

GAS PRESSURE REGULATOR & MODULATOR CATALOG

6th Edition



MAXITROL®

www.maxitrol.com

⚠ WARNING

Service and installation must be performed by a trained/experienced service technician.

All products used with combustible gas **must** be installed and used **strictly** in accordance with the instructions of the Original Equipment Manufacturer (OEM) and with all applicable government codes and regulations, e.g. plumbing, mechanical, and electrical codes and practices. Maxitrol products should be installed and operated in accordance with Maxitrol Safety Warning Instructions.

Maxitrol Company is NOT responsible for any errors or omissions in reliance by anyone of any information set forth in this catalog without additional reference to local requirements and applicable ordinances or codes.

Other worldwide approvals and certifications available upon inquiry.



M/MR SERIES

Modulating Valves

For atmospheric, infrared, and direct fired burners, modulator and modulator/regulator valves provide precise, non-fluctuating, instantaneous temperature control without requiring a motor or mechanically driven butterfly valve. No external mechanical activation required. MR valve (only) performs dual function of modulation and pressure regulation. Applications include stabilized area heating, elevated heating, consistent higher baking/drying temperatures, and other process applications that require maintaining consistent temperatures.



MR212

Specifications

Pipe Sizes	3/8" to 3" threaded connections with NPT or ISO7-1 threads. 4" flange (212J only)
Housing Material	All models: aluminum.
Mounting	Must be mounted in upright position in horizontal pipe run, downstream of all other controls except high pressure cut-off switch if used (refer to MMR_MT_EN_09.2017). NOTE: All Maxitrol modulating valves should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see SELMMRSR_MI_EN.FR.ES).
Certifications	MR410, MR410H-1, MR510, MR510H-1, MR610, and MR610H-1: CSA certified to Z21.18 and CSA 6.3-M82. M511, M611, MR212D, E, and G: UL recognized for compliance to nationally published safety, construction, and performance standards in the U.S. and Canada.
Fuel Gases	Natural, Manufactured, Mixed, Liquefied Petroleum and Liquefied Petroleum Gas Air Mixtures. H, H-1 models for use with Liquefied Petroleum and other applications.
Rated Inlet Pressure	CSA Tested: MR410, MR410H-1, MR510, MR510H-1, MR610, MR610H-1, M411, M511, M611, M420, M420H, M520, M520H, M620, M620H, M451, M551, M651: ½ psi (3.4 kPa); CSA Rated: MR212D, MR212E, MR212G, MR212J: 5 psi (34 kPa).
Upstream Pressure Regulator Required	YES: M valves NO: MR valves
Emergency Exposure Limits	MR410, MR410H-1, MR510, MR510H-1, MR610, MR610H-1, M411, M511, M611, M420, M420H, M520, M520H, M620, M620H, M451, M551, M651: 2.5 psi (17 kPa); MR251D, MR251E, MR251G, MR212D, MR212E, MR212G, MR212J: 12.5 psi (86 kPa)
Ambient Temperature Ranges	All models: Operating: -40° to 125°F (-40° to 50°C); Non-operating: -50° to 185°F (-45° to 85°C)
Vent	M411, M511, M611, M420, M520, M620, M420H, M520H, M620H, MR410 (H)(-1), MR510(H)(-1), MR610(H)(-1), M551, M651: Vertical vent outlet 1/8" NPT – 12A06 installed. Models MR212 and MR251: Two vents located in upper housing, both equipped with vent limiting means.

Model Designations

Direct Fired (Negative pressure/pull through): M411, M511, M611, MR212D, MR212E, MR212G, MR212J.
Direct Fired (Positive pressure/push through): MR212D-1, MR212E-1, MR212G-1, MR212J-1.
Indirect Fired (Valves designed to operate on indirect fired atmospheric burner applications): M420, M520, M620, M451, M551, MR251D, MR251E, MR251G, MR410, MR510, MR610. 'H' Suffix Models designed with wider modulation span for use with LP (liquid propane gas) and other applications: MR410H-1, MR510H-1, MR610H-1, M420H, M520H, M620H.

Capacity

NOTE: For flows in excess of those shown below, consult with Maxitrol Company.

