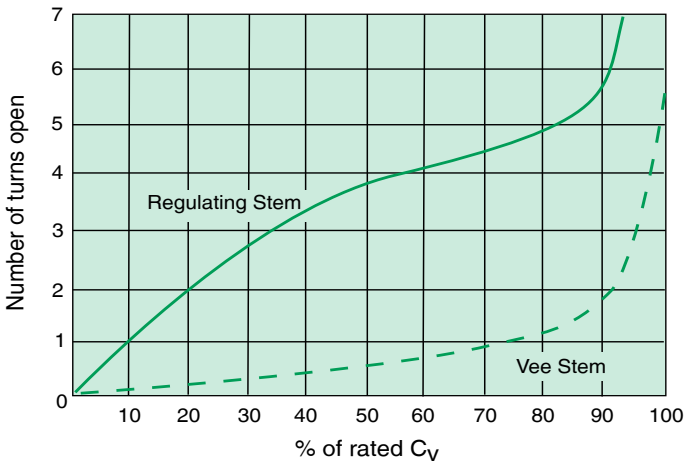
** *For complete temperature ratings see pressure/temperature rating guide in Technical Information section.*





To ensure proper fit use Autoclave tubing

Generalized Flow Coefficient Curves (C_V)



Ordering Procedure

For complete information on available stem types, optional connections and additional valve options, see Needle Valve Options section or contact your Sales Representative. The Metric Series valves are furnished complete with connection components, unless otherwise specified.

Typical catalog number: **NM400VM4071**

NM400VM — Valve Series
- **NM200VM** (2000 bar)
- **NM400VM** (4000 bar)

4 — Outside Diameter Tube Size
- **4**-1/4"
- **6**-3/8"
- **9**-9/16"

07 — Stem/Seat Type
- **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
- **88** - Regulating stem with replaceable seat

1 — 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

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Options — Options

For extreme temperature and other options, see Valve Options.

Valve Options

Extreme Temperatures
Standard Autoclave valves with Teflon packing may be operated to 232°C (450°F). High temperature packing is available for service from -252°C (-423°F) to 649°C (1200°F) by adding the following suffixes to catalog order number.

TG - standard valve with Teflon glass packing to 316°C (600°F).
GY - standard valve with graphite braided yarn packing to 427°C (800°F).
HT - extended stuffing box valve with graphite braided yarn packing to 649°C (1200°F).
B - standard valve with cryogenic trim material and Teflon packing to -73°C (-100°F).
LT - extended stuffing box valve with Teflon packing & Cryogenic trim materials to -252°C (-423°F).

Valve Maintenance

Repair Kits: add "R" to the front of valve catalog number for proper repair kit. (Example: **RNM400VM4071**)

Valve Bodies: Valve bodies are available. Order using the eight (8) digit part number found in the valve drawing or contact your Sales Representative for information.

Consult your Autoclave representative for pricing on repair kits and valve bodies. Refer to the Tools, Installation, Operation and Maintenance section for proper maintenance procedures.

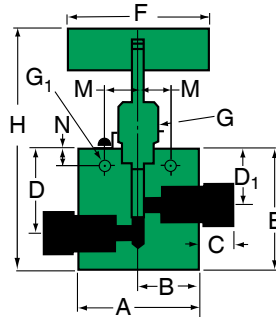
Catalog Number	Stem Type	Outside Diameter Tube	Orifice Diameter	Dimensions - mm (inches)												Block Thick-ness	Valve Pattern
				A	B	C	D	D_1	E	F	G	G_1	H*	M	N		
2-Way Straight																	
NM400VM4071	VEE	6.35	3.00	50.00	25.00	12.70	50.00	38.00	65.00	101.60	23.80	7.00	132.08	17.53	16.00	30.00	See Figure 1
NM400VM4081	REG	(1/4)	(0.12)	(1.97)	(0.98)	(0.50)	(1.97)	(1.50)	(2.56)	(4.00)	(0.94)	(0.28)	(5.20)	(0.69)	(0.63)	(1.18)	
NM400VM6071	VEE	9.53	3.00	50.00	25.00	13.46	50.00	38.00	65.00	101.60	23.80	7.00	132.08	17.53	16.00	30.00	
NM400VM6081	REG	(3/8)	(0.12)	(1.97)	(0.98)	(0.53)	(1.97)	(1.50)	(2.56)	(4.00)	(0.94)	(0.28)	(5.20)	(0.69)	(0.63)	(1.18)	
NM200VM9071	VEE	14.29	5.00	64.00	32.00	18.29	50.00	38.00	70.00	101.60	23.80	7.00	136.91	17.53	16.00	38.00	
NM200VM9081	REG	(9/16)	(0.20)	(2.52)	(1.26)	(0.72)	(1.97)	(1.50)	(2.76)	(4.00)	(0.94)	(0.28)	(5.39)	(0.69)	(0.63)	(1.50)	
NM400VM9071	VEE	14.29	3.00	64.00	32.00	18.29	50.00	38.00	70.00	101.60	23.80	7.00	136.91	17.53	16.00	38.00	
NM400VM9081	REG	(9/16)	(0.12)	(2.52)	(1.26)	(0.72)	(1.97)	(1.50)	(2.76)	(4.00)	(0.94)	(0.28)	(5.39)	(0.69)	(0.63)	(1.50)	
2-Way Angle																	
NM400VM4072	VEE	6.35	3.00	50.00	25.00	12.70		38.00	70.00	101.60	23.80	7.00	136.91	17.53	16.00	30.00	See Figure 2
NM400VM4082	REG	(1/4)	(0.12)	(1.97)	(0.98)	(0.50)		(1.50)	(2.76)	(4.00)	(0.94)	(0.28)	(5.39)	(0.69)	(0.63)	(1.18)	
NM400VM6072	VEE	9.53	3.00	50.00	25.00	13.46		38.00	80.00	101.60	23.80	7.00	146.81	17.53	16.00	30.00	
NM400VM6082	REG	(3/8)	(0.12)	(1.97)	(0.98)	(0.53)		(1.50)	(3.15)	(4.00)	(0.94)	(0.28)	(5.78)	(0.69)	(0.63)	(1.18)	
NM200VM9072	VEE	14.29	5.00	64.00	32.00	18.29		38.00	88.00	101.60	23.80	7.00	154.69	17.53	16.00	38.00	
NM200VM9082	REG	(9/16)	(0.20)	(2.52)	(1.26)	(0.72)		(1.50)	(3.46)	(4.00)	(0.94)	(0.28)	(6.09)	(0.69)	(0.63)	(1.50)	
NM400VM9072	VEE	14.29	3.00	64.00	32.00	18.29		38.00	88.00	101.60	23.80	7.00	154.69	17.53	16.00	38.00	
NM400VM9082	REG	(9/16)	(0.12)	(2.52)	(1.26)	(0.72)		(1.50)	(3.46)	(4.00)	(0.94)	(0.28)	(6.09)	(0.69)	(0.63)	(1.50)	

