

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.



RZ and 210Z

Zero Governor Design

Both the RZ and 210Z series are adaptable for air-gas mixing applications. Because of the balanced valve construction, Z models offer superior performance at an economical price compared with other types of atmospheric regulators.

Maxitrol's RZ and 210Z zero governor model regulators are used for flow control of burners, nozzle mixers, mixing tees and proportional premixers.



Specifications

Pipe Sizes	RZ Models: 3/8" to 1 1/4" threaded connections with NPT or ISO 7-1 threads. 210Z Models: 1" to 3" threaded connections with NPT or ISO 7-1 threads. 4" 125 lb. flange (210JZ only).
Housing Material	R400Z, R500Z, R600Z, R700Z, 210DZ, 210EZ, 210GZ, 210JZ: aluminum.
Mounting	R400Z, R700Z, 210DZ, 210EZ, 210GZ, 210JZ mount in an upright position only. R500Z, R600Z, suitable for multi-positional mounting. If a v Limit [®] or v Protect [®] is installed, mount in an upright horizontal position only.
	NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).
Certifications	R400Z, R500Z, R600Z, R700Z, 210DZ, 210EZ, 210GZ: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.
Fuel Gases	Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.
Rated Inlet Pressure	CSA Certified: R400Z, R500Z, R600Z: 1/2 psi (3.4 kPa); R700Z, 210DZ, 210EZ, 210GZ: 5 psi (34.5 kPa)
Maxitrol Tested	R400Z, R500Z, R600Z: 1 psi (6.9 kPa); 210JZ: 5 psi (34.5 kPa)
Emergency Exposure Limits	R400Z, R500Z, R600Z, R700Z: 12.5 psi (86 kPa) 210DZ, 210EZ, 210GZ, 210JZ: 25 psi (172 kPa)
Ambient Temperature Ranges	R400Z, R600Z, R700Z: -40 to 205°F (-40 to 96°C) R500Z: 32 to 205°F (0 to 96°C) 210DZ, 210EZ, 210GZ, 210JZ: -40 to 200°F (-40 to 93°C)
Sensing Taps	R700Z, 210Z Models have convenient tap locations available for downstream sensing, cross connections, and differential control. Four locations can be tapped and plugged for measuring pressure.
Remote Sensing	R700Z, 210DZ, 210EZ, 210GZ models may be ordered with remote sensing. The internal sensing tube is omitted and external sensing taps are provided. Add suffix letter "R" to model number when ordering.
Minimum Regulation	R400Z: Suitable for pilot flow applications. (P) (Circle P) (0.15 CFH NG), R500Z, R600Z, R700Z: 10 CFH.
Low-Fire By-Pass	With the main valve closed, an adjustable by-pass provides a minimum firing rate. Add suffix "L" (left side), "R" (right side), or "B" (both sides) when ordering.
Model Designations	(F) Factory-set; fixed non-adjustable regulator. Welch plug replaces seal cap. (M) B.S.P. - PL parallel thread - conforms to ISO 7-1, where pressure tight joints are made on the threads.

Capacities and Pressure Drop



Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Pressure Drop - inches w.c. (kPa)											By-Pass (L & R Suffix Only)
		0.2 (0.05)	0.4 (0.10)	0.6 (0.15)	0.8 (0.20)	1.0 (0.25)	1.5 (0.37)	2.0 (0.50)	2.5 (0.62)	3.0 (0.75)	3.5 (0.87)	4.0 (1.0)	
R400Z	3/8" x 3/8"	77 (2.16)	110 (3.08)	134 (3.75)	155 (4.34)	174 (4.87)	212 (5.94)	245 (6.86)	274 (7.67)	--	--	--	5-90 (0.14-2.5)
	1/2" x 1/2"	86 (2.41)	121 (3.39)	148 (4.14)	172 (4.82)	192 (5.38)	235 (6.58)	271 (7.59)	303 (8.48)	--	--	--	
R500Z	1/2" x 1/2"	163 (4.56)	231 (6.47)	283 (7.92)	327 (9.16)	366 (10.3)	447 (12.5)	516 (14.6)	577 (16.2)	635 (17.8)	685 (19.2)	730 (20.4)	10-125 (0.28-3.5)
	3/4" x 3/4"	196 (5.49)	277 (7.76)	340 (9.52)	392 (11.0)	438 (12.3)	537 (15.0)	620 (17.4)	693 (19.4)	760 (21.3)	820 (22.7)	876 (24.5)	
R600Z	3/4" x 3/4"	298 (8.34)	421 (11.8)	516 (14.5)	595 (16.7)	666 (18.7)	816 (22.9)	942 (26.4)	1054 (29.5)	1150 (32.2)	1245 (34.9)	1335 (37.4)	10-330 (0.28-9.3)
	1" x 1"	330 (9.24)	468 (13.1)	572 (16.0)	661 (18.2)	739 (20.7)	906 (25.4)	1046 (29.3)	1169 (32.7)	1280 (35.8)	1380 (38.6)	1480 (41.4)	
R700Z	1" x 1"	360 (10.2)	510 (14.4)	620 (17.6)	720 (20.4)	800 (22.7)	980 (27.8)	1130 (32.0)	1270 (36.0)	1390 (39.4)	1500 (42.5)	1600 (45.3)	10-330 (0.28-9.3)
	1 1/4" x 1 1/4"	670 (19.0)	800 (22.7)	880 (24.9)	950 (26.9)	1000 (28.3)	1230 (34.8)	1410 (39.9)	1580 (44.7)	1730 (49.0)	1870 (53.0)	2000 (56.6)	