Model	Pipe Size	Flow Rate in CFH (m³/h)	100 (2.83)	150 (4.25)	200 (5.66)	250 (7.1)	300 (8.5)	350 (9.9)	400 (11.3)	450 (12.7)	500 (14.2)	600 (17.0)	700 (19.8)	750 (21.2)	Min. Flow
MR410 MR410H-1 M411*	3/8 X 3/8	Pressure Drop in inches w.c. (Pa)	0.33 (82)	0.75 (188)	--	--	--	--	--	--	--	--	--	--	5-90 (0.14-2.5)
M420* M420H* M451	1/2 X 1/2		0.27 (67)	0.61 (153)											
MR510 MR510H-1 M511*	1/2 X 1/2		--	0.17 (42)	0.30 (75)	0.47 (118)	0.67 (168)	0.92 (230)	--	--	--	--	--	--	5-125 (0.14-3.5)
M520* M520H* M551	3/4 X 3/4		--	0.12 (30)	0.21 (52)	0.32 (80)	0.47 (118)	0.64 (160)	0.83 (207)						5-185 (0.14-5.2)
MR610 MR610H-1	3/4 X 3/4		--	--	--	0.14 (35)	0.20 (50)	0.27 (67)	0.36 (90)	0.45 (113)	0.56 (140)	0.81 (203)	--	--	10-330 (0.28-9.3)
M620* M620H* M651	1 X 1		--	--	--	0.12 (30)	0.16 (40)	0.22 (55)	0.29 (72)	0.37 (92)	0.45 (113)	0.66 (165)	0.90 (225)	1.00 (250)	

* Models to which min. flow applies. (Minimum flow maximum calculated $\Delta P = 3.5''$ w.c. [single by-pass])

M/MR SERIES

Modulating Valves

Capacity

NOTE: For flows in excess of those shown below, consult with Maxitrol Company.

Model	Pipe Size	Flow Rate in CFH (m³/h)	100 (2.83)	150 (4.25)	200 (5.66)	300 (8.5)	400 (11.3)	500 (14.2)	600 (17.0)	700 (19.8)	800 (22.7)	900 (25.5)	1000 (28.3)	CSA Listed	Min. Flow
M611*	3/4 x 3/4	Pressure Drop in inches w.c. (Pa)	0.02 (5)	0.06 (15)	0.09 (23)	0.20 (50)	0.36 (90)	0.56 (140)	0.81 (203)	1.10 (275)	1.45 (363)	1.83 (458)	--	1000	10-330 (0.28-9.3)
	1 x 1		0.02 (5)	0.05 (12)	0.07 (18)	0.16 (40)	0.29 (72)	0.46 (115)	0.66 (165)	0.90 (225)	1.18 (295)	1.50 (375)	1.85 (463)		

Model	Pipe Size	Flow Rate in CFH (m³/h)	1000 (28.3)	1500 (42.5)	2000 (56.5)	2500 (70.8)	3000 (85.0)	3500 (99.0)	5000 (142)	6000 (170)	7000 (198)	10000 (283)	11000 (311)	CSA Listed	Min. Flow Applies to MR212's only
MR212D* MR251D	1 x 1	Pressure Drop in inches w.c. (Pa)	1.9 (475)	2.9 (725)	4.9 (1225)	6.2** (1550)	--	--	--	--	--	--	--	2250	25-300 (0.71-8.5)
	1¼ x 1¼		1.7 (425)	2.3 (575)	3.1 (775)	4.8 (1200)	5.9** (1475)							2750	
	1½ x 1½		1.7 (425)	2.2 (550)	2.9 (725)	3.9 (975)	5.4 (1350)							3000	
MR212E*	1½ x 1½		--	--	1.9 (475)	2.4 (600)	2.9 (725)	3.5 (875)	6.0** (1500)	--	--	--	--	4750	25-300 (0.71-8.5)
MR251E	2 x 2				1.9 (475)	2.1 (525)	2.4 (600)	2.7 (675)	5.5 (1375)	6.0** (1500)	--	--	--	5250	
MR212G*	2½ x 2½		--	--	--	--	--	1.9 (475)	2.2 (550)	2.6 (650)	3.0 (750)	6.1 (1525)	--	10000	50-450 (1.4-12.7)
MR251G	3 x 3							--	2.1 (525)	2.3 (575)	2.6 (650)	4.6 (1150)	5.6 (1400)	11000	--