G - Packing gland mounting hole drill size
G_1 - Bracket mounting hole size
Panel mounting drill size: 0.22" (5.59 mm) all valves.

All dimensions for reference only and subject to change.
** H Dimension is with stem in the closed position.*

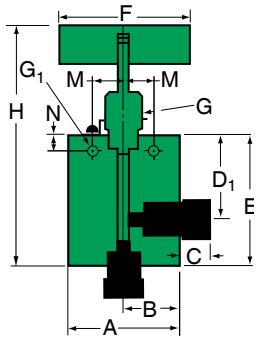
For prompt service, Autoclave stocks select products. Consult factory.

Figure 1



2-Way Straight

Figure 2

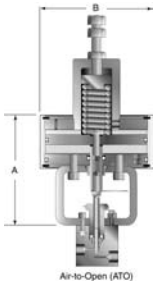
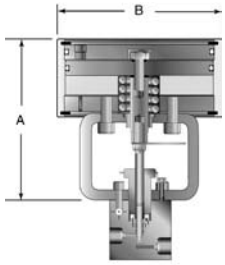


2-Way Angle

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)			
 Air-to-Open (ATO)	 Air-to-Close (ATC)	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: Anodiozed 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 cm2 (19.37 in^2)
  O2S and C2S types: 250 cm2 (38.75 in^2)
- Approximate air usage/cycle at 7 bar:
  O1S and C1S types: .0011 SCM (.04 SCF)
  O2S and C2S types: .0025 SCM (.08 SCF)

Ait-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															
NM400VM4071-C1S	Medium Duty C1S Series	Air Pressure: bar (psi)	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		Stem travel: mm (in)	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															
Series NM200VM Valves															
	Medium Duty C1S Series	Air Pressure: bar (psi)	3.50	4.30	5.80	6.60									1,400 (20,306)
			(51)	(62)	(84)	(96)									
NM200VM9071-C1S		Stem travel: mm (in)	6.40	6.40	6.40	6.40									
NM200VM9072-C1S			(0.25)	(0.25)	(0.25)	(0.25)									
		Flow Coefficient Cv	0.78	0.78	0.78	0.78									
Series NM400VM Valves															
NM400VM4071-C2S	Heavy Duty C2S Series	Air Pressure: bar (psi)	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		Stem travel: mm (in)	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															
Series NM200VM Valves															
	Heavy Duty C2S Series	Air Pressure: bar (psi)	1.50	1.90	2.70	3.10	3.50	4.20							2,000 (29,008)
			(22)	(28)	(39)	(45)	(51)	(61)							
NM200VM9071-C2S		Stem travel: mm (in)	6.40	6.40	6.40	6.40	6.40	6.40							
NM200VM9072-C2S			(0.25)	(0.25)	(0.25)	(0.25)	(0.25)	(0.25)							
		Flow Coefficient Cv	0.78	0.78	0.78	0.78	0.78	0.78							

Ait-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 Pre-Compression: mm (in)	2.90	3.90	5.80	6.70	7.70	9.60	11.60	13.50	14.50				
NM400VM6072-01S			(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 Pre-Compression: mm (in)	5.80	7.70	11.60	13.50									
NM200VM9072-01S			(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 Pre-Compression: mm (in)	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			(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	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 Pre-Compression: mm (in)	3.60	4.80	7.20	8.40	9.60	12.0							
NM200VM9072-02S			(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)	(0.25)	(0.16)							
		Flow Coefficient Cv	0.78	0.78	0.78	0.78	0.78	0.73							