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums.
See pages 58-59 for Regulator Sizing Requirements and Examples.

NOTE: Consult Maxitrol for UL certifications.

Model	Pressure Drop - inches w.c. (kPa) unless noted
	By-Pass (L & R Suffix Only)
R400Z	5 - 90 (0.14 - 2.5)
R500Z	10 - 125 (0.28 - 3.5)
R600Z	10 - 330 (0.28 - 9.3)
R700Z	10-330 (0.28-9.3)

By-pass flow maximum calculated at a pressure drop. (Delta P) = 3.5" w.c. (single by-pass)

RZ and 210Z

Zero Governor Design

Capacities and Pressure Drop

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Pressure Drop - inches w.c. (kPa) unless noted										
		0.1 (0.025)	0.3 (0.075)	0.5 (0.125)	1.0 (0.25)	3.0 (0.75)	5.0 (1.25)	7.0 (1.74)	0.5 psi (3.45)	0.75 psi (5.17)	1 psi (6.89)	1.5 psi (10.34)
210DZ	1" x 1"	--	--	--	900 (25.2)	1600 (44.8)	2000 (56.0)	2400 (67.2)	3300 (92.4)	4100 (115)	4750 (133)	5800 (162)
	1 1/4" x 1 1/4"	--	--	--	1100 (30.8)	1900 (53.2)	2500 (70.0)	2900 (81.2)	4100 (115)	5000 (140)	5850 (164)	7150 (200)
	1 1/2" x 1 1/2"	--	--	--	1200 (33.6)	2100 (58.8)	2700 (75.6)	3200 (89.6)	4500 (126)	5500 (154)	6350 (176)	7750 (217)
210EZ	1 1/2" x 1 1/2"	--	1050 (29.4)	1350 (37.8)	1915 (53.6)	3315 (92.8)	4280 (120)	5065 (142)	7125 (199)	8725 (244)	10075 (282)	12340 (345)
	2" x 2"	--	1210 (33.9)	1560 (43.7)	2210 (61.9)	3825 (107)	4940 (139)	5845 (164)	8225 (230)	10070 (282)	11630 (326)	14245 (399)
210GZ	2 1/2" x 2 1/2"	1410 (39.5)	2450 (68.6)	3160 (88.5)	4470 (125)	7740 (217)	9995 (280)	11825 (331)	16635 (466)	20370 (570)	23525 (659)	28810 (807)
	3" x 3"	1555 (43.5)	2695 (75.5)	3475 (97.3)	4920 (138)	8520 (239)	11000 (308)	13020 (365)	18310 (513)	22425 (628)	25890 (725)	31710 (888)
210JZ	4" x 4"	2700 (75.6)	4700 (132)	6000 (168)	8600 (241)	15000 (420)	19000 (532)	23000 (644)	32000 (896)	40000 (1120)	45500 (1274)	55700 (1560)

NOTE: CSA maximum capacities vary with spring range and pipe size. Please contact Maxitrol directly for CSA maximums. See pages 58-59 for Regulator Sizing Requirements and Examples.

Model	Pressure Drop - inches w.c. (kPa) unless noted
	By-Pass (L Suffix Only)
210DZ	10 - 90 (0.28 - 2.5)
210EZ	10 - 90 (0.28 - 2.5)

By-pass flow maximum calculated at a pressure drop. (Delta P) = 3.5" w.c.