Model	Pipe Size	Flow Rate in CFH (m³/h)	6000 (170)	8000 (227)	10000 (283)	12000 (340)	14000 (397)	16000 (397)	18000 (510)	20000 (566)	22000 (623)	24000 (680)	27000 (765)	30000 (850)	Min. Flow
MR212J	4 x 4	Pressure Drop in inches w.c. (Pa)	1.9 (475)	2.1 (525)	2.4 (600)	2.7 (675)	3.1 (775)	3.6 (900)	4.5 (1125)	5.4 (1350)	6.6 (1650)	7.8 (1950)	9.9 (2475)	12.4 (3100)	100-1000 (3.0-28.3)

*U.L. recognized
**Pressure Drop figures derived from CSA Maximum Listed Capacities in far right column (not flow at column top).

M/MR Series Applications Table

Model	Max. Current Draw (amps)	Application	Function	CSA Tested* Inlet Pressure	Inlet Pressure Operating Limits	Upstream Pressure Regulator Required	Maximum Emergency Exposure	Output Control Means Standard Factory Setting (if applicable)
M411 M511 M611	0.4 0.5 0.6	Direct Fired (Negative Pressure) Burners	Increase in voltage corresponds to increase in outlet pressure	1/2 psi (3.4 kPa)	Upstream pressure regulator setting	Yes	2.5 psi (17 kPa)	Low Fire: adjustable orifice bypass High Fire: upstream pressure regulator setting less pressure drop NOTE: 7" w.c. (1.7 kPa) max outlet pressure
M420 M420H M520 M520H M620 M620H	0.4 0.7 0.5 0.85 0.6 1.0	Atmospheric Burners H Models for higher outlet pressures (such as LP applications)	Increase in voltage corresponds to increase in outlet pressure	1/2 psi (3.4 kPa)	Upstream pressure regulator setting	Yes	2.5 psi (17 kPa)	Low Fire: adjustable orifice bypass High Fire: upstream pressure regulator setting less pressure drop NOTE: 7" w.c. (1.7 kPa) max outlet pressure NOTE: H models: 11" w.c. (2.7 kPa) max outlet pressure
M451 M551 M651	0.4 0.5 0.6	Atmospheric Burners - where higher outlet pressures are needed	Increase in voltage corresponds to increase in outlet pressure	1/2 psi (3.4 kPa)	Upstream pressure regulator setting	Yes	2.5 psi (17 kPa)	Low Fire: spring adjustment Std. Model: 1.2" - 2.5" w.c. (0.30-0.62 kPa) "1" models: 2" - 4.5" w.c (0.50-1.1 kPa) High Fire: upstream pressure regulator setting less pressure drop
MR251D MR251E MR251G	0.4	Atmospheric Burners - where higher outlet pressures are needed	Increase in voltage corresponds to increase in outlet pressure	- -	5 psi (34 kPa)	--	12.5 psi (86 kPa)	Low Fire: spring adjustment 2" - 4.5" w.c. (0.50-1.1 kPa) High Fire: maximum 7" w.c. (1.7 kPa) above minimum setting
MR212D MR212E MR212G MR212J	0.4	Direct Fired (Negative Pressure) Burners	Increase in voltage corresponds to increase in outlet pressure	5 psi** (34 kPa)	5 psi (34 kPa)	--	12.5 psi (86 kPa)	Low fire: adjustable orifice bypass High fire: spring adjustment High Fire Setting: Std. model: 2 - 5" w.c. (0.50-1.25 kPa) "2" model: 2" - 5" w.c. (0.50-1.25 kPa) reduced to 0-3" w.c. (0-0.75 kPa)
MR410 MR410H-1 MR510 MR510H-1 MR610 MR610H-1	0.4 0.7 0.5 0.85 0.6 1.0	Atmospheric Burners H-1 models for higher outlet pressure (such as for LP applications)	Decrease in voltage corresponds to increase in outlet pressure	1/2 psi** (3.4 kPa)	1 psi (7 kPa)	--	2.5 psi (17 kPa)	Low fire: spring adjustment High fire: spring adjustment Std. model: 3" - 5" w.c. (0.75-1.25 kPa) max-4" w.c. (1.0 kPa) "1" model: min-1.5" w.c. (0.38 kPa) max-4" w.c. (1.0 kPa) 'H-1' model: min outlet pressure = 1.75" w.c. (0.44 kPa) max outlet pressure = 11" w.c. (2.7 kPa) NOTE: 'H-1' models: 7.5" to 12" w.c. (1.87 to 3 kPa) max outlet pressure

* Where no ANSI standard currently exists, Maxitrol Controls have been CSA tested for use as a component of Maxitrol Selectra® systems.