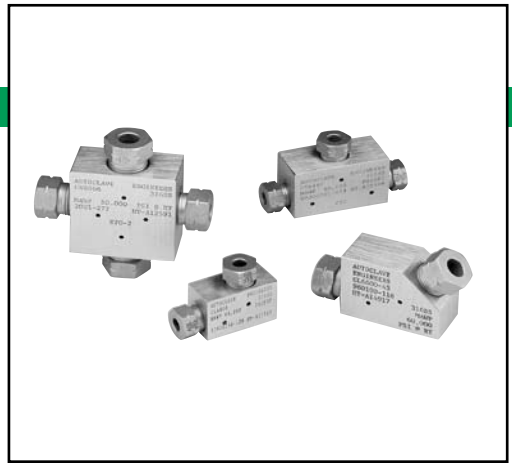
Caution: While testing has shown O-rings to provide satisfactory service life, both cyclic and shelf life may vary widely with differing service conditions, properties of reactants, pressure and temperature cycling and age of the O-ring. FREQUENT INSPECTIONS SHOULD BE MADE to detect any deterioration,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

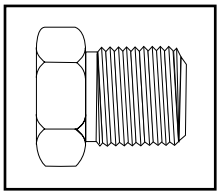
Pressures to 4000 bar (58016 psi)



Autoclave Engineers high pressure metric fittings are rated for pressures to 58016 psi (4,000 bar). Utilizing Autoclave Engineers high pressure coned-and-threaded connections, these fittings are correlated with Series NM200VM and NM400VM valves, and Autoclave Engineers high pressure tubing.

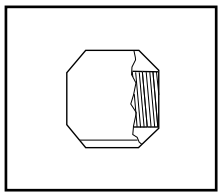
Connection Components

All Autoclave Engineers valves and fittings are supplied complete with appropriate glands and collars. To order these components separately, use order numbers listed. When using plug, collar is not required.



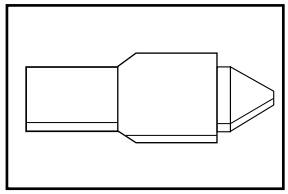
Gland
MAGL ( )

Add tube size ( )
1/4" - 40
3/8" - 60
9/16" - 90



Collar
ACL ( )

Example:
1/4" Gland - MAGL (40)



Plug
AP ( )

To ensure proper fit use Autoclave Engineers tubing.

Connection Type	Gland	Collar	Plug	Connection Components (Industry Standard)
MF250C MF375C MF562C200 MF562C400	MAGL( )	ACL( )	AP( )	Autoclave Engineers high pressure fittings 1/4, 3/8 and 9/16 connection components to 4000 bar (58016 psi). For use with MN200VM and MN400VM valves and fittings.

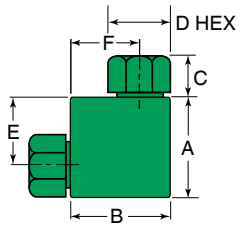
Note: Special material glands may be supplied with four flats in place of the standard hex.

Catalog Number	Connection Type	Outside Diameter Tube mm (in)	Pressure Rating bar (psi)*	Minimum Opening	Dimensions - inches (mm)							Block Thickness	Fitting Pattern
					A	B	C	D Typical	E	F	G Thickness		
Elbow													
MCL4400	MF250C	3.63 **(1/4)**	4,000 **(58,016)**	3.00 **(0.12)**	29.00 **(1.14)**	36.00 **(1.42)**	12.70 **(0.50)**	17.00 **(0.67)**	18.00 **(0.71)**	25.00 **(0.98)**		22.00 **(0.87)**	**See Figure 1**
MCL6600	MF375C	5.45 **(3/8)**	4,000 **(58,016)**	3.00 **(0.12)**	36.00 **(1.42)**	44.00 **(1.73)**	15.50 **(0.61)**	22.00 **(0.87)**	22.00 **(0.87)**	30.00 **(1.18)**		26.00 **(1.02)**	
MCL9900	MF562C400	8.16 **(9/16)**	4,000 **(58,016)**	5.00 **(0.20)**	50.00 **(1.97)**	64.00 **(2.52)**	19.30 **(0.76)**	32.00 **(1.26)**	30.00 **(1.18)**	44.00 **(1.73)**		38.00 **(1.50)**	
MCLX9900	MF562C200	8.16 **(9/16)**	2,000 **(29,008)**	8.00 **(0.31)**	50.00 **(1.97)**	64.00 **(2.52)**	19.30 **(0.76)**	32.00 **(1.26)**	30.00 **(1.18)**	44.00 **(1.73)**		38.00 **(1.50)**	
Tee													
MCT4440	MF250C	3.63 **(1/4)**	4,000 **(58,016)**	3.00 **(0.12)**	36.00 **(1.42)**	36.00 **(1.42)**	12.70 **(0.50)**	17.00 **(0.67)**	25.00 **(0.98)**	18.00 **(0.71)**		22.00 **(0.87)**	**See Figure 2**
MCT6660	MF375C	5.45 **(3/8)**	4,000 **(58,016)**	3.00 **(0.12)**	44.00 **(1.73)**	44.00 **(1.73)**	15.50 **(0.61)**	22.00 **(0.87)**	30.00 **(1.18)**	22.00 **(0.87)**		26.00 **(1.02)**	
MCT9990	MF562C400	8.16 **(9/16)**	4,000 **(58,016)**	5.00 **(0.20)**	58.00 **(2.28)**	64.00 **(2.52)**	19.30 **(0.76)**	32.00 **(1.26)**	38.00 **(1.50)**	32.00 **(1.26)**		38.00 **(1.50)**	
MCTX9990	MF562C200	8.16 **(9/16)**	2,000 **(29,008)**	8.00 **(0.31)**	58.00 **(2.28)**	64.00 **(2.52)**	19.30 **(0.76)**	32.00 **(1.26)**	38.00 **(1.50)**	32.00 **(1.26)**		38.00 **(1.50)**	
Cross													
MCX4444	MF250C	3.63 **(1/4)**	4,000 **(58,016)**	3.00 **(0.12)**	36.00 **(1.42)**	50.00 **(1.97)**	12.70 **(0.50)**	17.00 **(0.67)**	18.00 **(0.71)**	25.00 **(0.98)**		22.00 **(0.87)**	**See Figure 3**
MCX6666	MF375C	5.45 **(3/8)**	4,000 **(58,016)**	3.00 **(0.12)**	44.00 **(1.73)**	60.00 **(2.36)**	15.50 **(0.61)**	22.00 **(0.87)**	22.00 **(0.87)**	30.00 **(1.18)**		26.00 **(1.02)**	
MCX9999	MF562C400	8.16 **(9/16)**	4,000 **(58,016)**	5.00 **(0.20)**	64.00 **(2.52)**	76.00 **(2.99)**	19.30 **(0.76)**	32.00 **(1.26)**	32.00 **(1.26)**	38.00 **(1.50)**		38.00 **(1.50)**	
MCXX9999	MF562C200	8.16 **(9/16)**	2,000 **(29,008)**	8.00 **(0.31)**	64.00 **(2.52)**	76.00 **(2.99)**	19.30 **(0.76)**	32.00 **(1.26)**	32.00 **(1.26)**	38.00 **(1.50)**		38.00 **(1.50)**	