Spring Selection: inches w.c (kPa)

Model	Outlet Pressure Range
R400Z	-1.5 to 1.0 (-0.37 to 0.25)
R500Z	-1.0 to 2.5 (-0.25 to 0.62)
R600Z	-1.0 to 1.5 (-0.25 to 0.37)
R700Z	-1.0 to 1.5 (-0.25 to 0.37)

Model	Outlet Pressure Range
210DZ	-1.0 to 1.5 (-0.25 to 0.37)
210EZ	-1.0 to 1.5 (-0.25 to 0.37)
210GZ	-1.0 to 1.5 (-0.25 to 0.37)
210JZ	-1.0 to 1.5 (-0.25 to 0.37)

NOTE: See pages 56-57 for complete Spring Selection Chart.

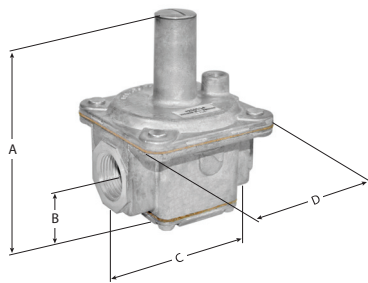
RZ and 210Z

Zero Governor Design

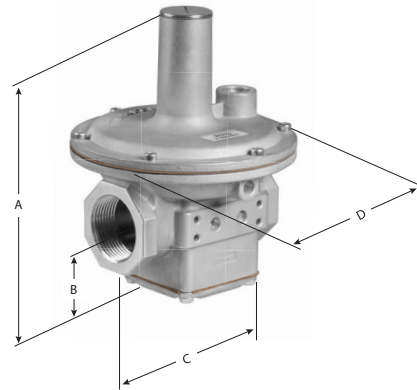
Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions			
				A	B	C	D
R400Z	3/8", 1/2"	1/8" NPT	2.4" (60 mm)	3.3" (83 mm)	0.9" (24 mm)	2" (51 mm)	2" (51 mm)
R500Z	1/2", 3/4"	1/8" NPT	3.6" (90 mm)	4.7" (119 mm)	1.2" (30 mm)	3" (79 mm)	3.1" (79 mm)
R600Z	3/4", 1"	1/8" NPT	4.3" (109 mm)	5.7" (144 mm)	1.5" (37 mm)	4" (102 mm)	3.9" (98 mm)
R700Z	1" , 1 1/4"	3/8" NPT	5.0" (128 mm)	6.9" (176 mm)	1.9" (48 mm)	4.4" (113 mm)	5.4" (139 mm)
210DZ	1", 1 1/4", 1 1/2"	3/8" NPT	5.4" (138 mm)	9" (229 mm)	2.4" (60 mm)	6" (152 mm)	7" (178 mm)
210EZ	1 1/2", 2"	1/2" NPT	8.3" (211 mm)	11.3" (286 mm)	2.9" (75 mm)	8" (203 mm)	9.1" (232 mm)
210GZ	2 1/2", 3"	3/4" NPT	11.9" (302 mm)	16.5" (419 mm)	4.6" (116 mm)	11.8" (300 mm)	13.5" (343 mm)
210JZ	4"	3/4" NPT	18.4" (467 mm)	24.3" (616 mm)	5.4" (138 mm)	13.8" (349 mm)	18" (457 mm)

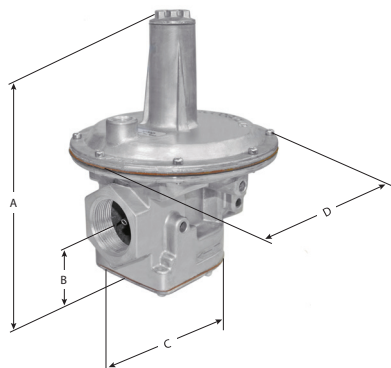
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve.
Actual production dimensions may vary somewhat from those shown.