**CSA Rated Inlet Pressures are established by ANSI Z21.18, CSA 6.3, and CSA 6.5 standards where applicable.

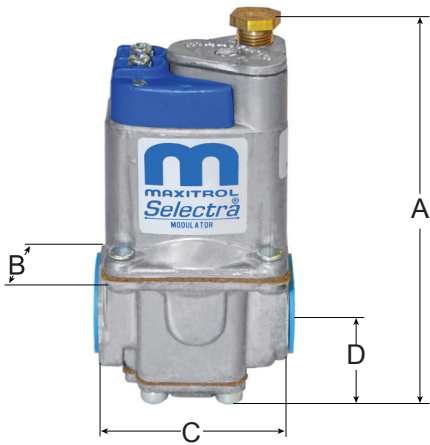
M/MR SERIES

Modulating Valves

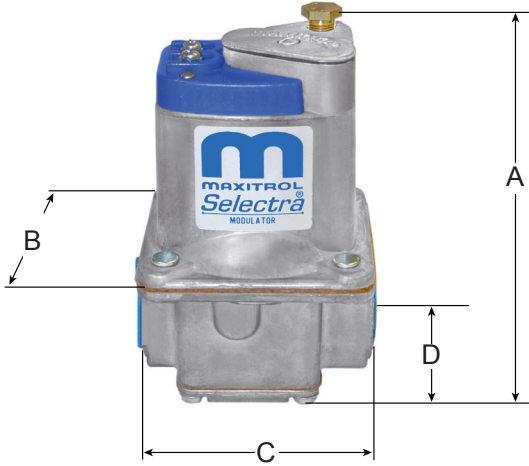
Dimensions

Model	Swing Radius	Dimensions - Expressed in Inches (mm)			
		A	B	C	D
MR410, MR410H-1, M411, M420, M420H, M451	3.1 (79)	3.9 (100)	2 (51)	2.5 (54)	0.9 (24)
MR510, MR510H-1, M511, M520, M520H, M551	4.3 (109)	5.3 (135)	3.25 (83)	3.4 (86)	1.2 (30)
MR610, MR610H-1, M620, M620H, M651	5.7 (145)	7.1 (180)	3.9 (99)	4 (102)	1.5 (37)
M611	6.2 (158)	7.7 (196)	3.9 (99)	4 (102)	1.5 (37)

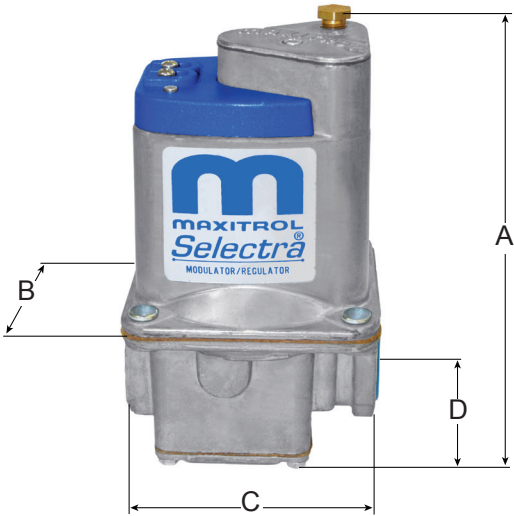
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