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

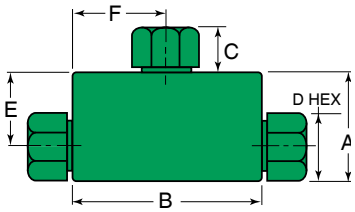
All dimensions for reference only and subject to change.
For prompt service, Autoclave stocks select products. Consult your local representative.

Figure 1



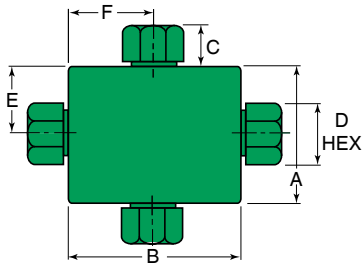
Elbow

Figure 2



Tee

Figure 3



Cross

Note: Fittings such as 45° elbows, reducer elbows, and reducer 45° elbows are available upon request.
For mounting hole option add suffix PM to catalog number, consult factory for mounting hole dimensions.
Contact your local sales representative for additional information.

Catalog Number	Connection Type	Outside Diameter Tube mm (in)	Pressure Rating bar (psi)*	Minimum Opening	Dimensions - inches (mm)							Block Thickness	Fitting Pattern
					A	B	C	D Typical	E	F	G Thickness		

Straight Coupling

M400F4433	MF250C	3.63 **(1/4)**	4,000 **(58,016)**	3.00 **(0.12)**	22.00 **(0.87)**	42.00 **(1.65)**	12.70 **(0.50)**	17.00 **(0.67)**					**See Figure 4**
M400F6633	MF375C	5.45 **(3/8)**	4,000 **(58,016)**	3.00 **(0.12)**	27.00 **(1.06)**	48.00 **(1.89)**	15.50 **(0.61)**	22.00 **(0.87)**					
M400F9933	MF562C400	8.16 **(9/16)**	4,000 **(58,016)**	5.00 **(0.20)**	36.00 **(1.42)**	55.00 **(2.17)**	19.30 **(0.76)**	32.00 **(1.26)**					
M200F9933	MF562C200	8.16 **(9/16)**	2,000 **(29,008)**	8.00 **(0.31)**	36.00 **(1.42)**	55.00 **(2.17)**	19.30 **(0.76)**	32.00 **(1.26)**					

Union Couplings are designed with a removable seat insert allowing disassembly and tubing removal without the necessity of loosening other items in a line.

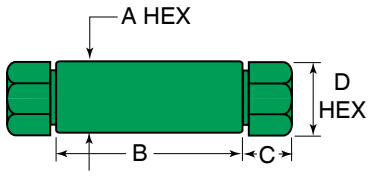
Ball Check Valve

MCB4401	MF250C	3.63 **(1/4)**	4,000 **(58,016)**	2.40 **(0.09)**	36.00 **(1.42)**	73.00 **(2.87)**	15.50 **(0.61)**	17.00 **(0.67)**	44.90 **(1.77)**				**See Figure 5**
MCL6601	MF375C	5.45 **(3/8)**	4,000 **(58,016)**	2.40 **(0.09)**	36.00 **(1.42)**	81.00 **(3.19)**	17.40 **(0.69)**	22.00 **(0.87)**	47.90 **(1.89)**				
M40CB9901	MF562C400	8.16 **(9/16)**	4,000 **(58,016)**	2.40 **(0.09)**	36.00 **(1.42)**	83.00 **(3.27)**	19.30 **(0.76)**	32.00 **(1.26)**	47.50 **(1.87)**				
MCB9901	MF562C200	8.16 **(9/16)**	2,000 **(29,008)**	5.00 **(0.20)**	36.00 **(1.42)**	97.00 **(3.82)**	19.30 **(0.76)**	32.00 **(1.26)**	49.90 **(1.96)**				