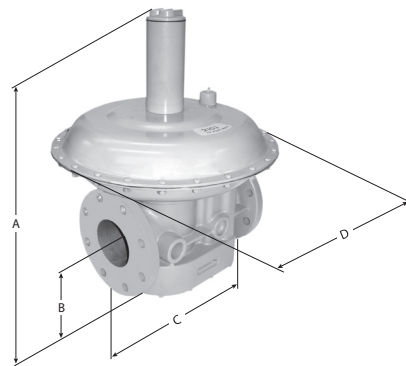
R400Z, R500Z, R600Z



R700Z



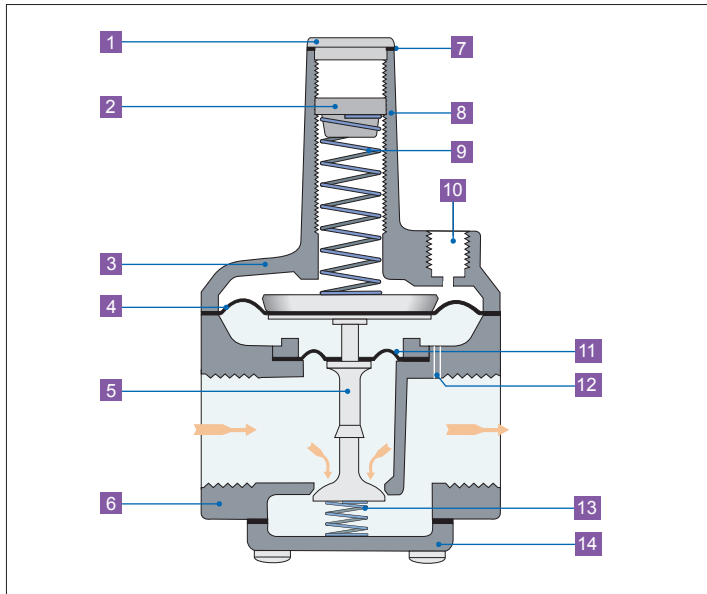
210DZ, 210EZ, 210GZ



210JZ

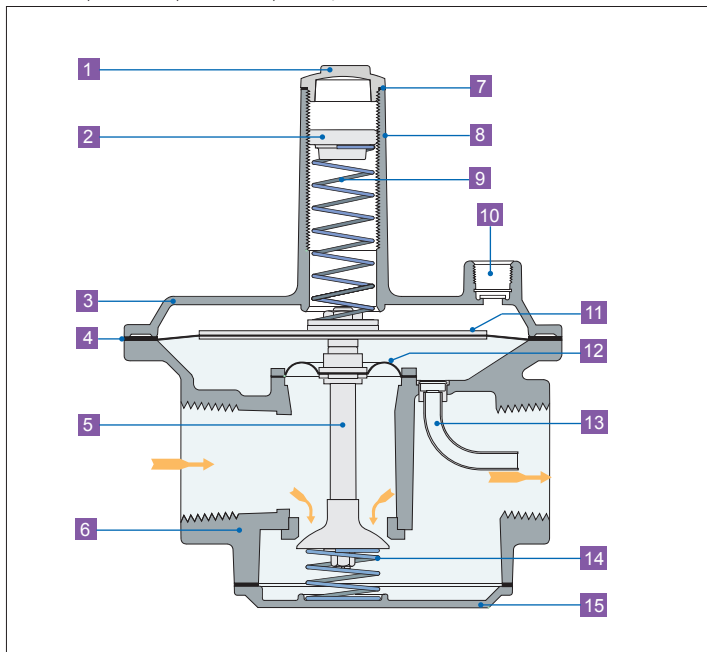
Zero Governor Design

R400Z, R500Z, R600Z, R700Z



- 1 Welch Plug or Seal Cap
- 2 Adjusting Screw
- 3 Top Housing
- 4 Regulating Diaphragm
- 5 Stem & Valve
- 6 Bottom Housing
- 7 Seal Cap Gasket
- 8 Stack
- 9 Spring
- 10 Vent Connection
- 11 Balancing Diaphragm
- 12 Sensing Hole
- 13 Counter Spring
- 14 Bottom Plate

210DZ, 210EZ, 210GZ, 210JZ



- 1 Welch Plug or Seal Cap
- 2 Adjusting Screw
- 3 Top Housing
- 4 Regulating Diaphragm
- 5 Stem & Valve
- 6 Bottom Housing
- 7 Seal Cap Gasket
- 8 Stack
- 9 Spring
- 10 Vent Connection
- 11 Diaphragm Plates
- 12 Balancing Diaphragm
- 13 Sensing Tube
- 14 Counter Spring
- 15 Bottom Plate

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

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.

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

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.

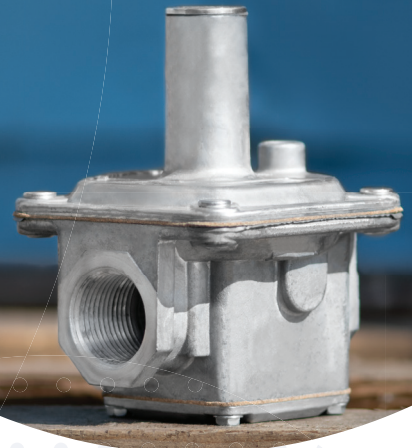
BALANCED VALVE

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.

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