MR410, MR410H-1, M411,
M420, M420H, M451



MR510, MR510H-1, M511,
M520, M520H, M551

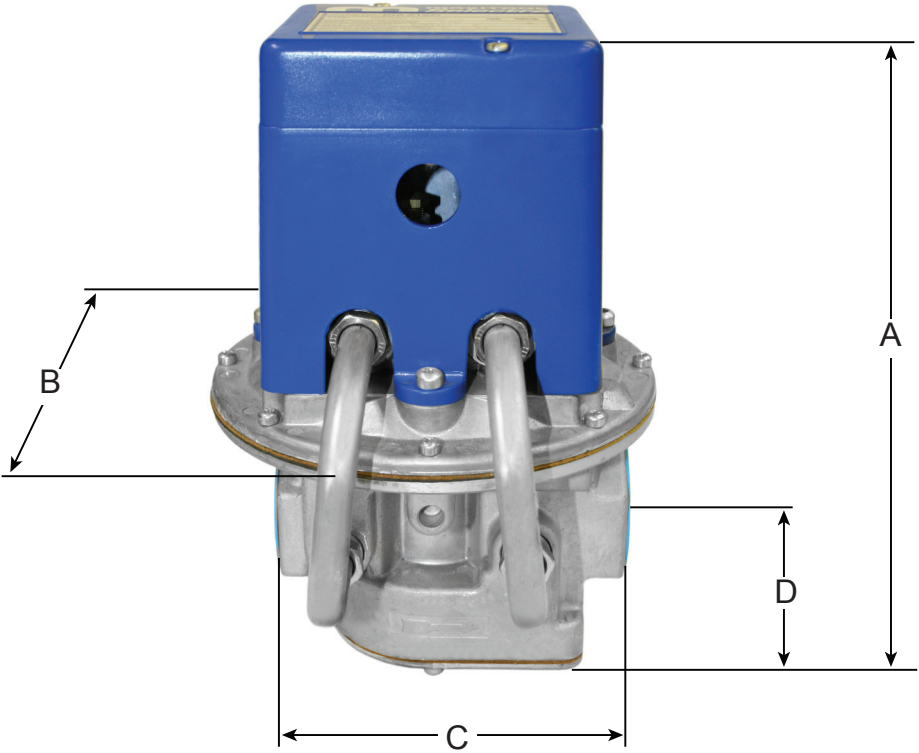


MR610, MR610H-1, M611,
M620, M620H, M651

Dimensions

Model	Swing Radius	Dimensions - Expressed in Inches (mm)			
		A	B	C	D
MR212D, MR251D	8.1 (206)	10.2 (259)	7 (178)	5.5 (140)	2.3 (59)
MR212E, MR251E	8.6 (218)	11.25 (286)	9.1 (232)	8 (203)	3 (76)
MR212G, MR251G	10.4 (264)	14.75 (375)	13.5 (343)	11.75 (298)	4.6 (118)
MR212J	--	24 (610)	21.5 (546)	13.9 (352)	5.9 (149)

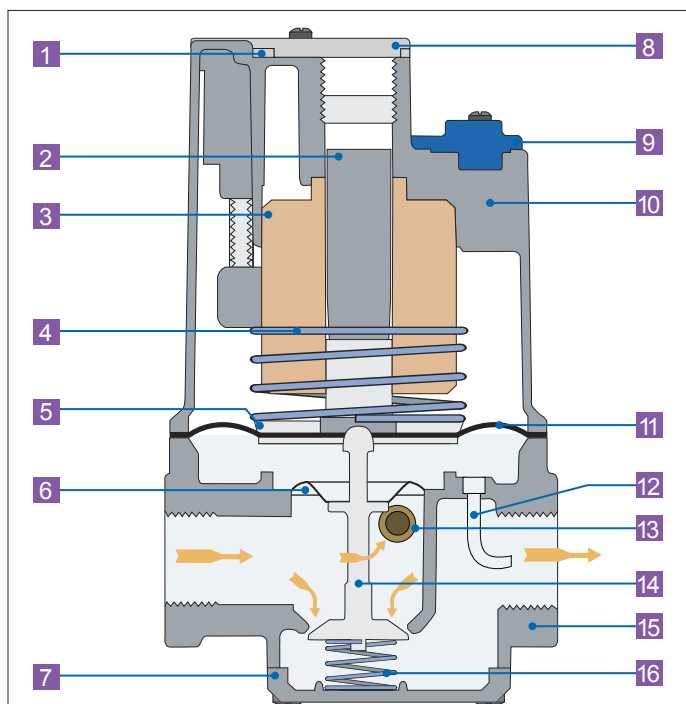
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve. Actual production dimensions may vary somewhat from those shown.