O-Ring Check Valve

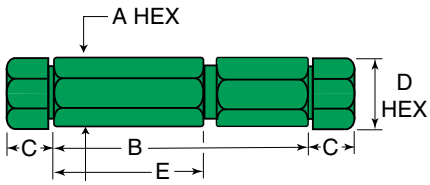
MCK4400	MF250C	3.63 **(1/4)**	4,000 **(58,016)**	2.40 **(0.09)**	36.00 **(1.42)**	73.00 **(2.87)**	15.50 **(0.61)**	17.00 **(0.67)**	44.90 **(1.77)**				**See Figure 5**
MCK6600	MF375C	5.45 **(3/8)**	4,000 **(58,016)**	2.40 **(0.09)**	36.00 **(1.42)**	81.00 **(3.19)**	17.40 **(0.69)**	22.00 **(0.87)**	47.90 **(1.89)**				
M40CK9900	MF562C400	8.16 **(9/16)**	4,000 **(58,016)**	2.40 **(0.09)**	36.00 **(1.42)**	83.00 **(3.27)**	19.30 **(0.76)**	32.00 **(1.26)**	47.50 **(1.87)**				
MCK9900	MF562C200	8.16 **(9/16)**	2,000 **(29,008)**	5.00 **(0.20)**	36.00 **(1.42)**	97.00 **(3.82)**	19.30 **(0.76)**	32.00 **(1.26)**	49.90 **(1.96)**				

Figure 4



Straight Coupling

Figure 5



Ball / O-Ring Check Valve

*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.

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.

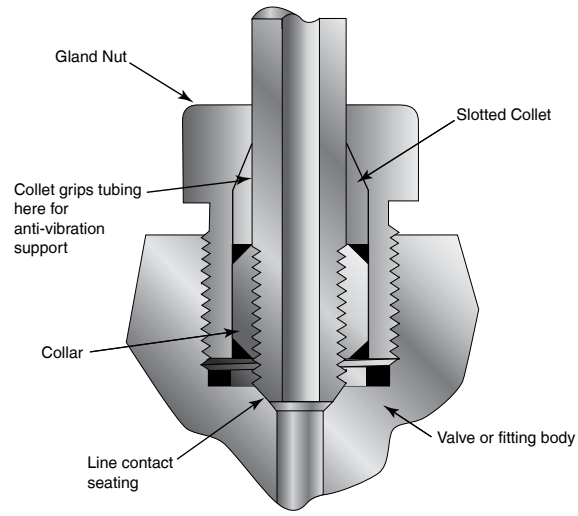
Anti-Vibration Collet Gland Assembly

Pressures to 4000 bar (58016 psi)

Series MKCGL Sizes to 14.29 mm (9/16")
For extreme conditions of vibration and/or shock in tubing systems, such as a valve or fitting on an unsupported line near a compressor, Autoclave coned-and-threaded connections are offered with the Anti-Vibration Collet Gland Assemblies. Completely interchangeable with standard Autoclave high pressure connections, the Collet Gland Assemblies provide equally effective pressure handling capability.

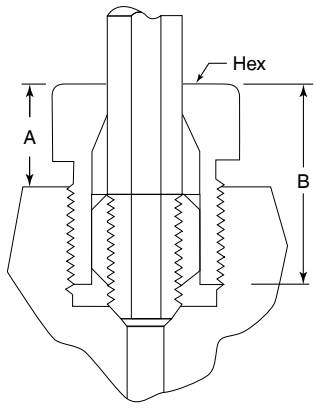
In standard connection systems, the bending stresses on the threaded area of the tubing imposed by excessive vibration or movement may cause premature fatigue failure of the tubing at the back of the thread. By moving the stress concentration back to the unthreaded part of the tubing and providing a wedge-type gripping action, the Autocalve Engineers anti-vibration collet gland assembly strengthens the entire structure. With stress concentration reduced and overall stress level maintained well below the endurance limit of the material, the result is virtually unlimited vibrational fatigue life.

A less complex and more economical design than other vibration-resistant connections, the Collet Gland Assembly utilizes the same coned-and-threaded features of Autoclave high pressure connections. In Series KCGL the gland nut is recessed to accommodate a tapered, slotted collet that grips the tubing at a point behind the threaded area of the tubing. The design provides a slight difference in angles between the collet and the corresponding taper of the gland nut. As the nut is tightened, it acts to wedge the tapered end of the collet into a gripping engagement with the tubing and, at the same time, forces the collar and tubing assembly into line contact with the connection seat.



Series MKCGL
Pressures to 4,000 bar (58016 psi)

Catalog Number	Part	Outside Diameter Tubing Size mm (in)	Dimensions -mm (inches)		
			A	B	Hex
MKCGL40-316	Complete assembly	6.35 (1/4)	12.70 (0.50)	24.00 (0.94)	17.00 (0.67)
MKCL40-316	Slotted collet				
MKGL40-316	Gland nut				
*ACL 40 Collar					
MKCGL60-316	Complete assembly	9.53 (3/8)	15.50 (0.61)	27.00 (1.06)	22.00 (0.87)
MKCL60-316	Slotted collet				
MKGL60-316	Gland nut				
*ACL 60 Collar					
MKCGL90-316	Complete assembly	14.29 (9/16)	19.30 (0.76)	32.0 (1.26)	32.0 (1.26)
MKCL90-316	Slotted collet				
MKGL90-316	Gland nut				
*ACL 90 Collar					



Series MKCGL
4,000 bar (58016 psi)

*Standard Autoclave Engineers collar not included in complete assembly

All dimensions for reference only and subject to change.

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

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 tolerences. 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 availabilty.