M/MR SERIES

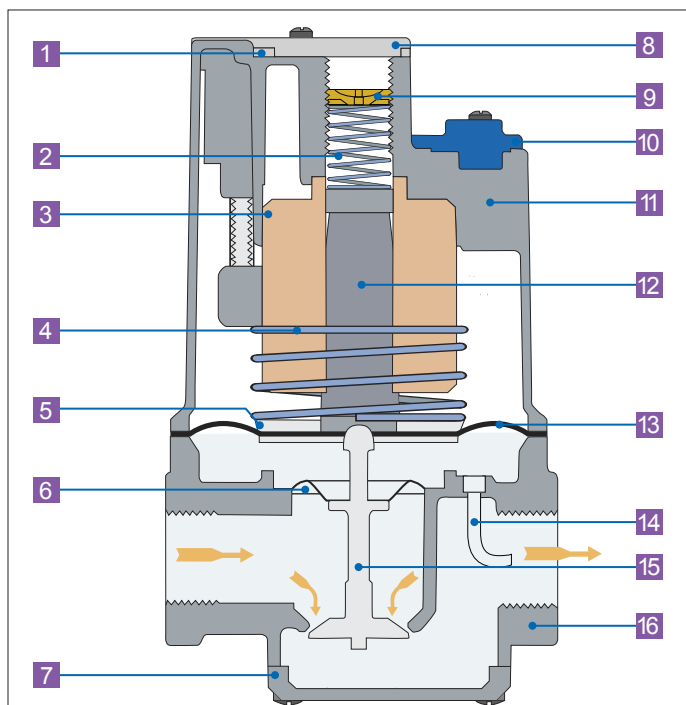
Modulating Valves

M Series



- | | | | |
|----|---------------------|----|----------------|
| 1 | Seal Cap Gasket | 11 | Diaphragm |
| 2 | Plunger | 12 | Sensing Tube |
| 3 | Solenoid | 13 | Bypass |
| 4 | Spring | 14 | Stem and Valve |
| 5 | Diaphragm Plates | 15 | Bottom Housing |
| 6 | Balancing Diaphragm | 16 | Counter Spring |
| 7 | Bottom Plate | | |
| 8 | Seal Cap | | |
| 9 | Wire Terminal | | |
| 10 | Top Housing | | |

MR Series

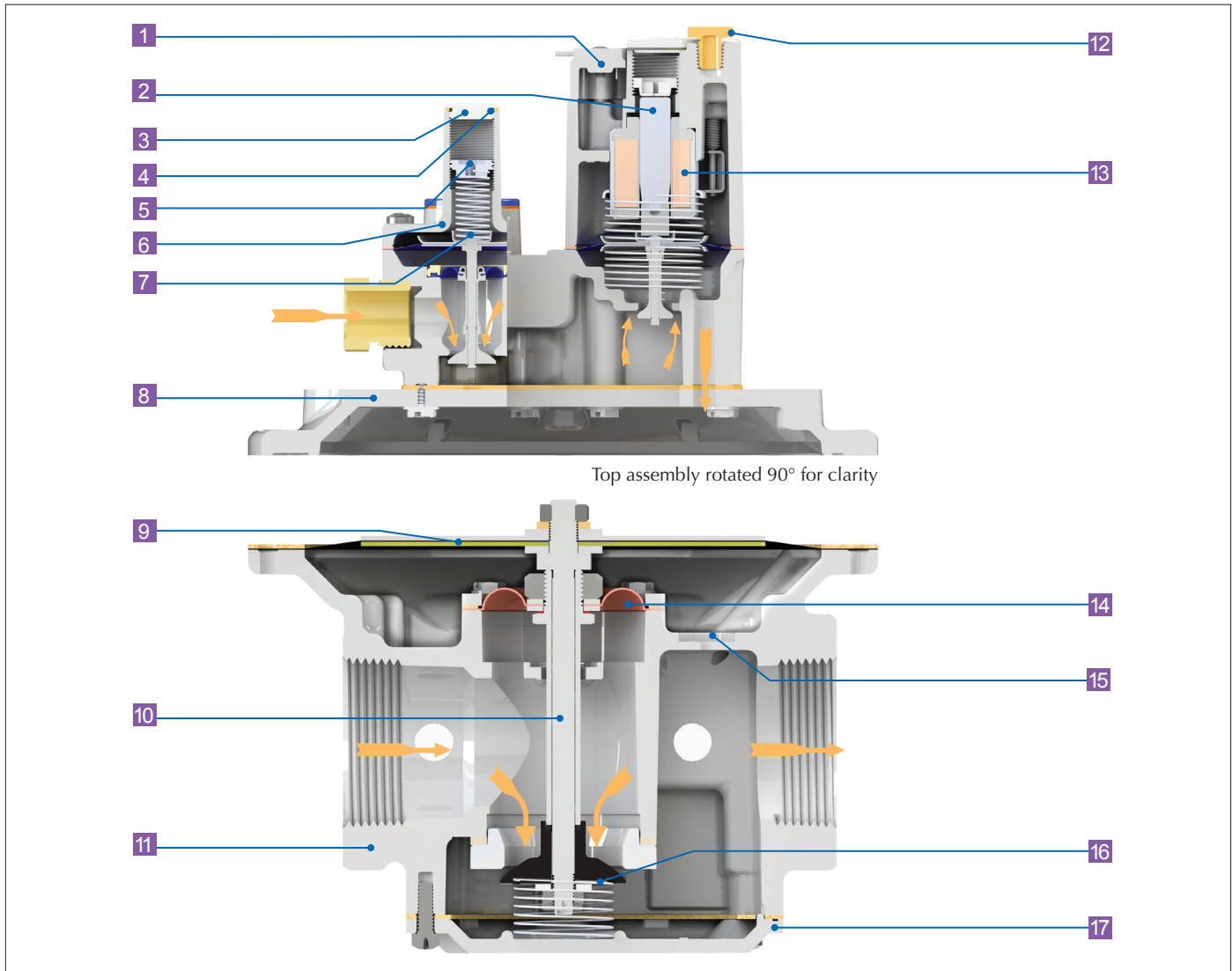


- | | | | |
|----|---------------------|----|----------------|
| 1 | Seal Cap Gasket | 11 | Top Housing |
| 2 | Plunger | 12 | Plunger |
| 3 | Solenoid | 13 | Diaphragm |
| 4 | Spring | 14 | Sensing Tube |
| 5 | Diaphragm Plates | 15 | Stem and Valve |
| 6 | Balancing Diaphragm | 16 | Bottom Housing |
| 7 | Bottom Plate | | |
| 8 | Seal Cap | | |
| 9 | Adjusting Screw | | |
| 10 | Wire Terminal | | |

NOTE: Diagrams are graphical representations only and may differ from actual product.

NOTE: Maxitrol offers application specific control systems for M/MR Series valves. Consult Maxitrol or see MMR_MT_EN to determine which system suits your application.

MR212



NOTE: Diagrams are graphical representations only and may differ from actual product.

1	Wire Terminal	8	Top Housing	15	Sensing Hole
2	Plunger	9	Regulating Diaphragm	16	Counter Spring
3	Seal Cap	10	Main Stem and Valve	17	Bottom Plate
4	Seal Cap Gasket	11	Bottom Housing		
5	Adjusting Screw	12	Vent Limiter		
6	Stack	13	Solenoid		
7	High Fire Spring	14	Balancing Diaphragm		

SIZING A REGULATOR

See www.maxitrol.com for our Regulator Sizing Program. Please contact Maxitrol directly for more information on sizing a regulator.

System Requirements

When sizing a regulator the following must be known:

- Gas Type
- Available Inlet Pressure
- Desired Outlet Pressure
- Zero Governor Application (indicated by model number ending in “Z”)
- Will the regulator control main burner and pilot load OR main burner only?
- Required minimum and maximum flow rate in cfh or m³/h or Btu/h
- Pipe Size

In most cases, the manifold pipe size has already been selected on the basis of good engineering practice, and the regulator pipe size should conform to this size.

The capacity of any regulator is not an absolute value but will vary with the application depending on the prevailing differential pressure.

⚠ WARNING

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All Maxitrol products should be installed and operated in accordance with Maxitrol Safety Warning Instructions.