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) Outside Diameter	Inside Diameter	Wall Thickness	Flow Area in.² (mm²)	Working Pressure psi (bar)* -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	**6.35** (1/4)	**2.77** (0.109)	**1.78** (0.070)	**5.89** (0.009)	2,070 **(30,023)**	2,070 **(30,023)**	1,990 **(28,863)**	1,890 **(27,413)**	1,750 **(25,382)**
MS15-191	304SS						2,070 **(30,023)**	1,950 **(28,283)**	1,780 **(25,817)**	1,750 **(25,382)**	1,670 **(24,222)**
MS15-088	316SS	MF375C	**9.52** (3/8)	**5.16** (0.203)	**2.18** (0.086)	**20.93** (0.032)	2,070 **(30,023)**	2,070 **(30,023)**	1,990 **(28,863)**	1,890 **(27,413)**	1,750 **(25,382)**
MS15-190	304SS						2,070 **(30,023)**	1,950 **(28,283)**	1,780 **(25,817)**	1,750 **(25,382)**	1,670 **(24,222)**
MS15-086	316SS	MF562C200	**14.28** (9/16)	**7.92** (0.312)	**3.18** (0.125)	**49.72** (0.076)	2,070 **(30,023)**	2,070 **(30,023)**	1,990 **(28,863)**	1,890 **(27,413)**	1,750 **(25,382)**
MS15-188	304SS						2,070 **(30,023)**	1,950 **(28,283)**	1,780 **(25,817)**	1,750 **(25,382)**	1,670 **(24,222)**
4000 BAR											
MS15-081	316SS	MF250C	**6.35** (1/4)	**2.11** (0.083)	**2.11** (0.083)	**3.27** (0.005)	4,140 **(60,047)**	4,140 **(60,047)**	3,980 **(57,726)**	3,780 **(54,825)**	3,500 **(50,764)**
MS15-182	304SS						4,140 **(60,047)**	3,900 **(56,556)**	3,560 **(51,634)**	3,500 **(50,764)**	3,340 **(48,443)**
MS15-087	316SS	MF375C	**9.52** (3/8)	**3.18** (0.125)	**3.18** (0.125)	**7.85** (0.012)	4,140 **(60,047)**	4,140 **(60,047)**	3,980 **(57,726)**	3,780 **(54,825)**	3,500 **(50,764)**
MS15-183	304SS						4,140 **(60,047)**	3,900 **(56,556)**	3,560 **(51,634)**	3,500 **(50,764)**	3,340 **(48,443)**
MS15-083	316SS	MF562C400	**14.28** (9/16)	**4.75** (0.187)	**4.75** (0.187)	**17.66** (0.027)	4,140 **(60,047)**	4,140 **(60,047)**	3,980 **(57,726)**	3,780 **(54,825)**	3,500 **(50,764)**
MS15-185	304SS						4,140 **(60,047)**	3,900 **(56,556)**	3,560 **(51,634)**	3,500 **(50,764)**	3,340 **(48,443)**

Note:
1. Autofrettaged tubing available (see technical Information section: Pressure Cycling for Autofrettage information)
2. 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.

All dimensions for reference only and subject to change.
For prompt service, Autoclave stocks select products. Consult your local representative.

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

Metric Series - Safety Heads

Ordering Information

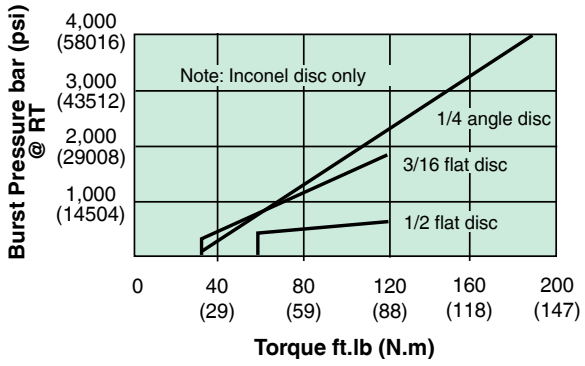
To order an Autoclave Universal Safety Head, use the catalog order number from table. ADD THE SIZE OF THE RUPTURE DISC YOU WANT AS A SUFFIX TO THE CATALOG NUMBER; SUCH AS MCS6600-1/4A. Then order desired rupture discs from rupture disc section. (This is important since the disc size determines which hold-down ring will be furnished with the safety head.)

Hold-down nut torque values

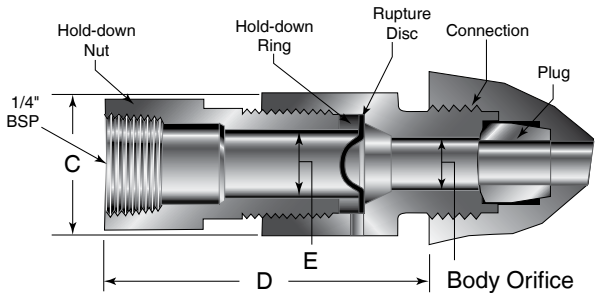
Torque@ Minimum Pressure N.m (Ft. lb.)	bar (psi)	Torque@ Maximum Pressure N.m (Ft. lb.)	bar (psi)	Rupture Disc inches	Hold-down Ring Part Number
30 (22)	345 (5,000)	130 (95)	1830 (26,542)	3/16 Flat	101A-0439
60 (44)	280 (4,061)	130 (95)	690 (10,000)	1/2 Flat	1020-7434
30 (22)	280 (4,061)	200 (147)	4,000 (58,016)	1/4 Angle	102A-0439

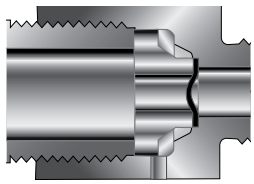
3/16 flat seat disc cannot be used with safety head assemblies SS6600, SS8600 and CSX9600. Torque values for intermediate pressures may be linearly interpolated. Use minimum torque value for pressures lower than those shown.

Hold-down nut torque requirements vs. rupture disc burst pressure rating @ RT

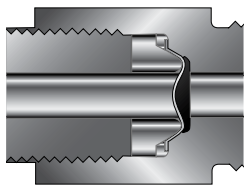


1/2 Flat Disc illustrated in Safety Head





3/16 Flat rupture disc



1/4 Flat rupture disc

Catalog Number Without Disc	Body Part Number	Plug Part Number	Hold-down Gland Part Number	Fits Connection Type	Fitting Pressure Rating bar (psi)	Body Torque N.m (Ft.lb.)	Plug Orifice mm (inches)	Body Orifice mm (inches)	Rupture Disc Size mm (inches) 3/16F Port E*	1/4A Port E*	1/2F Port E*	Dimensions mm (inches) C	D
High-Pressure: 4,000 bar (58,016 psi)													
MCS4600	101C-6570	1030-4877	3/16 & 1/2 Flat 101C-6569	MF250C	4,000 (58,016)	30 (22)	2.08 (.082)	3.18 (.125)	4.78 (0.188)	6.35 (0.25)	12.7 (0.50)	27.00 (1.06)	63.00 (2.48)
MCS6600	101C-6571	1030-6096		MF375C	4,000 (58,016)	60 (44)	3.17 (.125)	5.56 (.219)	4.78 (0.188)	6.35 (0.25)	12.7 (0.50)	27.00 (1.06)	58.00 (2.28)
MCS9600	101C-6572	1030-6097	1/4 Angle 101C-6575	MF562C400	4,000 (58,016)	110 (81)	4.70 (.188)	7.13 (.281)	4.78 (0.188)	6.35 (0.25)	12.7 (0.50)	27.00 (1.06)	56.50 (2.22)

Port E* - Minimum disc blow-out diameter of hold down ring

Note: Interchangeable hold-down rings permit use of several different sizes and types of rupture disc in a single safety head.

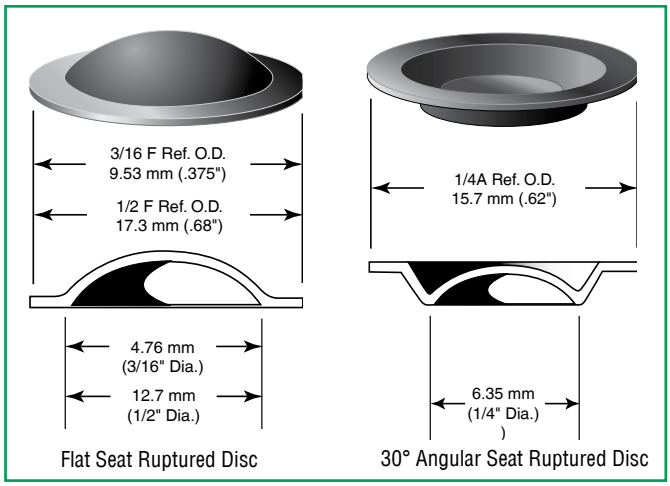
Maximum pressure rating is based on the lowest rating of any component. Actual working pressure may be determined by tubing pressure rating, if lower.

All dimensions for reference only and subject to change.
For prompt service, Autoclave stocks select products. Consult your local representative.

Metric Series - Prebulged Rupture Discs

Ordering Information

- Specify quantity, disc size, type, material and temperature.
- Indicate desired rupture rating which should be at least 110% of operating pressure. Tolerances are +6% to -3% of nominal rating and will burst at ±5% of furnished rating. Discs are rated at 22°C (72°F).
- Minimum order of 6 discs required for materials other than Inconel.



Disc Material	Disc Size Seat Type	Rupture Pressures Standard Available Range ± 5%	Maximum Temperature Rating
	Inches	bar (psi)	°C (°F)
Inconel (Standard)	3/16 flat	86.2 to 1378.9 (1,250 to 20,000)	482 (900)
	1/4 angle	62.1 to 4136.8 (900 to 60,000)	482 (900)
	1/2 flat	34.5 to 690.0 (500 to 10,000)	482 (900)

Note: A- Inconel discs are normally available from stock. For the other materials, the minimum quantity to be ordered is six pieces.
B- Other materials are available upon request.
C- Frequent replacement may be desirable to avoid premature rupture due to repetitive pressure/temperature cycling and corrosion.
D- For a complete list of stock rupture discs, see pages 10-13 in the accessories section of the catalog.

Teflon coating available on one or both sides to increase minimum rupture rating.

CAUTION: High pressure-to-rupture ratios, severe pressure or temperature cycling, corrosion and metal fatigue affect disc life and rupture pressure. Frequent disc replacement may be desirable to avoid premature rupture. Rupture disc manufactures recommended a 140 to 170 percent margin on disc ratings for extended disc life.

All dimensions for reference only and subject to change.
For prompt service, Autoclave stocks select products. Consult your local representative.