HOW TO CALCULATE PRESSURE DROP AT VARIOUS FLOW RATES FROM CAPACITY CHART

LP Applications - When using natural gas pressure drop chart to determine LP pressure drop in terms of Btu/h, multiply NAT Btu/h by 1.61; in terms of CFH multiply NAT CFH by 0.645.

Formula: $P_2 = P_1 \times (Q_2/Q_1)^2$

P2 = Pressure drop at desired flow rate
P1 = Known pressure drop

Q2 = Desired flow rate
Q1 = Known flow rate

A. Check Capacity Chart, ensuring regulator has ample range of regulation and individual load capacities (for use with pilot) for the application.

B. Know the minimum encountered inlet pressure. MINIMUM INLET PRESSURE MINUS “P2” MUST BE GREATER THAN DESIRED OUTLET PRESSURE. Solve for “P2” using the formula above. (See examples on page 59.)

Sizing Examples

RUBBER SEAT POPPETS

For main burner and pilot load applications.

Example: To select an RV type regulator:

- Known: Single 150,000 Btu/h main burner; pipe size 1/2"; inlet pressure 7" w.c.; outlet pressure 4" w.c.
- Solution: The RV48 (1/2") has a maximum capacity of 230,000 Btu/h and a maximum individual load of 160,000 Btu/h. The pressure drop at a flow rate of 150,000 Btu/h is 0.4" w.c., well below the available differential of 3" w.c. The RV48 (without "L" fixed orifice) is the correct regulator to use for the application.

STRAIGHT-THRU-FLOW (S-T-F)

For main burner only applications not requiring a lockup type regulator. When sizing the S-T-F series, it is recommended that pressure drop not exceed 1/2 of available differential pressure.

Example: To select an RV type regulator:

- Known: Flow rate 2,000,000 Btu/h; pipe size 1 1/4"; inlet pressure 9" w.c.; outlet pressure 5" w.c.
- Solution: The RV81 (1 1/4") has a maximum capacity of 2,500,000 Btu/h. The pressure drop at a flow of 2,000,000 Btu/h is 0.66" w.c. The RV81 (1 1/4") is the correct regulator to use with this application. The pressure drop of the RV61 (1 1/4") at a flow rate of 2,000,000 Btu/h is 2.64" w.c. This is within the available differential but exceeds the recommended 50% maximum.

LEVER ACTING

For main burner and pilot load application requiring positive dead-end lockup (see Definitions page 63).

Example: To select a 325 series regulator:

- Known: Single 145,000 Btu/h burner; pipe size 1/2"; inlet pressure 2 psi; outlet pressure 7" w.c.
- Solution: The 325-3's pressure drop at a flow rate of 145,000 Btu/h is 7" w.c., well below the available differential of 1 3/4 psi. However, the Maximum Individual Load for the 325-3 is only 100,000 Btu/h. The 325-5 (1/2") is the correct regulator to use with this application.

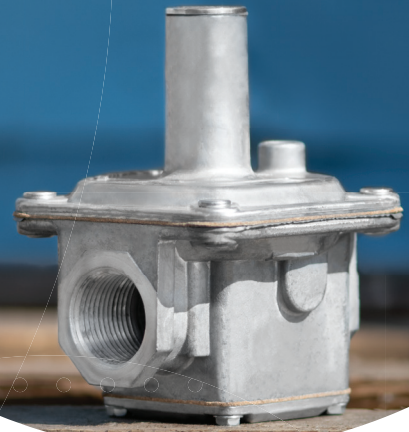
BALANCED VALVE

For main burner and pilot load application requiring a lockup type regulator or zero governor usage (see Definitions page 63).

Example: To select a 210 or R/RS series regulator:

- Known: Desired flow rate 6,000,000 Btu/h; pipe size 1 1/2"; inlet pressure 1 psi; outlet pressure 9" w.c.
- Solution: The 210E (1 1/2") has a maximum capacity of 10,000,000 Btu/h. The 210D (1 1/2") has a capacity of 6,000,000 Btu/h. Therefore, the 210E (1 1/2") will give you the desired outlet pressure of 9" w.c. and is the correct regulator to use for the application.

MAXITROL®



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