Metric Series - Manual Coning and Threading Tools

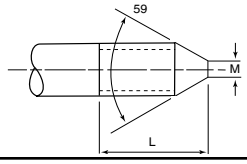
Ordering Information

OD tube		ID tube		Coning tools and components			Threading tools and components				
inches	mm	inches	mm	Complete Tool	Collet	Coning blade set of 2	Complete Tool	Tool only	Threading die Catalog	Threading die Thread Type	Guide Bushing
1/4”	6.35	0.109	2.77	MCTM4	90248	101F-1577	402A	402	PO214	1/4-28	1010-0343
1/4”	6.35	0.083	2.11								
3/8”	9.52	0.203	5.15	MCTM6	90250	101F-1601	402C	402	PO215	3/8-24	1010-0344
3/8”	9.52	0.125	3.17	MCTH6	90250	101F-1578					
9/16”	14.28	0.312	7.92	MCTM920	90251	1010-5218	402E	402	PO216	9/16-18	1010-0345
9/16”	14.28	0.187	4.76	MCTH960	90251	1010-0883					

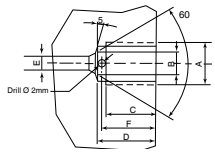
Note: Complete tool comes with collet and blade. Only one tool is required for all tubing sizes.

Make up of tube connection

Tube male connection



Female connection

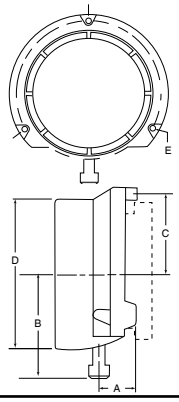


OD tube		ID tube		Coning tools and components				Threading tools and components						
inches	mm	inches	mm	Dimensions mm (in) L	Dimensions mm (in) M	Left Hand Thread*	Male Connection Type	Female Connection type	Dimensions mm (inches) A thread	B	C	D	E	F
1/4”	6.35	0.109	2.77	15.1 (.594)	3.6 (.141)	1/4-28	MM250CX	MF250C	M16x1.5	5 (.196)	9.5 (.374)	12 (.472)	3 (.118)	10.7 (.421)
1/4”	6.35	0.083	2.11	14.3 (.566)	3.6 (.141)	1/4-28	M250C							
3/8”	9.52	0.203	5.15	19.4 (.754)	6.4 (.251)	3/8-24	MM375CX	MF375C	M20x1.5	8 (.314)	13.5 (.531)	15 (.590)	3 (.118)	14 (.551)
3/8”	9.52	0.125	3.17	19.1 (.751)	5.6 (.220)	3/8-24	M375C							
9/16”	14.28	0.312	7.92	24.2 (.956)	10.3 (.405)	9/16-18	MM562CX	MF562C200	M30x2	12.7 (.500)	15 (.590)	19 (.748)	8 (.314)	17 (.669)
9/16”	14.28	0.187	4.76	23.8 (.437)	7.1 (.2.79)	9/16-18	M562C	MF562C400	M30x2	10 (.393)	15 (.590)	19 (.748)	5 (.296)	17 (.669)

*UNF thread class 2 (National fine)

Metric Series - Pressure Gauges

Pressures to 7000 bar (101,528 psi)



Catalog Number	Pressure Range bar (psi)	Minor Interval Value		Dial Diameter mm (inches)	Dimension mm (inches)				
		Internal-bar (psi)	Min-bar (psi)		A	B*	C	D	E
P-80063	0-1000 (0-14,504)	100 (1450)	10 (145)	114 (4.5)	40 (1.56)	100 (3.94)	136 (5.35)	125 (4.92)	7 (0.29)
P-80064	0-1600 (0-23,206)	200 (2901)	20 (290)	114 (4.5)	40 (1.56)	100 (3.94)	136 (5.35)	125 (4.92)	7 (0.29)
P-80048	0-2500 (0-36,260)	500 (7252)	20 (290)	152 (6.0)	40 (1.56)	100 (3.94)	136 (5.35)	125 (4.92)	7 (0.29)
P-80049	0-4000 (0-58,016)	500 (7252)	50 (725)	152 (6.0)	67 (2.64)	120 (4.72)	191 (7.50)	164 (6.44)	7 (0.29)
P-80050	0-6000 (0-87,024)	1,000 (14,504)	50 (725)	152 (6.0)	67 (2.64)	120 (4.72)	191 (7.50)	164 (6.44)	7 (0.29)

Note: Metric gauges are dual scale BAR/MPa

*Dimension shown without metric adapter.

Materials and Features

- Accuracy within ±0.5% of full scale range
- 1/4" F250C Autoclave high pressure connection
- Gauge supplied with metric MF250C adapter
- Plastic dial cover/solid front aluminum alloy case
- Blow-out back panel for pressure relief in the event of Bourdon tube failure
- 316 Stainless steel Bourdon tubes**
- Gauges available with bottom and back connections
- Precision stainless steel movement for accuracy and resistance to atmospheric corrosion
- Pointer zero adjustment located on front of gauge behind dial cover for convenience
- Gauges are commercially cleaned when shipped
- Gauges up to 1600 bar (23,206 psi) oxygen cleaned upon request
- Gauges glycerin filled upon request

Instrument quality gauges

- **Flush panel mounting** - Interchangeable dial cover retaining rings are stocked to permit flush panel mounting of any instrument quality gauge. These will be furnished at an additional charge when specified - add “PM” to order number.

- **Optional electrical contact face** - Available for all instrument quality gauges. With adjustable low and high electrical contacts, this option permits gauges to provide pressure control for automatic or remote operation, or for fail-safe set points.

**Bourdon tube material for 0-2500 bar (0-36,260 psi) gauge is K Monel. Bourdon tube material for 0-4000 bar (0-58,016 psi) and 0-6000 bar (0-87,024 psi) gauge is Inconel 718.

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